



**Research
Development
and Technology
Division**

Missouri
Department
of Transportation

1617 Missouri Blvd.
P.O. Box 270
Jefferson City,
Missouri 65101

Analysis of PCC Pavement Rehabilitation in Missouri

Project Description:

Missouri has been an active participant in the national Long Term Pavement Performance (LTPP) program since 1990. Existing and specially built pavements around Missouri were designated as LTPP sections. Performance data has been collected annually on these sections. Some of the sections were originally Portland cement concrete (PCC) pavements that underwent different forms of rehabilitation. A point in time had been reached at which it was believed an adequate amount of information was available to develop rudimentary performance conclusions.

Analysis of these rehabilitated PCC pavements was performed under contract in 2000 by ERES Consultants, a Division of Applied Research Associates, Inc. Four Specific Pavement Study (SPS) sites, consisting of multiple test sections built specifically for the LTPP program, and five General Pavement Study (GPS) sites, consisting of single existing test sections, were examined. Because of the greater wealth of data generated under controlled circumstances in the extensive testing arenas at the SPS sites, substantially more emphasis was placed on these in the analysis.

The SPS test site constructed in 1991 on I-35 near Bethany included sections that were rubblized, break and seated, undersealed, and diamond ground. Most of the sections were overlaid with varying thicknesses of asphalt concrete (AC). Some were fitted with edge drains. Joints were resealed on three of the bare PCC sections. One section had its AC overlay sawed and sealed over the old joint locations.

The SPS test site constructed in 1990 on US 67 near Festus was composed primarily of bonded PCC sections. They varied by type of surface preparation and PCC overlay thickness. (A more thorough examination of the total bonded PCC overlay experiment project on US 67, of which the SPS site was only part, is available in RDT Report 00-002A.)

The SPS site constructed in 1996 on US 65 north of Sedalia contained Missouri's first Superpave overlays. The test sections varied by mix design and binder grade.

The SPS site constructed in 1998 on Rt. 8 near Potosi was similar in composition to the I-35 site; however, there were no rubblized test sections.

Data collected at these sites included ride, rutting and other surface distresses, deflection testing, and traffic loadings.

Observations and Conclusions:

The I-35 SPS site yielded the most pertinent information.

- All AC overlaid sections have generally maintained acceptable or border-line acceptable smoothness.
- Faulting returned to original levels on diamond ground sections within six years.
- Rubblized sections had less overall transverse cracking through the AC overlays than break and seat sections.
- All AC overlaid sections had substantial centerline longitudinal cracking.
- Retrofitted longitudinal edge drains did not provide evident contributions.
- Two of the rubblized sections exhibited longitudinal cracking in the wheelpaths.

Comparing the cost effectiveness of every rehabilitation strategy to each other was difficult because of the different inherent distresses, especially between bare PCC and AC overlaid PCC. The only universal performance measure was ride or IRI. Therefore, the following ratio was employed:

$$\text{Cost effectiveness} = (\text{Cost}_{\text{Option 1}} - \text{Cost}_{\text{Control}}) / (\text{IRI}_{\text{Control}} - \text{IRI}_{\text{Option 1}}).$$

Although this method of comparing test sections was considered the best available, it had one serious limitation. Lack of uniformity in original PCC condition required a much greater repair investment in some test sections than others. This skewed the cost-effectiveness. If initial conditions had been nearly identical, as was the original intent of the LTPP program, the order of cost-effectiveness would have been markedly rearranged.

The US 67 SPS site provided insight to a lesser-used rehabilitation technique.

- Transverse and longitudinal cracking occurred rapidly after construction. Thicker PCC overlays tended to have more cracking. It is believed that the fast-track paving mix might have contributed to the degree of cracking. Beyond this point in time there was very little increase in cracking.
- Initial roughness ranged from smooth to moderately rough in the overlaid test sections. Since then all sections, including the lone AC overlay section, have had similar very gradual increases in IRI.
- Faulting has remained negligible at all PCC overlay sections.

Historical performance data was limited for the US 65 and Rt. 8 sites due to their recent construction. Therefore, performance trends for these were inconclusive.

Recommendations:

This study should be used as the foundation for future analysis of PCC pavement rehabilitation sites in Missouri. The performance trends have already shed light on the short-term applicability of certain strategies. At present, however, the LTPP test sections have not matured enough to provide reliable cost-effectiveness comparisons with each other.

Contact:

John Donahue

Phone: (573) 526-4334

Email: donahj@mail.modot.state.mo.us