

**SECTION 402 - BITUMINOUS (FOUR APPLICATION)
MACADAM PAVEMENT (EMULSIFIED ASPHALT)**

402.01 Description. This work includes furnishing and placing a crushed aggregate course penetrated and bound and sealed with emulsified asphalt on a prepared surface according to the contract. *

The sequence of operations and quantities of materials for the various types of finished pavement thicknesses is outlined in Table 402-I.

402.02 Materials.

(A) Bituminous Material. The bituminous material shall be an emulsified asphalt, Type RS-1, conforming to Section 702 - Bituminous Materials. |

(B) Aggregate. Aggregates shall conform to Subsection 703.12 - Aggregate for Highway Construction. (See Table 402-I for required sizes.) |

402.03 Construction Requirements.

(A) Weather Limitations. The Contractor shall not place the penetration macadam on wet surfaces when the air temperature is below sixty (60) degrees Fahrenheit or when weather conditions otherwise would prevent proper construction. *

(B) Equipment. The Engineer will require the following equipment or its equivalent: *

(1) Equipment for heating and applying bituminous material shall conform to Subsection 405.03(B) - Equipment. |

(2) A power broom or power blower.

(3) A self-propelled mechanical spreader for spreading coarse aggregate.

(4) A mechanical revolving cylinder-type aggregate spreader or mechanical roller-type hopper spreader for spreading fine aggregate.

(5) A sufficient number of steel wheel rollers to compact the surface to the required density. These rollers shall be the three (3) wheeled self-propelled type weighing not less than twelve (12) tons with a compression on the rear wheels of not less than three hundred twenty-five (325) pounds per linear inch of tire width.

(C) Preparation of Surface. Before starting construction of the macadam pavement, the Contractor shall prepare the surface according to the contract. Unless acceptable side forms are in place, the Contractor shall place the shoulder material in sufficient height so that the *

the Contractor can compact the shoulder material and yet provide support *
 for the edges of the pavement. The Contractor shall prepare the surface *
 and the shoulders according to the contract at the time paving begins. If *
 the prepared surface becomes damaged or otherwise unsatisfactory, the *
 Contractor shall repair the prepared surface at no cost to the State *
 before work proceeds. *

(D) Placing and Compacting Coarse Aggregate. The Contractor shall place *
 the coarse aggregate of the required sizes by acceptable mechanical *
 methods in the quantities required so that the thoroughly compacted layer *
 shall be of the form and dimensions required. The Contractor shall *
 remove and replace areas of non-uniformly graded aggregate with suitable *
 material before rolling begins. The Contractor shall make these *
 corrections by hand picking whenever necessary and shall continue after *
 initial rolling until the appearance and texture of the aggregate are *
 uniform and all irregularities are corrected. *

The Contractor shall dry roll the coarse aggregate until the coarse *
 aggregate is compacted and keyed. Rolling shall be parallel to the road *
 centerline and shall start at the outer edges of the road, overlap equal *
 portions of aggregate and shoulder, and progress toward the center, *
 overlapping on successive passes by at least half (1/2) the width of the *
 roller, except that on superelevated curves, rolling shall progress from *
 the lower to the upper edge. Rolling shall continue until the aggregate *
 does not creep or wave ahead of the roller. *

The Contractor shall remove and replace material which crushes *
 excessively under the roller or becomes segregated as to prevent free and *
 uniform penetration of the bituminous material with suitable aggregate. *
 The compacted coarse aggregate shall have a firm, even surface. *

Along curbs, headers and walls, and at other places not accessible *
 to the roller, the Contractor shall tamp the aggregate thoroughly with *
 mechanical tampers, hand tampers or other acceptable means. Each hand *
 tamper shall weigh not less than fifty (50) pounds and have a face area *
 of not more than one hundred (100) square inches. *

The Contractor shall remove and replace aggregates in courses which *
 become coated or mixed with dirt or clay before the application of the *
 bituminous material with clean aggregate, then rolled. *

The Contractor shall correct irregularities which appear during or *
 after rolling by loosening the surface, removing or adding coarse rock as *
 required, and then re-rolling such area and adjacent surrounding surface. *

Dry rolling shall cease when the surface of the coarse aggregate can *
 support the distributor and before the voids are closed sufficiently to *
 prevent the free uniform penetration of the bituminous material. *

Before application of the bituminous material, the Engineer will *|
 test the surface of the aggregate layer using a ten (10) foot *|
 straightedge at selected locations. The variation of the surface from *|
 the testing edge of the straightedge between two (2) contacts with the *|
 surface shall at no point exceed three-sixteenth (3/16) inch. The *|
 Contractor shall correct the humps or depressions exceeding the *|
 specified tolerance by removing the defective work and replace the *|
 defective work with new materials as specified. *

TABLE 402-I - APPROXIMATE QUANTITIES PER SQUARE YARD					
Spreading of Crushed Rock & Application of Bituminous Matl	QUANTITIES				
	Finished Pavt. Thickness	3"	2-1/2"	2"	1-1/2"
Coarse Rock (X-Quantity required for thickness)	Size 1 Size 2 Size 3 Size 4	X	X	X	X
1st Chips	Size 8-Lbs. Cu. Yds.	20 0.008	15 0.006	10 0.004	- None
1st Application	Gallons	0.870	0.750	0.620	0.500
Keystone	Size 6-Lbs. Cu. Yds.	40 0.016	30 0.012	25 0.010	- -
	Size 7-Lbs. Cu. Yds.	- -	- -	- -	25 0.010
2nd Application	Gallons	1.000	0.870	0.870	0.620
2nd Chips	Size 8-Lbs. Cu. Yds.	15 0.006	15 0.006	15 0.006	13 0.005
3rd Application	Gallons	0.380	0.380	0.380	0.380
3rd Chips	Size 8-Lbs. Cu. Yds.	10 0.004	10 0.004	10 0.004	10 0.004
4th Application	Gallons	0.130	0.130	0.130	0.130
Rock Sand	Size 9-Lbs. Cu. Yds.	5 0.002	5 0.002	5 0.002	5 0.002
Total Asphalt Emulsion-Gallons		2.380	2.130	2.000	1.630

(E) **First Spreading of Chips.** The Contractor shall then fill the coarse rock layers with chips to approximately one (1) inch of the surface. The Contractor shall spread the chips uniformly by a mechanical spreader in the quantity specified in Table 402-I and lightly broom and roll the chips until the chips works into proper position. The Contractor shall omit this first application of chips in the construction of pavements having a finished thickness of one and one-half (1-1/2) inches. *

(F) **First Application of Emulsified Asphalt.** The Contractor shall apply the emulsified asphalt uniformly on the chip-filled, coarse rock surface by a pressure distributor at the rate set forth in Table 402-I. *

(G) **Spreading Keystone.** Immediately following the first application of emulsified asphalt, the Contractor shall spread the keystone uniformly in the quantity set forth in Table 402-I. The Contractor shall drag broom the keystone to aid in uniform distribution and roll except as noted in Subsection 402.03(H), until the voids in the coarse rock are filled and the keystone is thoroughly locked into the surface. The Contractor shall add additional keystone, as required, either mechanically or manually. *

(H) **Rolling and Brooming.** The Contractor shall discontinue the rolling and brooming of each crushed rock layer that is spread over an emulsified asphalt application temporarily when the initial breaking of the asphaltic emulsion occurs. The Contractor shall resume when the asphalt has completely adhered to the crushed rock. *

(I) **Second Application of Emulsified Asphalt.** The Contractor shall apply the second application of emulsified asphalt uniformly on the keystone-filled, coarse rock surface by a pressure distributor at the rate set forth in Table 402-I. The application of the emulsion shall not be earlier than twelve (12) hours nor later than seventy-two (72) hours after the first application of emulsified asphalt. *

(J) **Second Spreading of Chips.** Immediately after the second application of emulsified asphalt, the Contractor shall spread the chips uniformly over the surface with a mechanical spreader in the quantities specified in Table 402-I. The Contractor shall then drag broom the chips into the voids of the coarse aggregate surface. The Contractor shall roll during the brooming process and continue, except as noted in Subsection 402.03(H) - Rolling and Brooming, until the pavement is thoroughly and uniformly compacted. *

(K) **Third Application of Emulsified Asphalt and Spreading of Chips.** The Contractor shall make a third application of emulsified asphalt and spreading of chips as specified in Subsections 402.03(I) and 402.03(J). *

(L) **Seal Coat.** The Contractor shall not apply the fourth application of asphaltic emulsion and covering of sand as a seal coat earlier than twenty-four (24) hours or later than seven (7) days after completion of the third application of emulsified asphalt and spreading of chips. *

Before the application of the seal coat, the Contractor shall sweep the surface of the pavement clean of loose material and foreign matters. The Contractor shall then apply the fourth application of asphalt emulsion uniformly by a pressure distributor at the rate specified in Table 402-I. Immediately after the application, the Contractor shall spread the rock sand uniformly by a mechanical spreader in the quantity specified in Table 402-I. The Contractor shall roll and drag broom the sand lightly to obtain bond and uniform distribution.

(M) Surface Requirements. The pavement surface, when completed, shall be uniform in texture, smooth, true to crown and grade and free of defects. No portion of the pavement shall be more than one-fourth (1/4) inch below a pavement-width template cut to crown shown on the typical sections (or below a straightedge on superelevated sections) and placed on the pavement at right angle to the centerline.

(N) Pavement Protection. The Contractor shall keep traffic, except those that are necessary for construction, off the pavement until the Contractor have rolled the chips applied to the third application of emulsified asphalt. Where the pavement is placed half-width at a time, the Contractor shall exercise great care in making the joint between the two (2) halves.

The Contractor shall take suitable precautions during construction to prevent the pavement from being mixed or coated with dirt or other unsuitable matter.

402.04 Method of Measurement. The Engineer will measure the crushed rock for bituminous macadam pavement by the ton according to Section 109 - Measurement and Payment. At the time of weighing for payment, the Engineer will deduct the moisture in excess of three (3) percent (based on dry weight of aggregate) in rock sizes 1, 2, 3, 4, 6 and 7 from the weighed tonnage. The Engineer will deduct the moisture in excess of five (5) percent (based on dry weight of aggregate) in rock sizes 8 and 9 from the weighed tonnage.

The Engineer will measure the Bituminous material by the gallons, according to Section 109 - Measurement and Payment.

402.05 Basis of Payment. The Engineer will pay for the accepted quantities of crushed rock, measured as provided above, at the contract unit price per ton of the various sizes used complete in place.

The Engineer will pay for the accepted quantities of bituminous material at the contract unit price per gallon complete in place.

The Contractor shall consider payment of the specified items full compensation for the complete macadam pavement, including materials, equipment, tools, labor, and incidentals necessary to complete the work.

402.05

The Engineer will make payment under:

Pay Item	Pay Unit
Crushed Rock, Size No. _____	Ton
Bituminous Materials	Gallon