The Standard Specifications are revised as follows:
SECTION 902, DELETE LINES 1 THROUGH 284.

SECTION 902, AFTER LINE 285, INSERT AS FOLLOWS:

SECTION 902 – ASPHALT MATERIALS

902.01 Asphalt. *Asphalt is defined as a cementatious material obtained from petroleum processes. Asphalts shall be sampled and tested in accordance with the applicable requirements of 902.02.*

(a) Performance Graded Asphalt Binders. *Performance graded asphalt binders shall be supplied by an approved suppler in accordance with ITM 581.*

Performance graded, PG asphalt binders shall be in accordance with the following:

GRADE	*PG 58-28*	*PG 64-22*	*PG 64-28*	*PG 70-22*	*PG 70-28*	*PG 76-22*
ORIGINAL BINDER						
Flash Point, minimum °C		*230*				
Viscosity, maximum, 3 Pa·s, Test Temp., °C		*135*				
DSR, G/sin δ (delta), minimum, 1.00 kPa, Test Temp. @ 10 rad/s, °C*	*58*	*64*	*64*	*70*	*70*	*76*
ROLLING THIN FILM OVER RESIDUE						
Mass Loss, maximum, %		*1.00*				
DSR, G/sin δ (delta), minimum, 2.20 kPa, Test Temp. @ 10 rad/s, °C*	*58*	*64*	*64*	*70*	*70*	*76*
PRESSURE AGING VESSEL (PAV) RESIDUE						
PAV Aging Temperature °C (Note 1)	*100*	*100*	*100*	*100*	*100*	*100*
*DSR, G*sin δ (delta), maximum, 5000 kPa, Test Temp. @ 10 rad/s, °C*	*19*	*25*	*22*	*28*	*25*	*31*
Physical Hardening (Note 2)		*Report*				
Creep Stiffness, S, maximum, 300 MPa, m-value, minimum, 0.300 Test Temp. @ 60 s, °C	*-18*	*-12*	*-18*	*-12*	*-18*	*-12*

NOTES 1. Oven temperature tolerance shall be ± 0.5°C.
2. Physical Hardening is performed on a set of asphalt beams according to AASHTO T 313, Section 12.1, except the conditioning time is extended to 24 h ± 10 min at 10°C above the minimum performance temperature. The 24 h stiffness and m-value are reported for information purposes only.

1. Appeals. *If the Contractor does not agree with the acceptance test results for the lot, a request may be made in writing for additional testing. The appeal shall be submitted within 30 calendar days of receipt of the Department's written results. The basis of the appeal shall include complete AASHTO M 320 test results for the specific sublot in question plus test values from all other sublots for the parameters being disputed.*

If an appeal is accepted, the Department will randomly select two additional sublot samples if available from the lot in question. The additional sublot samples if available and the backup sample will be tested in an AASHTO accredited laboratory for the failing test parameters. The backup and additional test results for each test will be averaged. The average value for each test will be considered the final lot value. The Contractor will be notified in writing of the additional test results, the final lot values, and the appeal conclusions.

If the appeal is not accepted, the Department will respond to the Contractor stating the grounds for the denial.

(b) Asphalt Emulsions. *Asphalt emulsions shall be composed of an intimate homogeneous suspension of a base asphalt, an emulsifying agent, and water. Asphalt emulsions may contain additives to improve handling and performance characteristics. Failure of an emulsion to perform satisfactorily in the field shall be cause for rejection, even though it passes laboratory tests. The grade used shall be in accordance with the table for asphalt emulsions as shown herein.*

AE-90 is a medium-breaking, moderate penetration, high-asphalt content type, intended for hot and cold plant mixing, road mixing, and seal coats or as otherwise specified.

AE-90S is a rapid setting, anionic type emulsion for seal coat applications.

AE-150 is a medium-breaking, moderately soft penetration type, intended for use in surface treating, tack coats, and coating open and dense graded aggregate, or as otherwise specified.

AE-150-L is a medium-breaking, relatively low-viscosity type. It may be specified in lieu of AE-T or AE-150 when a softer asphalt or greater aggregate penetration is desired. AE-150-L is suitable for sand seals.

AE-PL is a medium-slow-breaking, low-viscosity, low-asphalt content type, intended for use as a prime or as dust palative.

AE-T is a medium-breaking, comparatively low penetration type, intended for tack coats, seed mulching, or as otherwise specified.

HFRS-2 is a quick-breaking, high-viscosity, high-float, relatively high asphalt content type, intended for seal coats.

RS-2 is a quick-breaking, high-viscosity, relatively high-asphalt content type, intended for seal coats.

AE-PMP is a polymerized modified asphalt emulsion intended for use as a prime coat material.

AE-PMT is a polymerized modified asphalt emulsion intended for use as a tack coat material.

360 *The requirements for asphalt emulsions shall be in accordance with the following:*

Characteristic (1) (2)	*Test Method*	*RS-2*	*HFRS-2*	*AE-90*	*AE-90S*	*AE-T*	*AE-150*	*AE-150L*	*AE-PL*	*AE-PMT (6)*	*AE-PMP (6)*
Test on Emulsion											
Viscosity, Saybolt Furol at 25°C, min.	*AASHTO T 72*			*50*			*50*				*20+*
Viscosity, Saybolt Furol at 25°C, max.	*AASHTO T 72*					*100*		*100*	*115*	*100*	
Viscosity, Saybolt Furol at 50°C, min.	*AASHTO T 72*	*75*	*75*		*50*		*75*				
Viscosity, Saybolt Furol at 50°C, max.	*AASHTO T 72*	*400*	*400*				*300*				
Demulsibility w/35 mL, 0.02N CaC12, %, min.	*AASHTO T 59*	*50*	*50*		*30*						
Demulsibility w/50 mL, 0.10N CaC12, %, min.	*AASHTO T 59*			*75*		*75*				*25+*	*25+*
Oil Distillate by Distillation, mL/100 g Emul. (3)	*AASHTO T 59*	*4.0*	*4.0*	*4.0*	*3.0*	*4.0*	*7.0*	*7.0*	*3.0*	*3.0*	*3.0*
Residue by Distillation, %, min.	*AASHTO T 59*	*68*	*68*	*68*	*65 (5)*	*54*	*68*	*60*	*30*		
Residue by Distillation, %, max.	*AASHTO T 59*					*62*		*65*			
Sieve Test, %, max.	*AASHTO T 59*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*
Penetrating Ability, mm, min.	*902.02(w)*								*6*		
Stone Coating Test, %	*902.02(t)3a*			*90*			*90*	*90*			
Settlement, %, max.	*AASHTO T 59*	*5*	*5*	*5*							
Storage Stability, %, max.	*AASHTO T 59*				*1*						
Asphalt Content by Distillation at 204°C, %, min.										*54*	*45*
Asphalt Content by Distillation at 204°C, %, max.										*62*	
Tests on Residue											
Penetration (0.1 mm) at 25°C, 100g, 5 s, min. (4)	*AASHTO T 49*	*100*	*100*	*100*	*90*	*50*				*50*	*300+*
Penetration (0.1 mm) at 25°C, 100g, 5 s, max. (4)	*AASHTO T 49*	*200*	*200*	*200*	*150*	*200*				*200*	
Penetration (0.1 mm) at 25°C, 50g, 5 s, min. (4)	*AASHTO T 49*						*100*	*100*			
Penetration (0.1 mm) at 25°C, 50g, 5 s, max. (4)	*AASHTO T 49*						*300*	*300*			
Ductility at 25°C, mm, min.	*AASHTO T 51*	*400*	*400*	*400*		*400*					
Solubility in Org. Sol., %, min.	*AASHTO T 44*	*97.5*	*97.5*	*97.5*	*97.5*	*97.5*	*97.5*	*97.5*	*97.5*	*97.5*	*97.5*
Float Test at 50°C, s, max. (4)	*AASHTO T 50*										
Float Test at 60°C, s, min. (4)	*AASHTO T 50*		*1200*	*1200*	*1200*	*1200*	*1200*	*1200*			
Force Ratio	*AASHTO T 300*				*0.3*						
Elastic Recovery, at 4°C	*AASHTO T 301*				*58*						
Polymer Content by Infrared										*1.5+*	*1.5+*

NOTES: (1) Broken samples or samples more than 10 days old will not be tested.

(2) Combined percentage of the residue and oil distillate by distillation shall be at least 70% (note the different units – ml for oil and % for residue).

(3) Oil distillate shall be in accordance with ASTM D 396, table 1, grade no. 1.

(4) The Engineer may waive the test.

(5) Maximum temperature to be held for 15 minutes 200 ± 5°C.

(6) Asphalt shall be polymerized prior to emulsification.

370 ***(c) Cutback Asphalts.*** *Cutback asphalts shall be composed of an intimate homogeneous mixture of an asphalt base and a suitable distillate designed for medium, or slow curing. Cutback asphalts may also contain an additive as an aid in uniformly coating wet, damp, or dry aggregates used in patching mixtures or HMA pavements. These asphalts shall not contain more than 0.3% water as determined by AASHTO T 55, shall not separate when allowed to stand, and shall not foam when heated to permissible temperatures. When an additive is used, it shall be incorporated homogeneously in the asphalt at the point of manufacture. The temperature of the cutback asphalt shall not be higher than shown for that grade in 902.03.*

380 ***1. Medium Curing Asphalts With and Without Additives.*** *Medium curing asphalts with and without additives shall be in accordance with the following:*

Characteristics	Grades			
	MC-70 MCA-70	MC-250 MCA-250	MC-800 MCA-800	MC-3000 MCA-3000
Flash Point (Open Tag.), °C[4]	38+	66+	66+	66+
Kinematic Viscosity at 60°C (cSt.)[2]	70-140	250-500	800-1600	3000-6000
Saybolt-Furol Viscosity at 50°C (s)	60-120			
Saybolt-Furol Viscosity at 60°C (s)		125-250		
Saybolt-Furol Viscosity at 83°C (s)			100-200	300-600
Distillation[1]				
Distillate (% of total distillate to 360°C MC-70 @ 225°C):				
to 225°C	0-20	0-10		
to 260°C	20-60	15-55	35+	15+
to 316°C	65-90	60-87	45-80	15-75
Residue from distillation to 360°C (volume % by difference)	55+	67+	75+	80+
Tests on Residue from Distillation:[1]				
Penetration, 25°C, 100 g, 5 s - (0.1 mm)				
(without additive)	120-250	120-250	120-250	120-250
(with additive)	120-300	120-300	120-300	120-300
Ductility, 25°C (10 mm)[3]	100+	100+	100+	100+
Solubility in organic solvents, %	99.5+	99.5+	99.5+	99.5+

(1) Test may be waived when approved.
(2) Viscosity may be determined by either the Saybolt-Furol or Kinematic test. In case of dispute, the Kinematic viscosity test shall prevail.
(3) If the ductility at 25°C is less than 100, the material will be acceptable if its ductility at 16°C is 100+.
(4) Flash point by Cleveland Open Cup may be used for products having a flash point greater than 80°C.

2. Slow Curing Asphalts With and Without Additives. *Slow curing*
390 *asphalts with and without additives shall be in accordance with the following:*

Characteristics	Grades			
	SC-70 SCA-70	SC-250 SCA-250	SC-800 SCA-800	SC-3000 SCA-3000
Flash Point (Cleveland Open Cup), (°C)	66+	79+	93+	107+
Kinematic Viscosity at 60°C (cSt)(2)	70-140	250-500	800-1600	3000-6000
Saybolt-Furol Viscosity at 50°C (s)	60-120			
Saybolt-Furol Viscosity at 60°C (s)		125-250		
Saybolt-Furol Viscosity at 83°C (s)			100-200	300-600
Distillation(1)				
Total Distillate to 360°C (% by volume)	10-30	4-20	2-12	5
Float Test of Distillation Residue at 50°C (s)	20-100	25-110	50-140	75-200
Ductility of Asphalt Residue at 25°C (10 mm)(1)	100+	100+	100+	100+
Solubility in organic solvents, %(1)	99.5+	99.5+	99.5+	99.5+

(1) Test may be waived when approved.
(2) Viscosity may be determined by either the Saybolt-Furol or Kinematic test. In case of dispute, the Kinematic viscosity test shall prevail.

(d) Utility Asphalt. The asphalts shall be uniform in character and shall not foam when heated to 177°C (350°F). Utility asphalts shall be in accordance with the following:

Characteristics/Grades	UA-I	UA-II	UA-III
Softening Point (Ring & Ball), °C	46-63	63-85	79.5-96
Penetration of Original Samples(1) (0.1 mm)			
at 4°C, 200 g, 60, s Min.	10	10	10
at 25°C, 100 g, 5 s	50-100	25-45	15-35
at 46°C, 50 g, 5 s	100 Min.	130 Max.	90 Max.
Ductility @ 25°C, 50 mm/min, 10 mm, Min.(1)	30	10	2.5
Solubility in Organic Solvents, percent, Min.(1)	99.0	99.0	99.0
Flash Point (Cleveland Open Cup), °C, Min.(1)	225	225	225
Penetration of Residue from Thin Film Oven Test, 25°C, 100 g, 5 s, (0.1 mm) Min.(1)	30	15	10

(1) Test will be performed when complete physical characteristics are needed or desired.

400

(e) Asphalt for Coating Corrugated Metal Pipe. Asphalt for coating corrugated metal pipe shall be in accordance with the following:

Physical Properties	Minimum	Maximum
Softening Point (Ring & Ball), °C	93	110
Penetration of Original Samples (0.1 mm)		
at 4°C, 200 g, 60 s, Min.	20	
at 25°C, 100 g, 5 s	35(1)	
Solubility In Organic Solvents, %	99.0	
Flash Point (Cleveland Open Cup), °C	232	
Flow Test, mm		6.4
Shock Test	3 of 4 specimens shall pass	

(1) May be 30 minimum provided all four shock test specimens pass.

902.02 Sampling and Testing Asphalt Materials. *The tests and AASHTO reference are as follows:*

(a) Sampling Bituminous Materials ……AASHTO T 40
The following exceptions to AASHTO T 40 shall apply:

1. *Samples may be obtained at any time before material is incorporated into the work.*

2. *Samples for all grades of asphalt emulsion shall be a minimum of 1.9 L (1/2 gal.). The size of samples of other liquid material may be 1.0 L (1 qt).*

3. *Samples of liquid materials shall be obtained ~~as follows~~ at one of the following :*

   a. *bulk storage tanks from ~~approved~~ sampling valves located in the tank or line and asphalt plant storage tanks from ~~approved~~ sampling valves located in the tank*

   b. *transports from ~~approved~~ sampling valves*

   c. *distributors from ~~approved sampling~~ valves*

   d. *other storage or locations as approved*

   e. *sampling by other recognized devices may be approved*

(b) Water in petroleum products, except the solvent or carrier may be toluene……AASHTO T 55

(c) Density, Specific Gravity, or API Gravity of Crude Petroleum and Liquid Products by Hydrometer Method…… AASHTO T 227

(d) Specific Gravity of Semi-Solid Bituminous Materials…. AASHTO T 228

(e) Specific Gravity of Solid Pitch and Asphalt…… AASHTO T 229

(f) Flash and Fire Points (Open Cup)

1. *When the flash point is higher than 79°C (175°F), "Flash and Fire Points by Cleveland Open Cup"……AASHTO T 48*

2. When the flash point is 79°C (175°F) or lower, "Flash Point with Tagliabue Open Cup"……AASHTO T 79

(g) Softening Point of Bituminous Materials, Ring and Ball ……AASHTO T 53

(h) Penetration of Bituminous Materials……AASHTO T 49

(i) Loss on Heating……AASHTO T 47

(j) Solubility in Organic Solvents, except the solvent may be 1,1,1,-Trichloroethane……AASHTO T 44

(k) Inorganic Matter or Ash ……AASHTO T 59

(l) Saybolt-Furol Viscosity……AASHTO T 72

(m) Ductility of Binder Material, except that the conditioning period of the specimens may be shortened, and that only one normal test will be required. Shortened conditioning period: The specimen shall be allowed to cool in air for at least 30 min. It shall then be trimmed and placed in the water bath for a period of 60 to 90 min before testing. In case of failure or dispute, three normal tests will be required and specimens shall be conditioned as in AASHTO T 51

(n) Distillation of Cutback Asphaltic Products, except the length of condenser tube may be 400 mm ± 24 mm…….AASHTO T 78

(o) Float Test for Bituminous Materials……AASHTO T 50

(p) Kinematic Viscosity of Asphalts …… AASHTO T 201

(q) Absolute Viscosity of Asphalts …… AASHTO T 202

(r) Effect of Heat and Air on Asphalt Materials, Thin-Film Oven Test…… AASHTO T 179

(s) Effect of Heat and Air on a Moving Film of Asphalt, Rolling Thin Film Oven Test…… AASHTO T 240

(t) Testing Asphalt Emulsions……AASHTO T 59
The following exceptions to T 59 shall apply:

1. For the Residue by Distillation test, the specified aluminum alloy still shall be the referee still.

2. When tests on the residue are not required, the percent of residue for emulsion grades RS-2, AE-90, AE-90S, and AE-T only, may be determined by the Residue by Evaporation test of AASHTO T 59. The percent of residue shall be determined by the Residue of Distillation test in all cases of failure or dispute.

3. The stone coating test shall be performed as follows on a mixture of 465 ± 1 g of reference stone and 35.0 ± 0.1 g of asphalt emulsion:

a. For AE-90 and AE-90S, the mixture of stone and asphalt shall be mixed vigorously for 5 min. At the end of the mixing period, the mix shall be rinsed by running sufficient tap water at the side of the container to completely immerse the mix. The tap water shall then be poured off and the rinsing step repeated as necessary until the rinse water pours off essentially clear. The stone shall remain a minimum of 90% coated.

b. For AE-150 and AE-150-L, the mixture of stone and asphalt shall be mixed vigorously for 5 min and then allowed to stand for 3 h. At the end of this time, the mixture shall again be mixed vigorously for 5 min. At the end of the mixing period, the mix shall be rinsed by running sufficient tap water at the side of the container to completely immerse the mix. The tap water shall then be poured off and the rinsing step repeated as necessary until the rinse water pours off essentially clear. The stone shall remain a minimum of 90% coated for AE-150 and AE 150-L.

4. For the Demulsibility test, normally only one test will be required. In case of failure or dispute, the specified procedure in AASHTO T 59 will be followed.

5. For oil portion from Residue by Distillation, report the number of milliliters of oil per 100 g of emulsion.

(u) For coating test for cutback asphalts with additive, 20 g of 20 to 30 mesh Ottawa sand shall be placed in a clean 60 mL (2 oz) wide-mouthed jar and covered with 25 g of distilled water at room temperature. One gram of the liquid asphalt to be tested shall be placed gently upon the surface of the water so that it floats and does not contact the sand. The lid shall then be placed on the jar and tightened securely. If the liquid asphalt to be tested is grade 70 or 250, the jar and contents shall be shaken vigorously for 30 s. If the grade is 800 or 3000, the jar and contents shall be immersed in a 46°C (115°F) water bath for 5 min to bring the contents of the jar to a temperature of approximately 38°C (100°F). The jar shall then be shaken vigorously for 30 s. After shaking, the asphalt coating on the sand shall be observed under a constant, strong light. Complete coating of the sand is required.

(v) Stripping tests for HMA mixtures using binder materials, with or without additives, shall be performed as follows:

1. Test 1. *A sample of produced mixture, 500 g, minimum, shall be obtained for testing. The size of test specimen and the amount of distilled water shall be:*

Approximate Size of Aggregate	*Minimum Weight of Test Specimen*	*Amount of Distilled Water*
Sand	*100 g*	*400 mL*
12	*100 g*	*400 mL*
11	*150 g*	*600 mL*
9	*200 g*	*600 mL*

Place the specimen in the boiling distilled water and stir with a glass rod at the rate of one revolution per second for 3 min. The aggregate shall retain a minimum of 90% of its asphalt film compared with the remainder of the sample, upon completion of this procedure.

2. Test 2. *Approximately 500 g of produced mixture shall be heated to 121°C (250°F) in a laboratory oven for 2 h; stirred and cooled to 92.5°C (200°F). Then a portion of the mix shall be placed in boiling distilled water, quantity of mix and quantity of boiling water shall be as specified in Test 1, and stirred with a glass rod at the rate of one revolution per second for 3 min. The aggregate shall retain a minimum of 90% of its asphalt film compared with the remainder of the sample, upon completion of this procedure.*

Note: The purpose of these tests is to determine the relative compatibility of the aggregate and asphalt, and to detect tendency of Asphalt Emulsions to reemulsify. Test 2 may be performed as a method of determining whether compatibility can be achieved, Test 1 having given unsatisfactory results.

(w) Penetrating Ability of AE-PL.

1. Apparatus and Equipment:

a. Sand mixture:

(1) Dry Standard Ottawa Sand (AASHTO T 106)…… 90 parts

(2) Dry Reference Limestone Dust, portion passing 300 mm (#50) sieve only. Reference Limestone Dust used by the Department is Limestone Calcium Carbonate manufactured by France Stone Co. The Department will furnish approximately 2.3 kg (5 lb) of Reference Limestone Dust upon request …… 10 parts

(3) Water..... 3 parts

b. Container, 170 g (6 oz) ointment tin

c. Ruler or other measuring device

d. Timing device readable in seconds

e. Compacting Device. Rimac Spring Tester or other device suitable for compacting sand by applying a 140 kPa (20 psi) load. The compacting device shall include an adapter consisting of two metal discs slightly smaller in diameter than a 170 g (6 oz) ointment tin separated by a spacer 25 to 50 mm (1 to 2 in.). The 65 mm (2.5 in.) diameter discs used in determining weight of coating in AASHTO T 65 or ASTM A 90 are satisfactory.

f. Small, square ended spatula or putty knife

2. Procedure:

Thoroughly mix Standard Ottawa Sand, Reference Limestone Dust, and water. Weigh 190 ± 1 g of sand mixture into a 170 g (6 oz) ointment tin. Level surface of sand with a spatula. Place the compacting adapter on the sand surface and slowly, over a period of about 5 s, compact the sand until the 140 kPa (20 psi) load is achieved, which is approximately 45 kg (100 lb) on the Rimac Spring Tester. Remove the compacting device, avoiding disturbance to the sand surface. Quickly pour 12 g of the emulsion from a height of about 100 mm (4 in.) onto top of sand mixture. Start timer at start of pour. Stop timer when all emulsion penetrates into sand mixture. Delay 2 min, then remove sand and mixture from one side of ointment tin, about 1/2 of mixture. Measure to determine average depth of penetration into sand mixture. Penetration time shall be 100 s or less; penetration depth shall be 6 mm (1/4 in.) or more.

(x) Flow Test for Asphalt for Coating Corrugated Metal Pipe..... AASHTO M 190

(y) Shock Test for Asphalt for Coating Corrugated Metal Pipe..... AASHTO M 190

(z) Viscosity Determinations of Unfilled Asphalts Using the Brookfield Thermosel Apparatus..... AASHTO T 316

(aa) Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer..... AASHTO T 315

(bb) Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel……AASHTO R 28

(cc) Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer .. AASHTO T 313

640 ***902.03 Application Temperatures.*** *Binder materials for the several applications indicated in the specifications shall be applied at temperatures not to exceed those shown in the following:*

Type and Grade of Material	*Maximum Application Temperature °C (°F)*	
	Spray	*Mix*
MC-70, MCA-70 ……	*66 (150)*	
MC-250, MCA-250 ……	*107 (225)*	*93 (200)*
MC-800, MCA-800 ……	*121 (250)*	*107 (225)*
MC-3000, MCA-3000 ……	*135 (275)*	*121 (250)*
SC-70, SCA-70……	*93 (200)*	
CS-250, SCA-250……	*107 (225)*	*107 (225)*
SC-800-3000, SCA-800-3000 ……	*121 (250)*	*121 (250)*
All Emulsions……	*71 (160)*	*82 (180)*
All Penetration and Viscosity, Utility and Pipe Coating……	*177 (350)*	*163 (325)*
PG Binders……	*Note (1)*	*Note (1)*

Note (1): In accordance with manufacturer's recommendations.