Types based on the requirement of the industry.

Business, Industries

TYPESOF BITUMEN Bitumen can be found in different properties, specification and the uses are based on the requirement of the industry. Bitumenis available in variety of grade types which are penetration grade bitumen, oxidisedbitumen, cut-back bitumen, bitumen emulsion and polymer modified bitumen. Penetration grade bitumen is bitumen that isrefined and manufactured at different viscosities. Penetration test need to becarried out to characterise its hardness. Thus, it was named by penetrationbitumen. The range of penetration grade bitumen for road bitumen is from 15 to450. But the range that commonly used is 25 to 200.

By fluxing the remaining bitumenwith oils under partial control could bring the needed hardness of the bitumen. The BS EN 1426 and BS EN 1427 distribute the penetration and softening pointvalues for the respective grades. This will be a big help in pinpointing theequiviscosity of the bitumen grade and its hardness. Penetration values denotethe grades, for instance, 40/60 as a penetration value of 50 ± 10.

The BS EN13303 also contributes to the measure of loss on heating with respective limitsfor all penetration bitumen grades. This is to certify that there are novolatile components present. So, the setting and hardening of the bitumenduring the preparation is undergone do not get disturb. The BS EN 12592provides the solubility values to make sure there is less or no contaminant inthe bitumen material. Penetration grade bitumen advantages are this bitumen mayprovide a better interrelationship with a low temperature asphalt binderproperties than the viscosity test, which is performed at 60°C. Besides, thetest is quick and inexpensive, thus it can be

used in the field. In contrast, there are also its disadvantages. This bitumen’s shear rate is variable andhigh during the test.

Since asphalt binders typically behave as non-Newtonianfluid at 25° C, this will affect the test results. The test also does notprovide information with which to establish mixing and compaction temperatures. Cut-back bitumen is bitumen that was blendedwith more or less volatile hydrocarbon component.

The viscosity of this bitumen has been minimised bythe addition of solvent which is normally obtained from petroleum. After theapplication is done, the bitumen’s original viscosity is reclaimed. The solventthat had been used in cutback bitumen is called the “ cutter” or” flux”.

There are three types of solvents that have been used for theblending process which are slow-curing, medium-curing or rapid-curing solvents. The rate for bitumen to cure when get uncover to air can be determined by thechoice of the solvents. A rapid-curing (RC) solvent evaporated much faster thana medium-curing (MC) solvent. The setting time of bitumen is influenced by theevaporation rate of the solvent. The proportion of solvent added determines theviscosity of the cutback bitumen at which the higher the proportion of solvent, the lower the viscosity of the cutback. Cutbacks are more workable thanpenetration grade bitumen at which they are more easily reshaped. Only slightamount of heat are required to liquefy cutback bitumen than penetration bitumen, thus make it much facile to be used at lower temperatures.

Cutback bitumen canbe applied at lower temperatures compared to penetration grades due to itslower bitumen solvents viscosity. However, cutback bitumen does have its ownweakness which it consumes non-renewable energy resources which arefundamentally lost through evaporation. Oxidised Bitumen is the refined bitumen thatthrough further treatment by the introduction of processed air. This processgives us oxidised bitumen.

Soft bitumen is being instigated by the air that isunder pressure into it by maintaining the controlled temperature. Reaction ofthis introduced oxygen and bitumen component forming the compounds of highermolecular weight. Thus, rise in asphaltenes and maltenes content causing aharder mix. This is lessening the ductility and temperature vulnerability ofthe mix.

Normally, oxidised bitumen is applied in industrial practices. Bothsoftening point and penetration test become the references in designing andspecifying this bitumen. For instance, oxidised bitumen 85/40 has softeningpoint of 85 ± 5°C and penetration point of 40 ± 5 dmm. Oxidised bitumen alsohas to follow the solubility, loss on heating and streak point criteria. Oxidisedbitumen is utterly water resistant, highly flexible and durable. Furthermore, it is chemically really stable.

It is a very adaptable compound that is notonly chemically stable but also very durable compound apart from beingcompletely water resistant. It also has some conspicuous practical advantagesthat make it very sought after compound in various applications. However, thismodified bitumen has one disadvantage to use in coating composition, which hastendency to provide

solutions that tend to extend the body on aging. Theseundesirable body characteristics more pronounced in some solvents than inothers. It is significantly unhealthy among the case of the additional volatilecrude solvents.

The initial high body of modify bitumen solutions is of courseundesirable, visible of the subsequent low solid content of solutions havingviscosities sufficiently low for application by the while a substitute forslightly of the latter, with none substantial increase in body of the answer. Bitumenemulsion is the products in which droplets of bitumen preparation are scatteredin an aqueous medium. An emulsifier is applied to stabilise the mixture. Bitumen emulsion lets the handling, transport and application of bitumen atlower temperatures and is mainly implemented in road surfacing applications. Thistype of bitumen forms a two-phase system consisting of two immiscible liquids, bitumen and water, stabilised by an emulsifier. One of them is dispersed asfine globules within the other liquid. Bitumen emulsion is formed when discreteglobules of bitumen dispersed in a continual form of water.

It is essential forlaying purposes. Basically, emulsions with low bitumen content and lowviscosity are prone to settlement. This settlement can be minimised by balancingthe densities of two phases. To achieve this, addition of calcium chloride tothe aqueous phase is a main way. However, the coefficient of thermal expansionof bitumen and aqueous phase are not the same. Only at a specific temperaturecan make their densities to be the same.

The phase behaviour’s viscosity can beincreased by introducing a yield value, thus settlement can be eliminated. Thereare many advantages of bitumen emulsion, one of them are bitumen emulsionprovides a convenient and environmentally friendly option as it is water based. Besides, it doesn’t need extra heat while placing. It is also used inbituminous road construction, maintenance and repair work. However, bitumenemulsions do have its flaw.

The setting time may vary due to temperature, windand type of emulsion. In addition, not all single type of bitumen emulsion canbe applied for all works. It relies on the aggregate type setting time. Polymer modified bitumen is the type ofbitumen achieved by the modification of strength and the rheological propertiesof the penetration graded bitumen.

The polymer used can be either plastic orrubber. These polymers differs the strength and the viscoelastic properties ofthe bitumen. This is achieved by elastic response increase, improvement incohesive property, enhancement in fracture strength and providing ductility. Some of the examples of rubber polymers used are styrene block copolymers, synthetic rubbers, natural and recycled rubbers. Plastics which arethermoplastic polymers are also used. Polymer modified bitumen also one of thespecially designed and engineered bitumen grades that is used in makingpavement, roads for heavy duty traffic and home roofing solutions to withstandextreme weather conditions. It is normal bitumen with added polymer which givesits extra strength, high cohesiveness and resistance to fatigue, stripping anddeformations, making it a favourable material for infrastructure.

When polymeris added to regular bitumen, it becomes more elastomeric, which provides itwith additional elasticity. The polymer that is added is styrene butadienestyrene (SBS) which acts as a binder modification agent. The primary objectiveof SBS polymer modified bitumen is to provide extra life to pavement, roads andconstruction designs. Some of the qualities exhibited by polymer modifiedbitumen are higher rigidity, increase resistance to deformations, increaseresistance to cracks and stripping, better water resistance properties and highdurability. Some popular plastomers and thermoplastic elastomers in bitumenmodification are discussed regarding their advantages and disadvantages. Although polymers improve bitumen properties to some extent, there are stillsome drawbacks limiting the future development of bitumen polymer modificationsuch as high cost, low ageing resistance and poor storage stability of polymermodified bitumen.