SP- 230455
(New)

SPECIAL PROVISION
FOR
POLYMER MODIFIED SCRUB SEAL

Plymouth County
STPN-012-2(052)--2J-75

Sioux County
NHSN-018-1(101)--2R-84

Effective Date
December 15, 2026

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

230455.01 DESCRIPTION.

A. This work shall consist of furnishing all materials, equipment, labor, and preparation necessary for the application of the polymer modified asphaltic rejuvenating emulsion (PMRE) scrub seal. A PMRE scrub seal is the application of PMRE with a scrub broom followed immediately by an application of a single layer of cover aggregate.

B. The applied material shall completely seal the pavement surface and provide a uniform textured surface. The treatment can be applied as a wearing surface or as an interlayer.

C. On Primary Road projects where limestone or crushed gravel cover aggregate is used, dust control shall be required by applying diluted asphalt emulsion to the completed scrub seal surface. On non-Primary Road projects, dust control shall be as specified in the contract documents.

D. When the contract documents specify, place a bituminous fog seal meeting the requirements of Section 2306 of the Standard Specifications to the completed polymer scrub seal surface.

230455.02 MATERIALS.

A. Polymer Modified Asphalt Rejuvenating Emulsion Binder.

1. Perform inspection and acceptance of emulsified asphalt according to Materials I.M. 437.

2. Provide PMRE for scrub seal meeting the requirements of AASHTO M 345, *Standard Specification for Materials for Emulsified Asphalt Scrub Seal*.

3. Provide emulsified asphalt compatible with project aggregate when tested according to Materials I.M. 349.

4. If Type 2 Friction aggregate is used, include an anti-strip additive in the formulation of the PMRE. Perform a Boil Test (ASTM D3625) using the Type 2 aggregate that will be used on the project. Coat the aggregate with the formulated emulsion (with anti-stripping agent) and allow sample to cure for 24 hours. Percent of uncoated particles must be 5% or less. Perform and report percent of uncoated particles to the District Materials Engineer.

5. Material Certifications and Testing.
   - **a.** Sample emulsion according to Materials I.M. 204 Appendix P and Materials I.M. 323. In Materials I.M. 204 Appendix P, sample and test in the same manner as seal coat requirements. Store and test within the time frame specified in Section 3.1 of AASHTO M 316.
   - **b.** Submit to the Engineer certification that the emulsion meets the specification.
   - **c.** Submit certifications and test results on the latex and the recycling agent to the Engineer 2 weeks prior to construction.
   - **d.** Submit certifications and test results on the emulsion to the Engineer at least 5 days prior to supplying material.
   - **e.** Prior to and during the project, the Engineer may require one-gallon samples of the finished emulsion from the supplier's storage tanks to submit for testing. This testing will be at the Contracting Authority's expense.

B. Coarse Aggregate.

1. Apply requirements of Articles 4125.01 and 4125.03 of the Standard Specifications with the following additions. Scrub seal cover aggregate shall be durable and free from deleterious materials. Gradation requirements are specified in Table 1. All percentages are by weight. Coarse aggregate (retained on the No. 4 screen) shall be crushed. On Primary projects, crushed stone or crushed gravel is required. Meet the fracture and quality requirements in Table 2.

Table 230455.02-1: Scrub Seal Aggregate Gradation Limits

Nominal Sieve Size	Passing, % (min-max)	Job Mix Formula QA Tolerance , %
1/2”	100	-
3/8”	100	-
No. 4	30-80	±7
No. 8	5-30	±4
No. 16	0-15	±4
No. 200	0-3	-

Table 230455.02-2: Fracture and Quality Requirements

Property	Method	Interlayer Application	Surface Treatment Application
Fracture, 1 Face, % min	AASHTO T335	70	85
Fracture, 2 Face, % min	AASHTO T335	60	80
Los Angeles Abrasion, max, % loss a	AASHTO T96	40	40
Sand Equivalence a	AASHTO T176	60	60
A Freeze b	Office of Materials Test Method No. Iowa 211, Method A	10	10
Alumina	Office of Materials Test Method No. Iowa 222	0.7	0.7

a For type 2 friction aggregate, LA Abrasion maximum shall be maximum of 30%. Sand Equivalence applies to Type 2 Friction aggregate only.

b If the Alumina value passes, the A-Freeze is not needed for specification compliance. If the Alumina value fails, determine the A Freeze value for specification compliance. Alumina does not apply to gravel. C-Freeze testing is not required.

2. If Sand Cover Aggregate is required to prevent tracking of emulsion, apply Section 4125 of the Standard Specifications.

C. Asphalt Emulsion for Dust Control.
Use grade CSS-1, CSS-1H, or SS-1H as specified in Section 4140 of the Standard Specifications. Dilute with water prior to application. Use an initial dilution rate of seven parts water to one part emulsion.

D. Water.
Comply with Section 4102 of the Standard Specifications.

230455.03 CONSTRUCTION.
Apply Article 2307.03 of the Standard Specifications with the following modifications herein.

A. Scrub Seal Design.

1. Design the scrub seal and determine the starting application rate for the bituminous material and scrub seal aggregate in accordance with AASHTO PP 91-21, "Standard Practice for Emulsified Asphalt Scrub Seal Design". Base the mix design on the traffic volume and pavement conditions. Provide the following 2 weeks prior to construction:
- **a.** Job mix formula gradation and quality test results as specified in SP-230455.02.
- **b.** Scrub Seal aggregate design application rate.
- **c.** Bituminous Material design application rate. Report design application rate and the application rate plus 12%.
- **d.** 150 pound sample of aggregate from each proposed aggregate source.

2. Obtain acceptance from the Engineer prior to construction.

B. Equipment.
Use equipment meeting requirements of Section 2001 of the Standard Specifications and the following. All equipment required for performance of the work shall be approved before construction is to begin and shall be maintained in satisfactory operating condition. Furnish an accurate thermometer, hand brooms, and other small tools and equipment essential for the completion of the work.

1. Aggregate Spreader.
Calibrate the aggregate spreader to meet the requirements of ASTM D5624, Standard Practice for Determining the Transverse-Aggregate Spread Rate for Surface Treatment Applications, if required by the Engineer.

2. Equipment for Distributing Bitumen.
The pressure distributor shall have a computerized rate control that automatically adjusts the distributor's pump to the ground speed.

3. Heating Equipment.
Apply Article 2001.11 of the Standard Specifications.

4. Scrub Broom.
- **a.** The scrub broom frame shall be constructed such that the scrub broom is attached to or towable behind the distributor truck. The scrub broom must be equipped with the means to mechanically raise and lower the scrub broom off and on to the road surface at designated points of completion and start up. It shall be towable in the elevated

position. The weight of the broom assembly shall be such that it does not squeegee the emulsion off the roadway surface.

b. The scrub broom must cover the width of a normal driving lane in one pass. The main body of the scrub broom shall be a frame minimum 6 feet 9 inches wide and minimum length of 10 feet. The maximum transverse rigid frame width at any point shall not exceed 6 feet 9 inches. The nearest member and diagonal members shall be equipped with emulsion scrub broom heads configured to evenly spread and work the emulsion across the treatment area. The furthest members shall be equipped with emulsion scrub brooms paralleling the back of the distributor. Each individual emulsion scrub broom attached to the scrub broom assembly shall be approximately 3 1/2 inches wide by 6 1/2 inches high by 16 inches long and have stiff nylon bristles. Bristle height is to be maintained at a minimum of 5 inches.

c. The scrub broom shall be equipped with hinged wing assemblies with mounted brooms attached to the main body to increase the width. The hinged wing maximum width is 4 feet 6 inches per side.

5. Rollers.

a. Use self-propelled, pneumatic tired rollers meeting the requirements of Article 2002.05, C of the Standard Specification to embed the cover aggregate.

b. One pneumatic tired roller will be required for work involving sand cover aggregate.

c. A minimum of two pneumatic rollers will be required for work involving other cover aggregate.

6. Brooms.

a. Apply Article 2001.14 of the Standard Specifications.

b. When using a power broom to remove loose aggregate from a newly seal coated surface, ensure that it is capable of exerting uniform down pressure (for the full width of the broom and without vibration or bounce) sufficient to remove loose aggregate without dislodging particles which are stuck in the binder bitumen.

7. Weighing Equipment.

Apply Article 2001.07 of the Standard Specifications.

C. Pre-Paving On-Site Meeting

Conduct a meeting with the Engineer at the project site prior to beginning work. The agenda for this meeting will include:

1. Review of detailed work schedule.

2. Review of the traffic control plan.

3. Discussion of Construction activities:

- Pavement surface preparation
- Weather Considerations
- Test strip
- Application rates
- Construction process and sequence

4. Inspection of equipment.

5. Calibration and adjustment to equipment as needed.

D. Weather Limitations.

1. Place the scrub seal when the pavement and atmospheric temperature are greater than 60°F and rising. Do not place if it is raining or when the pavement surface has standing water.

2. Do not apply scrub seals after September 1 on Primary projects or after September 15 on other projects. When the entire project cannot be completed by the specified cutoff date, do not complete placement on one side only for the full length of the project. Instead, complete both sides to the same location by the specified cutoff date.

E. Construction.

1. Surface Preparation.

a. Prepare surface immediately before bitumen is applied and clean the entire surface to be treated as well as any adjacent gutters, of all foreign material, vegetation, dirt, and debris including dust. Blade, clean, and perform incidental work required to produce a clean surface. If the power broom fails to remove dust from depressions and pockets, use hand brooms.

b. The surface shall be cleaned and shall be reasonably dry when the bituminous binder is applied. In rural areas, blade or sweep material removed from the road surface off the road surface. In cities and towns, remove the material according to Article 1104.08 of the Standard Specifications. This material becomes the property of the Contractor. Material cleaned from the surface shall be properly disposed of.

2. Repairs.

If pavement repairs have been performed within the last 2 weeks, those areas shall have a tack coat applied and cured to the patched area prior to scrub seal placement.

3. Test Strip.

Construct a continuous 1000 foot long by lane width test strip. A longer test strip may be approved by the Engineer. The Engineer will review the test strip no later than the next working day. Apply the bituminous material at the application rate determined by the mix design. Spread the aggregate at the design application rate. Obtain Engineers acceptance of the test strip before proceeding with the Work. Additional test strips will be constructed until the emulsion and aggregate application rate is accepted by the engineer. The following test strip requirements must be approved by the Engineer prior to continuing placement:

a. Typical stone chip embedment is 2/3 of typical stone chip height. This can be checked by pulling out several chips by hand.

b. Chip seal edge is neat and uniform along the roadway lane, shoulder, and curb lines.

c. Finished surface has no untreated areas greater than 1 inch wide and 4 inches long in any 120 square yard area.

d. Compare the test strip aggregate and binder application rates with the application rates provided to the Engineer prior to the project. The binder application rate must be ± 0.05 gallons per square yard of target binder application rate.

e. Approximate time for the emulsion to set adequately such that it will not pick up on vehicle tires.

4. At the end of roadway sections or intersections, account for excess emulsion in the emulsion “wave” pulled by the scrub broom. This may require rate adjustments near the end of placement so excess emulsion can be drug out by the scrub broom. Construct roadway end sections with clean joints and place the remaining emulsified material required to complete the pass at the specified rate.

5. Remove surplus aggregate by sweeping on the same day as the scrub seal construction. Sweep with care to not dislodge aggregate that is setting. Re-sweep areas the day after the initial sweeping. The entire surface shall be clean of all loose material within 24 hours and prior to placement of any surface course. Dispose of the surplus seal coat aggregate in a manner satisfactory to the engineer.

6. No traffic is permitted on scrub seal road surface until after the specified rolling has been completed and the asphaltic material has set and will not pick up on vehicle tires.

7. Protect all utility castings using tarpaper, plastic, or other approved material. Properly fit covers to the casting and remove protective covering upon completion of sweeping and before opening the road to traffic.

8. **Traffic Control.**
   - **a.** On two lane roadways the road should be closed for construction of the scrub seal and surface course or fog seal. Furnish and install the following:
     - **1)** Road Closures at each end of the project and other locations noted in the project documents.
     - **2)** Type 3 barricades at public side roads within the project limits as shown in Standard Road Plan TC-252, situation 5. If a side road is expected to be closed for longer than 15 minutes, install Standard Road Plan TC-252, situation 3.
     - **3)** Furnish and install **"LOOSE STONE - REDUCE SPEED" signs**, along with a 35 mph advisory speed plate, at all public side roads and at a spacing of not more than 2 miles between signs in each direction if no public side roads are present.
     - **4)** Pilot car and/or flaggers should be used to control local traffic during periods when work is in progress.
   - **b.** On multilane pavements keep traffic off the freshly placed scrub seal using a lane closure overnight for a minimum of 12 hours and until the scrub seal has been swept to remove any loose aggregates.
   - **c.** Traffic control setups which cause unnecessary stopping or turning movements generally will not be allowed.
   - **d.** Unless otherwise stated in the contract documents, furnish the signs and mounting devices, including posts.

F. Application of Bituminous Binder and Coarse Aggregate.

Apply Article 2307.03, B of the Standard Specifications with the following additions. Construct one full lane width at a time. The edges of the limits of the scrub seal application on both sides of the road shall be maintained in a neat and uniform line.

1. **Material Application Rates.**
   - **a.** The binder application rate shall be within ±0.05 gallons per square yard of the approved application rate.
   - **b.** Maintain the aggregate application rate within 1 pound per square yard of the approved application rate established during the test strip.

2. **Bituminous Binder Application.**
   - **a.** The bituminous binder shall be uniformly applied at a temperature of 140°F to 180°F, and at the rate specified. Correct the rate of application for temperature to deliver the desired volume at 60°F.
   - **b.** Using a distance of 250 feet, perform a yield check to verify the application rate is correct. The Engineer may require additional yield checks be performed if the application rate is questioned. If the application rate is not the optimum application rate to achieve proper stone embedment, immediately notify the Engineer. Adjust and document the new application rate by stationing. The Engineer may require the Contractor to verify application is within 0.05 gallons per square yard of the intended application rate by ASTM D2995, Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors, Option A.
   - **c.** Immediately following application of the polymer modified bituminous rejuvenating emulsion binder to the roadway surface, the material shall be scrubbed with the scrub broom for the purpose of forcing the emulsion into the existing surface voids and distributing the emulsion over variable roadway surface textures and conditions. Do not allow the binder to streak on the road surface. If the Engineer determines that streaking is

occurring, cease operations until the Engineer is satisfied that streaking has been eliminated.

3. **Coarse Aggregate Application.**
   - **a.** Apply cover aggregate at a rate necessary to provide full coverage of the binder and to avoid tracking. Coarse aggregate shall be spread uniformly without ridges or gaps at the specified rates. If the target rate is not the optimum application rate due to the gradation of the aggregate or due to existing surface conditions of the pavement, immediately notify the Engineer and document the new rate by stationing.
   - **b.** Immediately after applying the binder, apply cover aggregate uniformly without ridges or laps at the specified rate, adjusted as directed by the Engineer, to produce a minimum of excess loose particles. Spread the material in such manner that the tires of the truck or aggregate spreader at no time contact the uncovered and newly applied binder. Before rolling, correct deficiencies in the application of cover aggregate in a manner satisfactory to the Engineer.
   - **c.** Projects with segments greater than 12,000 square yards shall use a minimum of two rollers. Rollers shall proceed at a maximum speed of 5 mph and the entire surface shall receive a minimum of three roller passes for scrub seal cover aggregate. The first roller pass shall be performed within 1 minute of aggregate spreading.
   - **d.** Satisfactory embedment usually will be secured by one roller coverage if sand cover is used and three roller coverages if scrub seal cover aggregate is used. One roller coverage is interpreted as the number of passes of the roller required to ensure that the entire area has been touched at least once by the entire roller.
   - **e.** After rolling, protect the surface from traffic damage during the period required for the binder to cure sufficiently and prevent dislodging of the aggregate particles by normal traffic. During this period and as directed by the Engineer, correct deficiencies in cover aggregate by spreading additional aggregate or by light brooming.
   - **f.** Stockpiling and loading methods shall permit ready identification of material and minimize segregation and contamination of the aggregate.
   - **g.** Blend aggregate at the stockpiles to provide uniformly damp material. At the time of spreading, ensure the surfaces of the cover aggregate are damp, but with no free water. This will be determined by visual inspection.
   - **h.** Spreading of the aggregate shall be adjusted to produce a minimum of excess loose particles, shall provide complete coverage, and there shall be no “excessive” bleed-through after rolling.
   - **i.** The spreading operation shall be accomplished in such a manner that neither the tires of trucks nor the spreader come into contact with the newly applied bituminous material.
   - **j.** Using 250 feet, perform a yield check to verify the aggregate application rate is correct. The Engineer may require additional yield checks be performed if the application rate is questioned. If the application rate is not the optimum application rate to achieve proper stone coverage, immediately notify the Engineer. Adjust and document the new application rate by stationing.
   - **k.** Do not use previously applied aggregate.

G. Quality Control.

1. To measure compliance, provide the Engineer with a daily report of the following:
   - Aggregate gradation (one at the start of daily production, minimum).
   - Aggregate moisture content (one at the start of daily production, minimum).
   - Yield check on bituminous binder (three per day minimum).
   - Yield check on aggregate (three per day minimum).
   - Temperature check on bituminous binder (three per day minimum).

2. If test results exceed any of the identified quality control tolerances, immediately notify the Engineer. The Engineer will review the test results and the corrective action taken. Perform another test and if the results still exceed the quality control tolerance, cease placement.

Immediately notify the Engineer and identify the cause of the excessive deviation and detail corrective action necessary to bring the deficiency into compliance. Do not resume placement without approval of the Engineer.

3. **Bituminous Binder.**
   The application rate shall not exceed a tolerance of ±0.05 gallons per square yard from the specified rate, and within the temperature range as specified.

4. **Coarse Aggregate.**
   The aggregate shall be clean, uniform, and shall be within the gradation range as specified.

H. Placement of Surface Course.
If a fog seal or a surface course is to be placed over the scrub seal, a minimum period of 24 hours shall be observed prior to the placement of the fog seal or surface course. Place fog sealer surface course within 72 hours of the scrub seal material placement unless otherwise approved by the Engineer. Fog seal shall be placed in accordance with Section 2306 except traffic control for the fog seal shall be in accordance with Article SP-230345.03, E, 8.

I. Field Acceptance.
During the application of the scrub seal, inspect the scrub seal for deficiencies resulting from poor workmanship, flushing, tracking from equipment, surface patterns, loss of stone, and sweeping. Inspect workmanship for untreated areas, minimum overlap on longitudinal joints, and minimum overlap on construction joints. Correct any deficiencies to the satisfaction of the Engineer.

230455.04 METHOD OF MEASUREMENT.
Measurement for the quantities of the various classes work involved in bituminous scrub seal, satisfactorily constructed, will be as follows:

A. Scrub Seal.
The Engineer will measure the bituminous scrub seal by area of pavement surface in square yards to the nearest 0.1 square yard according to the contract documents. The areas of manholes, intakes, or other fixtures will not be deducted from the measured area.

B. Binder Bitumen.
Gallons computed from field measurements of distributors or from tank cars or transport trucks as provided in Article 4100.03 of the Standard Specifications. Includes bitumen for fillets at intersecting roads, drives, and turnouts. When quantities computed from field measurements check within 1.0% of the billed gallons, payment will be based on billed gallons. When quantities computed from field measurements differ from billed gallons by more than 1.0%, payment will be based on the quantity from field measurements. From these quantities, any amount used as fuel, left in cars, or otherwise not delivered to the road surface will be deducted. The Engineer will advise the Contractor promptly, in writing, of the quantities deducted.

C. Asphalt Emulsion for Dust Control.
Undiluted asphalt emulsion measured as provided in SP-230345.04, B.

230455.05 BASIS OF PAYMENT.
For the various items of work involved in the scrub seal, measured as provided above, payment will be the contract unit price as described below. Payment for additional rolling the Engineer requires will be according to Article 1109.03, B of the Standard Specifications.

A. Scrub Seal.
Paid per square yard for furnishing all preparation, aggregate materials, testing, equipment, labor, clean-up, and incidentals necessary to complete the work as specified.

B. Binder Bitumen.

Paid per gallon for the quantity of binder bitumen spread on accepted portions of the road and the quantity used in making trial runs for adjustment of distributors. The contract unit price for accepted quantities includes necessary additives as well as the costs of providing and applying the material as required by the contract.

C. Asphalt Emulsion for Dust Control.

1. Per gallon for the number of gallons placed.

2. Payment is full compensation for sweeping, furnishing, mixing with water and applying the asphalt emulsion, and curing of the dust control material.