COCHIN PORT TRUST

COCHIN-682009, KERALA, INDIA

Tele: 91-0484-2666414, 2666871

Telefax: 91-0484-2666414

E-mail:coptce@gmail.com

E-QUOTATION DOCUMENT FOR RECTIFICATION TO THE ROAD FROM KALAMUKKU JUNCTION TO RMP THODU.

Website:www.tenderwizard.com/CPT

SUPTDG. ENGINEER(CM)'S OFFICE

COCHIN PORT TRUST

COCHIN-682009

QUOTATION No.T1/Q-05/2021-C

1.GENERAL CONDITIONS

1. The work consists of "**Rectification to the road from Kalamukku junction to RMP Thodu**" and includes the following:
   - i) Earth Work Excavation
   - ii) Disposal of Building rubbish
   - iii) Providing Wet Mix Macadam (WMM)
   - iv) Providing tack coats
   - v) Providing and laying Bituminous Macadam and
   - vi) Providing and laying semi dense Bituminous Concrete.

2. The bidders need to obtain the one time User ID & password for log-in to e-tendering Portal www.tenderwizard.com/COPT from the service provider M/s. KEONICS by paying registration amount of Rs.1124/- through online Payment using Credit/Debit Card/Net banking or DD in favour of "KSEDCL, Bangalore".
3. The intending bidder must have valid Class-II or III digital signature certificate to submit the bid. For further details, please contact e-Tender Help Desk No. 080-40482000/ 080-49352000/ 9746118529/ 9605557738.
4. The quotationers shall have experience in taking up installation of DRDO Technology Bio- Digesters. Scanned copy of relevant certificate shall be submitted along with the quotation.
5. e-Quotations are invited on behalf of Cochin Port Trust, from experienced, resourceful and bonafide contractors having minimum qualification criteria as per the quotation notice.
6. The Quotation document will be available as two separate files in the e-quotation Portal; containing the following:
   - i. Quotation Notice & General Conditions.
   - ii. Schedule of Quantities of Work.
7. Both 5(i) & filled in 5(ii) above shall be submitted "Online" only. The name and address of the quotationers shall be necessarily entered in the space provided in the Schedule of Quantities of Work.
8. The Quotationer shall inspect the site before submitting the quotation in order to make them fully aware of the site and its conditions.
9. Clarifications if any required can be obtained by contacting the Asst. Exe. Engineer/ Asst. Engineer of concerned Civil section.
10. The work shall be completed within 60 Days from the date of receipt of work order.
11. The Engineer-in-Charge of the work (Engineer's Nominee/ Nominee) shall be Suptdg. Engineer (CM).
12. Payments will be made online after completing the work to the entire satisfaction of the Engineer-in-Charge and also after deducting the taxes prevailing in force at the time of payment of bills.
13. Water & Electricity

Water: Water, if required for the work, shall be arranged by the Quotationer at his own cost.

Electricity: The Quotationer shall make his own arrangements for the temporary connection for electricity required, if any, and make necessary payment for it direct to the Department concerned. No payment will be made by the Employer on this account.

14. The rate/percentage quoted shall be excluding Goods & Service Tax (GST).
15. The Quotationer shall have valid GST Registration number. GST as applicable for the work will be paid extra by the Port. The GST applicable as per law can be billed on the Port Trust, which will be paid to the Quotationer by the Board along with the bills, for which the Quotationer shall hold valid GST Registration number.
16. All materials, tools, plants and equipments required for completing the work shall be provided by the Quotationer at his own cost. All materials required for the work shall be got approved by the Engineer-in-Charge before using in the work. Any fittings or accessories which may not be specifically mentioned in the specification but are usual or necessary as per good industry practice, shall be provided by the Quotationer without extra cost to the Port. All works shall be carried out as per relevant ISS.
17. All labour, skilled or unskilled for the work shall be provided by the Quotationer at his own cost and settling any disputes with the labour shall be, Quotationer's responsibility.
18. All care and precautionary measures for avoiding any kind of damage/ accidents in the work site shall be taken by the Quotationer. All safety precautions shall be taken while carrying out the work. The Quotationer shall supply the necessary safety equipments to the workers employed by him and also ensure that they use it, while carrying out the work. The Quotationer shall be solely liable and responsible for accidents if any, occurring during the period of Contract.
19. The work shall be completed without causing any damage to the existing structures/cables etc. In case any damage is caused, the same has to be rectified at Quotationer's risk and cost.
20. The Port will in no way be responsible for any loss/damages caused in connection with the work.
21. The quantities specified in the schedule of quantities of work are only approximate and shall be increased or decreased at the discretion of the Engineer-in-Charge according to actual requirements. Payment will be made as per actual measurements, according to the percentage quoted.
22. Quotations shall be valid for a period of 60 days from the due date of submission of quotation.
23. Completion Period: The whole work shall be completed within 60 days from the date of receipt of work order. In case the Quotationer is not permitted to carry out the work due to some problem from Employer's side, he should maintain a record of such time lost, duly counter signed by the Engineer-in-Charge and this period

will not be included while determining the delay in completion period. In case the works are not completed within the specified completion periods due to any fault of the Quotationer, it will be considered as a breach of contract and the Quotationer will not be considered for any other work in future.

24. Liquidated Damages: In case of delay in completion of the contract, liquidated damages (L.D) may be levied at the rate of half percent (½%) of the Contract Price per week of delay, subject to a maximum of 10% of the Contract Price. The amount of Liquidated Damages can be adjusted or set-off against any sum payable to the Quotationer.

25. Defects Liability Period: The defects liability period for the work shall be 12 months from the date of completion of the work. In the event of any defect/ deficiency being noticed during the period, which is attributable to the defective materials/design/ workmanship, the Quotationer shall make good the same at his cost.

26. Security Deposit: Security deposit @ 3% of Contract Price shall be recovered from the Quotationer's bill. The amount towards Security Deposit so deducted will be released only after successful completion of the defect liability period of 1 year, subject to certification from the Engineer-in-Charge.

27. Execution of Agreement: The successful Quotationer will be required to execute within 14 days from the date of receipt of work order, an agreement at his expense on proper value Kerala State Stamp Paper in the prescribed departmental form, consisting of the work order issued to the Quotationer, together with the Quotation submitted by him including General Conditions, for the due and proper fulfilment of the contract.

28. Till signing of agreement, the Quotation together with the acceptance letter shall constitute a binding contract between the Quotationer and Cochin Port.

29. The Contractor shall comply with all the provisions of the Indian Workmen's Compensations Act, Public Liability Policy, Provident Fund Regulations, Employees Provident Fund and ESI Act etc. amended from time to time and rules framed there under and other laws affecting the Contract labour that may be brought in to force from time to time.

30. **The contractor shall be registered under EPF and ESI Act and the employees employed under them shall be covered in the EPF and ESI scheme, as applicable under the act.**
If the number of employees proposed to be engaged in the work is less than the threshold limit under ESI/ EPF act, an undertaking to this effect shall be included in the tender submission.

SIGNATURE OF QUOTATIONER

2.SPECIFICATIONS FOR MATERIALS

1. GENERAL

1.1 Except where otherwise specified or authorized by the Engineer-in-Charge, materials supplied by the contractor shall conform to the latest edition of the Indian Standard Specifications and code of practices published by the Indian Standard Institution. Samples of materials to be supplied by the contractor shall be shown to the Engineer-in-Charge sufficiently in advance for approval of its quality for use on the work.

1.2 All materials supplied shall be stored appropriately to prevent deterioration/ damage from any cause what so ever and to the entire satisfaction of the Engineer-in Charge.

1.3 The materials required for the work shall be brought to the site and stacked at the places shown by the Engineer-in-Charge and the same shall be got approved for use in work sufficiently advance so that the progress of the work is not affected by the supply of materials.

1.4 Payment for the materials supplied, shall be given only after they are used on the work.

1.5 Tolls are payable by the contractor as per rules for vehicles using the Port's road for supplying the materials.

2. MATERIALS FOR WET MIX MACADAM

2.1 Aggregates: Coarse aggregate shall be crushed stone.

2.2 The aggregates shall conform to the physical requirements set forth in Table 400.10 of MORT&H's Specification for Road and Bridge works.

2.3 Grading requirements: The aggregates shall conform to the grading given in Table 2.1 below:

TABLE 2.1

(Table 400-13 of MORT&H 'specification)

Grading Requirements of aggregates for Wet Mix Macadam

IS Sieve Designation	Percent by weight passing the IS sieve
53.00mm	100
45.00mm	95-100
26.50mm	-
22.40mm	60-80
11.20mm	40-60
4.75mm	25-40
2.36mm	15-30
0.600mm	8-22
0.750mm	0-5

Materials finer than 425 micron shall have Plasticity Index (PI) not exceeding 6. The final gradation approved within these limits shall be graded from coarse to

fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

2.4 WATER

2.4.1 Clean fresh water free from oils, acids, alkalies, salt, sugar, organic materials or other harmful materials shall be used. The water used shall comply with clause 5.4 of IS: 456-2000.

2.4.2 Cochin Port Trust will not supply water for the work. Water has to be arranged by the contractor himself for the construction works at his own risk and cost.

2.4.3 Samples of water arranged by the contractor shall be taken by the Engineer in Charge and got tested in accordance with the provisions of relevant BIS codes. In case test results indicate that the water arranged by the contractor does not conform to the relevant BIS codes, the same shall not be used for any works. The cost of tests shall be borne by the contractor.

3. MATERIALS FOR TACK COAT

3.1 The binder used for tack coat shall be bituminous emulsion, Rapid setting type conforming to IS :8887.

4. AGGREGATES FOR BITUMINOUS MACADAM

4.1 Coarse aggregates

The coarse aggregates shall consist of crushed rock, crushed granite or other hard material passing through 26.50mm sieve and retained on the 2.36 mm sieve. They shall be clean, hard, durable, of cubical shape, dry, free from dust and soft or friable matter, organic or other deleterious matter. The aggregate shall satisfy the physical requirements set forth in Table 500-3 of MORT&H's Specification for Road and Bridge works.

4.2 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 75 micron sieve. They shall be clean, hard, durable, dry and free from dust, soft or friable matter, organic or other deleterious matter.

4.3 Combined grading

The aggregates shall be proportioned and blended to produce a uniform mixture complying with the requirements of Table 500-4 of Ministry of Road Transport & Highways Specification for Road & Bridge work as below.

[TABLE 500-4 of MOSRT &H's specification]

Mix designation	Grading-2
Nominal aggregate size	19 mm
IS Sieve (mm)	Cumulative % by weight of total aggregate passing
26.5	100
19.0	90-100
13.2	56-88

4.75	16-36
2.36	4-19
0.3	2-10
0.075	0-8
Bitumen content % by weight of total mixture	3.3
Bitumen grade	VG-30

4.4 **BITUMEN**

Bitumen for work shall be of VG-30 grade.

4.5 **MATERIALS FOR TACK COAT**

The binder used for tack coat shall be bituminous emulsion, Rapid setting type conforming to IS :8887.

4.6 **Bitumen**

4.6.1 The bitumen used for the work shall be of VG 30 grade.

4.6.2 As far as possible, the bitumen required for the work shall be procured from BPCL-KR / IOC / HPCL. In case supply from BPCL-KR / IOC / HPCL is not available, the contractor shall obtain specific approval from the Engineer-in-Charge well in advance for purchase from other source(s). The bitumen shall, if required by the Engineer-in-Charge, be tested and analyzed by an independent analyst approved by the Engineer-in-charge at the Contractor's cost and result produced to the Engineer-in-Charge before its use on the work.

4.6.3 The bitumen brought to the site and bitumen remaining unused after completion of work shall not be removed from the site without written permission of the Engineer-in-Charge.

4.6.4 The contractor shall maintain a register showing the quantities and dates of receipt, daily consumption and balance in the pro forma approved by the Engineer-in-charge and it shall be accessible to the Engineer-in-Charge.

5. MATERIALS FOR BITUMINOUS CONCRETE

5.1 Coarse aggregates

The coarse aggregates shall consist of crushed rock, crushed granite or other hard material retained on the 2.36 mm sieve. They shall be clean, hard, durable, of cubical shape, dry, free from dust and soft or friable matter, organic or other deleterious matter. The aggregate shall satisfy the physical requirements set forth in Table 500-3 of MORT & H's specification for Road and Bridge works.

5.2 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 75 micron sieve. They shall be clean, hard, durable, dry and free from dust, soft or friable matter, organic or other deleterious matter.

5.3 Filler

Filler shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement approved by the Engineer-in-Charge. The filler shall be graded within the limits indicated in **Table 500-9** of MORT&H's Specification for Road & Bridge works below.

Table 500-9

IS Sieve (mm)	Cumulative percent passing by weight
0.6	100
0.3	95-100
0.075	85-100

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.

5.4 **Combined grading**

The combined grading of the coarse and fine aggregate and added filler shall fall within the limits shown in Table 500-18 of MORT&H's Specification for Road & Bridge work below.

Table 500-18

Nominal aggregate size	13 mm
IS Sieve (mm)	Cumulative % by weight of total aggregate passing
19	100
13.2	79-100
9.5	70-88
4.75	53-71
2.36	42-58
1.18	34-48
0.6	26-38
0.3	18-28
0.15	12-20
0.075	4-10
Bitumen content % by mass of total mix	
Bitumen grade	VG 30 Grade

6 ATERIALS NOT SPECIFIED

6.1 All materials not herein detailed and fully specified but which may be required for use on works, shall be subjected to the approval of the Engineer-in-Charge without which they shall not be used anywhere in the permanent works

7 SAMPLING AND TESTING OF MATERIALS

7.1 Sampling and testing of the material supplied by the contractor for use on the Work shall be done as per the provisions of the relevant BIS codes/specifications.

In the absence of BIS specification in a particular case, the sampling and testing shall be done as directed by the Engineer-in-Charge as per sound engineering practice. Material conforming to the specifications and approved by the Engineer-in-Charge shall only be used by the Contractor.

7.2 All the sampling and testing shall be done at the Contractor's cost.

SIGNATURE OF QUOTATIONER

3.DETAILED SPECIFICATIONS FOR ITEMS OF WORKS

1. GENERAL

1.1 Except where otherwise specified or authorized by the Engineer-in-Charge, materials supplied by the contractor shall conform to the latest edition of the Indian Standard Specifications and code of practices published by the Indian Standard Institution. Samples of materials to be supplied by the contractor shall be shown to the Engineer-in-Charge sufficiently in advance for approval of its quality for use on the work.

1.2 All materials supplied shall be stored appropriately to prevent deterioration/ damage from any cause whatsoever and to the entire satisfaction of the Engineer-in-Charge.

1.3 The materials required for the work shall be brought to the site and stacked at the places shown by the Engineer-in-Charge and the same shall be got approved for use in work sufficiently in advance so that the progress of the work is not affected by the supply of materials.

1.4 Payment for the materials supplied, shall be given only after they are used on the work.

1.5 Tolls are payable by the contractor as per rules for vehicles using the Port's road for supplying the materials.

2. WET MIX MACADAM BASE (WMM)

2.1 The work consists of providing, laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass for required thickness in two layers over Soling/sub base to lines and grades as per directions of the Engineer-in-Charge.

2.2 Construction operations

(i) Preparation of base

The surface of the sub-base to receive the Wet Mix Macadam course shall be prepared to the specified lines and camber and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained, if necessary by sprinkling water. Any sub-base irregularities, where predominant, shall be made good by providing appropriate type of profile corrective course (leveling course) as per Clause 501 of MORT&H's Specification for Road and Bridge works or as directed by the Engineer-in-Charge.

(ii) Provision of lateral confinement of aggregates

While constructing Wet Mix Macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of Wet Mix Macadam layer and following the sequence of operations described in Clause 407.4.1 of MORT&H's Specification for Road and Bridge works or as directed by the Engineer-in-Charge.

(iii) Preparation of mix

(a) Wet Mix Macadam shall be prepared using appropriate methods which shall ensure production of mix of proper and uniform quality as directed by the Engineer in charge.

(b) Optimum moisture for mixing shall be determined in accordance with IS: 2720 (Part-8) after replacing the aggregate fraction retained on 22.4mm sieve with material of 4.75mm to 22.4mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

(iv) Spreading of mix

(a) Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub grade in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

(b) The first layer of mix shall be spread by suitable means so as to get a uniform and level surface as directed by the Engineer-In-Charge. The second layer of mix shall be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer – in-charge shall be used.

(c) The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer shall be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregate as spread should be of uniform gradation with no pockets of fine materials.

(v) Compaction

(a) After the mix has been laid to the required thickness, grade and camber, the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100mm, a smooth wheel roller of 80 to 100 kN weight may be used. For a compacted single layer upto 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN or equivalent capacity roller. The speed of the r**oll**er shall not exceed 5 km/hr.

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

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

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

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

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

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

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

(vi) Setting and drying

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

2.3 **Surface evenness**

The surface finish of construction shall conform to the requirements of Clause 902 of MORT&H's Specification for Road and Bridge works or as directed by the Engineer-in-Charge.

2.4 Quality control

For control on the quality of materials and works carried out, relevant provisions of Section 900 of MORT&H's Specification for Road and Bridge works shall apply or as directed by the Engineer-in-Charge.

2.5 Measurement for payment

Wet Mix Macadam course shall be measured as finished work in cubic metres.

2.6 Rate

The contract unit rate for WMM shall be payment in full for carrying out the required operations including full compensation for making arrangements for traffic, furnishing all materials to be incorporated in the work including all royalties, fees, rents wherever necessary and all leads and lifts, all labour, tool, equipment and incidentals to complete the work to specifications, carrying out the required tests for quality control etc.

3. BITUMEN EMULSION TACK COAT

3.1 General

(i) The work consists of application of a single coat of bitumen emulsion (RS) over the already cleaned surface.

(ii) The tack coat distributor shall be a self-propelled or towed bitumen pressure sprayer, equipped for spraying the material uniformly at specified rate. Small areas, inaccessible to the distributor or narrow strips shall be sprayed with pressure hand sprayer, or as directed by the Engineer-in-charge.

3.2 Preparation of Base

The surface on which tack coat is to be applied shall be clean and free from dust, dirt, and any extraneous material. 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–in-charge.

3.3 Application of Tack coat

The rate of application of the tack coat shall be as specified in the Schedule of Quantities. The bitumen emulsion shall be sprayed uniformly on the prepared surface. The sprayer used for applying tack coat shall be operated in such a way that will ensure an even distribution of primer on the surface. The normal range of spraying temperatures for a bituminous emulsion shall be 20^{o}C to 70^{o}C. Excessive deposits of emulsion on the surface caused by stopping and starting the sprayer or distribution by leakage should not be allowed, spraying shall in all case be carried out parallel to the centre line of the surface. Tack coat shall be applied just ahead of the oncoming bituminous macadam and bituminous concrete construction and 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.

3.4 Measurement for payment

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

3.5 Rate

The contract unit rate for tack coat shall be payment in full for carrying out the required operations as specified above. The rate quoted shall also include cost of labour, material, plants and equipments etc. required for surface preparation and providing tack coat.

4. PROVIDING BITUMINOUS MACADAM

The work consists of providing bituminous macadam of 100mm average thickness with bitumen of VG 30 grade on a previously prepared sub base.

4.1 Construction operations

Laying shall be suspended while free standing water is present on the surface to be covered, or during rain, fog and dust storms. After rain, the bituminous surface, prime or tack coat, shall be blown off with a high pressure air jet to remove excess moisture, or the surface let to dry before laying shall start. Laying of bituminous mixtures shall not be carried out when the air temperature at the surface on which it is to be laid is below 10^{o}C or when the wind speed at any temperature exceeds 40 km per hour at 2m height unless specially approved by the Engineer-in-Charge.

4.2 Preparation of base

The base on which Bituminous Macadam is to be laid shall be prepared, shaped and compacted to the required profile in accordance with clause 501.8 and 902.3 of MORT&H's Specification for Road and Bridge works or as directed by the Engineer-in-Charge. The surface shall be thoroughly swept clean by a mechanical broom, and the dust removed by compressed air. In locations where mechanical broom cannot access, other approved methods shall be used as directed by the Engineer-in-Charge. A prime coat shall be applied in accordance with Clause 3 above.

4.3 Applying Tack Coat

Tack coat shall then be applied as per Clause.3 above over the surface thus prepared.

4.4 Mixing and transportation of the mixture

4.4.1 Mixing

Pre-mixed bituminous materials, including bituminous macadam and bituminous concrete 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 can be found in Table 500-5 of MORT & H's Specification for Road and Bridge works; the difference in temperature between the binder and the aggregate should at no time exceed 14^0 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.

Table -1 Manufacturing and rolling temperatures

(Table 500-5 of MORT & H's Specification)

Bitumen Penetration	Bitumen Mixing (^{o}C)	Aggregate Mixing (^{o}C)	Mixed Material (^{o}C)	Rolling (^{o}C)	Laying (^{o}C)
65	150-165	150-170	165 Maximum	90 Minimum	125 Minimum

Instead of installing a hot mix plant for the work at work site, the contractor shall be permitted to use an existing plant conforming to the above specifications, in the nearby locality subject to the following conditions.

a) All materials required for the bituminous works shall be stored at the hot mix plant premises sufficiently in advance and stacked, measured and got approved by the Engineer-in-Charge before use in the work. Conveyance for the inspection / supervision of the material / works by the department staff at the plant site shall be arranged by the contractor without any extra cost to the department.

b) Storage tank of adequate capacity for storing bitumen required for the work shall be arranged by the contractor at his risk and cost so that the progress of the work is not affected for want of bitumen.

c) The contractor shall maintain a record of daily consumption and balance quantities of all materials measured for use in the work and also bitumen supplied from the department, at the plant site which shall be jointly signed by the representative of the Engineer-in-Charge and the contractor before starting each day's work and its closing on the day.

d) The contractor shall take all precautionary measures to ensure the required temperature of the mix at the time of placing the same at work site.

4.4.2 **Transporting**

Bituminous materials shall be transported in clean insulated vehicles, and unless otherwise agreed by the Engineer-in-charge shall be covered while in transit or awaiting tipping. Subject to the approval of the Engineer-in-charge a thin coating of diesel or lubricating oil may be applied to the interior of the vehicle to prevent sticking and to facilitate discharge of the material.

4.4.3 **Spreading**

(i) Except in areas where a mechanical paver cannot access, bituminous materials shall be spread, levelled and tamped by an approved self–propelled paving machine. As soon as possible after arrival at site, the materials shall be supplied continuously to the paver and land without delay.

(ii) 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 where a mechanical paver cannot be used, the material shall be spread, raked and levelled with suitable hand tools by experienced staff and compacted to the satisfaction of the Engineer-in-Charge..

(iii) The minimum thickness of material laid in each paver pass shall be in accordance with the minimum values given in the relevant parts in MORT&H's Specification for Road and Bridge works.

4.5 **Rolling**

The compaction shall carry out in accordance with the provisions of clause 4.6 and 4.7 below shall apply, as modified by the approved laying trials. Rolling shall be continued until the specified density is achieved, until there is no further movement under the roller. The required frequency of testing is defined in Clause 903 of MORT & H's Specification for Road and Bridge works.

4.6 **Compaction**

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

(ii) 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 relevant part of the MORT&H's Specification for Road and Bridge works. 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 centre longitudinally except that on super elevated and unidirectional cambered portions, it shall progress from the lower to the upper edge parallel to the centre 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 rolling shall be done with 80-100 KN dead weight smooth-wheeled rollers. The finish rolling shall be done with 80-100 KN vibrating tandem rollers.

(iii) Where compaction is to be determined by density of cores the requirements to prove the performance of rollers shall apply in order to demonstrate that the specified density can be achieved. In such cases the Contractor shall nominate the 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.

(iv) 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 upper side of the layer, overlapping on successive passes by at least one-third of the width of the rear roll.

(v) In portions super elevated and uni-directional camber, after the edge has been rolled, the roller shall progress from the lower to the upper edge.

(vi) 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 or other foreign matter on the pavement either when the rollers are operating or standing. The wheels of rollers shall be kept moist with water, and the spray system provided with the machine shall be in good working order, to prevent the mixture from adhering to the wheels. Only sufficient moisture to prevent adhesion between the wheels of rollers and the mixture should be used. Surplus water shall not be allowed to stand on the partially compacted pavement.

4.7 **Joints**

(i) Where longitudinal joints are made in pre-mixed bituminous materials, the materials shall be fully compacted and the joint made flush.

(ii) All joints shall be offset at least 300mm from parallel joints in the layer beneath or as directed, and in a layout approved by the Engineer-in-Charge. 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.

4.8 **Measurement for payment**

(i) Bituminous Macadam shall be measured as finished work in cubic metres on the basis of volume of ingredients premeasured at plant site.

(ii) For one cubic metre of compacted volume of Bituminous Macadam, quantity of each type of aggregate and bitumen used for the work shall be as per clause 12.3 below.

5. BITUMINOUS CONCRETE WEARING COURSE

The work consists of providing 40mm thick Bituminous Concrete Wearing Course on the already provided tack surface.

5.1 Mix design

The mix for bituminous concrete shall be design mix. The mix shall meet the following requirements set out in Table 500-19 of MORT & H's Specification for Road and Bridge works below.

Table - 2 Requirements for Bituminous Concrete
(Table 500-19 of MORT & H's Specification)

Minimum stability (KN at 60°C)	9.0
Minimum flow(mm)	2
Maximum flow (mm)	4
Compaction level (Number of blows)	75 Blows on each of the two faces of the specimen
Percent air voids	3-6
Percent voids in mineral aggregate (VMA)	12-14
Percent voids filled with bitumen (VFB)	65-75
Loss of stability on immersion in water at 60°C (ASTM D 1075)	Minimum 75 percent retained strength

5.2 Job Mix Formula

5.2.1 The contractor shall inform the Engineer-in-Charge in writing, at least 7 days before the start of the work, of the job mix formula proposed for use in the works, and shall give the following details:

i. Source and location of all materials.
ii. Proportions of all materials expressed as follows each is applicable
    a. Binder type, and percentage by weight of total mixture.
    b. Coarse aggregates/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 grading of the individual aggregate fractions, and the proportion of each in the combined grade.
v. The results of tests enumerated in Table 500-11 as obtained by the Contractors.
vi. Where the mixer is a batch mixer, the individual weights of each type of aggregate, and the binder per batch.
vii. Test results of physical characteristics of aggregates to be used.
viii. Mixing temperature and compacting temperature.

5.2.2 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 mixture and its different ingredients satisfy the physical and strength requirements of these specifications.

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

5.2.4 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 to the Engineer-in-Charge for approval before the placing of the material.

5.2.5 **Plant Trials- Permissible Variation in Job Mix Formula**

5.2.5.1 Once the laboratory job mix formula is approved, the Contractor shall carry out plant trials at the mixer to establish that the plant can be set up to 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 of MORT& H's Specification for Road and Bridge works below.

5.2.5.2 These variations are intended to apply to individual specimens taken for the quality control test in accordance with Section 900 of MORT&H's specification for Road and Bridge works.

Table -3

(Table 500-13 of MORT& H's Specification)

Description	Permissible variation	
	Base/Binder Course (Bituminous Macadam)	Wearing course (Bituminous concrete)
Aggregate passing 90mm sieve or larger	±8%	±7%
Aggregate passing13.2mm.9.5mm	±7%	±6%
Aggregate passing 4.75mm	±6%	±5%
Aggregate passing 2.36mm,1.18mm,0.6mm	±5%	±4%
Aggregate passing 0.3mm,0.15mm	±4%	±3%
Aggregate passing 0.075mm	±2%	±1.5%
Binder content	±0.3%	±0.3%
Mixing Temperature	±10°C	±10°C

Once the plant trials have demonstrated the capability of the plant, and the trials are approved, the laying operation may commence.

5.2.6 Laying Trials

5.2.6.1 Once the plant trials have been successfully completed and approved, the Contractor shall carryout laying trials, to demonstrate that the proposed mix can be successfully laid, and compacted all in accordance with the specifications hereinafter. The laying trial shall be carried out on a suitable area, approved by the Engineer-in-Charge. The area of the laying trials shall be a minimum of 100 Sq.m of construction, and it shall be similar to that of the proposed road of it shall be in all respects, particularly compaction, the same as the proposed construction on which the bituminous material is to be laid.

5.2.6.2 The Contractor shall previously inform the Engineer-in-Charge 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.

5.2.6.3 Once the laying trials have been approved, the same plant and methodology shall be applied to the laying of the material on the work, and no variation of

either shall be acceptable, unless approved in writing by the Engineer-in-Charge, who may at his discretion require further laying trials.

5.2.7 Construction operations

Laying shall be suspended while free standing water is present on the surface to be covered, or during rain, fog and dust storms. After rain, the bituminous surface, prime or tack coat, shall be blown off with a high pressure air jet to remove excess moisture, or the surface let to dry before laying shall start. Laying of bituminous mixtures shall not be carried out when the air temperature at the surface on which it is to be laid is below 10^{o}C or when the wind speed at any temperature exceeds 40km per hour at 2m height unless specially approved by the Engineer-in-Charge.

5.2.8 **Preparation of base**

The base on which Bituminous concrete material is to be laid shall be prepared as directed by the Engineer-in-Charge. The surface shall be thoroughly swept clean by a mechanical broom, and the dust removed by compressed air. In locations where mechanical broom cannot access, other approved methods shall be used as directed by the Engineer-in-Charge.

5.2.9 Applying Tack Coat

Tack coat shall be provided as directed by the Engineer-in-Charge as per Clause.5.4 above.

5.2.10 Mixing and transportation of the mix

5.2.10.1 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 can be found in Table 500-5 of MORT & H's Specification for Road and Bridge works; the difference in temperature between the binder and the aggregate should at no time exceed 14^{0} 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.

Table -1 Manufacturing and rolling temperatures

(Table 500-5 of MORT & H's Specification)

Bitumen Penetration	Bitumen Mixing (^{o}C)	Aggregate Mixing (^{o}C)	Mixed Material (^{o}C)	Rolling (^{o}C)	Laying (^{o}C)
65	150-165	150-170	165 Maximum	90 Minimum	125 Minimum

Instead of installing a hot mix plant for the work at work site, the contractor shall be permitted to use an existing plant conforming to the above specifications, in the nearby locality subject to the following conditions.

a) All materials required for the bituminous works shall be stored at the hot mix plant premises sufficiently in advance and stacked, measured and got approved by the Engineer-in-Charge before use in the work. Conveyance for the inspection / supervision of the material / works by the department staff at the

plant site shall be arranged by the contractor without any extra cost to the department.

b) Storage tank of adequate capacity for storing bitumen required for the work shall be arranged by the contractor at his risk and cost so that the progress of the work is not affected for want of bitumen.

c) The contractor shall maintain a record of daily consumption and balance quantities of all materials measured for use in the work and also bitumen supplied from the department, at the plant site which shall be jointly signed by the representative of the Engineer-in-Charge and the contractor before starting each day's work and its closing on the day.

d) The contractor shall take all precautionary measures to ensure the required temperature of the mix at the time of placing the same at work site.

5.2.10.2 **Transporting**

Bituminous materials shall be transported in clean insulated vehicles, and unless otherwise agreed by the Engineer-in-charge shall be covered while in transit or awaiting tipping. Subject to the approval of the Engineer-in-charge a thin coating of diesel or lubricating oil may be applied to the interior of the vehicle to prevent sticking and to facilitate discharge of the material.

5.2.10.3 Spreading

(i) Except in areas where a mechanical paver cannot access, bituminous materials shall be spread, levelled and tamped by an approved self–propelled paving machine. As soon as possible after arrival at site, the materials shall be supplied continuously to the paver and land without delay.

(ii)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 where a mechanical paver cannot be used, the material shall be spread, raked and levelled with suitable hand tools by experienced staff and compacted to the satisfaction of the Engineer-in-Charge.

(iii)The minimum thickness of material laid in each paver pass shall be in accordance with the minimum values given in the relevant parts in MORT&H's Specification for Road and Bridge works.

5.2.10.4 **Rolling**

The compaction shall carry out in accordance with the provisions of clause 6.2.7.5 and 6.2.7.6 below shall apply, as modified by the approved laying trials. Rolling shall be continued until the specified density is achieved, until there is no further movement under the roller. The required frequency of testing is defined in Clause 903 of MORT & H's Specification for Road and Bridge works.

5.2.10.5 Compaction

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

(ii)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 relevant part of the MORT&H's Specification for Road and Bridge works. 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 centre longitudinally except that on super elevated and unidirectional cambered portions, it shall progress from the lower to the upper edge parallel to the centre 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 rolling shall be done with 80-100 KN dead weight smooth-wheeled rollers. The finish rolling shall be done with 80-100 KN vibrating tandem rollers.

(iii)Where compaction is to be determined by density of cores the requirements to prove the performance of rollers shall apply in order to demonstrate that the specified density can be achieved. In such cases the Contractor shall nominate the 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.

(iv)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 upper side of the layer, overlapping on successive passes by at least one-third of the width of the rear roll.

(v)In portions super elevated and uni-directional camber, after the edge has been rolled, the roller shall progress from the lower to the upper edge.

(vi)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 or other foreign matter on the pavement either when the rollers are operating or standing. The wheels of rollers shall be kept moist with water, and the spray system provided with the machine shall be in good working order, to prevent the mixture from adhering to the wheels. Only sufficient moisture to prevent adhesion between the wheels of rollers and the mixture should be used. Surplus water shall not be allowed to stand on the partially compacted pavement.

5.2.10.6 Joints

(i)Where longitudinal joints are made in pre-mixed bituminous materials, the materials shall be fully compacted and the joint made flush.

(ii) All joints shall be offset at least 300mm from parallel joints in the layer beneath or as directed, and in a layout approved by the Engineer-in-Charge. 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.

5.2.10.7 Surface finish and quality control.

The surface finish of completed construction shall conform to the requirements of Clause 902 of MORT&H's Specification for Road and Bridge works or as directed by the Engineer-in-Charge. For control on the quality of materials and works carried out, relevant provisions of Section 900 of MORT&H's Specification for Road and Bridge works shall apply.

5.2.11 Measurement for payment

(i) Bituminous concrete shall be measured as finished work in cubic metres on the basis of volume of ingredients premeasured at plant site.

(ii) For one cubic metre of compacted volume of bituminous concrete, quantity of each type of aggregate and filler and bitumen used for the work shall be as per the proportion of ingredients determined in the mix design.

5.2.12 Rate

The contract unit rate for premixed bituminous courses 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 control.
(ii) Preparation of the surface to receive the material.
(iii) Providing all materials to be incorporated in the work including arrangement for stock yards, all royalties, fees, rents wherever necessary and all leads and lifts;
(iv) Mixing, transporting, laying and compacting the mix as specified.
(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 if so directed by the Engineer-in-Charge.
(vii) Carrying out all tests for control of quality; and
(viii) The rate shall cover the provision of bitumen at the rate specified in the contract.
(ix) The rates are to include for all necessary testing, mix design, transporting and testing of samples, and cores. If there is no laboratory at work site, the Contractor must arrange to carry out all necessary testing at an outside Laboratory, approved by the Engineer-in-Charge, and all costs incurred are deemed to be included in the rate quoted.
(x) The cost of all plant and laying trials as specified to prove the mixing and laying methods is deemed to be included in the Contractor's quoted rate.

6. QUANTITIES OF MATERIALS TO BE USED FOR VARIOUS WORKS FOR ITEMS

Quantities of materials to be used for various items of works shall be as given below.

a)	**Tack coat @ 0.40Kg/m2**	**For Ten Square Metre**
	Bitumen Emulsion (RS)	4.00 Kg
b)	**Tack coat @ 0.25Kg/m2**	**For Ten Square Metre**
	Bitumen Emulsion (RS)	2.50 Kg

c)	**Bituminous Macadam**	**For one cubic Metre**
	Bitumen VG 30 grade	73.00 Kg
	25 to 10 mm metal	0.57m^3
	10 to 5 mm	0.57m^3
	5mm and below	0.28m^3
b)	**Bituminous Concrete**	**For one cubic Metre**
	Bitumen VG 30 grade Minimum bitumen content	5% by weight of total mix
	Aggregates and filler	As per mix design

SIGNATURE OF QUOTATIONER