

DEPARTMENT OF TRANSPORTATION

STATE OF GEORGIA

SUPPLEMENTAL SPECIFICATION

Section 868—Bituminous Adhesive for Raised Pavement Markers

Delete Section 868 and substitute the following:

868.1 General Description

This section includes the requirements for bituminous hot-melt adhesive used to place raised pavement markers.

868.1.01 Related References

A. Standard Specifications

[Section 106—Certification of Materials](#)

B. Referenced Documents

AASHTO	ASTM	
T 48	C 430	D 1856
T 49	D 70	D 2669
T 53	D 1754	D 2712
T 202	D 1796	D 3407

868.2 Materials

868.2.01 Bituminous Adhesive

A. Requirements

1. Adhesive

Use an adhesive made of asphaltic material and a homogeneously mixed filler that meets the following physical requirements:

- a. Adhesive Properties: Use the asphaltic material with filler.

	Min.	Max.	Test Method

Softening point	200° F (95 °C)	—	AASHTO T 53
Penetration, mm 3.5 oz (100 g), 5 sec., 77 °F (25 °C)	10	20	AASHTO T 49
Flow	—	0.2 in (5 mm)	ASTM D 3407 (modified in Subsection 868.2.01.C)
Viscosity, 400 °F (204 °C)	—	60 Poises (6.0 Pa-s)	ASTM D 2669 (modified in Subsection 868.2.01.C)
Flash point, C.O.C.	550 °F (285 °C)	—	AASHTO T 48

- b. Asphalt Properties: Use the filler-free material derived from the extraction and Abson recovery process explained in [Subsection 868.2.01.C](#).

	Min.	Max.	Test Method
Penetration, mm 3.5 oz (100 g), 5 sec., 77 °F (25 °C)	25	—	AASHTO T 49
Viscosity, 275 °F (135 °C)	12 Poises (1.2 Pa-s)	—	AASHTO T 202
Viscosity ratio, 275 °F (135 °C)	—	2.2	See Subsection 868.2.01.C

- c. Filler Properties: Use the filler separation techniques described in [Subsection 868.2.01.C](#).

	Min.	Max.	Test Method
Filler content, percent by weight	50	70	See Subsection 868.2.01.C
Filler fineness, percent passing			
No. 325 (45 µm)	75		ASTM C 430 (modified in Subsection 868.2.01.C)
No. 200 (75 µm)	95		
No. 100 (150 µm)	100		

- d. Certification: Submit a certification from the manufacturer that includes the physical properties of the bituminous adhesives and that the material conforms with this Specification, as stated in [Subsection 106.05, “Materials Certificate.”](#)

2. Packaging and Labeling

- Pack the adhesive in a self-releasing cardboard container of approximately 10 in (250 mm) that can be stacked properly.
- Fill the containers with two 30 lb (13.5 kg) cubes that have a net weight of 60 lbs (27 kg).
- Put the manufacturer, quantity, and batch number on the label.
- Print “Bituminous Adhesive for Pavement Markers” on the label.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

1. Flow

Determine flow according to Section 6, Flow, of ASTM D 3407.

- a. Set the oven temperature at $158^{\circ} \pm 2^{\circ}\text{F}$ ($70^{\circ} \pm 1^{\circ}\text{C}$).
- b. Prepare samples according to Subsection 7.1 of AASHTO T 49.

2. Viscosity

Determine viscosity according to ASTM D 2669 using a spindle speed of 10 rpm.

- a. Heat the adhesive to approximately 410°F (210°C) and then let cool.
- b. Determine viscosity at $400^{\circ} \pm 1^{\circ}\text{F}$ ($204^{\circ} \pm 0.6^{\circ}\text{C}$).

3. Asphalt Properties

Determine the base asphalt properties based on the material obtained from the following extraction and Abson recovery methods:

- a. Extract the asphalt by heating the adhesive to the point where it will easily flow.
- b. Add 125 to 150 g of adhesive to 400 mL of trichloroethylene that has a temperature of 125° to 150°F (51° to 66°C).
- c. Stir the mixture to dissolve the asphalt.
- d. Decant the trichloroethylene-asphalt mixture.
- e. Recover the asphalt using the Abson recovery method described in ASTM D 1856, except do not use the extraction methods of ASTM D 2712, and do not filter the solvent-asphalt mixture.
- f. Centrifuge the extraction solution of trichloroethylene and asphalt for at least 30 minutes at 770 times gravity in a batch centrifuge.
- g. Decant the solution into a distillation flask. Do not include any filler sediment.
- h. Apply heat and bubble carbon dioxide slowly until the solution reaches a temperature of 300°F (149°C).
- i. Increase the carbon dioxide flow to between 800 to 900 mL per minute.
- j. Maintain the decanted solution temperature between 320° and 335°F (160° and 168°C) with this carbon dioxide flow for at least 20 minutes and until the trichloroethylene vapors are completely removed from the distillation flask.
- k. Repeat the extraction-recovery method as necessary to obtain the desired quantity of asphalt.
- l. Determine penetration, 275°F (135°C) viscosity, and viscosity ratio with the recovered asphalt.

4. Viscosity Ratio

Determine the 275°F (135°C) viscosity ratio by comparing the 275°F (135°C) viscosity on the base asphalt before and after the Thin-Film Oven Test.

- a. Perform the Thin-Film Oven Test as described in ASTM D 1754.
- b. Determine the specific gravity with a pycnometer as described in ASTM D 70 for use in the Thin-Film Oven Test.

- c. Calculate the 275 °F (135 °C) viscosity ratio by dividing the viscosity after the Thin-Film Oven Test by the original 275 °F (135 °C) viscosity.

5. Filler Material

Separate the filler material from the asphalt to determine filler content and filler fineness.

a. Filler Content

- 1) Determine the portion by weight of the adhesive that is insoluble in 1, 1, 1-trichloroethane by weighing 10.00 ± 0.01 g of solid adhesive into a centrifuge flask with a volume of approximately 100 mL, as specified in ASTM D 1796.
- 2) Add 50 mL of 1, 1, 1-trichloroethane to the adhesive.
- 3) Break the adhesive into small pieces to dissolve the solids.
- 4) Place the sample flask in a balanced centrifuge and spin with a minimum relative centrifugal force of 150 (as determined in Section 6 of ASTM D 1796) for 10 minutes.
- 5) Remove the sample flask and decant the solvent, without losing any solids.
- 6) Repeat the application of solvent and centrifuging until the solvent is clear and the filler is visually free of asphalt.
- 7) Dry the filler at $160^\circ \pm 5^\circ\text{F}$ ($71^\circ \pm 3^\circ\text{C}$) to remove solvent and weigh the resulting filler.
- 8) Filter the decanted solvent to verify that no filler was lost.
- 9) Calculate the percent filler content as follows:

$$\text{Filler Content, \% by weight (g)} = \frac{\text{Filler Wt. (g)} \times 100}{\text{Original Adhesive Wt. (g)}}$$

b. Filler Fineness

- 1) Determine filler fineness according to ASTM C 430, using No. 325 (45 μm), No. 200 (75 μm), and No. 100 (150 μm) sieves.
- 2) Modify this method by using a water-soluble, non-ionic wetting agent, such as Triton X-100, to aid the wetting action. Use a surfactant solution that is approximately 1 percent by weight.
- 3) Thoroughly wet the 1-gram dry sample in the surfactant solution.
- 4) Soak the sample for 30 minutes.
- 5) Transfer the filler to the sieve cup.
- 6) Spray water on the filler for two minutes.
- 7) Add surfactant solution as needed and physically disperse clumped particles.
- 8) Dry the sample and handle as directed in ASTM C 430.

The Department will reject any bituminous adhesive if it meets all requirements of this Specification but fails in actual use.

D. Materials Warranty

General Provisions 101 through 150.

