

**DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF ENGINEERING SERVICES**  
Transportation Laboratory  
5900 Folsom Blvd.  
Sacramento, California 95819-4612



## METHOD OF TEST FOR FLEXIBLE BITUMINOUS ADHESIVE

### A. SCOPE

This method describes the procedure of testing flexible, polymer-modified, hot melt bituminous adhesive.

### B. REFERENCES

- ASTM D 5 – Penetration of Bituminous Materials
- ASTM D 36 – Softening Point of Bitumen (Ring-and-Ball Apparatus)
- ASTM D 113 – Ductility of Bituminous Materials
- ASTM D 4402 – Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
- ASTM D 5167 – Melting of Hot-Applied Joint and Crack Sealant and Filler for Evaluation

### C. APPARATUS

1. Oil-jacketed melter as described in ASTM D 5167.
2. Penetrometer and needle meeting the requirements in ASTM D 5.
3. Brookfield Thermosel viscometer with a SC4-27 spindle, sample thimble and temperature controlled sample chamber.
4. An oven that can be maintained between 221 to 374°F.
5. Mold and test apparatus as described in ASTM D 113 for ductility.
6. Cylindrical steel mandrel 1 in. in diameter, 6 in. wide and supported at both ends.
7. Concrete brick, the bonding surface shall be lightly abrasive blasted.
8. Aluminum test plug, 2 in. in diameter with a flat bonding surface on one end and a threaded hole on the other end for a hook. Bonding surface should be freshly abrasive blasted.
9. Tensile testing machine with a capability of at least 10,000 lb force and apparatus for determining adhesive bond strength.
10. Test apparatus and brass shoulder rings as described in ASTM D 36.

**D. SAMPLES**

Use a hot knife to cut representative sections, be sure to take a sample of the full depth of the container in accordance with ASTM D 5167. Melt at the manufacturer's recommended safe heating temperature in an oil-jacketed melter for 3 hr before casting samples.

**E. PROCEDURE**

PART 1 PENETRATION (NEEDLE)

1. Pour sample into a 4 oz seamless can to the rim. Let cool overnight.
2. Condition sample for at least 2 hr at 77°F and test in accordance with ASTM D 5 using a load of 100 g (total weight of needle, shaft and any added weights).
3. Record the needle penetration in dmm at the end of 5 s.

PART 2 VISCOSITY

1. Condition the thermosel chamber, thimble and spindle at 374°F for at least 1 hr before testing.
2. Fill the preheated thimble with melted adhesive.
3. Set the spindle speed to 20 RPM and note the reading when the viscometer has stabilized. Initial readings are always high; wait until the readings have stabilized for 1 minute before recording the viscosity. Use of a chart recorder is helpful in determining when the reading has leveled off.

PART 3 DUCTILITY

1. Cast the adhesive in two ductility molds, overfilling the molds slightly. Let the molds cool and then trim the top surface flush with the mold using a hot knife. Condition one sample at 77°F and another at 39°F for 2 hr.
2. Test the sample as described in ASTM D 113. Test the sample conditioned at 77°F at a rate of 2 in./min. Test the sample conditioned at 39°F at a rate of 0.4 in./min.

PART 4 FLEXIBILITY

1. Cast a sample 1 in. wide, 6 in. in length and  $\frac{1}{8}$  in. thick using a mold that is coated with a release agent. Overfill the mold slightly, then let the sample cool and trim the top flush with the top of the mold using a hot knife.
2. Condition test specimen and mandrel at 20°F for 4 hr before testing.

3. Bend the test specimens 90 degrees over a 1 in. diameter mandrel at a uniform rate of 10 s while maintaining intimate contact between the mandrel and the specimen containing the sample. Wear thick cotton gloves while performing the bend test to insulate the cold sample from warm hands.
4. Examine the specimen for cracks or breaks.



#### PART 5 ADHESIVE BOND STRENGTH

1. Condition the test plug at 221°F for at least 2 hr before bonding to the concrete surface.
2. Pour about a 3 in diameter sample of the flexible bituminous adhesive onto the concrete brick. Immediately press the heated plug into the puddle of adhesive and squeeze out the excess. Remove the excess from around the plug after it cools with a hot knife. Prepare three of these bond test specimens.
3. If testing the retro-reflective pavement marker surface, pour the adhesive onto the bottom of an over-turned marker then press a heated plug into the hot adhesive, let cool and trim off excess adhesive as noted in 2 above. Prepare three of these bond test specimens.
4. Let assembly cool overnight at 77°F.
5. Thread the hook into the test plug and pull the assembly in the tensile tester at a crosshead speed of 0.2 in./min until bond failure. Record the bond strength as;

Bond strength (psi) = peak load, lb<sub>f</sub>/3.14



6. Report the average of 3 results.

#### PART 6

#### SOFTENING POINT

1. Prepare and test in accordance with ASTM D 36.

**F. HEALTH AND SAFETY**

It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Prior to handling, testing or disposing of any materials, testers must be knowledgeable about safe laboratory practices, hazards and exposure, chemical procurement and storage, and personal protective apparel and equipment.

Caltrans Laboratory Safety Manual is available at:

[http://www.dot.ca.gov/hq/esc/ctms/pdf/lab\\_safety\\_manual.pdf](http://www.dot.ca.gov/hq/esc/ctms/pdf/lab_safety_manual.pdf)

**End of Text  
(California Test 440 contains 5 pages)**