

**DELAWARE COUNTY
DELAWARE COUNTY ENGINEER'S OFFICE**

SUPPLEMENTAL SPECIFICATION 1205

SLURRY SEAL

APRIL 6, 2011

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1205.01 Description. This work consists of constructing a cold laid emulsified asphalt pavement course to provide a surface course for existing pavements. The paving mixture is composed of a polymer modified emulsified asphalt binder, crushed aggregate, mineral filler, water, and other additives.

1205.02 Materials. Use an emulsified asphalt binder (Binder) consisting of the following materials milled together:

- A. CSS-1h or CSS-1m emulsified asphalt conforming to 702.04, except the cement-mixing test is waived.
- B. Other emulsifiers.

Emulsion Setting Time - Prior to shipment of each new formulation of emulsified asphalt, the Contractor shall perform a towel test to verify that the emulsion will set sufficiently quick for early release of traffic.

Ensure that the Binder has a minimum of 3 percent solids based on the weight of the asphalt binder content of the Binder.

Ensure that the Binder has a minimum of 62 percent residue when tested according to AASHTO T 59 at 77 °F (25 °C) for 24 hours in a forced draft oven. Ensure that the residue conforms to the following requirements:

Test	Description	Specification
AASHTO T 53	Softening Point	60 °C minimum
AASHTO T 202	Absolute Viscosity @ 60 °C	8000 poise minimum

Conform to 703.01 and 703.05 for aggregate, except as follows:

Percent by weight of fractured pieces	100
Sand Equivalence (ASTM D 2419)	45 minimum

Aggregate gradation, including mineral fillers shall be according to the following:

**TABLE 1205.02-1
AGGREGATE GRADATION**

Sieve Size	Total Percent Passing		
	Type I	Type II	Type III
3/8 inch (9.50 mm)	100	100	100
No. 4 (4.75 mm)	100	90 to 100	70 to 90
No. 8 (2.36 mm)	90 to 100	65 to 90	45 to 70
No. 16 (1.18 mm)	65 to 90	45 to 70	28 to 50
No. 30 (600 µm)	40 to 65	30 to 50	19 to 34
No. 50 (300 µm)	25 to 42	18 to 30	12 to 25
No. 100 (150 µm)	15 to 30	10 to 21	7 to 18
No. 200 (75 µm)	10 to 20	5 to 15	5 to 15

Screen the aggregate for oversize material prior to use. For mineral filler, use Portland cement conforming to ASTM C 150, Type I. Use water conforming to 499.02. Use mix set additives as required.

1205.03 Proportioning. Submit to the Laboratory a sample of the Binder to be used and a complete mix design prepared by an approved laboratory. Verify the compatibility of the aggregate, Binder, mineral filler, and other additives. Make the mix design with the same materials that will be used on the project.

Ensure that the mix design:

- A. Has aggregate meeting the gradation specified.
- B. Has a mineral filler content of 0.25 to 3.0 percent by dry weight of aggregate.
- C. Meets the specified properties of the following International Slurry Seal Association (ISSA) tests:

**TABLE 1205.02-2
MIX DESIGN PROPERTIES**

ISSA Test No.	Description	Specification
TB-139 (1-90)	Wet Cohesion	
	30 minutes min. (set time) 60 minutes min. (traffic)	12 kg-cm min. 20 kg-cm min or near spin
TB-106	Slurry Seal Consistency	2.0 – 3.0 cm
TB-114 (1-90)	Wet Stripping	90 percent min.
TB-100 (90)	Wet Track Abrasion Loss 1-hour soak	807 g/m ² max.
TB-144 (2-89)	Saturated Abrasion Compatibility	3 g loss max.
TB-113 (1-90)	Mix Time @ 77 °F (25 °C)	Controllable to 180 seconds (minimum)
TB-109	Excess Asphalt by LWT Sand Adhesion	538 g/ m ² max.

Check the ISSA TB-139 (set time) and ISSA TB-113 (mix time) tests at the highest temperature expected during construction. For the ISSA TB-113 test at 104 °F (40 °C), preheat all ingredients and containers.

The residual asphalt by dry weight of aggregate shall be according to table 1205.04-1

**TABLE 1205.02-3
RESIDUAL ASPHALT CONTENT
(BY DRY WEIGHT OF AGGREGATE)**

Type I	Type II	Type III
10 to 16%	7.5 to 13.5%	6.5 to 12%

Ensure that the final mix design states the following (all percentages are based on the dry weight of the aggregate):

- A. Source of each individual material.
- B. Aggregate gradation.
- C. Percentage of aggregate.
- D. Sand equivalence of the aggregate.
- E. Percentage of mineral filler (minimum and maximum).
- F. Percentage of water (minimum and maximum).
- G. Percentage of mix set additives (if required).
- H. Percentage of Binder and type.
- I. Quantitative effects of moisture content on the unit weight of the aggregate.

1205.04 Weather Limitations. Apply the mixture only when it is not raining and the existing pavement surface temperature is a minimum of 40 °F (5 °C) and there is no forecast of an atmospheric temperature below 32 °F (0 °C) within 24 hours from the time the mixture is applied. Between September 30 and May 1, do not apply the mixture if the existing pavement surface temperature is less than 50 °F (10 °C).

1205.05 Mixing Equipment. Produce the mixture in an automatic sequenced, self-propelled, continuous flow mixing machine equipment with a conveyer belt aggregate delivery system of either truck-mounted or front feed continuous loading design. Introduce the emulsion within the first one-third of the mixer length to ensure proper mixing of all materials before exit from the pugmill.

For continuous loading mixing machines, equip the machine with opposite side driving stations to allow full control of the machine from either side. Equip the mixer with a remote forward speed control at the back mixing platform so the back operator can control forward speed and level of mixture in the paving or rut box. Provide material control devices that are readily accessible and positioned so the amount of each material used can be determined at any time.

Equip the mixing machine with a water pressure system and nozzle type spray bar to provide a water spray ahead of and outside the spreader box when required. Apply water at a rate that will dampen the surface, but will not create free flowing water ahead of the spreader box.

1205.06 Equipment Calibration. Before mix production, calibrate the mixing equipment in the presence of the Engineer. Generate documentation for the Engineer, including individual calibrations of each material at various settings. Perform a new calibration if there is any change in the mix design. Supply all of the equipment, materials, and scales necessary to perform the calibration. Following calibration and adjustments for changes in the mix design, do not make any further calibration adjustments to the mixing equipment without the Engineer's approval.

1205.07 Spreading Equipment. Apply the mixture uniformly by means of a conventional spreader box.

If a rut fill course is specified, apply the mixture with a V-shaped rut filling spreader box. Equip the rut filling spreader box with a steel strike-off.

Attach either type of spreader box to the mixer and equip it with paddles mounted on an adjustable shaft to continually agitate and distribute the materials throughout the box. Ensure that the equipment provides sufficient turbulence to prevent the mix from setting in the box or causing excessive side build-up or lumps. To prevent loss of the mixture from the box, attach flexible seals, front and rear, in contact with the road. Operate the spreading equipment in such a manner as to prevent the loss of the mixture on super-elevated curves.

For surface courses, attach a secondary strike-off to the spreader.

The Contractor may use burlap drags or other drags, if necessary, to obtain the desired finish. Replace hardened drags or drags having excessive build-up.

1205.08 Maintenance of Traffic. Maintain one-lane, two way traffic on two lane streets and highways in accordance with the Contract Documents. Provide drums, traffic cones, flaggers, signs and other equipment as directed by the Engineer.

1205.09 Surface Preparation. Before applying the mixture, thoroughly clean the surface.

If required by the Contract Documents, apply a tack coat conforming to Item 407, consisting of one part asphalt emulsion and three parts water. Apply the tack coat at a rate of 0.06 to 0.12 gallon per square yard.

Remove raised pavement markers according to 621.08. The Contractor may fill the depression caused by the removal of the casting with material meeting this specification.

Remove any existing longitudinal pavement markings 740.03 (polyester), 740.04 (thermoplastic) and 740.07 (epoxy) using an abrasion method conforming to 641.10. Protect drainage structures, monument boxes, water valve, etc. during material application.

1205.10 Test Strip. Construct a test strip for the Engineer to evaluate. Construct this test strip 1000 feet long, and include all of the application courses specified. Construct the test strip at the same time of day or night the full production will be applied.

The Engineer will evaluate the completed test strip after 24 hours of traffic to determine if the mix design is acceptable. The Contractor may begin full production after the Engineer accepts the test strip.

If the slurry seal is not being applied between September 30 and May 1, the Department will waive the test strip if the Contractor has constructed a Department approved test strip this construction season with the same materials and mix design.

1205.11 Application. Apply the paving mixture in a manner to fill cracks, shallow potholes, and minor surface irregularities and achieve a uniform surface without causing skips, lumps, or tears. Carry a sufficient amount of material at all times in all parts of the spreader box to ensure complete coverage. Avoid overloading of the spreader box. Do not allow lumping, balling, or unmixed aggregate in the spreader box.

Lightly spray water ahead of the spreader box as needed to suit the surface texture, temperature, surface dryness and humidity. Do not spread mixture on pooled or standing water.

Apply paving mixtures at the rates specified in table 1205.10-1.

**TABLE 1205.10-1
APPLICATION RATE OF SLURRY SEAL**

	Pounds Per Square Yard (lb/yd ²)		
	Type I	Type II	Type III
Placed on existing surfaces	10 to 12	14 to 18	19 to 22
Placed on tack coated surface or intermediate slurry seal course	8 to 10	10 to 14	15 to 19

Provide a smooth, neat seam of 1 to 3 inches (25 to 75 mm) where two passes meet. Immediately remove excess material from the ends of each run.

Construct surface courses wide enough to cover the outside edges of rut fill and leveling courses. Maintain straight edge lines along curbs and shoulders. Do not allow runoff of these areas. Ensure that lines at intersections are straight.

Use squeegees and lutes to spread the mixture in areas inaccessible to the spreader box and areas requiring hand spreading. Lightly dampen areas to be hand worked prior to spreading the mixture. The Contractor may adjust the mix set additive to provide a slower setting time if hand spreading is needed. Do not adjust the water content to adjust the setting time. If hand spreading, pour the mixture in a small windrow along one edge of the surface to be covered and spread it uniformly by a hand squeegee or lute.

Ensure that the slurry seal cures at a rate that will permit traffic on the pavement within 2 hours after application without damaging the pavement surface. However, should the contractor have concerns about adequate cure, work out an arrangement agreeable to the project before releasing traffic on the pavement.

If there is an excessive streaking problem created by high amounts of oversize material in the mix, stop applying the mixture and take steps to correct the streaking problem. Do not resume work until the Engineer is satisfied the problem has been corrected.

If a section of pavement is not going to be exposed to traffic within 48 hours, compact it with a pneumatic tire roller after curing. Conform the pneumatic tire roller to 401.13, and inflate the tire pressure to 40 to 60 pounds per square inch.

421.12 Acceptance. Maintain continuous control of the Binder to dry aggregate proportioning to conform to the approved mix design within a tolerance of ± 2 gallons per ton. Control the spread rate to not less than the specified quantity of aggregate per square yard on a dry weight basis.

The Engineer will base acceptance of the Binder to dry aggregate proportion and spread rate on the Engineer's summary of quantities used each day. The Engineer will approve and accept a day's application of slurry seal provided:

- A. The Engineer's summary indicates conformance with the above control requirements for proportioning and spread rate and
- B. The pavement is free from excessive scratch marks, tears, rippling and other surface irregularities, longitudinal joints and lane edges coincide with any lane lines and edge lines and transverse joints are uniform, neat and provide a smooth transition.

421.13 Method of Measurement. The Department will measure Slurry Seal by the number of square yards complete and accepted in place. The Department will base the width of the pavement course on the width shown on the plans, specified in this specification, or directed

by the Engineer. The Department will measure the length along the centerline of each roadway or ramp.

The Department will measure the number of raised pavement markers removed.

421.14 Basis of Payment. The Department will not pay for materials, equipment, or labor to make corrections.

Tack coat, if required by the Contract Documents, shall be paid for according to Item 407 Tack Coat.

The cost of any removal of any existing longitudinal pavement markings according to 421.08 is incidental to Slurry Seal.

The Department will pay for removal of existing raised pavement markers according to Item 621 Raised Pavement Markers Removed.

The Department will pay for the construction of accepted test strips at the individual bid prices for the courses constructed.

The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
1205	Square Yard	Slurry Seal, Type I
1205	Square Yard	Slurry Seal, Type II
1205	Square Yard	Slurry Seal, Type III