Office of Innovation, Partnerships & Energy
Innovation, Research & Implementation Section

# Executive Summary Report

# MONITORING AND MODELING OF PAVEMENT RESPONSE AND PERFORMANCE

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## Problem

Over the years, the Ohio Department of Transportation has constructed several pavements with a range of designs and materials to study and improve overall statewide performance. These pavements require constant monitoring to determine how they perform over time and what mechanisms are at work to cause distress. One major effort was the DEL-23 Test Road where 40 AC and PCC test sections in the SPS-1, SPS-2, SPS-8 and SPS-9 experiments were constructed for SHRP. While many sections have been replaced, many other sections remain in service. These remaining sections and seven PCC replacement sections need to be evaluated periodically. Other existing test roads around the state also need ongoing evaluation to assess performance, including in particular the perpetual AC pavement and long-life PCC pavement in Wayne County (WAY-30).

## Objectives

- Monitor the new perpetual AC and long-lasting PCC pavements constructed in Ohio and other existing instrumented pavements in the state.
- Verify ME design procedures for all pavements in the study by comparing theoretical calculations with measured response and performance
- Calibrate ME procedures presented in the NCHRP 1-37A AASHTO Pavement Guide for Ohio using data collected in this and other previous studies.
- Controlled testing of perpetual pavement systems to determine their relative performance and to recommend the most promising layer configurations (materials and thicknesses).
- Document all research findings in a final report.

## Description

Perpetual AC pavement and long lasting PCC pavements were constructed on US-30 in Wayne County to compare the performance of these new designs and to reduce maintenance and the associated traffic delays. ATH-33 was a rigid pavement constructed in Nelsonville using blast furnace slag and fly ash as a partial replacement for cement. Sections with these materials were also cured with

membrane and wet burlap to observe any differences in performance. ATH-50 was a rigid pavement with ground granulated blast furnace slag added to the concrete.

A few stainless steel tube dowel bars filled with concrete and a few fiberglass dowel bars were installed and compared with standard epoxy coated steel dowel bars. LOG-33 was an AC pavement containing six different bases to determine their effect on performance. MEI-33 was a PCC pavement constructed partially on a clay subgrade and partially on a sandy subgrade. Some of the joints in both sections were sealed and some were unsealed to set up a test matrix of joint sealing and subgrade type. Various testing was performed at these sites, but the most common types of testing were FWD and controlled vehicle testing with loaded dump trucks to measure responses to dynamic loading.

## Conclusions and Recommendations

*WAY-30*

No clear differences in performance are apparent on sections of PCC containing fly ash and ground granulated blast furnace slag. As the previous report on WAY-30 concluded, this pavement cured at an ideal temperature and had no significant loss of support after curing. No distresses have appeared in these sections, other than one cracked slab that may be a result of an irregularity in the base.

The perpetual AC and long lasting PCC pavements are both performing well at this time.

The one joint with composite dowel bars shows high deflections and low load transfer. Deflections at joints between Stations 876 and 877 with standard epoxy coated dowel bars were highly variable, but load transfer remained good.

As shown from the TDR data collected, subgrade moisture fluctuates slightly with the seasons, but does not change significantly.

A new MEPDG software simulation of the two pavements generates results with various differences from those of the previous simulation [Sargand, Figueroa, and Romanello, 2008]. The simulated AC perpetual pavement stayed below the original design limits for all results. The final total and subgrade rutting values were higher in the new simulation because the input subgrade parameters were worst-case values from the project data. In the case of PCC, most of the simulated measures improved considerably, sometimes as much as an order of magnitude. The major exception was the percentage of slabs cracked, which at 4% after 20 years is still well belohbars.3590om014(n)5.2de(n)5.2.0014 nshe.rs 2(t Tt)4.6( were simsilase (f) ste TDry foree Ts-1.6(iic6.4(stu2(s t)3y,teel 2 )]TJ2)6(barroo]TJ2)tvalu