FDR in Utah

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Outline

- History
  - Success
  - Failures

- Present Times
  - FDR Program
  - Specification
  - Selecting Projects
Recycling History

- 3 or 4 FDR projects (depending on definition)
  - SR 21: 23 Years ago
- 2% Portland Cement Slurry
  - Recipe/Expected 250 psi @ 7 days
- CIPR for 20+
- Several HIPR projects
Successful History
Parley’s Canyon

- Flagship Project?
- Canyon Climb – 3000’ in 10 miles
- 2 degree curves
- I-80, Connecting Salt Lake City and Park City
Parley’s Canyon
Parley’s Canyon
Parley’s Canyon
Pavement Condition

- Much of Superelevation either gone or in reverse
- Significant structural failures in truck lanes
- Lots of asphalt surfacing
- Minimal base, in poor condition
Design Parameters

- 20 year design period
- Replace Asphalt Surface
  - (Marshall to SuperPave)
  - PG 70-28
- Design Traffic
  - 50,000 AADT
  - 8+% Trucks (slow moving)
Solution
(from notes and memory)

- Profile Milling (wire guide)
- 8” (+1”) of 2% Portland Cement treated material (varied from 0% to 100%) existing base, rest was existing HMA
- Capped with 7” of SuperPave
- 1” OGSC
Project Notes

- Cement Treated Layer done in two steps
  - Original pulverization and grading
  - Addition of Portland Cement and compaction
- Had 30 minutes to get treated materials to grade
  - Original pulverization had to be within 1” of final grade before adding cement
- 1” fluff in materials after final compaction
Concept Comments

- Happened because of Industry involvement
- Was cost effective
  - $500k out of $8M
- Had little trouble, even with grades and super-elevations.
Not so Successful History
I-80 HIPR

- I-80 MP 20 to 30
- 2" HIPR in 1992
- Microsurfacing over the top in 1993
- HIPR layer stripped severely, leading to significant ruts
SR-36, North of Tooele

- 8 mile stretch of 5 lane arterial
- New construction on A-6/A-7 materials
- Intent, with encouragement from industry, was to treat the existing subgrade and base and pave over
- NO SUBCONTRACTORS BID ON PROJECT
- $1,000,000 change order for fabric and base
Why did we stop?

- Normal cautiousness
- Constant change in Pavement Design Engineers
  - Learning curve
- No real Industry push
- Base aggregates were cheap
Present Times
UDOT FDR Program

- Costs for materials increasing
- Trend towards recycling
- Good success on CIPR projects
- Industry involvement (SEM Materials)
Recent Projects
(not ours)

- Two LG Projects in St. George
  - 8” of FDR plus 2” HMA cap
- Monticello Airport (wet grade)
Design Process/Thoughts

- Little or no base present
- Varying depths and layer of surfacing
- Typical savings in the areas of $500k in $3 to $5 M (10+\%)
- Intended to last the life of the road
  - Could be perpetual
- \( a_i = 0.16 \) to 0.28
  - \( M_r = 120 \) ksi to 150 ksi
Specification

General Outline:

- Pulverize the existing in-place material
- Moisture condition pulverized material
- Mix with emulsion
- Place to line, grade and compact
Specification

Acceptance Criteria:

- Gradation (2” minus on pulverized material)
- Quality of emulsion
- Compaction (97% of daily curve)
- No mix verification yet
  - Working on Resilient Modulus Testing
  - SEM’s business based on success
## Specification

### Mix Design:
- Performed by Contractor/Supplier

<table>
<thead>
<tr>
<th>Test</th>
<th>Coarse</th>
<th>Fine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term strength test, 1 hour</td>
<td>80 min.</td>
<td>75 min.</td>
</tr>
<tr>
<td>Indirect tensile strength (ITS)</td>
<td>40 min.</td>
<td>35 min.</td>
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<tr>
<td>Conditioned ITS</td>
<td>25 min.</td>
<td>20 min.</td>
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<tr>
<td>Resilient modulus</td>
<td>150 min.</td>
<td>120 min.</td>
</tr>
<tr>
<td>Thermal cracking (IDT)</td>
<td></td>
<td>See note in appendix</td>
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</tbody>
</table>
Specification

Contractor QC:
- Pre-Construction Meeting
- Moisture Content of Pulverized Material
- Emulsion Content
- Depth Control
- Contour and Profile
- Moisture Content before Surfacing
This Summer and Next

- Two Projects in R4
  - SR 491: 8” FDR + HMA/SMA
  - SR 10: 12” FDR + HMA/SMA

- Four Projects in R2
  - SR 68, SR 171, SR 48, SR 71
  - All are 6” FDR + HMA/OGSC
Selecting Projects

(Still working out this one)

- Varying or multiple layers of HMA
- Low priority for Rehabilitation funding
- Minimal existing base
- Profile can be raised
- Distance from good materials sources
- Comparable to a remove and replace with 8” to 16” of new base course
Dangling Participles

- Solventless Emulsion perceived as Proprietary
- Need verification of strength and durability
  - BYU Research Project
- Concerns about permeability
- Need to get to Resilient Modulus Testing
- Varying Depths of application
- Contractor’s business is based on a successful project
Summary

- FDR has a foothold in Utah
  - Reduces cost
  - Recycles materials
  - Speeds up construction

- A few things to work on
  - Validation of design criteria
  - Get past some bad tastes

- Industry involvement was a key!!
Questions?