KENTUCKY RIDES ON US

Asphalt.

ASPHALT PARKING LOT GUIDE

A publication for owners, architects and engineers who design and construct asphalt parking lots

PAIKY
Plantmix Asphalt Industry of Kentucky
PAIKY.org

PARKING LOT GUIDE

KENTUCKY PARKS ON US

Overview

The automobile has become an integral part of modern civilization. As we increasingly rely on personal transportation, we find that the demand for adequate parking also becomes an issue. Nearly all building structures will incorporate some parking features to accommodate their workers, customers, and deliveries. Office buildings and retail stores across America are opening their doors and trying to attract new customers. First impressions are critical and the parking lot serves as a crucial gateway to what that first impression might be.

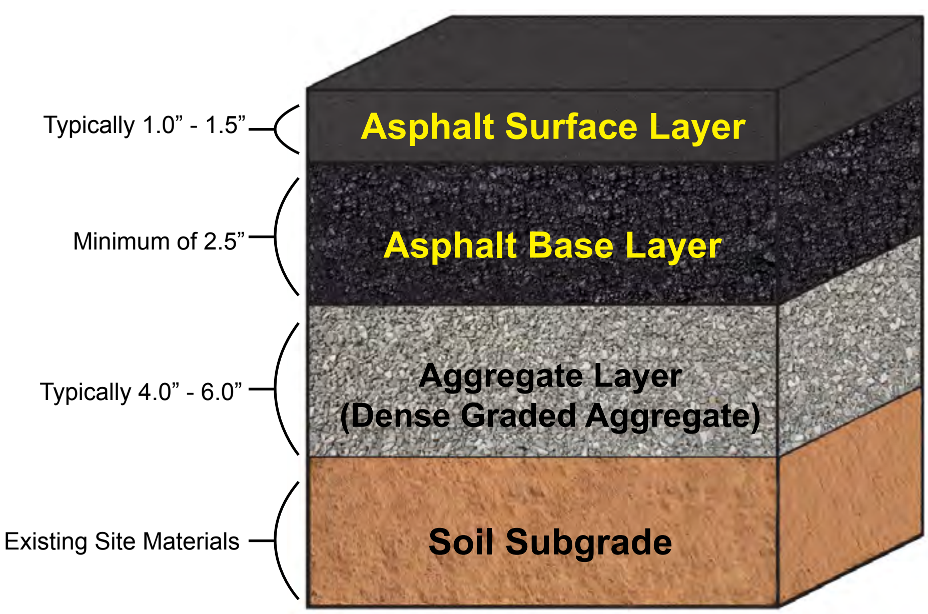
Today's parking lots are engineered with the latest advances in road science to meet the needs of motorists as well as the demands of traffic. As a result, the industry utilizes the technology and advancements to improve the quality of the pavement continuously. Ultimately, the goal is to provide a finished product that remains durable, smooth, safe, and sustainable for a long period of time.

This publication provides owners, architects and engineers guidance on the design and construction of parking lot pavements that serve the user and last for generations.

Pavement Thickness Design

From our busiest distribution centers to the remote parking lot frequented only at the height of holiday shopping, asphalt pavements must account for a multitude of variables requiring that individual projects are uniquely engineered. This section will address the structural design – or thickness – of an asphalt pavement. In its simplest form, the thickness of an asphalt pavement is determined by the quality and strength of the subgrade materials and the volume and composition of the traffic that is expected to travel on the pavement.

Pavement Thickness Schematic



Asphalt pavements are typically characterized as a layered system where different materials are utilized and each layer contributes to the overall strength and function of the pavement structure. Most parking lots in Kentucky are built on a foundation of native subgrade soils and an aggregate layer (typically dense graded aggregate) is utilized to provide load-carrying structure and to improve the working platform for the asphalt paving materials. Following the placement and compaction of the soil and aggregate layers, two or more layers of asphalt pavement are added to complete the pavement structure. The most common approach is to utilize a base asphalt mixture over the aggregate layer and then to utilize a surface mixture as the final riding course.

Traffic Analysis

The weight and frequency of truck and passenger vehicle traffic over a pavement is a critical and sensitive parameter in designing the thickness of any pavement structure. It is easy to see that pavements which experience heavy truck traffic will require a thicker pavement section than one that hosts only passenger cars. However, the challenge is to quantify that traffic so that we can utilize this information in the various pavement design methods and computer programs.

The effect of traffic is often expressed as Equivalent Single Axle Loads (ESAL). ESAL refers to the pavement distress caused by an axle load of given magnitude in relation to the distress caused by a single 18,000-pound axle load. In the American Association of State Highway and Transportation Officials (AASHTO) research, on which many design methods are based, 18,000 pounds was taken as a standard load and assigned a damage factor of one. For decades, AASHTO has played an integral role in providing guidance for the design of pavements for roadways and highways. Heavier axle loads have ESAL factors greater than one and lighter axles less. The advantage of the ESAL concept is that factors for different axles (of one truck and also of trucks of different types) may be added, and thus the cumulative effects of many trucks of different types may be evaluated. ESAL factors apply not only to trucks but also to lighter vehicles such as cars, pickups and sports utility vehicles. However, the ESAL factor for these passenger vehicles is quite small as compared to a heavily loaded commercial truck.

Most pavement design methods will utilize ESALs as an input parameter but that information is not always readily available. Without specific data on the number of ESALs expected for a specific pavement, designers may seek out other forms of data to help them estimate the expected traffic. One such alternate approach is to consider the number of vehicles that will travel over the pavement each day. This information may be used to help quantify the traffic and is expressed as the Average Daily Traffic (ADT). When utilizing ADT data, the designer must also determine another key piece of data to complete the analysis. The percentage of trucks must be well defined and understood well. The combination of ADT and the percentage of trucks is often sufficient information for computer programs to calculate the ESALs for a given pavement.

In the case of new construction projects, the designer may not know how much traffic to expect and must make an educated guess. The Institute of Transportation Engineers (ITE) has taken some of the guesswork out of the equation by publishing its Trip Generation Manual which provides traffic data for various land use classifications. These are helpful tools and excellent guidance when designing a new facility. Selected excerpts from these tables have been included in this publication to assist designers in determining how much traffic they should anticipate for some typical applications.

Since the design of an asphalt pavement is heavily influenced by the truck traffic, it is important that the designer have a firm grasp on the volume of truck traffic to utilize in the planning and design of the pavement.

This publication includes several schematic diagrams which should help provide some additional guidance on when and where to expect certain categories of traffic. Heavy truck traffic areas could include distribution centers or loading and unloading areas around commercial facilities. Parking lots that are primarily used by passenger cars but do experience the occasional delivery or garbage truck would be considered moderate. Light truck traffic would generally apply to parking facilities dominated by passenger cars and sport utility vehicles with little or no opportunity for commercial truck access.

Subgrade Materials

The subgrade material for most pavements will be naturally occurring soils or rock and must be examined and well understood before designing a pavement. There are two primary methods currently being used to categorize soils (for roadways) that have similar characteristics: (1) American Association of State Highway and Transportation Officials (AASHTO) System and (2) Unified Soil Classification System (USCS). The purpose of classifying subgrade soil by soil type and strength value is to predict how the soil will perform when loaded.

The consistency, quality, and moisture conditions of the naturally occurring materials are all factors in the pavement design process. Additionally, the designers must determine if the existing site materials are suitable for the project. If deemed unsuitable, the engineers will make a determination if they should be removed and replaced with better materials or if they should be mechanically improved or chemically stabilized.

Through inspection and geotechnical analysis, most engineers will consider all the factors on a project and assign a relative strength value to the subgrade materials. Local conditions such as the depth to bedrock, water table, and frost depth should all be considered. There are several design methods that may utilize different classification systems when designing pavements, but the most common approach in Kentucky is the California Bearing Ratio (CBR). The design engineer or geotechnical consultant will utilize their field investigation, laboratory testing, and local experience to assign a strength value to the subgrade. This value will be utilized in the design methodology and is a sensitive parameter in determining the pavement thickness.

California Bearing Ratio (CBR) Table

CBR	Soil Description and Characterization
1-3	Highly compressible fine grained soils with a liquid limit greater than 50
4-5	Low compressible fine grained soils with a liquid limit less than 50
6-8	Coarse grained soils, sand and sandy soils, or gravel and gravely soils
9-11	Rock (limestone, sandstone, etc), select granular materials, or chemically stabilized soils

Types of Layered Systems

Geotechnical consultants, architects, and design consultants must make a choice regarding the type of layered system to be used on the project. Parking lots are typically designed in one of two ways.

» **Aggregate Base**
The most common method involves placing a layer of granular base on top of the subgrade material. The asphalt pavement is then placed over the granular-base layer.

» **Full-Depth®**
A second method is called "full-depth" hot mix asphalt pavement (Full-Depth® is registered by the Asphalt Institute with the U.S. Patent Office). Full-depth pavements are characterized by placing the asphalt directly on the subgrade material (without a granular-base layer).

Local site conditions and experience will often dictate the choice of utilizing a granular base design or a full-depth design.

High Stress Areas (Loading Docks and around Trash Dumpsters)

Areas in and around truck loading docks and trash dumpsters represent severe loading conditions for the pavement and should be carefully considered when designing the parking lot. Light duty pavement sections utilized in these areas can be prone to premature failures. The designer should take two factors into consideration: (1) the location of the loading dock and dumpster and (2) pavement thickness in that area.

If possible, locate the dumpster in such a way to minimize the route that the garbage truck must travel through the parking lot to and from the dumpster pad. Routine truck traffic in an otherwise light duty section will result in a much thicker pavement design than is necessary and will increase costs. It is typically more cost effective to isolate the dumpster area and truck traffic to a small portion of the parking lot and address this area with a separate pavement design. Once the truck route to and from the loading dock and dumpster pad has been established, consider a heavy duty pavement section to accommodate this rather severe loading condition. As a general rule, those sections leading into the dumpster (areas where the truck will stop, load, and unload), the minimum recommended thickness is six (6.0) inches of asphalt over four (4.0) inches of dense graded aggregate base.

Thickness Design Methods

When it comes to the thickness design of asphalt pavements, designers have several choices in design methods and software programs. In addition to the resources available nationally, many states have also developed design methods so check with your local agency or state paving association for additional guidance.

Many state DOTs utilize the “AASHTO Guide for Design of Pavement Structures,” a document has been updated and revised periodically over the years. While the 1993 version is still being utilized by many states, AASHTO has developed a new mechanistic-empirical approach which is now included as an interim guide and will likely be formally adopted soon. AASHTO also has computer software (AASHTOWare) which includes a pavement design feature by the name of DARWin.

The primary asphalt pavement design methods and software are as follows:
» AASHTO 1993
» Kentucky Transportation Cabinet (Design Memo 6-99)
» Asphalt Institute SW-1
» PerRoad and PerRoadExpress by the Asphalt Pavement Alliance (APA)

For the purpose of parking lot designs in Kentucky, most designs are based on AAHSTO 1993. As a result, PAIKY has developed thickness design tables based on AASHTO 1993 to help guide designers.

PAIKY Design Tables

The Plantmix Asphalt Industry of Kentucky (PAIKY) has developed three tables based on AASHTO 1993 to be used as guidance for architects and engineers when designing asphalt pavements. Designers must first determine the anticipated traffic for the parking lot and utilize this information to establish which table is appropriate for the project.

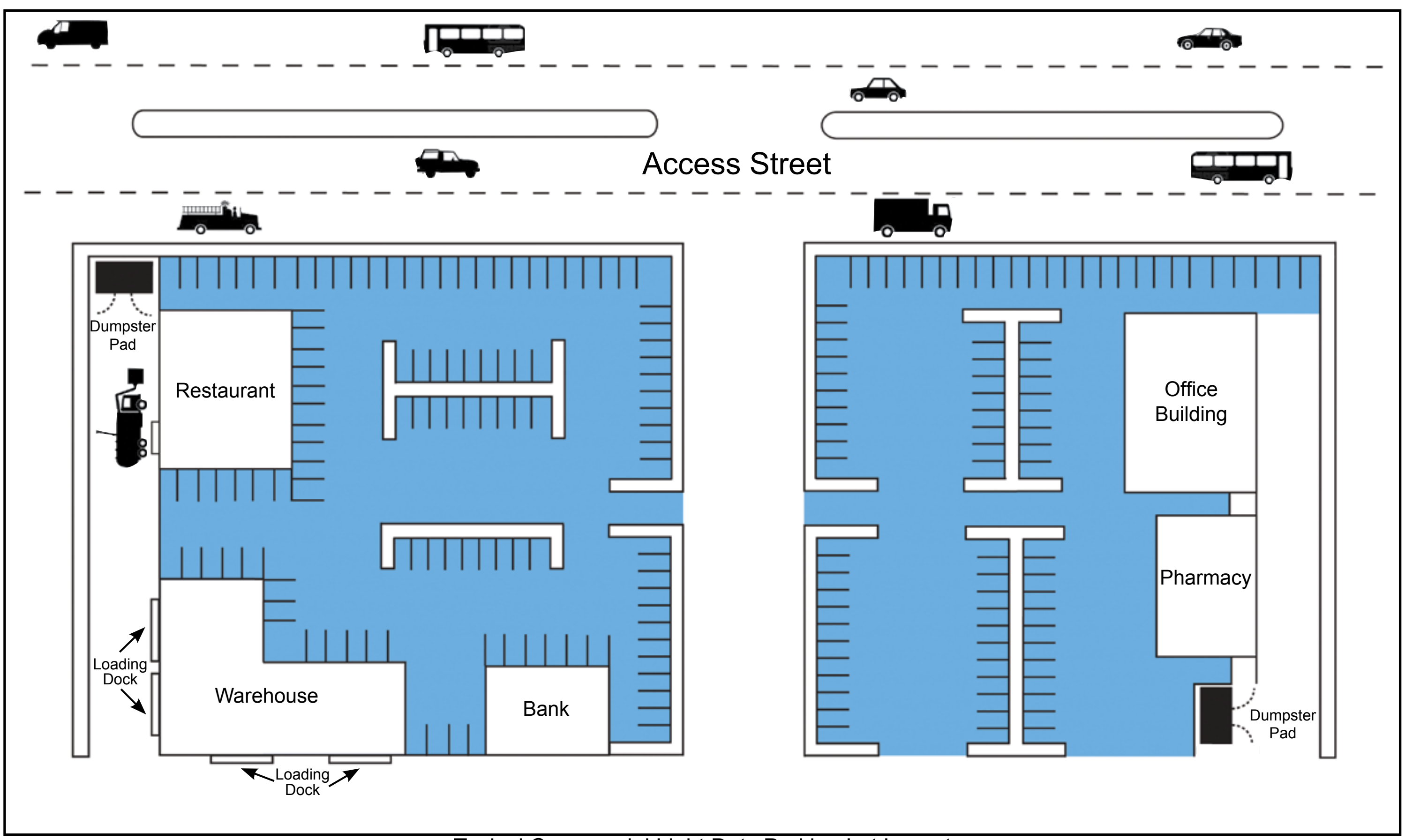
For the purpose of this guide, light duty traffic has been defined as a pavement that is exposed primarily to light duty vehicles (passenger cars, SUVs, etc.) and the occasional delivery truck. These pavements typically experience 120,000 ESALs or less and/or fewer than 1,500 vehicles per day. The assumption for these structures is that the traffic stream will consist of 98 percent passenger vehicles and 2 percent single unit trucks.

In situations where more truck traffic is expected, design tables for moderate traffic levels have been established. The assumed traffic stream for these pavements is 92 percent passenger vehicles with a mixture of single unit trucks (5 percent) and combination trucks (3 percent). This table should be utilized when some moderate amount of single unit and combination truck traffic is expected and ranges from 250,000 to 1 million ESALs (ADT from 700 to 3,000).

For this purpose of this guide, heavy duty pavements have been defined as those exceeding 1 million ESALs up to 8 million ESALs (ADT greater than 3,000 and less than 24,000). The assumed traffic stream for heavy duty pavements is also 92 percent passenger vehicles with a mixture of single unit trucks (5 percent) and combination trucks (3 percent).

Light Traffic Applications

For typical parking lot applications or other pavements that are likely to host passenger vehicles, the attached table will provide guidance on the thickness of the aggregate base and the layers of base and surface asphalt. Most commercial building structures have well defined areas for passenger car parking as shown below. The type and condition of the subgrade soil materials are sensitive parameters in the design thickness and are important to the long-term performance of the pavement. Consult with a geotechnical engineer to assist in evaluating the site conditions and to perform testing and analysis to establish a CBR value appropriate for the project.



Typical Commercial Light Duty Parking Lot Layout

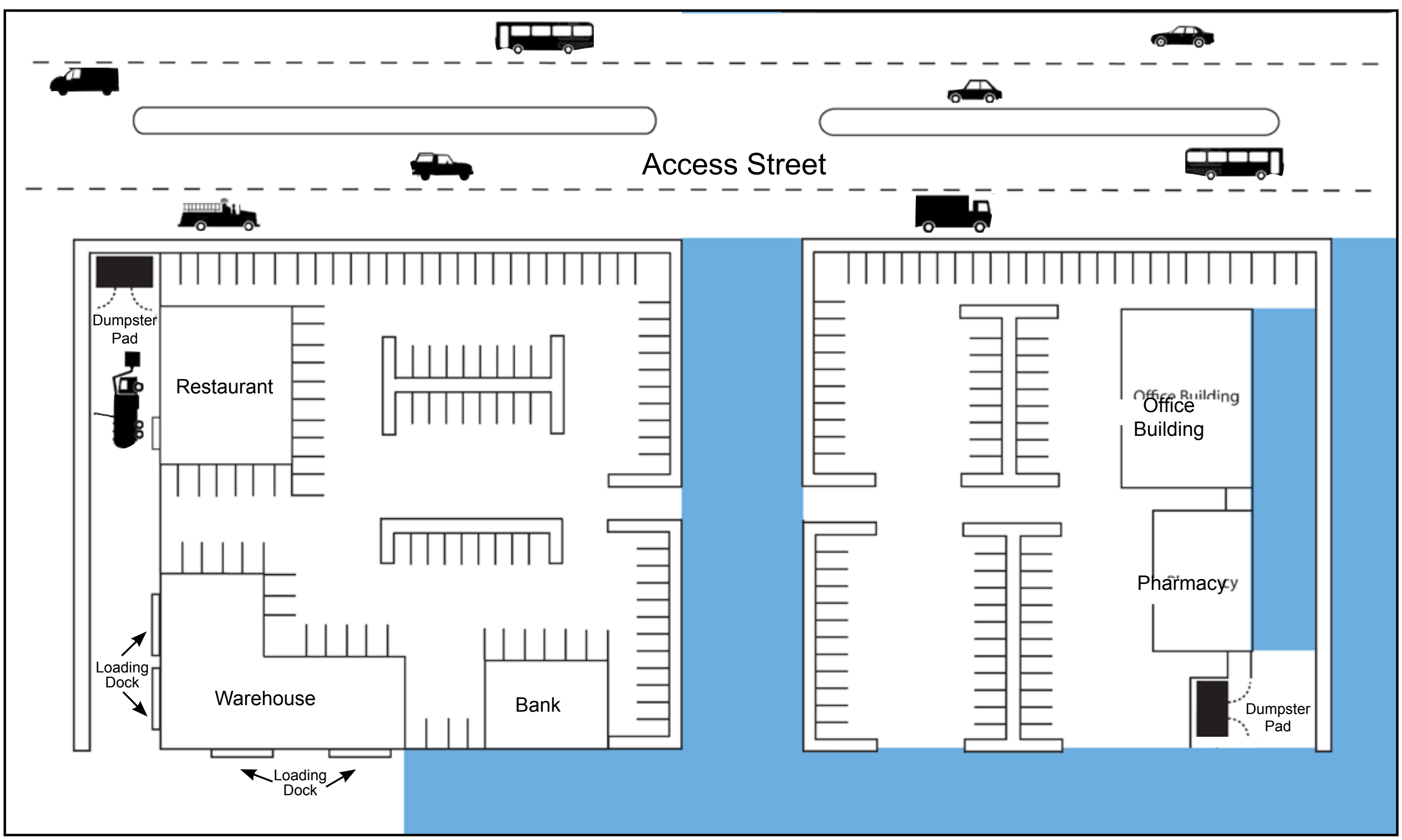
PAIKY Pavement Design Table (AASHTO 1993)
Light Duty Traffic Applications

Traffic Characteristics	**Primarily Passenger Vehicles (98%) with a few Single Unit Trucks (2%)**				
Estimate ESALs	**7,000**	**15,000**	**30,000**	**60,000**	**120,000**
Average Daily Traffic	**< 100**	**< 200**	**< 400**	**< 700**	**< 15,000**

	CBR Value = 1.0 (Soil Stabilization Recommended)				
Asphalt Surface Thickness (in)	1.50	1.50	1.50	1.50	1.50
Asphalt Base Thickness (in)	3.00	3.50	4.00	4.50	5.50
Aggregate Thickness (in)	6.00	6.00	6.00	6.00	6.00
	CBR Value = 2.0 (Soil Stabilization Recommended)				
Asphalt Surface Thickness (in)	1.50	1.50	1.50	1.50	1.50
Asphalt Base Thickness (in)	3.00	3.25	3.50	4.00	4.50
Aggregate Thickness (in)	6.00	6.00	6.00	6.00	6.00
	CBR Value = 3.0				
Asphalt Surface Thickness (in)	1.50	1.50	1.50	1.50	1.50
Asphalt Base Thickness (in)	2.75	3.00	3.25	3.50	4.00
Aggregate Thickness (in)	6.00	6.00	6.00	6.00	6.00
	CBR Value = 4.0				
Asphalt Surface Thickness (in)	1.50	1.50	1.50	1.50	1.50
Asphalt Base Thickness (in)	2.50	2.75	3.00	3.25	3.50
Aggregate Thickness (in)	6.00	6.00	6.00	6.00	6.00
	CBR Value = 5.0				
Asphalt Surface Thickness (in)	1.50	1.50	1.50	1.50	1.50
Asphalt Base Thickness (in)	2.50	2.50	2.75	3.00	3.25
Aggregate Thickness (in)	6.00	6.00	6.00	6.00	6.00
	CBR Value = 6.0				
Asphalt Surface Thickness (in)	1.50	1.50	1.50	1.50	1.50
Asphalt Base Thickness (in)	2.50	2.50	2.50	2.75	3.00
Aggregate Thickness (in)	6.00	6.00	6.00	6.00	6.00
	CBR Value = 7.0				
Asphalt Surface Thickness (in)	1.50	1.50	1.50	1.50	1.50
Asphalt Base Thickness (in)	2.50	2.50	2.50	2.50	2.75
Aggregate Thickness (in)	6.00	6.00	6.00	6.00	6.00
	CBR Value = 8.0 or above				
Asphalt Surface Thickness (in)	1.50	1.50	1.50	1.50	1.50
Asphalt Base Thickness (in)	2.50	2.50	2.50	2.50	2.50
Aggregate Thickness (in)	6.00	6.00	6.00	6.00	6.00

Moderate Traffic Applications

For parking lot applications, driving lanes or other pavements that are likely to experience some truck traffic along with passenger vehicles, the attached table will provide guidance on the thickness of the aggregate base and the layers of base and surface asphalt. Most commercial developments will have some common driving lanes between buildings which may experience heavier truck traffic and higher volumes of passenger cars. Consult with a geotechnical engineer to assist in evaluating the site conditions and to perform testing and analysis to establish a CBR value appropriate for the project.



Typical Commercial Moderate Duty Parking Lot Layout

PAIKY Pavement Design Table (AASHTO 1993)
Moderate Duty Traffic Applications

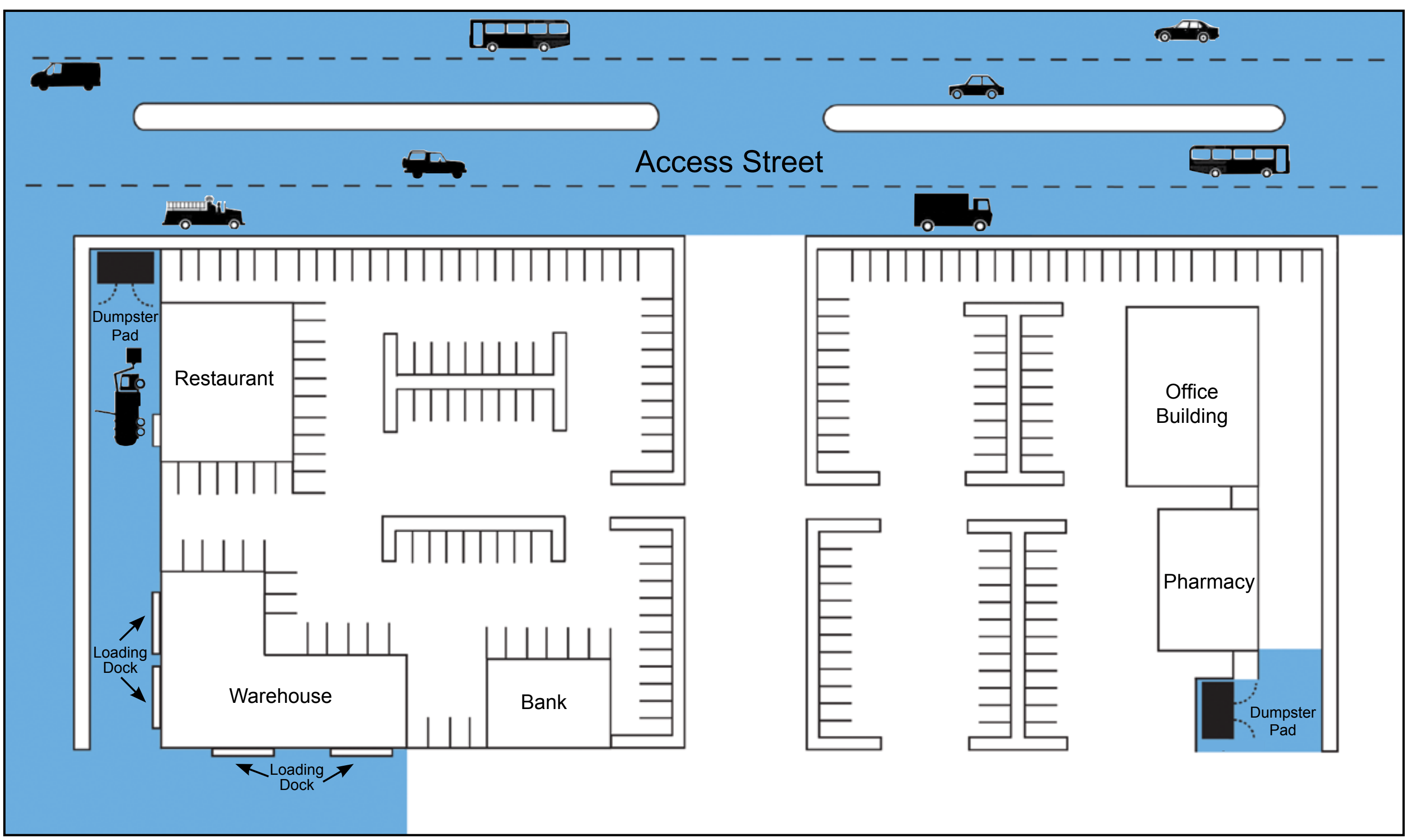
Traffic Characteristics	**Autos (92%), Single Unit Trucks (5%), and Combination Trucks (3%)**		
Estimate ESALs	250,000	500,000	1,000,000
Average Daily Traffic	< 700	< 1,500	< 3,000

	CBR Value = 1.0 (Soil Stabilization Recommended)		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	6.00	6.50	8.00
Aggregate Thickness (in)	8.00	8.00	8.00
	CBR Value = 2.0 (Soil Stabilization Recommended)		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	5.00	6.00	6.50
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 3.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	4.50	5.50	6.00
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 4.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	4.00	5.00	5.50
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 5.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	3.75	4.50	5.00
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 6.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	3.50	4.00	4.50
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 7.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	3.25	3.50	4.00
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 8.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	3.00	3.25	3.50
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 9.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	2.75	3.00	3.25
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 10.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	2.50	2.75	3.00
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 11.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	2.50	2.50	2.75
Aggregate Thickness (in)	6.00	6.00	6.00

Heavy Traffic Applications

For heavily traveled areas with substantial truck traffic leading into parking lots, around dumpsters and loading docks, the attached table will provide guidance on the thickness of the aggregate base and the layers of base and surface asphalt. Most commercial and light industrial facilities with loading docks will have an established truck route in and out of the facility. Consult with a geotechnical engineer to assist in evaluating the site conditions and to perform testing and analysis to establish a CBR value appropriate for the project.

For pavements expected to experience more than 8 million ESALs or for facilities such as truck distribution centers where the anticipated traffic stream is much different than the assumptions in this guide document, perform a detailed analysis of the anticipated traffic loading conditions. If the analysis suggests that the pavement will experience more than 8 million ESALs, consult with the PAIKY office for assistance in determining the most appropriate design technique.



Typical Commercial Heavy Duty Parking Lot Layout

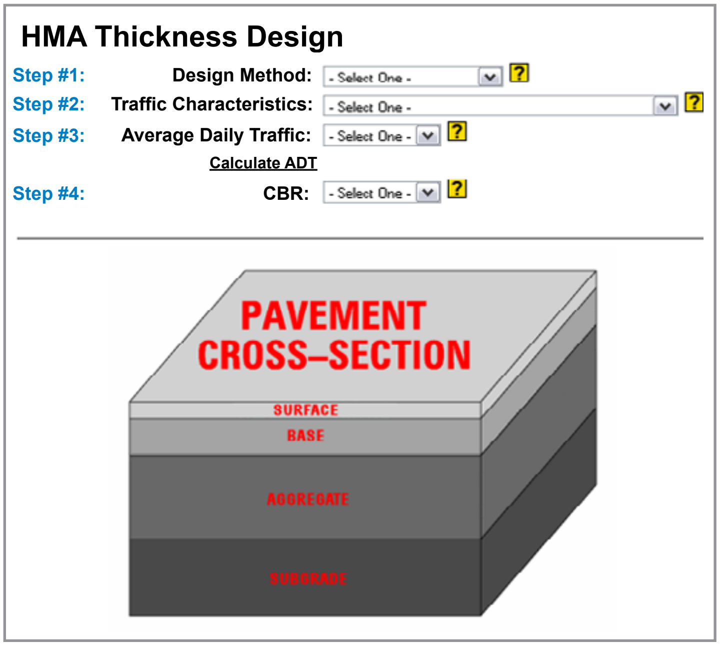
PAIKY Pavement Design Table (AASHTO 1993)
Heavy Duty Traffic Applications

Traffic Characteristics	**Autos (92%), Single Unit Trucks (5%), and Combination Trucks (3%)**		
Estimate ESALs	2,000,000	4,000,000	8,000,000
Average Daily Traffic	< 6,000	< 12,000	< 24,000

	CBR Value = 1.0 (Soil Stabilization Recommended)		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	9.50	10.00	11.00
Aggregate Thickness (in)	8.00	10.00	12.00
	CBR Value = 2.0 (Soil Stabilization Recommended)		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	7.50	9.00	10.00
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 3.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	6.50	7.50	9.00
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 4.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	6.00	7.00	8.00
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 5.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	5.50	6.50	7.50
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 6.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	5.00	5.50	6.50
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 7.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	4.50	5.50	6.50
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 8.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	4.00	5.00	6.00
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 9.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	3.75	4.75	5.75
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 10.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	3.50	4.50	5.50
Aggregate Thickness (in)	6.00	6.00	6.00
	CBR Value = 11.0		
Asphalt Surface Thickness (in)	1.25	1.25	1.25
Asphalt Base Thickness (in)	3.25	4.25	5.25
Aggregate Thickness (in)	6.00	6.00	6.00

PAIKY Website Design Tool

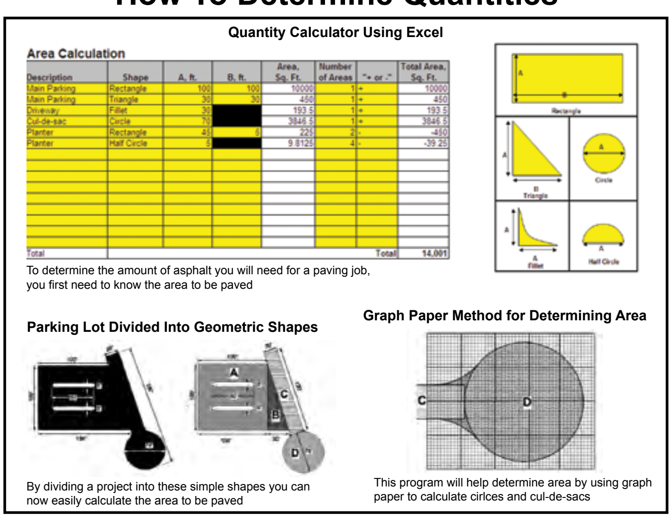
In addition to the information and tables provided in this print document, the Plantmix Asphalt Industry of Kentucky (PAIKY) has developed an on-line pavement design tool that may be accessed from our website at www.paiky.org. Users should explore the section of the website entitled "Technical Resources" and will find the interactive pavement design guide featured there. This design procedure allows the user to utilize the same input parameters and tables provided in the section above in a web-based environment and provides reporting features that are helpful when documenting a pavement design analysis.



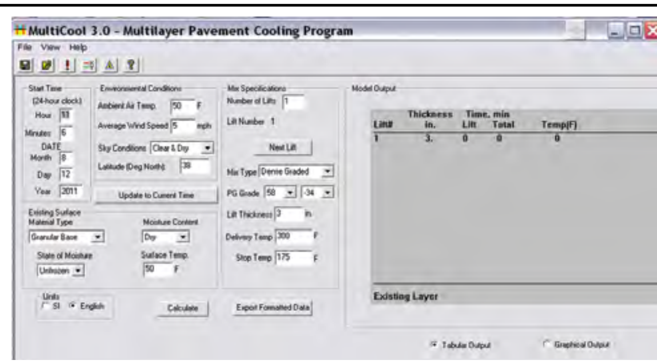
Contractor and Calculating Tools

The National Asphalt Pavement Association (NAPA) has developed tools to assist designers and contractors in calculating quantities for paving contractors. For additional information, visit www.asphaltpavement.org and click on the tab entitled "Asphalt Pavement." The Contractor tools shown below provide guidance and tools for calculating pavement quantities as well as cooling rates for asphalt pavement.

How To Determine Quantities



How To Determine Mix Cooling Time



MultiCool is a user-friendly, simple computer program that calculates the rate of cooling in an HMA mat during construction. It requires that the user input such items as the time of day (entered automatically according to the computer's clock), latitude, air temperature, wind speed, mix information and lift thickness for each HMA lift, type of material being paved over, its temperature and whether or not the soil or base are frozen.

Source: NATIONAL ASPHALT PAVEMENT ASSOCIATION
Web Site - www.hotmix.org

Site Design Considerations

Drainage

It is often said that the three most important things to consider when designing a pavement are drainage, drainage, and drainage. It is absolutely critical that any pavement be well designed for proper drainage. Drainage problems are frequently a major cause of parking area pavement failures and should be given special consideration during the design and construction phases.

Without proper drainage, stormwater can cause premature deterioration of the surface layers. In addition, moisture will penetrate into the subgrade layers, which could weaken the entire pavement structure resulting in severe distress.

When designing a pavement structure, consider both surface and subsurface drainage. Similar to the approach when building a new house – pavements require both a roof and an under drain system. The pavement surface should be sloped to drain storm water from the surface. Even with the best construction practices, it is inevitable that water will get into the pavement structure and therefore should be designed to drain that water in an effort to protect the subgrade materials from degradation.

Automatic sprinkler systems have become common throughout medians in parking areas. The result is more and more water on and in our pavement structure. Constant exposure to moisture can deteriorate the pavement and/or the underlying subgrade soils so caution should be taken to confine this water to the grassy areas.

Slopes

Parking areas should have a minimum slope of 2 percent to facilitate drainage. Pavement cross slopes of less than 2 percent are hard to construct without forming flat spots or depressions that can lead to ponding water (bird baths). There is a tendency among designers to overlook the need for grade information at key points in intersections, cross-overs and transitions between grade lines.

Design of Asphalt Mixtures for Parking Lots

In order to achieve optimum performance and durability of a parking lot, the asphalt mixtures should be specifically designed for individual project conditions. The Kentucky Transportation Cabinet (KYTC) has detailed specifications and nomenclature for mixtures utilized on KYTC projects. In addition, local agencies such as city and county governments may have specifications and mixtures that they prefer. Due to the availability of materials and conditions in an area, designers should consider using mixtures that have a history of proven performance.

Mix Designs

Asphalt pavements are made up of three primary components: 1) aggregates; 2) liquid asphalt binder; and 3) air. The asphalt binder acts as the binding agent to glue aggregate particles into a dense mass and to waterproof the mixture. When bonded together, the mineral aggregate acts as a stone framework to impart strength and toughness to the system. Asphalt mixtures also include a small percentage of air voids which are necessary for pavement durability. The performance of the mixture is affected both by the properties of the individual components and their combined reaction in the system.

KYTC officially adopted the Superpave Mix Design system in their 2000 edition of the standard specifications but there are still some local agencies who may utilize the Marshall method for designing asphalt mixtures. The geography of Kentucky is favorable in terms of yielding quality aggregate materials for use in asphalt pavements. Kentucky is fortunate to have an abundance of quality limestone throughout the state but each material used in an asphalt mixture must be tested in combination with the different grades of liquid asphalt. Again, local experience, knowledge, and history should be the overriding factors in selecting an asphalt mixture that is appropriate for the project.

Parking lots are much different than roadways because vehicles are not traveling at high speeds and are far more likely to experience more turning movements. Because of these differences, care must be exercised when designing parking lot mixtures utilizing KYTC mixtures and specifications. Parking lots may experience oxidation, aging, tire scrubbing, and some brittleness not often seen on heavily traveled roadways and must be designed accordingly. Generally speaking, asphalt mixtures utilized in parking lots should be higher in total liquid asphalt content than a similarly traveled roadway.

Liquid Asphalt "Binder"

In most cases, the grade of binder is specified according to the climate and level of traffic for the particular application. The performance grade (PG) binder system allows the selection of asphalt cement according to the high and low service temperatures and the level of traffic.

Aggregates

A wide variety of mineral aggregates are used to produce asphalt pavements. Kentucky is fortunate to have roughly 120 quarry operations and most of those produce a crushed limestone product that may be used in asphalt pavements. Natural sands and gravels are available along our rivers and streams but these rounded particles are not as desirable in our modern Superpave mixtures. In areas where gravel is available, it should be crushed in order to obtain more angular and cubical particles.

Processed aggregate has been quarried, crushed, separated into distinct size fractions, washed, or otherwise processed to achieve certain performance characteristics of the finished product. Some asphalt mixtures will utilize synthetic aggregates – materials that are not mined or quarried and often are the result of an industrial byproduct such as blast furnace slag.

Important Parameters

Asphalt mixtures that have a good track record on highways and roadways are not always desirable for parking lot applications. Mixtures that perform well under posted speed conditions may experience distresses with slow and stopped traffic. Additionally, parking lot pavements are more susceptible to brittleness caused by light and limited vehicle traffic and ongoing exposure to the elements. The following factors should be considered:

» Design air voids in the range of 3.5 to 4 percent – air voids provide for long-term durability of the pavement
» The total liquid asphalt binder should be slightly higher than roadway mixtures – this will help to prolong pavement life by slowing oxidation
» Consider surface mixtures with finer gradations – mixtures designed to pass above the Restricted Zone will have a finer surface texture desired on most parking lot applications

Reclaimed Asphalt Pavement (RAP)

Recycling reclaimed asphalt pavement is an excellent way to reuse the asphalt pavement that has reached the end of its service life. Recycling RAP in new asphalt mixes reduces the demand for virgin materials and, in the case of parking lots, can stiffen the mixture which minimizes the chance for scuffing or tire scrubbing. Most state agencies currently have specifications which allow the use of RAP and provide guidance on the design and testing of those mixtures. If available, RAP should be considered and allowed for all asphalt paving mixtures including the final surface.

Recycled Asphalt Shingles (RAS)

As with RAP, reusing reclaimed asphalt shingles is an excellent way to reduce the demand for the virgin materials, particularly the asphalt binder. “Post-manufactured RAS” are processed manufacturer’s shingle scrap by-product. “Post-consumer RAS” or “tear-offs” are processed shingle scrap removed from residential structures. Both manufacturer waste and tear-offs should be considered where available. When the shingles are properly processed and the mixture is well designed, a RAS mixture will yield excellent performance. With utilization of higher RAS contents, selection of an appropriate asphalt binder grading is important in minimizing thermal cracking.

Warm-Mix Asphalt (WMA)

Warm Mix Asphalt is an emerging technology whereby production and construction temperatures of asphalt mixtures are significantly reduced (50-100 degrees F) by foaming of the asphalt binder or using a chemical additive. In either case, fumes and emissions are greatly reduced and the asphalt remains workable at those lower temperatures. Warm mix is rapidly gaining acceptance and many states already allow these technologies to be used. Warm mix asphalt should be allowed on all mixtures including the final surface layer.

Construction of Parking Lots

When properly designed and constructed, parking areas become an integral part of the overall facility and will provide excellent service to the owners and their customers. In order to achieve a high quality parking lot, the owner should select a contractor with trained personnel and who has demonstrated high quality workmanship on similar projects. For a list of qualified contractors, please contact the PAIKY office or view a listing of our membership from the PAIKY website (www.paiky.org).

Subgrade & Aggregate Base

The subgrade is of the utmost importance because it must serve both as a working platform to support construction equipment and as the foundation for the final pavement structure. During construction, the native soils may be evaluated by proofrolling the area using heavy construction equipment. This is done to identify any unsuitable or soft areas that need to be removed or improved prior to placing subsequent layers. Unsuitable soils can be improved by blending aggregates with soil or by chemical stabilization using cement, kiln dust, or hydrated lime. All debris, topsoil, vegetation, or unsuitable materials should be removed and replaced with quality materials.

All fill materials should be placed in thin lifts (12 inch maximum) at the proper moisture content and compacted prior to placement of the next lift. A properly prepared subgrade will not deflect excessively under the weight of a loaded truck. Prior to the start of paving operations, the subgrade soils should be checked for stability, moisture content, and proper grade. For projects designed with a layer of stone between the soil subgrade and the asphalt pavement, that layer must also be placed and compacted to proper moisture content, density and grade.

Quality Workmanship

It is important that the owner or prime contractor select a local asphalt-paving contractor that is familiar with the materials that perform best in that region and who is experienced in constructing quality asphalt pavements. The paving contractor is responsible for quality control on the project and will be responsible for the quality of the asphalt mixture and the finished pavement surface.

The paving contractor should utilize a self propelled asphalt paving machine capable of producing a smooth and consistent layer of material. Through proper techniques at the asphalt plant and during trucking operations, take precautions to minimize the chances for material segregation (physical separation of the larger aggregates and smaller aggregates) of the mixture. The contractor must also insure adequate compaction equipment is available to meet the project specifications while achieving a smooth finish.

Asphalt Base Mixture Construction

The asphalt base course should be placed directly on the soil subgrade (full-depth design) or on the prepared aggregate base (aggregate base design). Asphalt mixtures used in base applications are characterized by larger aggregates and are typically placed in thicker layers. The base layer should be placed and compacted to the thickness indicated on the plans. The thicknesses shown on the plans represent the finished and compacted pavement thickness – not the loose thickness prior to compaction. Compaction of the asphalt base layers is critical to the performance of the pavement because it provides the structural foundation to support the weight of the traffic. In order to achieve compaction of a base mixture, research and experience indicates that the thickness of the layer must be at least three times the size of the largest aggregate in the mixture.

Tack Coat

The purpose of a tack coat is to promote the bond between pavement layers. A tack coat may not be required if the asphalt layers are placed in subsequent days and the surface remains clean and free of dust. Older pavement surfaces that will receive an overlay and milled surfaces will often utilize a tack coat.

The tack coat material is typically placed just prior to paving and must be applied to a surface that is clean and free of debris or loose materials. Most tack coat products are asphalt emulsions which need some time to “break” or cure. After the tack coat breaks, the product will dry and become sticky indicating it is ready for the next layer of asphalt. The time necessary for the tack coat to break is dependent on the weather conditions at the time of placement.

Asphalt Surface Mixture Construction

The asphalt surface layer is typically placed in one layer and compacted to the finish grade shown on the plans. The surface should not vary from the established grade by more than ¼ inch in 10 feet when measured in any direction. Rolling and compaction should start as soon as the asphalt material can be compacted without displacement and continue until it is thoroughly compacted and all the roller marks disappear.

APPENDIX A

Overview of Asphalt Mixtures in Kentucky

In order to properly identify and specify asphalt mixtures in Kentucky, you must first know the nomenclature and understand a few key parameters. This information is critical in specifying or reviewing asphalt mixtures for parking lot and roadway applications.

Traffic

The anticipated traffic for a parking lot or roadway is often quantified and expressed in Equivalent Single Axle Loads (ESALs). Depending on the number of ESALs anticipated for a 20-year design life, the Kentucky Transportation Cabinet has established three (3) traffic levels.

» Class 2 Mixtures – Under 3 Million ESALs (Parking Lots, City Streets, County Roads)
» Class 3 Mixtures – Between 3 Million and 30 Million ESALs (Higher Truck Traffic)
» Class 4 Mixtures – Greater than 30 Million ESALs (Interstates, Parkways & US 23)

Generic Mixture Description

For simplicity and ease in identification, the Kentucky Transportation Cabinet has established some generic terms to help identify the position of this mixture in the overall pavement structure. Asphalt base mixtures (BASE) refer to the lower layers of the pavement structure which typically utilize larger aggregates. If and when utilized, asphalt binder mixtures (BIND) refer to the intermediate layer between the base and surface courses. Asphalt surface mixtures (SURF) refer to the top layer of pavement and these mixtures typically utilize smaller aggregates for smoothness and finer texture.

Nominal Maximum Aggregate Size

Asphalt mixtures are categorized based on the nominal maximum aggregate size which, in simplistic terms, is the largest size of aggregate utilized in that mixture. Surface mixtures in Kentucky will have a nominal maximum aggregate size of 0.38” or 0.5” and all binder mixtures utilize a 0.5” aggregate size. Base mixtures may range from 0.75” up to 1.5” depending on the project and application. The specified aggregate size will influence the thickness of that lift of material. Generally, the layer thickness will be a minimum of 3 times the nominal maximum aggregate size and a maximum of 5 times the nominal maximum aggregate size.

Polish Resistant Aggregate Requirement

For interstate, parkways and other pavements with high traffic and high speeds, it may be desirable to utilize special aggregates which maintain a higher skid resistance and do not “polish” over time. In those cases, the Kentucky Transportation Cabinet will require a Type “A” or Type “B” aggregate. However, for all base and binder mixtures, lower volume roadways, and parking lots, utilize a Type “D” aggregate.

Performance Graded Binder Designation

The base grade of asphalt binder for Kentucky is a PG 64-22. This grade is appropriate for most roadways and parking lot applications. In isolated cases with heavy truck traffic or high stress applications, consider bumping the PG 64-22 to a PG 76-22 for added rut resistance and durability.

Asphalt Mixtures for Parking Lot Applications

Light duty parking lots across Kentucky will perform well when utilizing the mixtures indicated below. In cases with heavy truck traffic (distribution centers, etc.), designers should seek additional input based on site-specific conditions and may utilize different mixtures than those shown below.

Base Mixtures

The typical base mixtures utilized on parking lot applications are almost always Class 2 mixtures and the official KYTC mixture designations are as follows:

» Class 2 BASE 0.75 D PG 64-22 or
» Class 2 BASE 1.0 D PG 64-22

The paving contractor will propose a mixture which considers aggregate availability, price, and field conditions when choosing between a 0.75” or 1.0” base mixture. Another important consideration in this decision is the lift thickness. The 0.75” mixtures are most desirable when placed between 2.25 to 3.5 icnhes thick whereas the thickness range on the 1.0” mixture is from 3 to 4 inches. Please note that KYTC specifications allow paving contractors to submit a higher class mixture (Class 3 instead of Class 2) if desired.

Binder Mixtures

If and when utilized, the binder mixture is an intermediate layer between the base and surface and for parking lots; the most common binder mixture designation is as follows:

» Class 2 BIND 0.5 D PG 64-22

When selecting a binder mixture, the compacted lift thickness should be between 1.5 and 2.25 inches.

Surface Mixtures

For the vast majority of light duty parking lots across the Commonwealth, the official KYTC mixture designations for surface mixtures are as follows:

» Class 2 SURF 0.38 D PG 64-22 or

When pavement density is required, the minimum lift thickness for a 0.38” mixture should be 1.25” but the thickness can be adjusted to 1.0” if density is not required. When a 0.5” surface mixture is selected, always specify a 1.5” lift thickness. Some contractors will tweak the conventional KYTC mixtures by adding some river sand (typically 20% or less) or other locally available material to produce a mixture with a finer surface texture.

Asphalt Mix Design Review Checklist

Prior to the start of a paving project, the contractor is often required to submit a copy of the asphalt mixture design to the owner, owner's representative, architect, or engineer for review and approval. In many cases, the contractor will submit an Excel worksheet utilized by the Kentucky Transportation Cabinet for approval of asphalt mixtures on highway projects. The following checklist outlines the key parameters that should be reviewed and considered during the mix approval process.

- Verify that the type of mixtures submitted matches the requirements set forth in the project proposal, plans or specifications (the contractor will need to submit separate designs for Base, Binder, and Surface mixtures).
    - Confirm that the mixture designations for Base and Surface mixtures are appropriate for the project and application.
    - Confirm the ESAL Class for the mixture
    - Confirm the nominal maximum aggregate size
    - Confirm a type "D" aggregate type unless otherwise specified
    - Verify that the contractor is utilizing a PG 64-22 liquid asphalt binder grade unless otherwise specified in the project proposal, plans, or specifications.
    - Check surface mixture designs versus the minimum asphalt content criteria
- Minimum of 5.0% Asphalt Content for 0.5" binder mixtures
- Minimum of 5.3% Asphalt Content for 0.38" surface mixtures
- Review the proposed gradation (often called the Job Mix Formula or "JMF") for the proposed mixture to be sure these meet the gradation bands set forth by AASHTO M 323

SUPERPAVE MIXTURE GRADINGS

NOMINAL MAXIMUM AGGREGATE SIZE

SIEVE SIZE	ASPH BASE 1.5	ASPH BASE 1.0	ASPH BASE 0.75	ASPH BIND/SURF 0.5	ASPH SURF 0.38	ASPH SURF No. 4
2"	100	---	---	---	---	---
1 1/2"	90-100	100	---	---	---	---
1"	<90	90-100	100	---	---	---
3/4"	---	<90	90-100	100	---	---
1/2"	---	---	<90	90-100	100	100
3/8"	---	---	---	<90	90-100	95-100
#4	---	---	---	---	<90	90-100
#8	15-41	19-45	23-49	28-58	32-67	---
#16	---	---	---	---	---	30-60
#30	---	---	---	---	---	---
#50	---	---	---	---	---	---
#100	---	---	---	---	---	---
#200	0-6	1-7	2-8	2-10	2-10	6-12

NOTE: Nominal Aggregate Size=one sieve size larger than the first sieve to retain more than 10%.

- Confirm that the design air voids are within the master range of 3-4 percent
- Check to see that the design meets the minimum asphalt content criteria
- When pavement density is required – calculate the maximum theoretical density by multiplying the average Maximum Specific Gravity (MSG) of the mixture by 62.4 and record this number for reference. KYTC Specifications require a minimum of 92.0 percent in-place density. Due to subgrade material and site conditions, 92 percent may be difficult to obtain on commercial parking lot applications. However, in-place density values below 89 percent may experience performance problems.

APPENDIX B

ASPHALT PAVING
SAMPLE SPECIFICATION FOR LOW-VOLUME APPLICATIONS

ASPHALT PAVING

PART 1 - GENERAL

1 RELATED DOCUMENTS

A Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2 SUMMARY

A Related Sections include the following:

1 Division 2 Section "Earthwork" for aggregate subbase and base courses and for aggregate pavement shoulders.

3 SYSTEM DESCRIPTION

A Provide asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of the Kentucky Transportation Cabinet (KTC), except as modified herein.

1 Standard Specification: Kentucky Transportation Cabinet (KTC) Standard Specifications for Road and Bridge Construction, latest edition, and Supplemental Specifications to the Standard Specifications.
2 Additional Reference: Asphalt Institute MS-2
3 Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

4 SUBMITTALS

A Job-Mix Designs: For each job mix proposed for the Work.

5 QUALITY ASSURANCE

A Asphalt Producer Qualifications: Engage a firm experienced in producing asphalt similar to that indicated for this Project and with a record of successful in-service performance.

1 Producer firms shall be qualified through the Kentucky Transportation Cabinet as an approved Asphalt Mix Producing Firm.

B Testing and inspection: The owner shall retain a qualified testing laboratory for testing and inspection.

6 PROJECT CONDITIONS

A Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp. Comply with the provisions of KTC Standard Specifications Section 403.03.01 for temperature requirements. Asphalt Pavement may be placed between November 15th and April 1st if the ambient temperature requirements are met or if approved by the architect/engineer.

PART 2 - PRODUCTS

1 AGGREGATES

A General: Use materials and gradations that have performed satisfactorily in previous installations.

B Coarse Aggregate: Sound, angular crushed stone, or crushed gravel, complying with KTC Standard Specifications Section 805.

C Fine Aggregate: Natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations there of complying with KTC Standard Specifications Section 804.

D Recycled (Reclaimed) Asphalt Pavement (RAP): milled or removed asphalt pavement may be utilized in accordance with KTC Standard Specifications Section 409.

2 ASPHALT MATERIALS.

A Asphalt Binder: AASHTO MP 1, Performance Graded Binder PG 64-22 for general applications.

B Tack Coat: Comply with provisions in KTC Standard Specifications Section 406.

3 MIXES

A Asphalt: Hot-laid, asphalt plant mixes meeting the requirements of the Standard Specifications of the Kentucky Transportation Cabinet (KTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements:

1 Base Course: Produce KTC mixture designation Class 2 Base or a Marshall mixture from AI MS-2. There shall be no restrictions on polish resistant aggregates (utilize KTC Type “D” aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with KTC Standard Specifications Section 409.
2 Surface Course: KTC mixture designation Class 2 Surface or a Marshall mixture from AI MS -2. The mixture gradation may pass through the restricted zone and there shall be no restriction on polish resistant aggregates (utilize KTC Type “D” aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with KTC Standard Specifications Section 409.

B Asphalt: Hot-laid, asphalt plant mixes designed according to procedures established by the Kentucky Transportation Cabinet (KTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements.

1 Provide mixes complying with composition, grading, and tolerance requirements in KTC Standard Specifications or AI MS-2 for the following nominal, maximum aggregate sizes:
a Base Course: Mixture with a nominal maximum aggregate size of .75 inch (19 mm) with a minimum Voids in the Mineral Aggregate (VMA) of 12 percent.
b Surface Course: Mixture with a nominal maximum aggregate size of 0.38 inch (9.5 mm) with a minimum VMA of 14 percent.

PART 3 - EXECUTION

1 EXAMINATION

A Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B Proof-roll subbase using loaded dump trucks or heavy rubber-tired construction equipment to locate areas that are unstable or that require further compaction.

C Proceed with paving only after unsatisfactory conditions have been corrected.

D Repairs to Base Course: Fill excavated pavements with asphalt base mix and, while still hot, compact flush with adjacent surface.

E Patching: Partially fill excavated pavements with asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, surface layer finished flush with adjacent surfaces.

2 SURFACE PREPARATION

A General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1 Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B Tack Coat: Comply with provisions in KTC Standard Specifications Section 406.

3 ASPHALT PLACING

A Machine place asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Comply with applicable provisions of KTC Standard Specifications Section 403 for delivery, placement, spreading and compaction of the mixture.

1 Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent.

4 INSTALLATION TOLERANCES

A Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1 Base Course: Plus or minus 1/2 inch (13 mm).
2 Surface Course: Plus or minus 1/4 inch (6 mm).
3 Design for a minimum fall of 1% to facilitate drainage (2% recommended)

END OF SECTION

APPENDIX C
Sustainable Features in Asphalt Pavement

Asphalt is a sustainable product and may provide significant benefits to owners when designing and building parking lots for building structures. The asphalt industry has been a leader in recycling and has been doing this for decades – long before green construction practices were given the consideration they are today. Through innovation and new technology, the asphalt industry is utilizing more recycled asphalt each year. In addition, the industry is now utilizing warm mix asphalt to save fuel and fumes, is recycling roofing shingles, and is constructing porous asphalt pavements for storm water management.

Leadership in Energy & Environmental Design (LEED)

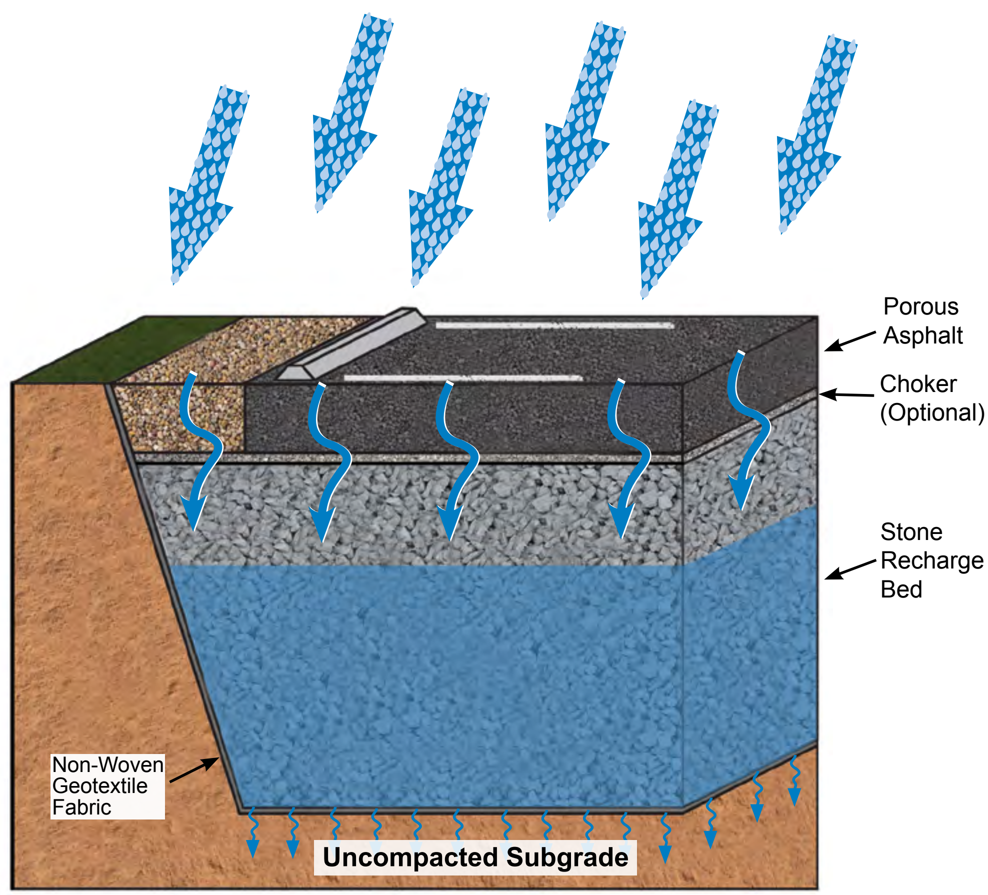
The United States Green Build Council (USGBC) has developed LEED as a certification and rating system for the design, construction, and operation of facilities which utilize sustainable features. The LEED system strives to achieve green solutions in areas such as energy savings, water efficiency, CO2 emission reductions, and stewardship of resources and environmental impact.

With decades of experience in recycling, the asphalt industry is well positioned to assist in this component of the LEED building system. More recently, the industry has made great strides and advancements in developing systems to address storm water management through porous pavement designs. Asphalt pavements can assist designers in achieving LEED credit points in a variety of categories through the use of both traditional and new features and technology.

Porous Asphalt Pavement

Porous asphalt pavements are designed to retain stormwater events and, as a result, they are unique and different from conventional asphalt parking lots. These systems are comprised of a porous (open-grade) asphalt surface placed over a granular working platform on top of a reservoir of large stone. The reservoir layer is designed to have the storage capacity to hold water from storm events. Unlike a typical roadway or parking lot pavement where water is designed to be diverted away from the pavement – porous pavements allow the water to drain through.

Properly designed and constructed porous asphalt pavement will provide a path and storage location for stormwater – a sustainable feature that will minimize any water discharge from the site and greatly reduce erosion and flash flooding. Projects that require LEED certification should be eligible for valuable credits when utilizing porous pavements. In addition, some local agencies may levy a stormwater fee for impervious areas that can be greatly reduced or eliminated with the use of a porous pavement system.



Designers should carefully consider porous pavements when stormwater management issues are critical and site conditions are conducive. These projects generally require fill and more material (stone aggregate base) and are therefore more expensive than a conventional parking lot pavement. The designer should also be aware of the soil types, site conditions, topography, and traffic to be certain that a porous pavement will perform in the given application. Because of the soil types common to Kentucky (85 percent fine graded clay materials), porous pavement will require a system to facilitate subsurface drainage.

The National Asphalt Pavement Association (NAPA) has published a thorough and authoritative guide on the design of porous asphalt pavements. The Information Series 131 publication from NAPA (IS-131) will be beneficial for anyone involved in the design and construction of a porous pavement system.

Warm-Mix Asphalt

Warm-mix asphalt is the generic name of technologies that allow the producers of asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road. Reductions of 50 to 100 degrees Fahrenheit have been documented. These reductions have the obvious benefits of decreasing the production of greenhouse gases and improve working conditions for employees on the paving crew. Engineering and construction benefits include better compaction of pavements; the ability to pave at lower temperatures, extending the paving season; and the potential to be able to recycle at higher rates.

Recycling

The asphalt industry reclaims about 100 million tons every year and reuses or recycles about 95 million tons. This makes it America's number one recycled product. In addition to recycling our own product, asphalt pavements may incorporate asphalt roofing shingles (tear offs and post consumer waste) along with rubber from used tires, blast furnace slag, and glass.

Conclusion

In order for a pavement to perform well and stand the test of time, designers must explore the site conditions and analyze the anticipated traffic. These critical parameters are necessary to the long-term performance of any pavement. Please give strong consideration to experience with local conditions and materials along with the performance of projects in the area. For guidance and assistance on projects that are unique and do not fall within the guidelines set forth in this publication, please contact a PAIKY member.

Plantmix Asphalt
Industry of Kentucky

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Publication: APLG-1

For Your Next Paving Project, Contact One of these Qualified Contractors:

Please Visit www.PAIKY.org for Asphalt Plant Locations.

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3009 Atkinson Avenue, Suite 300
Lexington, KY 40509
Phone: 859-543-3361

ATS CONSTRUCTION
3009 Atkinson Avenue, Suite 400
Lexington, KY 40509
Phone: 859-223-7001

BARRETT PAVING MATERIALS, INC.
600 Shepherd Drive
Lockland, OH 45215
Phone: 513-271-6200

BLUEGRASS PAVING, INC.
P.O. Box 667
Florence, KY 41022
Phone: 859-372-0075

CHARLES DEWEESE CONSTRUCTION
765 Industrial Bypass
Franklin, KY 42135
Phone: 270-586-9122

E & B PAVING, INC.
P.O. Box 5066
Evansville, IN 47716-5066
Phone: 812-475-1363

EATON ASPHALT PAVING COMPANY
1075 Eaton Drive
Covington, KY 41017
Phone: 859-331-2303

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P.O. Box 32065
Louisville, KY 40232
Phone: 502-364-9100

GADDIE-SHAMROCK, LLC
P.O. Box 280
Columbia, KY 42728
Phone: 270-384-2451

H.G. MAYS CORPORATION
P.O. Box 797
Frankfort, KY 40602
Phone: 502-875-1282

HALL CONTRACTING OF KENTUCKY
3800 Crittenden Drive
Louisville, KY 40209
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HAMILTON-HINKLE PAVING COMPANY
100 Farmers Bank Drive, Suite 400
Georgetown, KY 40324
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HAYDON MATERIALS
40 Lucknow Court
Bardstown, KY 40004
502-348-3926

HINKLE CONTRACTING COMPANY, LLC
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Paris, KY 40361
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J.H. RUDOLPH & CO.
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Evansville, IN 47716
812-476-4921

JIM SMITH CONTRACTING
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Grand Rivers, KY 42045
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LEN RIEGLER BLACKTOP
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LOUISVILLE PAVING COMPANY/
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