

Penetration test of bitumen- Step by Step Procedure and significance

Why to do penetration test of bitumen?

Penetration test of bitumen determines whether the bitumen under specified temperate is hard or soft. The value obtained by penetration test is the measure of hardness-softness of bitumen. It is a measure of the consistency of semi-solid bitumen.

Condition for testing of bitumen

This test consists of determining how far a standard steel needle will penetrate vertically into the binder under standard conditions of temperature, load, and time.

Temperature – 25 degree Celsius.

Sample may 100 gm and

Testing time 5 sec.

The results obtained are expressed in the unit of penetration, where one unit is equal to 1/10 mm.

Apparatus Required

- Heating Oven
- Thermometer
- Penetration Machine
- Water Bath container

- Sample Container (Depth 35 mm Diameter- 55 mm)
- Steel Needle

Procedure for Penetration test of bitumen



Penetration test of bitumen

Take a sample of bitumen in a large container and heat up to 90 degree. But keep in mind it should be less than 90 degree.

Now pour the heated sample of bitumen fully into a small container that we have taken in the apparatus required.

Let it to be in room temperature of about 15 degree Celsius to 25 degree Celsius for 60 minutes to 90 minutes

Now put the sample of bitumen into water bath whose temperature should be between 25 degrees Celsius to (+) or (-) 0.1 degree Celsius.

Put in water bath till 60 minutes to 90 minutes.

Take out sample from the water bath and put it to the penetration machine taking the initial value of the penetration machine.

Now, switch on the machine and let the needle penetrate the sample of bitumen till 5 seconds.

Keep in mind, while testing sample the temperature should be nearly 25 degree Celsius.

At least three samples should be tested in the same way and the average value of penetration should be preferred.

Bitumen test report will look like given below,

Bitumen test report

Source of materials :-

Bitumen Grade :-

Period of cooling :-

Room Temperature:-

Poured in Water Bath :-

Pouring Temperature :-

S.N	Sample Test Name	Value
1.	Temperature of penetration (Degree Celsius)	
2.	Time of penetration (Second)	
3.	Final Penetration (mm)	
4.	Initial Penetration (mm)	
5.	Penetration (mm)	
6.	Average Penetration. (mm)	

Significance of Penetration Test

The penetration test is carried out to classify bitumens into different grades. In BS (UK) literature, the ranges start from 15 (hardest bitumen) to 450 units (softest Bitumen). in India,

bitumen's are available with penetration values varying from 20 to 450.

Bitumen's with low penetration values are known bad crack Lower penetration values are recommended for use in hot climates and higher penetration values in cold climates.

However, lower penetration bitumen are used for preparing hot mix hot and Bituminous premixes.

Cohesive bonds with lower penetration bitumen are stronger than with higher penetration bitumen.

Softer bitumens are used for bitumen macadam and cold asphalt. Penetration values below 20 have been associated with bad cracking of road surfacing while cracking rarely

Occurs When penetration exceeds 30. Thus, the cracking behavior of bitumen may be judged based on penetration values.

Precaution for Penetration test

- The room temperature should not be higher than 26 degrees Celsius.
- The water bath container should have fresh water.
- The needle of the penetration machine should be of standard dimension.
- Sample container should be of standard dimension
- Sample should not be over heated.

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