

# OHIO DEPARTMENT OF TRANSPORTATION OFFICE OF PAVEMENT ENGINEERING RESEARCH IMPLEMENTATION PLAN

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**Title:** Load Response Instrumentation of SHRP Pavement

**State Job Number:** 14583

**PID Number:**

**Research Agency:** University of Cincinnati

**Researcher(s):** Dr. Andrew Bodocsi & Dr. Mark Bowers

**Technical Liaison(s):** Roger Green

**Research Manager:** Karen Pannell

**Sponsor(s):** Howard Wood

**Study Start Date:** 6/13/94

**Study Completion Date:** 12/13/99

**Study Duration:** 66 months

**Study Cost:** \$299,388

**Study Funding Type:** 80% Federal/20% State from ODOT SPR (2)

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## **STATEMENT OF NEED:**

As part of its support for the Strategic Highway Research Program (SHRP), the Ohio Department of Transportation, in conjunction with the Federal Highway Administration constructed a comprehensive test road encompassing four of nine experiments in the Specific Pavement Studies (SPS) of SHRP. The 3.4 mile long project is located on US 23 in Delaware County. The Ohio/SHRP test road is a four lane divided highway constructed in the 170 foot wide median of the existing facility. The new southbound lanes were constructed of asphalt concrete (AC) and contain the SPS-1 and SPS-9 experiment. The new northbound lanes were constructed using Portland cement concrete (PCC) and contain the SPS-2 experiment. Once ODOT decided to participate in the SHRP, staff engineers viewed this as an opportunity to obtain pavement response data for validating and calibrating pavement analysis models. After review of the experimental design of the SHRP sections, thirty three of the forty original sections were chosen for environmental and dynamic load response instrumentation using a total of 1296 gages for measuring strain, deflection, pressure, moisture, temperature, and frost depth. Research was needed to calibrate, install, and to measure pavement response during controlled loading, moisture and temperature in the pavement structure, and climatic conditions above the pavement. Due to the large number of gages being installed, the effort was divided among six universities. The University of Cincinnati was one of two universities responsible for the calibration and installation of dynamic response instrumentation.

## **RESEARCH OBJECTIVES:**

- Calibrate, install and monitor dynamic response sensors in 16 test sections on the Ohio/SHRP test road.
- Investigate the effect of concrete strength, concrete pavement thickness, base type, and temperature on the performance of joints in PCC pavement with a 15' joint spacing.

## **RESEARCH TASKS:**

1. Calibrate, install and monitor strain gages and LVDTs in 16 test.
2. Measure and analyze joint movement in 10 pavement sections.
3. Prepare final report.

## **RESEARCH DELIVERABLES:**

- Calibrated instrumentation installed in the pavement on the Ohio/SHRP test road.
- Final report.

**RESEARCH OBSERVATIONS AND RECOMMENDATIONS:**

- The coefficient of thermal expansion for concrete pavement on DEL-23 is  $6.28 \times 10^{-6}/^{\circ}\text{F}$ .
- The computed adjustment factor for slab-base friction ranged from 0.36 to 0.64. The average was 0.43.
- The strength of the concrete had little, if any, effect on joint movement.
- Thicker PCC slabs, regardless of base, had more joint movement (4% to 33% more).
- Stabilized bases provide a smoother foundation and less interface friction for PCC slabs.
- Joint movements were no more than 43% of the theoretical “free” movement. Movements are relatively small and would result in very little fatigue deterioration of the sealants.

**PROJECT PANEL COMMENTS:**

The instrumentation was successfully calibrated and installed at the Ohio/SHRP test road. The results of the joint movement study indicate the joint sealants in the 15’ slabs will not experience fatigue deterioration.

**IMPLEMENTATION STEPS & TIME FRAME:**

The Ohio/SHRP Test Road was instrumented and opened to traffic on August, 1996. Current specifications and standard drawings for sealing joints in concrete pavements were validated.

**EXPECTED BENEFITS:**

Accurate load response data will be collected and reported to the SHRP national database.

**EXPECTED RISKS, OBSTACLES, & STRATEGIES TO OVERCOME THEM:**

N/A

**OTHER ODOT OFFICES AFFECTED BY THE CHANGE:**

None

**PROGRESS REPORTING & TIME FRAME:**

N/A

**TECHNOLOGY TRANSFER METHODS TO BE USED:**

The Final Report of the research has been distributed to 49 state transportation departments, different FHWA offices, selected national libraries, and others.

**IMPLEMENTATION COST & SOURCE OF FUNDING:**

N/A

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**Approved By:** (attached additional sheets if necessary)

**Office Administrator(s):**

Signature: David Humphrey Office: OPE Date: 12/07/2006

**Division Deputy Director(s):**

Signature: Howard Wood Division: Planning Date: 12/07/2006