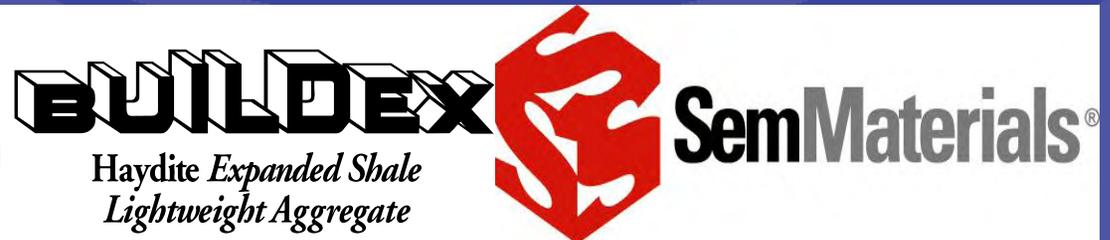


Innovation Panel #3:

Cold in-Place Recycling

MoDOT Northwest
District

MoDOT



Background

- District One: Gentry County, Route E&H
- Provide a cost effective treatment to a low volume cold mix route
 - Smoother Pavement
 - Re-established cross slope
 - Improved Drainage

CIR Process Advantages

- Environmentally friendly by recycling the pavement
- Prep costs are reduced for Maintenance
- Eliminates trucking costs by using material on site

CIR Process Disadvantages

- CIR does not add additional pavement structure
- Roadway sub-grade may not withstand heavy equipment and traffic during construction
- CIR must include a surface treatment

Gentry County, Rte E and H

- Partnership between MoDOT and SemMaterials
- SemMaterials provided the CIR process and material for the chip seal
- MoDOT provided traffic control and performed chip seal
- Project Length 20.26 miles
- Project cost: \$37,700 per centerline mile plus MoDOT Labor
- Experimented with both 3" and 2" depth CIR

Existing Conditions







CIR Operation







Completed Surface

09/23/2008





Tyler Francis, Technical Marketing

Kevin Hardee, Field Engineering



Site Investigation

- Coring the roadway
 - Investigate the x-section of the road
 - Depth of pavement
 - Pavement history
 - Suitable candidate for CIR?
 - Material for an engineered mix design

Engineered System

◆ Defined Sampling Procedure



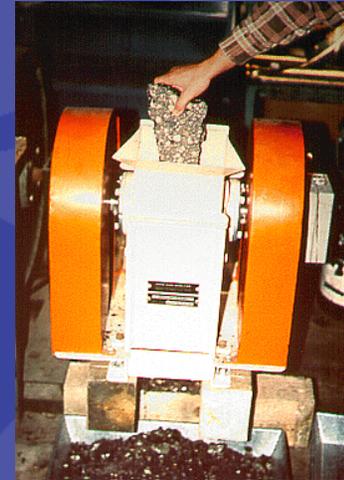
Engineered Mix Design

- Formulation of Emulsion around performance related testing
 - Raveling Test
 - Rutting Test – Marshall Stability
 - Moisture Susceptibility – Retained Stability
 - Cold weather cracking temperature - IDT

Engineered System

◆ Mix design

- RAP crushed to defined gradations
- Emulsion formulated
- Superpave Gyratory Compactor (SGC) mixes at field moisture content



◆ Performance-related tests



Performance-Related Specifications

Property	Criteria	Purpose
Compaction effort , Superpave Gyrotory Compactor	1.25° angle, 600 kPa stress, 30 gyrations Report	Density indicator
Density , ASTM D 2726 or equivalent	Report	Compaction indicator
Retained stability based on long-term stability	70% min.	Resistance to moisture damage
Marshall stability , ASTM D 1559 Part 5, 40° C	1,250 lb min.	Stability indicator
Raveling test , new procedure	2% max.	Resistance to raveling
Indirect tensile test , AASHTO T322, Modified	LTPPBind temperature for climate & depth	Resistance to cracking

Also: Mix Design, Construction Equipment, Construction Methods, Max Top Size, QC & QA

Density Compaction Effort Superpave Gyrotory Compactor

Lab



Field



Field Engineering

- Emulsion content adjustment
 - Field sample sieve analysis gradation compared to mix design gradations
- Quality Control
 - Perform rutting and moisture susceptibility testing daily

How OR became involved

- Coordinated with District from start of project
- Found other state DOT experiences with CIR & shared with district
- Attended field placement
- Developed a 5 year field review plan

How OR became involved

- Developed an Advancements publication
 - Posted on MoDOT website
- Plan to place CIR on minor routes with economic stimulus funds

The background is a solid blue color. In the upper half, the word "MODDOT" is written in a large, bold, blue, sans-serif font, with the letters slightly overlapping. Below the text, there are several abstract, curved blue shapes that resemble stylized waves or a series of overlapping arcs. The overall design is clean and modern.

Questions?