This NSSP is to be used on pilot projects for data collection of asphalt rubber binder Performance Grade determination to be used for the development of performance graded asphalt rubber binder specifications.

Contact Sri Balasubramanian, Office of Asphalt Pavement for approval to use this NSSP.

1

Add to section 37-2.05B(1)(c) of the RSS:

At least 10 days before starting seal coat activities, submit the name of a testing laboratory that participates in the AASHTO Materials Reference Laboratory (AMRL) program and the Department's Independent Assurance Program that will be used for asphalt rubber binder specification compliance and Performance Grade determination testing.

Within 15 days of the first day of asphalt rubber production, submit an Asphalt Rubber Binder Performance Grade Determination report that contains the following:

1. General Information
   - 1.1 Contract number
   - 1.2 Contractor
   - 1.3 Name of resident engineer
   - 1.4 Resident engineer phone number
   - 1.5 Asphalt rubber binder producer
   - 1.6 Contact name of asphalt rubber binder producer
   - 1.7 Asphalt rubber binder contact phone number
2. Asphalt rubber binder testing laboratory
   - 2.1 Name of the laboratory
   - 2.2 Dynamic Shear Rheometer
     - 2.2.1 Manufacturer
     - 2.2.2 Model
     - 2.2.3 Temperature control system
   - 2.3 Name of the tester
3. Asphalt rubber binder formulation and data as follows:
   - 3.1 For asphalt binder and asphalt modifier submit:
     - 3.1.1 Source and grade of asphalt binder
     - 3.1.2 Source and type of asphalt modifier
     - 3.1.3 Percentage of asphalt modifier by weight of asphalt binder
     - 3.1.4 Percentage of combined asphalt binder and asphalt modifier by weight of asphalt rubber binder
     - 3.1.5 Test results for the specified quality characteristics
   - 3.2 For crumb rubber modifier submit the following:
     - 3.2.1 Each source and type of scrap tire crumb rubber and high natural rubber
     - 3.2.2 Percentage of scrap tire crumb rubber and high natural rubber by total weight of asphalt rubber binder
     - 3.2.3 Test results for the specified quality characteristics
   - 3.3 For asphalt rubber binder submit the following:
     - 3.3.1 Minimum reaction time and temperature
     - 3.3.2 Submit the production report for the lot generated from data collected from the asphalt rubber binder blending plant.
     - 3.3.3 Test results for the specification compliance quality characteristics
     - 3.3.4 Test results for Performance Grade determination of asphalt rubber binder

2.

Submit Asphalt Rubber Binder Performance Grade Determination report to the Engineer and electronically to the following:

PGAR@dot.ca.gov

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Add to section 37-2.05B(1)(d) of RSS:

On the first day of asphalt rubber production from a single lot, sample asphalt rubber binder for specification compliance testing and grade determination of asphalt rubber binder testing. The authorized testing laboratory must perform specification compliance testing and grade determination of asphalt rubber binder testing.

4

Test asphalt rubber binder for specification compliance for the following quality characteristics:

Asphalt Rubber Binder

Quality characteristic	Test method
Cone penetration @ 25 °C, 1/10 mm	ASTM D 217
Resilience @ 25 °C, percent rebound	ASTM D 5329
Softening point, °C	ASTM D 36
Viscosity @190 °C, Pa • s ($x10^{-3}$)	ASTM D 7741

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Determine the Performance Grade of Asphalt Rubber Binder using ASTM D 7643 as a guideline for grade determination.

6

For Performance Grade determination, use AASHTO T 315 (Modified), with the following modifications:

1. Test original binder and RTFO aged binder with the Dynamic Shear Rheometer using 25 mm plates and a 3 mm gap.
2. Test the PAV aged binder with the Dynamic Shear Rheometer using 8 mm plates and a 3mm gap.
3. Trim samples at 3.15 mm.

7

Ensure that the Dynamic Shear Rheometer software can accommodate a 3 mm gap in its calculations.

8

Determine the grade of the asphalt rubber binder by testing the following quality characteristics:

Performance Grade Determination of Asphalt Rubber Binder

Quality characteristic	Test method	Grade determination
		Asphalt rubber binder
Original binder		
Flash point, min, °C	AASHTO T 48	230
Dynamic shear, test temperature at 10 rad/s, °C min. G*/sin(delta), kPa	AASHTO T 315 (Modified)	 Pass and Fail[a] 1.00
RTFO test[b], mass loss, max, %	AASHTO T 240 or ASTM D 2872	Report only
RTFO test aged binder		
Dynamic shear, test temperature at 10 rad/s, °C min, G*/sin(delta), kPa	AASHTO T 315 (Modified)	 Pass and Fail[c] 2.20
Dynamic shear, test temperature at 10 rad/s, °C, Phase Angle, max (delta), degree	AASHTO T 315 (Modified)	 Pass and Fail[d] Report only
Elastic recovery, test temperature, °C min recovery, %	AASHTO T 301	 25 Report only
PAV[e] aging, temperature, °C	AASHTO R 28	 110
RTFO test and PAV aged binder		
Dynamic shear, test temperature at 10 rad/s, °C max G*sin(delta), kPa	AASHTO T 315 (Modified)	 Pass and Fail[f] 5000
Creep stiffness, test temperature, °C max S-value, MPa min m-value	AASHTO T 313	 Pass and Fail[g] 300 0.300

[a]Report G*/sin(delta) for the initial fail temperature, the passing temperature one grade below the initial fail temperature.
[b]RTFO means the asphaltic residue obtained using the rolling thin film oven test. The residue from mass change determination may be used for other tests.
[c]Report G*/sin(delta) for the initial fail temperature, the passing temperature one grade below the initial fail temperature.
[d]Report the phase angle measured at both the pass and fail temperature of the RTFO aged binder.
[e]PAV" means pressure aging vessel.
[f]Report G*sin(delta) for the initial fail temperature and the passing temperature one grade below the initial fail temperature.
[g]Report stiffness S and m-value for the initial fail temperature and the passing temperature one grade below the initial fail temperature.

9

After the grade determination, determine percent recovery and non-recoverable creep compliance of the asphalt rubber binder at the determined grade under the Multiple Stress Creep Recovery (MSCR) test AASHTO TP 70.

10

For AASHTO TP 70, test the RTFO aged binder using AASHTO T 315 (Modified), with the following modification:

1. Test on the Dynamic Shear Rheometer using 25 mm plates and a 3 mm gap.
2. Trim samples at 3.15 mm.

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Test asphalt rubber binder for percent recovery and non-recoverable creep compliance based on the following quality characteristics and report the test results:

Percent Recovery and Non-Recoverable Creep Compliance of Asphalt Rubber Binder

Quality characteristic	Test method	Elastic response
		Asphalt rubber binder
RTFO test aged binder		
Multiple Stress Creep Recovery (MSCR) Standard traffic “S” grade $J_{nr3.2}$, max 4.0 kPa^{-1} J_{nrdiff}, max 75% Test temperature, °C	AASHTO TP 70	Report only[a]
Multiple Stress Creep Recovery (MSCR) Heavy traffic “H” grade $J_{nr3.2}$, max 2.0 kPa^{-1} J_{nrdiff}, max 75% Test temperature, °C		
Multiple Stress Creep Recovery (MSCR) Very heavy traffic “V” grade $J_{nr3.2}$, max 1.0 kPa^{-1} J_{nrdiff}, max 75% Test temperature, °C		
Multiple Stress Creep Recovery (MSCR) Extremely heavy traffic “E” grade $J_{nr3.2}$, max 0.5 kPa^{-1} J_{nrdiff}, max 75% Test temperature, °C		

[a]Report test results following the test method.