



Designation: **D 5841 – 9500**

## **Standard Specification for Type III Polymer Modified Asphalt Cement for Use in Pavement Construction<sup>1</sup>**

This standard is issued under the fixed designation D 5841; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

### **1. Scope**

1.1 This specification covers asphalt cements that have been modified by the addition of the appropriate polymer for use in pavement construction. It was developed to provide a reference for specifying polymer modified asphalt and reflects the properties of currently available commercial products. The tests are intended to measure compatibility and degree of modification, not performance characteristics. This is not intended to be a performance based specification.

1.2 Type III polymer-modified asphalts are typically made with ethyl vinyl acetate. However any polymer may be used that will give the required test results when blended with the desired asphalt.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### **2. Referenced Documents**

#### *2.1 ASTM Standards:*

D 5 Test Method for Penetration of Bituminous Materials<sup>2</sup>

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<sup>1</sup> This specification is under the jurisdiction of ASTM Committee ~~D-4~~ D04 on Road and Paving Materials and is under the direct responsibility of Subcommittee D04.45 on Modified Asphalt Specifications.

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- D 36 Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)<sup>3</sup>
- D 92 Test Method for Flash and Fire Point by Cleveland Open Cup<sup>4</sup>
- D 140 Practice for Sampling Bituminous Materials<sup>2</sup>
- D 1754 Test Method for Effect of Heat and Air on Asphaltic Materials (Thin-Film Oven Test)<sup>2</sup>
- D 2042 Test Method for Solubility of Asphalt Materials in Trichloroethylene<sup>2</sup>
- D 2170 Test Method for Kinematic Viscosity of Asphalts (Bitumens)<sup>2</sup>
- D 2872 Test Method for Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)<sup>2</sup>

**3. Physical Requirements**

- 3.1 The polymer modified asphalt cement shall be homogeneous, free from water and shall not foam when heated to 347°F (175°C).
- 3.2 The polymer modified asphalt cement shall conform to the requirements of Table 1.
- 3.3 The polymer modifier and the asphalt cement shall be compatible and pre-blended prior to use.

**4. Sampling and Test Methods**

- 4.1 Sample and test the polymer modified asphalt cement in accordance with the following test methods and practices:
  - 4.1.1 *Sampling*—Practice D 140.
  - 4.1.2 *Penetration*— Test Method D 5.
  - 4.1.3 *Viscosity at 275°F (135°C)*—Test Method D 2170.
  - 4.1.4 *Softening Point*— Test Method D 36.
  - 4.1.5 *Flash Point, Cleveland Open Cup*—Test Method D 92.
  - 4.1.6 *Solubility in Trichloroethylene*—Test Method D 2042.
  - 4.1.7 *Rolling Thin-Film Oven Test*—Test Method D 2872.
  - 4.1.8 *Thin-Film Oven Test*—Test Method D 1754.

**5. Test Method for Type III Polymer Modified Asphalt**

- 5.1 *Separation Test for Type III Polymer Modified Asphalt:*
  - 5.1.1 *Scope:*
    - 5.1.1.1 This test is a simple qualitative test for compatibility of low density polymers in asphalt.
- 5.2 *Apparatus:*

<sup>2</sup> Annual Book of ASTM Standards, Vol 04.03.  
<sup>3</sup> Annual Book of ASTM Standards, Vol 04.04.  
<sup>4</sup> Annual Book of ASTM Standards, Vol 05.01.

**TABLE 1 Requirements for Type III Polymer Modified Asphalt Cement**

Designation	III-A		III-B		III-C		III-D		III-E	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Penetration at 39.2°F, 200 g, 60 s	-48		-35		-28		-22		-18	
Penetration at 39.2°F (4°C), 200 g, 60 s	48		35		28		22		18	
Penetration at 77°F, 100 g, 5 s	-30	-150	-30	-150	-30	-150	-30	-150	-30	-150
Penetration at 77°F (25°C), 100 g, 5 s	30	150	30	150	30	150	30	150	30	150
Viscosity, 275°F, cSt <sup>A</sup>	150	1500	150	1500	150	1500	150	1500	150	1500
Viscosity, 275°F (135°C), cSt	150	1500	150	1500	150	1500	150	1500	150	1500
Flash Point GOC, °F	425		425		425		425		425	
Flash Point COC, °F (°C)	425 (218)		425 (218)		425 (218)		425 (218)		425 (218)	
Softening Point, R and B, °F	425		430		435		440		445	
Softening Point, R and B, °F (°C)	125 (52)		130 (54)		135 (57)		140 (60)		145 (63)	
Separation, 275°F, 18 h	Report		Report		Report		Report		Report	
Separation, 275°F (135°C), 18 h	Report		Report		Report		Report		Report	
Solubility in TCE, %	99		99		99		99		99	
RTFOT Residue <sup>B</sup>										
RTFOT Residue <sup>A</sup>										
Penetration, 39.2°F, 200 g, 60 s	-24		-18		-14		-11		-9	
Penetration, 39.2°F (4°C), 200 g, 60 s	24		18		14		11		9	
Loss, %		1		1		1		1		1

<sup>A</sup>The absolute viscosity should be run in a Modified Koppers or Asphalt Institute vacuum capillary viscometer. Report the viscosity at a shear rate of 1 s<sup>-1</sup>.  
<sup>B</sup>Thin-film oven test may be used, but rolling thin-film test shall be referee method.

5.2.1 *Containers*—Standard 6 oz metal sample cups (1.875 in. high by 2.75 in. inside diameter).

5.2.2 *Oven*—An oven capable of maintaining  $275 \pm 10^{\circ}\text{F}$  ( $135 \pm 5^{\circ}\text{C}$ ).

5.3 *Procedure:*

5.3.1 After a blend of polymer in asphalt has been prepared and is still at elevated temperature, pour enough of the mix into a clean 6 oz metal test cup to fill it to the formed roll on the cup (approximately  $\frac{1}{4}$  in. from the top). Place the sample in a controlled temperature oven at  $275^{\circ}\text{F}$  ( $135^{\circ}\text{C}$ ) for 15 to 18 h. Remove carefully from the oven without disturbing the surface and observe the sample. After the initial observation, a spatula can be used to gently probe the sample and check consistency of any surface layer and check for sludge on the bottom. These observations and tests should be done while the sample is still hot, within 5 min after removal from the oven.

5.3.2 Depending on the physical characteristics of the polymer and compatibility of the particular asphalt/polymer system, varying conditions will be noted. These are described and should be reported as follows:

Description	Report
Homogeneous, no skinning or sludge	Homogeneous
Slight polymeric skin at edges of cup	Slight edge skinning
Thin polymeric skin on entire surface	Thin total skinning
Thick polymeric skin ( $\frac{1}{32}$ in. + ) on entire surface	Thick total skinning
No surface skinning but thin sludge at bottom of container	Thin bottom skinning
No surface skinning but thick ( $\frac{1}{4}$ in. + ) sludge at bottom of container	Thick bottom sludge

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