POROUS ASPHALT: DESIGN AND CONSTRUCTION
CHALLENGES & OPPORTUNITIES

Mark A. Palmer, P.E., LEED AP
City Engineer, City of Puyallup

POROUS ASPHALT: DESIGN AND PERFORMANCE GOALS

1. Properly integrated into site design
2. Permeable wearing course
3. Flexible Pavement Section designed for saturated subgrade conditions
4. Pavement designed to infiltrate 100% of rainfall
5. Pavement depth sufficient to eliminate frost heave
6. Durable, long lasting wearing course
7. Constructible Design (materials, sequencing)
8. Prevents or accounts for surface water run-on
9. Provides drainage redundancy (inlet, outlet)
10. Addresses potential storm water flows in subgrade/trenches

POROUS ASPHALT: CONSIDERATION FOR USE

<table>
<thead>
<tr>
<th>Design Consideration</th>
<th>Porous Asphalt</th>
<th>Pervious Concrete</th>
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<tbody>
<tr>
<td>Does not require certified installer</td>
<td>X</td>
<td></td>
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<tr>
<td>Can be made in small batches</td>
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<td>X</td>
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<tr>
<td>Cost Effective (initial and life cycle) for High Load/Volume Roads</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Can be used almost immediately</td>
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<td>X</td>
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<tr>
<td>More sensitive to traffic volume/soils</td>
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COKER COURSE GRADATION MISCEUES

- Watch for too much aggregate of one size (poorly graded)
- Not enough fracture face
- Too little voids (too much fines)

Nearly 50% of material between ½” and 3/8”

COKER COURSE GRADATION MISCEUES

- Result of gradation miscue (poorly graded) on choker course
- Rutting, lack of interlocking

GRADATION CORRECTION

- Correction added correctly graded material to existing poorly graded material.
- Rutting greatly reduced
- Subsequent areas with strictly correct mix work even better.
AGGREGATE SPECIFICATION CHART

- Good way to see visually how gradation should look
- Original, poorly graded aggregate is near vertical line
- Replacement material has curve that emulates specification curve

GEOGRID

- Check manufacturer’s recommendations for placement mid to top of reservoir course to maximize load spreading
- Can reduce overall section thickness important for arterials
- Section shown is proposed WSU Puyallup LID Frontage Phase 1 detention
- Porous asphalt treated base also helps reduce section thickness

CITY OF PUYALLUP PROJECTS

8th Ave NW LID Retrofit
- Gutters 100%, pervious=100%,渗透
- Porous Gravel Street
- Porous concrete sidewalk (south side)
- Porous Paver sidewalk (north side)
- ROW rain gardens

Design Considerations:

- Edge Constraint?
- 1’ flush curb for 8th Ave NW
- Porous gravel shoulder for 6th Ave SW & Wilson Loop
- Barrier curb could be used as well
- Don’t recommend curb and gutter for new
- Crown?
- 1% crown on 8th Ave VS 3% City standard
- No crown or 1% cross slope 6th Ave & Wilson Loop
CITY OF PUYALLUP PROJECTS

Wilson Loop (Porous Alley Initiative)
- Replaced HMA section with pervious asphalt section
- Street had failed, frequent complaints
- Frequent ponding on roadway
- Utilized pervious rock shoulders
- Wilson Loop and 6th both holding up well with traffic crossing edge frequently

6th Ave SW (Porous Alley Initiative)
- Water main replacement drove project
- Frequent street flooding events, adverse grade, no storm drainage
- Replaced HMA section with pervious asphalt section
- Utilized pervious rock shoulders

POROUS GRAVEL SHOULDER MIX
- Mix used by City of Puyallup is blend developed by PW Streets. Uses a standard 1-1/4” CSBC rock blended with #57 rock.
- CSBC had void content of 12.5%
- #57 rock had void content of 41.3%
- Staff mixes the rock manually at 1:1 ratio
- Used as reservoir course and for porous gravel alleys, shoulders
- Can be used as single rock under porous asphalt, no choker course required-workable surface for pavers
- Creates drivable, firm but porous surface
CONSTRUCTION OBSERVATION KEYS

- Make sure compaction starts within the compaction range specified by the mix design.
- Too Early (too hot) - Final mat will not have desired porosity.
- Too Late (too cold) - Final mat will not compact to desired density, surface may be uneven, likely candidate for raveling and eventual rutting.
- Have some device for measuring asphalt temperature during placement AND know your mix's compaction temperature range.

CONSTRUCTION TESTING KEYS

- Working on compaction/density specification.
- Just now comparing data between Tacoma and Puyallup projects.
- Stay tuned for more information.

CONSTRUCTION TESTING KEYS - MORE INFORMATION

- Similar results for voids and density on Puyallup projects.
- Little less variability, may be due to vibratory compacting on Puyallup projects.
CONSTRUCTION TESTING - AHA!

• Air voids is calculated directly from % compaction and RICE of design mix (maximum mix density)
• Target air voids is 16-22%, therefore target density is 78-84% compaction
• To increase pavement durability, suggest that 80-85% compaction be established for field acceptance

POST CONSTRUCTION

Several owners later, porous asphalt driveway is seal coated

POST CONSTRUCTION

• Consider installing signage advising unique nature of pavement
• Covenants or other instruments tied to land/title for private developments
MAINTENANCE

- Sweep regularly with regenerative air or vacuum sweepers
  - TOP: Tymco Model 600 Regenerative Sweeper also available with Alternative Fuel option
  - Bottom: Elgin Crosswind Regenerative Sweeper also available with Alternative Fuel option

POST CONSTRUCTION

- Other Concerns/Issues
  - Protection of pavement during building construction.
  - Homeowner/End User care of pavement.
  - Education of maintenance personnel.
  - Utility installations and road way repairs.

CONTACT INFORMATION:

MARK A. PALMER, P.E., LEED® AP
CITY ENGINEER, CITY OF PUYALLUP
(253) 435-3606
MPALMER@CI.PUYALLUP.WA.US
Questions???

CITY OF PUYALLUP
PROJECTS
8th Ave NW LID Retrofit
• Converted 100% impervious=>100% Pervious
• Porous Asphalt Street
• Pervious concrete sidewalk (south side)
• Permeable Paver sidewalk (north side)
• ROW rain gardens
CITY OF PUYALLUP PROJECTS

Wilson Loop (Porous Alley Initiative)
- Replaced HMA section with pervious asphalt section
- Street had failed, frequent complaints
- Frequent ponding on roadway
- Utilized previous rock shoulders

6th Ave SW (Porous Alley Initiative)
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Riverwalk Trail/JEB III Link
- Pervious asphalt trail
- Connects to Foothills Trail
- Allows East Pioneer Way storm flows to pass laterally
CITY OF PUYALLUP PROJECTS
CLARKS CREEK PARK RIPARIAN HABITAT & POROUS MAINTENANCE ROAD

November 6, 2014
Municipal Stormwater Conference

Corporate Yards South Entrance
- Pervious concrete entrance, 24' wide
  - Heavy equipment access needed because of sight distance restriction on 39th Ave SE
  - Utilized porous alley mix of 1-1/4" blended with #57 rock for reservoir course
  - Conservative 12" thick section

POROUS GRAVEL ALLEYS
- Using mix of 1-1/4 and #57 rock
  - Allows 2-3 years between maintenance vs. one-two times/year with dense graded
  - Inexpensively addresses ponding issues
COMING SOON

November 6, 2014 Municipal Stormwater Conference

CITY OF PUYALLUP PROJECTS

39th Ave SW, 11th ST SW to 17th ST SW

- Pervious concrete roadway & sidewalks
- Standard concrete for intersections
- Overall less cost than HMA
- Construction 2015

CITY OF PUYALLUP PROJECTS

WSU LID FRONTAGE IMPROVEMENT

- Pervious concrete and porous asphalt roadways
- Testing built into design
- Standard concrete for intersections
- Phased Construction starting 2015
• Pervious concrete roadways and bike track, sidewalks
• Construction projected for 2016