

Experiment #02

Ring-Ball Test for Softening Point of Bitumen

Introduction

Ring and ball test is used to determine the softening point of bitumen. This test consists of two brass ring and two steel balls, using which the softening point of various bituminous materials are determined.

The softening point of bitumen or tar is the temperature at which the substance attains particular degree of softening. As per IS: 334-1982, ASTM E28-67 or ASTM D36 or ASTM D6493 – 11, it is the temperature in °C at which a standard ball passes through a sample of bitumen in a mould and falls through a height of 2.5 cm, when heated under water or glycerine at specified conditions of test.

The binder should have sufficient fluidity before its applications in road uses.

Uses of Softening Point

The determination of softening point helps to know the temperature up to which a bituminous binder should be heated for various road use applications. Softening point is determined by ring and ball apparatus.

Apparatus for Softening Point Test

1. The ring and ball apparatus consisting of:

1. Steel balls-two numbers each of 9.5 mm diameter weighing 3.5 ± 0.05 g.
2. Brass rings-two numbers each having depth of 6.4 mm. The inside diameter at bottom and top is 15.9mm and 17.5 mm respectively.
3. Ball guides to guide the movement of steel balls centrally.
4. Support -that can hold rings in position and also allows for suspension of a thermometer.
The distance between the bottom of the rings and the top surface of the bottom plate of the support is 25mm.

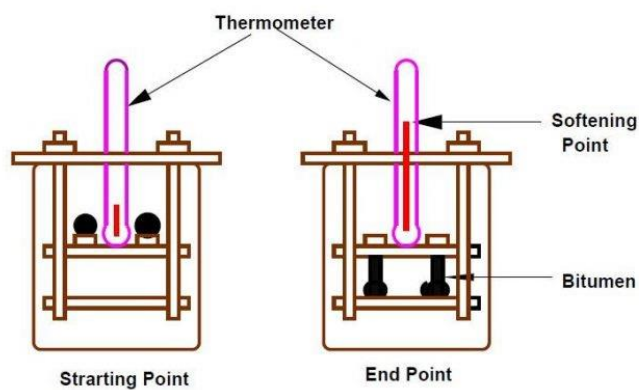
2. Thermometer

that can read up to 100° C with an accuracy of 0.2° C.

3. Bath—heat resistant glass beaker

not less than 85 mm in diameter & 1220mm deep.

4. Stirrer



Procedure for Softening Point Test on Bitumen

Preparation of test sample

Heat the material to a temperature between 75-100° C above its softening point; stir until, it is completely fluid and free from air bubbles and water. If necessary, filter it through IS sieve 30.

Place the rings previously heated to a temperature approximating to that of the molten material, on a metal plate which has been coated with a mixture of equal parts of glycerine and dextrin.

After cooling for 30 minutes in air, level the material in the ring by removing the excess material with a warmed, sharp knife.

Performing Experiment

1. Assemble the apparatus with the rings; thermometer and ball guides in position

2. Fill the bath with distilled water to a height of 50mm above the upper surface of the rings. The starting temperature should be 5° C.
Note: Use glycerin in place of water if the softening point is expected to be above 80° C; the starting temperature may be kept 35° C.
3. Apply heat to the bath and stir the liquid so that the temperature rises at a uniform rate of 5 ± 0.5 °C per minute.
4. As the temperature increases the bituminous material softens and the balls sink through the rings carrying a portion of the material with it.
5. Note the temperature when any of the steel balls with bituminous coating touches the bottom plate.
6. Record the temperature when the second ball touches the bottom plate. The average of the two readings to the nearest 0.5°C is reported as softening point.

Precautions During Softening Point Test

1. Distilled water should be used as the heating medium.
2. During the conduct of test the apparatus should not be subjected to vibrations. (iii)The bulb of the thermometer should be at about the same level as the rings.

Observations and Calculations

Temperature when the ball touches bottom, °C	1	2

Results

Softening point of bitumen / tar = °C

Recommended Values of Bitumen Softening Point

Softening point indicates the temperature at which binders possess the same viscosity. Bituminous materials do not have a melting point. Rather, the change of state from solid to liquid is gradual over a wide range of temperature. Softening point has particular significance for materials to be used as joint and crack fillers. Higher softening point ensures that they will not flow during service. Higher the softening point, lesser the temperature susceptibility. Bitumen with higher softening point is preferred in warmer places.