Perpetual Pavement Demonstration

September 12, 2007

Cedar Road from Brainard Rd. to Lander Rd.
Cuyahoga County Engineer’s Presenters:

► Brian Driscoll, P.E. – Chief Highway Design Engineer

► Thomas Sotak, P.E. – Area Construction Engineer

► E. Todd Zima – Project Engineer
Project Overview

► Cedar Road Reconstruction and Widening

► From Brainard Rd. to Lander Rd.

► In the Cities of Lyndhurst, Mayfield Heights, and Pepper Pike
Project Overview

- Design and Construction Managed by the Cuyahoga County Engineer’s Office
- Plans Prepared by DLZ
- Design Assistance Provided by Flexible Pavements of Ohio
- Contractor: Burton Scot Contractors, LLC
- Bid Amount: $5,160,899.00
Project Overview

- Approximately 0.7 Miles of Full-Depth Full-Width “Perpetual Pavement” Between Brainard Rd. and Lander Rd.

- Some Composite Pavement West of Brainard

- Some Composite Pavement on Brainard

- Some Composite Pavement on Lander
Project Overview

► New Lane Configuration Varies and Isn’t Really Important Here

► Project Also Includes:

  ▪ Sanitary Sewer
  ▪ Storm Sewers and Culverts
  ▪ Sidewalk
  ▪ Traffic Signals
Perpetual Pavement

Let’s Talk About How Perpetual Pavement Works!
Perpetual Pavement

OK, Why Not Concrete Pavement?
Perpetual Pavement

OK, Why Not Conventional Full-Depth Flexible Pavement?
Perpetual Pavement

► OK, We Decided to Use A Perpetual Pavement Design! What Next?
Perpetual Pavement

► DLZ Provided a Conventional Full-Depth Flexible Pavement Design

► Used All the Regular Parameters:
  - Current ADT (22676)
  - Design ADT (23421)
  - Trucks 5%
  - B:C Ratio 2:1
  - Directional Distribution (57% Eastbound)
  - Mr 7200 PSI (From Geotechnical Report)
  - CBR 6 (From Geotechnical Report)
  - G.I. 8 to 11 (From Geotechnical Report)
Perpetual Pavement

► Conventional Pavement Design (Cont.)

► Put all the Above in a Blender

► Or, Follow the Design Guidelines in Section 200 and 400 of the ODOT Pavement Design & Rehabilitation Manual
Perpetual Pavement

Conventional Pavement Design (Cont.)

The Result: Design Structural Number: 4.5

- 448 AC Surface $1.25'' \times 0.35 = 0.44$
- 448 AC Intermediate $1.75'' \times 0.35 = 0.61$
- 302 Bitum. Agg. Base $9'' \times 0.35 = 3.15$
- 304 Aggregate Base $6'' \times 0.14 = 0.84$
- Total Pavement Structure $18'' = 5.04$
Perpetual Pavement

► OK, Finally Let’s Talk About Perpetual Pavement!

► We had DLZ Talk To Flexible Pavements of Ohio

► Flexible Pavements of Ohio Turned to Their Own Experts to Provide a Perpetual Pavement Design
The Resulting Perpetual Pavement Design:

- 1.5” 442 AC Surface Course, 12.5 mm Superpave Type A (446), PG 70-22M
- 1.75” 442 AC Intermediate Course, 19mm Superpave Type A (446), PG 70-22M
- 4.75” 302 Bit. Agg. Base, PG 64-22 Compacted to 93% Minimum Density
- 4” 302 Bit. Agg. Base, PG 64-22 Designed at 3% Air Voids, Compacted to 94% Minimum Density
- 6” 304 Aggregate Base
- TOTAL PAVEMENT STRUCTURE = 18”
Cost Factors

► OK, Got It So Far?

► But Can I Afford the “Good Stuff”? 

► Flexible Pavements of Ohio Estimated Perpetual Pavement to Be 10% More Than Conventional Full-Depth Flexible Pavement
## Cost Factors

### Cost of Perpetual Pavement

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>442 1-1/2” Surf.</td>
<td>$121,680</td>
</tr>
<tr>
<td>407 Tack for Int.</td>
<td>$ 1,864</td>
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<tr>
<td>442 1-3/4” Intermediate</td>
<td>$131,040</td>
</tr>
<tr>
<td>407 Tack for Int.</td>
<td>$ 1,864</td>
</tr>
<tr>
<td>302 4-3/4” 93% Min. Density</td>
<td>$275,652</td>
</tr>
<tr>
<td>407 Tack</td>
<td>$ 3,792</td>
</tr>
<tr>
<td>302 4” 3% Air, 94% Den.</td>
<td>$232,035</td>
</tr>
<tr>
<td>408 Prime Coat</td>
<td>$ 23,667</td>
</tr>
<tr>
<td>304 6” Agg. Base</td>
<td>$167,998</td>
</tr>
<tr>
<td>Spl. Geotextile Fabric</td>
<td>$  33,078</td>
</tr>
<tr>
<td>204 Subgrade Compaction</td>
<td>$  43,264</td>
</tr>
</tbody>
</table>

**TOTAL**                                    **$1,035,934**
Cost Factors

► Total Bid Price = $5,160,899.00

► Total Cost of Perpetual Pavement = $1,036,000.00*

► So a 10% Premium for Perpetual Pavement Means We Paid About $100,000 More.

► $5,160,899/$5,060,899 = 102%

► Therefore, We Can Assume That We Paid a 2% Premium Over Total Cost of Project.
Cost Factors

► Just For Fun, Compare to Conventional Full-Depth Flexible

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<tr>
<td>Item 448 1-1/4” Surface</td>
<td>$92,040</td>
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<tr>
<td>Item 407 Tack for Int.</td>
<td>$1,864</td>
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<tr>
<td>Item 448 1-3/4” Intermediate</td>
<td>$114,660</td>
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<tr>
<td>Item 407 Tack for Int.</td>
<td>$1,864</td>
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<tr>
<td>Item 302 9” Bit. Agg. Base</td>
<td>$561,700***</td>
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<td>Item 408 Prime Coat</td>
<td>$23,667</td>
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<tr>
<td>Item 304 Agg. Base</td>
<td>$167,998</td>
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<td><strong>TOTAL</strong></td>
<td><strong>$1,040,135</strong></td>
</tr>
</tbody>
</table>
Cost Factors

► What About --- Gulp! --- CONCRETE??

► Our Minimum Thickness Would Be 10”

► Burton Scot Bid $42.50 / sy for 9” RCP

► On Crocker-Stearns (10” RCP), Low Bidder = $39.50 / sy

► Average of All Crocker-Stearns Bidders = $47.00 / sy
Cost Factors

Cost of Concrete

- Item 451 10” RCP $1,055,808
- Item 304 6” Agg. Base $167,993
- Item Spl. Geotextile Fabric $33,078
- Item 204 Subgrade Compaction $43,264

- TOTAL $1,300,143

$1,300,143 / $1,035,934 = 125%
Construction Administration
Concerns

► Thomas P. Sotak, P.E.
► Area Construction Engineer
Construction Administration
Concerns

► Testing

- Plans Called for Item 302 Base Course To Be Placed With a Density Requirement

- County Had No Experience Testing for Density Due to Use of Item 448 on County Jobs

- Flexible Pavements of Ohio Suggested Use of ODOT SS 1055 for Both Base Courses and Intermediate / Surface Courses
Construction Administration

Concerns

► Other Considerations

- Both Surface and Intermediate Courses Utilize PG 70-22M Binder

- Normal ODOT Specification (442.04) Calls for PG 64-22 Intermediate Course
Construction Administration Concerns

► Other Considerations (Cont.)

- Subgrade Preparation
- Utility Issues
- Maintenance of Traffic – Elevated Pavement
- Placement Temperatures