COLD-IN-PLACE RECYCLING

A Cost Effective Pavement Preservation Treatment

Kit Black, P.E.    October 15, 2013
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2. Equipment & Construction Process
3. Project Selection Criteria
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CIR Definition

- COLD-IN-PLACE RECYCLING – Recycling of asphalt pavement without the application of heat to produce a rehabilitated pavement. Rap is mixed with an additive(s) to produce a reprocessed material used as an asphalt pavement layer.
Typical CIR Construction Process

- **Rolling Pattern**
  - Establish rolling pattern to maximize compaction
  - Steel wheel: vibratory and static
  - Pneumatic: use as break down, intermediate, or finish roller

- **Same day release to traffic**

- **Fog seal**
  - Used as extra insurance against surface raveling
Project Selection Criteria

Cold-In-Place Recycling          2013 Transportation Short Course

Time, years (exact values vary depending on traffic, materials, etc.)
Project Selection Criteria

- Adequate asphalt surface thickness – 3” to 6”

- Base & Subgrade layers in good condition
  - No (or only isolated) full-depth failures – repair these areas prior to CIR

- Material properties of existing asphalt surface layer
  - Asphalt Content
  - Aggregate gradation
  - Aggregate shape
Project Evaluation

- Visual assessment of the pavement condition
- Pavement testing
  - Falling Weight Deflectometer (FWD)
  - Roadway cores
  - Dynamic Cone Penetrometer (DCP)
  - Trenching
- Lab evaluation of asphalt materials
- Mix design
  - Optimize additive(s) type and amount
    - Emulsion
    - Aggregate
    - Lime
    - Fly Ash
Amarillo District CIR Experience

- US 83 Ochiltree County – 2010
- US 83 Hemphill County - 2013
US 83 Ochiltree County

- US 83 – From Oklahoma to 6.1 miles South
- Constructed – Fall 2010
- ADT – 2,700 VPD (in the rural section)
- 36% Trucks
- ESALs – 4,300,000 (20 yr period)
- Contractor – Hall Bros. Recycling & Road Science
Existing Roadway Typical Section
Proposed Roadway Typical Section

42' D-GR HMA PG 70-28
(1.5") (165 LBS/SF)

27' 1-CST

26' Cold In-Place Recycle (5" Depth)
Emulsion (CSS-1H)
AGGR (TY-D GR-2 SAC-B)

9'
Shoulder

12'
Lane

12'
Lane

9'
Shoulder
- Base repairs made prior to CIR process
After 3 Years of Service
US 83 Hemphill County

- US 83 – From Lipscomb Co line to 6.1 miles South
- Constructed – Fall 2013
- ADT – 2,000 VPD
- 33% Trucks
- ESALs – 2,500,000 (20 yr period)
- Contractor – Koss Construction & Colas Solutions
Existing Pavement Section

- **4” ACP** (multiple thin lifts)
- **8” Flex Base**
- **12” Salvage Flex Base**
- **Low PI Subgrade**
Proposed Roadway Typical Section

- 40' D-GR HMA PG70-28 (1.5") (165 LB/SLY)
- 28' 1-CST ASPH (CRS-2), AGGR TY B GR4
- 26' COLD IN PLACE RECYCLE (4' DEPTH)
### Additives

- 1.5% Lime Slurry
- 2.5% Engineered Emulsion
- 10% GR-2 Aggregate
US 83 Hemphill County

GR-2 Aggregate
(¾” max size)
US 83 Hemphill County

Cold-In-Place Recycling          2013 Transportation Short Course
CIR After Two Nights of Traffic
(before fog seal)

CIR After Fog Seal
## US 83 Hemphill County – Production Testing

<table>
<thead>
<tr>
<th></th>
<th>Density, %</th>
<th>Hamburg (# passes @ 0.5 in rut)</th>
<th>Tensile Strength, psi</th>
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<tr>
<td>SS 3254</td>
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<td>5K – 15K</td>
<td>40</td>
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<tr>
<td>Project Minimum</td>
<td>90.2</td>
<td>2,250</td>
<td>41.1</td>
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<tr>
<td>Project Maximum</td>
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<td>20,000+</td>
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<td>Project Average</td>
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<td>17K – 18K</td>
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<td>(14 Project Tests)</td>
<td></td>
<td>6 tests &gt; 20K</td>
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</table>

### TxDOT Special Specification 3254
- 14 Project Production Tests – 1 per day of production
Potential Cost Savings

- Prices and materials vary by region
- Difficult to compare ‘Apples to Apples’
- Typically compare CIR to Mill & Fill or HMA Overlay
- Past experience shows 30% - 50% cost savings
COLD-IN-PLACE RECYCLING

A cost effective Pavement Preservation Tool for the ‘Toolbox’
QUESTIONS

COLD-IN-PLACE RECYCLING

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Kit Black, P.E.
TxDOT – Amarillo District
kit.black@txdot.gov