

39-1.02D Asphalt Rubber Binder**39-1.02D(1) General**

Use asphalt rubber binder in RHMA-G, RHMA-O, and RHMA-O-HB. Asphalt rubber binder must be a combination of:

1. Asphalt binder
2. Asphalt modifier
3. CRM

The combined asphalt binder and asphalt modifier must be 80.0 ± 2.0 percent by weight of asphalt rubber binder.

39-1.02D(2) Asphalt Modifier

Asphalt modifier must be a resinous, high flash point and aromatic hydrocarbon and must have the values for the quality characteristics shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Value
Viscosity, m^2/s ($\times 10^{-6}$) at 100 °C	ASTM D 445	$X \pm 3^a$
Flash point, Cleveland Open Cup, °C	ASTM D 92	207 min
Molecular analysis		
Asphaltenes, percent by mass	ASTM D 2007	0.1 max
Aromatics, percent by mass	ASTM D 2007	55 min

^a The symbol "X" is the proposed asphalt modifier viscosity. "X" must be from 19 to 36. A change in "X" requires a new asphalt rubber binder design.

Asphalt modifier must be from 2.0 to 6.0 percent by weight of the asphalt binder in the asphalt rubber binder.

39-1.02D(3) Crumb Rubber Modifier

CRM consists of a ground or granulated combination of scrap tire crumb rubber and high natural rubber. CRM must be 75.0 ± 2.0 percent scrap tire rubber and 25.0 ± 2.0 percent high natural rubber by total weight of CRM. Scrap tire crumb rubber must be from any combination of automobile tires, truck tires, or tire buffings.

Sample and test the scrap tire crumb rubber and high natural rubber separately. CRM must have the values for the quality characteristics shown in the following table:

Crumb Rubber Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Value
Scrap tire crumb rubber gradation (% passing no. 8 sieve)	LP-10	100
High natural rubber gradation (% passing no. 10 sieve)	LP-10	100
Wire in CRM (% max.)	LP-10	0.01
Fabric in CRM (% max.)	LP-10	0.05
CRM particle length (inch max.) ^a	--	3/16
CRM specific gravity ^a	California Test 208	1.1–1.2
Natural rubber content in high natural rubber (%) ^a	ASTM D 297	40.0–48.0

^a Test at mix design and for certificate of compliance.

CRM must be ground and granulated at ambient temperature. If steel and fiber are cryogenically separated, it must occur before grinding and granulating. If cryogenically produced, CRM particles must be large enough to be ground or granulated and not pass through the grinder or granulator.

SECTION 39

HOT MIX ASPHALT

CRM must be dry, free-flowing particles that do not stick together. CRM must not cause foaming when combined with the asphalt binder and asphalt modifier. You may add calcium carbonate or talc up to 3 percent by weight of CRM.

39-1.02D(4) Asphalt Rubber Binder Design and Profile

Submit a proposal for asphalt rubber binder design and profile. In the design, include the asphalt, asphalt modifier, and CRM and their proportions. The profile is not a performance specification and only serves to indicate expected trends in asphalt rubber binder properties during binder production. The profile must include the same component sources for the asphalt rubber binder used.

Design the asphalt rubber binder from testing you perform for each quality characteristic and for the reaction temperatures expected during production. The 24-hour (1,440-minute) interaction period determines the design profile. At a minimum, mix asphalt rubber binder components, take samples, and perform and record the tests shown in the following table:

Asphalt Rubber Binder Reaction Design Profile

Test	Minutes of reaction ^a							Limits
	45	60	90	120	240	360	1440	
Cone penetration @ 77 °F, 0.10-mm (ASTM D 217)	X ^b				X		X	25–70
Resilience @ 77 °F, percent rebound (ASTM D 5329)	X				X		X	18 min.
Field softening point, °F (ASTM D 36)	X				X		X	125–165
Viscosity, centipoises (LP-11)	X	X	X	X	X	X	X	1,500–4,000

^a Six hours (360 minutes) after CRM addition, reduce the oven temperature to 275 °F for 16 hours. After the 16-hour (1,320-minutes) cooldown after CRM addition, reheat the binder to the reaction temperature expected during production for sampling and testing at 24 hours (1,440 minutes).

^b "X" denotes required testing

39-1.02D(5) Asphalt Rubber Binder

After interacting for at least 45 minutes, asphalt rubber binder must have the values for the quality characteristics shown in the following table:

Asphalt Rubber Binder

Quality characteristic	Test for quality control or acceptance	Test method	Value	
			Minimum	Maximum
Cone penetration @ 77 °F, 0.10 mm	Acceptance	ASTM D 217	25	70
Resilience @ 77 °F, percent rebound	Acceptance	ASTM D 5329	18	--
Field softening point, °F	Acceptance	ASTM D 36	125	165
Viscosity @ 375 °F, centipoises	Quality control	LP-11	1,500	4,000

39-1.02E Aggregate

Aggregate must be clean and free from deleterious substances.

The specified aggregate gradation must be determined before the addition of asphalt binder and includes supplemental fine aggregate. The Department tests for aggregate grading under California Test 202, modified by California Test 105 if there is a difference in specific gravity of 0.2 or more between the coarse and fine parts of different aggregate blends.

Choose sieve size TV within each TV limit presented in the aggregate gradation tables.

The proposed aggregate gradation must be within the TV limits for the specified sieve sizes shown in the following tables: