



SITE OFFICE ADDRESS

BRIDGE AND ROOF CO. (INDIA) LIMITED

BANDEL ROB PROJECT SITE,
OPP.ROTARY HOOGHLY EYE HOSPITAL
P.O.- ADCCONAGAR, P.S.- MOGRA, DIST.- HOOGHLY,
WEST BENGAL, PIN - 712121

“CONSTRUCTION OF BITUMINOUS SERVICE ROAD, MAIN ROAD AND BOTH SIDE APPROACHES OF RE WALL, ROAD MARKING, TRAFFIC SIGNALS, REPAIRING OF POT HOLES ETC. WITH ALL MATERIAL, MACHINERY & MANPOWER ON SUBCONTRACT BASIS IN CONNECTION WITH CONSTRUCTION OF ROAD OVER BRIDGE (ROB) INCLUDING APPROACH ROAD FROM STKK ROAD TOWARDS BANDEL CARSHED ROB, SERVICE ROAD, FOOTPATH, ROAD SIGNAGE, DRAINAGE ETC. IN LIEU OF LEVEL CROSSING 1A/3T AT BANDEL CARSHED ON BANDEL-KATWA BROAD GAUGE RAIL LINE, AT CHINAGE 631.8 KMP ON GRAND TRUNK ROAD IN THE DISTRICT HOOGHLY IN WEST BENGAL”.

TENDER NO. : BR / BANDEL / 51073 / NIT/ ROAD WORK DATE – 08/02/2024

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BANDEL ROB PROJECT SITE,
OPP.ROTARY HOOGHLY EYE HOSPITAL
P.O.- ADCCONAGAR, P.S.- MOGRA, DIST.- HOOGHLY,
WEST BENGAL, PIN - 712121

TENDER DOCUMENT

FOR

“CONSTRUCTION OF BITUMINOUS SERVICE ROAD, MAIN ROAD AND BOTH SIDE APPROACHES OF RE WALL, ROAD MARKING, TRAFFIC SIGNALS, REPAIRING OF POT HOLES ETC. WITH ALL MATERIAL, MACHINERY & MANPOWER ON SUBCONTRACT BASIS IN CONNECTION WITH CONSTRUCTION OF ROAD OVER BRIDGE (ROB) INCLUDING APPROACH ROAD FROM STKK ROAD TOWARDS BANDEL CARSHED ROB, SERVICE ROAD, FOOTPATH, ROAD SIGNAGE, DRAINAGE ETC. IN LIEU OF LEVEL CROSSING 1A/3T AT BANDEL CARSHED ON BANDEL-KATWA BROAD GAUGE RAIL LINE, AT CHINAGE 631.8 KMP ON GRAND TRUNK ROAD IN THE DISTRICT HOOGHLY IN WEST BENGAL”.

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BRIDGE AND ROOF CO. (INDIA) LIMITED

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WEST BENGAL, PIN - 712121

ANNEXURE - I

NOTICE INVITING TENDER

NOTICE INVITING TENDER

1. **Single Percentage (%)** Sealed tenders are invited on behalf of Bridge And Roof Co. (India) Limited. (here-in-after called BANDR) for Construction of Bituminous Service Road, Main Road And Both Side Approaches of RE Wall, Road Marking, Traffic Signals, Repairing of Pot Holes etc. with all Material, Machinery & Manpower on Sub-Contract Basis in connection with Construction of Road Over Bridge (ROB) including Approach Road from STKK Road Towards Bandel Carshed ROB, Service Road, Footpath, Road Signage, Drainage etc. in Lieu of Level Crossing 1A/3T at Bandel Carshed on Bandel-Katwa Broad Gauge Rail Line, At Chinage 631.8 Kmp on Grand Trunk Road in the District Hooghly in West Bengal on Sub Contract Basis in connection with our Bandel ROB project Site, Bandel, Hooghly – 712121 (W.B).
2. The Chairman cum Managing Director (CMD) / Director (Project Management) of BANDR shall be the Accepting Officer here-in-after referred to as such for the purpose of this Contract.
3. A tenderer shall quote in figures as well as in words rate(s) tendered. In case of any discrepancy between the two, rate(s) quoted in words shall prevail. In case of discrepancy between quoted rate and amount, rate shall prevail.
4. Submission of a tender by a tenderer implies that he has read this notice and all other Tender Documents and has made himself aware of the scope of work to be done and of conditions of contract and local conditions and other factors having bearings on execution of the work.
- 5.

Tender Fees : Rs. 2000/- + GST 18% = **Rs.2360.00** (Rupees Two Thousand Three Hundred Sixty Only) in form of **DD/Pay order/ Banker's Cheque drawn on any nationalized Bank, in favour of Bridge And Roof Co. (India) Ltd., payable at Kolkata.** MSME bidder will not be exempted from submission of Tender Fees.

Earnest Money Deposit: **Rs. 4,00,000/-** (Rupees Four lakhs only) in form of **DD/Pay order/ Banker's Cheque drawn on any nationalized Bank, in favour of Bridge And Roof Co. (India) Ltd., payable at Kolkata.** MSME bidder will not be exempted from submission of EMD.

The E.M.D. of unsuccessful bidders will be refunded / returned after finalization of tender or the expiry of the tender validity Period whichever is earlier. Unless otherwise stated elsewhere in tender document, the E.M.D. of successful bidder(s) will be kept as initial security deposit after awarding of the job which will be adjusted from Retention Money.

6. Tenderer, while submitting tender, should not make any deviation to the terms and conditions stipulated in this tender document. In case any tenderer make any deviation to the terms and conditions, such tender may be liable to be rejected.
7. BANDR does not bind themselves to accept the lowest or any tender and BANDR shall not assign any reason for non – acceptance and / or rejection of any and / or not to award the work or part of work to any tenderer.
8. Bid shall be submitted in two parts
Part – I : Containing one copy each of following documents:
 - a. **Bidder's Covering letter of offer.**
 - b. Signed & stamped NIT documents (comprising of total documents-all pages) including documents related to Qualifying criteria as per Annexure-II of the Tender Document & un-priced part with the word "**quoted**" written against each item.
 - c. "**No Deviation Certificate**" in prescribed format in Bidder's Letter Head.
9. Part – II : Containing original priced offer in the prescribed format of the tender document duly signed and stamped.

Part - I & Part - II shall be submitted in separate sealed envelopes and to be put in one outer cover and cloth bound and sealed. Both inner and outer covers shall be superscribed as follows:-

Annexure - I

Part – I: Techno-Commercial bid for “Construction of Bituminous Service Road, Main Road And Both Side Approaches of RE Wall, Road Marking, Traffic Signals, Repairing of Pot Holes etc. with all Material, Machinery & Manpower on Sub-Contract Basis in connection with Construction of Road Over Bridge (ROB) including Approach Road from STKK Road Towards Bandel Carshed ROB, Service Road, Footpath, Road Signage, Drainage etc. in Lieu of Level Crossing 1A/3T at Bandel Carshed on Bandel-Katwa Broad Gauge Rail Line, At Chinage 631.8 Kmp on Grand Trunk Road in the District Hooghly in West Bengal on Sub Contract Basis in connection with our Bandel ROB project Site, Bandel, Hooghly – 712121 (W.B).”

Part - II: Priced Offer for “Construction of Bituminous Service Road, Main Road And Both Side Approaches of RE Wall, Road Marking, Traffic Signals, Repairing of Pot Holes etc. with all Material, Machinery & Manpower on Sub-Contract Basis in connection with Construction of Road Over Bridge (ROB) including Approach Road from STKK Road Towards Bandel Carshed ROB, Service Road, Footpath, Road Signage, Drainage etc. in Lieu of Level Crossing 1A/3T at Bandel Carshed on Bandel-Katwa Broad Gauge Rail Line, At Chinage 631.8 Kmp on Grand Trunk Road in the District Hooghly in West Bengal on Sub Contract Basis in connection with our Bandel ROB project Site, Bandel, Hooghly – 712121 (W.B).”

Outer most cover: Shall be superscribed with offer for “Construction of Bituminous Service Road, Main Road And Both Side Approaches of RE Wall, Road Marking, Traffic Signals, Repairing of Pot Holes etc. with all Material, Machinery & Manpower on Sub-Contract Basis in connection with Construction of Road Over Bridge (ROB) including Approach Road from STKK Road Towards Bandel Carshed ROB, Service Road, Footpath, Road Signage, Drainage etc. in Lieu of Level Crossing 1A/3T at Bandel Carshed on Bandel-Katwa Broad Gauge Rail Line, At Chinage 631.8 Kmp on Grand Trunk Road in the District Hooghly in West Bengal on Sub Contract Basis in connection with our Bandel ROB project Site, Bandel, Hooghly – 712121 (W.B).”

(NITNo . :BR / BANDEL / 51073 / NIT/ ROAD WORK DATE – 08/02/2024)” and shall be addressed to:-

To,
The Dy. Resident Manager,
Bridge And Roof Co. (India) Ltd.,
Bandel ROB Project Site,
Opp.Rotary Hooghly Eye Hospital
P.O.- Adconagar, P.S.- Mogra
Dist.- Hooghly, West Bengal,
Pin - 712121

and should reach his office as mentioned above on or before 22/02/2024 and within 4.00 P.M. Due date of submission shall be written on all the covers / envelopes of the bid without fail.

10. Tender submitted by tenderers shall remain valid for acceptance for period 90 (Ninety) days from the date set for submission of the tender. The tendered shall not be entitled within the said period of 90 (Ninety) days to revoke or cancel or vary / alter the tender given or any of its item thereof, without the consent of BANDR.
11. Incomplete tender and tender received later than the due date of submission of the tender shall be rejected.

For and on behalf of Bridge And Roof Co. (India) Limited

**(N.Podar)
Dy. Resident Manager**

BRIDGE AND ROOF CO. (INDIA) LTD.

FORMAT FOR NO DEVIATION CERTIFICATE

[To be submitted in Bidders Letter Head]

To,
The Dy. Resident Manager,
Bridge And Roof Co. (India) Ltd.,
Bandel ROB Project Site,
Opp: Rotary Hooghly Eye Hospital
P.O.-Adconagar, P.S.- Mogra,
Dist.- Hooghly, West Bengal, Pin – 712121

Subject: No Deviation Certificate for "CONSTRUCTION OF BITUMINOUS SERVICE ROAD, MAIN ROAD AND BOTH SIDE APPROACHES OF RE WALL, ROAD MARKING, TRAFFIC SIGNALS, REPAIRING OF POT HOLES ETC. WITH ALL MATERIAL, MACHINERY & MANPOWER ON SUBCONTRACT BASIS IN CONNECTION WITH CONSTRUCTION OF ROAD OVER BRIDGE (ROB) INCLUDING APPROACH ROAD FROM STKK ROAD TOWARDS BANDEL CARSHED ROB, SERVICE ROAD, FOOTPATH, ROAD SIGNAGE, DRAINAGE ETC. IN LIEU OF LEVEL CROSSING 1A/3T AT BANDEL CARSHED ON BANDEL-KATWA BROAD GAUGE RAIL LINE, AT CHINAGE 631.8 KMP ON GRAND TRUNK ROAD IN THE DISTRICT HOOGHLY IN WEST BENGAL".

TENDER NO. : BR / BANDEL / 51073 / NIT/ ROAD WORK DATE – 08/02/2024

Dear Sir,

With reference to above this is to confirm that as per Tender conditions we have visited Site before submission of our Offer and noted the job content and site condition etc. We also confirm that we have not changed/modified the above tender document and in case of observance of the same at any stage it shall be treated as null and void.

We hereby also confirm that we have not taken any deviation from Tender Clause together with other reference as enumerated in the above referred Notice Inviting Tender and we hereby convey our unqualified acceptance to all terms & conditions as stipulated in the Tender Document.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit the deviations shall stand null and void.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized
Representative of the Tenderer)

BRIDGE AND ROOF CO. (INDIA) LIMITED
BANDEL ROB PROJECT SITE,
OPP.ROTARY HOOGHLY EYE HOSPITAL
P.O.- ADCCONAGAR, P.S.- MOGRA, DIST.- HOOGHLY,
WEST BENGAL, PIN - 712121

TENDER NO. : BR / BANDEL / 51073 / NIT/ ROAD WORK DATE – 08/02/2024

ANNEXURE - II

QUALIFYING CRITERIA

QUALIFYING CRITERIA

Qualifying Criteria for participating in the Tender for "Construction of Bituminous Service Road, Main Road And Both Side Approaches of RE Wall, Road Marking, Traffic Signals, Repairing of Pot Holes etc. with all Material, Machinery & Manpower on Sub-Contract Basis in connection with Construction of Road Over Bridge (ROB) including Approach Road from STKK Road Towards Bandel Carshed ROB, Service Road, Footpath, Road Signage, Drainage etc. in Lieu of Level Crossing 1A/3T at Bandel Carshed on Bandel-Katwa Broad Gauge Rail Line, At Chinage 631.8 Kmp on Grand Trunk Road in the District Hooghly in West Bengal on Sub Contract Basis in connection with our Bandel ROB project Site, Bandel, Hooghly – 712121 (W.B)."

Ref. TENDER NO. : BR / BANDEL / 51073 / NIT/ ROAD WORK DATE – 08/02/2024

1. Qualifying Criteria for participation in Tender :-

- a) The Tenderer should have successfully executed one 'similar nature' of job valuation not less than **Rs. 160.00 lakhs** or two similar jobs each of costing not less than **Rs. 100.00 lakhs** or three similar jobs each of costing not less than **Rs. 80.00 lakhs** during last 7(Seven) years reckoned from the last date of submission of offer.

Note: "Similar Work" shall means "a Project comprising Construction of Road Work inclusive of Civil Works etc. in any Industrial / Infrastructure Sector or any type of Road work during last 07 (Seven) years ending last day of the month previous to the one in which bids are invited.

"Completed" means that work of above value (Executed Gross Value) or till Gross Value of Work executed (in case of running work) should have been completed ending last day of the month previous to the one in which bids are invited.

- b) Avg. Annual Turnover during the last three financial years should not be less than **Rs.60.00 Lakhs**. Copy of Audited Balance Sheet(s) alongwith Turnover Certificate duly signed by Chartered Accountant with his / her Seal, Signature & Registration Number for last 03 (Three) financial years ending **31.03.2023**. The year in which no Turnover is shown, would also be considered for working out the average. **Turnover should be of the Bidding Company and not for Subsidiary / Associate Company / Group Company etc.**
- c) The bidder must have PAN issued by Competent Authority.
- d) The bidder must have GST Registration Certificate issued by Competent Authority.

Note: Bidder should submit the copy of last filed Monthly / Quarterly GSTR-3B return as GST clearance Certificate along with GST Registration Certificate with offer / bid failing which their offer will not be considered for further evaluation.

- e) The bidder must be P. F. & ESIC registered.
[If not registered with the Concerned Department, then the Bidder should give a declaration in their Letter head alongwith Techno Commercial part of their Offer towards submission of the same within one month of award of Work and before releasing any Payment in their favour].

2. Details to be furnished by the Tenderer:

The Tenderer should furnish the following details seriatim as under:-

- a) Name, Address, details of the Organization.
- b) **Copy of Completion Certificate along with** corresponding LOI/WO or any other documents mentioned in above duly certified by Client's substantiating the above nature as well as **Executed Value of Work & Completion Date**.
- c) Copy of Audited Balance Sheet(s) alongwith Turnover Certificate duly signed by Chartered Accountant with his / her Seal, Signature & Registration Number for last 03 (Three) financial years ending **31.03.2023**. The year in which no Turnover is shown, would also be considered for working out the average. **Turnover should be of the Bidding Company and not for Subsidiary / Associate Company / Group Company etc.**

- d) **Photo Copy of PAN Card issued by Income Tax Authority.**
- e) **Photo Copy of GST Registration Certificate**
Note: Bidder should submit the copy of last filed Monthly / Quarterly GSTR-3B return as GST clearance Certificate along with GST Registration Certificate with offer / bid failing which their offer will not be considered for further evaluation.
Moreover, contractors having registration in other state (except West Bengal) should give Declaration in their Letter head that they shall raise their Tax Invoice by charging IGST only.
- f) **Photo Copy of P. F. & ESIC Registration Certificate**
[If not registered with the Concerned Department, then the Bidder should give a declaration in their Letter head along with Techno Commercial part of their Offer towards submission of the same within one month of award of Work and before releasing any Payment in their favour].
- g) **Information on litigation history**, liquidated damage, disqualification etc. declaration in **Tenderer's Letter Head**
Bidder(s) who had a record of Court Case / Litigation History with BANDR /our Client against previous Tender / Contracts shall not be considered for these Tenders.
- h) **Constitution and legal status** along with attested copies of Deeds/Articles and Memorandum of Association etc. as applicable.
- i) **Name(s) of the Owner/Partners/Promoters** and Directors of the Firm/Company
- j) **Bank Solvency Certificate**/Letter from the Banker. The Solvency Certificate shall not be more than 3 (Three) months old from the last date of bid submission.
- k) **List of Tools & Plants** and Equipments available to the Bidder.
3. The company reserves the right to waive minor deviations if they do not materially affect the capability of the Tenderer to perform the contract.
- (i) The Bidder must provide any further details required for the review upon request from BANDR. Failure to comply with any request by BANDR for such information will result in rejection of their offer.
- (ii) BANDR may, in its absolute discretion suspend or disqualify a Bidder/Bidders who, at any time, is considered to have breached any of the qualification conditions or has performed in an unsatisfactory manner without assigning any reason whatsoever.
- (iii) BANDR will not be liable for any loss or damages incurred by the Bidder/ Bidders in the above exercise.
4. **Disqualification of Bid** : BANDR reserves the right to disqualify such bidders who had a record of not meeting the contractual obligations against earlier contracts entered into with the BANDR.

For & on behalf of Tenderer

BRIDGE AND ROOF CO. (INDIA) LTD

TENDER DOCUMENT FOR

“CONSTRUCTION OF BITUMINOUS SERVICE ROAD, MAIN ROAD AND BOTH SIDE APPROACHES OF RE WALL, ROAD MARKING, TRAFFIC SIGNALS, REPAIRING OF POT HOLES ETC. WITH ALL MATERIAL, MACHINERY & MANPOWER ON SUBCONTRACT BASIS IN CONNECTION WITH CONSTRUCTION OF ROAD OVER BRIDGE (ROB) INCLUDING APPROACH ROAD FROM STKK ROAD TOWARDS BANDEL CARSHED ROB, SERVICE ROAD, FOOTPATH, ROAD SIGNAGE, DRAINAGE ETC. IN LIEU OF LEVEL CROSSING 1A/3T AT BANDEL CARSHED ON BANDEL-KATWA BROAD GAUGE RAIL LINE, AT CHINAGE 631.8 KMP ON GRAND TRUNK ROAD IN THE DISTRICT HOOGHLY IN WEST BENGAL”.

TENDER NO: BR / BANDEL / 51073 / NIT/ ROAD WORK DATE 08/02/2024

ANNEXURE-III

GENERAL CONDITIONS OF CONTRACT

GENERAL CONDITIONS OF CONTRACT

ANNEXURE – III

1. DEFINITION:

In constructing these conditions, the specifications, the schedule of quantities & rates, tender and agreement, the following words shall have the meaning hereby assigned to them except when the subject or context otherwise requires:

- a) "Owner/Client" shall mean "West Bengal Highway Development Corporation Limited" (here-in-after called WBHDCL) having their Registered office at 4th & 5th Floor, HRBC Bhawan, Munshi Premchand Sarani, Kolkata – 700021. & include their successors & permitted assigns as well as their authorized officer / representatives.
- b) "Company" shall mean "Bridge And Roof Company (I) Ltd"(BANDR) having its registered office at `Kankaria Centre'4th& 5th floor, 2/1, Russel Street, Kolkata-700071 inviting this Tender.
- c) The "Works" or "Work" shall unless there be something other in the subject of context repugnant to such construction, be construed and taken to mean the works by virtue of the contract contracted to be executed whether temporary or permanent and whether original, altered, substituted or additional.
- d) The "Engineer-in-charge" shall mean Engineering Officer appointed by the Company or his duly authorized representative who shall direct, supervise and be in-charge of the works for the purpose of this Contract.
- e) The "Accepting Authority" shall mean the authority mentioned in the Instructions to Bidders of the Tender Document.
- f) "Tenderer/Bidder" shall mean the firm/party who quotes against this Notice Inviting Tender.
- g) The "Contractor" shall mean the agency undertaking the work and shall include legal representative or successors or permitted assigns of such agency as the case may be.
- h) The "Contract" shall mean the Notice Inviting Tender, the tender and acceptance thereof and the formal agreements if any, executed between Bridge And Roof Co. (India) Ltd. and the Contractor together with documents referred to therein including their conditions with annexure and any special conditions, the specifications, designs, drawings, Schedule of Quantities & Rates with rates and amounts. All these documents taken together shall be deemed to form one contract and shall be complementary to one another.
- i) "Contract Price" shall mean the sum accepted or the sum calculated in accordance with the prices accepted in tender or the contract rates as payable to the Contractor for the entire execution and full completion of work.
- j) "Site" or "Work Site" shall mean the site of the contract works and shall include the lands, buildings and other erection thereupon, or under, in or through which the works are to be executed or carried out and any other lands or places provided by BANDR for the purpose of the contract.
- k) Words imparting the singular only also include the plural and vice-versa when the context requires. Words imparting persons include firms and Corporations and vice-versa where the context requires.
- l) "Specification" shall mean all directions, various technical specifications, provisions and requirement attached to this document/order, which pertain to the methods and manner or performing the work to the quantities and qualities thereof as may be amplified or modified by the company during the performance of the contract. It shall also include the latest edition including all agenda/corrigenda or relevant Indian Standard Specifications & other relevant codes. In agenda/corrigenda or relevant Indian Standard Specifications & other relevant codes. In any dispute, the decision of the "Company" will be final.
- m) "Consultant" shall mean any consultant nominated by the Company or by the Company's client.
- n) The "Period of Liability" in relation to the contract means the specified period from the date of Issue of completion certificate by the Company.
- o) The "Appointing Authority" for the purpose of arbitration shall be the Chairman Cum Managing Director or any other persons as designated by him.
- p) The "Alteration/Variation Order" means and order given in writing by the Company to affect additions/alteration to or deletions from the scope of work.
- q) "Letter of Intent (LOI)" shall mean an intimation by a letter to tenderer that the tender has been accepted in accordance with the provisions contained therein and shall be issued by the Chairman Cum Managing Director or his authorized representative.

2. **SCOPE OF WORK:**

The Scope of work to be carried out under this contract shall be as under but not limited to the following:-

The work consist of "Construction of Bituminous Service Road, Main Road And Both Side Approaches of RE Wall, Road Marking, Traffic Signals, Repairing of Pot Holes etc. with all Material, Machinery & Manpower on Sub-Contract Basis in connection with Construction of Road Over Bridge (ROB) including Approach Road from STKK Road Towards Bandel Carshed ROB, Service Road, Footpath, Road Signage, Drainage etc. in Lieu of Level Crossing 1A/3T at Bandel Carshed on Bandel-Katwa Broad Gauge Rail Line, At Chinage 631.8 Kmp on Grand Trunk Road in the District Hooghly in West Bengal on Sub Contract Basis in connection with our Bandel ROB project Site, Bandel, Hooghly – 712121 (W.B)." to be carried out in accordance with the drawings and Schedule of Quantities & Rates. It includes furnishing all materials, labour, tools and equipment and management necessary for the incidental to the construction and completion of the work. All work, during its progress and upon completion, shall conform to the lines, elevations and grades as shown on the drawings furnished by the Company. Should any detail essential for efficient completion of the work be omitted from the drawings and specifications it shall be the responsibility of the Contractor to inform the **Company and to furnish and install such detail with Company's concurrence, so that upon completion of the proposed work the same will be acceptable and ready for use.**

BANDR may in their absolute discretion issue further drawings and/or written instructions, details, directions and explanations, which are, hereafter collectively referred to as "BANDR's instructions" in regard to:

- i) The variation or modification of the design quality or quantity of works or the addition or omission or substitution of any work.
- ii) Any discrepancy in the drawings or between the Schedule of Quantities & Rates and/or drawings and/or specification.
- iii) The removal from the site of any defective material brought thereon by the Contractor and the substitution of any other material thereof.
- iv) The demolition removal and/or re-execution of any work executed by the Contractor/s.
- v) The dismissal from the work of any persons employed thereupon.
- vi) The opening up for inspection of any work covered up.
- vii) The rectification and making good of any defects under clauses hereinafter mentioned and those arising during the maintenance period (retention period) / defect liability period.
- viii) Royalty at the prevalent rates and all other incidental **expenditure including Environmental & Pollution Clearance Charges etc. if any shall have to be paid by the Contractor on all the materials like stone metals, sand, etc. collected by him for the execution of the work directly to the concerned revenue Authority of the State or Central Government. His rates are deemed to include all such expenditure and nothing extra shall be paid.**

The Contractor shall forthwith comply with and duly execute any work comprised in such BANDR's instructions, provided always that verbal instructions, directions and explanations given to the Contractor's or his representative upon the works by BANDR shall if involving a variation be confirmed in writing to the Contractor/s within seven days. No works, for which rates are not specifically mentioned in the priced schedule or quantities, shall be taken up without written permission of BANDR. Rates of items not mentioned in the priced Schedule of Quantities & Rates shall be fixed by BANDR as provided in the corresponding clauses of the tender document.

Scope of Supply: Scope of supply of materials/facilities shall on Contractor's Scope within his quoted rates include all necessary materials, manpower & machinery whichever is required to complete the work.

3) **SCHEDULE OF QUANTITIES & RATES:**

The quantities for various items of works as shown in the Schedule of Quantities & Rates of probable items of works are based on the basic design drawing prepared and issued by BANDR's Client .However, if quantity variations become necessary due to Design consideration / Site conditions etc. those have to be done by the contractor at the time of execution of work at their finally accepted rates(s). **No conditional rate will be allowed in any case.**

4) **SITE INSPECTION:**

The work site is situated at "In Lieu of Level Crossing 1A/3T AT Bandel Carshed on Bandel-Katwa Broad Gauge Rail Line, at Chinage 631.8 Kmp on Grand Trunk Road In The District Hooghly in West Bengal" Tenderer are advised to inspect & examine the site & its surroundings and satisfy themselves about the conditions of site before submission of their offer. The nature of work, means & access to the site, and all other necessary information as to the risks, contingencies and other circumstances which may influence or affect their offer & work. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent to any misunderstanding or otherwise shall be allowed.

5) **SUFFICIENCY OF QUOTATION:**

The Bidder shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his quotation for the works and of the rates and process quoted in the Schedule of Quantities & Rates with rates and prices shall, except as otherwise provided, cover all his obligations and liabilities under the Contract and all matters and things necessary for the proper completion as maintenance of the works.

6) a) **EARNEST MONEY DEPOSIT:**

Rs. 4,00,000/- (Rupees Four lakhs only) in form of DD/Pay order/ Banker's Cheque drawn on any nationalized Bank, in favour of Bridge And Roof Co. (India) Ltd., payable at Kolkata. MSME bidder will not be exempted from submission of EMD.

The E.M.D. of unsuccessful bidders will be refunded / returned after finalization of tender or the expiry of the tender validity Period whichever is earlier. Unless otherwise stated elsewhere in tender document, the E.M.D. of successful bidder(s) will be kept as initial security deposit after awarding of the job which will be adjusted from Retention Money.

MSME bidder will not be exempted from submission of EMD.

The Earnest Money may be forfeited :-

a) If the Bidder withdraws the Bid during the Period of Bid validity.

b) In case of Successful Bidder, if the Bidder fails within the specified time limit to Sign the Work order. During scrutiny or at any stage of bidding or even after award of contract ,if it is come to the notice to tender inviting authority that the credential or any other papers found incorrect / manufactured/fabricated.

b) **RETENTION MONEY:**

5%(Five percent) of gross value of the R/A bill & Final bill will be deducted by cash and retained with the Company towards Security Deposit for the due & faithful performance of the Contractor's obligations under the Contract. **EMD amount of Rs. 4,00,000.00** (Rupees Four Lakhs Only) submitted by the successful tenderer will be treated as a part of Security Deposit. The deduction towards the Security Deposit will start after adjustment of EMD amount submitted in the form of A/c Payee Cheque / Demand Draft (DDs) / Pay Order/ Banker's Cheque, against value of work done in R/A bills and the total deduction will not be more than 5% of the value of work executed by the bidder. The deduction of Security Deposit from the R/A bill & Final bill will be calculated as below:

5% of the cumulative value of R/A Bills / Final Bill – [EMD amount + Cumulative Security Deposit already deducted in the previous R/A bill].

The accumulated retention amount less the recoveries, if any, will be refunded and released to the contractor after defect liability period against their appeal in writing.

c) **Security Cum Performance Bank Guarantee**

The tenderer shall submit Security Cum Performance **Bank Guarantee** (SPBG) towards his undertaking for the Performance of the Contract as to be awarded to him, equal to **5%** (Five percent) of the Contract value from a Nationalized Bank in Company's approved proforma within **15 days** after receipt of LOI, The said Bank Guarantee shall be kept valid till completion of the Defect Liability Period / Guarantee Period. Bidder to note that RA Bills payments shall not be released by site unless PBG is submitted and confirmed. BG shall be further extended by the agency if required.

7) **DEVIATION / VARIATIONS:**

The Engineer-in-charge shall have power (i) to make alterations in, omissions from, additions to or substitutions for the original specifications, drawing, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and (ii) to omit a part of the works in case of non-availability of portion of the site or for any other reasons, and the Contractor shall be bound to carry out the works in accordance with any instructions given to him by the Engineer-in-charge and such alterations, omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work which the Contractor may be directed to do in the matter above specified as part of the works, shall be carried out by the Contractor on the same conditions in all respects including price on which he agreed to do the main work.

8) **SUSPENSION OF WORK:**

The Contractor shall, on receipt of the order in writing of the Engineer-in-charge, suspend the progress of the work or any part thereof for such time and in such manner as the Engineer-in-Charge may consider for any of the following reasons:

- i) On account of any default or part of the Contractor, or
- ii) For proper execution of the works or part thereof for reasons other than the default of the Contractor, or
- iii) For safety of the works or part thereof.

The Contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the engineer-in-charge. Nothing extra shall be payable to Contractor on any account for such suspension of works.

9) **COMPLETION PERIOD:**

Time of completion of the work is the essence of the contract and Contractor shall strictly follow and adhere to the Completion Schedule as specified or as to be prepared and handed over to the Contractor by the Engineer-in-charge after notification of acceptance of Tender.

Completion period is very important in this case. Normally no extension of time will be given, however, because delay if any, in the construction of Roads suitable extension will be considered.

- a) Period of completion for the entire work will be **06 (Six) months** to be reckoned from the date of issue of Letter of Intent/Telex of Intent whichever is earlier.
- b) The Contractor shall mobilize all his T&Ps and manpower **within 7(seven) days** from the date of issue of LOI. If the Contractor commits default in commencing the execution of work as aforesaid, company shall without prejudice to any other right or remedy be at liberty to take any actions which it shall deem fit and proper against the Contractor.

No price variation shall be admissible on the contract rate for any item during the entire period of contract including extended periods. The Contractor shall not have any claim whatsoever in this regard except statutory variation of duties and taxes imposed by Govt. of India.

10) **DELAY IN EXECUTION OF WORKS :**

If The Works be delayed by :

- a) force majeure, or
- b) abnormally bad weather, or
- c) serious loss or damage by fire, or
- d) civil commotion, local combination of workmen, strike or lockout, affecting any of the trades employed on the work, or
- e) delay on the part of other Contractors engaged by Company in executing work not forming part of the Contract, or
- f) non-availability of stores, which are the responsibility of Company to supply, or
- g) non-availability or break-down of Tools & Plant to be supplied or supplied by Company, or

- h) any other cause which, in the absolute discretion of Engineer-in-Charge, is found as beyond the Contractor's control; then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

11) **TOOLS, PLANTS AND EQUIPMENTS :**

- 11.1 The Contractor shall arrange at his own expense all tools, plant and equipment (herein after referred to as T&P) required for execution of the work.
- 11.2 If the Contractor requires any item of T&P on hire from the Company, the Company will, if such item is available, hire it to the Contractor at a rate to be fixed by the Engineer-in-Charge.
- 11.3 If at any time Company's T&P has not worked at all during a day except for a breakdown, or has worked for less than eight hours during a day, the Contractor shall be charged for one working day.
- 11.4 If any item of Company's T&P has stopped working on account of breakdown before it has worked for four hours in a day, the Contractor will be charged for half a working day. If the item has stopped working after it has worked for more than four hours but less than eight hours, the Contractor will be charged for a full working day.
- 11.5 The Contractor shall be responsible for care and custody of Company's T&P (including employment of Chowkidwar's) during the period Company's T&P remain with him and any damage (fair wear and tear excepted) to any of the equipment (except for Expected Risks provided always the Contractor has taken precautions necessary to protect it from such risks) shall be made good at the Contractor's expense to the satisfaction of the Engineer-in-Charge unless such damage is caused because of negligence of crew provided by the Company.
- 11.6 Company's T&P hired to the Contractor shall be returned at the place of issue (unless otherwise directed) by the Contractor to the Engineer-in-Charge on completion of the work or section of the work or earlier on termination of the hire by the Company as hereinafter provided on a written notice by the Engineer-in-Charge. The Company shall be entitled to terminate the hire on two day's notice without assigning any reason whatsoever and the Contractor shall have no claim to any payment of compensation or otherwise whatsoever on account of termination of hire of Company's T&P by the Company.
- 11.7 If owner's/client's, T&P are given to the Contractor on hire for execution of the work through the company, the same charges/rents as would be levied on the Company shall be charged to the Contractor and similar conditions as applicable to the Company for hire of T&P from Owner/Client will also apply in the case of the Contractor without any alteration.

12) **MATERIALS:**

The Contractor shall at his own expense, provide all materials required for the work other than those which are to be supplied by the Company and specifically mentioned elsewhere in this Tender Documents.

- 12.1 All materials to be provided by the Contractor shall be in conformity with the specifications laid down in the contract and the Contractor shall, if requested by the Engineer-in-charge, furnish proof to the satisfaction of him that the materials so comply.
- 12.2 The Contractor shall, at his own expense and without delay, supply to the Engineer-in-charge samples of materials proposed to be used in the works. The Engineer-in-charge shall within seven days of supply of samples or within such further period as he may require intimate to the Contractor in writing/inform the Contractor whether samples are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the Engineer-in-charge for his approval fresh samples complying with the specification laid down in the Contract.
- 12.3 The Engineer-in-charge shall have full powers to require removal of any or all the materials brought to site by the Contractor which are not in accordance with the Contract specifications or do not conform in character or quality to samples approved by him. In case of default on the part of the Contractor in removing rejected materials the Engineer-in-charge shall be at liberty to have them removed by other means. The Engineer-in-charge shall have full powers to procure other proper materials to be substituted for rejected materials and in the event of the Contractor refusing to comply, he may arrange to supply by other means. All costs, which may attend upon such removal and/or substitution, shall be borne by the Contractor.
- 12.4 All charges on account of transportation, octroi, terminal or sales tax and other duties on materials obtained for the works from any source (including materials supplied by the Company) shall be borne by the Contractor.

13) **MATERIALS SUPPLIED BY COMPANY:**

- 13.1 Contractor shall submit to the Company from time to time as directed by Engineer-in-charge or on completion, the reconciliation statement in the proforma and manner to be specified by Engineer-in-charge, showing thereon the consumption of materials issued to the Contractor, if any, by the Company for incorporation and fixing in the works including preparatory work. Permissible wastage allowance for material appropriation shall be same as to be approved by Engineer-in-charge. Cost of any wastage beyond permissible limit shall be charged to the Contractor at the rates as to be decided by the Engineer-in-charge. **In all cases, however, the material cost shall be recovered from the Contractor's Running Account / Final Bill as per relevant clause as mentioned elsewhere in this document.**
- 13.2 In case, any materials are supplied by the Company to the Contractor on chargeable basis/ issue rates, the following provisions will apply
- i) For the materials which the Company has agreed to supply to the Contractor, if any, he shall give a reasonable notice in writing of his requirements to the Engineer-in-charge in accordance with the agreed phased programme. Such materials shall be supplied for the purposes of the contract only and the value of materials so supplied at the rates specified shall be set off or deducted, as and when materials are consumed in items of work for which payment is being made to the Contractor, under the Contract. At the time of submission of bills the Contractor shall properly account for the materials issued to him to the satisfaction of the Engineer-in-charge, certify that balance of materials supplied are available at site.
 - ii) The Contractor shall bear the cost of loading, transporting to site, unloading, storing under cover as required, assembling and joining the several parts together as necessary and incorporating of fixing materials in the works including all preparatory work of whatever description as may be required.
- 13.3 Materials required for the works, whether brought by the Contractor or supplied by the Company, shall be stored by the Contractor only at places approved by the Engineer-in-charge, storage and safe custody of materials shall be the responsibility of the Contractor.
- 13.4 **Company's officials concerned with the contract shall be entitled at any time to inspect & examine any materials intended to be in or on the works, either on the site or at factory or workshop or other place(s) where such materials are assembled, fabricated, manufactured or at any place(s) where these are lying or from which these are being obtained and the Contractor shall give such facilities as may be required for such inspection and examination.**
- 13.5 All materials brought to the site shall become and remains the property of the Company and shall not be removed off the Site without the prior written approval of the Engineer-in-Charge. 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 expense 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.

14. **LABOUR :**

- The Contractor shall employ labour in sufficient numbers to maintain the required rate of progress and quality to ensure workmanship of the degree specified in the Contract and to the satisfaction of the Engineer-in-Charge. The Contractor shall not employ in connection with the Works any person who has not completed his eighteen years of age.
- 14.1 The Contractor shall furnish to the Engineer-in-Charge at the intervals mentioned in Schedule F, a distribution return of the number & description by trades of the workpeople employed on the Works. The Contractor shall also submit on the 4TH and 19TH of every month to the Engineer-in-Charge a true statement showing in respect of the second half of the current month (i) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them and (ii) the number of female workers who have been allowed Maternity Benefit as provided in the Maternity Benefit Act, 1961 of Rules made there under and the amount paid to them.
- 14.2 The Contractor shall pay to labour employed by him wages not less than fair wages as defined in the Contractor's Labour Regulations.
- 14.3 The Contractor shall in respect of labour employed by him comply with or cause to be complied with the Contractor's Labour Regulations in regard to all matters provided therein.
- 14.4 The Contractor shall comply with the provisions of the payment of Wages Act, 1936, Minimum Wages Act, 1948, Employer's Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefit Act, 1961 and Mines Act, 1952 or any modifications thereof or any other law relating thereto and rules made thereunder from time to time.

- 14.5 The Contractor shall be liable to pay his contribution and the employee's contribution to the State Insurance Scheme in respect of all labour employed by him for the execution of the contract, in accordance with the provision of "The Employee's State Insurance Act, 1948" as amended from time to time. In case the Contractor fails to submit full details of his account of labour employed and the contribution payable, the Engineer-in-Charge shall recover from the running bills of Contractor and amount of contribution as assessed by him. The amount so recovered shall be adjusted against the actual contribution payable for Employees State Insurance.
- 14.6 The Engineer-in-Charge shall on a report having been made by an Inspecting Officer as defined in the Contractor's Labour Regulation have the power to deduct from the money due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reasons of non-fulfillment of the Conditions of the Contract for the benefit of workers, non-payment of wages or of deduction made from his or their wages which are not justified by the terms of the Contract or non-observance of the said Contractor's Labour Regulations and Acts and Rules framed there under.
- 14.7 In the event of the Contractor committing a default or breach of any of the provisions of the aforesaid Contractor's Labour Regulations, as amended from time or furnishing any information of submitting or filling any Form / Register / Slip under the provisions of these Regulations which is materially incorrect then on the report of the Inspecting Office as defined in the Contractor's Labour Regulation, the Contractor shall without prejudice to any other liability pay to the Company a sum as applicable as per prevailing Rules as liquidated damages for every default, breach or furnishing, making, submitting, filling materially incorrect statement as may be fixed by the Engineer-in-Charge & in the event of the Contractor's default continuing in this respect, the liquidated damages may be enhanced for each day of default subject to a maximum percent of the estimated cost of the Works put to tender. The Engineer-in-Charge shall deduct such amount from bills or security deposit of the Contractor and credit the same to the Welfare Fund constituted under Regulations. The decision of the Engineer-in-Charge in this respect shall be final and binding.
- 14.8 The Contractor shall at his own expense comply with or cause to be complied with Model Rules for Labour Welfare framed by Government from time to time for the protection of health and for making sanitary arrangements for workers employed directly or indirectly on the Works. In case the Contractor fails to make arrangement as aforesaid, the Engineer-in-Charge shall be entitled to do so and recover the cost thereof from the Contractor.
- 14.9 The Contractor shall at his own expense arrange for the safety provisions as required by the Engineer-in-Charge, in respect of all labour directly or indirectly employed for performance of the Works and shall provide all facilities in connection therewith. In case the Contractor fails to make arrangements and provide necessary facilities as aforesaid, the Engineer-in-Charge shall be entitled to do so and recover the cost thereof from the Contractor.
- 14.10 Failure to comply with Model Rules for Labour Welfare, Safety Code or the provisions relating to report on accidents and to grant of maternity benefits to female workers shall make the Contractor liable to pay to the Company as liquidated damages as applicable as per prevailing Rules for each default or materially incorrect statement. The decision of the Engineer-in-Charge in such matters based on reports from the Inspecting Officers as defined in the Contractors Labour Regulation as appended to these conditions shall be final and binding and deductions for recovery of such liquidated damages may be made from any amount payable to the Contractor.

15.00 **POSSESSION OF SITE BY CONTRACTOR :**

The Contractor shall not be permitted to enter on (other than for inspection purposes) or take possession of the site until instructed to do so by the Engineer-in-Charge in writing. The portion of the site to be occupied by the Contractor shall be defined and/or marked on the site plan, failing which these shall be indicated by the Engineer-in-Charge at site and the Contractor shall on no account be allowed to extend his operations beyond these areas. In respect of any land allotted to the Contractor for purposes of or in connection with the contract the Contractor shall be a licence subject to the following and such other terms and conditions as may be imposed by the licensor :

- i) that such use or occupation shall not confer any right of tenancy of the land to the Contractor.
- ii) that the Contractor shall be liable to vacate the land on demand by the Engineer-in-Charge.
- iii) that the Contractor shall have no right to any construction over this land without the written permission of the Engineer-in-Charge. In case, he is allowed to construct any structure he shall have to demolish and clear the same before handing over the completed work unless agreed to the contrary.

15.1 The Contractor shall provide, if necessary or if required on the site, all temporary access there to and shall alter, adopt and maintain the same as required from time to time and shall take up and clear them away as and when no longer required and as and when ordered by the Engineer-in-Charge and make good all damage done to the site.

16.0 **SETTING OUT WORKS**

The Engineer-in-Charge shall supply drawings, levels and other information necessary to enable the Contractor to set out the Works and be responsible for the accuracy of the same. He shall amend at his own cost and to the satisfaction of the Engineer-in-Charge any error found at any stage which arise through in accurate setting out unless such error is based on incorrect data furnished in writing by the Engineer-in-Charge, in which case the cost of rectification shall be borne by the Company. The Contractor shall protect and preserve all benchmarks used in setting out the Works till end of the Defects Liability period unless the Engineer-in-Charge directs their removal.

17.0 **MATERIALS OBTAINED FROM EXCAVATION:**

Materials of any kind obtained from excavation on the site shall remain the property of the company and shall be disposed of as the Engineer-in-Charge may direct.

All fossils, coins, articles of value of antiquity and structures and other remains or things of geological or archaeological interest discovered on the site shall be the absolute property of the Company and the Contractor shall take reasonable precautions to prevent his workmen or any other person from removing or damaging any such article or thing shall immediately upon discovery thereof and before removal acquaint the Engineer-in-Charge with such discovery and carry out the Engineer-in-Charge's directions as to the disposal of the same at the expense of the company.

18.0 **WATCHING & LIGHTING :**

The Contractor shall provide and maintain at his own expense all lights, guards fencing and watching when and where necessary or required by the Engineer-in-Charge for the protection of the Works or for the safety and convenience of these employed on the Works or the public.

19.0 **CONTRACTOR'S SUPERVISION:**

The Contractor shall either himself supervise the execution of the works or shall appoint a competent agent approved by the Engineer-in-charge, if the Contractor has himself not sufficient knowledge and experience to be capable of receiving instructions or cannot give his full attention to the works, then the Contractor shall at his own expense employ as his accredited agent an engineer approved by the Engineer-in-charge. Orders given to the Contractor's agent to the Contractor himself. If the Contractor fails to appoint a suitable agent as directed by the Engineer-in-charge, the Engineer-in-charge shall have full powers to suspend the execution of the works until such date as suitable agent is appointed and the Contractor shall be held responsible for the delay so caused to the works.

20.0 **INSPECTION & APPROVAL:**

All works embracing more than one process shall be subject to examine & approval at each stage thereof and the Contractor shall give due notice to the Engineer-in-charge or his authorized representative when each stage is ready. In default of such notice, the Engineer-in-charge shall be entitled to appraise the quality and extent thereof.

20.1 No work shall be covered up or put out of view without the approval of the Engineer-in-charge or his authorized representative and the Contractor shall afford full opportunity for examination of foundations before permanent work is placed thereon. The Contractor shall give due notice to the Engineer-in-charge or his authorized representative whenever any such work or foundation is ready for examination and the Engineer-in-charge or his representative shall without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such work or of examining such foundations. In the event of the failure of the Contractor to give such notice he shall, if required by the Engineer-in-charge, uncover such work at the Contractor's expense.

20.2 Company's/Owner's representatives concerned with the Contract shall have powers at any time to inspect and examine any part of the works and the Contractor shall give such facilities as may be required for such inspection and examination.

21.0 **POWERS OF ENGINEER-IN-CHARGE'S REPRESENTATIVE:**

The duties of the representatives of the Engineer-in-charge are to watch & supervise the works & to test & examine any materials to be used or workmanship employed in connection with the works. He shall have no authority to order any work involving any extra payment by the Company nor to make any variation in the works.

- 21.1 The Engineer-in-charge may from time to time delegate to his representative any of the powers & authorities vested in the Engineer-in-charge and shall furnish to the Contractor a copy of all such written delegation of powers & authorities. Any written instruction or written approval given by the representative of the Engineer-in-charge to the Contractor within the terms of such delegation shall bind the Contractor & the Company as through it had been given by the Engineer-in-charge.
- 21.2 Failure of the Representative of the Engineer-in-charge to disapprove any work or materials shall not prejudice the power of the Engineer-in-charge thereafter to disapprove such work or materials & to order the pulling down, removal or breaking up thereof.
- 21.3 If the Contractor shall be dissatisfied with any decision of the Representative of the Engineer-in-charge he shall be entitled to refer the matter to the Engineer-in-charge who shall thereupon confirm, reverse or vary such decision.

22.0 **REMOVAL OF WORKMEN**

The Contractor shall employ in and about the execution of the Works only such persons as are skilled and experienced in their several trades and the Engineer-in-Charge shall be at liberty to object to and require the Contractor to remove from the Works any person employed by the Contractor in or about the execution of the Works who in the opinion of the Engineer-in-Charge misconducts himself or is incompetent or negligent in the proper performance of his duties and such person shall not be again employed upon the Works without permission of the Engineer-in-Charge.

23.0 **WORK DURING NIGHT OR ON SUNDAYS AND HOLIDAYS**

Subject to any provisions to the contrary contained in the Contract, none of the permanent works shall be carried out during night or on Sundays or on authorised Holidays without the permission in writing of the Engineer-in-Charge except when the work is unavoidable or absolutely necessary for the safety of life, property of Works in which case the Contractor shall immediately advise the Engineer-in-Charge accordingly.

24.0 **COMPLETION CERTIFICATE:**

As soon as the work is completed, the Contractor shall give notice of such completion to the Engineer-in-charge & within a reasonable period of receipt of such notice the Engineer-in-charge shall inspect the work & shall furnish the Contractor with a certificate of completion indicating (a) the date of completion (b) defects to be rectified by the Contractor and/or (c) items for which payment shall be made at reduced rates. When separate periods of completion have been specified for items or groups of items, the Engineer-in-charge shall issue separate completion certificates for such item or groups of items. No certificate of completion shall be issued, nor shall the work be considered to be complete till the Contractor shall have removed from the premises on which the work has been executed all scaffolding, sheds & surplus materials, except such as are required for rectification of defects, rubbish & all huts & sanitary arrangements required for his workmen in the site in connection with the execution of the work, as shall have been erected by the Contractor or, the workmen and cleaned all dirt from the parts of building(s) in upon or about which the work has been executed or of which he may had possession for the purpose of the execution thereof and cleaned floors, gutters and drains, eased doors and sashes, oiled locks fastening labeled keys clearly and handed them over to the Engineer-in-charge or his Representative and made the whole premises fit for immediate occupation or use to the satisfaction of the Engineer-in-charge. If the Contractor shall fail to comply with any of the requirements of this conditions as aforesaid, on or before the date of completion of the works, the Engineer-in-charge may at the expense of the Contractor fulfill such requirements and dispose of the scaffoldings, surplus materials and rubbish etc. as he thinks fit and the Contractor shall have no claim in respect of any such scaffolding or surplus materials except for any sum actually realised by the sale thereof less the cost of fulfilling the requirements and any other amount that may be due from the Contractor. If the expense of fulfilling such requirements is more than the amount realized on such disposal as aforesaid, the Contractor shall forthwith on demand pay such excess to the Company.

- 24.1 If at any time before completion of the entire work, items or groups of items for which periods of completion have been specified, have been completed, the Engineer-in-charge with the consent of the Contractor takes possession of any part or parts of the same then notwithstanding anything expressed or implied elsewhere in this Contract:

- a) Within ten/thirty days of the date of completion of such items or groups of items or possession of the relevant part the Engineer-in-charge shall issue completion certificate for the relevant part as in condition above provided the Contractor fulfils his obligations under that condition for the relevant part.
- b) The Defects Liability Period in respect of such items and the relevant part shall be deemed to have commenced from the certified date of completion of such items or the relevant part as the case may be.

25. **COMPENSATION FOR DELAY:**

If the Contractor fails to maintain the required progress or to complete the work and clear the site on or before the contract or extended date/period of completion he shall, without prejudice to any other right or remedy of the Company on account of such breach, pay as agreed compensation amount calculated as to be stipulated or such smaller amount as be fixed by the authority on the contract value of the work for every week that the progress remains below that specified or that the work remains incomplete.

This will also apply to items or group of items for which separate period of completion has been specified.

For this purpose the term 'Contract Value' shall be the value at contract rates of the work as ordered.

- 25.1 Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed the specified limit of the Contract value or of the Contract value of the item or group of items of work for which a separate period of completion is given.
- 25.2 The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Company.

26. **DEFECTS LIABILITY PERIOD:**

The Contractor shall guarantee and maintain the works for a **period of 36(Thirty Six) months** or specifically mentioned elsewhere in the Tender, after the date of issue of completion certificate by the Engineer-in-charge which will be reckoned as Defect Liability/Maintenance period of the works. The Contractor shall be responsible to make good and remedy at his own expenses within such period as may be stipulated by the Engineer-in-charge, any defect which may develop or may be noticed before the expiry of Defect Liability/Maintenance Period. The Contractor will have to quote his rate considering the above aspect. **For repair or maintenance work the Defect Liability Period shall be 1(One) year from the date of completion of the work/handing over the work whichever is later.**

27. **CONTRACTOR'S LIABILITY & INSURANCE**

From commencement to completion of the works, the Contractor shall take full responsibility for the case thereof & for taking precautions to prevent loss or damage & to minimize loss or damage to the greatest extent possible and shall be liable for any damage or loss that may happen to the works or any part thereof and all Company's T&P from any cause whatsoever(save and except the Excepted Risks) and shall at his own cost repair and make good and the same so that at completion, the works and all company's T&P shall be in good order and condition and in conformity in every respect with requirement of the contract and instructions of the Engineer-in-charge.

27. **FACILITIES TO OTHER CONTRACTOR**

The Contractor shall, in accordance with the requirements of the Engineer-in-charge, afford all reasonable facilities to other Contractor engaged contemporaneously on separate contracts in connection with the works and for departmental labour and labour of any other property authorized authority or statutory body which may be employed at the site on execution of any work not included in the contract or of any contract which the company may enter into in connection with or ancillary to the works.

28. **NOTICES TO LOCAL BODIES:**

The Contractor shall comply with and give all notice required under any Governmental authority, instrument, rule or order made under any Act of Parliament, State laws or any regulation of bye laws of any local authority relating to the works. We shall before making any variation from the contract drawing necessitated by such compliance give to the Engineer-in-charge a written notice giving reasons for the proposed variation and obtain the Engineer-in-charge's **instruction therein.**

The Contractor shall pay and indemnify the company against any liability in respect of any fees or charges payable under any Act of Parliament, State Laws or any Government instrument, rule or order and any regulations or bye-laws of any local authority in respect of works.

29. **SUB-CONTRACT:**

The Contractor shall not sublet any portion of the contract without the prior written approval of the Accepting Authority.

30. **INSTRUCTIONS & NOTICES:**

- (i) Subject or otherwise provided in this contract, all notices to be given on behalf of the Company and all other actions to be taken on its behalf may be given or taken by the Engineer-in-charge's or any officer for the time being entrusted with the functions, duties and powers of the Engineer-in-charge.
- (ii) All instructions notice and communications etc. under the contract shall be given in writing and if sent by registered post to the last known place of above business of the Contractor shall be deemed to have been served on the date when in the ordinary course of post these would have been delivered to him.
- (iii) The Contractor or his agent shall in attendance at the Site(s) during all working hours and shall superintend the execution of the works with such additional assistance in each trade as the Engineer-in-charge may consider necessary. Orders given to the Contractor's Agent shall be considered to have the same force as if they had been given to the Contractor himself.

31. **FORECLOSURE :**

- (i) If at any time after acceptance of the tender the Company shall decide to abandon or reduce the scope of the Works for any reason whatsoever and hence not require the whole or any part of the Works to be carried out, the Engineer-in-Charge shall give notice to that effect to the Contractor and the Contractor shall have no claim to any payment of compensation or otherwise, whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the Works.

31.1 The Contractor shall be paid at Contract rates full amount for works executed at site and, in addition, a reasonable amount as certified by the Engineer-in-Charge for the item hereunder mentioned which could not be utilized on the work to the full extent because of the foreclosure :

- (a) Any expenditure incurred on preliminary site work, e.g. temporary access roads, temporary labour huts, staff quarters and site office; storage accommodation and water storage tanks.
- b) i) The Company shall have the option the takeover Contractor's materials or any part thereof either brought to site or of which the Contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work), provided, however, the company shall be bound to take over the materials or such portions thereof as the Contractor does not desire to retain. For materials taken over or to be taken over by the Company, cost of such materials. The cost shall, however, take into account purchase, price, transportation & deterioration or damage which may have been caused to materials whilst in the custody of the Contractor.
- ii) For Contractor's materials not retained by the Company reasonable cost of transporting such materials from sites to Contractor's permanent stores or to his other Works, whichever is less. If materials are not transported to either of the said places, no cost of transportation shall be payable.
- c) If any materials supplied by the Company are rendered surplus, the same except normal wastage shall be returned by the Contractor to the Company at rates not exceeding those at which these were originally issued less allowance for any deterioration of damage which may have been caused whilst the materials were in the custody of the Contractor. In addition, cost of transporting such materials from Site to the Company stores, if so required by the Company.
- d) Reasonable compensation for transfer of T&P from site to Contractor's permanent stores or to his other Works, whichever is less. If T&P are not transported to either of the said places, no cost of transportation shall be payable.

31.2 The Contractor shall, if required by the Engineer-in-Charge, furnish to him books of account, wage books, time sheets and other relevant documents as may be necessary to enable him to certify the reasonable amount payable under this Condition.

32. **TERMINATION OF CONTRACT FOR DEATH :**

If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies and if the Contractor is a partnership concern and one of the partners dies then unless the Accepting Authority is satisfied that the legal representatives of the individual Contractor or of the Proprietor of the Proprietary concern and in the case of partnership, the surviving partners, are capable of carrying out and completing the Contract, the Accepting Authority shall be entitled to cancel the Contract as to its in completed part without the Company being in any way liable to payment of any compensation to the estate of the deceased Contractor and/or to the surviving partners of the Contractors firm on account of the cancellation of the Contract. The decision of the Accepting Authority that the legal representatives of the deceased to the surviving partners of the Contractor's firm cannot carry out and complete the contract shall be final and binding on the Parties. In the event of such cancellation the company shall not hold the estate of the deceased Contractor and/or the surviving partners of the Contractors firm liable in damaged for not completing the Contract.

33. **CANCELLATION OF CONTRACT:**

- i) If the Contractor:
- (a) At any time makes default in proceeding with the works with due diligence and continues to do so after a notice in writing of 7 days from the Engineer-in-charge, of Commits default in completing with any of the terms and conditions of the Contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-charge, or
- (b) Fails to complete the works or items of work with individual dates of completion, on or before the date(s) of completion, and does not complete them within the period specified in a notice given in writing in that behalf by the Engineer-in-charge, or
- (c) Shall give or agree to give to any person in Company's service or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or for bearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other Contract for the company, or
- (d) Shall enter into a contract with the company in connection with which omission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have previously been disclosed in writing to the Accepting Authority /Engineer-in-charge.
- (e) Shall obtain a contract with the company as result or ring tendering or other non-benefited methods of competitive tendering, or
- (f) Being an individual, or if firm, any partner thereof, shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any processing for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction under any Insolvency Act for the time being in force or make any conveyance or assignment of his effective or composition or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any Insolvency act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors, or
- (g) Shall suffer an execution being levied on his goods and allow it to be continued for a period or 21 days, or
- (h) Assigns, transfers, sublets(engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or attempts to assign, transfer or sublet the entire works or any portion thereof without the prior written approval of the Accepting Authority, the Accepting Authority may, without prejudice to any other right to remedy which shall have accrued or shall accrue thereafter; the Company by written notice cancel the contract as a whole or only such items or work in default from the contract.
- (ii) The Accepting Authority shall on such cancellation have powers to:
 - (a) Carry out the incomplete work by any means at the risk and cost of the Contractor.
 - (iii) On cancellation of the Contract in full or in part the Engineer-in-Charge shall determine what amount, if any, is recoverable from the Contractor for completion of the works or part of the works or in case the works or part of the works is not to be completed, the loss or damage suffered by the Company. In determining the amount, credit shall be given to the Contractor for the Value of the work executed by him up to the time of cancellation, the value of Contractor's **materials taken over and incorporated in the work**, and use of tackle and machinery belonging to the Contractor.
 - (iv) Any excess expenditure incurred or to be incurred by the company in completing the works or part of the works or the excess loss or damages suffered or may be suffered by the Company as aforesaid after allowing such credit shall be recovered from any money due to the Contractor shall be called upon in writing to pay the same within 30 days.
 - (v) If the Contractor shall fail to pay the required sum within the aforesaid period of 30 days, the Engineer-in-Charge shall have the right to sale any or all of the Contractor's **unused materials, constructional plant** implements, temporary buildings etc. and apply the proceeds of sale thereof towards the satisfaction of any sums due from the Contractor under the Contract and if thereafter there be any balance outstanding from the Contractor, it shall be recovered in accordance with the provisions of the Contract.
 - (vi) Any sums in excess of the amounts due to the Company and unsold materials, constructional plant, etc. shall be returned to the Contractor, provided always that if cost or anticipated cost of completion by the Company of the works or part of the works is less than the amount which the Contractor would have been paid had been completed the works or part of the works, such benefit shall not accrue to the Contractor.

34. **LIABILITY FOR DAMAGE, DEFECTS OR IMPERFECTIONS & RECTIFICATION THEREOF:**

If the Contractor or his workmen or employees shall injure or destroy any part of the building in which they may be working or any building, road, fence etc. contiguous to the premises on which the work or any part of it is being executed, or if any damage shall happen to the work while in progress the Contractor shall upon receipt of a notice in writing in that behalf make the same good at his own expenses. If it shall appear to the Engineer-in-charge or his Representative at any time during construction or reconstruction or prior to the expiration of the Defects Liability period, that any work has been executed with unsound, imperfect or unskilled workmanship or that any materials or articles provided by the Contractor for execution of the work are unsound or of a quality inferior to that contract for, or otherwise not in accordance with the Contract, or that any defect, shrinkage or other faults have appeared in the work arising out of defective or improper materials or workmanship, the Contractor shall, upon receipt of a notice in writing in that behalf from the Engineer-in-charge forthwith rectify or remove and re-construct the work so specified in whole or part as the case may be and/or remove the materials or articles so specified and provide other proper and suitable materials or articles at his own expense, notwithstanding that the same may have been inadvertently passed, certified & paid for & in the event of his failing to do so within the period to be specified by the Engineer-in-charge in his notice aforesaid, the Engineer-in-charge may rectify or remove and re-execute the work and/or remove and replace with other materials or articles so specified & provide other proper and suitable materials or articles at his own expense, notwithstanding that the same may have been inadvertently passed, certified and paid for and in the event of his failing to do so within the period to be specified by the Engineer-in-charge in his notice aforesaid, the Engineer-in-charge may rectify or remove & re-execute the work and/or remove & replace with other materials or articles complained of, as the case may be, by other means at the risk and expense of the Contractor.

35. **URGENT WORKS:**

If any urgent work (in respect whereof the decision of the Engineer-in-charge shall be final & binding) becomes necessary & the Contractor is unable or unwilling at once to carry it out, the Engineer-in-charge may be his own or other work people carry it out, as he may consider necessary. If the urgent work shall be such as the Contractor is liable under the Contract to carry out at his expense, all expenses incurred on it by the Company shall be recoverable from the Contractor & be adjusted or set off against any such payable to him.

36. **RECORDS & MEASUREMENT:**

- i) The Engineer-in-charge shall except as otherwise stated ascertain and determine by measurement the value in accordance with the Contract or work done in accordance therewith.
- ii) All items having a financial value shall be entered in Measurement Book, level book etc. prescribed by the Company so that a complete record is obtained of all work performed under the Contract.
- iii) Measurement shall be taken jointly by the Engineer-in-charge or his authorized representative and by the Contractor or his authorized representative.
- iv) Before taking measurements of any work the Engineer-in-charge 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 measurement taken by the Engineer-in-charge or by the person deputed by him shall be taken to be correct measurements of the work.
- v) The Contractor shall, without extra charge provide assistance with every appliance labour, and other things necessary for measurement.
- vi) 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 Company 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 measurement.

37. **METHODS OF MEASUREMENT:**

Except where any general or detailed description of the work in quantities expressly those to the contrary, Schedule of Quantities & Rates shall be deemed to have been prepared and measurements shall be taken in accordance with the procedure set forth in the Schedule of Quantities & 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 Quantities & Rates/ Specification measurements shall be taken in accordance with the relevant Standard Method of Measurement issued by the Indian Standard Institution.

38. **ON ACCOUNT PAYMENT:**

- i) Interim bills shall be submitted by the Contractor at intervals as to be specified on or before the date fixed by the Engineer-in-charge for the work executed. The Engineer-in-charge shall then arrange to have the bill certified by taking or causing to be taken, where necessary, the requisite measurements of the work.
- ii) Payment on account for amount admissible shall be made on the Engineer-in-charge certifying the sum to which the Contractor is considered entitled by way of interim payment.
- iii) Any interim certificate given relating to work done or materials delivered may be modified or corrected by any subsequent interim certificate or by the final certificate. No certificate of the Engineer-in-charge supporting an interim payment shall itself be of conclusive evidence that any work or materials to which it relates is/are in accordance with the Contract.
- iv) Pending consideration of extension of date of completion interim payments shall continue to be made as herein provided.

39. **FINAL BILL PAYMENT:**

- i) The final bill shall be submitted by the Contractor within one month of the date fixed for completion of the work otherwise the Engineer In Charge's Certificate of the measurement and of the total amount payable shall be final and binding on the Contractor. No further claims shall be made by the Contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payment of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and at rates as approved by Engineer-in-charge, shall be made within the period specified.
- ii) After payment of the amount of the 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.

40. **GST-TDS:**

- (i) GST-TDS will be deducted by cash at source from Contractor's Invoice value before GST, **under GST Law w.e.f. 01.10.2018 as per Govt Notification No. 50/2018 – Central Tax dated 13.09.2018** for Taxable Services as per Act & Rules framed there under at such rates as may be applicable from time to time.
- (ii) **Income Tax :**
Income Tax will be deducted by cash at source from Contractor's all bills as per Income Tax act & Rules framed there under at such rates as may be applicable from time to time.

41. **EXTRA CLAIMS :**

Notwithstanding anything contained in the Contract, it should be clearly noted that no extra claim lodged/to be lodged by the Contractor shall be entertained by the Company in pursuant to this Contract. Nevertheless, if the Contractor insists and raises any extra claim bills, the Company shall pursue with the Owner in good faith, settlement of Rules for Extra items & claims, if raised by the Contractor on the Company and the decision taken by the Owner and the Company shall be binding upon and acceptable to the Contractor corresponding to & relevant with his part of the work. It should also be clearly understood that the pursuing of the Contractor's claim on the Company in good faith with the owner shall not mean under any circumstances, Company's acceptance of the rates of extra items and claims raised by the Contractor on the Company and at no point of time, Contractor's plea that irrespective of the decision taken by the Owner, the rates of extra items & claims shall have to be paid to the Contractor based on his claim stating that the Contract is between the Company and the Contractor having no relationship with the owner, shall contractually hold good because the Company have pursued Contractor's bills with the client in good faith only without going through the merit of the same.

42. **TAXES & DUTIES :**

The contractor shall be exclusively responsible for payment of all Taxes & duties (except Goods and Services Tax) that may be levied from time to time according to the Laws & Regulation now in force & also hereafter to be imposed, increased or modified from time to time. Nothing will be payable extra by the company in respect of any duties/taxes to be imposed on procurement of materials for execution of works contract.

43. **LABOUR CESS :**

Constructional Labour Welfare Cess @ 1% of Cost of Construction will be deducted from each bill of the contractor.

44. **ROYALTY :**

Payment of Royalty will be the responsibility of the Contractor within his quoted price every month the Contractor shall submit Royalty challan issued by the Competent Authority for Sand purchased by the Contractor and used in the job. It is mandatory for the Contractor to submit to the Company Royalty Certificate from the Mining Department before release of final bill payment due to him.

45. **THIRD PARTY INSURANCE :**

- (i) Before commencing the execution of the works the Contractor, but without limiting his obligations and responsibilities under Clause hereof, shall insure against his liability for any material or physical damage, loss or injury which may occur to any property including that of the Employer, or to any person, including that of the Employee of the employer, by or arising out of the execution of the works or in the carrying out of the contract.
- (ii) Minimum Amount of Third Party Insurance :
- (iii) Provision to Indemnify Employer :
The terms shall include a provision whereby, in the event of any claim in any respect of which the Contractor would be entitled to receive indemnity under the policy being brought or made against the Company, the insurer will indemnify the Company against such claims and any cost, charges and expenses in respect thereof.
- (iv) Amount of Such insurance shall be decided by our Engineer-in-Charge, Whose decision in this regard shall be final & binding upon the Contractor.

46. **DEFECTS AFTER TAKING OVER:**

In order that the Contractor could obtain a completion certificate he shall make good with all possible speed any defect arising from the defective workmanship by the Contractor or that may have been noted or developed, after the works or group of works have been taken over. The period allowed, for carrying out such work will be normally 1 (one) month. If any defect be not remedied within a reasonable time, the Company may proceed to do the work at Contractor's risk and expense and deduct from the final bill or any other dues of the Contractor's such amount as may be decided by the Company.

47. **WATER & ELECTRICITY:**

Construction Water & Power will be provided by BANDR in one point free of cost. Distribution of the same shall be Contractor's responsibility within their quoted price with all materials, tools & tackles etc.

48. **MOBILIZATION ADVANCE:**

Mobilization Advance shall not be allowed to the Contractor. The Bidder should quote their rates accordingly.

49. **EXTRA WORK RATE:**

In case any extra work beyond the above scope of work is required to be carried out, the same will be paid on mutually agreed settled rates by BANDR and Contractor. However, the Contractor will remain bound to execute the extra work on receipt of instruction from BANDR even before settlement of rates of such extra works.

50. **CONTRACTOR'S LABOUR WAGES & REGULIZATION:**

- a) No labour below the age of eighteen years shall be employed.
- b) The Contractor shall pay wages to labours engaged by him on the work as laid down in the payment of wages Act, Central Government of India.
- c) The Contractor shall obtain a license from appropriate licensing Authority for coverage under Contractor labour (Regulation and Abolition) Act. 1970 by payment of necessary prescribed fees and deposit before starting of work.
- d) The Contractor shall employ sufficient required category of workers in order to complete the works as per specification and within the scheduled time of completion as specified hereinbefore.
- e) Unskilled workmen shall be engaged from local land losers and villagers duly certified / identified by the appropriate authority.
- f) The Contractor shall strictly follow the statutory rules of Central / State Govt. and fulfill all the statutory obligation as stipulated in contract labour (regulation and abolition) Act. 1970.

- g) Any other facilities / benefits if required to be paid to the workers shall be borne by Contractor without any extra cost to BANDR.
- h) The contractor shall comply with the provisions of payment of Wages Act. 1936, Minimum Wages Act 1938, Workmen's Compensation Act 1923, Industrial Disputes Act 1947, Contract Labour (R&A) Act 1970, Building & other construction Workers (RE & CS) Act & Rules or any modifications there of any other law relating thereto the Contractor shall also engaged by them at the work site.
- i) The Engineer-in-charge shall on a report having been made by an inspecting officer as defined in contract labour (Regulation and Abolition) Act. 1970. have the power to deduct from the money due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker / worker reason of non-fulfillment of the conditions of the contract or the benefit of the workers, non-payment of wages or wages or of deduction made from his their wages which are not justified by the terms of the contract labour (Regulation and Abolition) Act, 1970 or non-observance of the said regulation.
- j) The Contractor shall indemnify the Company and/or Owner against payment to be made under and for observance of the provisions of any and all acts applicable.
- k) In regard to recruitment of laborers and payment of wages the Contractor will maintain all registers, which are generally as follows:
- i) Wage Slip
 - ii) Employment Card
 - iii) Register of Heads
 - iv) Register of Wage-cum-Master Roll
 - v) Register of Deductions for damage or loss
 - vi) Register of Fines
 - vii) Register of Advance.
 - viii) Register of Overtime.
51. **WORK DURING NIGHT OR ON SUNDAYS & HOLIDAYS:**
- Subject to any provisions to the contrary contained in the Contract, none of the permanent works shall be carried out during night or on Sundays or on authorized Holidays without the permission in writing of the Engineer-in-Charge except when the works is unavoidable or absolutely necessary for the safety of life, of works in which case the Contractors shall immediately advised the Engineer-in-Charge accordingly.
52. **FORCEMAJEURE:**
- Should there be war, whether declared or not, instruction restraint imposed by the Govt. of any authority, Act of legislature or other stoppage, delay or hindrances in the supply of fuel, explosion, accident, illegal strike, riot, Civil commotion, curfew, sabotage or other disorganization of labour or transport or any other inevitable or unforeseen event beyond control directly interfering in the work, which causes delay in execution of the work or should delays arise from any which have grounds for grant for additional time extension time shall be granted.
53. **STORAGE AREA & ACCOMMODATION FOR CONTRACTOR'S WORKMEN:**
- BANDR will provide area to the extent available inside the Project premises in order to enable the Contractor to keep their machineries/materials brought by them for execution of their work as the case may be. The Contractor shall however make his own arrangement at his cost for proper safety and security of his materials and BANDR shall not be held responsible for any damage/loss/theft of materials stored in the area provided by BANDR.
54. **JURISDICTION:**
- In regard to all disputes or claims arising out of the Contract of whatever nature, only the High Court at Kolkata shall alone have the exclusive jurisdiction.
55. **MEASURE TO PROTECT OWNER'S/BANDR'S PROPERTY:**
- The Contractor shall take all the possible measures to protect the properties of the owner/vender and BANDR at work site from any damages from his any workers & staffs.

56. No compensation will be paid by the department for any damage done by rain , flood, Cyclone or by any other natural calamities ,Labour made idle ,labour strike, public agitation or riot and so the rates of the contractor should include all such contingency during the execution of work.

57. **ARBITRATION :**

BANDR confidently feel that there shall not arise any disputes or differences during execution and completion of the order / Contract by the Contractor(s).

However, in the event of any dispute arising between the Company and the Contractor (hereinafter referred **individually as "the Party" and collectively as "the Parties"**), concerning the interpretations of any terms and conditions of the Contract and / or contractual obligations / performance / liabilities / responsibilities of the Parties to the said Contract, the disputing Party shall refer the matter to the other Party for holding a mutual discussion for resolving the dispute. In case the Parties fail to arrive to any settlement through mutual discussion, either of the Parties may avail the following remedies :

Resolution of Dispute through Conciliation :-

Any party may refer the dispute for Conciliation under Rules of Conciliation and Arbitration under SCOPE Forum of Conciliation and Arbitration (SFCA), 2003 and amendments made thereto from time to time. (**hereinafter referred as "the Rules"**) by making application to the Secretariat of the SCOPE Forum. The Party initiating conciliation shall send to the other party a written invitation to conciliate under the Rules, briefly identifying the subject matter of the dispute.

The settlement so rendered between the Parties in pursuance thereof shall be final and binding on the Parties. If the other party rejects the invitation, there will be no conciliation proceedings at all.

Resolution of Dispute through Arbitration :-

In case the dispute is not settled by conciliation within 30 days of the initiation of conciliation or such further period as the parties shall agree in writing, the dispute shall be referred to and finally resolved by Arbitration, in accordance with the Rules of Arbitration of SCOPE Forum of Conciliation and Arbitration, 2003 and amendments made thereto from time to time.

The entire proceedings of Arbitration shall be governed under the Arbitration and Conciliation Act, 1996.

The venue of Arbitration shall be mutually decided by the Parties.

In case the Parties do not agree for resolution of dispute through Conciliation and Arbitration by the above-mentioned SCOPE Forum, the disputing Party shall opt for stipulated rules laid down under the Arbitration and Conciliation Act, 1996.

The Contract and the Parties therein shall be governed under the jurisdiction of Calcutta High Court.

In the event of any dispute or difference relating to the interpretation and application of the provisions of the contracts and commercial agreements (except Income Tax, Customs, Excise duty and also concerning DPCL) between company (BANDR) and any other Public Sector Undertaking/Government Department/Bank/Port Trust etc., such dispute or difference shall be referred by either party for Arbitration to the sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary of the Government of India in-charge of the Department of Public Enterprises. **The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause.** The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may take a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India.

Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary/ Additional Secretary, when so authorized by the Law Secretary, whose decision shall bind the Parties finally and conclusively. The parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator. Subject to any amendment that may be carried out by the Government of India from time to time, the procedure to be followed in the arbitration shall be as mentioned above, which is as per O.M. No. 4(1)/2011-DPE(PMA)GL dated 12.06.2013. of Department of Public Enterprises, Ministry of Heavy Industries and Public Enterprises, Govt. of India or any modification issued in this regard.

58. **QUANTITY VARIATION IN VALUATION & ESCALATION:**

- a) No escalation is payable on any account.
- b) The quantities of the various items mentioned in schedule of quantities and prices are approximate and may vary upto $\pm 25\%$ or be deleted altogether. The quoted rate of each item will remain firm throughout the period of execution including the extension for reasons whatsoever, no claim of any nature shall be admissible in case the total contract price on completion of whole of the work, including extra item, if any, remains within + 35% of contract price.

59. **SPLITTING OF WORK**

BANDR reserves the right to split the total quantity of work Phase wise amongst one or more than one Contractor/ Agency according to BANDR's own convenience and suitability. The evaluation of the bid shall be done according to BANDR's own convenience.

Under such eventuality the following shall be affected unconditionally

- a) Completion time may be suitably reduced, if any, during discussion.
- b) The quoted price / rates for each item shall remain firm and fixed and valid until completion of the contract and shall not be subject to escalation for any reason what so ever.

Acceptance of Client/Owner of the project is a pre-requisite for consideration of Bidder's offer by BANDR for this Tender/Commercial Agreements etc. Accordingly Bidder(s) not acceptable to BANDR's Client/Owner shall not be considered & their offer shall be rejected by BANDR. No correspondence & claim etc. from the Bidder in pursuant to the Tender/Commercial Agreements shall be entertained by BANDR under any circumstances what so ever.

For & on behalf of Tenderer

BRIDGE AND ROOF CO. (INDIA) LTD

TENDER DOCUMENT FOR

“CONSTRUCTION OF BITUMINOUS SERVICE ROAD, MAIN ROAD AND BOTH SIDE APPROACHES OF RE WALL, ROAD MARKING, TRAFFIC SIGNALS, REPAIRING OF POT HOLES ETC. WITH ALL MATERIAL, MACHINERY & MANPOWER ON SUBCONTRACT BASIS IN CONNECTION WITH CONSTRUCTION OF ROAD OVER BRIDGE (ROB) INCLUDING APPROACH ROAD FROM STKK ROAD TOWARDS BANDEL CARSHED ROB, SERVICE ROAD, FOOTPATH, ROAD SIGNAGE, DRAINAGE ETC. IN LIEU OF LEVEL CROSSING 1A/3T AT BANDEL CARSHED ON BANDEL-KATWA BROAD GAUGE RAIL LINE, AT CHINAGE 631.8 KMP ON GRAND TRUNK ROAD IN THE DISTRICT HOOGHLY IN WEST BENGAL”.

TENDER NO: BR / BANDEL / 51073 / NIT/ ROAD WORK DATE – 08/02/2024

ANNEXURE-IV

SPECIAL CONDITIONS OF CONTRACT

BRIDGE AND ROOF CO. (INDIA) LTD.

SPECIAL CONDITIONS OF CONTRACT

1. These Special Conditions shall be read in conjunction with other provisions including General Conditions of the Contract and are supplementary to & complementary with each other. However, in the event of any provision of General Conditions are repugnant to or at variance with any provision of Special Conditions, then unless a different intention appears between the two, the provision given in "Special Conditions" shall be deemed to over-ride that provision of General Conditions and shall to the extent of such repugnancy or variation prevail & govern the contract.
2. The quantum of work shown in Schedule of Quantities & Rates (Annexure-VI) are approximate total against the Tender but payment shall be made to the Contractor strictly on the basis of actual quantities to be executed by the Contractor as certified by our Engineer-in-charge to be calculated at the fixed item rates quoted in the Schedule of Quantities & Rates of the work- order. Any increase or decrease in the quantities either individually or conjointly shall not form any basis or ground for revision of rates under any circumstances.
3. The entire works entrusted to the Contractor shall be executed by him strictly in accordance with approved drawings, specifications & procedures etc. of the Owner, as stipulated in the relevant contract between the Company and the Owner, also as per the relevant I.S. Specifications, Standard Engineering Code and Practice etc. as applicable to this case. However, in the event of any contradiction between the specifications approved by the Owner and I.S. Specifications, the former shall prevail and govern.
4. The quoted rates given in the Schedule of Quantities & Rates are inclusive of the Contractor's rate to provide all labours, manpower and supervision etc. and he shall thereof, deploy and engage, within the quoted rates, all technical personnel, all categories of skilled/semi- skilled/un-skilled workmen, technicians, operators, mechanics, electricians and supervising staff as required, directly or indirectly for the execution or completion of the works in all respect in a perfectly workmanship like manner as per approved specifications, drawings and the Time Schedule/Programme of Completion.
5. The Contractor shall within the quoted rates, make his own arrangement for the accommodation, transportation of his all workmen, supervisory staff and other persons to site and back. Nothing extra to be charged to the Company on this account under any circumstances whatsoever.
6. The Contractor shall construct his own temporary offices, stores etc. by providing all labour, materials etc. at his own cost and shall also demolish and remove these structures making the area perfectly clean as per direction of the Engineer-in-charge at his own cost.
7. The Contractor shall strictly follow the statutory rules of Central/State Government and fulfill all the statutory obligations as stipulated in contract labour Regulation and Abolition Act. 1970, including all other acts as mentioned in clause 18 of General Condition of Contract.
8. The Owner's, Engineer's and Company's representatives will have full power and authority to inspect the works at any time whenever in progress wither at site or at Contractor's workshop premises wherever situated and the Contractor shall afford and procure for them every facility and assistance required to carry-out such inspection and shall make available to them free of cost, all necessary instruments and device in checking of setting out works and in checking of any works done by the Contractors for the purpose of setting out and taking measurements of works.

The work shall be carried out in the best workmanlike manner and any defect or minor changes in the design/drawing etc. if pointed out shall be carried out by the contractor without any extra charge.

All material used in the work shall be as per the specifications of relevant item of work and conforming to the relevant specifications of IS/MORT&H. Manufacturers' test certificates for the equipments/material shall be submitted to the BANDR/Owner/Owner's consultant for approval before supply of equipment.

Any material supplied by the Company, if damaged in any way during cartage or execution of work or otherwise, shall be made good by the Contractor at his own cost.

Rate quoted shall be inclusive of clearing site including removal of surplus (both serviceable and unserviceable) earth, rubbish, materials etc. as per direction of the BANDR/Owner/Owner's consultant.

9. **TIME OF COMPLETION**

- a) Period of completion for the work will be **06 (Six) months**, to be reckoned from the date of issue of Letter of Intent/Telex of Intent.
- b) The Contractor shall mobilize all his T&Ps and manpower **within 7(seven) days** from the date of issue of LOI. If the Contractor commits default in commencing the execution of work as aforesaid, company shall without prejudice to any other right or remedy be at liberty to take any actions which it shall deem fit and proper against the Contractor.

No price variation shall be admissible on the contract rate for any item during the entire period of contract including extended periods. The Contractor shall not have any claim whatsoever in this regard except statutory variation of duties and taxes imposed by Govt. of India.

10. **MEASUREMENT & PAYMENTS:**

Measurements of contractor's work for the purpose of record and payment will be made on the basis of joint measurement against actual quantum of work executed & certified by BANDR through monthly R/A bills as follows:

- a. 95% of monthly running account bill shall be paid duly certified by the BANDR as well as Consultant & Client and can be released after getting payment from our Client.
- b. Balance 5% (Retention Money) will be payable along with final bill.

All deductions towards Income Tax shall be effected from each and every R/A bill including final bill as per statute and as applicable in the place of work.

c. **Mode of Payment**

All payment shall be made through AC Payee Cheque /RTGS/NEFT and the Contractor shall submit the following details to the company.

- i) Name of the company
- ii) Name of Bank
- iii) Name of Bank Branch
- iv) City
- v) Account Number
- vi) Account Type
- vii) IFSC Code of the Bank Branch
- viii) MICR Code of the Bank Branch

11. **SECURE DADVANCE**

No Secured Advance is allowed to the Contractor.

12. **PRICE ESCALATION**

Rates quoted by the Contractor shall always remain firm and shall not be paid or attract any escalation due to increase in labour wages or material prices etc. under any circumstances within the stipulated and or extended time of completion.

- b) The quantities of the various items mentioned in schedule of quantities and prices are approximate and may vary upto±25% or be deleted altogether. The quoted rate of each item will remain firm throughout the period of execution including the extension for reasons whatsoever, no claim of any nature shall be admissible in case the total contract price on completion of whole of the work, including extra item, if any, remains within + 35% of contract price.

13. **TAXES & DUTIES**

Notwithstanding any clause on Taxes & Duties mention anywhere in the Tender documents, Bid documents or any correspondence, the following Taxes & Duties clause shall be applicable with the implementation of GST w.e.f. 01.07.2017.

- i) The quoted price shall be exclusive of SGST & CGST / IGST
- ii) GST amount shall be paid to the CONTRACTOR at actual against submission of invoice issued in accordance with the Invoice Rules which prescribe following particulars shall be included in the invoice:-
 - (a) Name, address and GSTIN of the supplier
 - (b) A consecutive serial number of the invoice
 - (c) Date of issue
 - (d) Name, address and GSTIN or UIN, if registered of the recipient (Details of Receiver) (e) Name and address of the recipient and the address of the delivery, along with the State and its code (Address of delivery/Place of Supply).
 - (f) HSN Codes or Accounting Code of services (HSN/SAC Code).
 - (g) Description of goods or services
 - (h) Total value of supply of goods or services
 - (i) Taxable value of supply of goods or services taking into discount if any;
 - (j) Rate of tax (Central Tax, State Tax, Integrated Tax (for inter-state supply), Union Territory Tax or cess);
 - (k) Amount of tax charged in respect of taxable services (Central Tax, State Tax, Integrated Tax (for inter-state supply), Union Territory Tax or cess);
 - (l) Place of supply along with the name of state, and state code.
 - (m) Address of the delivery where the same is different from the place of supply; (n) Whether the tax is payable under Reverse Charge basis and
 - (o) Signature or digital signature of the supplier or his authorized representative.
- iii) In case of any advance including Mobilization Advance given as per Contract, the CONTRACTOR shall issue a GST Invoice containing all the details stated in (ii) (a) to (o). Subsequent recoveries / adjustment of Advance amount shall be separately indicated in the GST invoice for actual supply of Goods and Services.
- iv) In case of Price Variation of Construction Materials applicable as per Tender, the CONTRACTOR shall issue a GST Invoice containing all the details stated in (ii) (a) to (o).
- v) In case of Price Adjustment for delay in Completion applicable as per Tender Condition, the Contractor shall issue a Credit Note for the Price Reduction amount containing all the details stated in (ii) (a) to (o) lower incidence of GST.
- vi) It's the obligation on the part of Bidder/Vendor/Contractor/Consultant to discharge his liability by payment of GST to Government of India in cash OR utilization of Input Tax credit in respect of such supply of services through GST Invoice under this Contract, so that BANDR will avail input Tax credit on such supply. In the event that input tax credit of the GST charged by the Bidder / Vendor / Contractor / Consultant is denied by the tax authorities to BANDR due to reasons attributable to Bidder / Vendor / Contractor / Consultant, BANDR shall be entitled to recover such amount from the Bidder / Vendor / Contractor / Consultant by way of adjustment from the next invoice or from Bank Guarantee. In addition to the amount of GST, BANDR shall also be entitled to recover interest and penalty, in case same is imposed by the tax authorities on BANDR.

If there is an increase in the rate of output tax (Goods and Service Tax) or any new output tax is introduced in addition to the existing taxes or in lieu of existing taxes within the contractual period or extension thereof due to reasons not attributable to contractor, the BANDR shall reimburse the same against documentary proof. However, if such increase arises beyond the contractual completion period where delay is attributable to the contractor, the Contractor shall bear the increase in the rates of existing taxes or any new output tax.

All other provisions of The Goods and Services Act, 2017 shall be applicable for the contract and contractor shall ensure compliance of the same.

Notwithstanding anything to the contrary elsewhere provided in the Tender Document, the CONTRACTOR shall be exclusively liable for the payment of any and all taxes, levies, duties, cesses and charges now in force or hereafter imposed, increased or modified in respect of any work done and/or materials supplied and for the payment of all contributions and taxes for unemployment compensation, insurance and old age pension and annuity now or hereinafter imposed by the Central or any State Government or any authority with respect to or covered by the wages, salaries or other compensations paid to persons employed or engaged by the CONTRACTOR and doth hereby undertake to indemnify and keep indemnified the BANDR from and against the same and all claims, actions, demands and payments whatsoever against the BANDR howsoever arising there from or in connection therewith.

14. **COMPLETION CERTIFICATE:**

The Engineer-in-charge shall normally issue to the Contractor the completion certificate within 1(one) month after receiving an application from the Contractor and after verifying from the completion documents and satisfying himself that the work has been completed in accordance with and as set out in the construction and erection drawings and the contract documents and after getting acceptance from BANDR. The work will not be considered as complete and taken over by BANDR, until all the temporary works are revoked and work-site cleared to the satisfaction of the Engineer-in-charge.

15. **PAYMENT TO LABOURS:**

The Contractor shall make payment to his workers and staff regularly. The Contractor must inform the company at least one day before of disbursement of monthly payment to his workers.

16. **CONTRACTOR WILL FOLLOW EPF ACT:**

The Contractor shall register themselves under EPF Act. 1952 as amended in 1997. The Contractor will strictly abide by the provisions of employees provident fund act. Contractor will remain bound to produce the relevant documents in this regard like monthly PF deposit challan supported with wages sheet of workers etc. to BANDR every month.

17. **TERMINAL BENEFIT:**

The quoted rates are inclusive of terminal benefits, which will be paid to the workers by the Contractors.

18. **CONTRACTOR WILL FOLLOW EMPLOYEE'S STATE INSURANCE ACT:**

The Contractor shall register themselves under Employee's State Insurance Act., 1948 and shall obtain ESI Registration within one month from the date of issue of Letter of Intent and submit the copy of the same to the Engineer. The Contractor will strictly abide by the provisions of Employees State Insurance Act. The Contractor is bound to produce the relevant document in this regard like monthly ESI deposit challan supporting with wages sheet of workers etc.

19. **SPECIFICATION / STANDARD:**

The specification and standard of workmanship for work shall be as specified in latest MORT&H's specification.

After an offer is received from a Tenderer, it will be construed by the Company that the Tenderer has examined thoroughly and checked up carefully the complete latest MORT&H specification and Tender drawings irrespective of the fact that the Tenderer might or might not have done so. No claim direct or indirect will be entertained by the company on the plea from Contractor at any time that he had not examined the specification and drawings before tendering.

20. **TOOLS & PLANTS (TO BE PROVIDED BY CONTRACTOR):**

The Contractor is required to provide all necessary T&P and handling equipments for timely completion of the total works as per contract. In case of project requirement, some activities may have to pre-pone. In such cases the Contractor may have to deploy additional T&P. The quoted rate shall be inclusive of such requirements.

In the event of any failure on the part of the Contractor, BANDR may at their discretion terminate the contract on this ground and take out any or whole amount of the contract from the scope of the Contractor. In the event of failure of Contractor to deploy necessary and sufficient T&P, BANDR will be at liberty to arrange the same at the risk and cost of Contractor including transportation cost of same from any of BANDR site/other agency and charges as applicable shall be deducted from Contractor's R/A Bill. Decision of BANDR in this regard will be final and binding on the Contractor. The minimum Plants & machinery required has been furnished in Annexure - A of the Tender document.

21. **ENGINEER'S DECISION INRESPECT OF LABOUR DEPLOYMENT:**

Contractors shall arrange necessary labours as will be required to execute the works within the programmed schedule. In case this is felt by the Engineer-in-charge that the labours as deployed by the Contractors in works is not adequate, the Contractors shall be bound to increase the labour strength as per the instruction of the Engineer without any extra cost to BANDR for such increase of labour.

22. **COMMENCEMENT OF WORK:**

The work shall have to be taken up within ten days of the receipt of the LOI. Failure to do so will constitute a violation of the contract stipulation as regards of proportionate progress and timely completion of work and the Contractor will thereby make himself liable to pay compensation or other penal action as per stipulation of the Tender Document.

23. **TERMS AND CONDITIONS IN EXTENDED PERIOD**

When an extension of time for completion of work is granted by the Engineer-in-Charge for cogent reasons for which the Contractor have no control, it will be taken for granted by the working Contractor that the validity of the contract is extended automatically upto the extended period with all terms and conditions, rates etc. remaining unaltered, i.e. the tender is revalidated upto the extended period.

24. **CO-OPERATION WITH THE OTHER AGENCIES AND DAMAGES AND SAFETY OF ROAD USERS :**

All works are to be carried out in close co-operation with BANDR and other Contractors that may be working in the area of work. The work should also be carried out with due regard to the convenience of the road users and occupants of the adjacent locality, if any. All arrangements and programme of work must be adjusted accordingly. All precautions must be taken to guard against chances of injury or accidents to workers, road users, occupants of the adjacent locality etc. The Contractor must see that all damages to any property which, in the opinion of the Engineer-in-Charge are due to the negligence of the Contractor are promptly rectified by the Contractor at his own cost and expenses and according to the direction and satisfaction of the Engineer-in-Charge.

25. **TRANSPORTATION ARRANGEMENT:**

The Contractor shall arrange for all means of transport required for carriage and supply of materials required for the construction work.

26. **CONTRACTOR'S SITE OFFICE:**

The Contractor shall have an office adjacent to the work as may be approved by the Engineer- in-Charge where all directions and notice of any kind whatsoever, which the Engineer-in-Charge or his representative may desire to give to the Contractor in connection with the contract, may be left or sent by post to such office or delivered to the Contractor's authorized agent or representative. For such intimation to the Contractor's site office, it shall be deemed to the sufficient enough to be served upon the Contractor

27. **INCIDENTAL AND OTHER CHARGES:**

The cost of all materials, hire charges to Tools and plants, labour, Corporation/Municipal Fees for water supply, Royalty or road materials (if any), electricity and other charges of Municipalities or statutory local bodies, ferry charges, Toll charges, loading and unloading charges, handling chargers, overhead charges etc. will be deemed to have been covered by the rates quoted by the Contractor inclusive of Income Tax, Octroi Duty/Terminal Tax & Goods and Services Tax etc. All other charges for the execution of the specified work, including supply of materials and related carriage, complete or finished in all respect upto the entire satisfaction of the Engineer-in-charge of the work. No claim extra claim in this regard beyond the specified rate as per work schedule whatsoever in this respect will be entertained.

28. **EXTENSION OF TIME:**

For reasons over which the Contractor will have no control and which will retard the progress, extension of time for the period lost will be granted on receipt of application from the Contractor before the expiry date of contract. No claim whatsoever for idle labour, additional establishment, enhanced cost of materials and labour and hire charges of tools and plants price variation etc., would be entertained under any circumstances. The Contractor should consider the above factor while quoting this rate.

29. **CONTRACTOR'S GODOWN:**

The Contractor must provide suitable godown/storage area for storage of all construction materials & equipments at the site of work. No separate payment will be made for these godowns or for the store yard.

30. **CLEARING OF MATERIALS:**

Before starting any work, work site, where necessary, must be properly dressed after cutting clearing all varieties of jungles shrubs, bamboo clusters or any undesirable vegetation from the alignment or site of works on completion of works all temporary structure or obstruction including some pipes in underground work, if any, must also be removed. All scars of construction shall be obliterated and the whole site shall be left in a clear and neat manner to the satisfaction of the Engineer-In-Charge. No separate payment shall be made for all these works, the cost thereof being deemed to have been included in the rates of various items of works quoted by the Contractor in the schedule of probable items of works.

31. **SUNDRY MATERIALS:**

The Contractor must erect temporary pillars, master pillars etc. as may be required in suitable places as directed by the Engineer-In-Charge at his own cost before starting and during the work by which the BANDR's staff will check levels layout different works and fix up alignment and the Contractor shall have to maintain and protect the same till completion of the work. All machineries and equipments etc. and other sundry material like, pegs, strings, nails flakes instruments etc. and also skilled labour required for setting out the levels for laying out difference structures and alignment shall also be supplied by the Contractor as per direction of Engineer-in-Charge at his own cost without any extra claim toward BANDR.

32. **APPROVAL OF SAMPLE:**

Samples of all materials to be supplied by the Contractor and to be used in the work shall have to be approved by the BANDR/Owner/Owner's consultant and checking the quality of such materials shall have to be done as directed by BANDR/Owner/Owner's consultant prior to utilization in the work.

33. **WATER AND ENERGY:**

Water and Electricity will be arranged by the Contractor in his own cost.

All materials, tools and plants and all labour (skilled and unskilled) procurement of food for Contractors staff and crews, medical aids etc. are to be arranged for by the Contractor at his own cost. The cost for transportation of labour, materials and all other incidental items as required for work shall also have to be borne by the Contractor without any extra claim from BANDR.

34. **DRAWINGS:**

- (a) All works shall be carried out in conformity with the drawings supplied by BANDR. The Contractor shall have to carry out all the works according to the BANDR/Owner/Owner's consultant. General Arrangement Drawing and Detail Working Drawings to be supplied by the BANDR/Owner/Owner's consultant from time to time.
- (b) During execution of the work and before submission of Last/Final bill, the Contractor shall furnish to the BANDR/Owner/Owner's consultant from time to time all additions/alterations, deviations of the work in sufficient details which might take place at site throughout the construction period and recorded in Site Order Book enabling the BANDR/Owner/Owner's consultant to prepare "As Built Drawings" incorporating the changes which in the opinion of the BANDR/Owner/Owner's consultant will enable the owner to maintain all works including services of respective discipline and to proceed with future project construction works as required and shown in the drawing.
- (c) Shop drawings shall be submitted to BANDR/Owner/Owner's consultant by the Contractor.

35. **SERVICEABLE MATERIALS:**

The responsibility for stacking the serviceable materials (as per decision of the Engineer-in- Charge) obtained during dismantling of existing structures/roads and handing over the same to the Engineer-in-charge of BANDR lies with the Contractor and nothing will be paid on this account. In case of any loss or damage of serviceable materials prior to handing over the same to BANDR, full value will be recovered from the Contractor's bill at rates as will be assessed by the Engineer-in-Charge.

36. **UNSERVICEABLE MATERIALS:**

The Contractor shall remove all unserviceable materials, obtained during execution at place as directed. The Contractor shall dress up and clear the work site after completion of work as per direction of BANDR/Owner/Owner's consultant. No extra payment will be made on this account.

37. **CONTRACTOR'S RISK FOR LOSS OR DAMAGE:**

All risk on account of railway or road carriage or carriage by boat including loss or damage of vehicles, boats, barges, materials or labour, if any, will have to be borne by the Contractor without any extra claim towards BANDR.

38. **IDLE LABOUR AND ADDITIONAL COST:**

Whatever may be the reason no claim on idle labour, enhancement of labour rate additional establishment cost, cost of Toll and hire and labour charges of tools and plants, railway freight etc. would not be entertained under any circumstances.

39. **CHARGES AND FEES PAYABLE BY CONTRACTOR:**

- a) The Contractor shall pay all fees required to be given or paid by any statute or any regulation or by-law of any local or other statutory authority which may be applicable to the works and shall keep BANDR/Owner/Owner's consultant immune against all penalties and liabilities of every kinds for breach of such statute regulation or law.
- b) The Contractor shall save, harmless and indemnify BANDR/Owner/Owner's consultant from and against all claims, demands, suit and proceedings for or an account of infringement of any patent rights, design, trade mark of name of other protected write in respect of any constructional plant, machine, work, materials, thing or process used for or in connection with works or temporary works or any of them.

40. **TOOLS AND PLANTS:**

All Tools and Plants required for the work will have to be supplied by the Contractor at his own cost; all cost of fuel and stores for proper running of the Tools and Plants must be borne by the Contractor.

41. **EQUIPMENT FOR TESTING OF MATERIALS AT SITE LABORATORY:**

All necessary equipment for conducting necessary tests shall be provided at the site laboratory by the Contractor at his own cost as per MORT&H Specification latest revision and direction of BANDR/Owner/Owner's consultant.

42. **SAFETY, SECURITY AND PROTECTION OF THE ENVIRONMENT:**

The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein:

- a) have full regard for the safety of all persons and the works (so far as the same are not completed or occupied by BANDR / Client's department),
- b) provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Engineer-in-Charge for the protection of the Works or for the safety and convenience of the public or others,
- c) take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation,
- d) ensure that all lights provided by the Contractor shall be screened so as not to interfere with any signal light of the railways or with any traffic or signal lights of any local or other authority.
- e) ensure that all safety measures has been taken care of by the Contractor for the workers, staffs and other persons deployed at site.

43. **PROGRAM OF WORK:**

Before actual commencement of work the Contractor shall submit a program of construction of work with methodology clearly showing the required materials, men and equipment. The Contractor will submit a program of construction in the pattern of Bar Chart or Critical Path Method and a time table of progress of work to complete the work within the specific period for approval of the Engineer-In-Charge who reserves the right to make addition, alterations and substitutions to such program in consultation with the Contractor and such approved program shall be adhered to by the Contractor unless the same is subsequently found impracticable in part or full in the opinion of the BANDR/Owner/Owner's consultant and is modified by him.

44. **PRECAUTION DURING WORKS:**

The Contractor shall carefully execute the work without disturbing or damaging underground or overhead service utilities viz. Electricity, Telephones, Gas, Water pipes, Sewers etc. In case disturbances of service utilities is found unavoidable the matter should immediately be brought to the notice of the BANDR/Owner/Owner's consultant and necessary precautionary measures would be directed by the BANDR/Owner/Owner's consultant. If the service utilities are damaged or disturbed in any way by the Contractor during execution of the work, the cost of rectification or restoration of damages as would be fixed by the BANDR/Owner/Owner's consultant concerned will be recovered from the Contractor.

45. **TESTING OF QUALITIES OF MATERIALS AND WORKMANSHIP:**

All materials and workmanship shall be in accordance with the specifications laid down in the contract and also as per relevant IS codes and as per MORT&H specification. BANDR/Owner/Owner's consultant reserves the right to test, examine and measure the materials/workmanship direct at the place of manufacture, fabrication or at the site of works or any suitable place. The Contractor shall provide such assistance, instrument, machine, labour and materials as BANDR/Owner/Owner's consultant may require for examining, measuring and testing the works and quality, weight or quantity of materials used and shall supply samples for testing as may be selected and required by BANDR/Owner/Owner's consultant without any extra cost. Besides this, he will carry out tests from outside Laboratory as per instruction of BANDR/Owner/Owner's consultant. The cost of all such tests shall be borne by the agency and hence the same must be considered at the time of quoting rate.

46. **PROCUREMENT OF MATERIALS:**

All materials required to complete execution of the work shall be supplied by the Contractor after procurement from authorized and approved source.

47. **REJECTION OF MATERIALS:**

All materials brought to the site for use in the work shall be as per the specification of relevant item of work and conforming to the relevant specification of BIS and MORT&H, Manufacturers' test certificates for the equipment / material shall be submitted to the Engineer-in-Charge for the work for approval prior to supply of equipment/material. All materials brought to the site must be approved by the BANDR/Owner/Owner's consultant prior to use in the work. Rejected materials must be removed by the Contractor from the site within 24 hours of the issue of order to that effect. In case of non-compliance of such order, BANDR/Owner/Owner's consultant shall have the authority to cause such removal at the cost and expense of the Contractor and the Contractor shall not be entitled to claim for any loss or damage of that account.

48. **RECONCILIATION OF MATERIALS**

The Contractor shall submit a reconciliation statement of material with each R/A bill.

At the time of submission of bills, the Contractor shall properly account for the material as specified herein to the satisfaction of BANDR/Owner/Owner's consultant certifying that the balance material are available with his custody at site.

The approved drawings are to be considered for the purpose of reconciliation of materials.

49. **IMPLIED ELEMENTS OF WORK IN ITEMS:**

Except of such items as are included in the Specific Priced Schedule of probable items and approximate quantities no separate charges shall be paid for traffic control measures, shoring, shuttering, dewatering, curing etc. and the rates of respective items of works are to be deemed as inclusive of the same.

50. **DAMAGED/UNUSED MATERIALS:**

Any damaged / unused materials lying at Contractor's custody, which is found at the time of use to have been damaged and / or remaining unused, shall be rejected and / or removed immediately from the site by the Contractor or disposed of as directed by BANDR/Owner/Owner's consultant at the costs and expenses of the Contractor and the Contractor shall have no claim for compensation on account of any such materials so damaged / remaining unused as aforesaid.

51. **DEDUCTION AT SOURCE FROM THE CONTRACTORS' BILLS**

a) Labour welfare Cess will be deducted @ 1(one) % of gross bill value as per rule.

b) Income Tax will be deducted from each bill of the Contractor as per applicable rate and rules in force.

52. **DEFECTS LIABILITY PERIOD AND REFUND OF RETENTION MONEY :**

Defect Liability period of the subject work shall be 36 (thirty six) months after the date of issue of Completion Certificate by BANDR's Engineer-in-Charge.

The Retention Money shall be refunded to the Contractor after deducting the cost of defects repair, if any, after Defect Liability period.

53. **EXTRA ITEMS:**

(a) Claim/extra items, if any raised by Contractor for their scope of work shall be pursued by BANDR in good faith with Owner / Owner's consultant. Admittance/rejection of such claim/extra item by Owner / Owner's shall have to be accepted by the Contractor. Mere pursuing the claims/extra item papers by BANDR for the Contractor shall not be construed as admittance and/or assurance and/or commitment for settling such claim/extra items by BANDR.

- (b) For extra items, rates are to be derived from analysis of costs on inputs and direct Market rate documents are to be provided by the Contractor. The rates finally accepted by Client / Owner shall be binding on the Contractor but BANDR shall retain 50 % (fifty percent) of the component of overhead and profit, finally settled with Client / Owner and remaining part shall be passed on to the Contractor for his portion of works.

54. **SAFETY**

All equipments shall be complete with approved safety devices with provision for safe access of personnel to and around equipment for operation and maintenance which the contractor/his authorised supervisor should ensure.

The contractor may at times have to work on partly energized conditions. In such cases it shall be the responsibility of the contractor to arrange for necessary permits or shutdowns and to provide skilled & responsible persons for execution of the work. The Bidder should submit the Original Letter of authorization from approved OEM/OEMs authorizing them to participate in the tender for Fire Detection and Public Address System.

References, information and certificates from the respective clients certifying suitability, technical knowledge or capability of the applicant should be signed by an officer not below the rank of Executive Engineer or equivalent.

The Bidder may furnish any additional information which he thinks is necessary to establish his capabilities for successful completion of work. The Bidder are however, advised not to furnish superfluous information. No information shall be entertained after submission of offer unless it is called for by B&R.

The contractor shall be responsible to obtain necessary approval from the respective Authorities for Fire Detection and Alarm System. Contractor shall ensure that their sub-suppliers are from list of approved vendors only. In case of any deviation, contractor shall obtain prior approval for the same from the company and shall submit copies of such letters for approval along with inspection call.

55. **DEPLOYMENT OF MINIMUM TECHNICAL PERSONNEL:**

The prospective tenderers shall have technical personnel with minimum 5 years' experience in their full time engagement, the minimum being as mentioned below :

- | | | |
|--|---|--------|
| a) Civil Engineer (Degree holder) well conversant with MORT&H specification for Roads & Highways for day to day management/ supervision / inspection of progress of main work. | : | 1 Nos. |
| b) Surveyor / Supervisor | : | 1 Nos. |
| c) Quantity Surveyor | : | 1 Nos. |

Note: The bidder(s) have to furnish the deployment schedule of the above manpower in a separate sheet along with the techno commercial part of offer.

56. **INTEGRITY PACT** : The Bidder / Contractor is required to enter into an Integrity Pact with the Employer, in the Format at Annexure- VIII (d) . The Integrity Pact enclosed as Annexure –VIII (d) will be signed by BANDR for and on behalf of Employer as its Agent / Power of Attorney Holder at the time of execution of Agreement with the successful Bidder. While submitting the Bid, the Integrity Pact shall be signed by the duly authorized signatory of the Bidder. In case of failure to submit the Integrity Pact duly signed and witnessed, along with the Bid, the Bid is likely to be rejected.

In case of any contradiction between the Terms and Conditions of the Bid Document and the Integrity Pact, the former will prevail.

For & on behalf of Tenderer

BRIDGE AND ROOF CO. (INDIA) LIMITED

BANDEL ROB PROJECT SITE,
OPP.ROTARY HOOGHLY EYE HOSPITAL
P.O.- ADCCONAGAR, P.S.- MOGRA, DIST.- HOOGHLY,
WEST BENGAL, PIN - 712121

ANNEXURE - V

TECHNICAL SPECIFICATION

501 GENERAL REQUIREMENTS FOR BITUMINOUS PAVEMENT LAYERS**501.1 General**

Bituminous pavement courses shall be made using the materials described in the Specifications.

The use of machinery and equipment mentioned in various Clauses of these Specifications is mandatory. Details of the machinery and equipment are available in the Manual for Construction and Supervision of Bituminous Works. The equipment mandatory for any particular project shall be in accordance with the Contract Specifications for that project.

501.2 Materials**501.2.1 Binder**

The binder shall be an appropriate type of bituminous material complying with the relevant Indian Standard, as defined in the appropriate Clauses of these Specifications, or as otherwise specified herein. The choice of binder shall be stipulated in the Contract or by the Engineer. Where viscosity grades of bitumen are specified, they are referred to by a designation in accordance with IS:73. Where modified bitumen is specified, it shall conform to the requirements of IRC:SP:53 and IS:15462; and the following provision of this Specification shall apply.

- i) Modified bitumen from refinery sources or blended at approved central plant or at site using appropriate industrial process and plant with high shear mill, and testing facilities to achieve stable and homogenous mix shall be used. The use of high shear mixer or any other device capable of producing a homogeneous blend is essential when the modifier is in powder form.
- ii) Transportation tanks and storage tanks shall be insulated and equipped with effective heating system and circulation/ agitating device to maintain the specified temperature, homogeneity and viscosity of the bitumen during transit and storage.
- iii) Separation, difference in softening point (R&B), shall not be more than 3°C for any type of specified modified bitumen when tested as per Annex B of IS:15462.

Selection criteria for viscosity grade bitumen, based on highest and lowest daily mean temperatures at a particular site, are given in Table 500-1.

Selection criteria for modified bitumen shall be in accordance with IRC:SP:53.

**Table 500-1 : Selection Criteria for Viscosity-Graded (VG) Paving Bitumens
Based on Climatic Conditions**

Lowest Daily Mean Air Temperature, °C	Highest Daily Mean Air Temperature, °C		
	Less than 20°C	20 to 30°C	More than 30°C
More than -10°C	VG-10	VG-20	VG-30
-10°C or lower	VG-10	VG-10	VG-20

Both the highest daily mean air temperature and the lowest daily mean air temperatures mentioned in Tables 500-5 and 500-6 can be obtained for the weather station nearest to the project site from the Indian Meteorological Organization (IMO). This daily mean high temperature on a specific day is the same as daily "normal" high temperature for that day as usually reported in some newspapers. The highest of the 365 daily mean high air temperatures (which usually occurs on some day in May or June) is used in Tables 500-5 and 500-6. Likewise, the lowest daily mean air temperature (which usually occurs on some day in January) can also be obtained from the IMO. Since these are mean temperatures based on the average of 30-40 years data, these temperatures are significantly lower than the absolute maximum temperatures, which may have occurred in a specific year.

501.2.2 Coarse Aggregates

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on the 2.36 mm sieve. They shall be clean, hard, durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious matter. Where the Contractor's selected source of aggregates has poor affinity for bitumen, the Contractor shall demonstrate through test results that with the use of anti-stripping agents, the stripping value is improved to satisfy the specification requirements. The Engineer may approve such a source and, as a condition for the approval of that source, the bitumen shall be treated with approved anti-stripping agents, as per the manufacturer's recommendations, at the cost of the Contractor.

Where crushed gravel is proposed for use as aggregate not less than 90 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces, except that in the case of bituminous concrete the requirement in this regard shall be 95 percent.

The aggregates shall satisfy the physical requirements set forth in the individual relevant clause for the material.

501.2.3 Fine Aggregates

Fine aggregates shall consist of crushed or naturally occurring material, or a combination of the two, passing 2.36 mm sieve and retained on the 75 micron sieve. They shall be clean,

hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter. Natural sand shall not be allowed in binder and wearing courses. However, natural sand upto 50 percent of the fine aggregates may be allowed in base courses. 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). The plasticity index of the fraction passing 0.425 mm shall not exceed 4 when tested in accordance with IS:2720 (Part 5). The fine aggregates shall satisfy the physical requirements set forth in the individual relevant-clause for the material in question.

501.2.4 Sources of Material

The sources of materials proposed to be used by the Contractor shall be tested to the satisfaction of the Engineer who shall give the necessary approval. The Engineer may from time to time withdraw approval of a specific source, or attach conditions to the existing approval. Any change in aggregate source for bituminous mixes shall require a new mix design, and laying trials, where the mix is based on a job mix design. Stockpiles from different sources, approved or otherwise, shall be kept separate, such that there is no contamination between one material and another. Each source submitted for approval shall contain material sufficient for at least 5 days' work.

501.3 Mixing

Pre-mixed bituminous materials shall be prepared in a hot mix plant of adequate capacity and capable of yielding a mix of proper and uniform quality with thoroughly coated aggregates. Appropriate mixing temperatures are given in Table 500-2 of these Specifications. the difference in temperature between the binder and aggregate shall at no time exceed 14°C. In order to ensure uniform quality of the mix and better coating of aggregates, the hot mix plant shall be calibrated from time to time. The essential features of the hot mix plants are given in Annex A of IRC:27.

Table 500-2 : Mixing, Laying and Rolling Temperatures for Bituminous Mixes (Degree Celcius)

Bitumen Viscosity Grade	Bitumen Temperature	Aggregate Temperature	Mixed Material Temperature	Laying Temperature	*Rolling Temperature
VG-40	160-170	160-175	160-170	150 Min	100 Min
VG-30	150-165	150-170	150-165	140 Min	90 Min
VG-20	145-165	145-170	145-165	135 Min	85 Min
VG-10	140-160	140-165	140-160	130 Min	80 Min

* Rolling must be completed before the mat cools to these minimum temperatures.

If a continuous type mixing plant is used, the Contractor must demonstrate by laboratory analysis that the cold feed combined grading is within the grading limits specified for that bituminous bound material. In the case of a designed job mix, the bitumen and filler content shall be derived using this combined grading.

501.4 Transporting

Bituminous materials shall be transported in clean insulated and covered vehicles. An asphalt release agent, such as soap or lime water, may be applied to the interior of the vehicle to prevent sticking and to facilitate discharge of the material.

501.5 Laying

501.5.1 Weather and Seasonal Limitations

Laying shall be suspended:

- i) In presence of standing water on the surface;
- ii) When rain is imminent, and during rains, fog or dust storm;
- iii) When the base/binder course is damp;
- iv) When the air temperature on the surface on which it is to be laid is less than 10°C for mixes with conventional bitumen and is less than 15°C for mixes with modified bitumen;
- v) When the wind speed at any temperature exceeds the 40 km per hour at 2 m height.

501.5.2 Cleaning of Surface

The surface on which the bituminous work is to be laid shall be cleaned of all loose and extraneous matter by means of a mechanical broom and air jet. The equipment for applying a high pressure air jet from a compressor to remove dust or loose matter shall be available full time at the site.

501.5.3 Spreading

Prior to spreading the mix, the base shall be prepared by carrying out the required operations as per Clause 501.8 depending upon the site conditions. Except in areas where paver cannot get access, bituminous materials shall be spread, levelled and tamped by an approved self-propelled paving machine equipped with an electronic sensing device. The essential features of the paver finisher shall conform to Annex A of IRC:27. As soon as possible after arrival at site, the materials shall be supplied continuously to the paver and laid without delay. The

rate of delivery of material to the paver shall be regulated to enable the paver to operate continuously. The travel rate of the paver, and its method of operations, shall be adjusted to ensure an even and uniform flow of bituminous material across the screed, free from dragging, tearing and segregation of the material. In areas with restricted space (such as confined space, foot ways, of irregular shape and varying thickness, approaches to expansion joints, etc.) where paver cannot be used, the material shall be spread, raked and levelled with suitable hand tools by trained staff.

The minimum thickness of material laid in each paver pass shall be in accordance with the minimum values given in the relevant parts of these Specifications. When laying binder course or wearing course approaching an expansion joint of a structure, machine laying shall stop 300 mm short of the joint. The remainder of the pavement up to the joint, and the corresponding area beyond it, shall be laid by hand, and the joint or joint cavity shall be kept clear of surfacing material.

Bituminous material, with a temperature greater than 145°C, shall not be laid or deposited on bridge deck water-proofing systems, unless precautions against heat damage have been approved by the Engineer.

501.5.4 Cleanliness and Overlaying

Bituminous material shall be kept clean and uncontaminated. The only traffic permitted to run on bituminous material to be overlaid shall be that engaged in laying and compacting the next course or, where a binder course is to be sealed or surface dressed, that engaged on such surface treatment. Should any bituminous material become contaminated, the Contractor shall make it good to the satisfaction of the Engineer, in compliance with Clause 501.8.

Binder course material shall be covered by either the wearing course or surface treatment, whichever is specified in the Contract.

501.6 Compaction

Bituminous materials shall be laid and compacted in layers, which enable the specified thickness, surface level, regularity requirements and compaction to be achieved.

Compaction of bituminous materials shall commence as soon as possible after laying. Compaction shall be substantially completed before the temperature falls below the minimum rolling temperatures stated in the relevant part of these Specifications. Rolling of the longitudinal joints shall be done immediately behind the paving operation. After this, rolling shall commence at the edges and progress towards the center longitudinally except that on super-elevated and unidirectionally cambered portions, it shall progress from the lower to the upper edge parallel to the center line of the pavement. Rolling shall continue until all roller marks have been removed from the surface. All deficiencies in the surface after laying shall

be made good by the attendants behind the paver, before initial rolling is commenced. The initial or breakdown rolling shall be done with 8–10 tonne static weight smooth-wheel rollers. The intermediate rolling shall be done with 8–10 tonne static weight or vibratory roller or with a pneumatic tyre roller of 12 to 15 tonne weight, with a tyre pressure of at least 0.56 MPa. The Contractor shall demonstrate the efficiency of the equipment proposed to be used by carrying compaction trials. The procedure for site trials shall be submitted to the Engineer for approval. The finish rolling shall be done with 6 to 8 tonne smooth wheel tandem rollers. Rolling shall continue until the specified compaction is achieved.

Where compaction is to be determined by density of cores, the requirements to prove the performance of rollers shall apply in order to demonstrate that the specified density can be achieved. In such cases the Contractor shall specify the plant, and the method by which he intends to achieve the specified level of compaction and finish at temperatures above the minimum specified rolling temperature. Laying trials shall then demonstrate the acceptability of the plant and method used.

Bituminous materials shall be rolled in a longitudinal direction, with the driven rolls nearest the paver. The roller shall first compact material adjacent to joints and then work from the lower to the upper side of the layer, overlapping on successive passes by at least one-third of the width of the rear roll or, in the case of a pneumatic-tyred roller, at least the nominal width of 300 mm.

In portions with super-elevated and unidirectional camber, after the edge has been rolled, the roller shall progress from the lower to the upper edge.

Rollers should move at a speed of not more than 5 km per hour. The roller shall not be permitted to stand on pavement which has not been fully compacted, and necessary precautions shall be taken to prevent dropping of oil, grease, petrol/ diesel or other foreign matter on the pavement either when the rollers are operating or standing. The wheels of roller machine shall be in good working order, to prevent the mix from adhering to the wheels. Only sufficient moisture to prevent adhesion between the wheels of rollers and the mix should be used. Surplus water shall not be allowed to stand on the partially compacted pavement.

501.7 Joints

501.7.1 Where joints are made, the material shall be fully compacted and the joint made flush in one of the following ways:

- a) All joints shall be cut vertical to the full thickness of the previously laid mix. All loosened material shall be discarded and the vertical face coated with a suitable viscosity grade hot bitumen, or cold applied emulsified bitumen. While spreading the material along the joint the material spread shall overlap 25 mm to 50 mm on the previously laid mix beyond the vertical face of the joint. The thickness of the loose

overlap material should be approximately a quarter more than the final compacted thickness. The overlapped mix shall be dragged back to the hot lane so that the roller can press the small excess into the hot side of the joint to obtain a high joint density.

- b) By using two or more pavers operating in echelon, where this is practicable and in sufficient proximity for adjacent widths to be fully compacted by continuous rolling.

501.7.2 All longitudinal joints shall be offset at least 300 mm from parallel joints in the layer beneath or as directed, and in a layout approved by the Engineer. Joints in the wearing course shall coincide with either the lane edge or the lane marking, whichever is appropriate. Longitudinal joints shall not be situated in wheel track zones.

501.7.3 For transverse joints method a) above shall apply. Transverse joints in the successive and adjoining layers shall have a minimum offset of 2 m.

501.8 Preparation of Surface

501.8.1 Scope

This work shall consist of preparing an existing granular or black-topped surface for laying bituminous course. The work shall be performed on such widths and lengths as shown on the drawings or as instructed by the Engineer. The existing surface shall be firm and clean, and treated with Prime or Tack coat where specified in the Contract.

501.8.2 Materials

501.8.2.1 For Scarifying and Re-laying the Granular Surface

The material used shall be coarse aggregates salvaged from the scarification of the existing granular base course supplemented by fresh coarse aggregates and screenings so that aggregates and screenings thus supplemented correspond to Clauses 404 or 406.

501.8.2.2 For Patching Potholes and Sealing Cracks

Where the existing surface to be overlaid is bituminous, material required for patching and sealing cracks shall be in accordance with Clauses 3004.2 and 3004.3, or as directed by the Engineer.

501.8.2.3 For Profile Corrective Course

The type of material for use as profile corrective course shall be as shown on the drawings

or as directed by the Engineer. Where it is to be laid as part of the overlay/ strengthening course, the profile corrective course material shall be of the same specification as that of the overlay/ strengthening course. However, if provided as a separate layer, it shall be of the specification and details given in the Contract.

501.8.3 Construction Operations

501.8.3.1 Preparing Existing Granular Surface

Where the existing surface is granular, all loose materials shall be removed, and the surface lightly watered where the profile corrective course to be provided as a separate layer is also granular. Where the profile corrective course of bituminous material is to be laid over the existing granular surface, the latter shall, after removal of all loose material, be primed in accordance with Clause 502 and a tack coat applied in accordance with Clause 503.

The surface of all granular layers on which bituminous works are to be placed, shall be free from dust. All such layers must be capable of being swept, after the removal of any non-integral loose material, by means of a mechanical broom, without shedding significant quantities of material and dust removed by air jet, washing, or other means approved by the Engineer.

After cleaning, the surface shall be correct to line and level within the tolerances specified for base course.

501.8.3.2 Scarifying Existing Bituminous Surface

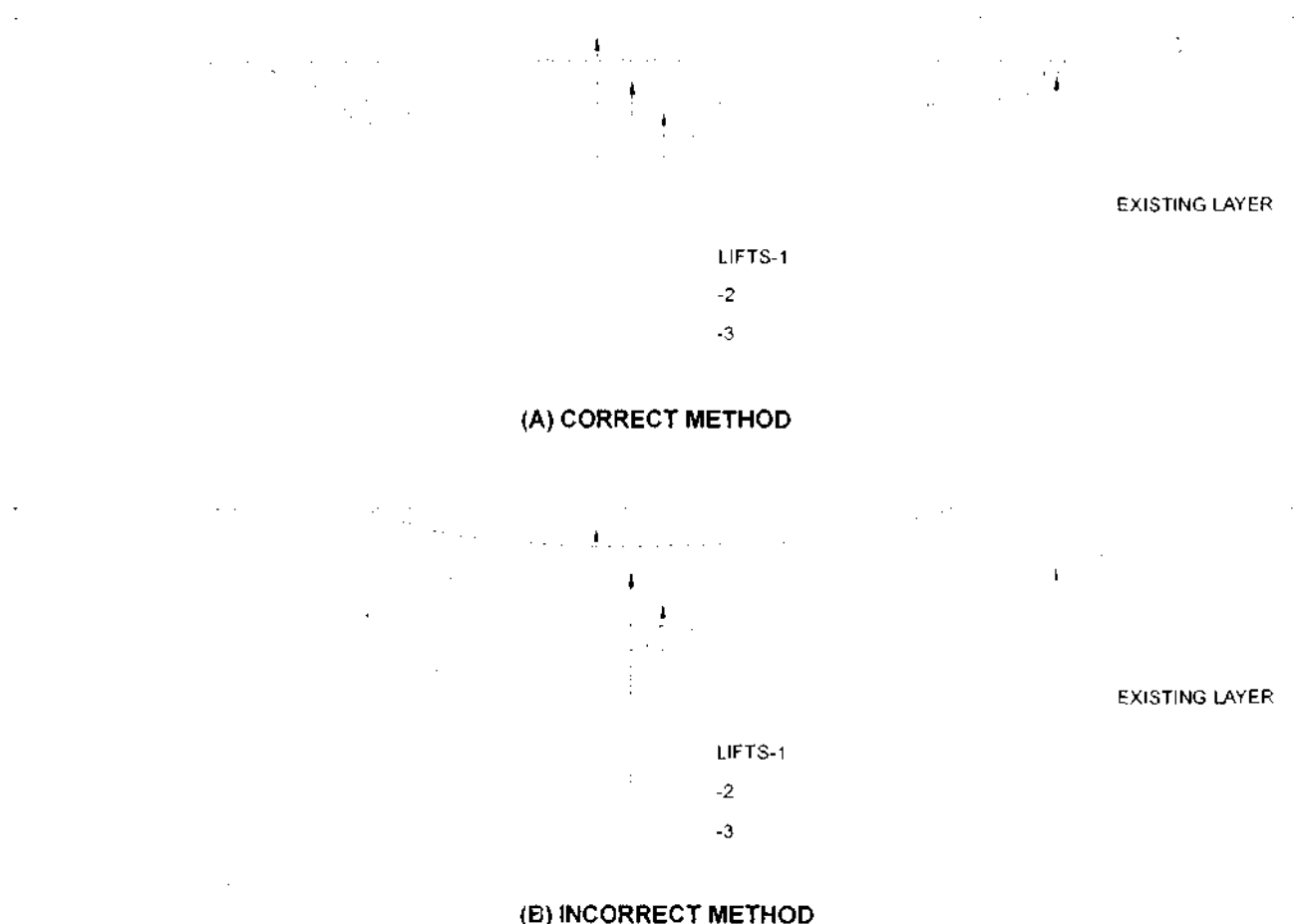
Where specified or shown on the drawings, the existing bituminous layer in the specified width shall be removed with care and without causing undue disturbance to the underlying layer, by a suitable method approved by the Engineer. After removal of all loose and disintegrated material, the underlying layers which might have been disturbed shall be suitably reworked supplementing the base material as necessary with suitable fresh stone aggregates and compacted to line and level. The compacted finished surface shall be primed in accordance with **Clause 502**. Reusable materials shall be stacked as directed by the Engineer with all leads and lifts.

501.8.3.3 Patching of Potholes and Sealing of Cracks

Where the existing surface to be overlaid is bituminous, any existing potholes and cracks shall be repaired and sealed in accordance with Clauses 3004.2 and 3004.3, or as directed by the Engineer.

501.8.3.4 Profile Corrective Course**a) Application of Profile Corrective Course**

- i) A profile corrective course for correcting the existing pavement profile shall be laid to varying thickness as shown on the Drawings.
 - ii) Any high spots in the existing black-topped surface shall be removed by a milling machine or other approved method, and all loose material shall be removed to the satisfaction of the Engineer.
 - iii) Where the maximum thickness of profile corrective course will be not more than 40 mm, the profile corrective course shall be constructed as an integral part of the overlay course. In other cases, the profile corrective course shall be constructed as a separate layer, adopting such construction procedures and using such equipment as approved by the Engineer, to lay the specified type of material, to thickness and tolerance as specified for the course to be provided.
 - iv) The profile corrective course shall be laid to tolerances and densities as specified for wearing course if it is laid integral with the wearing course. The profile corrective course shall be laid to tolerances and densities as specified for base course, if it is to be covered with a wearing course layer.
- b) **Laying on Granular Base** : After preparing the granular surface in accordance with Clauses 501.8.3.1 and 501.8.3.2, the profile corrective course shall be laid using material as described in Clauses 501.8.2.3 and 501.8.3.4 (a), or as otherwise described in the Contract, and compacted to the requirements of the particular Specification.
- c) **Laying on Existing Bituminous Surface** : The existing bituminous surface shall be prepared in accordance with Clause 501.8.3.3, and after applying a tack coat conforming to Clause 503, the bituminous profile corrective course shall be laid using material as described in Clauses 501.8.2.3 and 501.8.3.4(a) and compacted to the requirements of the Specification.
- d) **Correction of Local Depressions, Camber and Super-Elevation** : Where local sags or depressions occur in the existing pavement, a specific filling operation shall be instructed by the Engineer, which should be laid in accordance with Fig. 500-1. Normally, the maximum layer thickness at any point should not exceed 100 mm. In placing multiple lifts, they should be arranged according to the correct method as illustrated.



Note: Profile corrective course material to be in accordance with the lift thickness

Fig. 500-1 : Methods for Providing Corrective Course for Short Sags and Depressions

For correction of camber or super-elevation of the existing carriageway, the method shown in Fig. 500-2 shall be adopted, depending on the profile of the existing carriageway.

501.8.3.5 Covering the Profile Corrective Courses

Profile corrective course shall be so planned that the layer shall be covered by the designed base/wearing course at the earliest opportunity, before opening to regular traffic.

501.8.4 Surface Finish and Quality Control of Work

The relevant provisions of Section 900 shall apply.

501.8.5 Arrangements for Traffic

During construction operations, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

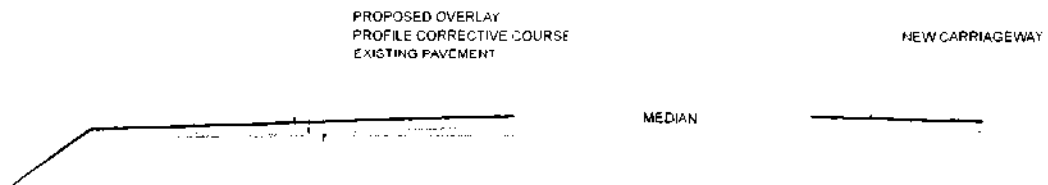
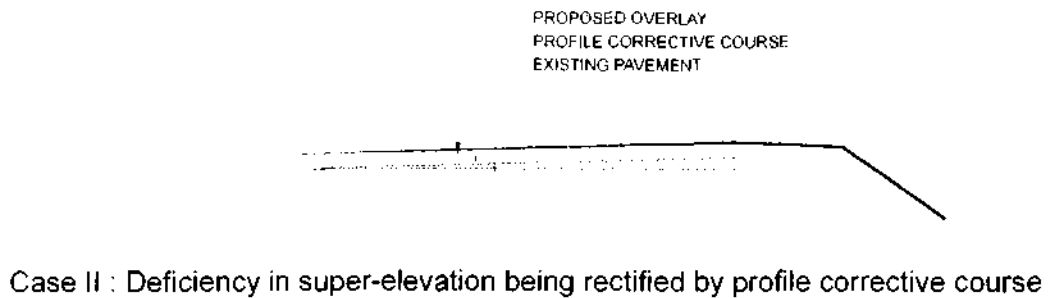
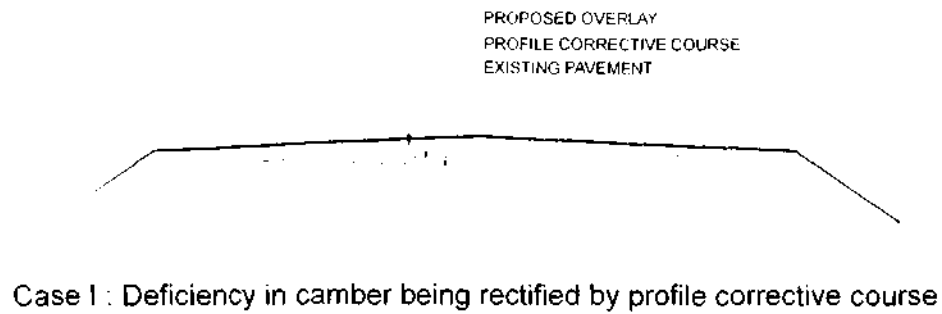


Fig. 500-2 : Correction of Camber or Super-Elevation

501.8.6 Environmental Protection

The provisions of Clause 111 and the provision of Annex A to Clause 501 shall apply.

501.8.7 Measurement for Payment

501.8.7.1 Cleaning of the Surface

The work of cleaning of the surface using mechanical broom and air-jet shall be incidental to the work of preparation of surface.

501.8.7.2 Scarifying

Scarifying the existing bituminous surface shall be measured and paid for on a square metre basis.

501.8.7.3 Prime Coat

Prime coat shall be measured and paid for on a square metre basis.

501.8.7.4 Tack Coat

Tack coat shall be measured and paid for on a square metre basis.

501.8.7.5 Potholes and Crack Sealing

The work of filling potholes shall be measured separately and be paid for in square metres or on weight basis in tonnes as specified in the Contract.

The work of sealing cracks by applying fog spray or emulsion slurry seal shall be measured in square metres, for the area covered by the spray.

The work of sealing cracks of size 3 mm to 6 mm in width shall be measured in square metres or in linear meters as specified in the Contract.

The work of sealing cracks of size greater than 6 mm width shall be measured in linear metres.

501.8.7.6 Profile Corrective Course

Profile corrective course shall be measured as the volume laid in position in cubic metres, or in tonnage, as stipulated in the Contract. The volume shall be calculated by plotting the exact profile of corrective course as required, and laid, superimposed on the existing pavement profile. Cross-sectional areas of the profile corrective course shall be measured at intervals of 10 m centre to centre on straight sections and at 5 m center to centre on curves longitudinally and at seven locations transversely, for two lane carriageway, and at three locations transversely for single lane and the volume shall be calculated using the method of end areas.

501.8.7.7 Filling of Local Depressions

The work of filling depressions where instructed to be carried out separately shall be measured by the weight of the bituminous material placed in position.

501.8.8 Rates**501.8.8.1 Rate for Scarifying**

The contract unit rate for scarifying existing bituminous surfaces, including repairing/reworking

disturbed underlying layers and removing and stacking reusable and unusable materials, shall include but not necessarily be limited to, the cost of all labour, supply of materials needed for repair/reworking, hire charges of tools and plant, and transportation of scarified materials with all leads and lifts.

501.8.8.2 Rate for Premixed Bituminous Material

The contract unit rate for premixed bituminous material shall be payment in full for carrying out the required operations including full compensation for, but not necessarily limited to:

- i) Making arrangements for traffic to Clause 112 except for initial treatment to verge, shoulders and construction of diversions;
- ii) Cleaning of the surface;
- iii) Providing all materials to be incorporated in the work including arrangement for stock yards, all royalties, fees, rents where necessary and all leads and lifts;
- iv) Mixing, transporting, laying and compacting the mix, as specified including all wastage in cutting joints;
- v) All labour, tools, equipment, plant including installation of hot mix plant, power supply units and all machinery, incidental to complete the work to these Specifications;
- vi) Carrying out the work in part widths of the road where directed;
- vii) Carrying out all tests for control of quality;
- viii) The rate shall cover the provision of bitumen at the application rate specified in the contract, with the provision that the variation in actual percentage of bitumen used shall be assessed and the payment adjusted accordingly as per Contract;
- ix) The rates include for all testing, mix design, transporting and testing of samples, and cores and tests as directed by the Engineer; and
- x) The cost of all plant and laying trials as specified to prove the mixing and laying methods shall be deemed to be included in the Contractor's rates.

501.8.8.3 Rate for Potholes and Crack Sealing

The rate for patching potholes shall be as per Clause 3004.2.6.

The rate for sealing cracks by applying fog spray shall be as per Clause 513.9.

The rate for sealing of cracks of width 3 mm or more shall be as per Clause 3004.3.3.5.

The contract unit rate for cracks between 6 mm and 15 mm shall be measured on a linear metre basis, and the rate is to include for all materials, tools, plant, labour, and transport.

501.8.8.4 Rate for Prime Coat

The Contract unit rate for prime coat shall be as per Clause 502.8.

501.8.8.5 Rate for Tack Coat

The Contract unit rate for tack coat shall be as per Clause 503.8.

501.8.8.6 Rate for Filling of Local Depressions

The Contract unit rate for filling of local depressions shall be payment in full for (i) furnishing all materials, (ii) all works involved including trimming, cleaning, backfilling, priming, application of tack coat, filling with bituminous material in layers and compacting each layer (iii) all labour, tools, equipment and incidentals to complete the works in accordance with the Specifications.

501.8.8.7 Rate for Profile Corrective Course

The Contract unit rate for profile corrective course when laid separately shall be payment in full for carrying out the required operations as specified, and shall include all components listed in Clause 501.8.8.2.

Annex 'A' to Clause 501**Annex 'A'
PROTECTION OF THE ENVIRONMENT****1 GENERAL**

- 1.1 This Appendix sets out limitations on the Contractor's activities specifically intended to protect the environment.
- 1.2 The Contractor shall take all necessary measures and precautions and otherwise ensure that the execution of the works and all associated operations on or off site are carried out in conformity with statutory and regulatory environmental requirements including those prescribed elsewhere in these specifications.
- 1.3 The Contractor shall take all measures and precautions to avoid any nuisance or disturbance arising from the execution of the Works. This shall wherever possible be achieved by suppression of the nuisance at source rather than abatement of the nuisance once generated.
- 1.4 In the event of any spoil, debris, waste or any deleterious substance from the site being deposited on any adjacent land, the Contractor shall immediately remove all such material and restore the affected area to its original state to the satisfaction of the Engineer.

2 WATER QUALITY

- 2.1 The Contractor shall prevent any interference with the supply to or abstraction from, and prevent any pollution of, water resources (including underground percolating water) as a result of the execution of the Works.
- 2.2 Areas where water is regularly or repetitively used for dust suppression purposes shall be laid to fall to specially-constructed settlement tanks to permit sedimentation of particulate matter. After settlement, the water may be reused for dust suppression and rinsing.
- 2.3 All water and other liquid waste products arising on the site shall be collected and disposed of at a location on or off the site and in a manner that shall not cause nuisance or pollution.
- 2.4 The Contractor shall not discharge or deposit any matter arising from the execution of the Works into any waters except with the permission of the Engineer and the regulatory authorities concerned.
- 2.5 The Contractor shall at all times ensure that all existing stream courses and drains within, and adjacent to, the site are kept safe and free from any debris and any materials arising from the Works.

- 2.6 The Contractor shall protect all watercourses, waterways, ditches, canals, drains, lakes and the like from pollution as a result of the execution of the Works.

3**AIR QUALITY**

- 3.1 The Contractor shall devise and arrange methods of working to minimize dust, gaseous or other air-borne emissions and carry out the Works in such a manner as to minimize adverse impacts on air quality.
- 3.2 The Contractor shall utilize effective water sprays during delivery, manufacture, processing and handling of materials when dust is likely to be created, and to dampen stored materials during dry and windy weather. Stockpiles of friable materials shall be covered with clean tarpaulins, with application of sprayed water during dry and windy weather. Stockpiles of material or debris shall be dampened prior to their movement, except where this is contrary to the Specifications.
- 3.3 Any vehicle with an open load-carrying area used for transporting potentially dust producing material shall have properly fitting side and tail boards. Materials having the potential to produce dust shall not be loaded to a level higher than the side and tail boards, and shall be covered with a clean tarpaulin in good condition. The tarpaulin shall be properly secured and extended at least 300 mm over the edges of the side and tail boards.
- 3.4 In the event that the Contractor is permitted to use gravel or earth roads for haulage, he shall provide suitable measures for dust palliation, if these are, in the opinion of the Engineer, necessary. Such measures may include sprinkling water on the road surface at regular intervals.

4**NOISE**

- 4.1 The Contractor shall consider noise abatement measures in his planning and execution of the Works.
- 4.2 The Contractor shall take all necessary measures so that the operation of all mechanical equipment and construction processes on and off the site shall not cause any unnecessary or excessive noise, taking into account applicable environmental requirements. The Contractor shall use all necessary measures and shall maintain all plant and silencing equipment in good condition so as to minimize the noise emission during construction works.

5 CONTROL OF WASTES

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

6 EMERGENCY RESPONSE

6.1 The Contractor shall plan and provide for remedial measures to be implemented in the event of occurrence of emergencies such as spillages of oil or bitumen or chemicals.

6.2 The Contractor shall provide the Engineer with a statement of the measures he intends to implement in the event of such an emergency, which shall include a statement of how he intends to provide personnel adequately trained to implement such measures.

7. MEASUREMENT

7.1 No separate measurement shall be made in respect of compliance by the Contractor with these provisions. The Contractor shall be deemed to have made allowance for such compliance with these provisions in the preparation of his prices for items of work included in the Bill of Quantities and full compensation for such compliance will be deemed to be covered by them.

502 PRIME COAT OVER GRANULAR BASE**502.1 Scope**

This work shall consist of the application of a single coat of low viscosity liquid bituminous material to a porous granular surface preparatory to the superimposition of bituminous treatment or mix. The work shall be carried out on a previously prepared granular/ stabilized surface to Clause 501.8.

502.2 Materials

502.2.1 The primer shall be cationic bitumen emulsion SS1 grade conforming to IS:8887 or medium curing cutback bitumen conforming to IS:217 or as specified in the Contract.

502.2.2 Quantity of SS1 grade bitumen emulsion for various types of granular surface shall be as given in Table 500-3.

Table 500-3 : Quantity of Bitumen Emulsion for Various Types of Granular Surfaces

Type of Surface	Rate of Spray (kg/sq.m)
WMM/WBM	0.7-1.0
Stabilized soil bases/Crusher Run Macadam	0.9-1.2

502.2.3 Cutback for primer shall not be prepared at the site. Type and quantity of cutback bitumen for various types of granular surface shall be as given in Table 500-4.

Table 500-4 : Type and Quantity of Cutback Bitumen for Various Types of Granular Surface

Type of Surface	Type of Cutback	Rate of Spray (kg/sq.m)
WMM/WBM	MC 30	0.6-0.9
Stabilized soil bases/ Crusher Run Macadam	MC 70	0.9-1.2

502.2.4 The correct quantity of primer shall be decided by the Engineer and shall be such that it can be absorbed by the surface without causing run-off of excessive primer and to achieve desired penetration of about 8-10 mm.

502.3 Weather and Seasonal Limitations

Primer shall not be applied during a dust storm or when the weather is foggy, rainy or windy or when the temperature in the shade is less than 10°C. Cutback bitumen as primer shall not

be applied to a wet surface. Surfaces which are to receive emulsion primer should be damp, but no free or standing water shall be present. Surface can be just wet by very light sprinkling of water.

502.4 Construction

502.4.1 Equipment

The primer shall be applied by a self-propelled or towed bitumen pressure sprayer equipped for spraying the material uniformly at specified rates and temperatures. Hand spraying shall not be allowed except in small areas, inaccessible to the distributor, or in narrow strips where primer shall be sprayed with a pressure hand sprayer, or as directed by the Engineer.

502.4.2 Preparation of Road Surface

The granular surface to be primed shall be swept clean by power brooms or mechanical sweepers and made free from dust. All loose material and other foreign material shall be removed completely. If soil/ moorum binder has been used in the WBM surface, part of this should be brushed and removed to a depth of about 2 mm so as to achieve good penetration.

502.4.3 Application of Bituminous Primer

After preparation of the road surface as per Clause 502.4.2, the primer shall be sprayed uniformly at the specified rate. The method for application of the primer will depend on the type of equipment to be used, size of nozzles, pressure at the spray bar and speed of forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified.

No heating or dilution of SS1 bitumen emulsion and shall be permitted at site. Temperature of cutback bitumen shall be high enough to permit the primer to be sprayed effectively through the jets of the spray and to cover the surface uniformly.

502.4.4 Curing of Primer and Opening to Traffic

A primed surface shall be allowed to cure for at least 24 hours or such other higher period as is found to be necessary to allow all the moisture/volatiles to evaporate before any subsequent surface treatment or mix is laid. Any unabsorbed primer shall first be blotted with a light application of sand, using the minimum quantity possible. A primed surface shall not be opened to traffic other than that necessary to lay the next course.

502.5 Quality Control of Work

For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

502.6 Arrangements for Traffic

During construction operations, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

502.7 Measurement for Payment

Prime coat shall be measured in terms of surface area of application in square metres.

502.8 Rate

The contract unit rate for prime coat shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.7 (i) to (v) and as applicable to the work specified in these Specifications. Payment shall be made on the basis of the provision of prime coat at an application rate of quantity at 0.6 kg per square metre or at the rate specified in the Contract, with adjustment, plus or minus, for the variation between this quantity and the actual quantity approved by the Engineer after the preliminary trials referred to in Clause 502.4.3.

503 TACK COAT**503.1 Scope**

The work shall consist of the application of a single coat of low viscosity liquid bituminous material to existing bituminous, cement concrete or primed granular surface preparatory to the superimposition of a bituminous mix, when specified in the Contract or as instructed by the Engineer. The work shall be carried out on a previously prepared surface in accordance with Clause 501.8.

503.2 Materials

The binder used for tack coat shall be either Cationic bitumen emulsion (RS 1) complying with IS:8887 or suitable low viscosity paving bitumen of VG 10 grade conforming to IS:73. The use of cutback bitumen RC:70 as per IS:217 shall be restricted only for sites at sub-zero temperatures or for emergency applications as directed by the Engineer. The type and grade of binder for tack coat shall be as specified in the Contract or as directed by the Engineer.

503.3 Weather and Seasonal Limitations

Bituminous material shall not be applied during a dust storm or when the weather is foggy, rainy or windy or when the temperature in the shade is less than 10°C. Where the tack coat

consists of emulsion, the surface shall be slightly damp, but not wet. Where the tack coat is of cutback bitumen, the surface shall be dry.

503.4 Construction

503.4.1 Equipment

The tack coat shall be applied by a self-propelled or towed bitumen pressure sprayer, equipped for spraying the material uniformly at a specified rate. Hand spraying shall not be permitted except in small areas, inaccessible to the distributor, or narrow strips, shall be sprayed with a pressure hand sprayer, or as directed by the Engineer.

503.4.2 Preparation of Base

The surface on which the tack coat is to be applied shall be clean and free from dust, dirt, and any extraneous material, and be otherwise prepared in accordance with the requirements of Clause 501.8. The granular or stabilized surfaces shall be primed as per Clause 502. Immediately before the application of the tack coat, the surface shall be swept clean with a mechanical broom, and high pressure air jet, or by other means as directed by the Engineer.

503.4.3 Application of Tack Coat

The application of tack coat shall be at the rate specified in Table 500-5, and it shall be applied uniformly. If rate of application of Tack Coat is not specified in the contract, then it shall be the rate specified in Table 500-5. No dilution or heating at site of RS1 bitumen emulsion shall be permitted. Paving bitumen if used for tack coat shall be heated to appropriate temperature in bitumen boilers to achieve viscosity less than 2 poise. The normal range of spraying temperature for a bituminous emulsion shall be 20°C to 70°C and for cutback, 50°C to 80°C. The method of application of tack coat will depend on the type of equipment to be used, size of nozzles, pressure at the spray bar, and speed or forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified.

Table 500-5 : Rate of Application of Tack Coat

Type of Surface	Rate of Spray of Binder in Kg per sq. m
Bituminous surfaces	0.20 – 0.30
Granular surfaces treated with primer	0.25 – 0.30
Cement concrete pavement	0.30 – 0.35

503.4.4 Curing of Tack Coat

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

503.5 Quality Control of Work

For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

503.6 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

503.7 Measurement for Payment

Tack coat shall be measured in terms of surface area of application in square metres.

503.8 Rate

The contract unit rate for tack coat shall be payment in full for carrying out the required operations including for all components listed in Clause 401.8 (i) to (v) and as applicable to the work specified in these Specifications. The rate shall cover the provision of tack coat, at 0.2 kg per square metre or at the rate specified in the Contract, with the provision that the variation between this quantity and actual quantity of bitumen used will be assessed and the payment adjusted accordingly.

504 BITUMINOUS MACADAM**504.1 Scope**

This work shall consist of construction in a single course having 50 mm to 100 mm thickness or in multiple courses of compacted crushed aggregates premixed with a bituminous binder on a previously prepared base to the requirements of these Specifications. Since the bituminous macadam is an open-graded mix, there is a potential that it may trap water or moisture vapour within the pavement system. Therefore, adjacent layer (shoulders) should have proper drainage quality to prevent moisture-induced damage to the BM.

504.2 Materials**504.2.1 Bitumen**

The bitumen shall be viscosity graded paving bitumen complying with Indian Standard Specification for paving bitumen, IS:73 or as specified in the Contract. The type and grade of

bitumen to be used would depend upon the climatic conditions and the traffic. Guidelines for selection of bitumen are given in Table 500-1.

504.2.2 Coarse Aggregates

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. It shall be clean, hard, durable and cubical shape, free from dust and soft organic and other deleterious substances. The aggregate shall satisfy the physical requirements specified in Table 500-6. Where crushed gravel is proposed for use as aggregate, not less than 90 percent by weight of the crushed material retained on 4.75 mm sieve shall have at least two fractured faces resulting from crushing operation. Before approval of the source, the aggregates shall be tested for stripping. Where the Contractor's selected source of aggregates have poor affinity for bitumen, as a condition for the approval of that source, the bitumen shall be treated with approved anti-stripping agents, as per the manufacturer's recommendations, without additional payment.

504.2.3 Fine Aggregates

Fine aggregates shall consist of crushed or naturally occurring mineral material, or a combination of two, passing 2.36 mm sieve and retained on 75 micron sieve. It shall be clean, hard, durable, free from dust and soft organic and other deleterious substances. Natural sand shall not be used in the binder course.

Table 500-6 : Physical Properties of Coarse Aggregate

Property	Test	Requirement	Test method
Cleanliness	Grain size analysis	Max. 5% passing 0.075 micron	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices	Max. 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value or	Max. 40%	IS:2386 Part IV
	Aggregate Impact Value	Max. 30%	IS:2386 Part IV
Durability	Soundness (Sodium or Magnesium)	5 cycles	
	Sodium Sulphate	Max. 12%	IS:2386 Part V
	Magnesium Sulphate	Max. 18%	IS:2386 Part V
Water absorption	Water absorption	Max. 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate	Min. Retained Coating 95%	IS:6241
Water sensitivity	Retained Tensile strength*	Min. 80%	AASHTO 283

* If the minimum retained tensile strength falls below 80 percent, use of anti stripping agent is recommended to meet the minimum requirements.

504.2.4 Aggregate Grading and Binder Content

The combined grading of the coarse aggregates and fine aggregates, when tested in accordance with IS:2386 Part 1, wet sieving method, shall conform to limits given in Table 500-8. The type and quantity of bitumen and appropriate thickness is also given in Table 500-7.

504.2.5 Proportioning of Material

The combined aggregate grading shall not vary from the lower limit on one sieve to the higher limit on the adjacent sieve to avoid gap grading. The aggregate may be proportioned and blended to produce a uniform mix complying with the requirements in Table 500-7. The binder content shall be within a tolerance of ± 0.3 percent by weight of total mix when individual specimens are taken for quality control tests in accordance with the provisions of Section 900.

504.3 Construction Operation**504.3.1 Weather and Seasonal Limitations**

The provisions of Clause 501.5.1 shall apply.

Table 500-7 : Aggregate Grading and Bitumen Content

Grading	1	2
Nominal maximum aggregate size*	40 mm	19 mm
Layer thickness	80 -100 mm	50 -75 mm
IS Sieve size (mm)	Cumulative % by weight of total aggregate passing	
45	100	
37.5	90-100	
26.5	75-100	100
19	–	90 – 100
13.2	35-61	56 – 88
4.75	13 – 22	16 – 36
2.36	4 – 19	4 – 19
0.3	2 – 10	2 – 10
0.075	0 – 8	0 – 8
Bitumen content ** percent by mass of total mix	3.3**	3.4**

* Nominal maximum aggregate size is the largest specified sieve size upon which any of the aggregate material is retained.

- ** Corresponds to specific gravity of the Aggregate being 2.7. In case aggregates have specific gravity more than 2.7, bitumen content can be reduced proportionately. Further, for regions where highest daily mean air temperature is 30°C or lower and lowest daily mean air temperature is -10°C or lower, the bitumen content may be increased by 0.5 percent.

504.3.2 Preparation of the Base

The base on which bituminous macadam is to be laid shall be prepared, shaped and compacted to the required profile in accordance with Clauses 501.8 and 902.3 as appropriate, and a prime coat, shall be applied in accordance with Clause 502 where specified, or as directed by the Engineer. The surface shall be thoroughly swept clean by a mechanical broom, and the dust removed by compressed air. In locations where mechanical broom cannot get access, other approved methods shall be used as directed by the Engineer.

504.3.3 Tack Coat

A tack coat in accordance with Clause 503 shall be applied as required under the Contract or as directed by the Engineer.

504.3.4 Preparation and Transportation of the Mix

The provisions of Clauses 501.3 and 501.4 shall apply.

504.3.5 Spreading

The provisions of Clause 501.5.3 shall apply.

504.3.6 Rolling

Compaction shall be carried out in accordance with the provisions of Clauses 501.6 and 501.7.

Rolling shall be continued until the specified density is achieved, or where no density is specified, until there is no further movement under the roller. The required frequency of testing is defined in Clause 903.

504.4 Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902. For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

504.5 Protection of the Layer

The bituminous macadam shall be covered with either the next pavement course or wearing course, as the case may be, within a maximum of forty-eight hours. If there is to be any delay, by the Contractor the course shall be covered by a seal coat to the requirement of Clause 512 before opening to any traffic. The seal coat in such cases shall be considered incidental to the work and shall not be paid for separately.

504.6 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

504.7 Measurement for Payment

Bituminous macadam shall be measured as finished work in cubic metres, or by weight in metric tonnes, where used as regulating course, or square metres at the specified thickness as indicated in the Contract or shown on the drawings, or as otherwise directed by the Engineer.

504.8 Rate

The contract unit rate for bituminous macadam shall be payment in full for carrying out the required operations as specified. The rate shall include cost for all components listed in Clause 501.8.8.2.

505 DENSE BITUMINOUS MACADAM**505.1 Scope**

The specification describes the design and construction procedure for Dense Bituminous Macadam, (DBM), for use mainly, but not exclusively, in base/binder and profile corrective courses. The work shall consist of construction in a single or multiple layers of DBM on a previously prepared base or sub-base. The thickness of a single layer shall be 50 mm to 100 mm.

505.2 Materials**505.2.1 Bitumen**

The bitumen shall be viscosity grade paving bitumen complying with the Indian Standard Specification IS:73, modified bitumen complying with Clause 501.2.1 or as otherwise specified in the Contract.

The type and grade of bitumen to be used shall be specified in the Contract.

505.2.2 Coarse Aggregates

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. They shall be clean, hard, durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious substances. Where the Contractor's selected source of aggregates has poor affinity for bitumen, the Contractor shall produce test results that with the use of anti-stripping agents, the stripping value is improved to satisfy the specification requirements. The Engineer may approve such a source and as a condition for the approval of that source, the bitumen shall be treated with an approved anti-stripping agent, as per the manufacturer's recommendations, at the cost of the Contractor. The aggregates shall satisfy the requirements specified in Table 500-8.

Where crushed gravel is proposed for use as aggregate, not less than 90 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

505.2.3 Fine Aggregates

Fine aggregates shall consist of crushed or naturally occurring mineral material, or a combination of the two, passing the 2.36 mm sieve and retained on the 75 micron sieve. These shall be clean, hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter. Natural sand shall not be allowed in binder courses. However, natural sand upto 50 percent of the fine aggregate may be allowed in base courses. The fine aggregate shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS:2720 (Part 37). The plasticity index of the fraction passing the 0.425 mm sieve shall not exceed 4, when tested in accordance with IS:2720 (Part 5).

505.2.4 Filler

Filter shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement approved by the Engineer. The filler shall be graded within the limits indicated in Table 500-9.

The filler shall be free from organic impurities and have a plasticity Index not greater than 4. The Plasticity Index requirement shall not apply if filler is cement or lime. Where the aggregates fail to meet the requirements of the water sensitivity test in Table 500-8, then 2 percent by total weight of aggregate, of hydrated lime shall be used and percentage of fine aggregate reduced accordingly.

505.2.5 Aggregate Grading and Binder Content

505.2.5.1 When tested in accordance with IS:2386 Part 1 (wet sieving method), the combined grading of the coarse and fine aggregates and filler for the particular mixture shall fall within the limits given in Table 500-10 for grading 1 or 2 as specified in the Contract. To avoid gap grading, the combined aggregate gradation shall not vary from the lower limit on one sieve to higher limit on the adjacent sieve.

Table 500-8 : Physical Requirements for Coarse Aggregate for Dense Bituminous Macadam

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max 5% passing 0.075 mm sieve	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices*	Max 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 35% Max 27%	IS:2386 Part IV
Durability	Soundness either :Sodium Sulphate or Magnesium Sulphate	Max 12% Max 18%	IS:2386 Part V
Water Absorption	Water Absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95%	IS:6241
Water Sensitivity	Retained Tensile Strength**	Min. 80%	AASHTO 283

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

** If the minimum retained tensile test strength falls below 80 percent, use of anti stripping agent is recommended to meet the requirement.

Table 500-9 : Grading Requirements for Mineral Filler

IS sieve (mm)	Cumulative Percent Passing by Weight of Total Aggregate
0.6	100
0.3	95 – 100
0.075	85 – 100

Table 500-10 : Composition of Dense Graded Bituminous Macadam

Grading	1	2
Nominal aggregate size*	37.5 mm	26.5 mm
Layer thickness	75 – 100 mm	50 – 75 mm
IS Sieve¹ (mm)	Cumulative % by weight of total aggregate passing	
45	100	
37.5	95 – 100	100
26.5	63-93	90-100
19	–	71-95
13.2	55-75	56-80
9.5	–	–
4.75	38-54	38-54
2.36	28-42	28-42
1.18	–	–
0.6	–	–
0.3	7 – 21	7 – 21
0.15	–	–
0.075	2 – 8	2-8
Bitumen content % by mass of total mix	Min 4.0**	Min 4.5**

* The nominal maximum particle size is the largest specified sieve size upon which any of the aggregate is retained.

** Corresponds to specific gravity of aggregates being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further the region where highest daily mean air temperature is 30°C or lower and lowest daily air temperature is – 10°C or lower, the bitumen content may be increased by 0.5 percent.

505.2.5.2 Bitumen content indicated in Table 500-10 is the minimum quantity. The quantity shall be determined in accordance with Clause 505.3.

505.3 Mix Design

The bitumen content required shall be determined following the Marshall mix design procedure contained in Asphalt Institute Manual MS-2.

The Fines to Bitumen (F/B) ratio by weight of total mix shall range from 0.6 to 1.2.

505.3.1 Requirements for the Mix

Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table 500-11.

Table 500-11 : Requirements for Dense Graded Bituminous Macadam

Properties	Viscosity Grade Paving Bitumen	Modified bitumen		Test Method
		Hot climate	Cold climate	
Compaction level	75 blows on each face of the specimen			
Minimum stability (kN at 600C)	9.0	12.0	10.0	AASHTO T245
Marshall flow (mm)	2 – 4	2.5 – 4	3.5 – 5	AASHTO T245
Marshall Quotient $\left(\frac{\text{Stability}}{\text{Flow}}\right)$	2 – 5	2.5 – 5		MS-2 and ASTM D2041
% air voids	3 – 5			
% Voids Filled with Bitumen (VFB)	65 – 75			
Coating of aggregate particle	95% minimum			IS:6241
Tensile Strength ratio	80% Minimum			AASHTO T 283
% Voids in Mineral Aggregate (VMA)	Minimum percent voids in mineral aggregate (VMA) are set out in Table 500-13			

505.3.2 Binder Content

The binder content shall be optimized to achieve the requirements of the mix set out in Table 500-11. The binder content shall be selected to obtain 4 percent air voids in the mix design. The Marshall method for determining the optimum binder content shall be adopted as described in the Asphalt Institute Manual MS-2.

Where maximum size of the aggregate is more than 26.5 mm, the modified Marshall method using 150 mm diameter specimen described in MS-2 and ASTM D 5581 shall be used. This method requires modified equipment and procedures. When the modified Marshall test is used, the specified minimum stability values in Table 500-12 shall be multiplied by 2.25, and the minimum flow shall be 3 mm.

Table 500-12 : Minimum Percent Voids In Mineral Aggregate (VMA)

Nominal Maximum Particle Size ¹ (mm)	Minimum VMA Percent Related to Design Percentage Air voids		
	3.0	4.0	5.0
26.5	11.0	12.0	13.0
37.5	10.0	11.0	12.0

Note : Interpolate minimum voids in the mineral aggregate (VMA) for designed percentage air voids values between those listed.

505.3.3 Job Mix Formula

The Contractor shall submit to the Engineer for approval at least 21 days before the start the work, the job mix formula proposed for use in the works, together with the following details:

- i) Source and location of all materials;
- ii) Proportions of all materials expressed as follows:
 - a) Binder type, and percentage by weight of total mix;
 - b) Coarse aggregate/Fine aggregate/Mineral filler as percentage by weight of total aggregate including mineral filler;
- iii) A single definite percentage passing each sieve for the mixed aggregate;
- iv) The individual gradings of the individual aggregate fraction, and the proportion of each in the combined grading;
- v) The results of mix design such as maximum specific gravity of loose mix (G_{mm}), compacted specimen densities, Marshall stability, flow, air voids, VMA, VFB and related graphs and test results of AASHTO T 283 Moisture susceptibility test:
- vi) Where the mixer is a batch mixer, the individual weights of each type of aggregate, and binder per batch;
- vii) Test results of physical characteristics of aggregates to be used;
- viii) Mixing temperature and compacting temperature.

While establishing the job mix formula, the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredients satisfy the physical and strength requirements of these Specifications.

Approval of the job mix formula shall be based on independent testing by the Engineer for which samples of all ingredients of the mix shall be furnished by the Contractor as required by the Engineer.

The approved job mix formula shall remain effective unless and until a revised Job Mix Formula is approved. Should a change in the source of materials be proposed, a new job mix formula shall be forwarded by the Contractor to the Engineer for approval before the placing of the material.

505.3.4 Plant Trials – Permissible Variation in Job Mix Formula

Once the laboratory job mix formula is approved, the Contractor shall carry out plant trials to establish that the plant can produce a uniform mix conforming to the approved job mix formula. The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used shall be within the limits as specified in Table 500-13 and shall remain within the gradation band. These variations are intended to apply to individual specimens taken for quality control tests in accordance with Section 900.

Table 500-13 : Permissible Variations in the Actual Mix from the Job Mix Formula

Description	Base/binder Course
Aggregate passing 19 mm sieve or larger	± 8%
Aggregate passing 13.2 mm, 9.5 mm	± 7%
Aggregate passing 4.75 mm	± 6%
Aggregate passing 2.36 mm, 1.18 mm, 0.6 mm	± 5%
Aggregate passing 0.3 mm, 0.15 mm	± 4%
Aggregate passing 0.075 mm	± 2%
Binder content	± 0.3%
Mixing temperature	± 10°C

505.3.5 Laying Trials

Once the plant trials have been successfully completed and approved, the Contractor shall carry out laying trials, to demonstrate that the proposed mix can be successfully laid and compacted all in accordance with Clause 501. The laying trial shall be carried out on a

suitable area which is not to form part of the works. The area of the laying trials shall be a minimum of 100 sq.m of construction similar to that of the project road, and it shall be in all respects, particularly compaction, the same as the project construction, on which the bituminous material is to be laid.

The Contractor shall previously inform the Engineer of the proposed method for laying and compacting the material. The plant trials shall then establish if the proposed laying plant, compaction plant, and methodology is capable of producing satisfactory results. The density of the finished paving layer shall be determined by taking cores, no sooner than 24 hours after laying, or by other approved method. The compacted layers of Dense Graded Bituminous Macadam (DBM) shall have a minimum field density equal to or more than 92% of the density based on theoretical maximum specific gravity (G_{mm}) obtained on the day of compaction in accordance with ASTM D 2041.

Once the laying trials have been approved, the same plant and methodology shall be applied to the laying of the material on the project, and no variation of either shall be acceptable, unless approved in writing by the Engineer, who may at his discretion require further laying trials.

505.4 Construction Operations

505.4.1 Weather and Seasonal Limitations

The provisions of Clause 501.5.1 shall apply.

505.4.2 Preparation of Base

The base on which Dense Graded Bituminous Material is to be laid shall be prepared in accordance with Clauses 501 and 902 as appropriate, or as directed by the Engineer.

505.4.3 Geosynthetics

Where Geosynthetics are specified in the Contract, this shall be in accordance with the requirements stated in Clause 703.

505.4.4 Stress Absorbing Layer

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements of Clause 517.

505.4.5 Prime Coat

Where the material on which the dense bituminous macadam is to be laid is other than a

bitumen bound layer, a prime coat shall be applied, as specified, in accordance with the provisions of Clause 502, or as directed by the Engineer.

505.4.6 Tack Coat

Where the material on which the dense bituminous macadam is to be laid is either bitumen bound layer or primed granular layer, tack coat shall be applied, as specified, in accordance with the provisions of Clause 503, or as directed by the Engineer.

505.4.7 Mixing and Transportation of the Mix

The provisions as specified in Clauses 501.3 and 501.4 shall apply. Table 500-2 gives the mixing, laying and rolling temperature for dense mixes using viscosity grade bitumen. In case of modified bitumen, the temperature of mixing and compaction shall be higher than the mix with viscosity grade bitumen. The exact temperature depends upon the type and amount of modifier used and shall be adopted as per the recommendations of the manufacturer. In order to have uniform quality, the plant shall be calibrated from time to time.

505.4.8 Spreading

The provisions of Clauses 501.5.3 and 501.5.4 shall apply.

505.4.9 Rolling

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials. The compaction process shall be carried out by the same plant, and using the same method, as approved in the laying trials, which may be varied only with the express approval of the Engineer in writing.

505.5 Opening to Traffic

It shall be ensured that the traffic is not allowed without the approval of the Engineer in writing, on the surface until the dense bituminous layer has cooled to the ambient temperature.

505.6 Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902. All materials and workmanship shall comply with the provisions set out in Section 900 of these Specifications.

505.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

505.8 Measurement for Payment

Dense Graded Bituminous Materials shall be measured as finished work either in cubic metres, tonnes or by the square metre at a specified thickness as indicated in the Contract drawings, or documents, or as otherwise directed by the Engineer.

505.9 Rate

The contract unit rate for Dense Graded Bituminous Macadam shall be payment in full for carrying out all the required operations as specified and shall include, to all components listed in Clause 501.8.8.2. The rate shall include the provision of bitumen, at 4 percent and 4.5 percent by weight of the total mixture for grading 1 and grading 2 respectively.

The variation in actual percentage of bitumen used shall be assessed and the payment adjusted plus or minus accordingly.

506 SAND ASPHALT BASE COURSE**506.1 Scope**

This work shall consist of a base course composed of a mixture of sand, mineral filler where required and bituminous binder, placed and compacted upon a prepared and accepted sub-base in accordance with these Specifications and the lines, levels, grades, dimensions and cross sections shown on the Drawings or as directed by the Engineer.

Note: Sand Asphalt Base course is used in special situations like quality coarse aggregates not being available within economical leads and/or water needed for conventional base course not being readily available, as in desert areas.

506.2 Materials**506.2.1 Bitumen**

The bitumen shall be paving bitumen of viscosity grade VG 30 or VG 20, as specified in the Contract, conforming to IS:73.

506.2.2 Sand

The sand shall be clean, naturally occurring or blended material free from any deleterious substances, dry and well graded within the limits given in Table 500-14 and with other physical properties conforming to the requirements of this Table.

Table 500-14 : Sand Grading and Physical Requirements

Sieve Size (mm)	Cumulative Percentage by Weight of Total Aggregate Passing
9.5	100
4.75	85 – 100
2.36	80 – 100
1.18	70 – 98
0.60	55 – 95
0.30	30 – 75
0.15	10 – 40
0.075	4 – 10
Plasticity Index (%)	6 max.
Sand equivalent (IS:2720 Part 37)	30 min.
Los Angeles Abrasion Value (IS:2386, Part 4)	40 max.

Note : Maximum thickness for sand asphalt is 80 mm.

506.2.3 Filler

When required, filler shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement as approved by the Engineer. The filler shall conform to Clause 505.2.4.

506.3 Mix Design

506.3.1 Requirements for the Mix

Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table 500-15.

506.3.2 Binder Content

The binder content shall be optimized to achieve the requirements of the mix set out in Table 500-15. The Marshall method for determining the optimum binder content shall be adopted as described in the Asphalt Institute Manual MS-2.

Table 500-15 : Requirements for Sand Asphalt Base Course

Parameter	Requirement
Minimum stability (kN at 60°C)	2.0
Minimum flow (mm)	2
Compaction level (Number of blows)	2 x 75
Percent air voids	3-5
Percent voids in mineral aggregate (VMA)	16 min.
Percent voids filled with bitumen (VFB)	65-75

506.3.3 Job Mix Formula

The Contractor shall develop the job mix formula proposed for use in the works and submit it to the Engineer for approval together with the following details :

- i) Source and location of all materials;
- ii) Proportions of all materials expressed as follows where each is applicable:
 - a) Binder, as percentage by weight of total mixture;
 - b) Sand/Mineral filler as percentage by weight of total aggregate including mineral filler;
- iii) A single definite percentage passing each sieve for the mixed aggregate;
- iv) The results of tests enumerated in Table 500-15 as obtained by the Contractor;
- v) Test results of physical characteristics of aggregates to be used;
- vi) Mixing temperature and compacting temperature.

While working out the job mix formula, the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mixture and its different ingredients satisfy the physical and strength requirements of these Specifications.

Approval of the job mix formula shall be based on independent testing by the Engineer for which joint samples of all ingredients of the mix shall be furnished by the Contractor as required by the former.

The approved job mix formula shall remain effective unless and until modified by the Engineer. Should a change in the source of materials be proposed, a new job mix formula shall be established by the Contractor and approved by the Engineer before actually using the materials.

506.3.4 Permissible Variation from Job Mix Formula

The Contractor shall produce a uniform mix conforming to the approved job mix formula, subject to the permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used, within the limits as specified in Table 500-12, with the condition that the gradation after the variation remains within the gradation envelop. These variations are intended to apply to individual specimens taken for quality control tests in accordance with Section 900.

506.4 Construction Operations**506.4.1 Weather and Seasonal Limitations**

Clause 501.5.1 shall apply.

506.4.2 Preparation of Base

The surface on which Sand Asphalt Base course Material is to be laid shall be prepared, shaped and graded in the profile required for the particular layer in accordance with Clauses 501 and 902 as appropriate or as directed by the Engineer. The surface shall be thoroughly swept clean free from dust and foreign matter using a mechanical brush, and the dust blown off by compressed air. In confined locations where mechanical plant cannot get access, other methods shall be used as approved by the Engineer. A prime coat, where specified, shall be applied in accordance with Clause 502 or as directed by the Engineer.

506.4.3 Tack Coat

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

506.4.4 Preparation and Transportation of the Mixture

The provisions of Clauses 501.3 and 501.4 shall apply.

506.4.5 Spreading

The provisions of Clauses 501.5.2 to 501.5.4 shall apply. Laying must be accomplished at a suitable temperature to ensure proper compaction. Guidance for mixing and compaction temperature for the particular bitumen may be taken from Table 500-3 and shall correspond to a viscosity of 2 Poise (0.2 Pa.s) and 3 poise (0.3 Pa.s) respectively, based on the original (unaged) bitumen properties.

506.4.6 Rolling

Clause 501.6 shall apply. Generally the initial or breakdown rolling shall be done with 8-10 tonne static weight smooth-wheeled rollers. The intermediate rolling shall be done with 8-10 tonne static weight or vibratory rollers or with a pneumatic tyred roller of 12-15 tonne weight having a tyre pressure of at least 0.56 MPa. The finish rolling shall be done with 8-10 tonne deadweight smooth wheeled tandem rollers. The exact pattern of rolling shall be established at the laying trials.

506.5 Opening to Traffic

It shall be ensured that the traffic is not allowed without the express approval of the Engineer in writing, on the surface until the paved mat has cooled below 60°C in its entire depth.

506.6 Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902.

For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

506.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

506.8 Measurement for Payment

Sand Asphalt Base course materials shall be measured as finished work, for the area covered, in cubic metres, metric tonnes, or in square metres, at a specified thickness, as stated in the Contract.

506.9 Rate

The Contract unit rate for Sand Asphalt Base course materials shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2 (i) to (x). The rate shall cover provision of 5 percent of bitumen by weight of the total mixture.

The variation in the actual percentage of bitumen used will be assessed and the rate, adjusted plus or minus, as applicable.

507 BITUMINOUS CONCRETE**507.1 Scope**

This work shall consist of construction of Bituminous Concrete, for use in wearing and profile corrective courses. This work shall consist of construction in a single layer of bituminous concrete on a previously prepared bituminous bound surface. A single layer shall be 30 mm/40 mm/50 mm thick.

507.2 Materials**507.2.1 Bitumen**

The bitumen shall conform to Clause 504.2.1.

507.2.2 Coarse Aggregates

The coarse aggregates shall be generally as specified in Clause 504.2.2, except that the aggregates shall satisfy the physical requirements of Table 500-16 and where crushed gravel is proposed for use as aggregate, not less than 95 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

Table 500-16 : Physical Requirements for Coarse Aggregate for Bituminous Concrete

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max 5% passing 0.075 mm sieve	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices	Max 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 30% Max 24%	IS:2386 Part IV
Durability	Soundness either: Sodium Sulphate or Magnesium Sulphate	Max 12% Max 18%	IS:2386 Part V
Polishing	Polished Stone Value	Min 55	BS:812-114
Water Absorption	Water Absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95%	IS:6241
Water Sensitivity	Retained Tensile Strength*	Min 80%	AASHTO 283

* If the minimum retained tensile test strength falls below 80 percent, use of anti stripping agent is recommended to meet the requirement.

507.2.3 Fine Aggregates

The fine aggregates shall be all as specified in Clause 505.2.3.

507.2.4 Filler

Filler shall be as specified in Clause 505.2.4.

507.2.5 Aggregate Grading and Binder Content

When tested in accordance with IS:2386 Part 1 (Wet grading method), the combined grading of the coarse and fine aggregates and filler shall fall within the limits shown in Table 500-17. The grading shall be as specified in the Contract.

Table 500-17 : Composition of Bituminous Concrete Pavement Layers

Grading	1	2
Nominal aggregate size*	19 mm	13.2 mm
Layer thickness	50 mm	30-40 mm
IS Sieve¹ (mm)	Cumulative % by weight of total aggregate passing	
45		
37.5		
26.5	100	
19	90-100	100
13.2	59-79	90-100
9.5	52-72	70-88
4.75	35-55	53-71
2.36	28-44	42-58
1.18	20-34	34-48
0.6	15-27	26-38
0.3	10-20	18-28
0.15	5-13	12-20
0.075	2-8	4-10
Bitumen content % by mass of total mix	Min 5.2*	Min 5.4**

Notes :

- * The nominal maximum particle size is the largest specified sieve size up on which any of the aggregate is retained.
- ** Corresponds to specific gravity of aggregate being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further the region where highest daily mean air temperature is 30°C or lower and lowest daily air temperature is - 10°C or lower, the bitumen content may be increased by 0.5 percent

507.3 Mix Design**507.3.1 Requirements for the Mix**

Clause 505.3.1 shall apply.

507.3.2 Binder Content

Clause 505.3.2 shall apply.

507.3.3 Job Mix Formula

Clause 505.3.3 shall apply.

507.3.4 Plant Trials – Permissible Variation in Job Mix Formula

The requirements for plant trials shall be as specified in Clause 505.3.4, and permissible limits for variation as given in Table 500-18.

Table 500-18 : Permissible Variations in Plant Mix from the Job Mix Formula

Description	Permissible Variation
Aggregate passing 19 mm sieve or larger	± 7%
Aggregate passing 13.2 mm, 9.5 mm	± 6%
Aggregate passing 4.75 mm	± 5%
Aggregate passing 2.36 mm, 1.18 mm, 0.6 mm	± 4%
Aggregate passing 0.3 mm, 0.15 mm	± 3%
Aggregate passing 0.075 mm	± 1.5%
Binder content	± 0.3%
Mixing temperature	± 10°C

507.3.5 Laying Trials

The requirements for laying trials shall be as specified in Clause 505.3.5. The compacted layers of bituminous concrete (BC) shall have a minimum field density equal to or more than 92 percent of the average theoretical maximum specific gravity (G_{mm}) obtained on the day of compaction in accordance with ASTM D2041.

507.4 Construction Operations**507.4.1 Weather and Seasonal Limitations**

The provisions of Clause 501.5.1 shall apply.

507.4.2 Preparation of Base

The surface on which the bituminous concrete is to be laid shall be prepared in accordance with Clauses 501 and 902 as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by mechanical broom and dust removed by compressed air. In locations where a mechanical broom cannot get access, other approved methods shall be used as directed by the Engineer.

507.4.3 Geosynthetics

Where Geosynthetics are specified in the Contract, this shall be in accordance with the requirements stated in Clause 703.

507.4.4 Stress Absorbing Layer

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements of Clause 517.

507.4.5 Tack Coat

The provisions as specified in Clause 504.4.6 shall apply.

507.4.6 Mixing and Transportation of the Mix

The provisions as specified in Clauses 501.3, 501.4 and 504.4.7 shall apply.

507.4.7 Spreading

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials.

507.4.8 Rolling

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials.

507.5 Opening to Traffic

Provisions in Clause 504.5 shall apply.

507.6 Surface Finish and Quality Control

The surface finish of the completed construction shall conform to the requirements of

Clause 902. All materials and workmanship shall comply with the provisions set out in Section 900 of these Specifications.

507.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

507.8 Measurement for Payment

The measurement shall be as specified in **Clause 505.8**.

507.9 Rate

The contract unit rate shall be all as specified in Clause 504.9, except that the rate shall include the provision of bitumen at 5.2 percent & 5.4 percent for grading 1 and grading 2 by weight of total mix respectively. The variation in actual percentage of bitumen used will be assessed and the payment adjusted plus and minus accordingly.

508 CLOSE-GRADED PREMIX SURFACING/MIXED SEAL SURFACING

508.1 Scope

508.1.1 The work shall consist of the preparation, laying and compaction of a close-graded premix surfacing material of 20 mm thickness composed of graded aggregates premixed with a bituminous binder on a previously prepared surface, in accordance with the requirements of these Specifications, to serve as a wearing course.

508.1.2 Close graded premix surfacing shall be of Type A or Type B as specified in the Contract documents. Type A grading is recommended for use in areas having rainfall more than 150 cm per year. In other areas Type B grading may be used.

508.2 Materials

508.2.1 Binder

The provisions of Clause 510.1.2.1 shall apply.

508.2.2 Coarse Aggregates

The provisions of Clause 511.1.2.2 shall apply.

508.2.3 Fine Aggregates

The fine aggregates shall consist of crushed rock, or natural sand or a mixture of both. These shall be clean, hard, durable, un-coated, mineral particles, dry; and free from injurious, soft or flaky particles and organic or deleterious substances.

508.2.4 Aggregate Gradation

The coarse and fine aggregates shall be so graded or combined as to conform to one or the other gradings given in Table 500-19, as specified in the contract.

Table 500-19 : Aggregate Gradation

IS Sieve Designation (mm)	Cumulative Percent by Weight of Total Aggregate Passing	
	Type A	Type B
13.2 mm	–	100
11.2 mm	100	88 – 100
5.6 mm	52 – 88	31 – 52
2.8 mm	14 – 38	5 – 25
0.090 mm	0 – 5	0 -5

508.2.5 Proportioning of Materials

The total quantity of aggregates used for Type A or B close-graded premix surfacing shall be 0.27 cubic metre per square metre area. The quantity of binder used for premixing shall be 22.0 kg and 19.0 kg per 10 square metre area for Type A and Type B surfacing respectively.

508.3 Construction Operations

The provisions of Clause 510.1.3.1 through Clause 510.1.3.5 shall apply.

508.4 Opening to Traffic

Traffic may be allowed after completion of the final rolling when the mix has cooled down to the surrounding temperature. Speed restrictions may be imposed at initial stages.

508.5 Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902. For control on the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

508.6 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be in accordance with the provisions of Clause 112.

508.7 Measurement for Payment

Close-graded premix surfacing, Type A or B shall be measured as finished work, for the area specified to be covered, in square metres at a specified thickness. The area will be the net area covered.

508.8 Rate

The contract unit rate for close-graded premix surfacing, Type A or B shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2.

509 SURFACE DRESSING**509.1 Scope**

This work shall consist of the application of one coat or two coats of surface dressing, each coat consisting of a layer of bituminous binder sprayed on a previously prepared, base, followed by a cover of stone chips rolled in to form a wearing course to the requirements of these Specifications.

509.2 Materials**509.2.1 Binder**

The binder shall either be bitumen conforming to IS:73 or rapid setting cationic bitumen emulsion (RS-2) conforming to IS:8887. Grade of bitumen shall depend upon the climatic condition. For selection of grade of bitumen guidance may be taken from Table 500-1. The type of binder to be used shall be stated in the Contract, or as directed by the Engineer.

509.2.2 Aggregates

The stone chips (cover aggregate) shall conform to the requirements of Clause 505.2.2., except that their water absorption shall be restricted to a maximum of 1 percent and they shall have a Polished Stone Value of minimum 60. [in BS:812 (Part-114)], of not less than 60. The size of the aggregate shall depend upon the type of surface on which it is laid and the traffic intensity. The chips shall be single sized, clean, hard, durable, of cubical shape; and free from dust and soft or friable matter, organic or other deleterious matter and conform to one of the gradings given in Table 500-21. The size of the aggregate shall depend upon the type of surface on which it is laid and the traffic intensity. Table 500-20 may be used as guidance.

Pre-coated Chips : As an alternative to the use of an adhesion agent or wherever specified in the Contract, the chips may be pre-coated before they are spread except when the sprayed binder film is a bitumen emulsion. Pre-coating the chips may be carried out by mixing aggregates with 0.75 to 1.0 percent of bitumen by weight of chips in a suitable mixer. The chips shall be heated to 160°C and mixed with the binder heated to its application temperature. The pre-coated chips shall be allowed to cure for at least one week or until they become non sticky and can be spread easily.

Table 500-20 : Recommended Nominal Size of Aggregates (mm)

Type of Surface	Traffic Intensity in Terms of Number of Vehicles Per Day in the Lane Under Consideration		
	1000-2000	200-1000	20-200
Very hard	10	6	6
Hard	13	10	6
Normal	13	10	6
Soft	19	13	13
Very soft		19	13

Table 500-21 : Grading requirements for Aggregates used for Surface Dressing

IS Sieve Designation (mm)	Cumulative Percent by Weight of Total Aggregates Passing for the Following Nominal Sizes (mm)			
	19	13	10	6
26.5	100			
19	85-100	100		
13	0-40	85-100	100	
9.5	0-7	0-40	85-100	100
6.3		0-7	0-35	85-100
4.75			0-10	
3.35				0-35
2.36	0-2	0-2	0-2	0-10
0.60				0-2
0.075	0-1.5	0-1.5	0-1.5	0-1.5
Minimum 65% by weight of aggregate	Passing 19 and retained on 13.2	Passing 13.2 and retained on 9.5	Passing 9.5 and retained on 6.3	Passing 6.3 and retained on 3.35

509.2.3 Rates of Spread of Binder and Chips

The rate of spread of binder and chips will depend upon the nominal size of the aggregate and the extent of its embedment into the surface. The rate shall be determined as per the procedure given in Manual for Construction and Supervision of Bituminous Construction. Approximate rate of application of aggregates, and binder under average conditions are given in Table 500-22.

Table 500-22 : Approximate Rate of Application of Binder and Aggregates

Nominal Aggregate Size mm	Binder (Kg/m ²)			Aggregates Cu.m/m ²
	Uncoated Aggregates		Coated Aggregates	
	Bitumen	Emulsion	Bitumen	
19	1.2	1.8	1.0	0.014-0.015
13	1.0	1.5	0.8	0.009-0.011
10	0.9	1.3	0.7	0.007-0.009
6	0.75	1.1	0.6	0.003-0.005

Note : Bitumen for coated aggregates excludes quantity of bitumen required for coating.

509.2.4 Anti-Stripping Agent

Where the proposed aggregate fails to pass the stripping test then an approved anti-stripping agent (Appendix 4 for details) may be added to the binder in accordance with the manufacturer's instructions. The effectiveness of the proposed anti-stripping agent must be demonstrated by the Contractor, before approval by the Engineer.

509.3 Construction Operations**509.3.1 Weather and Seasonal Limitations**

Clause 501.5.1 shall apply.

509.3.2 Preparation of Base

The base on which the surface dressing is to be laid shall be prepared, shaped and conditioned to the specified lines, grade and cross section in accordance with Clause 501 or as directed by the Engineer. Prime coat, where needed, shall be provided as per Clause 502 or as directed by the Engineer. Where the existing surface shows signs of fatting up, the excess bitumen shall be removed as directed by the Engineer. The bituminous surface to be dressed shall be thoroughly cleaned either by using a mechanical broom and/or compressed air, or any other approved equipment/method as specified in the Contract or directed by the Engineer. The

prepared surface shall be dust free, clean and dry, (except in the case of cationic emulsion where the surface shall be slightly damp).

509.3.3 Application of Binder

After preparation of base, paving grade binder heated to an appropriate temperature or bitumen emulsion shall be sprayed uniformly using mechanical sprayers. During the operation the ratio between truck speed and pump revolution shall be maintained constant with the help of automatic control. When work resumes, the binder shall not be sprayed on the earlier completed surface. This can be done by covering the completed work with bitumen impregnated paper. Excessive deposit of bituminous material shall be immediately removed. The equipment described in IRC:SP:34 with synchronized spraying and compaction shall be preferred for better control and uniformity in construction.

The spraying temperatures for binder are given below:

Binder Grade	Whirling Spray Jets		Slot Jets	
	Min°C	Max°C	Min°C	Max°C
VG 10	180	200	165	175

509.3.4 Application of Stone Chips

Immediately after application of the binder, clean, dry chips (in the case of emulsion the chippings may be slightly damp) shall be spread uniformly by means of a mechanical chip spreader on the surface so as to cover the surface completely with a single layer of chips.

509.3.5 Rolling

Rolling of the chips should preferably be carried out by a pneumatic tyre roller in accordance with Clauses 501.6 and 501.7. Rolling shall commence at the edges and progress towards the centre except in super-elevated and uni-directional cambered portions where it shall proceed from the lower edge to the higher edge. Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass. While rolling is in progress, additional chips shall be spread by hand in necessary quantities required to make up irregularities. Rolling shall continue until all aggregate particles are firmly embedded in the binder and present a uniform closed surface.

509.3.6 Application of Second Coat of Surface Dressing

Where surface dressing in two coats is specified, the second coat should not be applied until the first coat has been open to traffic for two weeks. The surface on which the second coat is

laid must be clean and free of dust. The construction operations for the second coat shall be the same as described in Clauses 510.3.3 to 510.3.5.

509.4 Opening to Traffic

Traffic shall not be permitted to run on any newly surface dressed area until the following day. In special circumstances, however, the Engineer may allow the road to be opened to traffic immediately after rolling, but in such cases traffic speed shall be limited to 20 km per hour until the following day.

509.5 Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902.

For control on the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

509.6 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

509.7 Measurement for Payment

Each coat of surface dressing shall be measured as finished work for the area instructed to be covered, in square metres.

509.8 Rate

The Contract unit rate for surface dressing, based on the approximate rates of application for binder given in Table 500-22 and each size of chippings given in Clause 509.2.3, shall be adjusted, plus or minus, for the difference between the approximate rate of spread and the rate of spread determined based on design and approved by the Engineer. The adjusted rate shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2.

510 OPEN-GRADED PREMIX SURFACING

510.1 Open-Graded Premix Surfacing using Viscosity Grade Paving Bitumen

510.1.1 Scope

This work shall consist of preparation, laying and compaction of an open-graded premix surfacing material of 20 mm thickness composed of small-sized aggregate premixed with

bituminous binder on a previously prepared base, in accordance with the requirements of these Specifications to serve as a wearing course.

510.1.2 Materials

510.1.2.1 Binder

The binder shall be viscosity grade bitumen of a suitable grade as specified in the Contract, or as directed by the Engineer, and satisfying the requirements of IS:73. For selection of grade of bitumen guidance may be taken from Table 500-1.

510.1.2.2 Aggregates

The aggregates shall conform to Clause 504.2.2 except that the water absorption shall be limited to a maximum of 1 percent. The Polished Stone Value, shall not be less than 55, when tested as per BS:812-114.

510.1.2.3 Proportioning of Material

The materials shall be proportioned in accordance with Table 500-23.

Table 500-23 : Quantities of Materials Required for 10 m² of Road Surface for 20 mm Thick Open-graded Premix Surfacing

	Materials	Quantity
Aggregates		
a)	Nominal Stone size 13.2 mm (passing 22.4 mm sieve and retained on 11.2 mm sieve)	0.18 m ³
b)	Nominal Stone size 11.2 mm (passing 13.2 mm sieve and retained on 5.6 mm sieve)	0.09 m ³
	Total	0.27 m³
Binder		
a)	For 0.18 m ³ of 13.2 mm nominal size stone of 52 kg bitumen per m ³	9.5 kg
b)	For 0.09 m ³ of 11.2 mm nominal size stone of 56 kg bitumen per m ³	5.1 kg
	Total	14.6 kg

510.1.3 Construction Operations**510.1.3.1 Weather and Seasonal Limitations**

Clause 501.5.1 shall apply.

510.1.3.2 Preparation of Surface

The underlying surface on which the bituminous surfacing is to be laid shall be prepared, shaped and conditioned to the specified lines, grade and cross-section in accordance with Clause 501. A prime coat where needed shall be applied in accordance with Clause 502 as directed by the Engineer.

510.1.3.3 Tack Coat

A tack coat complying with Clause 503, shall be applied over the base preparatory to laying of the surfacing.

510.1.3.4 Preparation of Premix

Hot mix plant of appropriate capacity and type shall be used for the preparation of the mix material. The hot mix plant shall have separate dryer arrangement for heating aggregate.

The temperature of the binder and aggregate at the time of mixing, laying and compaction shall be in conformity with the temperature given in Table 500-3. The difference in temperature between the binder and aggregate shall at no time exceed 14°C. Mixing shall be thorough to ensure that a homogeneous mix is obtained in which all particles of the aggregates are coated uniformly.

The mix shall be immediately transported from the mixer to the point of use in suitable vehicles or hand barrows. The vehicles employed for transport shall be clean and the mix being transported covered in transit if so directed by the Engineer.

510.1.3.5 Spreading and Rolling

The pre mixed material shall be spread on a previously prepared base to Clause 501 by a paver unless specified otherwise in the Contract to the desired thickness, grades and crossfall (camber). The cross-fall should be checked by means of camber boards and irregularities levelled out. Excessive use of blades or rakes should be avoided. As soon as sufficient length of bituminous material has been laid, rolling shall commence with 8–10 tonne rollers, smooth wheel tandem type or other approved equipment. Rolling shall begin at the edge and progress towards the centre longitudinally, except that on superelevated and uni-directional cambered portions, it shall progress from the lower to upper edge parallel to the centre line of the pavement.

When the roller has passed over the whole area once, any high spots or depressions, which become apparent, shall be corrected by removing or adding premixed materials. Rolling shall then be continued until the entire surface has been rolled and all the roller marks eliminated. In each pass of the roller the preceding track shall be overlapped uniformly by at least one-third width. The roller wheels shall be kept damp to prevent the premix from adhering to the wheels. In no case shall fuel/lubricating oil be used for this purpose. Excess use of water for this purpose shall also be avoided.

Rollers shall not stand on newly laid material. Rolling operations shall be completed in every respect before the temperature of the mix falls below the rolling temperature indicated in Table 500-3.

510.1.3.6 Seal Coat

A seal coat conforming to Clause 511 of the type specified in the Contract shall be applied to the surface immediately after laying the surfacing.

510.1.4 Opening to Traffic

No traffic shall be allowed on the road until the seal coat has been laid. After the seal coat is laid, the road may be opened to traffic according to Clause 511.4.

510.1.5 Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902. For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

510.1.6 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

510.1.7 Measurement for Payment

Open graded premix surfacing shall be measured as finished work, for the area instructed to be covered, in square metres.

510.1.8 Rate

The contract unit rate for open-graded premix surfacing shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2.

510.2 Open Graded Premix Surfacing Using Cationic Bitumen Emulsion**510.2.1 Scope**

This work shall consist of the preparation, laying and compaction of an open graded premix surfacing of 20 mm thickness composed of small-sized aggregate premixed with a cationic bitumen emulsion on a previously prepared surface, in accordance with the requirements of these Specifications to serve as a wearing course.

510.2.2 Materials**510.2.2.1 Binder**

The binder for Premix wearing course shall be Cationic Bitumen emulsion of Medium Setting (MS) grade complying with IS:8887 or as specified in the Contract.

510.2.2.2 Aggregate

The requirements of Clause 511.1.2.2 shall apply.

510.2.3 Proportioning of Materials

The materials shall be proportioned as per quantities given in Tables 500-24.

Table 500-24 : Quantities of Aggregate for 10 m² Area

Aggregates		
a)	Coarse aggregate nominal 13.2 mm size, passing IS 22.4 mm sieve and retained on IS 11.2 mm sieve	0.18 m ³
b)	Coarse aggregate nominal 11.2 mm size; passing IS 13.2 mm sieve and retained on IS 5.6 mm sieve	0.09 m ³
	Binder	20 to 23 kg

510.2.4 Construction Operations**510.2.4.1 Weather and Seasonal Limitations**

Clause 501.5.1 shall apply except that the minimum air temperature for laying shall be 10°C. Cationic bitumen emulsions shall not normally be stored below 0°C.

510.2.4.2 Preparation of Surface

The underlying surface on which the premix surfacing is to be laid shall be prepared, in accordance with the requirements of Clause 504.3.2 for a newly primed surface, and in accordance with Clause 505.4.2 where an existing bituminous surface is to be overlaid.

510.2.4.3 Preparation of Binder

Before opening, the cationic bitumen emulsion drums shall be rolled at a slow speed, to and fro at least 5 times, for a distance of about 10 metres, to distribute any storage sedimentation.

510.2.4.4 Tack Coat

A tack coat complying with Clause 503, shall be applied over the surface preparatory to laying of the surfacing where specified in the Contract, as directed by the Engineer.

510.2.4.5 Preparation of Premix

Premixing of cationic bitumen emulsion and aggregates can be carried out in a suitable mixer such as cold mixing plant as per IS:5435 (Revised) or concrete mixer or by pay loaders in exceptional cases where approved by the Engineer. Where specified in the Contract, continuous mixing operation shall be done either in batch or continuous hot mix plant suitable for emulsion mixes.

When using concrete mixer for preparing the premix, 0.135 cu.m (0.09 cu.m of 13.2 mm size and 0.045 cu.m of 11.2 mm size) of aggregates per batch shall be used. This quantity will be for 5 sq.m of road surface with 20 mm average thickness.

The aggregates required for one batch shall be prepared adjacent to the mixer.

The coarse aggregate of 13.2 mm size shall be placed into the mixer followed by 5 to 6.5 kg of Cationic bitumen emulsion and then the 11.2 mm size aggregate shall be added, followed by 5 to 6.5 kg of Cationic bitumen emulsion. After the materials have been mixed thoroughly, the mix shall be immediately transported to the laying site in suitable vehicles. Too much mixing shall be avoided.

510.2.4.6 Spreading and Rolling

The premixed cationic bitumen emulsion and aggregates shall be spread uniformly by a paver within 10 minutes of applying the tack coat. All levelling, raking etc. should be completed within 20 minutes of the time of mixing.

The mix shall be spread uniformly to the desired thickness, grades and crossfall (camber). The crossfall shall be checked by means of camber boards and irregularities levelled out. Too much raking is to be avoided.

The rolling shall start immediately after laying the premix. A smooth wheeled tandem roller of 8-10 tonnes shall be used, unless other compaction methods are approved by the Engineer, based on the results of laying trials, if necessary. While rolling, wheels of roller should be clean and kept moist to prevent the premix from adhering to the wheels. In no case shall fuel/lubricating oil be used for this purpose. Use of water for this purpose shall be strictly limited to an absolute minimum.

Rolling shall commence at the edges and progress towards the centre longitudinally except in the case of superelevated and uni-directionally cambered sections where rolling shall be carried out from the lower edge towards the higher edge parallel to the centre line of the road.

After one pass of roller over the whole area, depressions or uncovered spots should be corrected by adding premix material. Rolling shall be continued until the entire surface has been rolled, to maximum compaction and all the roller marks eliminated. In each pass of the roller, the preceding track shall be overlapped uniformly by at least one-third width. Roller(s) shall not stand on newly laid material. Joints, both longitudinal and transverse to the road sections laid and compacted earlier, shall be cut vertically to their full depth so as to expose fresh surface which shall be painted with a thin coat of binder before the new mix is laid.

510.2.5 Seal Coat

A seal coat, conforming to Clause 511, as specified in the Contract, shall be applied immediately after laying the premix carpet.

510.2.6 Opening to Traffic

Traffic should not be allowed over the premix surface till seal coat is laid. After the seal coat is laid, traffic may be allowed in accordance with Clause 511.4.

510.2.7 Surface Finish and Quality Control

The surface finish of construction shall conform to the requirements of Clause 902. For control of the quality of materials and work carried out, relevant provision of Section 900 shall apply.

510.2.8 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

510.2.9 Measurement for Payment

Open graded premix surfacing shall be measured as finished work, for the area instructed to be covered, in square metres. All allowances for wastage in cutting of joints shall be deemed to be included in the rate.

510.2.10 Rate

The contract unit rate for premix carpet shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2.

511 SEAL COAT**511.1 Scope**

This work shall consist of the application of a seal coat for sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall (camber).

Seal coat shall be of either of the two types specified below:

- A) Liquid seal coat comprising of an application of a layer of bituminous binder followed by a cover of stone chips.
- B) Premixed seal coat comprising of a thin application of fine aggregate premixed with bituminous binder.

511.2 Materials**511.2.1 Binder**

The requirements of Clauses 510.1.2.1 and 510.2.2.1 shall apply.

The quantity of bitumen per 10 square metres, shall be 9.8 kg for Type A, and 6.8 kg for Type B seal coat. Where bituminous emulsion is used as a binder, the quantities for Type A and Type B seal coats shall be 15 kg and 10.5 kg respectively.

511.2.2 Stone Chips for Type A Seal Coat

The stone chips shall consist of angular fragments of clean, hard, tough and durable rock of uniform quality throughout. They shall be free of soft or disintegrated stone, organic or other deleterious matter. Stone chips shall be of 6.7 mm size defined as 100 percent passing through 11.2 mm sieve and retained on 2.36 mm sieve. The quantity used for spreading shall be 0.09 cubic metre per 10 square metre area. The chips shall satisfy the quality requirements

given in Table 500-8 except that the upper limit for water absorption value shall be 1 percent.

511.2.3 Aggregate for Type B Seal Coat

The aggregate shall be sand or grit and shall consist of clean, hard, durable, uncoated dry particles, and shall be free from dust, soft or flaky/elongated material, organic matter or other deleterious substances. The aggregate shall pass 2.36 mm sieve and be retained on 180 micron sieve. The quantity used for premixing shall be 0.06 cum per 10 sqm area.

511.3 Construction Operations

511.3.1 Weather and Seasonal Limitations

The requirements of Clause 501.5.1 shall apply.

511.3.2 Preparation of Surface

The seal coat shall be applied immediately after laying the bituminous course which is required to be sealed. Before application of seal coat materials, the surface shall be cleaned free of any dust or other extraneous matter.

511.3.3 Construction of Type A Seal Coat

The construction operations shall be the same as described in Clause 509.3.3 to 509.3.5.

511.3.4 Construction Type B Seal Coat

511.3.4.1 Using Paving Bitumen

The construction operations shall be the same as in Clause 510.1.3.

511.3.4.2 Using Emulsion

The construction operations shall be the same as in Clause 510.2.4.

511.4 Opening to Traffic

In the case of Type B seal coat, traffic may be allowed soon after final rolling when the premixed material has cooled down to the surrounding temperature. In the case of Type A seal coat, traffic shall not be permitted to run on any newly sealed area until the following day.

In special circumstances, however, the Engineer may open the road to traffic immediately after rolling, but in such cases traffic shall be rigorously limited to 20 km per hour until the following day.

511.5 Surface Finish and Quality Control Work

The surface of construction shall conform to the requirements of Clause 902.

For control on the quality of materials and the works carried out, the relevant provisions of **Section 900** shall apply.

511.6 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

511.7 Measurement for Payment

Seal coat, Type A or B shall be measured as finished work, over the area specified to be covered, in square metres at the thickness specified in the Contract.

511.8 Rate

The contract unit rate for seal coat Type A or B shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2.

512 SLURRY SEAL

512.1 Scope

The work consists of design and laying a mixture of mineral aggregate, slow setting cationic bitumen emulsion, water and additives, if needed, proportioned, mixed and uniformly spread over a previously prepared surface. The finally laid slurry seal shall have a homogenous mat, adhere firmly to the prepared surface and provide friction resistant surface texture throughout its surface life.

512.2 Type of Slurry Seals and Applications

Different types of slurry seal and their applications are given in Table 500-25. The type and application of the slurry seal shall be specified in the Contract.

Table 500-25 : Different Types of Slurry Seals

Items	Type I (2 – 3 mm)	Type II (4 – 6 mm)	Type III (6-8 mm)**
Application	Filling of hair cracks	Filling of surface cracks 1- 3 mm and preventive/ renewal treatment (upto 450 CVPD)***	Filling of surface cracks 3-6 mm and preventive/renewal treatment (upto 1500 CVPD)***
Quantity* of slurry (kg/m ²)	4.3 to 6.5	8.4 to 9.8	10.1 to 12
Residual binder (% by weight of dry aggregate)	10 to 16	7.5 to 13.5	6.5 to 12

* In terms by weight of dry aggregate

** Indicative only

*** CVPD : Commercial Vehicles per day

512.3 Materials

The materials for slurry seal shall conform to the following requirements.

512.3.1 Bitumen Emulsion

The bitumen emulsion shall be a cationic slow setting type SS 2, conforming to the requirements of IS:8887.

512.3.2 Aggregates

The mineral aggregates shall be crushed stone dust, clean, sharp, hard, durable and uncoated dry particles and shall be free from soft pieces and organic and other deleterious substances. The aggregate shall satisfy the requirement given in Table 500-26. The target grading shall conform to one of the three types given in Table 500-27.

Table 500-26 : Properties of Aggregates

Properties	Test Method	Specification
Sand Equivalent Value	IS:2720 (Part 37)	Min 50 percent
Water absorption*	IS:2386 (Part 3)	Max 2 percent
Soundness with- Sodium sulphate Magnesium sulphate	IS:2386 (Part 5)	Max 12 percent Max 18 percent

* In case water absorption exceeds 2% but is less than 4%, same may be permitted subject to conformity of soundness test and wet stripping test

Table 500-27 : Aggregate Grading

Sieve Size (mm)	Percentage by Mass Passing (Minimum Layer Thickness)		
	Type I (2-3 mm)	Type II (4-6 mm)	Type III (6-8 mm)
9.5	—	—	100
6.3	—	100	90–100
4.75	100	90–100	70–90
2.36	90–100	65–90	45–70
1.18	65–90	45–70	28–50
0.600	40–65	30–50	19–34
0.300	25–42	18–30	12–25
0.150	15–30	10–21	7–18
0.075	10–20	5–15	5–15

Tolerances : Percent passing each sieve shall not vary by more than the tolerance limit indicated in Table 500-28 and shall remain within the gradation band.

Table 500-28 : Tolerances for Slurry Seal

Description	Tolerance
Aggregate passing 4.75 mm	±5%
Aggregate passing 2.36 mm, 1.18 mm, 0.6 mm	±5%
Aggregate passing 0.3 mm	±4%
Aggregate passing 0.15 mm	±3%
Aggregate passing 0.075 mm	±2%

If more than one nominal size aggregate is used to produce the required grading, the correct amount of each type of aggregate used shall be proportioned separately to meet the requirements of grading as per Table 500-27, prior to adding other materials in the mixture. After target gradation has been submitted, the percent passing each sieve shall not vary by more than the tolerance limits given in Table 500-29, and shall remain within the gradation band. The aggregate will be acceptable based on average of five gradation tests at the job location.

512.3.3 Filler

Mineral filler shall be Ordinary Portland Cement. The quantity of filler shall be in the range of 0.5 to 2 percent by weight of dry aggregate.

512.3.4 Water

Water shall be potable, free from harmful salt and contaminants. The pH of the water shall be in the range of 6 to 7.

512.3.5 Additives

Chemical additives may be used to accelerate or retard the break-set time of the slurry or to improve the resulting surface finish. The quantity of additive, if used, shall be decided by mix design and to be adjusted as per the site/climate conditions. The specifications for additive shall be supplied by the supplier of the emulsion. The additive and emulsion shall be compatible with each other.

512.4 Mix Design

The compatibility of aggregate, emulsion, filler and additive(if needed) shall be verified by mix design for a selected type and grading of aggregate as specified in Tables 500-27 and 500-28. the design criteria for slurry seal mixture is specified in Table 500-29. The proposed slurry seal mix shall conform to the specified requirements, when tested in accordance with tests specified in Table 500-30. The mix design report shall clearly show the proportions of aggregate, filler, water and residual bitumen content based on the dry weight of the aggregates, additive usage (if any).

Table 500-29 : Mix Design Criteria for Slurry Seal Mix

Requirement	Specifications	Test Method
Mix Time, minimum	180 seconds	Appendix 1 IRC:SP:81
Consistency, maximum	3 cm	Appendix 3 IRC:SP:81
Wet cohesion, pass % minimum	20 kg.cm	Appendix 4 IRC:SP:81
Wet striping, Pass %, minimum	90	Appendix 5 IRC:SP:81
Wet Track abrasion loss, (one hour soak), maximum	800 g/m ²	Appendix 6 IRC:SP:81

Aggregate, bitumen emulsion, water and additive including set control additive (if needed), shall be proportioned by weight utilizing the mix design approved by the Engineer. The final mixture, after addition of water and additive (if used) shall be such that the slurry seal mixture has proper workability and permit traffic within four hours (without leading to ravelling after placement). Trial mix shall be prepared and laid at site for the designed mix and observed for breaking and setting time. Indicative limits of various ingredients for job mix of slurry seal shall be as given in Table 500-30.

Table 500-30 : Indicative Quantity of Ingredients

Ingredients	Limits (Percent by Weight of Dry Aggregates)
Cationic Bitumen Emulsion	10 to 16 for type I 7.5 to 13.5 for Type II 6.5 to 12 for Type III
Water	6 to 12
Filler	1.0 to 2.0
Additive	0.5 to 2.0

512.5 Construction**512.5.1 Weather and Seasonal Limitations**

Laying of slurry seal shall not be undertaken, if either the pavement temperature or air temperature is below 10°C. However during a dry spell, slurry seal may be laid in rainy season also, even if the surface is wet but there is no stagnant water on the pavement surface.

512.5.2 Surface Preparation

The underlying surface on which the slurry seal is to be applied shall be cleaned of all loose material, mud spots, vegetation and extraneous matter and shall be prepared and shaped to the needed profile. It is essential to pre-treat cracks on the pavement surface with an appropriate crack sealing material prior to application of slurry seal, if it is used for preventive/renewal treatment. The surface should be swept clean by removing caked earth and other foreign matter with wire brushes, sweeping with mechanical brooms and finally dusting with air jet or other means approved by the Engineer

512.5.3 Application of Tack Coat

Tack coat is not required normally for flexible pavements, unless surface is extremely hungry and dry. In case it is needed, Clause 503 shall apply.

512.5.4 Machine

The machine shall be specially designed and manufactured to lay slurry seal. It shall be self propelled equipment, truck mounted, consisting of following sub-assemblies used to manufacture and simultaneously spread these mixes on the surface:

- i) Aggregate bin.

- ii) Filler bin.
- iii) Water and Emulsion Tanks.
- iv) Additive Tanks.
- v) Aggregates and filler conveyors to supply the mixer box.
- vi) Pump or compressed air system to supply the emulsion/water.
- vii) Mixer Box.
- viii) Spreader box to place the mixed slurry on the job.

512.5.5 Calibration of Machine

Slurry seal laying machine shall be calibrated for flow of all the constituents as per the job mix in presence of Engineer. No machine shall be allowed to work on the project until the calibration has been completed and accepted by the engineer. 2 kg samples of slurry seal mix will be taken and verified for proportioning and mix consistency. The verification for application rate shall also be carried out in presence of the Engineer. The procedure for calibration and verification is as given in Appendix 7 of IRC:SP:81.

512.5.6 Application of Slurry Seal

A calibrated slurry seal machine, as per requirements of job mix, shall be used to spread the material. The surface shall be pre-wetted by fogging ahead of the spreader box (if required under hot weather conditions). The rate of application shall be adjusted during the day to suit temperature, surface texture and humidity. The mixture shall be agitated and mixed uniformly in the spreader box by means of twin shafted paddles or spiral augurs fixed in spreader box. A front seal shall be provided to ensure no loss of the mixture at the road contact point. The rear seal shall act as final strike off and shall be adjustable. The spreader box and rear strike off shall be so designed and operated that a uniform consistency is achieved to produce free flow of material to the rear strike off. A secondary strike off shall have the same adjustment as the spreader box. The spreader box shall have the suitable means provided to side shift the box to compensate for variation in pavement geometry. Sufficient amount of material shall be carried in all parts of spreader box at all times so that a complete coverage is obtained. Overloading of the spreader box shall be avoided. No lumping, balling and unmixed aggregates shall be permitted. No streak, caused by oversized aggregates shall be left on the finished surface. Longitudinal joints shall correspond with the edges of existing traffic lanes. Other patterns of longitudinal joints may be permitted, if pattern will not adversely affect the quality of finished surface. In case streak is formed, it shall be corrected immediately by fresh material and with use of squeeze. Longitudinal joints, common to two traffic lanes shall be butt joints with overlap not exceeding an average of 60-100 mm. The mixture shall be uniform and homogeneous after spreading on existing surfaces and shall not show separation of the emulsion and aggregates after setting.

512.5.7 Rate of Application

The rate of application shall be as per Table 500-26 (by weight of dry aggregates).

512.5.8 Rolling

Generally rolling is not required. Where rolling is felt necessary due to inadequate cohesion, a pneumatic tyred roller having individual wheel load between 0.75 to 1.5 tonne shall be used. Rolling shall commence as soon as the slurry has set.

512.6 Surface Finish and Quality Control

The surface finish of construction shall conform to the requirements of Clause 902. For control of the quality of materials and work carried out, relevant provision of Section 900 shall apply.

512.6.1 Opening to Traffic

Surface shall be opened to traffic after slurry is in a completely set condition. The maximum setting time shall be 4 hours. Speed of traffic shall be restricted to 20 km per hour for next 12 hours.

512.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

512.8 Measurement for Payment

Slurry seal shall be measured as finished work as specified, in square metres.

512.9 Rate

The contract unit rate for slurry seal shall be payment in full for carrying out the required operations including full compensation for the specified rate of application of the mix and the quantity of residual binder. The variation in rates of actual application shall be suitably adjusted plus or minus as provided in the Contract. The contract unit rate shall cover all operations listed in Clause 501.8.8.2.

513 FOG SPRAY**513.1 Scope**

The work covers a very light application of low viscosity bitumen emulsion for purposes of sealing cracks less than 3 mm wide or incipient fretting or disintegration in an existing

bituminous surfacing, and to help reduce loosening of chips by traffic on newly finished surface dressing.

513.2 Material

The bitumen emulsion shall be as specified in the Contract or as instructed by the Engineer. The emulsion shall be SS-1 complying with the requirements of IS:8887.

513.3 Weather and Seasonal Limitations

Spraying shall not take place when the temperature is below 10°C, nor in windy or dusty conditions, nor when it is raining or the surface to be sprayed is wet (a damp surface is acceptable but refer to Clause 513.4.2.).

513.4 Construction Operations

513.4.1 Equipment

The fog spray shall be applied by means of a self-propelled or towed bitumen pressure sprayer complying with the requirements of the Manual for Construction and Supervision of Bituminous Works. The spray bar should be protected from gusts of wind by means of a hood.

513.4.2 Preparation of Surface

The surface on which the fog spray is to be applied shall be thoroughly cleaned with compressed air, scrubbers etc. The cracks shall be cleaned with a pressure air jet to remove all dirt, dust etc.

513.4.3 Application

The fog seal shall be applied at a rate of 0.5-1.0 litres/m², using equipment such as pressure tank, flexible hose and spray bar or lance.

513.5 Blinding

If specified in the Contract or ordered by the Engineer, the fog spray shall be blinded with graded grit of 3 mm size and under, coated with about 2 percent of the emulsion by weight. The pre coated grit shall be allowed to be cured for at least one week or until they become non-sticky and can be spread easily.

513.6 Quality Control of Work

For control of quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

513.7 Arrangements for Traffic

During the spraying operations, arrangements for traffic shall be made in accordance with the provisions of Clause 112. The surface should not be opened to traffic for 24 hours after spraying. If pick-up does occur a light blinding of crusher dust or sand should be applied.

513.8 Measurement of Payment

Fog spray and blinding (if used) shall be measured in terms of surface area of application, for the area covered, in square metres.

513.9 Rate

The contract unit rate for fog spray and blinding (if used) shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2. (i) to (xi) as applicable to the work specified in these Specifications.

514 MICRO-SURFACING**514.1 Scope**

The work shall consist of design, testing and construction of micro-surfacing composed of modified bitumen emulsion, mineral aggregate, water and necessary additives (if needed), proportioned, mixed and uniformly spread over a properly prepared surface for surface treatment of pavements in accordance with these Specifications.

514.2 Type of Mirco-Surfacing

Micro-surfacing is applied on an existing pavement surface which is structurally sound but the surface shows signs of premature ageing, aggregate loss, cracking, high degree of polishing etc. It may be used as surface sealing treatment to improve skid resistance, surface durability, to seal fine and medium cracks and for preventive maintenance and periodic renewal treatment on low and medium traffic roads. Types of micro-surfacing and rates of application are given in Table 500-31.

Table 500-31 : Types of Micro-Surfacing and Rate of Application

Items	Type II (4 to 6 mm)**	Type III (6 to 8 mm)**
Application	Preventive and Renewal Treatment for Roads Carrying <1500 CVPD	Preventive and Renewal Treatment for Roads Carrying 1500 to 4500 CVPD
Quantity of mix* (kg/m ²)	8.4 to 10.8	11.1 to 16.3
Residual binder (percentage by weight of dry aggregate)	6.5 to 10.5	5.5 to 10.5

* By weight of dry aggregate.

** Indicative only.

514.3 Materials**514.3.1 Binder**

The bitumen emulsion shall be a modified bitumen emulsion conforming to requirements specified in Table 500-32. The modifier shall be polymer/rubber, preferably synthetic or natural rubber latex.

Table 500-32 : Requirement of Modified Bitumen Emulsion for Micro-Surfacing

Requirements	Specifications	Method of test
Residue on 600 micron IS sieve (percent by mass), maximum	0.05	IS: 8887
Viscosity by Say bolt Furol Viscometre, at 25°C, in second	20-100	IS :8887
Coagulation of emulsion at low temperature	Nil	IS :8887
Storage stability after 24 h (168 h), % maximum	2(4)	IS :8887
Particle charge, + ve/-ve	+ ve	IS :8887
Tests on residue:		
a) Residue by evaporation, % minimum	60	IS :8887
b) Penetration at 25°C/100 g/5 s	40-100	IS :1203
c) Ductility at 27°C, cm, minimum	50	IS :1208
d) Softening point, in °C, minimum	57	IS :1205
e) Elastic recovery*, %, minimum	50	IS :15462
f) Solubility in tri-chloroethylene, % minimum	97	IS :1216

* In case, elastic recovery is tested for Torsional Elasticity Recovery as per Appendix-8 of IRC:81, the minimum value shall be 20 percent.

514.3.2 Aggregates

As per Clause 512.3.2 (Type II and Type III Grading, Table 500-27).

514.3.3 Filler

As per Clause 512.3.3.

514.3.4 Water

As per Clause 512.3.4.

514.3.5 Additives

As per Clause 512.3.5.

514.4 Design and Proportioning of Micro-Surfacing Mix

514.4.1 The design criteria for micro-surfacing mixture is specified in Table 500-33. The mix design report shall clearly show the proportions of aggregate, filler, water and residual bitumen content based on the dry weight of aggregates and additives used (if any). The set time shall be determined by the method given in Appendix-2 of IRC:SP:81.

Table 500-33 : Mix Design Criteria for Micro-Surfacing Mix

Requirements	Specifications	Method of Test as given in IRC:SP:81
Mix time, minimum	120 s	Appendix-1
Consistency, maximum	3 cm	Appendix-3
Wet Cohesion, within 30 min, minimum.	12 kg cm	Appendix-4
Wet Cohesion, within 60 min, minimum	20 kg cm	Appendix-4
Wet stripping, pass %, minimum	90	Appendix-5
Wet track abrasion loss (one hour soak), maximum	538 g/m ²	Appendix-6

514.4.2 Aggregate, modified bitumen emulsion, water and additive (if used), shall be proportioned by weight of aggregate utilizing the mix design approved by the Engineer. If more than one type of aggregates is used, the correct amount of each type of aggregate used to produce the required grading shall be proportioned separately prior to adding other materials of the mixture, in a manner that will result in a uniform and homogenous blend. Final completed mixture, after addition of water and any additive, if used shall be such that the micro-surfacing mixture has proper workability and permit traffic within a short period depending upon the weather conditions without occurrence of ravelling and bleeding. Trial mixes shall be prepared and laid for the designed mix and observed for breaking time and setting time. The wet track abrasion test is used to determine the minimum residual bitumen content. Indicative limits of various ingredients for job mix of micro-surfacing shall be as given in Table 500-34.

Table 500-34 : Indicative ingredients in mix

Ingredients	Limits (Percent Weight of Aggregate)
Residual bitumen	6.5 to 10.5 for type II and 5.5 to 10.5 for Type III
Mineral filler	0.5 to 3.0
Additive	As needed
Water	As needed

514.5 Construction

As per Clause 512.5.

514.5.1 Weather and Seasonal Limitations

As per Clause 512.5.1.

514.5.2 Surface Preparation

As per Clause 512.5.2.

514.5.3 Application of Tack Coat

As per Clause 512.5.3.

514.5.4 Machine

As per Clause 512.5.4.

514.5.5 Calibration of Machine

As per Clause 512.5.5.

514.5.6 Application of Micro-Surfacing

A calibrated micro-surfacing machine as per requirements of job mix shall be used to spread the material. The surface shall be pre-wetted (if required under extreme hot weather conditions) by spraying water ahead of the spreader box. The rate of application of spray shall be adjusted during the day to suit temperature, surface texture and humidity. The application of micro-surfacing shall be as per Clause 512.5.6.

514.5.7 Rate of Application

The micro-surfacing mixture shall be of proper consistency at all times so as to provide the application rate required by the surface condition. The quantities of micro-surfacing mix (by weight of dry aggregate) to be used shall be as given in Table 500-31.

514.5.8 Rolling

As per Clause 512.5.8.

514.5.9 Quality Control and Surface Finish

The surface finish of construction shall conform to the requirements of Clause 902. For control of the quality of materials and work carried out, relevant provision of Section 900 shall apply.

514.6 Control of Traffic

Micro-surfacing mix requires about 2 hours to set. Traffic may be opened only after 2 hours restricting the speed to 20 km/h till 12 hours thereafter.

514.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

514.8 Measurement for Payment

Micro-surfacing shall be measured as finished work as specified, in square metres.

514.9 Rate

The contract unit rate for micro-surfacing shall be payment in full for carrying out the required operations including full compensation for the specified rate of application of the mix and the quantity of residual binder. The variation in rates of actual application shall be suitably adjusted plus or minus as provided in the Contract. The contract unit rate shall include full compensation for all operations listed in Clause 501.8.8.2.

515 STONE MATRIX ASPHALT (SMA)**515.1 Scope**

This work shall consist of construction in a single or multiple layer of fibre-stabilized SMA for use as wearing course/ binder course on a previously prepared bituminous bound surface. The 13 mm SMA in this Specification shall be used for wearing course with nominal layer thickness of 40 to 50 mm. The 19 mm SMA shall be used for binder (or intermediate) course with nominal layer thickness of 45 to 75 mm.

515.2 Materials**515.2.1 Bitumen**

The bitumen for fibre-stabilized SMA shall be viscosity grade paving bitumen conforming to Indian Standard Specification IS:73 or Modified Bitumen complying with IS:15462 and IRC:SP:53 of appropriate type and grade capable of yielding the design mix requirements, and as per Table 500-2.

515.2.2 Coarse Aggregates

The coarse aggregates shall consist of crushed rock retained on 2.36 mm sieve. It shall be clean, hard, durable, of cubical shape and free from dust and soft organic and other deleterious substances. The aggregates shall satisfy the physical requirements given in Table 500-35.

Table 500-35 : Physical Requirements for Coarse Aggregates for Stone Matrix Asphalt

Property	Text	Method	Specification
Cleanliness	Grain Size Analysis	IS:2386 (P-1)	< 2% passing 0.075 mm sieve
Particle Shape	Combined Flakiness and Elongation Index	IS:2386 (P-1)	< 30%
Strength	Los Angeles Abrasion Value	IS:2386(P-4)	< 25%
	Aggregate Impact Value	IS:2386 (P-4)	< 18%
Polishing	Polished Stone Value	IS:2386 (P-114)	> 55%
Durability	Soundness (either Sodium or Magnesium) - 5 cycles		
	Sodium Sulphate	IS:2386 (P-5)	< 12%
	Magnesium Sulphate	IS:2386 (P-5)	
Water Absorption	Water Absorption	IS:2386 (P-3)	< 2%

* Polishing requirement does not apply when the coarse aggregate is used for intermediate (binder) course.

515.2.3 Fine Aggregates

Fine aggregates (passing 2.36 mm sieve and retained on 0.075 mm sieve) shall consist of 100 percent crushed, manufactured sand resulting from crushing operations. The fine aggregate shall be clean, hard, durable, of fairly cubical shape and free from soft pieces, organic or other deleterious substances. The Sand Equivalent Test (IS:2720, Part 37) value for the fine aggregate shall not be less than 50. The fine aggregates shall be non plastic.

515.2.4 Mineral Filler

Mineral filler shall consist of finely divided mineral matter such as stone dust and/or hydrated lime. Fly ash shall not be permitted as a filler. The filler shall be graded within the limits indicated in Table 500-36.

Table 500-36 : Grading Requirement of Mineral Filler

IS Sieve (mm)	Cumulative % Passing by Weight of Total Aggregate
0.6	100
0.3	95-100
0.075	85-100

The filler shall be inert material free from organic impurities and shall have plasticity index not greater than 4. Plasticity index requirement will not apply if filler is hydrated lime. Where the complete SMA mixture fails to satisfy the requirement of Moisture Susceptibility Test (AASHTO T 283), at least 2 percent by total weight of aggregate of hydrated lime shall be used as filler and the percentage of fine aggregate reduced accordingly.

515.2.5 Stabilizer Additive

Only pelletized cellulose fibres shall be utilized. The dosage rate for cellulose fibres is 0.3 percent minimum by weight (on loose fibre basis) of the total mix. The dosage rate shall be confirmed so that the bitumen draindown does not exceed 0.3 percent when the designed mix is tested in accordance with ASTM D 6390.

515.2.6 The cellulose fibres to be used in pellets shall meet the following requirements:

- Maximum fibre length - 8 mm
- Ash content - maximum of 20 percent nonvolatile
- Oil absorption - more than 4 times of the fibre weight
- Moisture content - less than 5 percent by weight

When the Contractor submits the proposed job-mix formula for SMA for approval, it shall include the fibre manufacturer's most recently dated actual test data showing that the fibres meet the above requirements. The contractor shall protect the cellulose from moisture and contamination prior to incorporating it into the SMA.

515.3 SMA Mix Design

515.3.1 The combined grading of the coarse aggregate, fine aggregate and mineral filler (including hydrated lime if used) shall be within the limits shown in Table 500-37.

Table 500-37 : Composition of Stone Matrix Asphalt

SMA Designation	13 mm SMA	19 mm SMA
Course where used	Wearing course	Binder (intermediate) course
Nominal aggregate size	13 mm	19 mm
Layer thickness	40-50 mm	45-75 mm
IS Sieve (mm)	Cumulative % by weight of total aggregate passing	Cumulative % by weight of total aggregate passing
26.5	—	100
19	100	90-100
13.2	90-100	45-70
9.5	50-75	25-60
4.75	20-28	20-28
2.36	16-24	16-24
1.18	13-21	13-21
0.600	12-18	12-18
0.300	10-20	10-20
0.075	8-12	8-12

515.3.2 The SMA mixture will be designed using AASHTO MP8, Standard Specification for Designing Stone Matrix Asphalt and AASHTO PP 41, Standard Practice for Designing Stone Matrix Asphalt. The SMA mixture shall be compacted with 50 blows on each side using the Marshall procedure given in the Asphalt Institute MS-2 (Sixth edition). The designed mix shall meet the requirements given in Table 500-38.

Table 500-38 : SMA Mix Requirements

Mix Design Parameters	Requirement
Air void content, percent	4.0
Bitumen content, percent	5.8 min.
Celluloid fibres	0.3 percent minimum by weight of total mix
Voids in mineral aggregate (VMA), percent	17 min.
Voids in Coarse Aggregates (VCA) mix, percent	Less than VCA (dry rodded)
Asphalt drain down, percent ASTM D 6390 (Annex C of IRC:SP:79)	0.3 max.
Tensile Strength Ratio (TSR), per cent AASHTO T 283 (Annex E of IRC:SP:79)	85 min.

515.4 SMA Production**515.4.1 Mixing**

The SMA mix shall be prepared in a hot mix plant of adequate capacity and capable of yielding a mix of proper and uniform quality with thoroughly coated aggregate.

When viscosity grade bitumen is used, the mix temperature shall range from 150°C to 165°C. In case of modified bitumen, the temperature of mixing and compaction shall be higher than the mix with viscosity grade bitumen. The exact temperature depends upon the type and amount of modifier used and shall be adopted as per the recommendations of the manufacturer. In order to ensure uniform quality of mix, the plant shall be calibrated from time to time.

515.4.2 Handling Mineral Filler

Adequate dry storage will be provided for the mineral filler and provisions shall be made for proportioning the filler into the mixture uniformly and in the desired quantities. This is necessary because relatively large amounts of mineral filler are required in SMA mixes.

515.4.3 Fibre Additive

For batch plant, the fibre will be added directly into the weigh hopper above the pugmill. Adequate dry mixing time is required to disperse the fiber uniformly throughout the hot aggregate. Dry mixing time will be increased by 5 to 10 seconds. Wet mixing time shall be increased by at least 5 seconds. For drum mix plant, a separate fibre feeding system shall be utilized that can accurately and uniformly introduce fibre into the drum at such a rate as not to limit the normal production of mix through the drum. At no time shall there be any evidence of fibre in the baghouse/wasted baghouse fines.

515.5 SMA Placement and Compaction**515.5.1 Preparation of Existing Bituminous Surface**

The existing bituminous surface shall be cleaned of all loose extraneous matter by means of mechanical broom and high-pressure air jet from compressor or any other approved equipment/method. Any potholes and/or cracks shall be repaired and sealed.

515.5.2 Tack Coat

Clause 503 shall apply.

515.5.3 Transportation

Clause 501.4 shall apply.

515.5.4 Laying**515.5.4.1 Weather and Seasonal Limitations**

Clause 501.5.1 shall apply.

515.5.4.2 Spreading

Clause 501.5.3 shall apply.

515.5.5 Compaction

Clause 501.6. shall apply, except that the use of pneumatic roller shall not be permitted if there is a possibility of pick-up.

The density of the finished paving layer shall be determined by taking 150 mm diameter cores. The density of finished paving layer shall not be less than 94 percent of the average (sample size N=2) theoretical maximum specific gravity of the loose mix (G_{mm}) obtained on that day in accordance with ASTM D2041. That is, no more than 6 percent air voids shall be allowed in the compacted SMA mat.

515.5.6 Joints

Clause 501.7 shall apply.

515.6 Quality Control and Surface Finish

The surface finish of construction shall conform to the requirements of Clause 902. For control of the quality of materials supplied and work carried out, relevant portion of Section 900 shall apply.

515.7 Control of Traffic

It shall be ensured that traffic is not allowed on the SMA surface until the paved mat has cooled to ambient temperature in its entire depth.

515.8 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

515.9 Measurement for Payment

SMA shall be measured as finished work in sq.m at this specified thickness or in cu.m as specified in the Contract.

515.10 Rate

The contract unit rate for SMA shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2.

516 MASTIC ASPHALT**516.1 Scope**

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

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

516.2 Materials**516.2.1 Binder**

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

Table 500-39 : Requirements for Physical Properties of Binder

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

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

516.2.2 Coarse Aggregates

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

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

Table 500-40 : Grade and Thickness of Mastic Asphalt Paving and Grading of Coarse Aggregates

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

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

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

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

Table 500-41 : Grading of Fine Aggregate (Inclusive of Filler)

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

516.3 Mix Design**516.3.1 Hardness Number**

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

The hardness number shall be determined in accordance with the method specified in IS:1195-1978.

516.3.2 Binder Content

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

Table 500-42 : Composition of Mastic Asphalt Blocks without Coarse Aggregate

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

516.3.3 Job Mix Formula

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

516.4 Construction Operations**516.4.1 Weather and Seasonal Limitations**

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

516.4.2 Preparation of the Base

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

516.4.3 Tack Coat

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

516.4.4 Preparation of Mastic Asphalt

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

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

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

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

516.4.5 Spreading

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

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

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

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

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

516.4.6 Joints

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

516.4.7 Surface Finish

The mastic asphalt surface can have poor skid resistance after floating. In order to provide resistance to skidding, the mastic asphalt after spreading, while still hot and in a plastic condition, shall be covered with a layer of stone aggregate. This aggregate shall be 13.2 mm size (passing the 19.0 mm sieve and retained on the 6.7 mm sieve) or 9.5 mm size (passing the 13.2 mm sieve and retained on the 6.7 mm sieve) subject to the approval of the Engineer. Hard stone chips, complying with the quality requirements of Table 500-16, shall be precoated with bitumen at the rate of 2 ± 0.4 percent of VG 30 grade. The addition of 2 percent of filler complying with Table 500-9 may be required to enable this quantity of binder to be held without draining. The chips shall then be applied at the rate of 0.005 cu.m per 10 sq.m and rolled or otherwise pressed into the surface of the mastic layer when the temperature of the mastic asphalt is not less than 100°C.

516.5 Opening of Traffic

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

516.6 Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902.

For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

The surface of the mastic asphalt, tested with a straight edge 3 m long, placed parallel to the centre line of the carriageway, shall have no depression greater than 7 mm. The same shall also apply to the transverse profile when tested with a camber template.

516.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

516.8 Measurement for Payment

Mastic asphalt shall be measured as finished work in square metres at a specified thickness, or by weight in tonnes as stated in the Contract.

516.9 Rate

The contract unit rate for mastic asphalt shall be payment in full for carrying out the required operations including full compensation for all components listed under Clause 501.8.2.2.

517 CRACK PREVENTION COURSES**517.1 Scope**

The work shall consist of providing one or two coats of an elastomeric rubber membrane known as Stress Absorbing Membrane (SAM) over a cracked surface, followed by a covering of aggregate chips, and a Stress Absorbing Membrane Interlayer (SAMI), which is a material similar to SAM or which consists of a bitumen impregnated geotextile, as specified in the Contract.

517.2 Materials**517.2.1 Binder**

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

517.2.2 Aggregate

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

517.2.3 Rates of Spread of Binder and Aggregate

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

517.2.4 Geotextile

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

517.3 Construction Operations**517.3.1 Weather and Seasonal Limitations**

Clause 501.5.1 shall apply.

517.3.2 Preparation of Base

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

517.3.3 Application of Binder

517.3.3.1 The equipment and general procedures shall all be in accordance with the Manual for Construction and Supervision of Bituminous Works. The application temperature for modified binder shall be 160°-170°C. Binder for bitumen impregnated geotextile shall be applied according to Clause 703.4.4. The surface on which the binder is to be applied shall be dry.

Table 500-43 : Quantity of Materials Required for 10 sq.m of Road Surface for Stress Absorbing Membrane

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

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

517.3.4 Application of Aggregates

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

517.3.5 Sweeping

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

517.3.6 Two Coat SAM or SAMI

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

517.3.7 Geotextile Placement

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

517.4 Opening to Traffic

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

517.5 Surface Finish and Quality Control of Work

The surface finish shall conform to the requirements of Clause 902.

For control on the quality of materials and the works carried out, the relevant provisions of **Section 900** shall apply.

517.6 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

517.7 Measurement for Payment

Each application of SAM, SAMI or bitumen impregnated geotextile shall be measured as finished work, for the area specified, in square metres.

517.8 Rate

The contract unit rate for SAM, SAMI or bitumen impregnated geotextile shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2.

518 BITUMINOUS COLD MIX (INCLUDING GRAVEL EMULSION)**518.1 The Design Mix**

The work shall consist of providing a bituminous cold mix consisting of a mixture of unheated mineral aggregate and emulsified or cutback bitumen, laid in a single layer of 25-75 mm. The mix shall either be a design mix or a recipe mix.

518.2 Materials**518.2.1 Binder**

The binder shall be a slow/ medium setting bitumen emulsion conforming to IS:8887 or a medium curing cut-back conforming to IS:217.

The final selection of the binder shall be made only after laboratory evaluation with the aggregates to be used. A general guide for the selection of the binder is given in the Manual for Construction and Supervision of Bituminous Works.

The binder with the highest residual viscosity at ambient temperatures that can reasonably be handled by the mixing and laying equipment proposed shall be used.

518.2.1.1 Aggregates

The aggregates shall comply with the requirements of Clauses 505.2.2. and 505.2.3. If the aggregates are not properly coated with the binder, a small amount of hydrated lime or an approved antistripping agent (see Appendix 4) shall be proposed by the Contractor, for the approval of the Engineer.

518.2.1.2 Aggregate Grading and Binder Content

The combined aggregate grading for the particular mixture, when tested in accordance with IS:2386 Part I, (wet sieving method), shall fall within the limits shown in Table 500-44.

518.2.2 Mix Design**518.2.2.1 Requirements for the Mixture**

Apart from conformity with the grading and quality requirements for individual ingredients, the mix shall meet the requirements set out in Table 500-45.

Table 500-44 : Aggregate Grading and Bitumen Content

Nominal Maximum Size (mm)	9.5	13.2	19.0
Allowable Thickness (mm)	25-35	36-50	51-75
IS Sieve (mm)	Cumulative % by weight of total aggregate passing		
37.5	–	–	–
26.5	–	–	100
19.0	–	100	90-100
13.2	100	90-100	–
9.5	90-100	–	60-80
4.75	60-80	45-70	35-65
2.36	35-65	25-55	20-50
0.30	6-25	5-20	3-20
0.075	2-10	2-9	2-8
	Binder content, percent by weight of total mix		
Cutback		4-6	
Emulsion		7-10	

The binder content shall be determined by the modified Marshall Test.

Table 500-45 : Mix Requirements for Designed Cold Mix

Parameter	Emulsion ¹	Cutback ²
Minimum Stability	2.2 kN at 22.2°C for paving	2.2 kN at 25°C for maintenance 3.3 kN at 25°C for paving
Percent maximum stability loss on soaking	50 ³	25 ⁴
Minimum flow (mm)	2	2
Compaction level (number of blows)	50	75
Per cent air voids	3-5 ⁵	3-5
Per cent voids in mineral aggregate (VMA)	See Table 500-46	
Per cent minimum coating ⁶	50	

Notes: ¹Using Marshall method for emulsified asphalt-aggregate cold mix design".

Appendix F, MS-14

²Using "Marshall method for cut-back asphalt-aggregate cold mix design", Appendix H, MS-14

³With vacuum saturation and immersion

⁴Four days soak at 25°C.

⁵Refers to total voids in the mix occupied by air and water

⁶Coating Test, Appendix F, MS-14.

Table 500-46 : Minimum Percent Voids in Mineral Aggregate (VMA)

Nominal Maximum Particle Size IS Sieve (mm)	Minimum VMA (Percent)
9.5	16.0
12.5	15.0
19.0	14.0
25.0	13.0
37.5	12.0

518.2.2.2 Binder Content

The binder content shall be optimized by the Modified Marshall Test to achieve the requirements of the mix set out in Table 500-45. The method adopted shall be that described in Appendix F and H of Asphalt Institute's Manual, MS-14.

518.2.2.3 Job Mix Formula

The Contractor shall submit to the Engineer for approval at least one month before the start of the work, the job mix formula proposed for use in the works together with the following details:

- i) Source and location of all materials;
- ii) Proportions of all materials expressed as follows where each is applicable:
 - a) Binder, as percentage by weight of total mix;
 - b) Coarse aggregate/fine aggregate as percentage by weight of total aggregate;
- iii) A single definite percentage passing each sieve for the mixed aggregate;
- iv) The results of tests enumerated in Table 500-46 as obtained by the Contractor;

- v) Test results of the physical characteristics of the aggregates to be used;
- vi) Spraying temperature of binder if appropriate.

While working out the job mix formula, the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredients satisfy the physical and strength requirements of these Specifications.

Approval of the job mix formula shall be based on independent testing by the Engineer for which samples selected jointly with the Engineer of all ingredients of the mix shall be furnished by the Contractor as required by the former.

The approved job mix formula shall remain effective unless and until modified by the Engineer. Should a change in the source of materials be proposed, a new job mix formula shall be established by the Contractor and approved by the Engineer before actually using the materials.

518.2.2.4 Permissible Variation from the Job Mix Formula

It shall be the responsibility of the Contractor to produce a uniform mix conforming to the approved job mix formula, subject to the permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used, within the limits as specified in Tables 500-13 and 500-18. These variations are intended to apply to individual specimens taken for quality control tests in accordance with Section 900.

518.2.3 Construction operations

518.2.3.1 Weather and Seasonal Limitations

Construction with cold mix must not be undertaken when ambient temperatures below 10°C are expected, during rain, in standing water, or generally when poor weather is predicted. Bitumen emulsions and cutbacks depend on the evaporation of water and/or solvent for the development of their curing and adhesion characteristics. Cold weather, rain and high humidity slow down the rate of curing. Extra manipulation may be required to remove volatiles in cool and humid conditions. Wind increases the rate of evaporation.

518.2.3.2 Preparation of the Base

The base on which cold mix is to be laid shall be prepared, shaped and levelled to the required profile in accordance with Clauses 501 and 902 as appropriate, and a prime coat, where specified, shall be applied in accordance with Clause 502 or as directed by the Engineer.

518.2.3.3 Tack Coat

A tack coat in accordance with Clause 503 shall be applied over the base on which the cold mix is to be laid where specified in the Contract.

518.2.3.4 Preparation and Transportation of the Mix

Mixing can be carried out using one of the following types of mixer, which is provided with equipment for spraying the binder at a controlled rate and, if necessary, for heating the binder to a temperature at which it can be applied uniformly to the aggregate:

- a) rotary drum type concrete mixer for small jobs or asphalt cold mix plant;
- b) batch or continuous type mixer without dryer

A sufficient number of haul trucks with smooth, clean beds should be available to ensure continuous operation of the mixing plant. The type of truck used for transporting the mixture from the mixer to the road site shall suit to the Contractor's proposed laying procedure methodology.

518.2.3.5 Spreading

Designed cold mix shall be placed by a paver or grader as specified in the Contract. The mix shall not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing.

If spreading by motor grader, the grader shall have a blade that is straight and sharp and long enough to ensure finishing to close, straight, transverse tolerances and all joints and linkages must be in good condition. The grader must be heavy enough to hold the blade firmly and uniformly on the surface while spreading the mix.

If climatic conditions and aggregate grading do not permit evaporation of moisture or volatiles without aeration by manipulation, a grader shall be used to place designed cold mix.

Other methods of spreading may be used as approved by the Engineer.

518.2.3.6 Compaction

Initial compaction of the laid material shall preferably be carried out using a pneumatic-tyred roller of a weight appropriate to the layer thickness to be compacted with single layer thickness being 25-100 mm and all compaction being in accordance with Clauses 501.6 and 501.7. Smooth tyres shall be used. Final rolling and smoothing of the surface should be completed using steel wheel rollers. The Contractor shall demonstrate at laying trials that his proposed laying and compaction methods can achieve a satisfactory result.

518.2.4 Opening to Traffic

Traffic shall not be allowed to run on new work until all the water or volatiles in the mix have evaporated, as determined by the Engineer. The rate of evaporation will be influenced by the temperature, humidity and wind conditions.

518.2.5 Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902. For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

518.2.6 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

518.2.7 Measurement for Payment

Designed Cold Mix shall be measured as finished work, for the area covered, in cubic metres, by weight in metric tonnes, or by square metres at a specified thickness as specified in the Contract.

518.2.8 Rate

The contract unit rate for Designed Cold Mix shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2. The rate shall cover the provision of the specified grade of cutback in the mix at 5 percent of the weight of the total mix or emulsion at 8 percent of the weight of the total mix. However any variation in quantity of binder will be assessed on the basis of the amount agreed by the Engineer and the payment adjusted, plus or minus, as per the rate for cutback or emulsion quoted in the Bill of Quantities.

518.3 Recipe Cold Mix**518.3.1 Scope**

The work consists of construction of Recipe Cold Mixes composed of aggregate and emulsion binder which are laid immediately after mixing and while the emulsion is still substantially in an unbroken state. These mixes are considered suitable for emergency and repair work and temporary road surface improvement.

518.3.2 Materials**518.3.2.1 Binder**

Emulsions of sufficient stability for mixing with the particular graded aggregate should be used. Bitumen emulsion shall be slow/ medium setting conforming to IS:8887.

518.3.2.2 Aggregates

Any normal, clean, but not necessarily dry, aggregate shall be used, conforming to Clauses 505.2.2 and 505.2.3 provided that it has sufficiently high crushing strength with regard to the traffic to be carried. Typical gradings are given in Table 500-47.

518.3.2.3 Aggregate Grading and Binder Content

When tested in accordance with IS:2386 Part 1 (wet sieving methods) the combined aggregate grading for the particular mix shall fall within the limits shown in Table 500-47. The actual quantity of emulsion to be used shall be approved by the Engineer after seeing the results of trial mixes made in the laboratory.

518.3.3 Construction Operations**518.3.3.1 Weather and Seasonal Limitations**

As per Clause 518.2.3.1.

518.3.3.2 Preparation of Base

As per Clause 518.2.3.2.

518.3.3.3 Tack Coat

A tack coat in accordance with Clause 503 shall be applied over the base on which the cold mix is to be laid if specified in the Contract or required by the Engineer.

518.3.3.4 Preparation and Transportation of the Mix

As per Clause 518.2.3.4.

518.3.3.5 Spreading

As per Clause 518.2.3.5.

Table 500-47 : Composition of Recipe Mixes

Nominal Size (mm) and Type of Course	40 Single Course	40 Open Textured Base Course	14 Open Textured Wearing Course	6 Medium Textured Wearing Course
Allowable Thickness (mm)	75	75	31-50	21-30
IS Sieve Size mm	Cumulative % by weight of total aggregate passing			
45	100	100	-	-
37.5	90-100	90-100	-	-
26.5	55-90	55-85	-	-
19	-	-	100	-
13.2	35-55	15-35	90-100	-
9.5	-	-	55-75	100
6.3	20-30	-	25-45	90-100
3.35	10-20	0-10	15-25	45-65
2.36	-	-	-	75-100
1.18	-	-	-	10-30
0.60	-	-	-	-
0.30	2-10	-	-	-
0.15	-	-	-	-
0.075	-	-	2-6	2-8
Emulsion grade and quantity				
Quantity ⁽¹⁾ Kg/ tonne	55 to 70	45 to 65	70 to 90	85 to 100

518.3.3.6 Compaction

As per Clause 518.2.3.6.

518.3.4 Opening to Traffic

As per Clause 518.2.4.

518.3.5 Surface Finish and Quality Control of Work

As per Clause 518.2.5.

518.3.6 Arrangements for Traffic

As per Clause 518.2.6.

518.3.7 Measurement for Payment

As per Clause 518.2.7.

518.3.8 Rate

The contract unit rate for Recipe Cold Mix shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 501.8.8.2. The rate shall cover the provision of the specified grade of emulsion at the lower quantity in the range for each type of mix indicated in Table 500-47. However any variation of quantity in emulsion will be assessed on the basis of the amount agreed by the Engineer and the payment adjusted plus or minus, as per the rate for emulsion quoted in the Bill of Quantities.

519 RECYCLING OF BITUMINOUS PAVEMENT**519.1 Scope**

This work covers the recycling of existing bituminous pavement materials to upgrade an existing bituminous pavement which has served its initially intended purpose. The work shall be performed on such widths and lengths as shall be directed by the Engineer and may consist of pavement removal, stockpiling of materials from the old pavement, addition of new bitumen and untreated aggregates in the requisite proportions, mixing, spreading and compaction of the blended materials.

These specifications cover the hot process.

519.2 Reclaimed Bituminous Materials for Central Plant Recycling

519.2.1 The reclaimed bituminous material shall be used in the production of bituminous macadam and dense bituminous macadam subject to the Clauses 519.2.3 to 519.2.8, and subject to satisfactory completion of full investigations in respect of all related materials entirely at the Contractor's cost and subject to the approval of the Engineer. For

estimation purposes, an amount not greater than 60 per cent of reclaimed bituminous material shall be assumed.

519.2.2 Materials for Recycled Pavement

The recycled materials shall be a blend of reclaimed and new materials proportioned to achieve a paving mixture with the specified engineering properties. The reclaimed materials shall be tested and evaluated to find the optimum blend meeting the mixture requirements. Such testing and evaluation shall be carried out on representative sample, either cores sampled from the carriageway or samples taken from stockpiles in accordance with current practice. The sampling frequency should be sufficient to determine how consistent the reclaimed material is and to provide representative samples for composition analysis and measurement of properties of recovered binder. As an absolute minimum, one sample to represent 500 m two lane carriageway shall be taken.

519.2.3 Bitumen Extraction

The procedure described in ASTM D-2172 shall be used to quantitatively separate aggregates and bitumen from any representative sample of reclaimed bituminous pavement.

519.2.4 Aggregate Evaluation

Mechanical sieve analysis (IS:2386, Part I, wet sieving method) shall be performed on the aggregate portion of the reclaimed bituminous pavement sample to determine the grading. It is essential that the reclaimed materials to be recycled are consistent, as variable materials will cause problems with the control of quality and impede the efficiency of the recycling operation. Suitable sources of consistent material either in existing pavements, from stockpiled of known origin or from another suitable source shall be identified before a decision can be made on the optimum percentage of reclaimed material.

After selecting the proportion of reclaimed materials to be recycled, the grading of the mixture may need adjustment, to meet Specification requirements, by the addition of selected aggregate sizes.

519.2.5 Evaluation of Bitumen

When the amount of reclaimed bituminous materials to be used in the mixture exceeds 10 percent, the penetration value of the recovered binder from the reclaimed bituminous material, before mixing, shall exceed 15 pen, after recovery of binder in accordance with the requirements of BS:2000:Part 397, when tested in accordance with IS:1203. Provided the

above requirement is met, hardening of the old binder, during the original mixing process or through ageing, can be compensated for by adding softer bitumen, to obtain the appropriate final grade of binder.

The determination of the type and amount of binder required to be added in the final mix is essentially a trial and error procedure.

After mixing with recycled materials, the binder recovered from the mixture shall have a recovered penetration value not less than the value specified in Table 500-48.

Table 500-48 : Minimum Recovered Binder Penetration of Recycled Mixture

Specified Grade of Binder Viscosity Grade	Minimum Recovered Penetration Value of Binder after Mixing
40 (45 pen)	27
30 (65 pen)	39
10 (90 pen)	54

519.2.6 Rejuvenators

The use of rejuvenators, and a test to measure their effectiveness, is given in Clause 519.6.3.

519.2.7 Untreated Aggregates

If necessary, fresh untreated aggregates shall be added to the reclaimed bituminous pavement to produce a mix with the desired grading. The aggregate shall be checked for quality requirements in accordance with Table 500-7 or Table 500-10 as appropriate. Reclaimed aggregate, if any, or any aggregate normally used for the desired bituminous mix, or both, may be used for this purpose.

519.2.8 Combined Aggregate Grading

The blend reclaimed and new aggregate shall meet the grading criteria specified in the relevant parts of Clauses 505 or 506, as appropriate and as approved by the Engineer. The blend of aggregates shall be checked for resistance to stripping as specified in Tables 500-7 or 500-10 as appropriate.

519.3 Mixture Design

The combined aggregate grading and binder content shall comply with the relevant tables in Clauses 504 or 505 as appropriate. The mix design shall also comply with the requirements of Table 500-10. There may be a variation on three to four sieves with respect to percent passing, the permissible variation shall not exceed 3 to 4 percent per sieve.

519.4 Reclaiming Old Pavement Materials

The removal of pavement materials to the required depth shall be accomplished either at ambient temperature (cold process) or at an elevated temperature (hot process), as approved by the Engineer.

519.4.1 Cold Removal Process

In the cold process, the ripping and crushing operations shall be carried out using scarifiers, grid rollers, or rippers or by any other means as directed by the Engineer. The removed materials shall be loaded and hauled for crushing to the required size as directed by the Engineer. Alternatively, cold milling or planning machines can be used to reclaim bituminous pavement to controlled depths. Thereafter the bituminous layers are removed, any remaining aggregate materials that are to be incorporated in the recycled hot mix shall be scarified and removed. When the pavement material removal is completed, any drainage deficiencies shall be corrected. After that, the base/sub-base, as the case may be, shall be cut, graded and compacted to the required profile and density.

519.4.2 Hot Removal Process

In the hot process, the road surface shall be heated, by infra-red/ hot-air heating system, before scarification. A self propelled plant fitted with suitable arrangement for heating the existing bituminous surface shall be used. A milling drum shall follow the planer for removing the heated soft bituminous layer. The depth, width and speed of travel shall be adjusted to suit specific requirements as directed by the Engineer. During the heating process, the surface temperature of the road shall not exceed 200°C for more than 5 minutes.

519.4.3 Stockpiling

In the cold process, the reclaimed bituminous pavement material shall be stockpiled with height of stockpiles not exceeding 3 m. The reclaimed untreated aggregate base/sub-base material shall be stockpiled in the same manner as new aggregate. The number and location of stockpiles shall be carefully planned for efficient operation of the hot-mix plant.

519.5 Mixing and Laying

the requirements of Clauses 504.3 or 505.4, as appropriate shall apply.

519.6 In Situ Recycling – The Remix and Repave Processes**519.6.1 Scope**

In the process of repaving, the existing surface is preheated and scarified but the scarified material is not removed. A layer of fresh bituminous mix material prepared in the integrated mixing unit of the plant is then spread evenly on the scarified surface to give a uniform profile. The spread material should be compacted as soon as possible after laying. In the process, the total thickness of the pavement is increased by up to 50 mm.

In the remix process, the scarified material should be taken from the mixing unit of the plant where it is recycled with fresh binder, aggregate and recycling agent. Then the recycled mixture is spread on the preheated surface and tamped and compacted to the required profile.

519.6.2 Heating and Scarifying

Surfaces to be treated shall be heated by plant with surfaces insulated and fully enclosed. The heated width of surfacing shall exceed the scarified width by at least 75 mm on each side, except against the edge of the carriageway or kerb face. When new surfacing material is spilled onto the road surface it shall be removed before the existing surface is heated and scarified. Areas of unscarified material shall not exceed 50 mm x 50 mm.

The depth of scarification shall be such that the bottom of the scarified layer is parallel to and below the finished road surface level by the thickness of wearing course material specified. A tolerance of ± 6 mm is permissible.

Where street furniture and other obstructions occur, these shall be suitably protected or removed and the void covered. Surface dressing and large areas of road markings shall be removed by milling, planning scarifying or by similar approved processes.

The heated surface shall be evenly scarified to comply with the requirements of this Clause. When street furniture is left in place or raised, the adjacent area shall be scarified by other means, with the material either left in place or removed, prior to passage of the machine. If furniture needs to be repositioned on completion of work, the new wearing course material shall be used to make good the road surface for a maximum width of 200 mm around the obstruction.

During the reheating process, the surface temperature of the road shall not exceed 200°C for more than 5 minutes.

519.6.3 Rejuvenator

For Remix, when required, rejuvenator shall be uniformly sprayed across the fullwidth of the processed material. The machine shall incorporate a metre for continuous verification of quantities which shall be within $\pm 5\%$ of the specified rate. The volume of rejuvenator shall vary in relation to the operating speed of the machine, which shall be related to the volume of material mixed or scarified.

The rejuvenator shall be a non-emulsified aromatic extract. Its properties shall be verified using the Rolling Thin Film Oven Test.

Rejuvenation of the existing pavement may also be performed by adding new hot-mix bituminous material containing a soft binder for restoring the binder in the existing pavement to the required viscosity. Use of rejuvenating oil may be resorted to in case the target values of viscosity, penetration and softening are not met.

519.6.4 Mixing

When required, new hot-mix material shall be mixed with the heated and scarified road pavement material in a pugmill within the Remix machine, observing the mixing temperatures specified in Table 500-2.

After mixing, the recycled bituminous materials shall be automatically led to a finishing unit, which spreads and levels the mixture to the specified thickness and cross-section. The new bituminous concrete wearing course shall comply with Clause 507.

519.6.5 Additional Material (General)

The proportion of new hot-mix bituminous material, and the proportion of existing bituminous pavement material shall be as directed by the Engineer, together with the amount the road surface level is to be raised (if any).

The type and quantity of the new hot-mix material shall be determined by using the Marshall Mix Design procedure specified in the Asphalt Institute Manual MS-2, before work commences. Remix designs shall incorporate the stated proportion of material sampled from the existing road surface.

When additional coarse or fine aggregate or filler are required to be added, they shall comply with the requirements of Clause 508.2. The amount of additional coarse or fine aggregate or filler to be added to the existing bituminous pavement material shall be notified to the Engineer.

519.6.6 Additional Aggregate (Remix Process)

The coarse aggregate, fine aggregate and filler added to the Remixed material shall comply with the requirements of Clause 507.2.

519.6.7 New Surfacing (Repave and Remix/Repave Processes)

New surfacing material shall be bituminous concrete wearing course complying with Clause 508, or other wearing course material approved by the Engineer.

The new surfacing material shall be laid on, and compacted with, the reprofiled surfacing, which shall be at a temperature within the range of 100°C to 150°C.

519.6.8 Binder

The binder shall be recovered from samples taken from each layer of material laid. The method of recovery shall be in accordance with BS:2000: Part 397 or an equivalent test. The penetration of the binder shall be in the range 35-70 pen.

519.6.9 Mixture Design

The surfacing material shall be sampled from the paver hopper or augers. Care shall be taken that only the material forming the new surface layer is sampled. The sample shall be reduced at site by rifling or quartering to approximately 5 kg and placed loose in an air-tight container.

The sample shall only be reheated once whilst within the container. As soon as the sample reaches the required temperature, the reheated material shall be remixed and three Marshall test specimens prepared in accordance with the procedures specified in MS-2.

The bulk density of each specimen shall be measured before Marshall Stability testing. The mean stability and flow of the three specimen measured in accordance with the procedures specified in MS-2, shall comply with the requirements of Table 500-11.

The three Marshall specimens shall be combined and the maximum theoretical specific gravity (G_{mm}) of the mix shall be determined in accordance with ASTM D 2041. This maximum theoretical specific gravity (G_{mm}) corresponds to 0% air voids in the mix. The percent air voids (P_a) in the specimen of the compacted mixture given by $P_a = (G_{mm} - G_{mb}) \times 100 / G_{mm}$ shall meet the requirements of air voids laid down in Table 500-10, where G_{mb} is the actual bulk specific gravity of a Marshall specimen determined in the Laboratory.

519.7 Opening to Traffic

For recycled material forming the base or binder course layer, Clauses 504.5 or 505.5 shall apply as appropriate. For recycled material forming the wearing course layer, Clause 508.4 shall apply.

519.8 Surface Finish and Quality Control

The surface finish of the completed construction shall conform to the requirements of Clause 902.

For control of the quality of materials and the works carried out the relevant provisions of Section 900 shall apply.

519.9 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

519.10 Measurement for Payment

The recycled pavement work shall be measured in cubic metres or tonnes of finished work as stated in the Contract.

519.11 Rate

The contract unit rate for recycled pavement shall be payment in full for carrying out the required operations including full compensation for all items as Clause 501.8.8.2.

520 SUPPLY OF STONE AGGREGATES FOR PAVEMENT COURSES**520.1 Scope**

This Clause shall apply to the supply of stone aggregates only. The work shall consist only of collection, transportation and stacking the stone aggregates and stone filler for subsequent use in pavement courses. The actual work of laying the pavement courses shall, however, be governed by the individual Specification Clause for the actual work, given elsewhere in these Specifications. The size and quantities of the aggregates to be supplied shall be so selected by the Engineer that the grading requirements set forth in the individual Specification Clauses for the pavement courses, for which the supply is intended, are satisfied.

All the materials shall be procured from approved sources and shall conform to the physical requirements, specified in the respective Specification Clauses for the individual items given elsewhere in these Specifications.

520.2 Sizes of Stone Aggregates

The stone aggregates shall be designated by their standard sizes in the Contract and shall conform to the requirements shown in Table 500-49.

520.3 Stacking

520.3.1 Coarse Aggregates

Only the aggregates satisfying the Specifications requirements shall be conveyed to the roadside and stacked. Each size of aggregate shall be stacked separately. Likewise, materials obtained from different quarry sources shall be stacked separately and in such a manner that there is no contamination of one source with another.

Table 500-49 : Size Requirements for Coarse Stone Aggregates

S. No.	Nominal Size of Aggregate	Designation of Sieve Through which the Aggregates shall Wholly Pass	Designation of Sieve on which the Aggregates shall be Wholly Retained
1)	75 mm	106 mm	63 mm
2)	63 mm	90 mm	53 mm
3)	45 mm	53 mm	26.5 mm
4)	26.5 mm	45 mm	22.4 mm
5)	22.4 mm	26.5 mm	13.2 mm
6)	13.2 mm	22.4 mm	11.2 mm
7)	11.2 mm	13.2 mm	6.7 mm
8)	6.7 mm	11.2 mm	2.8 mm

520.3.2 Fine Aggregate

As stated in the individual relevant Specification Clauses.

The aggregates shall be stacked clear of the roadway on even clear hard ground, or on a platform prepared in advance for the purpose by the Contractor at his own cost and in a manner that allows correct and ready measurement. If the stockpile is placed on ground

BRIDGE AND ROOF CO. (INDIA) LIMITED

BANDEL ROB PROJECT SITE,
OPP.ROTARY HOOGHLY EYE HOSPITAL
P.O.- ADCCONAGAR, P.S.- MOGRA, DIST.- HOOGHLY,
WEST BENGAL, PIN - 712121

"CONSTRUCTION OF BITUMINOUS SERVICE ROAD, MAIN ROAD AND BOTH SIDE APPROACHES OF RE WALL, ROAD MARKING, TRAFFIC SIGNALS, REPAIRING OF POT HOLES ETC. WITH ALL MATERIAL, MACHINERY & MANPOWER ON SUBCONTRACT BASIS IN CONNECTION WITH CONSTRUCTION OF ROAD OVER BRIDGE (ROB) INCLUDING APPROACH ROAD FROM STKK ROAD TOWARDS BANDEL CARSHED ROB, SERVICE ROAD, FOOTPATH, ROAD SIGNAGE, DRAINAGE ETC. IN LIEU OF LEVEL CROSSING 1A/3T AT BANDEL CARSHED ON BANDEL-KATWA BROAD GAUGE RAIL LINE, AT CHINAGE 631.8 KMP ON GRAND TRUNK ROAD IN THE DISTRICT HOOGHLY IN WEST BENGAL".

ANNEXURE - VI

BILL OF QUANTITY

BRIDGE AND ROOF CO. (INDIA) LIMITED
(A GOVT. OF INDIA ENTERPRISE)

NIT No: BR / BANDEL / 51073 / NIT/ ROAD WORK DATED 08/02/2024

SCHEDULE OF RATES

Annexure - VI

Item No.	Description	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
1.4	Dismantling of Flexible Pavements. Dismantling of flexible pavements and disposal of dismantled materials with all lead and lifts, stacking serviceable and unserviceable materials separately. Reference to MORT&H's specification clause 202 and as directed by the Engineer.				-
1.41	i) Bituminous course (by mechanical means)	Cum	100.00	265.200	26,520.00
1.42	ii) Non Bituminous course (by mechanical means)	Cum	200.00	265.200	53,040.00
2.1	Excavation in Soil using Hydraulic Excavator/ mechanical means and Tippers with Disposal including all lead and lift. Excavation for roadwork in soil by hydraulic excavator/mechanical means including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting of usable soil to the embankment location within all lifts and lead and disposal of marshy soil/ unusable soil with all lead and lift and Reference to MORT&H's specification clause 301 and as directed by the Engineer.				-
2.11	(a) In all types of soil (Excluding marshy soil)	Cum	100.00	97.240	9,724.00
2.12	(b) In Marshy soil	Cum	50.00	265.200	13,260.00
2.2	Embankment Construction with approved material. Construction of embankment with approved material including all lead and lift complete as per drawings and MORT&H's Specification Clause 305 (Table-300-2) and as directed by the Engineer.				-
2.21	(i) With Pond ash (IRC-SP-58-2001)	Cum	100.00	279.565	27,956.50
2.22	(ii) With Sand (Zone-II, IS- 383-1970) (MORT&H Specification Clause 305)	Cum	50.00	1941.485	97,074.25
2.3	Construction of Embankment with Material Deposited from Roadway Cutting. Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2. complete with all lead and lift and Reference to MORT&H's specification clause 305 and as directed by the Engineer.	Cum	100.00	112.710	11,271.00
2.4	Construction of Subgrade and Earthen Shoulders. Providing and construction of subgrade/shoulder with approved materials including all leads and lifts complete as per drawings and MORT&H's Specification Clause 305 and as directed by the Engineer.				-
2.41	i) Pond ash/Fly ash mixed with sand (Sand shall not be less than 30% by weight of mix)	Cum	50.00	802.230	40,111.50
3.1	Granular Sub-Base (Table:- 400-1). Construction of granular sub-base by providing material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 and as directed by the Engineer. For grading -I (By Mix in Place Method)	Cum	50.00	2784.600	139,230.00
3.2	Wet Mix Macadam. Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density complete as per drawings and Reference to MORT&H's specification clause 406 (Table-400-13) and as directed by the Engineer.	Cum	50.00	2652.000	132,600.00
4.1	Prime Coat. Providing and applying primer coat with bitumen emulsion (Grade SS-1) on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means. Reference to MoRT&H's specification clause 502 and as directed by the Engineer. On WMM surface @0.70 kg/sqm.	Sqm	8000.00	64.090	512,720.00
4.2	Tack coat. Providing and applying tack coat with bitumen emulsion (Grade RS-1) using emulsion pressure distributor on the prepared bituminous/granular/cement concrete pavement surface cleaned with mechanical broom. Reference to MORT&H's specification clause 503 and as directed by the Engineer.				-
4.21	i) On bituminous surface @0.20 kg/sqm.	Sqm	2500.00	22.100	55,250.00
4.22	ii) On granular surface @0.25 kg/sqm.	Sqm	5000.00	26.520	132,600.00

SCHEDULE OF RATES

Annexure - VI

Item No.	Description	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
4.3	Emulsion variation. Add or deduct for variation in actual quantity of emulsion used against the specified quantity in schedule above.				-
4.31	i) For (Grade SS-1)	MT	0.25	59672.210	14,918.05
4.32	ii) For (Grade RS-1)	MT	0.25	59672.210	14,918.05
4.4	Dense Graded Bituminous Macadam. Providing and laying dense graded bituminous macadam (DBM) with batch type hot mix plant using crushed aggregates of specified grading, premixed with bituminous binder using VG-40 grade paving bitumen @ minimum 4.0% by weight of total mix and filler as per Table 500-10, transporting the hot mix to work site, laying with a paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No.505.4 complete in all respects and Reference to MoRT&H's specification clause 505 and as directed by the Engineer.				-
4.41	Grading 1	Cum	870.00	8701.875	7,570,631.25
4.5	Bituminous Concrete. Providing and laying bituminous concrete (BC) with batch type hot mix plant using crushed aggregates of specified grading, premixed with bituminous binder using VG-40 grade paving bitumen @ minimum 5.4% of mix and filler as per Table 500 -17, transporting the hot mix to work site, laying with a paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory tandem and pneumatic tyred ollers to achieve the desired compaction as per MORTH specification clause No. 507 complete in all respects and Reference to MoRT&H's specification clause 507 and as directed by the Engineer.				-
4.51	Grading 2	Cum	550.00	9827.870	5,405,328.50
4.6	Bitumen variation. Add or deduct for variation in actual quantity of bitumen used against the specified quantity in schedule.				-
4.61	i) VG 40 for dense graded bituminous macadam (DBM) and Bituminous Concrete (BC)	MT	2.00	37129.105	74,258.21
5.24	Providing and laying in position 65 mm thick wearing coat consisting of 40mm thick bituminous concrete overlaid with a 25mm thick layer of mastic asphalt over deck slab after applying tack coat complete as per drawings and Technical Specifications Sections 500 and 2700 and as directed by the Engineer.	sqm	250.00	1214.395	303,598.75
5.39	Modular Strip / Box Seal Joint. Providing and laying of a modular strip Box seal expansion joint including anchorage catering to a horizontal movement beyond 80 mm and upto 160 mm, manufactured by MORT&H, GOI Approved/ Empanelled manufacturer and complete as per approved drawing and standard specification to be installed by the manufacturer/ supplier or their authorized representative ensuring compliance to the manufacturer's instructions for installation. Reference to MORT&H's specification 2607 and as directed by the Engineer.	Rm	25.00	5525.000	138,125.00
5.43	Arrangement for driving and installing steel posts of 'H/2'H' sections including all H Piles and all materials of 5m length (min 3.0 m below ground) @2.0 m c/c as required to serve either as vertical restraints or as 'H' piles (All contractor's labour and materials including supply of 'H/2'H' sections and fabrication) complete as per drawings, MoRTH's Specifications Sections 1900 and as directed by Engineer. (Note: Contractor shall dismantle and remove all steel posts after completion of work at his cost including mending the damages good as per specification and as directed by the Engineer and all such material be the property of the contractor.) Rate quoted shall be only for making available all the above for construction purpose only.	Rm	25.00	9036.690	225,917.25
5.44	Arrangement of steel liner plates 6mm thick and 2m height between the 'H' / 2'H' sections to form temporary wall including all Steel Plates and all other materials , cutting, transporting to site, fabricating and setting out complete as per drawing, MoRTH's Specifications Sections 1900 and as directed by Engineer. (Note:Contractor shall dismantle and remove all steel plates after completion of work at his cost including mending the damages good as per specification and as directed by the Engineer and all such material be the property of the contractor.) Rate quoted shall be only for making available all the above for construction purpose only.	MT	1.25	26786.305	33,482.88
5.48	a) Providing and fixing in position 160mm dia PVC service/utility pipe including fittings, couplers, bends etc, omplete as per drawings and as directed by the Engineer.	Rm	200.00	563.550	112,710.00

SCHEDULE OF RATES

Annexure - VI

Item No.	Description	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
5.49	b) Providing and fixing in position 160mm dia PVC pipe below drainage spout including fittings, couplers, bends etc, complete as per drawings and as directed by the Engineer.	Rm	100.00	840.905	84,090.50
5.59	Painting Two Coats on New Concrete Surfaces Painting two coats after filling the surface with synthetic enamel paint in all shades on new concrete surfaces, Reference to MORT&H's Specifications 803 and as directed by the Engineer.	Sqm	2000.00	112.710	225,420.00
6.01	Drain at Edge of Pavement. Construction of drain 1 m x 0.75 m (inside dimensions) lined with R.C.C. (M-20) , 125 cm thick wall and covered with RCC (M-20) slab, 10 cm in thickness on urban roads. Reference to MoRT&H's specification clause 309 and as directed by the Engineer.	Rm	100.00	6563.700	656,370.00
6.07	Plain/Reinforced Cement Concrete in Open Foundation, Head wall, Cadal concrete etc. complete as per Drawing and Technical Specifications. Reference to MORT&H's specifications 1500, 1700 & 2100 and as directed by the Engineer.				-
6.08	i) PCC Grade M15	Cum	25.00	6522.815	163,070.38
6.09	ii) PCC Grade M20	Cum	25.00	7479.745	186,993.63
7.01	Retro-Reflectorised Traffic Signs. Providing and fixing of retro-reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing and reference to MORT&H's Specifications 801 and as directed by the Engineer.				-
7.02	a) Octagonal stop sign 900mm size.	Each	4.00	7956.000	31,824.00
7.03	b) Triangular sign 900 side.	Each	4.00	5304.000	21,216.00
7.04	c) Circular sign 600 dia.	Each	4.00	4641.000	18,564.00
7.05	d) Facility information signs 800mm x 600mm	Each	4.00	7956.000	31,824.00
7.06	e) Facility information signs 600mm x 450mm	Each	4.00	6630.000	26,520.00
7.07	Direction and Place Identification Signs Board. Providing and erecting direction and place identification retro- reflectorised sign as per IRC :67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area exceeding 0.9 sqm supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm, 2 Nos. firmly fixed to the ground by means of properly designed foundation with M 15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing reference to MORT&H's Specifications 801 and as directed by the Engineer				-
7.08	a) 3700mm x 2500mm	Each	1.00	132604.420	132,604.42
7.09	b) 2000mm x 1250mm	Each	1.00	34800.870	34,800.87
7.10	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface. Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes. Reference to MORT&H's Specifications 803 and as directed by the Engineer.	Sqm	300.00	663.000	198,900.00
7.11	Cast in Situ Cement Concrete M20 Kerb. Construction of cement concrete kerb with top and bottom width 115 and 165 mm respectively, 390 mm high in M 20 grade , kerb stone laid with kerb laying machine, all complete as per clause 409 and reference to MORT&H's Specifications 409 and as directed by the Engineer.				-
7.12	Using Concrete Batching and Mixing Plant	Rm	500.00	545.870	272,935.00

SCHEDULE OF RATES

Annexure - VI

Item No.	Description	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
8.02	Construction of temporary diversion and providing traffic safety and control devices where necessary and as per direction of the Engineer including maintenance thereof complete as per drawing and Technical Specification Clause 112 and as directed by the Engineer.	Rm	25.00	11796.980	294,924.50
8.06	Maintenance of Earthen Shoulder (filling with fresh soil). Making up loss of material/ irregularities on shoulder to the design level by adding fresh approved soil and compacting it with appropriate equipment and reference to MORT&H's Specifications 3003 and as directed by the Engineer.	Sqm	100.00	132.600	13,260.00
8.07	Repair to pot holes by removal of failed material, trimming the sides to vertical and leveling the bottom, clearing the same with compressed air or any appropriate method filled with B.M. (thickness not more than 75mm in single layer) applying bitumen emulsion prime coat at the bottom and bitumen emulsion tack coat on side and on bottom as per technical specification clauses 502 and 503 for Rural Road of MORD and as directed by the Engineer.	Cum	100.00	7293.000	729,300.00
8.08	Crack Filling. Filling of crack using slow curing bitumen emulsion and applying crusher dust in case cracks are wider than 3 mm and reference to MORT&H's Specifications 3004.3.3 and as directed by the Engineer.	Rm	25.00	26.520	663.00
8.09	Repairing pot-holes and making up small depressions using Cationic Bitumen Emulsion conforming to IS 8887- 1978 with stone metals / chips premixed with emulsion in concrete mixer or any other method approved by the Engineer-in-Charge, including cutting the pot-hole area in regular shapes with vertical edges, thorough cleaning & moistening of surface, applying tack coat, filling up the potholes with pre-mixed metals/chips in layer/layers as per specification and direction of the Engineer-in-charge, compacting by power roller, finishing the top of repaired surface levelled with adjoining area including cost and carriage of stone aggregates, blinding material & bitumen emulsion, hire & running charges of rollers and other tools & plants, cost of fuel & lubricants and other incidental charges excluding cost of applying tack coat. Using stone chips of size 22.4 mm and 11.2 mm in 60: 40 proportion, premixing with bitumen emulsion @ 70.7 kg per m3 of loose net volume of stone chips and as directed by the Engineer.	Cum	25.00	6364.800	159,120.00
8.1	Close Graded Premix Surfacing/Mixed Seal Surfacing Providing, laying and rolling of close- graded premix surfacing material of 20 mm thickness composed of 11.2 mm to 0.09 mm (Type-a) or 13.2 mm to 0.09 mm (Type-b) aggregates using penetration grade bitumen to the required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a batch mix type plant, laying and rolling with a Smooth wheeled roller 8-10 tonne capacity, and finishing to required level and grade and as directed by the Engineer.	Sqm	50.00	332.605	16,630.25
8.11	Bituminous Macadam Providing and laying dense graded bituminous macadam with batch mix type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.0 to 4.5 per cent by weight of total mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 505 complete in all respects. Reference to MORT&H's specification clause 505 and as directed by the Engineer.	Cum	40.00	9095.255	363,810.20
(I)	Total Amount (Rs.)				18,808,085.94
	Percentage increase (+) / Decrease (-) / At per applicable on table estimated cost for total work (i.e. on Sl. No. 'I' above), applicable on all items of Pre-filled SOQR	(+) or (-) or (AT PER)		% (.....)	Amount (Inwords)

NOTE: DO NOT QUOTE HERE

Signature of Bidder

BRIDGE AND ROOF CO. (INDIA) LIMITED

BANDEL ROB PROJECT SITE,
OPP.ROTARY HOOGHLY EYE HOSPITAL
P.O.- ADCCONAGAR, P.S.- MOGRA, DIST.- HOOGHLY,
WEST BENGAL, PIN - 712121

"CONSTRUCTION OF BITUMINOUS SERVICE ROAD, MAIN ROAD AND BOTH SIDE APPROACHES OF RE WALL, ROAD MARKING, TRAFFIC SIGNALS, REPAIRING OF POT HOLES ETC. WITH ALL MATERIAL, MACHINERY & MANPOWER ON SUBCONTRACT BASIS IN CONNECTION WITH CONSTRUCTION OF ROAD OVER BRIDGE (ROB) INCLUDING APPROACH ROAD FROM STKK ROAD TOWARDS BANDEL CARSHED ROB, SERVICE ROAD, FOOTPATH, ROAD SIGNAGE, DRAINAGE ETC. IN LIEU OF LEVEL CROSSING 1A/3T AT BANDEL CARSHED ON BANDEL-KATWA BROAD GAUGE RAIL LINE, AT CHINAGE 631.8 KMP ON GRAND TRUNK ROAD IN THE DISTRICT HOOGHLY IN WEST BENGAL".

ANNEXURE – VII

FORMAT

- (I) INTEGRITY PACT – Appendix - I
- (II) PERFORMANCE BANK GUARANTEE - Appendix - II
- (III) LETTER OF SUBMISSION - Appendix - III
- (IV) AFFIDAVIT CUM DECLARATION FOR MSME/NSIC/SSI UNIT – Appendix - IV

INTEGRITY PACT

Between

M/s. BRIDGE AND ROOF CO. (I) LTD. (B&R), a company registered under the Companies Act 1956 and having its registered office at **Kankaria Centre, 5th Floor, 2/1, Russel Street, Kolkata – 700071** hereinafter referred to as **"The Principal"**, which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

....., hereinafter referred to as **"The Bidder/Contractor"** which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/sfor(Name of Work). Tender Document No.....). **The Principal values full compliance** with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1. No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2. The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3. The Principal will exclude from the process all known prejudiced persons

1.2. If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s)/ Contractor(s)

2.1. The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2. The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3. The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant IPC/ PC Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2. The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidders(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines for Suspension of Business Dealings with Suppliers/ Contractors" framed by the Principal.

Section 4 – Compensation for Damages

- 4.1. If the Principal has disqualified the Bidder(s) from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.
- 4.2. If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.

Section 5 – Previous Transgression

- 5.1. The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2. If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all Bidders/ Contractors/ Sub-contractors

- 6.1. The Bidder(s)/ Contractor(s) undertake(s) to obtain from all subcontractors a commitment consistent with this Integrity Pact and report Compliance to the Principal. This commitment shall be taken only from those subcontractors whose **contract value is more than 20% of Bidder's/ Contractor's contract value with the Principal. The Bidder(s) / Contractor(s)** shall continue to remain responsible for any default by his Sub-contractor(s).
- 6.2. The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.
- 6.3. The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 – Criminal Charges against violating Bidders/ Contractors /Sub-contractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or arepresentative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 –Independent External Monitor(s)

- 8.1. The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
- 8.2. The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, B&R.
- 8.3. The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s) / Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Subcontractor (s) with confidentiality.
- 8.4. The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.
- 8.5. As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or take corrective action, or heal the situation, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
- 8.6. The Monitor will submit a written report to the CMD, B&R within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.
- 8.7. The CMD, BANDR shall decide the compensation to be paid to the Monitor and its terms and condition

8.8. If the Monitor has reported to the CMD, B&R, a substantiated suspicion of an offence under relevant IPC / PC Act, and the CMD, B&R has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.9. The number of Independent External Monitor(s) shall be decided by the CMD, BANDR.

8.10. The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

9.1. This Pact begins and shall be binding on and from the submission of bid(s) by bidder(s). It expires for the Contractor 12 months after the last payment under the respective contract and for all other Bidders 6 months after the contract has been awarded.

9.2. If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified as above, unless it is discharged/ determined by the CMD, B&R.

Section 10 – Other Provisions

10.1. This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. Kolkata.

10.2. Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3. If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4. Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5. Only those bidders/ contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal
(Office Seal)

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place -----

Date -----

Witness: _____

Witness: _____

(Name & Address) _____

(Name & Address) _____

FORM OF BANK GUARANTEE IN LIEU OF SECURITY CUM PERFORMANCE
(To be executed on Non-Judicial Stamp Paper of Appropriate Value)

BRIDGE AND ROOF CO.(INDIA).LTD.,
 Kankaria Centre, (5th Floor),
 2/1, Russel Street,
Kolkata - 700 071.

Dear Sirs,

In consideration of BRIDGE AND ROOF CO.(INDIA).LTD. (hereinafter called "The Company" which expression shall include its successors and assign) having awarded certain work for and relative to.....
 (name of the project/work) to
 (name & address of the Contractor) (hereinafter called the "Contractor") upon certain terms & conditions interalia mentioned in the Company's Letter of Intent No./Work Order No..... dated (hereinafter called the Contract, which expression shall include any formal contract entered into between the Company and the Contractor and all amendments and/or modifications in the Contract) inclusive of the condition that the Company may accept a Bank Guarantee of a Nationalised Bank in India in lieu of Cash Deposit against Security and due and faithful Performance of the said Contract :

We,..... (name of the Bank) a body registered/constituted under the..... having registered and Head Office at..... (hereinafter called "the Bank") at the request of the Contractor & with the intent to bind the Bank and its successors and permitted assigns, do hereby unconditionally & irrevocably guarantee payment to the company of the unpaid balance upto an aggregate limit of Rs..... (Rupees..... only) AND undertake to pay to the Company on demand and without protest or demur the unpaid balance of said Security cum Performance Guarantee subject to the aggregate limit of aforesaid Rs..... (Rupees.....only).

AND the Bank do hereby further agree and undertake as follows:

1. The Guarantee/undertaking herein contain shall remain in full force and effect during the period that would be taken for the performance of the said contract and the claim of the Company relative thereto satisfied and/or discharged and the Company accordingly discharge the Guarantee/undertaking subject, however, that the Company shall have no claim under this Guarantee/undertaking after20....., unless a notice of the claim under this Guarantee/undertaking has been served on the Bank before the expiry of the said date, in which event the same shall be enforceable against the Bank notwithstanding that the same is enforced after the expiry of the said date namely 20.....
2. The Company shall have the fullest liberty without reference to the Bank and without affecting in any way the liability of the Bank under this Guarantee/undertaking, at any time and/or from time to time to anywise vary the said Contract and/or any of the terms and conditions thereof or relative to the said Performance or to extend time of performance of the said Contract in whole or part or to postpone for any time and/or from time to time any of the obligations of the Contractor and/or power exercisable by the Company against the Contractor and either to enforce or forbear from enforcing any of the terms & conditions of or governing the said Contract or the said Performance or the Securities available to

the Company or any of them and the Bank shall not be released from its liability under these presents and the liability of the Bank shall remain in full force and effect notwithstanding any exercise by the Company of the liberty with reference to any or all the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, act or omission on the part of the Company or any indulgence by the Company to the Contractor or of any other act, matter or thing whatsoever which under the law relating to sureties would, but for this provision, have the effect of releasing the Bank from its liability hereunder or any part thereof.

3. It shall not be necessary for the Company to proceed against the Contractor before proceeding against the Bank and the Guarantee/undertaking herein contained shall be enforceable against the Bank notwithstanding the existence of any other security for any indebtedness of the Contractor to the Company (including relative to the said Performance) and notwithstanding that any such security shall at the time when claim is made against the Bank or proceedings taken against the Bank hereunder, be outstanding or unrealised.
4. The amount stated by the Company in any demand, claim or notice as the unpaid balance of the said Security cum Performance Guarantee for the time being shall as between the Bank and the Company for the purpose of these presents be conclusive of the said balance.
5. The liability of the Bank to the Company under this Guarantee/undertaking shall remain in full force & effect notwithstanding the existence of any difference or dispute between the Contractor and the Company, the Contractor and the Bank and/or the Bank and the Company, or otherwise howsoever touching or affecting these presents or the liability of the Contractor to the Company, and notwithstanding the existence of any instructions or purported instructions by the Contractor or any other person to the Bank not to pay or for any cause withhold or defer payment to the Company under these presents, with the intent that notwithstanding the existence of such difference, dispute or instruction, the Bank shall be and remain liable to make payment to the Company in terms hereof.
6. The Bank shall not revoke this Guarantee/undertaking during its currency except with the previous consent of the company in writings and also agree that any change in the constitution of the Contractor or the Bank or the Company shall not discharge the Bank's liability hereunder.
7. Notwithstanding anything herein contained the Bank's liability under this guarantee is restricted to Rs..... and the said guarantee shall remain in full force till..... (date) unless a suit or action to enforce the claim under this guarantee is filed against Bank within three month from the above date i.e., on or before (date) **all rights of the Company under the said guarantee shall be forfeited and Bank shall be relieved and discharged from all liabilities there under.**
8. The Bank doth hereby declare that Shri (name of the person signing on behalf of the Bank) who is..... (his designation) is authorized to sign this Guarantee/ Undertaking on behalf of the Bank & to bind the Bank thereby.

Dated thisday of20.....

Yours faithfully,

FOR

Signature :

Name & Designation :

Name of the Branch :

LETTER OF SUBMISSION

[To be submitted in Bidders Letter Head]

SINGLE PERCENTAGE RATE TENDER FOR "CONSTRUCTION OF BITUMINOUS SERVICE ROAD, MAIN ROAD AND BOTH SIDE APPROACHES OF RE WALL, ROAD MARKING, TRAFFIC SIGNALS, REPAIRING OF POT HOLES ETC. WITH ALL MATERIAL, MACHINERY & MANPOWER ON SUBCONTRACT BASIS IN CONNECTION WITH CONSTRUCTION OF ROAD OVER BRIDGE (ROB) INCLUDING APPROACH ROAD FROM STKK ROAD TOWARDS BANDEL CARSHED ROB, SERVICE ROAD, FOOTPATH, ROAD SIGNAGE, DRAINAGE ETC. IN LIEU OF LEVEL CROSSING 1A/3T AT BANDEL CARSHED ON BANDEL-KATWA BROAD GAUGE RAIL LINE, AT CHINAGE 631.8 KMP ON GRAND TRUNK ROAD IN THE DISTRICT HOOGHLY IN WEST BENGAL".

TENDER

I/ We have read and examined the Instructions to Bidders, General Conditions of Contract (GCC), Special condition of Contract (SCC), Additional Condition of Contract & Scope of Work, Technical Specification, Schedule of Quantities & other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the BHEL / B&R within the time specified in tender viz., schedule of quantities and in accordance in all respects with the specifications and the Conditions of contract (GCC & SCC) and with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

We agree to keep the tender open for **90 days** from the due date of submission of tender thereof and not to make any modifications in its terms and conditions.

I/we hereby declare that I/we shall treat the tender documents, Technical Specification and other records connected with the work as secret / confidential documents and shall not communicate information derived there from to any person other than a person to whom I/we am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Date: _____

Signature of Contractor
Postal Address

Witness:

Address:

Occupation:

(To be printed on a 100 Rupee NJ stamp paper)

AFFIDAVIT CUM DECLARATION

I,, S/O....., residing at, by age....., by domicile Indian, under the capacity of Sole Proprietor /Partner/Authorised Representative/Constituted Attorney/Karta (choose the correct option) ofABC....., (full name of MSME/NSIC/SSI) hereby solemnly declare and affirm as follows:

1. That ABC is a Micro/Small/Medium Enterprise (choose the correct option) and is registered under the Micro, Small and Medium Enterprises Development Act, 2006(hereinafter referred to as the MSMED Act) /National Small Industries Corporation (NSIC)/SSI and has its registered office at
2. That ABC avails all benefits under the said Act or NSIC as applicable and complies with all statutory formalities from time to time and has never been in default in this regard. (State the correct status of MSME mentioning stage of Part I and Part II in case the registration of MSME is in process as per relevant Act or registration under NSIC as applicable)
3. That ABC, being a Micro/Small/Medium Enterprise under MSMED Act, 2006 or Small Scale Industry or Enterprise registered under NSIC is entitled to claim exemption from deposit of Tender Fee and Earnest Money for the Tender put under notice by Bridge And Roof Co.(I) Limited, having their office at 2/1 Russel Street, Kolkata- 700071 (hereinafter referred to as the Company/BAndR) i.e. : Tender No..... for(name of the Project)
4. That all documents of Bid submitted by ABC before the Company/BAndR related to their registration, business activities, credentials and expertise are copies of original certificates and/or documents obtained on production of valid documents and facts.
5. That all the above representation and information disclosed in para 1 to 4 are correct and true to my knowledge and nothing material has been concealed. In case any documents or information are found to be false or forged, the bid submitted by ABC or any Job Order awarded to ABC shall be liable to cancelled by B&R and ABC shall be liable to indemnify B&R against the risk, cost and damage which the latter may suffer due to such acts of ABC.

IN WITNESS WHEREOF, I,..... of ABC HEREBY AFFIRM THIS AFFIDAVIT CUM DECLARATION ON THIS DAY OF

(Name)
Authorized Representative
(DEPONENT)

VERIFICATION

I, the above named Deponent do hereby verify that the contents of the above Affidavit cum Declaration are true and correct to my knowledge & belief and no part of it is false. Nothing material has been concealed therefrom.

Verified at Kolkata on this the day of,

(Name)
Authorized Representative
(DEPONENT)

(Signature of Notary Public)