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## Filterpave systems

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## FILTERPAVE SYSTEMS

### THE NEED

Stormwater regulations, Low Impact Development (LID) ordinances, sustainable building rating systems (LEED®, NAHB) and environmental concerns are driving design professionals to provide solutions, utilizing porous pavements, to better manage stormwater runoff. Porous pavement systems (PPS) range from turf protection systems (plastic pavers) to hard-surfaced systems (pervious concrete, porous asphalt, brick pavers). The need for hard-surfaced porous pavements has grown over the past few years as the market accepts PPS technology as a viable solution, as regulations leave few other options and as frequency of use increases.



FIGURE 1 EXAMPLE OF FILTERPAVE SYSTEMS

### THE TECHNOLOGY

The FilterPave system is a unique porous pavement system that uses post-consumer recycled glass as the open-graded aggregate. Approximately 90 glass beverage bottles are used in just one square foot of pavement, making constructive use of abundant recycled materials that are traditionally sent to the landfill and used as daily cover. In fact, nearly 75% of post consumer waste glass is still landfilled each year in the United States. The glass cullet is processed to remove the sharp edges and to obtain the correct particle size (approx. 0.12-0.25 in in diameter) and is treated with an agent to create a reactive surface on the glass for the polyurethane binder. The glass cullet is then mixed with the polyurethane binder on site in a volumetric mixer and formed and finished similar to low-slump concrete. The mixed polyurethane and glass aggregate has a set time of 30-45 minutes. A vibratory screed is often used to provide a slight compaction/settling of the material in the forms. A smooth finish is achieved by



working the surface with a finish trowel, Fresno blade and/or a power trowel, and the edges around the forms are finished with typical concrete edger.

## Typical Cross-Section

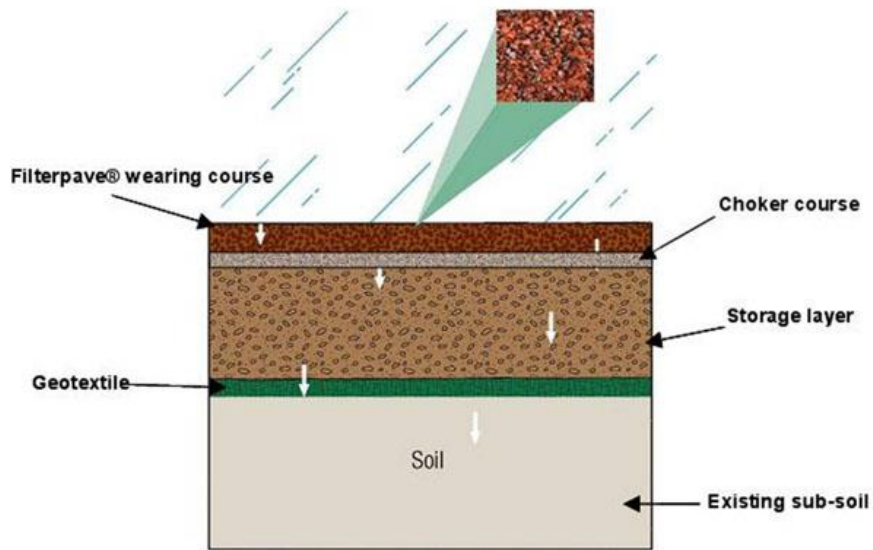


FIGURE 2 TYPICAL CROSS-SECTION OF FILTERPAVE SYSTEMS

Depending on weather conditions, the material is tack-free within four to six hours, can be walked on in 6-12 hours and has achieved 95% of its final hardness within 72 hours. The pavement can accept vehicle traffic after four days. An aliphatic polyurethane surface coating is sprayed or rolled on after the material is tack-free to ensure a wearing surface that is very stable to torsional forces.



FIGURE 3 INSTALLATION OF FILTERPAVE SYSTEMS



## THE BENEFITS

### Aesthetic

Color options are achieved through pigmented glass aggregate (amber brown, sedona red, sapphire blue, jade green, topaz brown). The glass content gives the pavement a unique architectural aesthetic and color options offer design flexibility through various effects and patterns.

### Environmental

FilterPave is one of the stormwater industry's truly sustainable products because not only can it infiltrate substantial quantities of storm water runoff, but it is also manufactured from 100% post-consumer recycled glass bonded together with a flexible bio-based polyurethane bonding resin.

- **Recycled Material:** The FilterPave system is made with a high percentage of recycled materials, making productive use of plentiful 100% post-consumer recycled glass and eliminating landfilling of the materials. FilterPave conserves natural aggregate supplies and reduces the carbon emissions associated with mining of stone.
- **Low Carbon Footprint:** Unlike most existing hard-surfaced porous pavement, the FilterPave system reduces contribution to the creation of hydrocarbons when compared to other porous systems, minimizing environmental impact. Asphalt, Concrete and Manufactured Pavers utilize petroleum based materials and are made of manufactured materials that are very high in energy consumption during their manufacture or mining process (bitumen, cement, aggregate).
- **Low Impact Development:** The highly permeable surface is a natural low-impact-development BMP for reducing stormwater runoff, managing stormwater on-site and reducing the requirements and costs for stormwater collection systems.
- **Green Building Credits/Points:** Depending on overall project utilization, Filterpave pavements offer contributions to LEED® green building credits and NAHB Green Points:

#### LEED Credit:

Sustainable Sites

Credit 5.1 – Site Development: Protect or Restore Habitat (1 point)

Credit 6.1 – Stormwater Design: Quantity Control (1 point)

Credit 6.2: – Stormwater Design: Quality Control (1 point)

Credit 7.1 – Heat Island Effect: Non-Roof (1 point)

#### NAHB Green Points:

Section I, Lot Design, Preparation and Development 1.3.5 Storm Water Management Plan (8 points possible)

- Minimize concentrated flows and seek to mimic natural hydrology
- Minimize impervious surfaces and use permeable materials for driveways, parking areas, walkways and patios.



- **Solar Reflectance Index (SRI) of Pigmented FilterPave:** SRI is a measure of a surface's ability to reject solar heat. The SRI values of the five colors range from 49 to 62, well within the limits to be classified as a cool pavement. Recent testing at the Stormwater Management Academy at the University of Central Florida (UCF) yielded the following results:
- **Infiltration Rate:** Filterpave will provide infiltration of storm water even under excessive sediment loading. The infiltration rate significantly exceeds the Florida draft storm water standard of 2.0 inches/hour after intentional plugging, and in many instances approaches 20 inches per hour – far more than is required to percolate most rainfall events. In fact, the limiting factor in design is the capacity of the open graded base course below FilterPave rather than the permeability of the FilterPave itself.
- **Water Quality Improvement:** FilterPave allows the stormwater to infiltrate on site. Based on a 25 year design storm (8.4 inches/hr) in Florida, a 33% reduction in phosphorus and nitrogen was achieved.
- **Sustainable Void Space:** The porosity of FilterPave was determined to be 39%, which is the measure of the permeability within the paving layer. Filterpave pavements are nearly twice as porous as pervious concrete and maintains the highest sustainable void space of any hard-surfaced porous pavement system.
- **Pavement Strength:** UCF testing also yielded an average compressive strength of 1160 psi and flexural strength of 508 psi. FilterPave exhibits the best characteristics of both flexible and rigid pavements. As such, the material has stronger compressive strength than porous asphalt and better flexibility than pervious concrete. These characteristics make FilterPave pavements appropriate for low and medium duty applications.

## APPLICATION

Filterpave pavements are appropriate for light-to-medium duty traffic areas including pedestrian courtyards, driveways, golf cart pathways, trails/walkways, entranceways, stormwater conveyances, and parking stalls/parking areas.

## STATUS

FilterPave projects of all applications have been installed in the US, Canada and Europe. A high profile parking project has been installed at the USDOE National Energy Renewable Laboratory (NREL) in Golden, Colorado. NREL is the largest net-zero-energy building green design-build project in North America. The site includes numerous energy efficient, sustainable products, including the FilterPave 18-stall parking reserved for car/van pool and energy efficient vehicles such as hybrids. A new training facility has been



established in Golden, Colorado for training of new contractors on the technology and installation procedures.

## **BARRIERS**

### **Critical issues in the research and any disadvantages/tradeoffs of the technology**

As the business grows, establishing glass sourcing at strategic geographical locations is paramount to reducing transportation costs and maximizing green credits. The aesthetics and stormwater runoff reduction cost benefits need to be appreciated by customers willing to pay the higher unit price for this pavement system (comparable with pervious concrete).

Yearly or more frequent maintenance of vacuuming the pavement is required to maintain the pavement's porosity. Because of the high sustainable void space, Filterpave pavements will take longer to clog than other hard-surfaced porous pavements.

## **POINTS OF CONTACT**

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## **REFERENCES**

1. Pollution Prevention article, Feb 2011 Adhesives & Sealants Industry, submitted by BASF Corporation.
2. Research, The Stormwater Management Academy at the University of Central Florida (UCF).

## **REVIEWERS**

Peer reviewed as an emerging construction technology

## **DISCLAIMER**

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