MaineDOT’s Porous Pavement
Maine Mall Road - 9 Years Later

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Asphalt Pavement Engineer,
MaineDOT

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What is Permeable/Porous Pavement?

Allow water to drain through the pavement structure into a stone bed and infiltrate into the soils below

Why?

Provide storm-water management systems that promote infiltration, improve water quality, and may eliminate need for detention basins or other drainage structures

Credit to: http://civilogistix.com/permeableporous-asphalt-pavement/
Project Information

Maine Mall Road in Portland, ME
- Urban location
- Mixed commuter and commercial traffic

Design AADT: 16,750 vehicles/day
Design ESALs: 3,277,700 (20 years)
Design Hourly Volume: 2412 vehicles
Percent Heavy Trucks: 5%
◦ Total watershed is 2200 acres; 640 acres (28 percent) is impervious
◦ All landowners with more than 1 acre of impervious surfaces - roofs, parking lots, roads - are regulated
Long Creek Watershed Imperviousness (ca. 1940)

Pervious Surfaces ~602 ac. (99%)
Impervious Surfaces ~9 ac. (1%)
Deciding Factors for Project

Permit Options

Individual Permit
- Apply water quality practices on all 64 acres regardless of impact on stream

General Permit
- Participate in Long Creek Watershed Management Plan with other landowners and collectively treat priority areas

- American Recovery and Reinvestment Act
- 100% Federal cost-sharing
- Satisfies part of MaineDOT Regulatory Requirements
- Opportunity to apply porous pavement to an urban highway
Pavement Section

OGFC

ATPB

Reservoir Stone

Filter Material

3"

6"

15"

6 – 12"
Filter Layer

- Filters pollutants
- Help mitigate water temperature
- Includes 3 longitudinal runs of 6” perforated UD pipe, with laterals every 120’
- Filter material meets gradation for MaineDOT Type B underdrain sand
Reservoir Stone Layer

<table>
<thead>
<tr>
<th>AGGREGATE REQUIREMENTS</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>2-1/2”</td>
<td>100</td>
</tr>
<tr>
<td>2”</td>
<td>95 – 100</td>
</tr>
<tr>
<td>1”</td>
<td>0 - 30</td>
</tr>
<tr>
<td>3/4”</td>
<td>0 – 5.0</td>
</tr>
<tr>
<td>L.A. Abrasion</td>
<td>25.0 max.</td>
</tr>
</tbody>
</table>

L.A. Abrasion: 25.0 max.
Asphalt Treated Permeable Base

- Binder: PG 76–28 with SBS polymer
- Minimum 2% binder
- 95 percent coated particles (AASHTO T 195)
- 35 gyration design: looking for specimen that will be stable
## Asphalt Treated Permeable Base

### JOB MIX FORMULA

<table>
<thead>
<tr>
<th>SIEVE SIZE</th>
<th>TARGET</th>
<th>SPEC RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5 mm</td>
<td><strong>100</strong></td>
<td>100</td>
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<tr>
<td>25 mm</td>
<td><strong>96</strong></td>
<td>95 – 100</td>
</tr>
<tr>
<td>19 mm</td>
<td><strong>90</strong></td>
<td>80 – 95</td>
</tr>
<tr>
<td>12.5 mm</td>
<td><strong>48</strong></td>
<td>35 – 70</td>
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<tr>
<td>4.75 mm</td>
<td><strong>6</strong></td>
<td>2 – 10</td>
</tr>
<tr>
<td>2.36 mm</td>
<td><strong>3</strong></td>
<td>0 – 5</td>
</tr>
<tr>
<td>0.075 mm</td>
<td><strong>1.3</strong></td>
<td>0 – 2.0</td>
</tr>
<tr>
<td>Binder content</td>
<td><strong>2.0</strong></td>
<td>2.0 minimum</td>
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</tbody>
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### AGGREGATE QUALITIES

<table>
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<tr>
<th>Category</th>
<th>Target</th>
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<tbody>
<tr>
<td>Micro-Deval</td>
<td>18.0 maximum</td>
</tr>
<tr>
<td>% Fractured</td>
<td>85/80</td>
</tr>
<tr>
<td>Flat/Elongated</td>
<td>10</td>
</tr>
</tbody>
</table>

2.0 minimum
ATPB Placement

- ATPB placed at 7.5” and compacted to 6” finished depth
- Placement/production temperatures: 290 – 340°F
- Breakdown rolling temperature at approx. 200 – 210°F
- Mixture needed to “stiffen” enough to support compaction equipment
Open Graded Friction Course

- Binder: PG 76–28 with SBS polymer
- Minimum 6.0% binder
- 20.0% Voids @ N_{des}
- 50 gyration design
- 0.3% Cellulose Fibers
## Open Graded Friction Course

### AGGREGATE QUALITIES

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
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<tbody>
<tr>
<td>Micro-Deval</td>
<td>18.0 maximum</td>
</tr>
<tr>
<td>% Fractured</td>
<td>100/90</td>
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<tr>
<td>Flat/Elongated</td>
<td>5 max.</td>
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<tr>
<td>Sand Eq.</td>
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<tr>
<td>FAA</td>
<td>45</td>
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<tr>
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<td>96</td>
<td>85 - 100</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>65</td>
<td>55 - 75</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>20</td>
<td>10 - 25</td>
</tr>
<tr>
<td>2.36 mm</td>
<td>8</td>
<td>5 - 10</td>
</tr>
<tr>
<td>0.075 mm</td>
<td>2.3</td>
<td>2.0 – 4.0</td>
</tr>
<tr>
<td>Binder content</td>
<td>6.0</td>
<td>6.0% minimum</td>
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OGFC Placement

- Similar placement temperatures as ATPB
- 12 ton static roller was used as breakdown (approx. 180-210 deg. F)
- 3-5 ton used as intermediate (approx 140 deg. F)
- 10 ton static finish roller, with 3-5 and 1 ton rollers to iron out any marks left behind
How does it look today?
Southbound Direction
Northbound Direction
Average Rutting

![Graph showing the average rut depth (in.) from 2008 to 2020. The rut depth increases from 0.05 in. in 2008 to 0.4 in. in 2020.]
Observations

- Project holding up well after nine years of service
- Localized raveling – primarily at construction joints
- Patching around the mall entrance – most likely due to tracking sand onto porous section
- MaineDOT very satisfied with the performance thus far
International Marine Terminal
Chassis Yard Paving Project
International Marine Terminal
Chassis Yard Paving
Team tasked with developing a few options for a pavement with these requirements:

- meets stormwater/infiltration requirements
- supports Port Authority yard vehicles
  - durable
  - constructible
  - cost effective
- flexible in vehicle and storage use
#1 Requirement

To provide a pavement structure that would allow stormwater to infiltrate and filter roadway pollutants before entering into the Casco Bay.
ESAL’s calculated for both vehicle types were combined for final design

Unloaded MI-JACK ESAL’s

TRACTOR TRAILER ESAL’s
International Marine Terminal
Chassis Yard Paving Project

Final Pavement Design

(DARWin 3.1 Software used to calculate final Porous Pavement design)

3" - OPEN GRADED SURFACE COURSE
6" - ASPHALT TREATED PERMEABLE BASE
STONE RESERVOIR LAYER
EXISTING BASE (PLACED BY OTHERS)

TYPICAL POROUS PAVEMENT SECTION
International Marine Terminal
Chassis Yard Paving Project

Pavement Construction
International Marine Terminal
Chassis Yard Paving Project

Phase 1
Drainage, subbase and lighting foundation installation
Questions?