US-27 OGFC Test Sections

2006 SE Pavement Management and Design Conference

Greg Sholar
Purpose of Research

- Evaluation/comparison:
  - Conventional FC-5 (open-graded mix).
  - FC-5 with thick polymer modified tack membrane.
  - Novachip proprietary mix.
  - Limestone vs. Granite.
Construction Plan

Five test sections (1.3 miles long each):
- FC-5 with FL limestone aggregate (Miami area).
- FC-5 FL limestone with polymer membrane.
- FC-5 with Nova Scotia granite aggregate.
- FC-5 Nova Scotia granite with polymer membrane.
- Novachip mix with Nova Scotia granite.
Evaluation Parameters

- Long term durability (cracking, rutting and ride quality).
- Field permeability.
- Friction resistance.
- Noise.
FC-5 and Novachip Differences

- **FC-5**
  - Standard FDOT mix used on high speed facilities.
  - Porous, open-graded mix for spray reduction.
  - Standard ARB-12 binder for this project.
  - Uses conventional tack coat.
  - Placed ¾” thick.
  - Based on Georgia’s OGFC mix.
FC-5 and Novachip Differences

**Novachip**
- Proprietary mix developed by Koch (now SEM).
- “Denser” open gradation.
- Comes in three sizes, depending on application.
- Used Type C gradation – coarsest.
- PG76-22 binder recommended.
- Uses thick polymer tack coat, i.e. membrane (Novabond).
- Special paver.
- Bottom line: premium mix.
Gradation Differences

Nova Chip Type C
(12.5 mm) Range

FC-5 Range
Tack Coat vs. Polymer Membrane

- **Standard FDOT tack:**
  - Conventional rapid set emulsion.
  - Applied at target rate of 0.045 gal/sy (diluted).

- **Polymer modified tack:**
  - Uses styrene-butadiene (SB) polymer.
  - Emulsified after polymer addition.
  - Generic specification for Novabond exists.
  - Target rate of 0.20 gal/sy.
Application Process for BACFC
Polymer Membrane

- Wicks 1/2 way up when hot.
- Final wick is 1/3 after water vaporization.
Benefits of Process

- Benefits:
  - No tracking.
  - Sticky polymer membrane for adhesion.
  - Much thicker than conventional tack.
  - Complete coverage.
As-Built Data
## Layer Thickness (inches)

<table>
<thead>
<tr>
<th></th>
<th>FC-5 LS</th>
<th>FC-5 LS</th>
<th>FC-5 GR</th>
<th>FC-5 GR</th>
<th>Novachip</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>w/ P.M.</td>
<td>w/ P.M.</td>
<td>W/ P.M.</td>
<td>W/ P.M.</td>
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<tr>
<td>0.81</td>
<td>0.73</td>
<td>0.85</td>
<td>0.85</td>
<td>0.89</td>
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</table>
## Asphalt Content

<table>
<thead>
<tr>
<th></th>
<th>FC-5 LS</th>
<th>FC-5 LS w/ P.M.</th>
<th>FC-5 GR</th>
<th>FC-5 GR W/ P.M.</th>
<th>Novachip</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td>6.4</td>
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<tr>
<td><strong>As-built</strong></td>
<td>6.0</td>
<td>6.2</td>
<td>5.5</td>
<td>5.8</td>
<td>4.5</td>
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<td></td>
<td>FC-5 LS w/ P.M.</td>
<td>FC-5 LS w/ P.M.</td>
<td>FC-5 GR w/ P.M.</td>
<td>FC-5 GR w/ P.M.</td>
<td>Novachip w/ P.M.</td>
</tr>
<tr>
<td>----------------</td>
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<td>-----------------</td>
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<tr>
<td>Tack Rate</td>
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<td>0.18</td>
<td>0.02</td>
<td>0.18</td>
<td>0.18</td>
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</table>
FC-5 Limestone
FC-5 Limestone w/ P.M.
FC-5 Limestone w/ P.M.
Transition: Limestone to Granite
FC-5 Granite w/ P.M.
FC-5 Granite w/ P.M.
FC-5 Granite w/ P.M.
FC-5 Granite w/ P.M.
Novachip w/ P.M.
Novachip w/ P.M.
Performance Data
Ride Number Data, US-27, Highlands Co.

Mix Type

- FC-5, LS
- FC-5, LS, PM
- FC-5, GR
- FC-5, GR, PM
- Novachip, GR

Dates:
- 7/14/2003
- 7/26/2004
- 7/27/2005
- 4/10/2006

Legend:
- LS = FL limestone
- GR = Nova Scotia Granite
- PM = Polymer Membrane

Mix Type

- FC-5, LS
- FC-5, LS, PM
- FC-5, GR
- FC-5, GR, PM
- Novachip, GR

IRI

- 7/14/2003
- 7/26/2004
- 7/27/2005
- 4/10/2006

LS = FL Limestone
GR = Nova Scotia Granite
PM = Polymer Membrane

Mix Type

<table>
<thead>
<tr>
<th>Rut Depth (inches)</th>
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<tbody>
<tr>
<td>0.00</td>
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<tr>
<td>0.02</td>
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<td>0.16</td>
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FC-5, LS
FC-5, LS, PM
FC-5, GR
FC-5, GR, PM
Novachip, GR

LS = FL limestone
GR = Nova Scotia Granite
PM = Polymer Membrane

7/14/2003
7/26/2004
7/27/2005
4/10/2006
Field Permeability

Mix Type

Permeability (x 10^-5 cm/s)

FC-5, LS
FC-5, LS, PM
FC-5, GR
FC-5, GR, PM
Novachip, GR

7/15/03
7/19/04
8/15/05
4/26/06

LS = FL Limestone
GR = Nova Scotia Granite
PM = Polymer Membrane
### Friction Data, US-27, Highlands Co.

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>Friction Number</th>
<th>Date</th>
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<td>FC-5, LS</td>
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<td>FC-5, LS, PM</td>
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<tr>
<td>FC-5, GR</td>
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<td>FC-5, GR, PM</td>
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<td>5/3/2006</td>
</tr>
<tr>
<td>Novachip, GR</td>
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<td>5/3/2006</td>
</tr>
</tbody>
</table>

LS = FL limestone  
GR = Nova Scotia Granite  
PM = Polymer Membrane
March 2004 by NCAT

LS = FL Limestone
GR = Nova Scotia Granite
PM = Polymer Membrane
Related Research

- BACFC, I-75, Marion County (Ocala).
- Two-mile BACFC section vs. control.
- October 2005.
Related Research

- Porous Friction Course.
- Coarser FC-5, 1 ¼ to 1 ½ inches thick.
- Conventional tack coat.
Conclusions

- Great test section...many variables examined.
- High truck traffic.
- Construction went well.
- Collecting a lot of data.
- All performing well so far.
- Main focus is long term durability.
Thank You!

Comments / Questions?