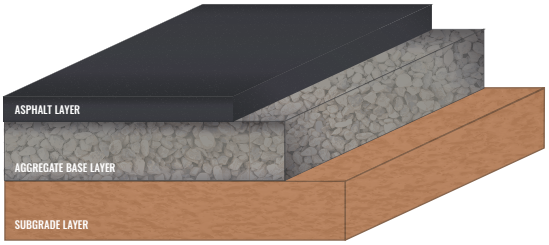
Bituminous Roadways, Inc.

Pavement Design

TRAFFIC LOADING AND STRENGTH OF THE SUBGRADE ARE CRITICAL TO DETERMINING THE DESIGN THICKNESS OF THE PAVEMENT LAYERS

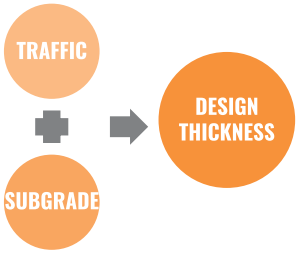
PAVEMENT DESIGN

By following a few basic principles of pavement design, one can ensure that a pavement will be strong and built to last. Asphalt pavements are made of an aggregate base layer and an asphalt pavement layer. The thickness of each layer is critical to resist the expected traffic loads and protect the subgrade. Therefore, asphalt pavement design is the process of determining the proper thicknesses of the aggregate base and asphalt pavement layers by defining the expected traffic loading and strength of the subgrade materials.



TRAFFIC LOADING

Traffic loading is selected by determining the type and frequency of vehicles typically using the pavement being designed. As vehicles travel over pavement, the weight of the vehicle causes asphalt pavements to flex underneath the wheels. Each time the pavement flexes, a very small amount of damage is caused. Heavier vehicles cause slightly more flexing and, therefore, more damage to the pavement. The size and frequency of vehicles using the pavement being designed should be considered when selecting the traffic loading category.



Traffic Loading Categories

Trails – pedestrian walking paths
Light Duty – mostly cars with a few large trucks (ex: Parking Lots)
Medium Duty – some large trucks (ex: Loading Dock Area)
Heavy Duty – frequent large trucks (ex: Distribution Center)

SUBGRADE STRENGTHS

The strength of the subgrade can be measured or it can be estimated from the type of subgrade material. A DCP is the tool used to measure the strength of the subgrade by driving a metal rod into the ground and measuring the distance traveled below the surface. A shorter distance traveled indicates a higher resistance and stronger subgrade.

Subgrade Categories

Soft – Clays	(DCP: < 1 blows/inch)
Medium – Silty Loams	(DCP: 1-2 blows/inch)
Firm – Silty Sands	(DCP: 3-4 blows/inch)

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GRANULAR EQUIVALENT

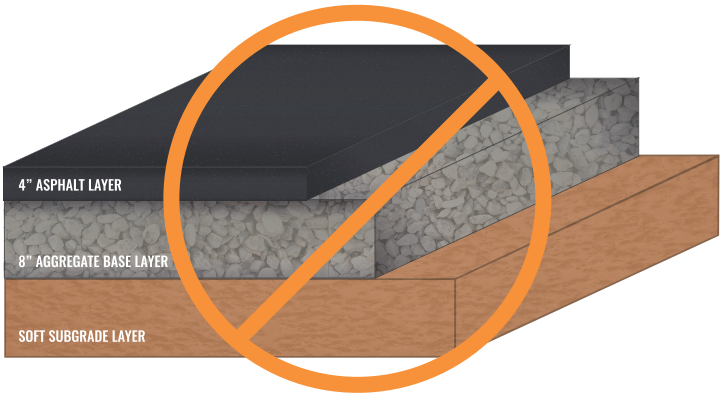
Granular Equivalent (GE) is a concept for relating the strengths of different materials. For example, 1 inch of class 5 aggregate is equal to 1 GE. Yet, 1 inch of asphalt pavement (which is much stronger than class 5 aggregate) is equal to 2.25 GE. To design a pavement, select and modify the thicknesses of the asphalt and class 5 aggregate layers until the sum total GE of the pavement design is greater than the minimum GE as the table indicates.

MINIMUM GRANULAR EQUIVALENT

Subgrade Strength	TRAFFIC LOADING CATEGORY			
	TRAILS	LIGHT	MEDIUM	HEAVY
Soft	12.5	19.0	23.0	25.5
Medium	11.5	17.0	20.0	22.5
Firm	10.5	14.0	17.0	19.5

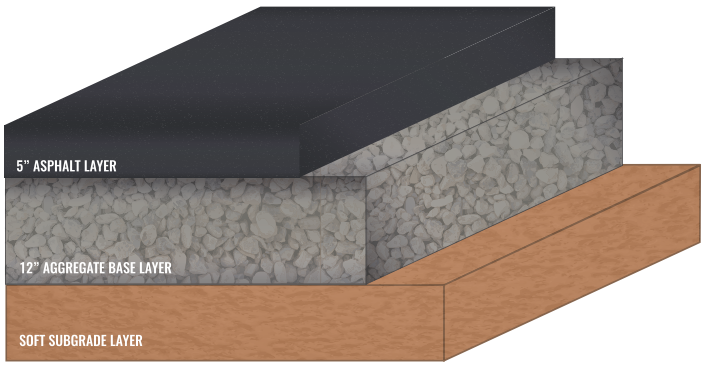
PAVEMENT DESIGN EXAMPLE

A loading dock area (**Medium Duty**) with clay subgrade (**Soft Subgrade**) | *Minimum Granular Equivalent is 23.0 GE*



4 inches of asphalt = **4 x 2.25 = 9.0 GE**
8 inches of class 5 = **8.0 GE**
Design GE = 9 + 8 = 17.0 GE < 23 Required GE

PAVEMENT WILL NOT SUPPORT THE TRAFFIC LOADING!



5 inches of asphalt = **5 x 2.25 = 11.25 GE**
12 inches of class 5 = **12.0 GE**
Design GE = 11.25 + 12 = 23.25 GE > 23 Required GE

PAVEMENT WILL SUPPORT THE TRAFFIC LOADING!

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