Program History

Initial PRF Costs

FHWA: $1,396,125
LA DOTD: $935,375
$2,334,500

- Experiment No. 1 – February 1996
- Experiment No. 2 – March 1999
- Experiment No. 3 – March 2001
- Experiment No. 4 – August 2004
# Experiment 1
## Comparison of Louisiana’s Conventional and Alternative Base Courses

<table>
<thead>
<tr>
<th>Lane 1 (control)</th>
<th>Lane 2</th>
<th>Lane 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5” Asphalt</td>
<td>5.5” Stone</td>
<td>4.0” Stone</td>
</tr>
<tr>
<td>8.5” stone</td>
<td>Geogrid reinforcement</td>
<td>6.0” Stone Stabilize Soil</td>
</tr>
<tr>
<td>fabric</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lane 4</th>
<th>Lane 5</th>
<th>Lane 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5” Asphalt</td>
<td>8.5” Cement Stabilized (300 psi plant mix)</td>
<td>8.5” Cement Treated (plant mix w/fibers)</td>
</tr>
<tr>
<td>8.5” Cement Stabilized (300 psi in-place mix)</td>
<td>8.5” Cement Treated (150 psi plant mixed)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lane 7 (control)</th>
<th>Lane 8</th>
<th>Lane 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5” Asphalt</td>
<td>4.0” Stone</td>
<td>12.0” Cement Treated (plant mix)</td>
</tr>
<tr>
<td>8.5” Cement Stabilized (300 psi in-place mix)</td>
<td>6.0” Cement Stabilized</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions:

• Thicker CTB out performed thinner CSB

• Stone interlayer base out performed stone base

• No difference:
  • plant mix and in-place mix bases
  • with the addition of fibers in CTB
  • stone stabilized soil base and stone base

• Geogrid reinforcement inconclusive
Experiment 1
Comparison of Louisiana’s Conventional and Alternative Base Courses

ALF Results (normalized to 0.75” rut)
Life Cycle Cost Analysis
High Volume Road

Initial Construction
$257,521/ln mi

Rehab Base
& Replace 9” AC
$208,241

Annualized cost = $16,078/ln mi/yr

Mill (2”) & Overlay (3.5”)
$66,965/ln mi

Annualized cost = $26,935/ln mi/yr

2:1 EASL advantage

Stone Interlayer Base
4” stone/8.5” cement stabilized base (30 yr design life)

12” Stone Base (15 yr design life)

40 % savings
Life Cycle Cost Analysis
Low Volume Road

Initial Construction
$85,902/ln mi

Reconstruct Base & Pavement
$85,902

Reconstruct Base & Pavement
$85,902

Annualized cost = $8,982/ln mi/yr

3:1 EASL advantage
12” Cement Treated Base
(30 yr design life)

8.5” Cement Stabilized Base
(10 yr design life)

Annualized cost = $14,947/ln mi/yr

40% savings
Cement Treated Bases
- 2001: 41% of total quantity bid
- 2002: 68% of total quantity bid
- 2003: 95% of total quantity bid

Stone Interlayer
- LA10/La77
- Lake Fause Point Road
- LA 28 plan change
- LA15 plan change
- More projects scheduled for bid
DOTD Impact : 2001 - 2003

- **Implementation**:
  - Cement treated bases (low volume roads)
    - Lane miles constructed
      - 2001 : 211 lane miles
      - 2002 : 172 lane miles
      - 2003 : 269 lane miles
    - Life cycle savings
      - 2001 : $1,258,600
      - 2002 : $2,284,600
      - 2003 : $3,889,180
      - $7,432,380

- **Implementation**:
  - Stone Interlayer bases (high volume roads)
    - Lane miles constructed
      - 1998 : 11 lane miles
      - 2003 : 35 lane miles
    - Life cycle savings
      - 2001 : $119,600
      - 2002 : $119,600
      - 2003 : $500,300
      - $739,500
## Research Cost / Benefit

### PRF operational costs
- 2000/2001: $314,300
- 2001/2002: $376,500

Total: $1,061,229

### Research costs (Exp. 3)
- 2000/2001: $98,220
- 2002/2003: $56,100

Total: $292,790

### Construction costs (Exp. 3)
- 2001: $198,190

### Total PRF costs
- (three year program)
- $1,552,209

### Total DOTD impact
- (three year implementation)
- $8,171,880

### Three year cost benefit
- 5.3 : 1
Performance of Stone Interlayer Pavements

Through accelerated pavement testing, LTRC finds an effective way to reduce reflection cracking in flexible pavements

By: Masood Rasoulian, P.E.
LTRC Senior Pavement Research Engineer
Experiment 2: Comparative Performance of Conventional and Rubberized Hot Mix Asphalt

<table>
<thead>
<tr>
<th>Lane 1</th>
<th>Lane 2</th>
<th>Lane 3 (control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5”</td>
<td>PRM Wearing Course</td>
<td>PAC 40 Wearing Course</td>
</tr>
<tr>
<td>2.0”</td>
<td>PAC 40 Binder Course</td>
<td></td>
</tr>
<tr>
<td>3.5”</td>
<td>AC 30 Base</td>
<td>PRM Base</td>
</tr>
<tr>
<td>8.5”</td>
<td>Stone Base</td>
<td></td>
</tr>
<tr>
<td>10”</td>
<td>Soil Cement Working Table</td>
<td></td>
</tr>
</tbody>
</table>

PRM: Powdered Rubber Modified
Life Cycle Cost Analysis
Low Volume Road

Modified Asphalt Base
(40 yr design life)

AC 30 Asphalt Base
(30 yr design life)

2:1 EASL advantage

Initial Construction
$236,401/ln mi

Mill 2’’ & Overlay 3.5’’
$66,965

Annualized cost = $18,702 / ln mi / yr

13 % savings

Initial Construction
$230,936/ln mi

Mill & Overlay
$66,965

Annualized cost = $21,409 / ln mi / yr

Mill 2’’ w/ Structural Overlay 7’’
$126,046
Experiment 3 (on-going)
Evaluation of Stone and Recycled Asphalt Pavement (RAP) Interlayers

Lane 1
Lane 2
Lane 3 (control)

<table>
<thead>
<tr>
<th>3.5” Asphalt</th>
<th>3.5” RAP</th>
<th>3.5” stone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement Treated</td>
<td>Cement Stabilized</td>
<td></td>
</tr>
</tbody>
</table>

- 3.5” Asphalt
- 3.5” RAP
- 3.5” Stone
- Cement Treated
- Cement Stabilized
Life Cycle Cost Analysis

RAP Interlayer

No EASL advantage

4” RAP over 8.5” Cement Stabilized Base (30 yr design life)

Initial Construction $189,092/ln mi
Mill & Overlay minor patching $66,965/ln mi
Annualized cost = $14,808/ln mi/yr

10 % savings

4” Stone over 8.5” Cement Stabilized Base (30 yr design life)

Initial Construction $211,057/ln mi
Mill & Overlay minor patching $66,965/ln mi
Annualized cost = $16,078/ln mi/yr
# Experiment 4 (under construction)

**Accelerated Loading Evaluation of a Subbase Layer, Blended Calcium Sulfate Base, and Foamed Asphalt Recycled Base**

<table>
<thead>
<tr>
<th>Lane 1A</th>
<th>Lane 2A</th>
<th>Lane 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5” Asphalt</td>
<td>8.5” BCS</td>
<td>8.5” Foamed RAP/Recycled Soil Cement Mix</td>
</tr>
<tr>
<td>8.5” Slag-Stabilized BCS</td>
<td>8.5” Foamed RAP/Recycled Soil Cement Mix</td>
<td>12” Cement treated subbase</td>
</tr>
<tr>
<td>12” Lime treated subgrade</td>
<td>12” Lime treated subgrade</td>
<td>12” Cement treated subbase</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lane 1B</th>
<th>Lane 2B</th>
<th>Lane 3B</th>
</tr>
</thead>
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<tr>
<td>3.5” Asphalt</td>
<td>8.5” Stone</td>
<td>8.5” Foamed RAP</td>
</tr>
<tr>
<td>8.5” Stone</td>
<td>8.5” Foamed RAP</td>
<td>12” Cement treated subbase</td>
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<tr>
<td>12” Lime treated subgrade</td>
<td>12” Cement treated subbase</td>
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Experiment 4 (under construction)
Accelerated Loading Evaluation of a Subbase Layer, Blended Calcium Sulfate Base, and Foamed Asphalt Recycled Base

- ALF construction tied to LA DOTD construction project
- Two experimental sections per lane
- Multiple unrelated experiments using alternate control lanes
- Results tied to field evaluations
- Numerical analysis based on lab program to expand factorial
Questions?