SPECIAL PROVISIONS
FOR
PENETRATING ENGINEERED FOG SEAL

Palo Alto County
STP-004-5(50)--2C-74

Effective Date
December 19, 2023

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

230101.01 DESCRIPTION.

Clean the pavement surface and apply engineered emulsion to the entire pavement surface, shoulder surface, or milled shoulder rumble strip using a bituminous distributor.

230101.02 MATERIALS.

A. Material Properties.
When applied to the pavement, the material shall change the physical properties of the asphalt binder contained in at least the upper 1/4 inch (or deeper) of the existing surface. The Engineer may verify in the field.

Table 230101.02-1: Engineered Emulsion Performance Requirements

Tests on Recovered Binder (ASTM D2172, ASTM D1856)	**Treated vs Untreated**
Complex Shear Modulus @ 60°C, 10 rad/sec (AASHTO T315)	≥ 40% reduction

B. Use approved products from the attached Materials I.M. 439 Modified. See attached Materials I.M. 439 Modified for approval process.

C. Do not reduce the retroflectivity of traffic paint and/or pavement markings by more than 5% when measured per Materials I.M. 386.

230101.03 CONSTRUCTION.

A. Equipment.
Use equipment meeting the requirements of Articles 2001.12 and 2001.14 of the Standard Specifications.

B. Cleaning.
Immediately prior to placement, clean the entire surface to be treated. Use scrapers, compressed air, or other approved methods.

C. General.
Calibrate the distributor to the specified target rate prior to start of work.

D. Application.

1. Uniformly apply engineered fog sealer at the approved rate (gallons per square yard of treatment area). The approved rate is product-specific and established per Materials I.M. 439 Modified. The Engineer may require a test strip to ensure adequate coverage. Provide metered quantities to the Engineer for yield checks.

2. The optimum application rate may be adjusted by the Engineer based on texture, porosity, and age of the treatment surface.

3. Use safety and convenience to the public without soiling their vehicles as a controlling factor.

4. For pavement applications, apply at a width of one-half of the roadway plus an overlap of approximately 4 inches at the middle of the road. Cover each width in one application while the opposite one-half of the roadway is left open to public traffic.

5. For shoulder applications, apply so the entire shoulder surface or milled rumble strip is covered in one application.

6. Do not apply to bridge decks or railroad rails and flangeways.

7. Test the reflectivity of the existing pavement markings before and after the application. Use the procedure in Materials I.M. 386 to determine retroreflectivity. Replace pavement markings when retroreflectivity is less than 100 when measured within 7 calendar days.

E. Limitations.

1. Unless the Engineer approves, do not place on damp or wet surfaces, during rainy or damp weather, or when rain is anticipated within one hour after application is completed.

2. Apply during weather conditions which allow satisfactory application. Do not apply when either surface temperature or air temperature is below 50°F.

3. A sand dam or other approved means may be necessary to prevent the material from running on to the area adjacent to the work area in areas of superelevated curves.

4. Do not allow traffic on the treated surface until the engineered fog sealer has fully cured.

F. Scheduling.

1. A preconstruction conference will be required for this work. This will normally be a single conference for all work of this type in each residency.

2. At the preconstruction conference, provide the Engineer a probable schedule for work of this type in the District jurisdiction, including the sequence for each project.

3. Schedule the test strip if required by the Engineer.

230101.04 METHOD OF MEASUREMENT.

A. Measurement for Engineered Emulsion for Fog Seal (Shoulder Rumble Strips) will be in square yards.

B. Measurement for Engineered Emulsion for Fog Seal (Centerline Rumble Strips) will be in square yards.

230101.05 BASIS OF PAYMENT.

A. Engineered Emulsion for Fog Seal (Shoulder Rumble Strips).

1. Payment for Engineered Emulsion for Fog Seal (Shoulder Rumble Strips), measured as provided above, will be at the contract unit price per square yard that is used on the project.

2. Payment is full compensation for:
- Cleaning the shoulder surface,
- Furnishing and applying the emulsion, and
- Protecting the pavement adjacent to the work area in areas of superelevated curves.

B. Engineered Emulsion for Fog Seal (Centerline Rumble Strips).

1. Payment for Engineered Emulsion for Fog Seal (Centerline Rumble Strips), measured as provided above, will be at the contract unit price per square yard that is used on the project.

2. Payment is full compensation for:
- Cleaning the pavement surface,
- Furnishing and applying the emulsion, and
- Protecting the pavement adjacent to the work area in areas of superelevated curves.

C. Any pavement markings that do not retain 95% of their initial retroreflectivity will be replaced at no cost to the Contracting Authority.

ENGINEERED FOG SEALER

GENERAL

Engineered fog sealers shall meet the requirements in the contract documents of the Iowa Department of Transportation. Approved brands of Engineered fog sealer are:

- RePlay, BioSpan Technologies, Inc., Ballwin, MO
- Delta Mist, Collaborative Aggregates, LLC, Kansas City, MO

ACCEPTANCE

Properly identified and certified materials may be incorporated into a project. Final acceptance will be based on the certifications and the results from project verification tests and/or in accordance with special requirements when specified. Project samples with noncompliant test results may require additional tests.

BRAND NAME APPROVAL

Request for approval shall be made in writing to the Office of Construction and Materials in Ames, Iowa. Include the following:

1. A complete product description
2. Manufacturer's material specifications
3. Manufacturer's recommended application rate (gallons per square yard)
    a. Rate for paved surfaces in good condition
    b. Rate for paved surfaces in poor condition
4. Submit test results from an accredited laboratory demonstrating all performance criteria is achieved. Engineered fog sealers shall be approved prior to application on a project.

The application rate will be product-specific. Field application will use the published rate and may be adjusted by the Engineer based on test strip results.

Approval of suppliers will be based on compliance with the following requirements:

A. Acceptable Control Laboratory

A control laboratory will be considered acceptable if it shows that test results can be obtained within precision limits established by AASHTO for each test. Precision will be judged by comparison with results obtained by the Central Laboratory in Ames. Laboratory facilities and procedures may be inspected and reviewed by Highway Division personnel.

Submit a minimum of two samples of each product in regular production annually to the Central Laboratory in Ames. Complete sample identification and supplier test results for all specified tests must be submitted for each sample. A comparison of the Central Materials Office test results with the suppliers' test results will be made.

B. Acceptable Quality Control Program

The supplier shall submit an outline of the Quality Control Program showing testing frequencies, tests performed, and a typical test report to the Office of Materials. Submit annual updates to the Central Laboratory.

C. Performance Testing

When applied to a pavement at least 3 years old ~~standard gyratory sample (or road core)~~, the material shall physically change the properties of the asphalt binder contained within at least ¼ inch from the surface (or deeper).

Gyratory Specimens

~~Fabricate hot mix~~ asphalt gyratory specimens at 4% air voids with PG 64-22 binder. Apply the recommended rate of sealer to the surface and wait at least 10 minutes. Slice the top ¼" portion of the treated specimen and extract and recover the binder. Analyze viscosity, softening point, penetration, residual polymer content, and ductility. Repeat the recovery and analysis on material that has not been treated and compare the results. Testing should be performed at an ~~AMRL~~ accredited lab and results ~~submitted for approval.~~

Road ~~Cores~~

Apply the recommended rate of sealer to the surface of the road core and wait at least 10 minutes. Slice the top ¼" portion of the treated specimen and extract and recover the binder. Analyze the complex shear modulus viscosity, softening point, penetration, residual polymer content, and ductility. Repeat the recovery and analysis on companion road cores that have not been treated and compare the results.

D. Retroreflectivity Retention

Submit retroreflectivity (before and after) results from a field project to demonstrate compliance with the specification at the recommended application rate.

E. Friction Testing

Once material properties and retroreflectivity retention requirements are acceptable, it shall be responsibility of the submitting party to demonstrate the product does not excessively reduce pavement friction. Arrange a pavement location off of the primary system where the product can be applied at the recommended rate. The application must be in the driving lane where speeds of at least 40 mph may be maintained for at least 1000 feet. Prior to sealing, contact the District Materials Engineer to schedule ribbed-tire friction testing. Ensure the sealed pavement has a minimum friction value of 40 when measured per ASTM E274 at 40 mph. Measurements shall be taken no more than 30 days after the pavement is sealed. It is the responsibility of the contractor to confirm availability of testing crews with the DME to ensure the 30-day testing window is achieved. When possible, the Agency will perform testing before and after the sealing work is completed. In lieu of ASTM E274, ASTM E-1911 may be used on laboratory fabricated specimens.

F. Records & Documentation

A satisfactory program for storage of test reports and shipment records shall be maintained. This program shall enable proper identification and documentation of all shipments made to projects and shall include a file of refinery test reports covering all asphalt binders.

Continued approval of a source will be based on the following:

A. Ability to consistently supply material meeting specifications

B. Ability to meet precision limits for testing.

C. Continuation of originally approved Quality Control Program.

D. Maintenance of required records

E. Proper documentation of shipments

Approval to deliver certified material may be withdrawn for inadequate compliance with these requirements.

MONITORING APPROVED SOURCES

Monitoring activities of suppliers, including inspection of test reports, quality control records and procedures, and shipping records will be conducted by the appropriate District Materials Office.

All District Materials Office monitoring activities shall be reported to the Central Materials Office.

DOCUMENTATION

Each shipment invoice covering certified materials delivered to a project shall have a signed certification statement as to product name, specific gravity or weight per gallon (liter), quantity in load, batch number or other identification, project number, and compliance with the appropriate Iowa Department of Transportation Specifications. A copy of this invoice shall be furnished to the Contracting Authority at the time of delivery.

A supplier receiving material shall promptly obtain a report of complete test analysis covering each batch or identifiable lot received.

APPENDIX A

ENGINEERED FOG SEALER APPLICATION RATES

	Surface Condition	
Product	Good	Poor
RePLAY (undiluted)	0.02 (gal/SY)	0.03 (gal/SY)
Delta Mist (diluted/undiluted)	0.067/0.12 (gal/SY	0.08/0.16 (gal/SY)