

Flash and Fire Point Test: Cleveland Open Cup Method

- Flash and Fire Point Test is a safety test.
- The flash point is one measure of the tendency of the test specimen to form a flammable mixture with air under controlled laboratory conditions.
- Every liquid has a vapor pressure, which is a function of that liquid's temperature.
- As the temperature increases, the vapor pressure increases.
- As the vapor pressure increases, the concentration of vapor of the flammable liquid in the air increases. Hence, temperature determines the concentration of vapor of the flammable liquid in the air.

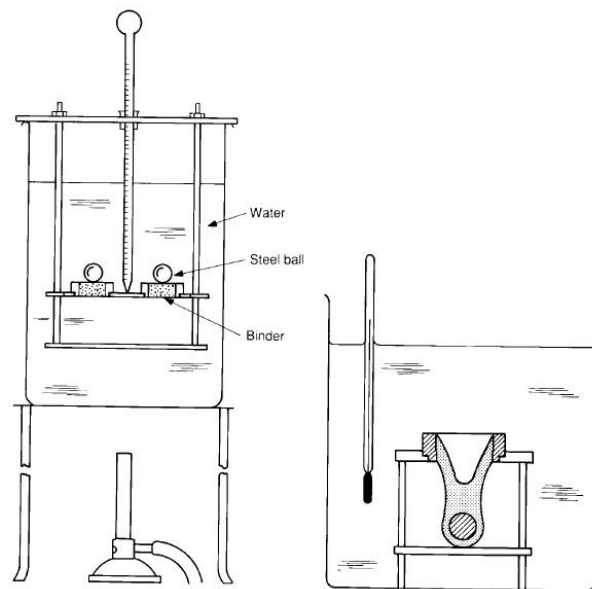
Flash Point: the lowest liquid temperature at which application of the test flame causes the vapors of the sample to ignite.

Fire Point: the temperature at which the test flame causes the sample to ignite and remain burning for at least 5 seconds.

- First, the test cup is filled with a portion of the asphalt. Then, the temperature of this chemical is increased rapidly and then at a slow, constant rate.
- The increase in temperature will cause the chemical to begin to produce flammable vapor in increasing quantities and density.
- A small test flame passing over the surface of the liquid causes the vapor to ignite at the flash point.
- The test flame produces at least five continuous seconds of ignition at the fire point.
- Recommended Values for any type of Bitumen grade:
 - Minimum Flash point value should be = 175°C.
 - Minimum Fire point value should be = Flash Point + 5°C.

Softening Point: Ring and Ball Test

- Bituminous materials do not have a definite melting point.
- Instead, as the temperature rises, these materials slowly change from brittle or very thick and slow-flowing materials to softer and less viscous liquids.
- The softening point is defined as the temperature at which a bitumen sample can no longer support the weight of a 3.5-g steel ball.
- Two horizontal disks of bitumen, cast in shouldered brass rings, are heated at a controlled rate in a liquid bath while each supports a steel ball.
- The softening point is reported as the mean of the temperatures at which the two disks soften enough to allow each ball, enveloped in bitumen, to fall a distance of 25 mm (1.0 inch).
- If the difference between the values obtained in the duplicate determinations exceeds 1°C repeat the test.



(a) Diagram of apparatus at beginning of test

(b) Diagram showing end of test

- A high softening point ensures that asphalt will not flow in service.
- For a given penetration, the higher the softening point the lower the temperature sensitivity.
- Together with the penetration at 25 °C, it can be used to compute the Penetration Index.