Concrete Pavements

Streets and local roads

Amy Wedel, Director Concrete Pavements

Palm Beach TPA

April 3, 2018
Outline

Why Concrete?

Top Recommendations

Concrete Paving Applications
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<th>Why Concrete?</th>
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<tr>
<td>Safety</td>
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<tr>
<td>Reflectivity / Urban Heat Island Effect</td>
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<tr>
<td>Resiliency</td>
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<tr>
<td>Lowest Life Cycle Cost</td>
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<tr>
<td>Long Life / Low Maintenance</td>
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<tr>
<td>Environmental Friendly Material</td>
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Safety

Better visibility reduces accidents
Rutting is an opportunity for hydroplaining.
Urban heat Islands

• Reduced urban heat islands
  • 10 to 20 degrees cooler

• Reduced AC needs
  • 1 degree equals 1.5% change in energy consumption

• Improve air quality
Resiliency

• How are pavement layers impacted?

• Do certain pavement types or base layers perform better when exposed to flood waters?
Pavement Resilience with respect to an event (e.g. Flooding) is characterized by two parameters:

1. Drop in performance, induced by the event (e.g. reduced ability to carry load).
2. Recovery time to reinstate or improve performance (LCA, LCCA).
Concrete and Asphalt Pavements are different due to how they deliver loads to the subgrade.

### Concrete Pavements are Rigid
- Concrete carries the load and distributes it over a large area
- Minor deflection
- Low subgrade contact pressure
- Subgrade uniformity is more important than strength

### Asphalt Pavements are Flexible
- The load is more concentrated and transferred to the underlying layers
- Higher deflection
- Subgrade, base/subbase strength are important
- Usually require more layers and greater thickness in order to protect the subgrade

Concrete’s rigidity spreads the load over a large area & keeps pressures on the subgrade low (therefore the flooded support system does not impact the load carrying capacity to the same degree as asphalt).
Relief and Rescue Efforts Must take place! Pavements are loaded...Are their lives shortened?

Meals that Matter
#MtMFlorence Update

(New) Location 1
98 S Trade Way
Rocky Point, NC

Location 2
7701 S Raeford Rd
Fayetteville, NC
Pavements that were submerged were found to be weaker than non-submerged pavements.

- **Asphalt pavements**
  - Overall strength loss was equivalent to two inches of new asphalt.
  - Duration of submergence was not a factor – damage occurred regardless of the length of time the pavement was submerged.
  - Estimated cost of rehabilitating the 200 miles of submerged state (asphalt) roads would be **$50 million**.

- **Concrete Pavements**
  - Little relative loss of strength due to flooded versus non-flooded conditions.
  - Mr (subgrade strength) for concrete pavements is similar for submerged and non-submerged pavements.
  - No information given on repairs or repair costs.

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**Key Findings**

RESEARCH LOOKING AT PAVEMENTS THAT WERE SUBMERGED BY HURRICANE KATRINA

**Impact of Hurricane Katrina on Roadways in the New Orleans Area, Technical Assistance Report No. 07-2TA**

Kevin Gaspard, Mark Martinez, Zhongjie Zhang, and Zhong Wu; LTRC Pavement Research Group. March 2007

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March 2007
Life Cycle Cost Analysis

• Competitive first costs
• Lowest costs in 5 to 10 years

Lowest total cost of ownership!
83 year old concrete road

- US 17/92 in Winter Park
- Built 1936
- slab thickness 7” (Reinforced)
Minimal Maintenance

• No resurfacing
• No deformities
Environmentally Friendly Material

- Local materials
- Recycled materials
- No hazardous materials
- Stormwater management (pervious concrete)
Outline

Why Concrete?

Top Recommendations

Concrete Paving Applications
Top Recommendations

- acceleration
- deceleration
- turning

Intersections

Roundabouts

Bus stops

Roadways with heavy trucks
Intersections

- Sample & Powerline
Roundabouts

Dean Still Road & 33, Polk county
Bus stops

Bus stops use a disproportionately high portion of roadway maintenance budgets.
Concrete Paving Applications

- Pervious Concrete
  - Roller Compacted Concrete (RCC)
  - Concrete Overlays
  - Full Depth Reclamation (FDR)
Pervious Concrete

- Stormwater management
  - Quality control
  - Quantity control
- Recharge aquifer

- May 15\textsuperscript{th} Workshop Ft. Lauderdale
Palm Beach State College
Loxahatchee Groves Campus
RCC roller compacted concrete

- Speed of Construction
- Economic solution
- Open to traffic in 24 hours
Concrete Overlays

- Concrete overlay (3” - 7”) on existing asphalt surface
- Existing asphalt serves as compacted base for concrete pavement
- Cost effective
- Durable (30 years 2018 FDOT)
FDR Full Depth Reclamation (recycled road)

• Recycle existing asphalt
• Strengthened stabilized base
• New top layer
More resilient roadway

**Increased Rigidity, Spreads Loads**

- Unstabilized granular base
- Cement-stabilized base

**Reduced Moisture Susceptibility**

- Moisture infiltrates base:
  - Through high water table
  - Capillary action
  - Causing softening, lower strength, and reduced modulus

- Cement stabilization:
  - Reduces permeability
  - Helps keep moisture out
  - Maintains high level of strength and stiffness even when saturated
Sustainable Element of FDR Process

Energy and Materials Use*

<table>
<thead>
<tr>
<th></th>
<th>New Base</th>
<th>Full-Depth Reclamation with Cement</th>
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</thead>
<tbody>
<tr>
<td>Number of Truck Trips</td>
<td>180</td>
<td>12</td>
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<tr>
<td>New Roadway Materials</td>
<td></td>
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</tr>
<tr>
<td>(tons)</td>
<td>300</td>
<td>4000</td>
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<tr>
<td>Material Landfilled</td>
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<tr>
<td>(cu yds)</td>
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<td>2700</td>
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<tr>
<td>Diesel Fuel Consumed</td>
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<td></td>
</tr>
<tr>
<td>(gallons)</td>
<td>3000</td>
<td>500</td>
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*Based on 1 mile 24-ft wide 2-lane road, 6-inch base
Industry Support

Analysis of options

Specifications
Questions?

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Thank you!