COLD IN-PLACE RECYCLING OF ASPHALT PAVEMENTS

2017 High Value Research Projects
Utah Department of Transportation
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UDOT has used CIR for many years for asphalt pavement rehabilitation.

Solvent-less emulsions are used to revive the asphalt millings for new base.

Typically add 2-inch overlay of HMA or SMA.

Experienced some early failures of CIR projects when opened to traffic.

Research conducted for $200,000 over 5 years.
Objective: Improve the construction process and specification for better performance of CIR asphaltic base with solventless emulsion

- Developed field and lab testing protocol for CIR mix
- Evaluated field mixes during the initial curing stages after compaction
- Refined and evaluated field testing procedures
- Developed a draft mix design process
Studied how a successful CIR mix with solvent-less emulsion behaves

Explored the factors contributing to successful field performance

Cored 6 CIR projects done over the last 8 years

Tested cores for density, stability, and fracture energy

Compared core test results to a Performance Index designed to normalize age, overlay condition, and CIR condition
Poor-performing CIR projects exhibited similar stability to high-performing CIR projects

Poor performers exhibited low density and low fracture energy compared to the good performers

New approach was developed for the mix design and parameters that result in good CIR pavement performance

Engineered emulsion CIR material was found to behave more like an unbound material during construction
CIR specification was completely reworked

Developed a CIR mat density target based on field mix 30-gyration pucks in the SGC

Used rolling patterns to set up the best compaction effort for mat density

Owner is now more knowledgeable and less dependent on contractor’s exclusive experience.
Implementation

- Performance tests were added from the CIR research to indicate if the mat is ready to open to traffic
  - Shear Vane: 35 inch-lb. max. torque
  - Marshall Hammer: 50 blows, 10 mm max. indentation
Implemented 4 projects successfully in 2016 with the new CIR specification, about 30 total centerline miles.

- Resulting cost savings with the CIR process are up to 30 percent, or $1,870,000, on these 4 projects when compared with typical reconstruction using hot-mix asphalt.

- Expecting great long-term performance and will keep watching.
References

- UDOT Special Provision, Section 02968S, In-Place Recycled Asphaltic Base with Solventless Emulsion, January 2017
- UDOT Champion, Howard Anderson, Materials Division
- Consultant, Kevin VanFrank, CME Transportation Group