Four-Year Study of Porous Asphalt Maintenance Practices on a Virginia Parking Facility

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Background: Stormwater

- Stormwater Control Measures (SCMs) to meet regulatory requirements
- Increased emphasis on the use of Low Impact Development (LID) systems and practices
- Permeable pavements are an accepted type of LID
Background: Permeable Pavements

- Considerations must include:
  - Hydraulics
  - Hydrology
  - Longevity
  - Maintenance
  - Regulatory requirements
  - Water quality
  - Cost

- Varying information available in literature

- VDOT has very little experience with permeable pavements
Background: Permeable Pavements

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Purpose

Construct a trial section and evaluate:

- Long-term performance
- Maintenance requirements
- Maintenance costs
- Potential rehabilitation methods
- Structural properties
Approach: Site Selection
**Approach:** Mix Design and Placement

- **PAM-9.5** (5.75 to 7.25% AC)
- **PAM-19.0** (5.0% AC)
- 16% minimum air voids
- 0.3% minimum cellulose fibers

- Three passes of 8 to 10 ton roller
- No tack between layers
- No construction traffic
Approach: Construction
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Approach: Experimental Design

- Different maintenance treatments:
  1. T1 = Regenerative Air (6 months)
  2. T2 = Conventional Vac (6 months)
  3. T3 = Regenerative Air (12 months)
  4. T0 = Control

- Measured change in permeability over time
Approach: Core Sample Collection
Approach: Field Permeability Measurements
Approach: Maintenance
Results: Average Infiltration Rates
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Average Infiltration Rates: 393 to 256 in/hr
Results: Average Infiltration Rates
Results: Percent Change in Infiltration
Results: Regression Analysis for Maintenance Treatments

**CONTROL**

- R² = 0.529

**REGENERATIVE AIR-6 MONTH**

- R² = 0.888

**CONVENTIONAL VACUUM-6 MONTH**

- R² = 0.8158

**REGENERATIVE AIR-12 MONTH**

- R² = 0.8264
**Results: Maintenance Costs**

- Hourly rates for vacuums: $95 to $185/hour
- Minimum charge times: 1 to 6 hours
- Cleaning time depends on vacuum type, lot design, etc.
- Actual cost was approximately $2,736/year
- Expected cost would range from $1,300 to $1,500/year
- EPA’s estimate for all SCMs is $2,400 to $11,000/year
Conclusions

• Average infiltration rate after four years is 123 in/hr, well above threshold of 10 in/hr
• No clear differences exist between the areas maintained using different vacuum systems or different cleaning intervals
• Sedimentation does not appear to be the primary factor contributing to the reduced infiltration rates
• Infiltration requirements should be adequate for 12-17 yrs
• Maintenance by way of vacuuming twice per year should cost less than $1500
Questions?