

## CVG2141 Quiz 10

### **1. What types of asphalt are used in civil engineering? List the possibilities of using the different types of asphalt.**

Types of asphalt used includes cementitious and liquid asphalt. Cementitious asphalt has two products, asphalt cement and asphalt concrete. Asphalt cement is a binder which is typically used for sealing. Asphalt concrete is a combination of binder and aggregates which is used as a surface layer in hot mixes for asphalt pavements. Liquid asphalt has two products, cutback and asphalt emulsion. Cutback is a mix of asphalt cement and solvent. It is usually used for maintenance applications, however, can have negative environmental impacts due to the release of volatile solvents and hydrocarbons. Asphalt emulsion consists of asphalt cement, water, and an emulsifier. This alternative is more commonly used since it is better for the environment and can be used for the same maintenance applications. It is thixotropic which means that it decreases in viscosity over time when there is an applied and sustained load. Specifically, this means that with an decreased load, the viscosity will increase making it more stiff.

### **2. List the different applications of liquid asphalts in civil engineering.**

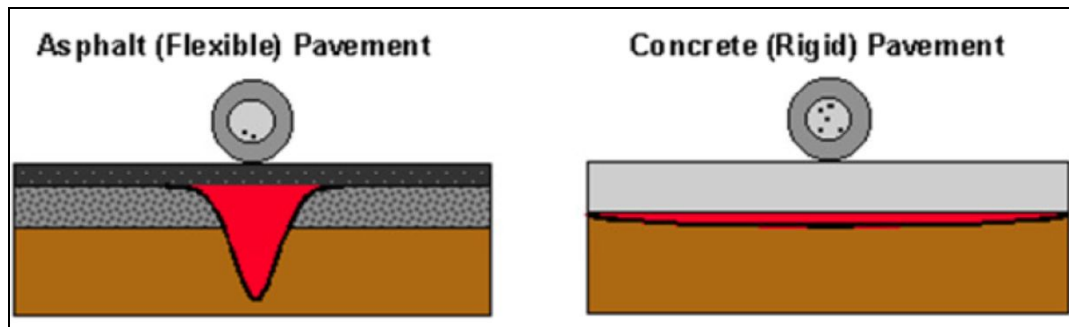
Liquid asphalt is typically used for maintenance or repair of pavements. Applications include tack coats, chip seals, slurry seals, fog seals, and crack seals. Tack coats are used to increase the bond between consecutive asphalt layers. Chip seals help to preserve pavement by an emulsion application and a uniform aggregate layer which helps to increase the vehicle adherence. Slurry seals work due to emulsion as it creates a sealed layer and levels off low surface pavements. Fog seals involve waterproofing pre-existing pavements by spraying diluted asphalt emulsion. Crack seals work by applying the asphalt in between cracks in order to fill them.

### **3. Describe the advantages and disadvantages of using asphalt and Portland cement concrete for pavements.** wanted distinct advantages and disadvantages,, ex - noise , bearing capacity, costs

Asphalt concrete can be advantageous since it has a lower initial cost and the construction requires less noise. However, it bears less capacity than portland cement concrete, has higher deformations, and requires more maintenance. Portland cement concrete can be beneficial since it can withstand larger loads without risk of rutting and less maintenance is required. However, it can have a higher initial cost.

### **4. Show the difference in structural behaviour between asphalt and concrete pavements.**

Structurally, asphalt pavement and concrete pavement differ since asphalt pavement is considered flexible while concrete pavement is rigid. Asphalt pavements distribute loads over a small area which transfers through the layers. While, concrete pavements distribute loads over a large area which typically only remains on the top layer.



**5. Describe the different layers of an asphalt pavement.**

The top layer of asphalt pavement is called the asphalt concrete layer. This layer should be the least permeable in order to minimize the amount of water spread to the lower layers. As well, since it is the most exposed, it is easily damaged resulting in it needing to be removed or replaced often. The second layer is called the base layer and it is a mix of coarse aggregates and asphalt cement. This layer has a lot less cement in it than the asphalt concrete layer. The third layer is the sub-base layer which consists of compacted aggregates. Lastly, the fourth layer is the compacted foundation soil.

**6. What is the PG of asphalt concrete? How do one select it?**

The performance grade of asphalt concrete describes the range of temperature which the concrete can undergo before extensive damage can occur from rutting, thermal cracking, and fatigue. The selection is significant because asphalt concrete is highly sensitive to temperature. If the temperature is too high, the material can become too soft and if the temperature is too low, the material can become too brittle. The range of temperature depends on the environment where the application is being made, as the common highest and lowest temperatures need to be taken into account. The cost must be considered as well since the larger the range means the greater the cost.

**7. Cite the durability related issues that can arise while the use of asphalt in pavements.**

Asphalt pavement might have durability issues due to the fact that it is highly sensitive to temperature. As a result durability issues can occur including rutting, thermal cracking, and fatigue. Rutting can be described as the longitudinal depression in pavements that occur because of hot temperatures and traffic. This can be avoided by selecting asphalt cements that can withstand large loads in hot temperatures. Moreover, thermal cracking can occur when pavements become brittle from cold temperatures. This can be avoided by selecting an asphalt cement that can withstand cold temperatures. Also, fatigue can occur due to cyclic loading over time, like repeated traffic. This can be mitigated by reducing the amount of traffic or increasing the mechanical properties of the pavement.