

Republic of Iraq

Ministry of Higher Education & Scientific Research

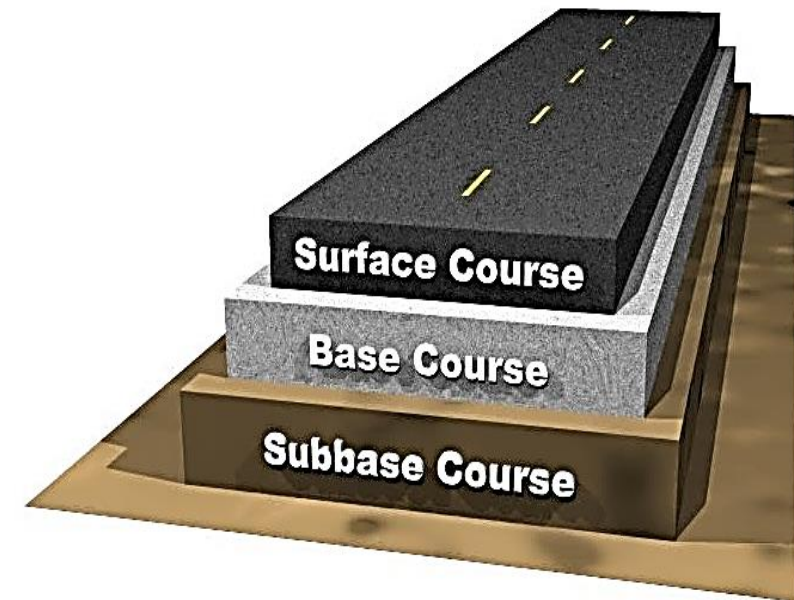
Al-Mustaqbal University College

Department of Building & Construction Engineering



## “HIGHWAY ENGINEERING” 3<sup>rd</sup> Stage

((التبليط المرن FLEXIBLE PAVEMENT))



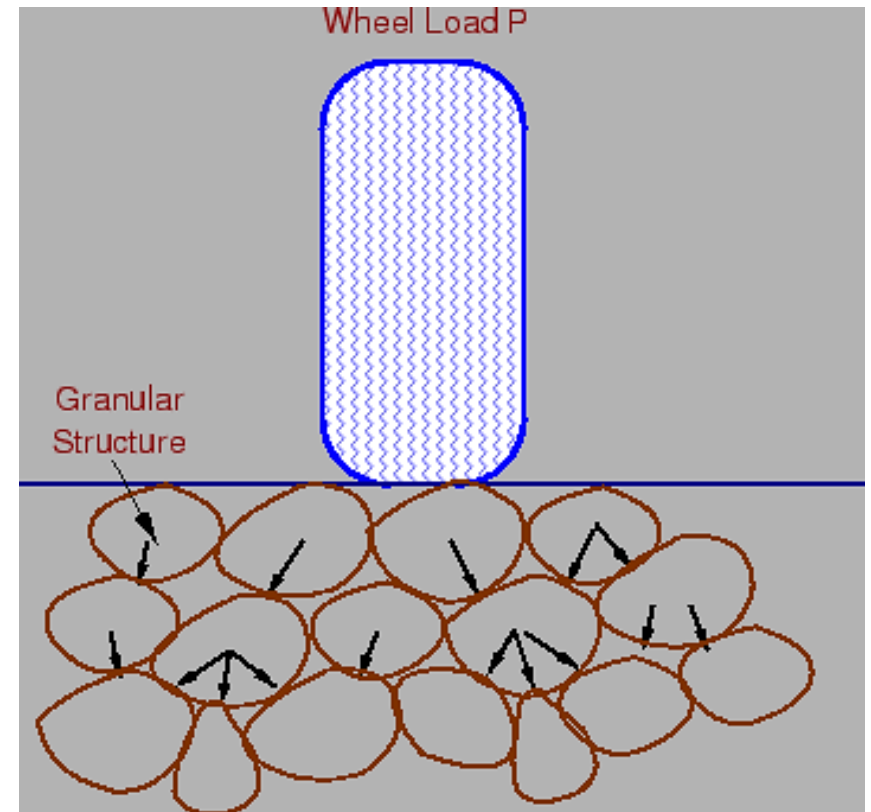
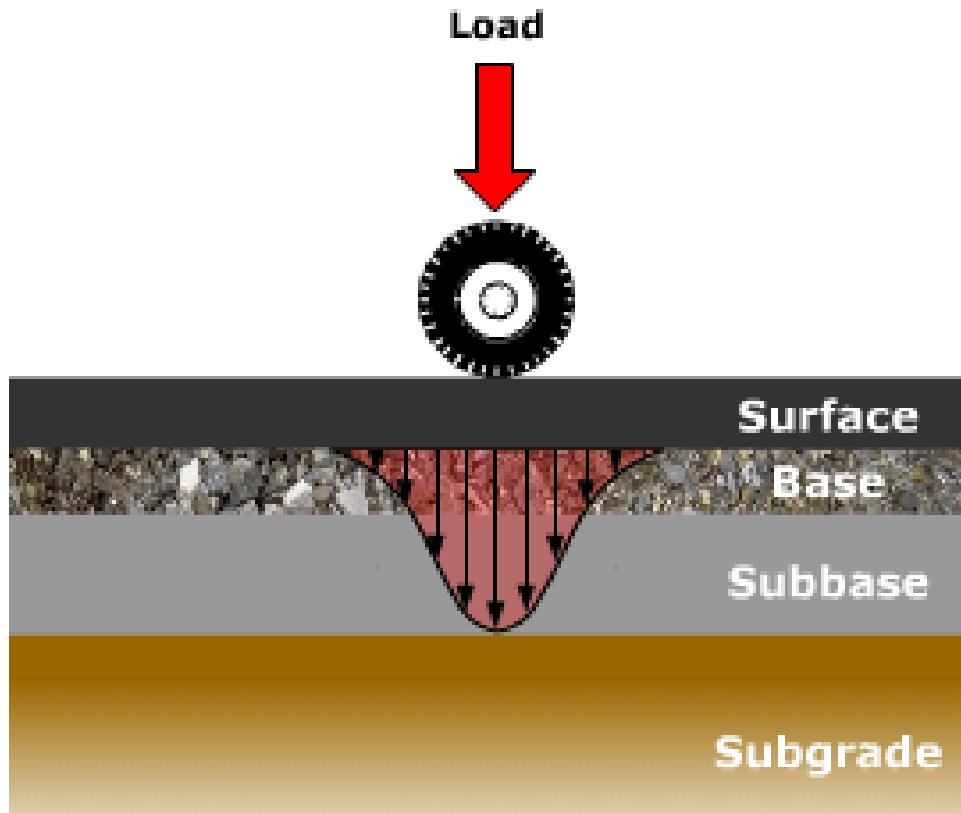
Prepared by The Senior Lecturer: Mr. Tameem Mohammed Al Musawi

## **FLEXIBLE PAVEMENT**

A typical flexible pavement consists of a bituminous surface course over base course and sub-base course. The surface course may consist of one or more bituminous or Hot Mix Asphalt (HMA) layers. Flexible pavements are designed in such a way that the load that reaches the subgrade does not exceed the bearing capacity of the subgrade soil. Consequently, the thicknesses of the layers above the subgrade vary depending upon strength of soil affecting the cost of a pavement to be constructed.



Flexible pavements will transmit wheel load stresses to the lower layers by grain-to-grain transfer through the points of contact in the granular structure

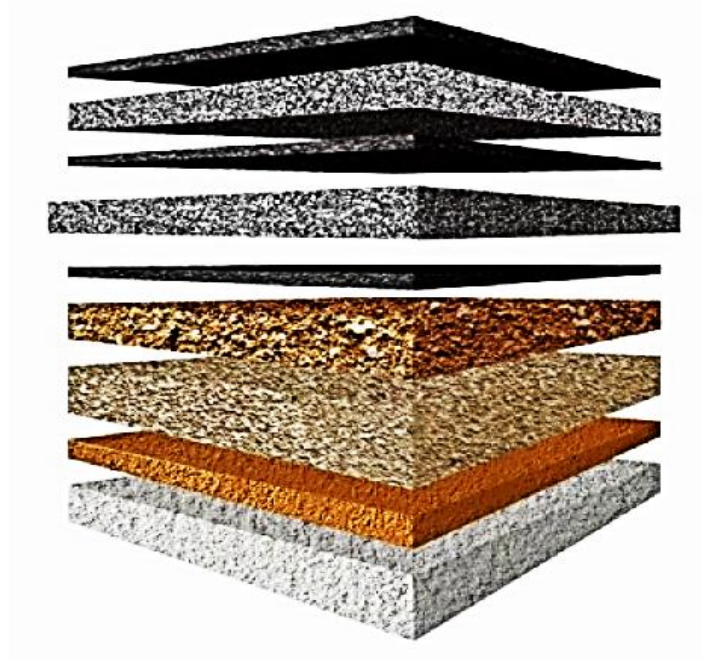


## Types of Flexible Pavements

The following types of construction have been used in flexible pavement:

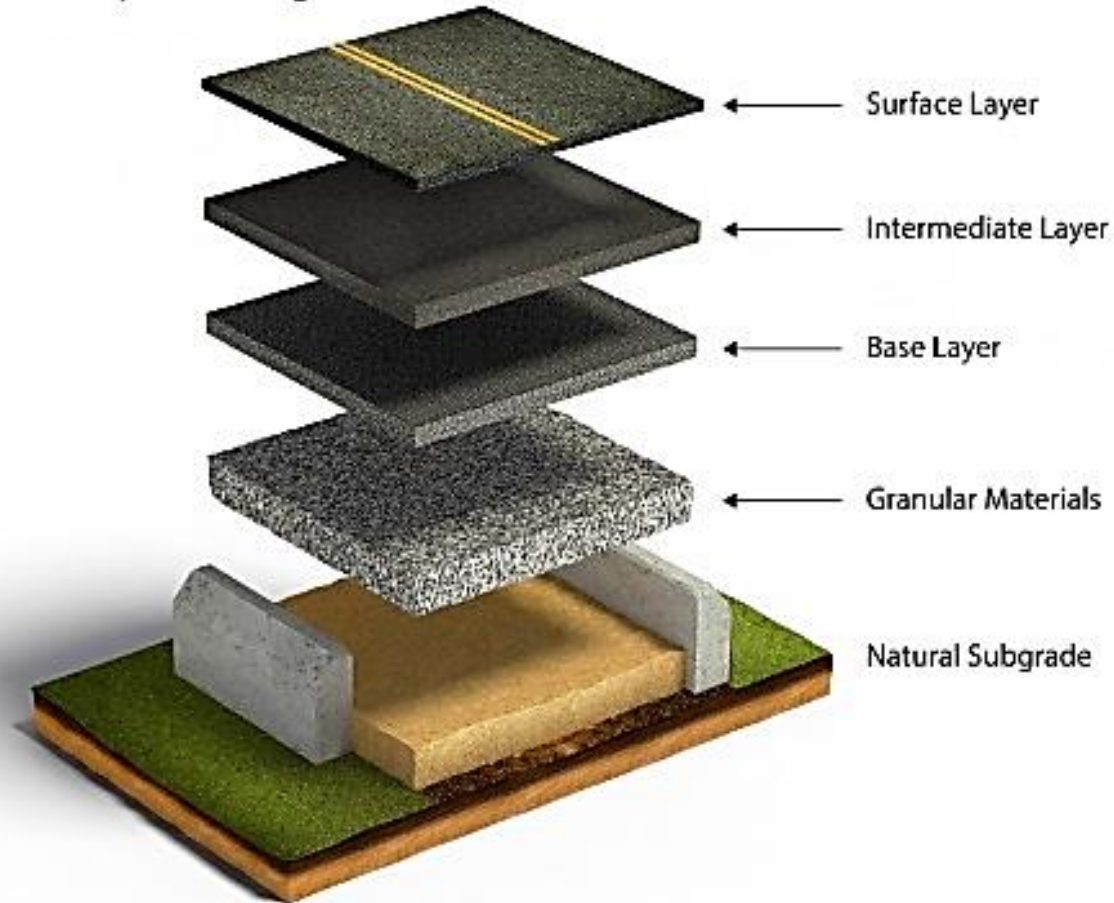
- Conventional layered flexible pavement,
- Full - depth asphalt pavement, and

**Conventional flexible pavements** are layered systems with high quality expensive materials are placed in the top where stresses are high, and low quality cheap materials are placed in lower layers.



**Full - depth asphalt pavements** are constructed by placing bituminous layers directly on the soil subgrade. This is more suitable when there is high traffic and local materials are not available.

Full-depth Perpetual Asphalt Design



## **Typical layers of a flexible pavement**

Typical layers of a conventional flexible pavement includes seal coat, surface course, tack coat, binder course, prime coat, base course, sub-base course, compacted sub-grade, and natural sub-grade.

### **Seal Coat:**

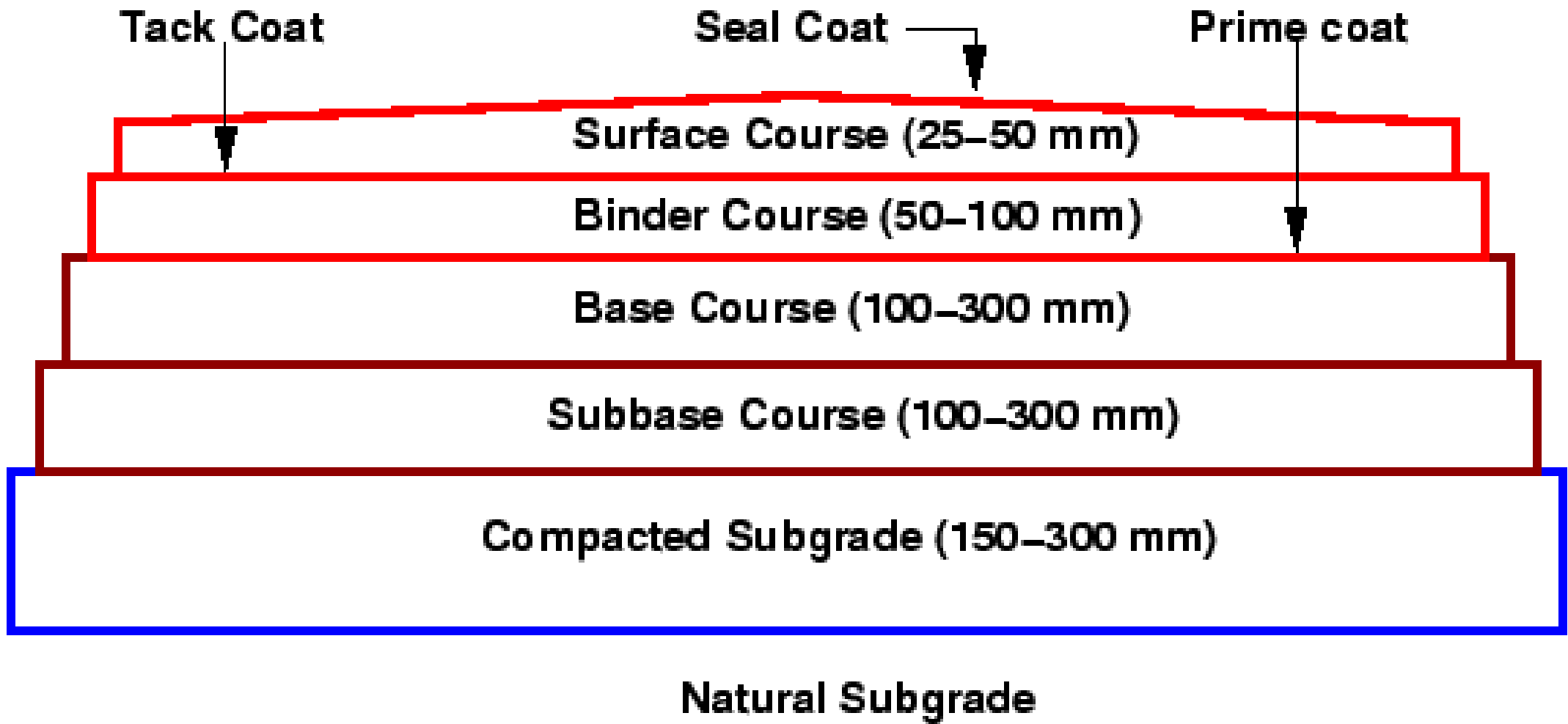
Seal coat is a thin surface treatment used to water-proof the surface and to provide skid resistance.

### **Tack Coat:**

Tack coat is a very light application of asphalt, usually asphalt emulsion diluted with water. It provides proper bonding between two layer of binder course and must be thin, uniformly cover the entire surface, and set very fast.

### **Prime Coat:**

Prime coat is an application of low viscous cutback bitumen to an absorbent surface like granular bases on which binder layer is placed. It provides bonding between two layers. Unlike tack coat, prime coat penetrates into the layer below, plugs the voids, and forms a water tight surface.



## **Surface course**

Surface course is the layer directly in contact with traffic loads and generally contains superior quality materials. They are usually constructed with dense graded asphalt concrete(AC). The functions and requirements of this layer are:

- 1- It provides characteristics such as friction, smoothness, drainage, etc. Also it will prevent the entrance of excessive quantities of surface water into the underlying base, sub-base and sub-grade,
- 2- It must be tough to resist the distortion under traffic and provide a smooth and skid- resistant riding surface,
- 3- It must be water proof to protect the entire base and sub-grade from the weakening effect of water.

## **Binder course**

This layer provides the bulk of the asphalt concrete structure. It's chief purpose is to distribute load to the base course The binder course generally consists of aggregates having less asphalt and doesn't require quality as high as the surface course, so replacing a part of the surface course by the binder course results in more economical design.



## **Base course**

The base course is the layer of material immediately beneath the surface of binder course and it provides additional load distribution and contributes to the sub-surface drainage. It may be composed of crushed stone, crushed slag, and other untreated or stabilized materials.

## **Sub-Base course**

The sub-base course is the layer of material beneath the base course and the primary functions are to provide structural support, improve drainage, and reduce the intrusion of fines from the sub-grade in the pavement structure. If the base course is open graded, then the sub-base course with more fines can serve as a filler between sub-grade and the base course. A sub-base course is not always needed or used. For example, a pavement constructed over a high quality, stiff sub-grade may not need the additional features offered by a sub-base course. In such situations, sub-base course may not be provided.

## **Sub-grade**

The top soil or sub-grade is a layer of natural soil prepared to receive the stresses from the layers above. It is essential that at no time soil sub-grade is overstressed. It should be compacted to the desirable density, near the optimum moisture content.