## Program History

### Initial PRF Costs

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHWA</td>
<td>$1,396,125</td>
</tr>
<tr>
<td>LA DOTD</td>
<td>$935,375</td>
</tr>
</tbody>
</table>

$$\text{Total: } 2,334,500$$

- Experiment No. 1 – February 1996
- Experiment No. 2 – March 1999
- Experiment No. 3 – March 2000
- Experiment No. 4 – August 2004
## Experiment 1
Comparison of Louisiana’s Conventional and Alternative Base Courses

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 8.5” stone / fabric separator</td>
<td>Best base: Stone Interlayer Base 4”stone/6” soil cement 10% in-place mix</td>
</tr>
<tr>
<td>2. 5.5” stone / geogrid reinforcement</td>
<td>2nd best base: Cement Treated Base 12” soil cement 4% plant mix</td>
</tr>
<tr>
<td>3. 4” stone / 6” stone stabilized soil</td>
<td></td>
</tr>
<tr>
<td>4. 8.5” cement stabilized soil – plant mix</td>
<td></td>
</tr>
<tr>
<td>5. 8.5” cement treated soil – plant mix</td>
<td></td>
</tr>
<tr>
<td>6. 8.5” cement treated soil – plant mix w/ fibers</td>
<td></td>
</tr>
<tr>
<td>7. 8.5” cement stabilized soil – in-place mix</td>
<td></td>
</tr>
<tr>
<td>8. 4”stone / 6” cement stabilized - in-place mix</td>
<td></td>
</tr>
<tr>
<td>9. 12” cement treated soil – plant mix</td>
<td></td>
</tr>
</tbody>
</table>

### Life Cycle Cost Benefit (30 yr design life)

- **Low Volume Road**
  - 12” Cement Treated - $8,982/lm/yr
  - 8.5” Cement Stabilized - $14,947/lm/yr
  - **40% reduced annual cost**

- **High Volume Road**
  - Stone Interlayer – $16,078/lm/yr
  - Stone - $26,935/lm/yr
  - **40% reduced annual cost**

### Implementation

- **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 (Bid May 98)
  - Lake Fause Point Road (Bid June 03)
  - I-10 (Bid March 04)
  - LA 37 (Bid Sept 05)
# Experiment 2: Comparative Performance of Conventional and Rubberized Hot Mix Asphalt

## Experiment

<table>
<thead>
<tr>
<th>Typical Section (All Lanes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5” Asphalt wearing course</td>
</tr>
<tr>
<td>2.0” Asphalt binder course</td>
</tr>
<tr>
<td>3.5” Asphalt base course</td>
</tr>
<tr>
<td>8.5” stone</td>
</tr>
<tr>
<td>10” soil cement</td>
</tr>
<tr>
<td>Lane 1 – Rubberized wearing course</td>
</tr>
<tr>
<td>Lane 2 – Rubberized base course</td>
</tr>
<tr>
<td>Lane 3 - Conventional asphalt mix</td>
</tr>
</tbody>
</table>

## Results

- AR-HMA in the base course showed lowest rutting susceptibility compared to Type 5A Base course
- AR-HMA in the WC presented similar performance when compared to Type 8F WC mix

## Life Cycle Cost Benefit

<table>
<thead>
<tr>
<th>(40 yr design life)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Asphalt Base Course</td>
</tr>
<tr>
<td>$21,409/lm/yr</td>
</tr>
<tr>
<td>Modified Asphalt Base Course (Rubber or Polymer)</td>
</tr>
<tr>
<td>$18,702/lm/yr</td>
</tr>
</tbody>
</table>

## Implementation

Recommendation: Modify Asphalt base course specifications to require polymer modified asphalt or rubberized asphalt.

## Decision

13% reduced annual cost
Experiment 3 (on-going)
Evaluation of Stone and Recycled Asphalt Pavement (RAP) Interlayers

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Preliminary Results (12/03)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane 1: 3.5” RAP / 10” cement treated soil</td>
<td>Average rut after 1,227,000 EASLs</td>
</tr>
<tr>
<td>Lane 2: 3.5” RAP / 6” cement stabilized soil</td>
<td>Lane 1 – 0.15 in</td>
</tr>
<tr>
<td>Lane 3: 3.5” stone / 6” cement stabilized soil</td>
<td>Lane 2 – 0.38 in</td>
</tr>
<tr>
<td></td>
<td>Lane 3 – 0.45 in</td>
</tr>
<tr>
<td></td>
<td>• Similar performance in RAP &amp; stone layers</td>
</tr>
<tr>
<td></td>
<td>• Better performance confirmed on thicker cement treated base layer</td>
</tr>
</tbody>
</table>

**Life Cycle Cost Benefit (Projected)**
*(30 yr Design Life)*

- Stone Interlayer - $16,078/lm/yr
- RAP Interlayer - $14,808/lm/yr

10 % reduction in annual cost

**Implementation**

- LA 347/103 Pilot project (St. Landry Parish)
  High cement content required for base course (13% for 150 psi)

**Decision**
# Experiment 4 (under construction)

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

### Experiment

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A: 8.5” BCS base / 12” lime treated subgrade</td>
<td>• Evaluate the effect a stronger more durable subbase has on pavement performance</td>
</tr>
<tr>
<td>2A: 8.5” BCS base / 12” cement treated subbase</td>
<td>• Investigate the potential of recycled foamed asphalt material as an alternative to stone bases</td>
</tr>
<tr>
<td>3A: 8.5” Foamed recycled soil cement - RAP mix / 12” cement treated subbase</td>
<td>• Evaluate the performance of Blended Calcium Sulfate Bases</td>
</tr>
<tr>
<td>1B: 8.5” Stone base / 12” lime treated subgrade</td>
<td></td>
</tr>
<tr>
<td>2B: 8.5” Stone base / 12” cement treated subbase</td>
<td></td>
</tr>
<tr>
<td>3B: 8.5” Foamed RAP / 12” cement treated subbase</td>
<td></td>
</tr>
</tbody>
</table>

## Innovations

- 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

## Projected Timeline

- April 03 Research proposal approved
- April 03 Construction bids taken
- May 04 Lane Construction*
- July 04 Begin Loading
- July 05 Complete Experiment

* DOTD lead project delayed

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**Informational**
DOTD Impact: 2001 - 2003

- **Cement treated implementation** (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

- **Stone Interlayer Implementation** (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
Development of a Laboratory Testing Facility for Evaluation of Base-Soil Behavior Under Repeated Loading (Proposed)

**Objectives**

- Develop an indoor pavement loading facility capable of simulating pavement structure, subgrade, and environmental conditions.
- Validate indoor facility to ALF
- Investigate geosynthetic reinforcement benefits on pavement performance.

**Equipment Options**

- Load actuator
- Geogrid
- Load cell
- Rollers
- LVDT
- Strain gage
- Steel beam
- Damper
- 1-ft dia. plate
- 5 ft distance from load center
- 6 ft distance from load center
- V. pressure cell
- Interface pressure cell

**Advantages**

- Lower cost for each experiment
- Can vary subgrade soil type
- Can vary subgrade condition
- Experiments can be constructed with in-house staff
- Faster turn around time
- Preliminary test to ALF

**Disadvantages**

- Scale effect
- Wheel wander effects
- Requires validation with ALF
- Requires commitment of indoor space
- High initial costs

**Proposed First Experiment**

- Repeat of ALF Exp. 1 - lane 003-A
- Effects of geosynthetic reinforcements vs. chemically treated subgrade soils.

**Informational**