

Experiment No. 10: SOFTENING POINT OF BITUMINOUS MATERIAL

INTRODUCTION

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.**

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.**

OBJECTIVE

To determine the **softening point of bitumen.**

REFERENCE STANDARD

AASHTO DESIGNATION: **T 53-92**; ASTM DESIGNATION: **D 36-89**

APPARATUS AND MATERIALS

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).

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

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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).

Thermometer - ASTM Low Softening point Thermometer having a range of -2 to $+80^{\circ}\text{C}$ or 30° to 180°F is specified.



Figure 10.1 Ring and Ball apparatus

REAGENTS AND MATERIALS

- Freshly boiled distilled water.
- USP Glycerin, or
- Ethyl Glycol, with a boiling point between 195 and 197°C (383 and 387°F).

SAMPLE PREPARATION

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.

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PROCEDURE

- ✚ 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).
- ✚ 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.
- ✚ Place the ball in the water but not on the specimen.
- ✚ 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.
- ✚ With suitable force, place the ball in the center of the upper surface of the bitumen in the ring, thus completing the assembly.
- ✚ Apply the heat in such a manner that the temperature of the water is raised 5°C (9°F) each minute.

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.

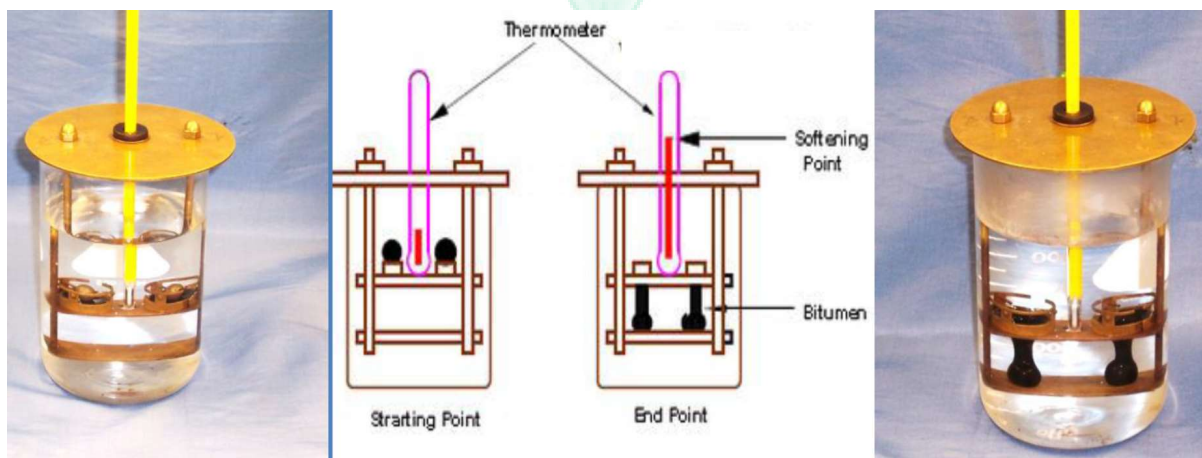


Figure 10.2: Illustration of softening point

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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.

ANALYSIS OF RESULTS

