Introduction to Infrastructural Engineering

Construction Materials6

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Rolled asphalt

- **Cut-back asphalt concrete**

  -Illegal in the United states since the 1970s, but many other countries around the world still use it.

  -The least environmentally friendly option, resulting in significantly more air pollution than the other forms.

  -Made by dissolving the asphalt binder in kerosene beforemixing it with the aggregate, reducing viscosity while the concrete is layered and compacted.

Mastic asphalt

- Also called sheet asphalt.
- Lower bitumen content than the rolled asphalt.
- Used for some roads and footpaths.
- Used also in roofing and flooring

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Mastic asphalt

- Stone mastic asphalt (SMA), is another variety.

- Becoming increasingly popular as an alternative to rolled asphalt.
- Benefits include

  -Anti-skid property

  -The absence of air pockets

  But if laid improperly

  -May cause slippery road conditions.

Physical properties of asphalt

- **Durability**

  - A measure of how asphalt binder physical properties change with age.

  - Sometimes called age hardening

  . - In general, as an asphalt binder ages, its viscosity increases and it becomes more stiff and brittle.

Physical properties of asphalt

- **Rheology**
- The study of deformation and flow of matter.
- Deformation and flow of the asphalt binder in HMA is important in HMA performance.
- HMA pavements that deform and flow too much may be susceptible to rutting and bleeding, while those that are too stiff may be susceptible to fatigue cracking.

Physical properties of asphalt

- **Safety**
- Asphalt cement like most other materials, volatilizes (gives off vapor) when heated.
- Flash point.
- For safety reasons, the flash point of asphalt cement is tested and controlled.

- **Purity**.
- Asphalt cement, as used in HMA paving, should consist of almost pure bitumen.
- Impurities are not active cementing constituents and may be harmful to asphalt performance.

Aggregate

- Collective term for sand, gravel and crushed stone mineral materials in their natural or processed state
- Roads and highways constitute the largest single use of aggregate at 40 percent of the total

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Aggregate origins and production

- Can either be natural or manufactured

I. Natural aggregates are generally extracted from larger rock formations through an open excavation

II. Manufactured rock typically consists of industrial byproducts such as slag (byproduct of the metallurgical processing – typically produced from processing steel, tin and copper)

- Specialty rock that is produced to have a particular physical characteristic not found in natural rock (such as the low density of lightweight aggregate).

Aggregate physical properties

- **Toughness and abrasion resistance**. Aggregates should be hard and tough enough to resist crushing, degradation and disintegration from activities such as manufacturing, stockpiling, production, placing and compaction.
- **Durability and soundness**. Aggregates must be resistant to breakdown and disintegration from weathering (wetting/drying) or else they may break apart and cause premature pavement distress.