

4.VISCOSITY TEST. **(IS : 1206 – 1978)**

INTRODUCTION:

Viscosity is defined as inverse of fluidity. Viscosity thus defines the fluid property of bituminous material. The degree of fluidity at the application temperature greatly influences the ability of bituminous material to spread, penetrate into the voids and also coat the aggregates and hence affects the strength characteristics of the resulting paving mixes.

Object:

To determine the viscosity of bitumen by Tar Viscometer.

Apparatus:

Tar Viscometer with 4mm and 10mm orifices – The apparatus consists of main parts like cup, valve, water bath, sleeves, stirrer, receiver and thermometers etc.

Procedure:

The tar cup is properly leveled and water in the bath is heated to the temperature specified for the test and is maintained throughout the test. Stirring is also continued. The sample material is heated at the temperature 20°C above the specified test temperature, and the material is allowed to cool. During this the material is continuously, stirred. When material reaches slightly above test temperature, the same is poured in the tar cup, until the leveling peg on the valve rod is just immersed. In the graduated receiver (cylinder), 25ml of mineral oil or one percent by weight solution of soft soap is poured. The receiver is placed under the orifice. When the sample material reaches the specified testing temperature within $\pm 0.1^{\circ}\text{C}$ and is maintained for 5 minutes, the valve is opened. The stopwatch is started, when cylinder records 25ml. The time is recorded for flow up to a mark of 75ml.(i.e., 50ml of test sample to flow through the orifice).

Results:

The time in seconds for 50ml of the test sample to flow through the orifice is defined as the viscosity at a given test temperature.

**VISCOSITY TEST OF BITUMEN
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Frequency of Tests

2 Samples / Consignment

Permissible Limits

Grade 30/40	2500+/-500Poises / Min.90 sec.
Grade 60/70	1000+/-200Poises / Min.70 sec.
Grade 80/100	500+/-100Poises / Min.50 sec.

Lab Ref. No : _____

Date of Sampling : _____

Grade of Sample : _____

Date of Testing : _____

Test Run	50 ml Collection.
Test Temp.	60°C
Viscosity	cm ² / sec.
Poise	Dyne.sec / cm ² (or) 1.02X10 ⁻² kg.sec/m ² (1kg.sec/cm ² = 98.1 Poise)
Stock	cm ² / sec.
4 mm Orifice	1cst = 0.076 sec.
10mm Orifice	1cst = 0.0025sec.

S.NO	DESCRIPTION	Test -1	Test -2	Test -3	Test -4	Mean Value
1	Specific Test Temp.°C					
2	Size of Orifice in mm					
3	Actual Test Temp.°C					
4	Test Run.					
5	Viscosity in Seconds.					

Remarks : _____

Tested by : _____ Checked by : _____
For Contractor For Contractor For Engineer

Limits:

Type of material	Orifice size, mm	Test temp, °C	Viscosity range, sec.
A35 & S35	10mm	60°C	90 - 100
A45 & S55	10mm	60°C	80 - 90
A55 & S55	10mm	60°C	70 - 80
A65 & S65	10mm	60°C	60 - 70
A90 & S90	10mm	60°C	50 - 60
A200 & S200	10mm	60°C	40 - 50
Cutback - RC,MC&SC - Grade - 0	4mm	25°C	25 - 75
Grade - 1	4mm	25°C	50 - 150
Grade - 2	10mm	25°C	10 - 20
Grade - 3	10mm	25°C	25 - 75
Grade - 4	10mm	40°C	14 - 45
Grade - 5	10mm	40°C	60 - 140

Viscosity conversion chart:

Known Viscosity	Required Viscosity							
	c.s. V _k	°Engler	sec. Redw I	sec. Redw II	sec. STV 10mm	sec. STV 4mm	sec. Saybolt Univ.	sec. Saybolt Furol.
Centi Stock V _k	1	0.132	4.10	0.41	0.0025	0.076	4.7	0.47
°Engler	7.58	1	31.10	3.11	0.019	0.576	35.63	3.563
secs.Redw I	0.244	0.0322	1	0.10	0.00061	0.0185	1.12	0.112
secs.Redw II	2.44	0.322	10	1	0.0061	0.185	11.2	1.12
secs.STV10mm	400	52.8	1640	164	1	30.4	1880	188
secs.STV4mm	13.2	1.74	54.1	5.41	0.033	1	62.04	6.024
secs.Saybolt.Un.	0.213	0.028	0.873	0.0873	0.00053	0.0162	1	0.10
secs.Saybolt.Fu.	2.13	0.28	8.73	0.873	0.0053	0.162	10	1