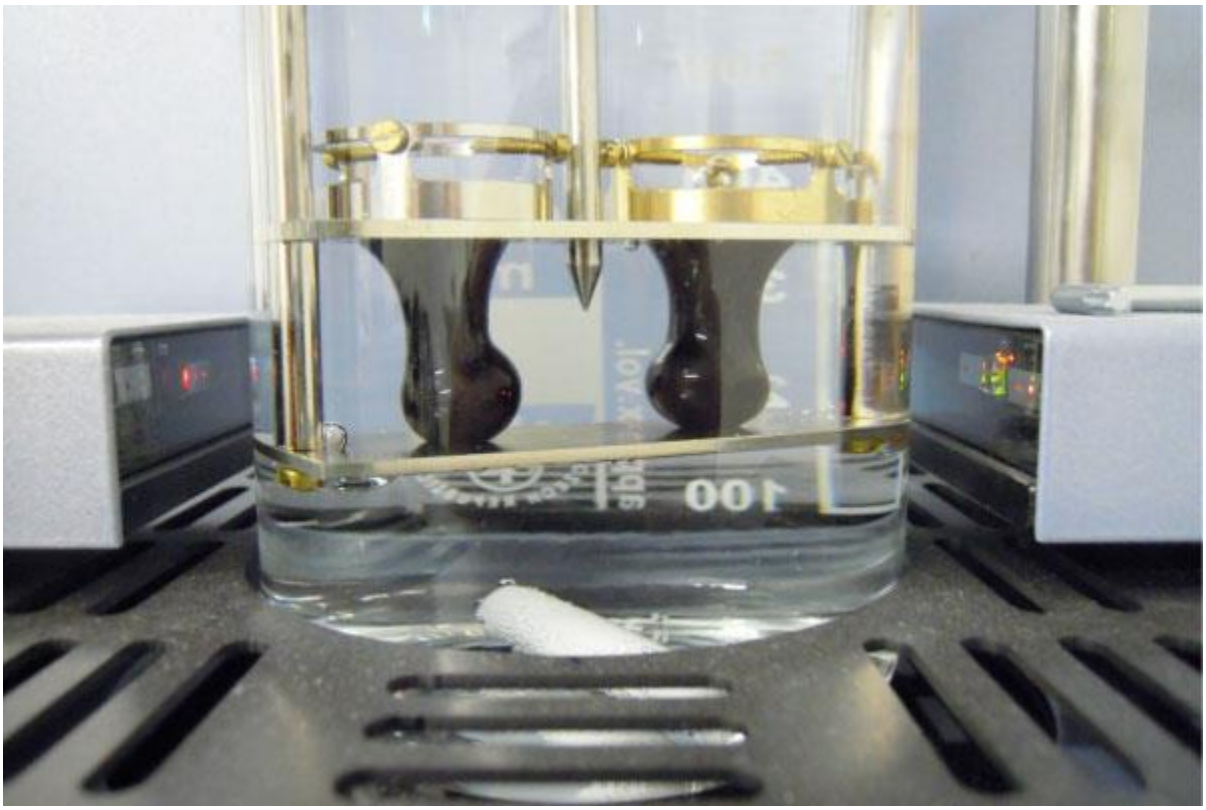
EXPERIMENT NO: 12

SOFTENING POINT OF BITUMINOUS MATERIAL

(RING AND BALL METHOD)

AASHTO DESIGNATION: T 53-92
(ASTM DESIGNATION: D 36-89)



1. SCOPE

1.1 The ring and ball softening point is extensively used to evaluate the consistency of bituminous binders. It is a very simple one, consisting of placing a 3/8 in diameter steel ball on a binder sample placed in a steel ring and immersed in a water bath. Heat is applied to the water and its temperature is raised until a value is reached when the test sample has become sufficiently soft to allow the ball, enveloped in binder to fall down. The water temperature at which this occurs is called the ring and ball softening point.

The softening point is not a melting point; bituminous binders do not melt but instead gradually change from semi-solids to liquids on the application of heat. It is useful for determining the temperature susceptibilities of bitumen which are to be used in thick films, such as in crack fillers. When two bitumen have the same penetration value, the one with the higher softening point is normally less susceptible to temperature changes.

2. REFERENCED DOCUMENTS

2.1 Standards

C 670 Practices for Preparing Precision Statements for Test Methods for Construction materials

E 1 Specification for ASTM Thermometers

T 40 Methods of Sampling Bituminous Materials

T 48 Test Method for Flash and Fire Points by Cleveland Open cup

3. APPARATUS AND MATERIALS

3.1 Ring- A brass ring of 15.875 mm (5/8 in) inside diameter, 6.35 mm (1/4 in) depth and thickness of wall is 2.38 mm (3/32 in). This ring shall be attached in a convenient manner to a brass with (diameter 1.85 mm = 0.072 in).

3.2 Ball - A steel ball 9.53 mm (3/8 in) in diameter having a mass of 3.50 ± 0.05 g.

3.3 Container - A glass vessel, not less than 8.5 cm (3.34 in) in diameter and measuring 10.5 cm (4.13 in.) in depth from the bottom of the flare (a 600 ml beaker, low form, meets this requirement).



Figure 12.1 Ring and Ball apparatus

3.4 Thermometer - ASTM Low Softening point Thermometer having a range of -2 to +80°C or 30°to 180°Fis specified.

4. REAGENTS AND MATERIALS

4.1 Bath liquids:
4.1.1 Freshly boiled distilled water.
4.1.2 USP Glycerin, or
4.1.3 Ethyl Glycol, with a boiling point between 195 and 197°C (383 and 387°F).

5. PREPARATION OF SAMPLE

Melt and thoroughly stir the sample avoiding incorporating air bubbles in the mass and then pour it into the ring. The ring, while being filled, should rest on a brass plate which has been amalgamated to prevent the bituminous material from adhering to it. Allow the excess material to cool for 1 hr then cut it off cleanly with a slightly heated knife.

6. PROCEDURE FOR MATERIALS HAVING SOFTENING POINTS 80^0C (176^0F) OR BELOW

6.1 Fill the glass vessel to a depth of substantially 8.25 cm (3.25 in) with freshly boiled, distilled water at 5°C (41°F).

6.2 Suspend the ring containing the sample in the water so that the lower surface of the filled ring is exactly 2.54 cm (1 in) above the bottom of the glass vessel and its upper surface is 5.08 cm (2 in) below the surface of the water.

6.3 Place the ball in the water but not on the specimen.

6.4 Suspend the thermometer so that the bottom of the bulb is level with the bottom of the ring and within 0.635 cm (3/4 in) but not touching the ring. Maintain the temperature of the water at 5°C (41°F) for 15 min.

6.5 With suitable force, place the ball in the center of the upper surface of the bitumen in the ring, thus completing the assembly.

6.6 Apply the heat in such a manner that the temperature of the water is raised 5°C (9°F) each minute.

7. SOFTENING POINT

Report the temperature recorded by the thermometer at the instant the bituminous material touches the bottom of the glass vessel as the softening point. No correction shall be made for emergent stem of the thermometer.

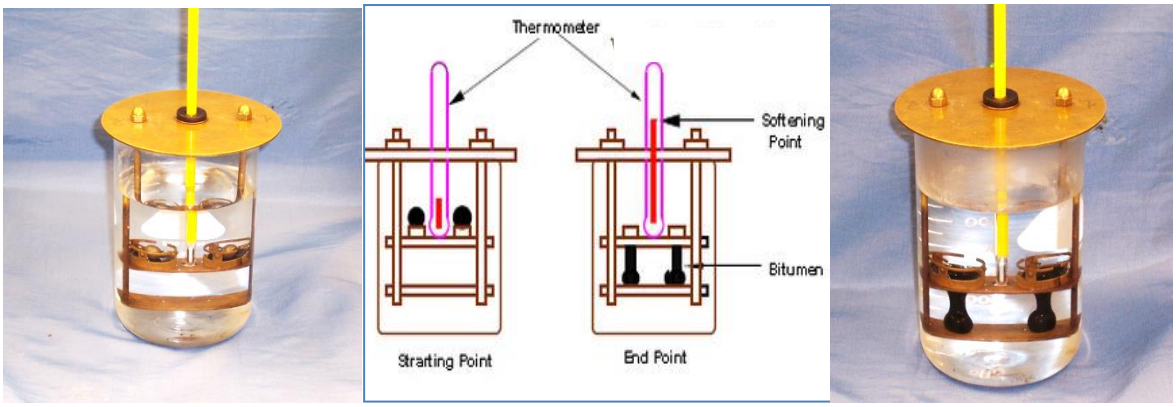


Figure 12.2 Illustration of softening point

8. PERMISSIBLE VARIATION IN RISE OF TEMPERATURE

The rate of rise of temperature shall be uniform and shall not be averaged over the period of the test. The maximum permissible variation for any minute period after the first three minutes shall be 0.5°C (0.9°F). All tests in which the rate of rise in temperature exceeds these limits shall be rejected.

9. PROCEDURE FOR MATERIALS HAVING SOFTENING POINTS ABOVE 80^0C (176^0F)

Thermometer- An ASTM high softening point Thermometer having a range of 30 to 200°C or 85 to 392°F is specified Modifications for Hard Materials.

Employ the same procedure as described above except that U.S.P., Glycerin shall be used instead of water, and the starting point of the Glycerin bath shall be 32°C (89.6°F). Bring the bath to this temperature and thoroughly agitate it, then place the apparatus and specimens in the bath, which shall be maintained, under agitation at the starting temperature for 15 min. In applying the heat, place the ring apparatus of the center of the container and place the burner midway between the center and edge of the beaker away from the specimen.

10. PRECAUTIONS

10.1 The use of freshly boiled distilled water is essential as otherwise air bubbles may form on the specimen and affect the accuracy of the results. Rigid adherence to the prescribed rate of heating is absolutely essential in order to secure accuracy of results.

A sheet of paper placed on the bottom of the glass vessel and conveniently weighted will prevent the bituminous material from sticking to the glass vessel, thereby saving considerable time and trouble in cleaning.

11. ACCURACY

The limit of accuracy of the test is 0.5°C (0.9°F).