Bitumen

Bitumen is a thermoplastic material and its stiffness is dependent on temperature. The temperature-vs-stiffness relationship of bitumen is dependent on the source of crude oil and the method of refining.

The Bureau of Indian Standards (BIS) introduced paving grade bitumen specifications (IS: 73-1950) for the first time in the year 1950 and classified it on penetration. The specifications were revised in the years 1962 and 1992. To improve the quality of Bitumen, BIS revised IS-73-1992 specifications based on Viscosity (Viscosity at 60^{o}C) in July 2006. As per these specifications, there are four grades VG-10, VG-20, VG-30 & VG-40. A few qualification tests like specific gravity, water content, ductility, loss on heating & Farass breaking point were removed from IS: 73-1992 specifications as these tests do not have any relationship either with the quality or performance of the product.

IndianOil commenced marketing of Bitumen as per Viscosity Grade specifications conforming to IS: 73-1992 from all its refineries from Aug 2009. Therefore, the Penetration grades have been replaced by Viscosity grade Bitumen.

According to viscosity (degree of fluidity) grading, higher the grade, stiffer the Bitumen. Tests are conducted at 60^{o} C and 135^{o} 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^{o} C, which is annual average pavement temperature, is also retained.

Different Grades of Bitumen marketed by Indian Oil :

VG-10 BITUMEN**:** VG-10 is widely used in spraying applications such as surface-dressing and paving in very cold climate in lieu of old 80/100 Penetration grade. It is also used to manufacture Bitumen Emulsion and Modified Bitumen products.

VG-20 BITUMEN**:** VG-20 is used for paving in cold climate & high altitude regions

VG-30 BITUMEN**:** VG-30 is primarily used to construct extra heavy duty Bitumen pavements that need to endure substantial traffic loads. It can be used in lieu of 60/70 Penetration grade.

VG-40 BITUMEN**:** VG-40 is used in highly stressed areas such as intersections, near toll booths and truck parking lots in lieu of old 30/40 Penetration grade. Due to its higher viscosity, stiffer Bitumen mixes can be produced to improve resistance to shoving and other problems associated with higher temperature and heavy traffic loads.

TABLE: VISCOSITY GRADE (VG) BITUMEN SPECIFICATION AS PER IS 73:2006

Characteristics	VG-10	VG-20	VG-30	VG-40
Absolute Viscosity, 60^{o}C, poises, min	800	1600	2400	3200
Kinematic Viscosity, 135^{o}C, CST, min	250	300	350	400
Flash point, C, min	220	220	220	220
Solubility in trichloroethylene, %, min	99.0	99.0	99.0	99.0
Penetration at 25^{o}C	80-100	60-80	50-70	40-60
Softening point, C, min	40	45	47	50
Tests on residue from thin film over test / RTFOT:				
i. Viscosity ratio at 60^{o}C, max	4.0	4.0	4.0	4.0
ii. Ductility at 25^{o}C, cm, min, after thin film over test	75	50	40	25