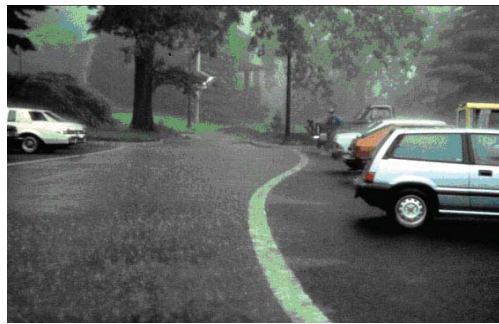


ASPHALT THE SMOOTH QUIET RIDE



Morris Arboretum – Pennsylvania



Shared Medical Systems, Pennsylvania

Morris Arboretum, Pennsylvania (Constructed in 1984) The Morris Arboretum porous system was built in the parking bays collecting runoff from the adjacent impervious drive lane. The drive lane is traditional impervious asphalt. The porous system is still in place and functioning today.

Shared Medical Systems, Pennsylvania (Constructed 1982) The Shared Medical Systems parking lot was constructed using a “back up” plan for storm water. The gravel header at the front of the parking spaces serves as both a gutter and a “back up” for storm water to enter the system should the porous pavement system become clogged. This pavement also remains in good condition today and the porous pavement has never become clogged.

Wal-Mart “Green” Supercenter, Colorado (Constructed 2004) Right in our backyard, this system was built several years ago and will be important to monitor over the next several years. The initial construction and the current monitoring have shown the installation to be successful.

Resources/References

- CAPA, www.co-asphalt.com
- Porous Asphalt Pavements, published by the National Asphalt Pavement Association, Information Series 131
- Stormwater magazine, “Porous Asphalt Pavement with Recharge Beds”, Michele C. Adams
- www.hotmix.org
- www.thcahill.com

This article was authored by Lisa Klotz. Lisa is the Laboratory Manager for Kleinfelder, Inc. in the Golden office. Kleinfelder, Inc. is an associate member of CAPA. Any questions or comments regarding the article can be directed to lklotz@kleinfelder.com or by contacting CAPA at Office@co-asphalt.com, 303-741-6150

PAVE GREEN - Pave with Asphalt
America’s Most Recycled Product

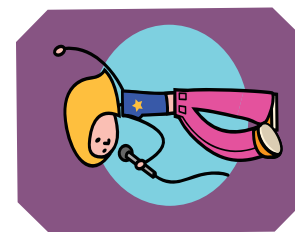


Paving The paving operation is similar to conventional paving techniques, and critical to ensure a successful installation. The asphalt mixes usually contain a polymer modified binder which requires higher temperatures for mixing, hauling and compacting. It is important to follow the temperature specifications for all phases of asphalt production and placement. Asphalt mix should not be mixed and stored for long periods of time or hauled for long distances. Once the asphalt is on site, there are a couple helpful hints to make paving go smoothly. Limiting truck movement on the aggregate surface is key. The use of a tracked paver is also helpful. The compaction is much less than with a regular mix, usually requiring one to two passes with a ten ton roller.

Success Stories Porous asphalt has been around for more than 30 years with many success stories.

Walden Pond, Massachusetts (Constructed 1977) The Walden Pond parking area was one of the first porous asphalt systems ever constructed. Some of the adjacent asphalt has been rehabilitated and overlaid. The porous asphalt section is in service after 30 years and has never been replaced.

Pavement of the Future: Porous Asphalt



The Asphalt RAP

PAVE GREEN - Pave with Asphalt
America’s Most Recycled Product

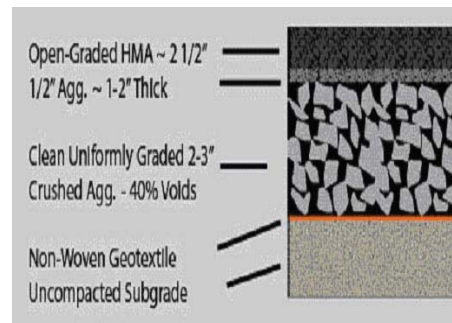
“The Asphalt RAP” is a publication of the
Colorado Asphalt Pavement Association



CAPA
6880 South Yosemite Court
Suite 110
Centennial, CO 80112
303-741-6150
www.co-asphalt.com
office@co-asphalt.com



Pavement of the Future: Porous Asphalt



Cross Section of a Porous Asphalt System



The infiltration bed serves as an underground detention basin

Water and asphalt pavements generally don't mix - except when you're dealing with porous asphalt pavements. Porous asphalt systems combine water and pavement providing an innovative solution to enhance storm water management. Some of the benefits of porous asphalt include:

Effective Stormwater Best Management Practice; Reduction in impact on existing storm water systems; LEED credits; “Green” technology; Detention basin elimination allows more land for other uses Improved water quality associated with runoff; Increased safety.

The History and Benefits

Porous asphalt was developed in the early 1970's by the Franklin Institute in Philadelphia, PA as an environmental study for the Environmental Protection Agency (EPA). Several sites on the east coast utilized porous asphalt following this study. Some of these early installations are still intact and functioning today after more than 30 years. Technology is moving west, including porous asphalt installations in Colorado.

The benefits are numerous. The use of a Porous HMA system allows the water to remain on-site thus eliminating the need for separate detention ponds, reduction or elimination of storm water systems, and reduction or elimination of curb and gutter. Safer in the winter months.

Permeable Subgrade

One of the key factors in a successful porous asphalt system is the subgrade. It is essential that the underlying soils are permeable and promote infiltration while also providing a sound structure for the pavement. A site/soils investigation must be conducted to provide a

How It Works

The porous system consists of permeable asphalt designed to facilitate storm water drainage to underlying courses, absorption by the subgrade and infiltration back into the aquifer.

ASPHALT THE SMOOTH QUIET RIDE

reliable design. As a part of this investigation, soil permeability must be measured to ensure that the porous system will infiltrate. The ideal soils should have a permeability of greater than 0.25 inches per hour. It is also important to use a geotextile fabric between the subgrade and the infiltration bed to prevent the migration of fine materials that could cause clogging of the system.

Infiltration Bed

Water is one of our most precious natural resources. Faced with increasing urban development, population growth and the increased cost of land, porous asphalt has become a very viable solution to storm water management. The infiltration bed serves as an underground detention basin allowing more land for other uses. The depth and overall design of the infiltration bed is determined by the annual runoff. The stone bed should be large enough to store storm water for a short period of time while it is being infiltrated back into the aquifer. Most porous asphalt systems are designed to accommodate a peak annual runoff event.

The Asphalt

One of the great things about porous asphalt is that it really isn't new technology, just "teaching an old dog new tricks". Porous asphalt is nearly equivalent to conventional asphalt, except the fine material is not incorporated in the mix. Eliminating the fines creates the extra void space, approximately 18-20%, to allow storm water to flow through to the underlying layers. The asphalt cement content of the mix is usually higher



The infiltration bed serves as an underground detention basin allowing more land for other uses.



The paving operation is similar to conventional paving techniques, and critical to ensure a successful installation.

than a typical mix, approximately 5.7 – 6.0%. The binder grade is also higher than a typical mix, a two grade "bump" is recommended. The increase in asphalt cement and grade helps to protect the aggregate as water passes through it on a regular basis. Modern installations include the use of polymer modified binders. Some of the early installations in warm climates experienced draindown that clogged the underlying pavement layers. Using polymer modified asphalt helps to stiffen the binder at high temperatures, to arrest the potential for draindown and improve fatigue resistance.

Water Quality

The EPA is the lead regulatory agency protecting our surface waters by setting limits on pollutants. The EPA approach to protecting our water resources includes



ASPHALT THE SMOOTH QUIET RIDE

Pavement of the Future: Porous Asphalt

Typical Impervious Asphalt



Porous Asphalt



reducing the overall stormwater runoff from an area and reducing the pollutant concentrations by implementing stormwater monitoring criteria. Porous asphalt captures the runoff and allows the stormwater, with potential contaminants, to infiltrate to lower layers of soil where physical and biological interactions remove contaminants. There is historical data from several porous asphalt installations that include the monitoring of stormwater runoff and documentation of stormwater contaminant reduction due to an effective porous asphalt system.

Safety

Another benefit to porous asphalt is an increase in safety. The mixture uses negligible fine materials, therefore the surface is comprised of coarse aggregate creating a skid resistant surface. The asphalt layer is also designed to drain storm water from the surface, leaving it free of ponded water. This alleviates hydroplaning and trips and falls. Many users of porous asphalt systems in colder climates have noted that there is little need for snow removal. The infiltration bed retains heat increasing the surface temperature, not allowing ice to form on the surface.

PAVE GREEN - *Pave with Asphalt*
America's Most Recycled Product

Constructing the Porous Asphalt System

Subgrade and Infiltration Bed

The subgrade is designed to be permeable; therefore, extra care should be taken to keep it that way. Avoid heavy traffic during construction that could over compact the area. If possible plan to build the porous system in one of the final stages of construction, possibly block traffic from the planned porous area prior to excavation. During excavation, use equipment with a light footprint, such as tracked equipment. If the subgrade should get slightly compacted, scarifying the surface can restore some of the permeability. After the subgrade has been excavated, immediately place the non-woven geo-textile fabric across the bottom of the bed. Placement of the stone for the infiltration is critical for a successful porous asphalt system. Again, reduce the amount of compaction on the subgrade. The stone is delivered along the edges of the excavation and then spread and graded using tracked equipment. Once the stone is to grade, a light static compaction can be implemented. A choker coarse is recommended on top of the stone layer to provide some stability while paving. This layer is comprised of approximately 1/2 inch nominal crushed aggregate, placed approximately 1-2" thick.

Constructing the Porous Asphalt System

- Subgrade and Infiltration Bed
- Paving
- Success Stories