Alternate Pavement Type Bidding

April 11, 2011
Macon Area Office
Overview

• Make You Aware of Current Process
  • Design
  • PTS – Pavement Type Selection
• Share Future Plans
  • MEPDG (DARWin-ME)
• Describe Alternate Pavement Type Bidding
• Share Way to Get Industry Input
Design Process

• AASHTO Interim Guide for Design of Pavement Structures
• Design Policy Manual
  • Chapter 10 – Pavement Design
• Pavement Design Software minor revision
AASHO Road Test

Loop 5
- Test Tangent
- Rigid
- Steel I-Beam
- Prestressed Concrete
- Flexible

Loop 6
- Test Tangent
- Rigid
- Steel I-Beam
- Reinforced Concrete
- Flexible
Asphalt Design

• Total Thickness based on Traffic, Soils, Location
• GDOT Standard Pavement Section

SN = SN_{HMA} + SN_{Base}
Concrete Design

• PCC Thickness based on Traffic, Soils, Location
• GDOT Standard Pavement Section

• Thickness from Nomograph
Concrete Design

**Concrete Elastic Modulus, \( E_c \) (10^6 psi)**

**Effective Modulus of Subgrade Reaction, \( k \) (pci)**

**Mean Concrete Modulus of Rupture, \( S_e \) (psi)**

**Examples:**
- \( k = 72 \) psi
- \( E_c = 5 \times 10^6 \) psi
- \( S_e = 650 \) psi
- \( J = 3.2 \)
- \( C_d = 1.0 \)

**Load Transfer Coefficient, \( J \)**

**Drainage Coefficient, \( C_d \)**

**Geometric Data:**
- \( S_e = 0.29 \)
- \( R = 95\% \) (\( Z_R = 1.645 \))
- \( \Delta PSI = 4.2 - 2.5 = 1.7 \)
- \( W = 5.1 \times 10^6 \) (18 kip/ESAL)

**Solution:**
- 0.100 inches (nearest half-inch from segment 2)

**Truss Diagram:**

**Graphs and Equations:**

\[
\log_{10} N = 2.88 + 7.35\log_{10}(D+1) - 0.06 + \frac{1.624 \times 10^{-7}}{D+1} - 1.5 \left( \frac{\Delta PSI}{4.5 - 1.5} + (4.22 - 0.32c_r) \log_{10} \right) + \frac{c_c c_d}{25.63 c_d} \left( \frac{0.75 - 1.132}{0.75 - (c_d/2)^{0.25}} \right)
\]
Pavement Type Selection

• Pavement Evaluation

• Pavement Type Selection Process
  – LCCA: Life-Cycle Cost Analysis
  – Decision Matrix
Pavement Evaluation - Existing Roadways

• Gather Historical Information
  – Existing Type of Pavement
• Review Concept for the Project
• Gather Existing Condition of Pavement
Life-Cycle Cost Analysis

- Possible Typical Section Alternates
  - Rehabilitation, Reconstruction, or New Construction
- Typical Sections Developed Using Design Process
- Typical Sections Compared Using LCCA
Life-Cycle Cost Analysis

• Economic Analysis over Time
  – Initial Cost
  – Maintenance Timing and Cost
  – Salvage Value
  – User Cost
  – Analysis Period
  – NPV – Net Present Value
LCCA – 40 year analysis period

- **Initial Construction**
- **Maintenance**
- **Salvage**

- Asphalt
- Concrete
LCCA

Compare Net Present Value (NPV) of alternates

Results used in Pavement Type Selection Process
Pavement Type Selection

• Additional Factors
  • Ease of Repairing/Maintaining
  • Constructability
  • Construction Time
  • Expected Life
  • Other

• Decision Matrix
  • Weighting Factors
## Decision Matrix

<table>
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<tr>
<th>Weight</th>
<th>Decision Factor 1</th>
<th>Decision Factor 2</th>
<th>Decision Factor 3</th>
<th>Decision Factor 4</th>
<th>TOTAL SCORE</th>
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<tbody>
<tr>
<td>Alt 1</td>
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<td>Alt 3</td>
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<td>Alt 4</td>
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### Decision Matrix

<table>
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<tr>
<th>Weight</th>
<th>Initial Cost</th>
<th>Maint Cost</th>
<th>Annual Cost</th>
<th>Other Factors</th>
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<tr>
<td>Alt 1</td>
<td>60 30</td>
<td>50 12.5</td>
<td>80 8</td>
<td>50 7.5</td>
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<td>100 25</td>
<td>50 5</td>
<td>90 13.5</td>
<td>58.50</td>
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</tbody>
</table>
Decision Analysis

• Weighting Factors
  – Relative (weighted) importance of factors considered in selection process
  – Sum of all weighting factors must equal 100

• Typical Section recommended based on final score
Future

Pavement Design

Today

Alternate Pavement Bidding

Group Meets monthly

Publish Process

Let AB Project

Nov 2011

Implement MEPDG
Research Underway

• MEPDG (DARWin-ME) – Related Research
  • CTE Determination
  • Traffic Load Spectra
  • Calibration and Validation for Georgia - Pending
Alternate Pavement-Type Bidding

• Pavement Type Selection Guide
  – National Guide in Development
  – Includes Chapter on Alternate Pavement-Type Bidding
## Alternate Pavement Type Bidding

<table>
<thead>
<tr>
<th>Alabama</th>
<th>Kentucky</th>
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<tr>
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GDOT Alternate Bidding

• Will consider projects when Decision Matrix scores are close
• Will consider projects that can be let without any type of A + B factors

• Bidding to be similar to current alternate base and alternate shoulder type bidding, i.e. only one alternate can be bid
Type of Potential Projects

• Reconstruction
• New Construction

• Not
  • Pavement Preservation
  • Widening that does not require reconstruction
Next Steps

1. Convene Small Group for Follow-up
   • Association representatives (1-2)
   • Input to Design Policy Manual Chapter 10.3 – Pavement Type Selection
   • Review of Specifications

2. Publish as GDOT Policies/Procedures

3. Place Alternative Bid in Let project
Timeline

Industry Meeting
Today

Goal: Sept 2011

Group Meets monthly

Publish Chapter 10.3

Let Project

Nov 2011

1st project:
West Cleveland Bypass – Phase I
Comments or questions can also be sent to:

altpavbid@dot.ga.gov