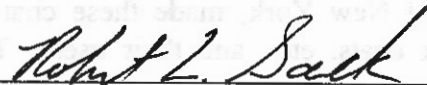


To: Superseded By EI 12-022 Effective 1/10/13		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 07-020
Title: REVISED STANDARD SPECIFICATIONS FOR SECTIONS 407 - TACK COAT, 618 - BITUMINOUS MATERIAL, AND 702 - BITUMINOUS MATERIALS			
Distribution: ☐ Manufacturers (18) ☐ Surveyors (33) ☒ Local Govt. (31) ☒ Consultants (34) ☒ Agencies (32) ☒ Contractors (39) ☐ _____ ()		Approved:  Robert L. Sack, Deputy Chief Engineer Research 1-June-07 Date	

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective with projects let on or after January 10, 2008.
- This EI does not supersede any other issuances.
- The revised specifications issued with this EI will be incorporated into the future revision of the Standard Specifications.

PURPOSE: The purpose of this EI is to revise Sections 407 - Tack Coat, 618 - Bituminous Material, and 702 - Bituminous Materials of the Standard Specifications.

TECHNICAL INFORMATION:

Section 407: Editorial changes were made to §407-3.01 *Equipment* and §407-3.02 *Application of Bituminous Materials*, to clarify and provide more detailed information.

Section 618: Additions and deletions of bituminous materials were made based on revisions to Section 702.

Section 702: The following revisions were made to this section:

- Performance-Graded (PG) Binders have to meet AASHTO M 320 *Performance-Graded Asphalt Binder*.
- Addition of RS-1h, RS-2h, CRS-1h, RS-2p, HFRS-2p, and CRS-2p emulsions which were previously under special specifications.
- Created a new Table 702-7 *Polymer-Modified Emulsions*, to separate polymer-modified emulsions from non-modified emulsions for clarity.
- Rapid setting emulsions were added to Table 702-9 *Tack Coat*, so they can be used for hot mix asphalt (HMA).
- The asphalt residue for tack coat application was increased to a minimum of 38% from 28% to improve bond between HMA layers.

IMPLEMENTATION: The Design Quality Assurance Bureau will insert the revised Sections 407, 618, and 702 into proposals let on or after January 10, 2008.

The following special specifications are disapproved:

- Item 407.011108 M - Asphalt Emulsion Fog Seal (for Median Strips)
- Item 407.011118 M - Asphalt Emulsion Fog Seal for Milled-In Audible Roadway Delineators

TRANSMITTED MATERIALS: This EI transmits the revised Sections 407, 618, and 702.

BACKGROUND: In the last few years, advancement in the development of various bituminous materials for both HMA and preventive maintenance items necessitated revising Sections 407 and 702. The Department, with the cooperation of the Liquid Asphalt Distributors Association (LADA), Inc. of New York, made these changes to improve both the quality of liquids for emulsions, tack coats, etc., and their uses. The necessary changes to these sections are as follows:

Section 407: Revisions to §407-3.01 *Equipment* and §407-3.02 *Application of Bituminous Materials* were made to improve the quality and provide more detailed information to better assist the Engineer in determining what is an acceptable application for the tack coat.

Section 618: This Section was revised based on changes made to Section 702.

Section 702: Additional grades of emulsions were added to meet the requirements of special specifications, Item 18402.06XXYY 6.3 mm, *Polymer-Modified Hot Mix Asphalt (HMA)* and Office of General Services Maintenance Contracts for *Polymer-Modified Asphalt Emulsions for Surface Treatments*.

Previously, the specification for the polymer-modified emulsions required the polymer content meet a minimum of 3%. However, the Department had no specified test requirements to assure that this minimum content was actually being met. The revised specification requires all polymer-modified emulsions meet a minimum percent of elastic recovery. Although this test requirement does not quantify the amount of polymer in the emulsions, it does assure the Department that there is sufficient presence of polymer blended in the emulsion.

CONTACT: For additional information regarding the changes to above Sections of the Standard Specifications contact Nancy Griffin or Zoeb Zavery of the Materials Bureau, Field Engineering II office. To contact Nancy Griffin telephone (518) 457-4579 or e-mail ngriffin@dot.state.ny.us and for Zoeb Zavery telephone (518) 485-5277 or e-mail zzavery@dot.state.ny.us.

TACK COAT

Page 264, *Delete* Section 407 - Tack Coat in its entirety and *replace* it with the following:

"SECTION 407 - TACK COAT

407-1 DESCRIPTION. This work shall consist of preparing and treating an existing portland cement concrete surface or hot mix asphalt surface, excluding the surface of permeable base material with tack coat in accordance with the Contract documents and as directed by the Engineer.

407-2 MATERIALS. The tack coat shall meet the requirements of Table 702-10 *Tack Coat*. This material will be sampled and tested in accordance with the Department's Materials Method (MM) 8.2 *Asphalt Emulsion - Quality Assurance*.

Rapid setting emulsions modified with chemical additives for fast breaking may be used as a tack coat at no additional cost to the state. Requests made to the Engineer to use these chemically modified rapid setting tack coats shall be done a minimum of 14 days prior to use. The Materials Bureau will be informed by the Engineer to determine if the proposed tack coat is acceptable for use.

407-3 CONSTRUCTION DETAILS.

407-3.01 Equipment. A distributor shall be used for applying tack coat. The distributor shall be capable of applying the tack coat uniformly on variable widths of surface up to 4.5 meters, with uniform pressure, and with an allowable variation from any specified rate detailed in Table 407-1 *Tack Coat Application Rates* not exceeding 0.10 L/m². Distributor equipment shall include a quantity measuring system and a thermometer for measuring temperature of tank contents. This equipment shall be calibrated within the last 12 months in accordance with ASTM D 2995 *Standard Practice for Estimating Application Rate of Bituminous Distributors*. A copy of the signed and dated calibration certification detailing the equipment by its serial number or other unique identifier shall be given to the Engineer prior to use.

Distributors shall be equipped with a power unit for the pump and full circulation spray bars shall be adjustable both laterally and vertically. An attached bristle broom designed such that it drags on the pavement behind the spray bars may be attached to the distributor. If the broom is used, it shall be adjustable laterally and vertically so that the full width of the applied tack coat is bristled uniformly into the pavement surface.

A bituminous material sampling valve shall be attached to the distributor. When samples are taken through such valves, they shall be considered representative of all material in the distributor tank. The distributor tank will be equipped with an agitator that is capable of ensuring the emulsion is homogenous. It is preferred that the asphalt emulsion stored in the distributor tank be heated and maintained at a temperature range between 30°C and 70°C.

Smaller hand operated power spray units will be permitted only in areas where the use of a distributor is impractical.

The Engineer will determine the final acceptance of all equipment used for applying the tack coat.

407-3.02 Application of Emulsion Material. The asphalt emulsion contained in the distributor tank shall be homogenous. Emulsified asphalts held in storage tanks, drums, or distributors for long periods are subject to settlement. The asphalt emulsion shall be sufficiently agitated or circulated to ensure a homogenous emulsion prior to sampling or application. The tack coat shall be applied to a prepared clean pavement and in a manner to offer the least inconvenience to traffic and to reduce pickup or tracking of the bituminous material. Upon application the material shall be as uniformly spread across the width of the designated area.

TACK COAT

The tack coat shall not be applied on a wet pavement surface or when the pavement surface temperature is below the temperature requirements outlined in Table 402-2 *Temperature and Seasonal Requirements*. The Engineer will approve the temperature and areas to be tack coated prior to application. To avoid "boil-off" of the water, the asphalt emulsion shall not be heated above 90°C. The application rate shall be as determined in Table 407-1. These are recommended application rates for tack coat on various surfaces types and may be modified by the Engineer based on prior experience.

TABLE 407-1 TACK COAT APPLICATION RATES

Surface Type	Application Rate (L/m ²)
New Hot Mix Asphalt	0.14 - 0.18
Milled Surfaces and Existing Hot Mix Asphalt	0.21 - 0.25
Portland Cement Concrete	0.17 - 0.30
Vertical Surfaces (curbs, drainage structures, and appurtenances)	0.27 - 0.32

407-4 METHOD OF MEASUREMENT. The quantity to be measured for payment will be in liters of asphalt emulsion for tack coat measured at 16°C to the nearest liter. The following formula will be used to calculate material quantity at 16°C:

$$\text{Volume}_{16^{\circ}\text{C}} = \text{Volume}_D \times [1 - (\Delta T \times 0.00045)]$$

$$\Delta T = \text{Delivered Temperature (}^{\circ}\text{C)} - 16$$

$$\text{Volume}_D = \text{Quantity Delivered (L)}$$

407-5 BASIS OF PAYMENT. The unit price bid per liter for tack coat shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment will be made under:

Item No.	Item	Pay Unit
407.0101	Tack Coat	Liter"

BITUMINOUS MATERIAL

Page 549, **Delete** Section 618 - Bituminous Material in its entirety and **replace** it with the following:

"SECTION 618 - BITUMINOUS MATERIAL

618-1 DESCRIPTION. Under this work the Contractor shall furnish and place bituminous material of the type and quantity specified on the plans or in the specifications.

618-2 MATERIALS. The bituminous materials shall meet the requirements of the following subsections of §700 - Materials and Manufacturing:

Miscellaneous Asphalt Cement (Grades 18 - 60)	702-0700
Rapid Curing Liquid Asphalts (Grade RC-70)	702-1100
Rapid Curing Liquid Asphalts (Grade RC-250)	702-1200
Rapid Curing Liquid Asphalts (Grade RC-250 with additive)	702-1300
Rapid Curing Liquid Asphalts (Grade RC-800)	702-1400
Rapid Curing Liquid Asphalts (Grade RC-800 with additive)	702-1500
Rapid Curing Liquid Asphalts (Grade RC-3000)	702-1600
Medium Curing Liquid Asphalts (Grade MC-30)	702-2000
Medium Curing Liquid Asphalts (Grade MC-70)	702-2100
Medium Curing Liquid Asphalts (Grade MC-250)	702-2200
Medium Curing Liquid Asphalts (Grade MC-250 with additive)	702-2300
Medium Curing Liquid Asphalts (Grade MC-800)	702-2400
Medium Curing Liquid Asphalts (Grade MC-3000)	702-2500
Anionic Asphalt Emulsions (Grade RS-1)	702-3001
Anionic Asphalt Emulsions (Grade RS-1h)	702-3002
Anionic Asphalt Emulsions (Grade RS-2)	702-3101
Anionic Asphalt Emulsions (Grade HFRS-2)	702-3102
Anionic Asphalt Emulsions (Grade MS-2)	702-3201
Anionic Asphalt Emulsions (Grade HFMS-2)	702-3301
Anionic Asphalt Emulsions (Grade HFMS-2h)	702-3401
Anionic Asphalt Emulsions (Grade HFMS-2s)	702-3402
Anionic Asphalt Emulsions (Grade SS-1)	702-3501
Anionic Asphalt Emulsions (Grade SS-1h)	702-3601
Polymer-Modified Asphalt Emulsions (Grade RS-2p)	702-3701
Polymer-Modified Asphalt Emulsions (Grade HFRS-2p)	702-3801
Cationic Asphalt Emulsions (Grade CRS-1)	702-4001
Cationic Asphalt Emulsions (Grade CRS-1h)	702-4002
Cationic Asphalt Emulsions (Grade CRS-2)	702-4101
Cationic Asphalt Emulsions (Grade CMS-2)	702-4201
Cationic Asphalt Emulsions (Grade CMS-2h)	702-4301
Cationic Asphalt Emulsions (Grade CSS-1)	702-4401
Cationic Asphalt Emulsions (Grade CSS-1h)	702-4501
Cationic Asphalt Emulsions (Grade CQS-1h)	702-4601
Polymer-Modified Asphalt Emulsions (Grade CRS-1p)	702-4701
Polymer-Modified Asphalt Emulsions (Grade CRS-2p)	702-4702
Polymer-Modified Asphalt Emulsions (Grade CQS-1hp)	702-4801
Synthetic Resins (Resin Binder)	702-7000
Synthetic Resins (Rapid Curing Resin Liquid)	702-7100

BITUMINOUS MATERIAL

618-3 CONSTRUCTION DETAILS. The construction details for the application of bituminous materials specified in sections 401, 402, 403, 405, 407, and 410 shall apply.

618-4 METHOD OF MEASUREMENT. The quantity to be measured for payment will be in liters of bituminous material incorporated in work, measured at 16°C to the nearest liter. The following formula will be used to calculate material quantity at 16°C:

$$\text{Volume}_{16^{\circ}\text{C}} = \text{Volume}_D \times [1 - (\Delta T \times 0.00045)]$$

$$\Delta T = \text{Delivered Temperature (}^{\circ}\text{C)} - 16$$

$$\text{Volume}_D = \text{Quantity Delivered (L)}$$

618-5 BASIS OF PAYMENT. The unit price bid per liter for bituminous material used shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment will be made under:

Item No.	Item	Pay Unit
618.07	Miscellaneous Asphalt Cement (Grades 18 - 60)	Liter
618.11	Rapid Curing Liquid Asphalts (Grade RC-70)	Liter
618.12	Rapid Curing Liquid Asphalts (Grade RC-250)	Liter
618.13	Rapid Curing Liquid Asphalts (Grade RC-250 with additive)	Liter
618.14	Rapid Curing Liquid Asphalts (Grade RC-800)	Liter
618.15	Rapid Curing Liquid Asphalts (Grade RC-800 with additive)	Liter
618.16	Rapid Curing Liquid Asphalts (Grade RC-3000)	Liter
618.20	Medium Curing Liquid Asphalts (Grade MC-30)	Liter
618.21	Medium Curing Liquid Asphalts (Grade MC-70)	Liter
618.22	Medium Curing Liquid Asphalts (Grade MC-250)	Liter
618.23	Medium Curing Liquid Asphalts (Grade MC-250 with additive)	Liter
618.24	Medium Curing Liquid Asphalts (Grade MC-800)	Liter
618.25	Medium Curing Liquid Asphalts (Grade MC-3000)	Liter
618.3001	Anionic Asphalt Emulsions (Grade RS-1)	Liter
618.3002	Anionic Asphalt Emulsions (Grade RS-1h)	Liter
618.3101	Anionic Asphalt Emulsions (Grade RS-2)	Liter
618.3102	Anionic Asphalt Emulsions (Grade HFRS-2)	Liter
618.3201	Anionic Asphalt Emulsions (Grade MS-2)	Liter
618.3301	Anionic Asphalt Emulsions (Grade HFMS-2)	Liter
618.3401	Anionic Asphalt Emulsions (Grade HFMS-2h)	Liter
618.3402	Anionic Asphalt Emulsions (Grade HFMS-2s)	Liter
618.3501	Anionic Asphalt Emulsions (Grade SS-1)	Liter
618.3601	Anionic Asphalt Emulsions (Grade SS-1h)	Liter
618.3701	Polymer-Modified Asphalt Emulsions (Grade RS-2p)	Liter
618.3801	Polymer-Modified Asphalt Emulsions (Grade HFRS-2p)	Liter
618.4001	Cationic Asphalt Emulsions (Grade CRS-1)	Liter
618.4002	Cationic Asphalt Emulsions (Grade CRS-1h)	Liter
618.4101	Cationic Asphalt Emulsions (Grade CRS-2)	Liter
618.4201	Cationic Asphalt Emulsions (Grade CMS-2)	Liter
618.4301	Cationic Asphalt Emulsions (Grade CMS-2h)	Liter
618.4401	Cationic Asphalt Emulsions (Grade CSS-1)	Liter

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618.4501	Cationic Asphalt Emulsions (Grade CSS-1h)	Liter
618.4601	Cationic Asphalt Emulsions (Grade CQS-1h)	Liter
618.4701	Polymer-Modified Asphalt Emulsions (Grade CRS-1p)	Liter
618.4702	Polymer-Modified Asphalt Emulsions (Grade CRS-2p)	Liter
618.4801	Polymer-Modified Asphalt Emulsions (Grade CQS-hp)	Liter
618.70	Synthetic Resins (Resin Binder)	Liter
618.71	Synthetic Resins (Rapid Curing Resin Liquid)	Liter"

BITUMINOUS MATERIALS

Page 727, **Delete** Section 702 - Bituminous Materials in its entirety and **replace** it with the following:

"SECTION 702 - BITUMINOUS MATERIALS

SCOPE. These specifications cover the material requirements and methods of testing bituminous materials classified into the following groups:

1. Performance-Graded (PG) Binders for Paving.
2. Miscellaneous Asphalt Cements.
3. Rapid and Medium Curing Liquid Asphalts.
4. Anionic, Cationic, and Polymer-Modified Asphalt Emulsions.
5. Synthetic Resins.
6. Asphalt Emulsion Tack Coat.

GENERAL. The bituminous material volume shall be measured at 16°C. The specific gravity at 16°C shall be included with each shipment of bituminous material to a plant or project site.

MATERIAL REQUIREMENTS. Bituminous materials shall meet the following requirements.

1. Performance-Graded (PG) Binders for Paving. PG Binder, designated PG XX-YY, is defined as the range of pavement temperatures expressed in degrees Celsius, maximum to minimum, over which the PG Binder can be expected to provide acceptable performance. The PG Binder shall be prepared from refining crude petroleum by suitable methods with the addition of a modifier, if necessary, to meet the required performance-grade. PG Binders shall meet the requirements of AASHTO M 320 *Standard Specification for Performance-Graded Asphalt Binder* and Table 702-1 *Performance-Graded Binders for Paving*. The PG Binder supplier shall certify that the PG Binder meets NYSDOT quality requirements for a Primary Source appearing on the Department's Approved List of Performance-Graded Binders for Paving. If the PG binder is modified, the supplier shall include type of modification and any special handling instructions in the certification. The PG Binder supplier shall provide the design mixing and compaction temperatures on a Form BR 320, *SUPERPAVE Performance Graded Binder Temperature Viscosity Data*. Also, the supplier shall provide AASHTO M 320 test data and all necessary shipping documents in accordance with the Department's Materials Method (MM) 8.1 *Quality Assurance Procedure for Performance-Graded (PG) Asphalt Binders*.

TABLE 702-1 PERFORMANCE-GRADED BINDERS FOR PAVING						
MATERIAL DESIGNATION	702-5828	702-5834	702-6422	702-6428	702-7022	702-7622
PERFORMANCE-GRADE	PG 58		PG 64		PG 70	PG 76
	28	34	22	28	22	22
Test Requirements	AASHTO M 320					

Silicone additives will be permitted in paving binders. Silicone may be introduced into the PG Binder in accordance with the manufacturer's recommendations either at the refinery, terminal, or at a mixing plant storage tank. PG Binder treated with silicone shall conform to the specifications for untreated PG Binder.

Any PG Binder previously approved that has been stored in the mixing plant tank over the winter shall be re-sampled and accepted by the Department before it is used.

BITUMINOUS MATERIALS

2. Miscellaneous Asphalt Cements. Asphalt cements shall meet the requirements in Table 702-2 *Miscellaneous Asphalt Cements*. The asphalt cement shall be homogenous, free from water, and shall not foam when heated to 175°C. The supplier shall maintain the identity of the asphalts in accordance with the Department's written instructions from the point of refining to the point where the asphalt is incorporated into the work. Test data and shipping documents shall be provided by the supplier in accordance with the Department's Materials Method (MM) 8.3 *Liquid Asphalts (Rapid and Medium Curing), Miscellaneous Asphalt Cements (Fillers), and Synthetic Resins – Quality Assurance*.

TABLE 702-2 MISCELLANEOUS ASPHALT CEMENTS		
MATERIAL DESIGNATION	702-0700	
GRADES	18 - 60	
Test Requirements	Minimum	Maximum
Penetration, 25°C, 100 g, 5 second (AASHTO T 49)	18	60
Flash Point, COC, °C (AASHTO T 48)	200	-
Solubility in trichloroethylene, % (AASHTO T 44)	99.5	-
Softening Point, °C (AASHTO T 53)	55	75
Loss on Heating, 163°C, 5 hour, % (AASHTO T 47)	-	1.0
Penetration of Residue, % of Original (AASHTO T 49)	60	-
Ductility, 25°C, 5 cm/minute, cm (AASHTO T 51)	5	-
Typical Uses	Joint and Crack Filler	

3. Rapid and Medium Curing Liquid Asphalts. Rapid and Medium Curing liquid asphalts shall meet the requirements in Table 702-3 *Rapid Curing Liquid Asphalts* and Table 702-4 *Medium Curing Liquid Asphalts*, respectively.

TABLE 702-3 RAPID CURING LIQUID ASPHALTS				
MATERIAL DESIGNATION	702-1100	702-1200 and 702-1300 ⁽¹⁾	702-1400 and 702-1500 ⁽¹⁾	702-1600
GRADE	RC-70	RC-250	RC-800	RC-3000
Test Requirements	ASTM D 2028 or AASHTO M 81			

- Material Designations 702-1300 and 702-1500 shall contain an anti-stripping additive and meet the stone coating requirements.

TABLE 702-4 MEDIUM CURING LIQUID ASPHALTS					
MATERIAL DESIGNATION	702-2000	702-2100	702-2200 and 702-2300 ⁽¹⁾	702-2400	702-2500
GRADE	MC-30	MC-70	MC-250	MC-800	MC-3000
Test Requirements	ASTM D 2027 or AASHTO M 82				

- Material Designation 702-2300 shall contain an anti-stripping additive and meet the stone coating requirements.

The liquid asphalts shall show no separation or curdling prior to use and shall not foam when heated to the application temperature.

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When required, an anti-stripping additive shall be added to the bituminous material to cause it to coat and adhere more effectively to wet and unheated aggregates. The additive shall have no deleterious effect upon the bituminous material and shall be completely miscible and thoroughly blended throughout the bituminous materials. The anti-stripping additive shall be added to the bituminous material only during the process when the asphalt cement and the solvent materials are blended to make the liquid asphalt. Material containing an anti-stripping additive shall conform to the specifications for untreated material.

4. Anionic, Cationic, and Polymer-Modified Asphalt Emulsions. The emulsion shall be homogeneous and show no separation of asphalt, after thoroughly mixing, within 30 days after delivery, provided separation has not been caused by freezing. Emulsified asphalts held in storage tanks, drums, or distributors for long periods are subject to settlement. The asphalt emulsion shall be agitated or circulated amply to ensure a homogenous emulsion prior to sampling or application of material. Material that has separated due to freezing is unacceptable at anytime. During production of polymer-modified emulsions, the polymer modifier shall be milled or blended into the base asphalt or emulsifying agent prior to the emulsification process.

Asphalt emulsions shall meet the requirements shown in Table 702-5 *Anionic Asphalt Emulsions*, Table 702-6 *Cationic Asphalt Emulsions*, or Table 702-7 *Polymer-Modified Emulsions*. Test data and shipping documents shall be provided by the supplier in accordance with the Department's Materials Method (MM) 8.2 *Asphalt Emulsion – Quality Assurance*.

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TABLE 702-5 ANIONIC ASPHALT EMULSIONS

TYPE	RAPID SETTING						MEDIUM SETTING						SLOW SETTING					
	702-3001		702-3002		702-3101		702-3102		702-3201		702-3301		702-3401		702-3501		702-3601	
MATERIAL DESIGNATION	RS-1		RS-1h		RS-2		HFRS-2		MS-2		HFMS-2		HFMS-2h		SS-1		SS-1h	
GRADE	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Tests Requirements																		
Emulsion:																		
Viscosity, Saybolt Furol, 25°C, second	20	100	20	100	-	-	-	-	100	-	100	-	100	-	20	100	20	100
Viscosity, Saybolt Furol, 50°C, second	-	-	-	-	75	400	75 ^(b)	400 ^(b)	100 ^(b)	400 ^(b)	100	400	-	-	-	-	-	-
Storage Stability Test, 1 Day (Difference in % Residue)	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1
Demulsibility, 35 ml, 0.02 N, CaCl ₂ , %	60	-	60	-	60	-	60	-	-	-	-	-	-	-	-	-	-	-
Cement Mixing Test, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sieve Test, %	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10
Residue by Distillation, %	55	-	55	-	63	-	63	-	65	-	65	-	65	-	57	-	57	-
Oil Distillate, Volume Total Emulsion, %	-	2	-	2	-	3	-	3	-	10	-	10	-	3	-	10	-	-
Residue from Distillation Test:																		
Penetration, 25°C, 100 g, 5 second	100	200	40	90	100	200	100	200	100	200	100	200	40	90	100	200	40	90
Ductility, 25°C, 5 cm/minute, cm	40	-	40	-	40	-	40	-	40	-	40	-	40	-	40	-	40	-
Solubility in trichloroethylene, %	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-
Float Test, ^(b) 60°C, second	-	-	-	-	-	-	1200	-	-	-	1200	-	1200	-	-	-	-	-
Suggested Temperature Range:																		
Mixing, °C	-	-	-	-	-	-	-	-	40	75	40	75	25	75	25	75	25	75
Spraying, °C	25	60	25	60	55	75	55	75	55	75	55	75	25	75	25	75	25	75
Typical Applications:⁽³⁾	Spray Patch		Tack Coat for HMA		Surface Treatment		Base and Shoulder Stabilization, Cold Mixes, Shoulder Seal		Hot & Cold Mixes		Stockpile Patching Mix		Base and Shoulder Stabilization					

Notes:

1. This viscosity requirement at 50°C applies to emulsion used for shoulder sealing.
2. Float Test AASHTO T 50, except that the residue from distillation shall be poured immediately into the float collar at 260°C.
3. These typical applications are intended only as a guide for selecting the proper emulsion grade.
4. The cement mixing test is waived if this grade of emulsion is used for stabilization.

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TABLE 702-6 CATIONIC ASPHALT EMULSIONS

TYPE	RAPID SETTING				MEDIUM SETTING				SLOW SETTING				QUICK SETTING	
	702-4001	702-4002	702-4101	702-4101	702-4201	702-4301	702-4401	702-4501	702-4601	702-4701	702-4801	702-4901	702-5001	702-5101
GRADE	CRS-1	CRS-1h	CRS-2	CRS-2	CMS-2	CMS-2h	CSS-1	CSS-1h	CSS-1h	CSS-1h	CSS-1h	CSS-1h	CSS-1h	CSS-1h
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Test Requirements	20	100	20	100	20	100	20	100	20	100	20	100	20	100
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	1	-	1	-	1	-	1	-	1	-	1	-	1
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emulsion:	Passes				Passes				Passes				Passes	
Viscosity, Saybolt Furol, 25°C, second	20	100	20	100	20	100	20	100	20	100	20	100	20	100
Viscosity, Saybolt Furol, 50°C, second	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Storage Stability Test, 1 Day (Difference in % Residue)	-	1	-	1	-	1	-	1	-	1	-	1	-	1
Classification Test	Positive				Positive				Positive				Positive	
Particle Charge Test	Positive				Positive				Positive				Positive	
Sieve Test, %	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10
Cement Mixing Test, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residue by Distillation, %	60	-	60	-	65	-	65	-	65	-	65	-	62	-
Oil Distillate, Volume Total Emulsion, %	-	3	-	3	-	12	-	12	-	12	-	12	-	-
Residue from Distillation Test:	100				100				100				100	
Penetration, 25°C, 100 g, 5 second	40	-	40	-	40	-	40	-	40	-	40	-	40	-
Ductility, 25°C, 5 cm/minute, cm	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-
Solubility in trichloroethylene, %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suggested Temperature Range:	25				25				25				25	
Mixing, °C	60				60				60				60	
Spraying, °C	25				25				25				25	
Typical Applications: ⁽²⁾	Spray Patch				Tack Coat for HMA				Surface Treatment				Base and Shoulder Stabilization	
	Quick-Set Shurry Seal				Quick-Set Shurry Seal				Quick-Set Shurry Seal				Quick-Set Shurry Seal	

Notes:

1. If the Particle Charge Test result is inconclusive, material having a maximum pH value of 6.7 will be acceptable.
2. These typical applications are intended only as a guide for selecting the proper emulsion grade.
3. The cement mixing test is waived if this grade of emulsion is used for stabilization.

BITUMINOUS MATERIALS

TABLE 702-7 POLYMER-MODIFIED ASPHALT EMULSIONS										
TYPE	RAPID SETTING								QUICK SETTING	
MATERIAL DESIGNATION	ANIONIC				CATIONIC				CATIONIC	
	702-3701		702-3801		702-4701		702-4702		702-4801	
GRADE	RS-2p		HFRS-2p		CRS-1p		CRS-2p		CQS-1hp	
Test Requirements	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Emulsion:										
Viscosity, Saybolt Furol, 25°C, second	—	—	—	—	20	100	—	—	20	100
Viscosity, Saybolt Furol, 50°C, second	75	400	75	400	—	—	100	400	—	—
Storage Stability Test, 1 Day (Difference in % Residue)	—	1	—	1	—	1	—	1	—	1
Classification Test	---		---		Passes		Passes		---	
Particle Charge Test	---		---		Positive ⁽³⁾		Positive		Positive ⁽³⁾	
Sieve Test, %	—	0.10	—	0.10	—	0.10	—	0.10	—	0.10
Demulsibility (ASTM D 244)	60	—	60	—	40	—	40	—	—	—
Ring and Ball Softening Point, °C ⁽⁷⁾	—	—	—	—	—	—	—	—	57	—
Residue by Distillation, % ⁽⁵⁾	63	—	63	—	60	—	65	—	62	—
Oil Distillate, Volume Total Emulsion, %	—	3	—	3	—	3	—	3	—	—
Residue from Distillation Test:										
Penetration, 25°C, 100 g, 5 second	100	200	100	200	100	250	100	250	40	90
Ductility, 25°C, 5 cm/minute, cm	40	—	40	—	40	—	40	—	40	—
Solubility in trichloroethylene, %	97.5	—	97.5	—	97.5	—	97.5	—	97.5	—
Float Test, ⁽²⁾ 60°C, second	—	—	1200	—	—	—	—	—	—	—
Elastic Recovery at 10°C ^(1,5) , %	50	—	50	—	50	—	50	—	40 ⁽⁶⁾	—
Suggested Temperature Range:										
Mixing, °C	—	—	—	—	—	—	—	—	—	—
Spraying, °C	55	75	55	75	—	—	55	75	—	—
Typical Applications: ⁽⁴⁾	Surface Treatment				Paver-Placed Surface Treatment		Surface Treatment		Micro-Surfacing	

Notes:

1. Elastic recovery procedure: Use ASTM D 6084 Testing Procedure "A." Samples will be tested at 10°C.
2. Float test AASHTO T 50, except that the residue from distillation shall be poured immediately into the float collar at 260°C.
3. If the Particle Charge Test result is inconclusive, material having a maximum pH value of 6.7 will be acceptable.
4. These typical applications are intended only as a guide for selecting the proper emulsion grade.
5. According to ASTM D 6997 except as modified, when the lower temperature reaches approximately 135°C move the ring burner approximately level with the bottom of the still. Increase the temperature to a maximum 177°C ± 5.5°C maintaining this temperature for 15 minutes.
6. Test results within the range of 35 and 40 will be further evaluated by the Materials Bureau for substantial conformance to the specification.
7. According to AASHTO T 53.

5. Synthetic Resins. The synthetic resins covered under these specifications are two types: synthetic resin binder and rapid curing synthetic resin liquid. The synthetic resin binder is a light insensitive liquid used in the colored synthetic resin binder concrete. The rapid curing synthetic resin liquid is a tack coat for the resin binder concrete and shall be light colored and compatible with the resin binder concrete placed over it.

The synthetic resin shall be homogeneous and shall meet the requirements in Table 702-8 *Synthetic Resins*.

BITUMINOUS MATERIALS

TABLE 702-8 SYNTHETIC RESINS				
TYPE	Resin Binder		Rapid Curing Resin Liquid	
MATERIAL DESIGNATION	702-7000		702-7100	
Test Requirements	Min.	Max.	Min.	Max.
Penetration, 25°C, 100 g, 5 second	75	100	-	-
Viscosity, 60°C, m ² /s (x 10 ⁻⁶)	-	-	8	30
Flash Point, COC, °C	204	-	-	-
Solubility in trichloroethylene, %	99.5	-	99.5	-
Loss of Heating, 163°C, 5 hr., %	-	1.0	-	-
Water, %	-	0.0	-	0.2
Color, (30% binder/70% toluene) Gardner Standard Color Scale, (ASTM D 1544)	-	16	-	-
Test on Residue from Thin Film Oven Test, (AASHTO T 179) Penetration, % of Original	47	-	-	-
Residue from Evaporation, 105°C, 3 hr., (ASTM D 1644), %	-	-	50	-
Suggested Spraying Temperature, °C	-	-	10	50
Typical Uses	Hot Plant Mix		Tack Coat	

6. Asphalt Emulsion Tack Coat. Tack coat emulsions held in storage tanks, drums, or distributors for long periods are subject to settlement. The tack coat emulsion shall be agitated or circulated amply to ensure a homogenous emulsion prior to sampling or application of material. Material that has separated due to freezing is unacceptable at anytime. The consistency of the tack coat shall be appropriate for pumping, sampling, and give uniform spray coverage.

Only the grades of emulsions detailed in Table 702-9 *Grades of Asphalt Emulsions Used for Tack Coats* shall be allowed in tack coat applications. Use of any other tack coat material requires prior approval by the Director, Materials Bureau on a project by project basis. Tack coat shall meet the requirements in Table 702-10 *Tack Coat*. These tack coats shall be produced by diluting these asphalt emulsion grades with an emulsifier and/or water and thoroughly mixing into a homogeneous liquid.

TABLE 702-9 GRADES OF ASPHALT EMULSIONS USED FOR TACK COATS		
ASPHALT EMULSION	GRADE	TACK COAT MATERIAL DESIGNATION
Anionic (Table 702-5)	RS-1h	702-9000
	HFMS-2h	702-9001
	SS-1h	702-9002
Cationic (Table 702-6)	CSS-1h	702-9003
	CRS-1h	702-9004

BITUMINOUS MATERIALS

TABLE 702-10 TACK COAT		
MATERIAL DESIGNATION	702-90XX ⁽¹⁾	
Test Requirements	Min.	Max.
Sieve Test, %	–	0.10
Residue by Distillation, %	38	45
Oil Distillate, Volume of Total Emulsion, %	–	2
Test on Residue from Distillation: Penetration, 25°C, 100 g, 5 second	40	90
Suggested Spraying Temperature, °C	25	65

1. XX = 00, 01, 02, 03, or 04.

BASIS OF APPROVAL. The procedural directives for sampling, testing, and certifying the bituminous material, and for achieving and maintaining Approved List status, are available from the Materials Bureau.

BASIS OF ACCEPTANCE. Acceptance of the bituminous material is based on the name of the primary source appearing on the Approved List for the specific group of bituminous material and satisfactory test results from samples taken at the location where the material is incorporated into the work. A primary source is defined as a firm that samples, tests, and certifies that the bituminous material is in conformance with the specifications.”