Ohio Asphalt Paving Conference
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Porous Asphalt – An Owner’s Perspective

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11,000 acres, 14 developed parks + several conservation areas

Governed by independent, unpaid board

Approx. 5m visits per year
15 lane miles of roads
Parking for 5,000 cars
33 miles of paved Bike and Hike Trail
Why porous pavement where there is so much room?
Why porous pavement?
Why porous pavement?
WHAT ON EARTH HAVE WE LEARNED FROM THIS??

• If it’s a good site for development, it’s probably a good site for porous
• If you’re designing to meet other standards, you’re designing for porous
• Don’t go it alone – use FPO specs
• Porous asphalt works, but be smart
• Be prepared for different maintenance
• Water doesn’t hurt porous asphalt
WHAT ON EARTH HAVE WE LEARNED FROM THIS??

- Site selection
- Design
- Construction
- Performance
- Maintenance
- Durability
Site Selection

- Resource protection – space, receiving waters, wetlands
Site Selection

- Traffic volume, loads, turning movements
Site Selection

- Sources of sediment, dirt – “run-on”, trees
Site Selection

- Soil – strength and permeability testing

Springfield Bog: sand

Tallmadge, Liberty Park, Brandywine: silty clays
Site Selection

- Surface and subgrade slopes
Site Selection

- Commitment to maintenance
Design

- Hydrologic design criteria per local regulations
- Regulations refer to “predevelopment” and “postdevelopment” discharge rates and volumes, and water quality practices.
- Need to measure (dye-test) rainfall vs. discharge from porous pavement & underdrain systems.
- Many variables, as with any other drainage design.

Our opinion: areas of porous pavement should be modeled similarly to dense meadow over the same soil when calculating time of concentration and runoff coefficients.
Design redundancies

- Soil infiltration rate – assume zero infiltration during storm duration
- Store design storm volume either in pavement base for infiltration or collect in underdrains and pipe to basin – OR BOTH
Design redundancies

• Soil infiltration rate – assume zero infiltration during storm duration
• Store design storm volume either in pavement base for infiltration or collect in underdrains and pipe to basin – OR BOTH
• DRAINAGE, DRAINAGE, DRAINAGE
Design

• Design as if it won’t be porous someday – institutional decision, lack of maintenance funds, ignorance
Design

- Redundancies in stormwater infrastructure
Design

• Base and pavement thickness - water storage volume vs. pavement structure
• Minimum thicknesses recommended for porous provide more than adequate pavement support
Porous Asphalt Section

- 3" porous asphalt
- 2" #57 limestone
- 9" #1/#2 crushed concrete or limestone
- geogrid
- stable (uncompacted?) subgrade
- redundant edge drain
- nonwoven fabric
- perf pipe to daylight
- subgrade
Porous Asphalt Section

- 2” porous asphalt surface
- 4” porous asphalt base
- 2” #57 limestone
- 9” #1/#2 crushed concrete or limestone
- geogrid
- stable (uncompacted?) subgrade
- nonwoven fabric
- perf pipe to daylight
Design

What do we do when we encounter weak or wet subgrade for “regular” asphalt?

What do we do when we need to reduce energy and stop erosion at pipe outlet?

IF YOU ARE DESIGNING TO MEET OTHER STANDARDS, YOU ARE PRACTICALLY DESIGNING FOR POROUS...
Design

• Surface and subgrade slopes and ADA

0% to 4% for porous pavement

5% max for ADA
2% max in loading areas

IF YOU ARE DESIGNING TO MEET OTHER STANDARDS, YOU ARE PRACTICALLY DESIGNING FOR POROUS
Design

• Mix design/spec
• Don’t reinvent the wheel!
• We use single 3” lift, considering two lifts.
Construction

• Experience counts!
• Work with FPO and others in the industry
• Communication with contractor and inspector
• Construction sequence
• Observe mix, temperature, compaction timing, compaction effort
• Cold joints
• Costs
Construction Sequence

Prevent wash from adjacent areas

Project sequence to build porous parking last
Construction Sequence
Construction Sequence

Prevent wash from adjacent areas

Project sequence to build porous parking last (not often practical)
Compact the mixture using a minimum of four (4) passes of a static tandem steel wheel roller having a minimum weight of 8 tons. Complete rolling before the mix temperature has dropped below 180 °F. (FPO spec)

Keep trucks off!
Cold joints
Cost

Standard duty asphalt drive
4,316 sy 8 bids
$25.44/sy - $29.50/sy

Porous asphalt parking
3,346 sy 8 bids
$27.24/sy - $33.50/sy
Cost

Porous asphalt trail
1,500 sy       6 bids
$26.00/sy - $35.00/sy

Porous asphalt parking
5,175 sy       6 bids
$28.70/sy - $36.48/sy

<table>
<thead>
<tr>
<th>Material</th>
<th>Thickness</th>
<th>Details</th>
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<tbody>
<tr>
<td>2” porous asphalt</td>
<td></td>
<td></td>
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<tr>
<td>8” #57</td>
<td></td>
<td>(6” #4 + 2” #57) geogrid</td>
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<tr>
<td>3” porous asphalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2” #57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9” #1/#2</td>
<td></td>
<td>geogrid</td>
</tr>
</tbody>
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BRANDYWINE 2011
Cost

Porous asphalt as bid
5,175 sy
$31.00/sy

Improved section
1,553 sy
$50.00/sy

3” porous asphalt
2” #57
9” #1/#2 geogrid

2” porous asphalt surface
4” porous asphalt base
2”+ #57
9” #1/#2 geogrid

(Not a large quantity, double mobilization, change order)
Performance

SAND RUN 2007
Performance
Performance
Performance
Performance
Performance

Overflow pipe in heavy rain
Maintenance

Sand Run – blow pine needles

Nature Realm – (BRAND X) pollen is pasty

Springfield Bog – Tallmadge – Liberty Park – Brandywine - SO FAR SO GOOD!

Strong vacuum sweeper might be in our future

KEEP IT CLEAN!
Maintenance

Careful plowing

Use only salt for de-icing

NO SEAL COAT!
Clogging anyone???
Clogging anyone???

Portland, OR study

100-yr storm: 2.5 in/hr

New porous asphalt: 43 in/hr
Clogging anyone???
Durability
Durability

NO  alligatingor (base failure, load)
NO  rutting/shoving (mix)
NO  pot-holing  (base, tack)
NO  frost-heaving  (soil)
NO  cracking at all!  (base, load)
Durability

NO alligating (base failure, load)

NO rutting/shoving (mix)

NO pot-holing (base, tack)

NO frost-heaving (soil)

NO cracking at all! (base, load)

NO FAILURE BY WATER
LESSONS LEARNED

• Know the site and test soil – know infiltration rate & expectations for project
• If you’re designing for stormwater compliance, ADA compliance, pavement structure, and LEED points, you are practically designing for porous
• Plan for overflow from base, even if small: D,D,D
• Consider using porous for drive lanes only
• Consider two-lift porous system
LESSONS LEARNED

• Don’t go it alone
• Good, experienced contractor is critical
• In context of a bigger project, cost difference for porous is small
• Keep it clean
Sand Run – 2007

Broke all the rules and it still works!
Sand Run – 2007

Broke all the rules and it still works!
Thank you!
Questions?