



BUOYANCY[®]
IMPEX PVT. LTD.

📍 "C" Tower, 10th Floor, Hampton Park,
Vesu, Surat 395007 Gujarat, India
☎ +91 99250 53193
+91 99250 53069
✉ info@buoyancyimpex.com
buoyancyinc@gmail.com

Viscosity grade Bitumen – (AR-4000/AR-40)

Viscosity grade Bitumen AR-4000/AR-40 exported by BUOYANCY[®] is strictly in compliance to (ASTM D3381-09) and AASHTO M226-80 (2008) standards. American Association of State Highway Officials (AASHTO) has two series of viscosity grade bitumen. One is denoted AC (asphalt cement), followed by a number indicating the viscosity in hundreds of poises at 60 °C. The second series is denoted AR (aged residue) followed by a number indicating the viscosity in poises (not hundreds of poises) at 60°C after the bitumen has been aged. The measurement of viscosity provides a more accurate method of specifying binder consistency and a more effective method of determining the temperature susceptibility of the bitumen. Viscosity is defined as the inverse of fluidity. Viscosity thus defines the fluid property of the bituminous material. Viscosity is the general term for consistency and it is a measure of resistance to flow. High viscosity grades AR-1000 to AR-16000 are generally suitable for the hot climate. AR Viscosity bitumen is graded through RTFOT system in which the Viscosity of bitumen (asphalt) is measured at 60 °C (140 °F) after the roll on thin film oven test.

Viscosity grade bitumen has a thermoplastic property which causes the material to soften at high temperatures and to harden at lower temperatures. This unique temperature/ viscosity relationship is important when determining the performance parameters such as the adhesion, rheology, durability and application temperatures of bitumen. In the Viscosity Graded Bitumen specifications, further special emphasis is placed on the Bitumen ductility.

Properties	Units	Result
Tests on Residue from Rolling Thin-Film Oven	-	AR-4000
Viscosity, 140°F (60°C)	P	4000 ± 1000
Viscosity, 275°F (135°C), Min	cSt	275
Penetration, 77°F (25°C), 100g, Min	0.1 mm	25
Penetration, 77°F (25°C), 100g, 5sec, Min	0.1 mm	45
Ductility at 25 °C, cm, min.	CM	75
Tests on original asphalt :		
Flash point, °C, min.	°C	227
Solubility in Trichloroethylene, %, min.	%Wt.	99

Advantages of Viscosity Grade Bitumen

- 1) Unlike penetration grades, same viscosity grade bitumen gave a similar rutting performance in hot weather.
- 2) Minimum penetration values were retained in the viscosity grading system to maintain acceptable.
- 3) Performance (in terms of resistance to fatigue cracking) at the yearly average service temperature of 25 °C
- 4) Minimum specified values of kinematic viscosity at 135 °C helped to minimize the potential of tender mixes during construction.

Accredited: ISO9001:2015 | ISO 14001:2015 | ISO45001:2018



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- 5) Minimum specified penetration at 25 °C and the minimum specified kinematic viscosity at 135 °C established the maximum allowable temperature susceptibility (slope of temperature versus stiffness line).
- 6) Viscosity grade bitumen is suitable for a wide range of temperatures: 25 °C for raveling/fatigue cracking; 60 °C for rutting; and 135 °C for construction. Temperature susceptibility (the change in asphalt binder rheology with temperature) can be somewhat determined because viscosity is measured at three different temperatures (penetration only is measured at 25 °C).
- 7) Since the viscosity values are measured at two temperatures, bitumen suppliers could provide to the users rational and accurate asphalt mixing and compaction temperatures (corresponding to bitumen viscosity of 170 and 280 centistokes, respectively)

Application of Viscosity Grade Bitumen (Asphalt)

Viscosity Grade Bitumen (Asphalt) is a standard grade Bitumen usually used as Paving Grade Bitumen suitable for road construction and for the production of asphalt pavements with superior properties. This grade of Bitumen is mainly used in the manufacture of hot mix asphalt for bases and wearing courses and possesses characteristics and qualities unique and quite different from other agents. They achieve very flexible and tenacious connections with other materials due mainly to viscoelastic response of bitumen, which behavior depends on how fast changes are applied. Viscosity Grade bitumen is specified by the methods described in ASTM Standard D3381-09 and AASHTO M226-80 (2008). Viscosity Graded specifications cover bitumen (asphalt) graded by Viscosity at 60°C (140 °F).

According to viscosity (degree of fluidity) grading, higher the grade, stiffer the Bitumen

Tests are conducted at 60°C and 135°C, which represent the temperature of road surface during summer (hot climate, similar to northern parts of India) and mixing temperature respectively. The penetration at 25°C, which is annual average pavement temperature, is also retained.

Test temperatures correlate well with

- 1) 25°C (77°F) – average pavement temp.
- 2) 60°C (140°F) – high pavement temp.
- 3) 135°C (275°F) – HMA mixing temp.

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