

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



**Title:** Ohio Route 50 Joint Sealant Experiment

**State Job Number:** 14668

**PID Number:**

**Research Agency:** University of Cincinnati

**Researcher(s):** Dr. Anatasios Ioannides and Dr. Issam Minkarah

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

**Research Manager:** Karen Pannell

**Sponsor(s):** Howard Wood

**Study Start Date:** 11/4/1996

**Study Completion Date:** 7/11/2002

**Study Duration:** 68 months

**Study Cost:** \$305,116

**Study Funding Type:** 100% Federal

## **STATEMENT OF NEED:**

Research in the state of Wisconsin over the past forty years has found no noticeable difference in performance between jointed concrete pavement (JCP) constructed with a sealed contraction joint and JCP constructed with a single, narrow, unsealed saw cut. The research was extensive, investigating pavements constructed with free draining bases or dense graded bases on fine grained or coarse grained subgrades. As a result of this research, Wisconsin has not sealed joints in concrete pavement since 1990. Wisconsin's experience led other states to investigate the effectiveness of sealing joints. In 1991, as a supplement to the LTPP SPS-4 experiment, Arizona DOT installed a joint seal experiment containing more than 20 different sealants as well as unsealed joints on US 60 in Mesa. In cooperation with Arizona DOT, similar test sections were constructed in Nevada, Utah and Colorado. Following discussions with ADOT's research engineer, ODOT decided to construct a test section identical to the ADOT site in order to provide data for the wet-freeze climatic zone. This research project was initiated to document the construction of the test sections and to monitor and report the initial performance of the test sections. This project was financed entirely with federal funds provided by the FHWA Test and Evaluation Project 30, "High Performance Concrete Pavement".

## **RESEARCH OBJECTIVES:**

- Assess the effectiveness of a variety of joint sealing practices after the initial sawing of the joints, and to examine their repercussions in terms of reduced construction costs and life cycle costs.
- Identify those materials and procedures that are most cost effective
- Determine the effect of joint sealing techniques on pavement performance

## **RESEARCH TASKS:**

- Monitor joint construction at the test site
- Evaluate the performance of joint sealant materials and techniques with respect to such features as adhesion, cohesion, etc., as well as the performance of the pavement
- Host an open house

## **RESEARCH DELIVERABLES:**

- A final report
- An open house

## **RESEARCH RECOMMENDATIONS:**

- Sealants having an average effectiveness below 75% should be removed and replaced
- Monitoring of joint sealant and pavement performance should continue for at least another five years
- Monitoring of pavement surface roughness via profile surveys should continue
- Implement a drainage outlet maintenance program
- Transverse contraction joint spacing in PCC pavements should be determined using the concept of the ratio of the slab length to the radius of relative stiffness of the slab-subgrade system.
- Pending the results of additional investigations, the use of compression seals should continue.

#### **PROJECT PANEL COMMENTS:**

Poured sealants on ATH-50 failed due to improper installation. The joint reservoirs were not sand blasted prior to installation.

No significant difference in performance between sealed and unsealed joints was observed when the test sites were reviewed by ODOT and local FHWA personnel on September 25, 2001 (2 to 3 years after construction).

#### **IMPLEMENTATION STEPS & TIME FRAME:**

While this study was ongoing, the Ohio Concrete Pavers Association submitted a request to remove the joint sealing requirement from the specifications.

As a result of information presented with that request, Wisconsin's experience, and the preliminary observations on this study, the following steps will be or have been taken:

- The sealing of transverse joints is a contractor option for concrete pavements constructed under ODOT's warranty (SS 884), QC/QA specification (SS 888), and QC/QA with warranty specification (896).
- OPE will request a proposal note removing the sealing requirement from Items 451 and 452 be included on future projects.
- OPE will request the joint sealing requirement will be removed from Items 451 and 452 during the next revision of the Construction and Material Specifications.

#### **EXPECTED BENEFITS:**

The expected benefit is a reduction in the cost of concrete pavement. The estimated savings is \$1.00 per square yard based on the cost savings realized after ODOT accepted the contractor's value engineering request to not seal joints on MEG-124-22.72, project 229(01).

Over the past five years, ODOT has constructed an average of 497,000 square yards of pavement per year. Assuming the annual square yardage of concrete pavements placement will continue at the same rate as in the past 5 years and an implementation life of 20 years, the benefit cost ratio for this project is 31.

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

A risk which has been identified is the possibility of incompressible material filling the unsealed joints causing blowups. Wisconsin has not reported any blowup problems on sections constructed without joint seals. A section of the Ohio D-cracking test road on ERI/LOR-2, constructed in 1973/74 was left unsealed. These sections did not experience blow ups. The use of narrow joints and short joint spacing should minimize the risk, if any.

The other risk which has been identified is the possibility of water infiltrating through the joints into the base and subgrade, weakening the pavement support, resulting in poor performance over the long term. Moisture probes have been installed under sealed and unsealed joints on ATH-50 by Ohio University

under a separate research project. Results of this research indicate the moisture under the unsealed joints is equal to or less than the moisture under the sealed joints.

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

None

**PROGRESS REPORTING & TIME FRAME:**

District 10 has constructed four additional projects to evaluate unsealed joints. Approximately half of the project length contains joints which were sealed using compression seals. The joints on the remainder of the project were sawed ¼" wide or less and were not sealed. Moisture under the pavement is being monitored by Ohio University on one of the projects (MEG-33) as well as ATH-50. This research has a completion date of February 6, 2006.

The FHWA is currently evaluating the effectiveness of sealing joints under a contract with ProTech Engineering. The ATH-50 and the four District 10 projects are being evaluated under this project. The project has a March, 2006 completion date.

**TECHNOLOGY TRANSFER METHODS TO BE USED:**

1. The Final Report of the research has been distributed to 49 state transportation departments, different FHWA offices, selected national libraries, and others.
2. An open house to present initial findings was held in Athens, Ohio on August 15 and 16, 2000.
3. Joint sealing is not required under Supplement Specifications 884, 888 and 896
4. A proposal note will be developed to remove the joint sealing requirement from Items 451 and 452.
5. The joint sealing requirement will be removed from the Construction and Material Specifications during the next revision.

**IMPLEMENTATION COST & SOURCE OF FUNDING:**

No funding needs are anticipated.

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

Office Administrator(s):

Signature: David Humphrey Office: OPE Date: 5/9/2005

Division Deputy Director(s):

Signature: Howard Wood Division: Planning Date: 5/12/2005