ERS
Route 5 Chickahominy Bridge

March 4, 2009
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Principal Research Scientist

A partnership of the Virginia Department of Transportation and the University of Virginia since 1948
Outline

- ERS
- Pilot Projects
- Chickahominy Bridge
  - Trial batches
  - Control charts
ERS - Goals

- To have long lasting concrete structures
- Provide innovation
- Ensure consistent uniform concrete
- Pay based on the quality of concrete
ERS

Includes

• Prequalification
  QC Plan by the Contractor applicable to preconstruction and during construction
• Mix design approval
• Acceptance
## Differences in Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Current</th>
<th>ERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mix Design</td>
<td>Prescriptive</td>
<td>Performance Measures</td>
</tr>
<tr>
<td>Testing</td>
<td>VDOT</td>
<td>Contractor and VDOT</td>
</tr>
<tr>
<td>Basis of Pay</td>
<td>Minimum</td>
<td>PWL</td>
</tr>
</tbody>
</table>
First Phase Pilot Projects

Salem:
Route 11 over the New River and Norfolk Southern Railroad tracks near Radford University

Culpeper:
Route 28 near Manassas
Salem
# Salem Mix Proportions

<table>
<thead>
<tr>
<th>Material</th>
<th>Amount (lb/yd³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement Type I/II</td>
<td>318</td>
</tr>
<tr>
<td>Fly ash Class F</td>
<td>159</td>
</tr>
<tr>
<td>Slag</td>
<td>159</td>
</tr>
<tr>
<td>Fine aggregate</td>
<td>1101</td>
</tr>
<tr>
<td>Coarse aggregate</td>
<td>1755</td>
</tr>
<tr>
<td>w/cm</td>
<td>0.45</td>
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</tbody>
</table>
# Salem Strength and Permeability

<table>
<thead>
<tr>
<th></th>
<th>Average (psi)</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>5016</td>
<td>305</td>
</tr>
<tr>
<td>Permeability</td>
<td>391</td>
<td>72</td>
</tr>
</tbody>
</table>

\[ N=31 \]
Culpeper

03/04/2009
Second Phase Pilot Projects

- Structures in different districts
- Route 624
- Route 95
- Chincoteague Bridge
- Route 5 Chickahominy bridge
Route 624 over Cat Point Creek

In the same mixture

- Crushed stone and gravel.
- Water reducer and retarding admixture
Route 95 Widening Project

Curing Box with continuous recording

From: 22 August 2008 10:30:00    To: 23 August 2008 11:16:20
Chincoteague Bridge Bascule Footing
Chincoteague Bridge

• In A3 Mass Concrete minimum cementitious material content is 588 lb/yd³
• In this project used 539 lb/cy³ of cementitious material content with 30% Class F fly ash
Rte 5 over Chickahominy
Rte 5 over Chickahominy

Quality coarse aggregate did not meet #57
Combined Aggregate Gradation: #57+#78+Sand
Rte 5 over Chickahominy

Three trial batches with different cementitious material and w/cm
Rte 5 over Chickahominy

Three trial batches with different cementitious material and w/cm

Coarse aggregate does not meet #57; however, combined aggregate is considered.
Control Charts
Fresh Concrete

- Slump Results
- Air Content
- Unit Weight
- Temperature
Control Charts
Hardened Concrete

1. Compressive Strength (Avg)
2. Compressive Strength Moving Average (psi)
3. Coulombs (Avg)
4. Coulombs Moving Average
THANK YOU

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