APPENDIX

Appendix A. Special Provisions for Bituminous Seal Coat

1. DESCRIPTION

This work will consist of an application of bituminous material followed by an application of cover aggregate on designated areas of an existing pavement.

2. MATERIALS

A Bituminous Material

The bituminous material for seal coat will be one of the following kinds and grades conforming to Mn/DOT standard specification 3151. When the Contract quantity exceeds 2000 gallons (7,570 L), and unless other options are permitted by the Plans or Special Provisions, the kind to be used will be Emulsified Asphalt, Cationic grades. In all cases the grade to be used will be as designated by the Engineer.

B Seal Coat Aggregate

Aggregate for bituminous seal coat shall conform to the requirements in the table below for grading and quality. The particular type or grading to be used shall be as shown in the Plans. All percentages are by weight.

The material shall meet the requirements for grading and quality when placed in hauling vehicles for delivery to the roadway, or during manufacture and placement into a temporary stockpile.

B1 Composition

The aggregate shall consist of sound, durable particles of sand, gravel or crushed stone, or combination thereof. It shall be clean, uniform in quality and free from wood, bark, roots and other deleterious materials. All aggregate to be used for bituminous seal coat shall conform to Class A, B, C or D as described in Mn/DOT standard specification 3137.2B.

B2 Gradation and Quality

Sieve Size	Total Percent Passing				
	FA-1	FA-2	FA-3	FA-4	FA-5
1 inch (25 mm)	100	100	100	100	100
3/4 inch (19 mm)	100	100	100	100	90-100
½ inch (12.5 mm)	100	100	100	90-100	20-55
3/8 inch (9.5 mm)	100	100	90-100	40-70	0-15
1/4 inch (6.3 mm)	100	100	40-70	0-15	0-5
U.S. No. 4 (4.75 mm)	95-100	85-100	0-15	0-5	---
U.S. No. 8 (2.36 mm)	---	10-40	0-5	---	---
U.S. No. 16 (1.18 mm)	45-80	0-10	---	---	---
U.S. No. 50 (300 µm)	10-30	0-5	---	---	---
U.S. No. 100 (150 µm)	2-10	---	---	---	---
U.S. No. 200 (75 µm)	0-1	0-1	0-1	0-1	0-1
% Shale, Max. by weight	5	5	3	2	2
Static Stripping Test	Pass	Pass	Pass	Pass	Pass
Flakiness Index, Maximum	N/A	30	30	30	30
Los Angeles Rattler Loss, %, Max., On Plus No. 4 Fraction			30	30	30

B3 Sampling and Testing

A	Sampling, Sieve Analysis, and Shale Test	Department's Bituminous Manual
B	Static Stripping Test	AASHTO T 182
C	Flakiness Index	FLH T 508
D	Los Angeles Rattler Loss	AASHTO T 96

C Water

All water will be potable and compatible with the chip seal. Compatibility must be ensured by the Contractor.

D Mix Design

The chip seal coat will be designed in accordance with the Asphalt Institute design method found in their Manual Series No. 19, 1979 Edition. The chip seal design will be prepared by qualified personnel experienced in asphalt surface treatment design.

The surface design will be based on the traffic volume(s) and pavement conditions contained in the plans. The final application rate for the asphalt binder and cover aggregate will be determined after the source of the material is known and field adjustments are made.

The design will include the following information:

(1) Aggregate gradation.
(2) Bulk specific gravity of the aggregate.
(3) Loose unit weight of the aggregate.
(4) Asphalt type and rate of application.
(5) Aggregate rate of application.

In addition to the above data, the Contractor will submit with the design of the seal coat a sample of the aggregate and emulsion for use by the Engineer for verifying the test results. The design may be verified by the Department.

After the mix design has been established, the mixture supplied to the project will conform to the following tolerances:

Passing U.S. No. 4 and larger sieves:	± 7%
Passing U.S. No. 8 to U.S. No. 100 sieves:	± 4%
Passing U.S. No. 200 sieve:	± 2%
Residual Asphalt (by extraction):	± 0.4%

3. CONSTRUCTION REQUIREMENTS

A Weather Limitations

Seal coating operations (including traffic restrictions on the freshly constructed seal coat) will be conducted:

(1) Not before May 15 nor after August 31;
(2) Only during daylight hours;
(3) When the pavement and air temperature is 60°F or higher;
(4) When the relative humidity is less than 75 percent; and
(5) When the road surface is dry and clean.

In addition, seal coat operations will not be done in foggy or rainy weather. The seal coating operations will not be started, and will be suspended, when any of the above conditions cannot be met.

B Equipment

B1 Distributor

The bituminous material will be applied with a distributor meeting the requirements of Mn/DOT standard specification 2321.3C1.

B2 Aggregate Spreader

The cover aggregate will be applied with an approved mechanical type aggregate spreader that is capable of distributing the aggregate uniformly to the required width and at the designated rate, with the application being sharply defined at the edges. The aggregate spreader will be a self-spreader type mounted on pneumatic-tired wheels that are so located as to operate on the freshly applied aggregate.

Prior to construction, the aggregate spreader will be calibrated in accordance with ASTM D5624-95 in the presence of the Engineer. The allowable deviation in the amount of aggregate spread on each of the rubber mats will not be more than ±1 lb./sq.yd. in the transverse direction or deviate more than ±1 lb./sq.yd. from the design application rate in the longitudinal direction.

B3 Pneumatic-Tired Roller

A sufficient number of self-propelled pneumatic-tired rollers will be used for rolling aggregates after spreading such that the entire width of the treatment area is covered in one pass of the rollers. In most cases this will require a minimum of three rollers. Each pneumatic-tired roller will have a total compacting width of not less than 60 inches and will have a minimum ground contact pressure of 80 pounds per square inch.

B4 Brooms

Brooms shall be motorized with a positive means of controlling vertical pressure and capable of cleaning the road surface prior to spraying bituminous material and removing loose particles after treatment as required.

C Road Surface Preparations

All roadway surfaces to be sealed will be cleaned by the Contractor. The Contractor will sweep the pavement with a motorized broom to remove all loose material. All depressions not reached by the power broom will be cleaned by the Contractor using hand brooming. The Contractor will ensure that the outer edges of the pavement to be sealed including 1-foot of the shoulder width, if applicable, are thoroughly cleaned. Work will not continue until the surface is approved by the Engineer.

All iron (manholes, gate valves, catch basins, etc.) shall be covered to prevent adherence of the asphalt binder. Suitable covering includes plywood disks, sand, kraft paper, roofing felt or other approved methods. The Contractor shall remove the protective coverings within two (2) hours after the seal coating operation and dispose of properly.

When specified in the Contract or ordered by the Engineer, a tack coat will be applied to the prepared road surface in accordance with Mn/DOT standard specification 2357.

D Traffic Control Plan

The Contractor shall submit a detailed traffic control plan to the Engineer for approval prior to beginning construction. The traffic control plan shall include the type and locations of all signs, barricades, temporary lane markers, flag persons and pilot vehicles, as necessary. All barricades and signs shall meet the requirements of the Minnesota Manual on Uniform Traffic Control Devices.

E Application of Bituminous Seal Material

Emulsified asphalt will not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing. Application of the bituminous material will be made only when the surface is dry as determined by the Engineer.

The beginning rate of application for the bituminous material will be at the rate determined by the surface treatment design. A short test strip (50-100 feet long) shall be constructed to ensure the binder application rate is adequate. After applying the binder to this test strip, the chip spreader will place the cover aggregate at the design application rate. The aggregate in the wheel paths of the chip spreader should be inspected for proper embedment. The Engineer will make adjustments to the rate of application if necessary. Application of the bituminous material will be made uniformly at this rate with the pressure distributor, one full lane width at a time (including shoulder). Further adjustments in the rate of application will be made by the Engineer, if needed, during the course of the work.

The temperature of the bituminous material at the time of application will be as approved by the Engineer, within the limits specified below:

Binder Type	Temperature Range (Deg.F)	Temperature Range (Deg.C)
CRS-1, CRS-2, CRS-2P	125 - 185	52 - 85
RS-1	70 - 140	21 - 60
RS-2, HFMS-2	125 - 185	52 - 85
RC-250	165 - 220	74 - 105
RC-800	200 - 225	93 - 107
RC-3000	230 - 290	110 - 145

F Application of Cover Aggregate

Immediately after the emulsified asphalt has been sprayed evenly over the roadway surface, aggregates of the type specified will be evenly applied to the roadway surface by self-propelled spreader equipment. The aggregate will be distributed uniformly by a spreader within 1-minute of the emulsified asphalt application. The speed of the spreader will be such that stones are not rolling over.

All aggregate will be moistened prior to placement to provide aggregates that are uniformly damp at the time of placement on the roadway.

The aggregate will be spread in one operation in such a manner that an 8-inch strip of emulsified asphalt is left exposed along the longitudinal center to form a lap for succeeding applications of emulsion. If necessary, thin or bare spots in the spread of aggregates will be corrected by hand spreading or other methods subject to approval of the Engineer.

G Rolling Operations

The aggregate will be rolled following spreading. A maximum time of 3 minutes will be allowed between the spreading of the aggregate and completion of the initial rolling of the aggregate. The rollers will proceed in a longitudinal direction at a speed less than or equal to 5 miles per hour. The rollers will make three complete coverages of the aggregate with the final pass being in the direction of traffic. The Engineer may require more rollers to ensure the rolling is being done quickly enough to embed the aggregate before the binder breaks.

I Protection of the Surface

No traffic will be permitted on the sealed road surface until after all rolling has been completed and the bituminous material has set to a degree satisfactory to the Engineer and will not pick up on vehicle tires.

In addition to other barricades and warning signs required by the Contract, the Contractor will furnish and deliver to the Project such other barricades and warning signs as the Engineer deems necessary for use in conjunction with seal coat construction. The Contractor will erect and maintain those barricades and signs at locations directed by the Engineer.

When the road under construction is open to traffic during daylight hours, the Contractor will furnish a minimum of two flag persons and a pilot vehicle to direct and guide traffic through the construction zone. One flagger will be stationed in advance of the seal coat operations and another at the rear barricade at the beginning of the uncovered bituminous material. It will be the duty of the flagger to stop all traffic and to acquaint the traveling public with the nature of the work underway, the limitations on the road surface available for traffic use, and the reason for reduced driving speed. All traffic, including construction traffic, will be held to speeds not exceeding 25 miles per hour. Advisory signing will be provided for a period of 24 hours after seal coat operations are completed to maintain vehicle speed to 25 mph.

On the morning following each day of seal coat operations the Contractor will sweep off the surplus aggregate from the previous day's seal coat construction. This operation will be conducted while the road surface is still cool, and care will be exercised that the aggregate which has set is not disturbed. Where sealing is done in municipalities, the Contractor will dispose of the surplus aggregate in a manner satisfactory to the Engineer.

4. METHOD OF MEASUREMENT

A Bituminous Material

Bituminous material applied on the road will be measured by volume in gallons at 60 degrees F.

B Seal Coat Aggregate

Seal coat aggregate will be measured as indicated in the Proposal, by weight or by volume (vehicular measure) of material deposited on the road.

5. BASIS OF PAYMENT

Payment for the accepted quantities of bituminous material (including any required additives) and seal coat aggregate at the appropriate Contract prices will be compensated in full for all costs of constructing the seal coat as specified.

Payment for the bituminous seal coat will be made on the basis of the following schedule:

Item No.	Item	Unit
2356.505	Bituminous Material for Seal Coat	Gallon
2356.507	Seal Coat Aggregate	Ton

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