Updates on Pervious Pavement Design and Construction

Jason T. Peterein, P.E.

June 19, 2012
Program Outline

• Pervious Pavement Basics
• Pervious Pavement Construction
• Maintenance
• MSD Regulations Update
Permeable Pavement—Does it work?
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Pervious Pavement Basics

• “When it rains, it drains…”
  – Surface Coarse (concrete, asphalt, blocks)
  – Base material
  – Observation Wells / Cleanouts
  – Underdrain
  – Drainage Characteristics of the underlying soils
Pervious Pavement Basics
(Porous Asphalt & Permeable Concrete)

- Permeable Surface
- Observation Well
- Base Material
- 12” min. thickness
- Underdrain
- Underlying Soils
Pervious Pavement Basics
(Permeable Interlocking Concrete Pavement “PICP” or “Pavers”)

Same performance concept, but slightly different components…
Pervious Pavement Basics
The Mechanics of BMP Performance

Permeable Surface

Precipitation

Run-on

Underdrain (Runoff)

Infiltration Zone

Underlying Soils

(Infiltration)
Pervious Pavement Basics

The world is not flat
Pervious Pavement Basics

• If using permeable pavement in conjunction with bioretention, make sure a good physical barrier such as a short wall or flush curb is in place to separate the two...
Pervious Pavement Basics

• If designed in conjunction with Bioretention, Permeable Pavement can preserve sheet flows and reduce erosion potential within the Bioretention Cell
Conventional Pavement

Permeable Pavement

Sheet Flow

*Slower Velocities, better sheet flow conditions
Pervious Pavement Construction

PICP – Delivered on Site
Pervious Pavement Construction

PICP – Bedding Course
Pervious Pavement Construction

PICP – Project Complete
Pervious Pavement Construction
Permeable Concrete - Installation
Pervious Pavement Construction

Permeable Concrete: Finished Product
Pervious Pavement Construction

Porous Asphalt – Up Close
Pervious Pavement Construction

As-Built Certification

Prior to MSD Construction Approval, a P.E. must certify that the permeable pavement construction was:

• Constructed in accordance with the MSD approved plans
• Accomplished by qualified personnel
• Was witnessed periodically by themselves or a representative under their supervision

Certification can be completed by the design engineer or a third party engineer (i.e. geotech doing the onsite testing services, other consultant)
Maintenance

- Maintenance Plan should be a “living” document
- Inspect frequently during the first year to establish benchmarks for “normalcy”
- Keep the drainage area clean
- Normally sweep/vacuum twice a year
- Protection - Signage
MSD Regulations Update

When Water Quality BMPs are required, Permeable Pavement may be utilized as a stand-alone BMP under certain cases.

New policy adopted on March 16, 2012.

Design Criteria posted on the MSD Website.
MSD Regulations Update

Design Parameters

• Subgrade Saturated Hydraulic Conductivity (in/hr)
• Infiltration Bed Thickness (in.)
• Ratio of Drainage Area to Pervious Pavement Area
MSD Regulations Update
Design Parameters

<table>
<thead>
<tr>
<th>Subgrade Saturated Hydraulic Conductivity (in./hr.)</th>
<th>Infiltration Bed Gravel Thickness (in.)</th>
<th>Maximum Ratio of Drainage Area to Pervious Pavement Area</th>
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- Based on Continuous Simulation Modeling using historical local rainfall data and conservative assumptions
- Very generalized – “typical St. Louis site”
  - Silty Clay soils over limestone
  - Not applicable to Major River sites (e.g. sites within Levee Districts)
- Assumes tributary area draining to the pervious pavement is 100% impervious
- If you apply the table you can satisfy WQv requirements
- Site specific continuous simulation modeling may be considered
MSD Regulations Update

Infiltration Bed Thickness

• Minimum Gravel Bed Thickness Remains 12”
• Provide adequate thickness to also keep frequent storms from ponding up into the pavement (2yr -24 hr event)
• The infiltration zone occurs beneath the underdrain, behind a subgrade berm, or a weir in the outfall structure.
MSD Regulations Update

Saturated Hydraulic Conductivity

- A Geotechnical Assessment of soils conditions is recommended
- Assume 0.05 in/hr without site specific soil testing
- On site soils investigation is required to support assumptions greater than 0.05 in/hr
MSD Regulations Update

Drainage Area Ratio

• The ratio of upgradient area to pervious pavement affects the percentage of captured storms and BMP longevity
• Typical ratios will range between 2:1 and maximum of 4:1
• Ratios are controlled by upstream drainage area characteristics
# MSD Pervious Pavement Information

http://www.stlmsd.com/engineering/planreview/PlanReviewInformation/ProprietaryBMPs

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<td>Phil Hocker</td>
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Summary

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- Pervious Pavement Construction
- Maintenance
- MSD Regulations Update
Questions

Jason Peterein, P.E.
jtpete@stlmsd.com
314-768-2773
www.stlmsd.com