Child Street
16 State House Station
Augusta, Maine 04333

Maine Department of Transportation

Transportation Research Division

Technical Report 96-25 and 97-19

Experimental Use of Sawed and Sealed Joints to Minimize Thermal Cracking

Interim Report - Fourth Year, June 2002

Transportation Research Division

Experimental Use of Sawed and Sealed Joints to Minimize Thermal Cracking

Introduction

"Saw and Seal" is the process of introducing uniformly spaced saw joints to a bituminous overlay in an attempt to eliminate or retard the formation of thermal and /or reflective cracking.

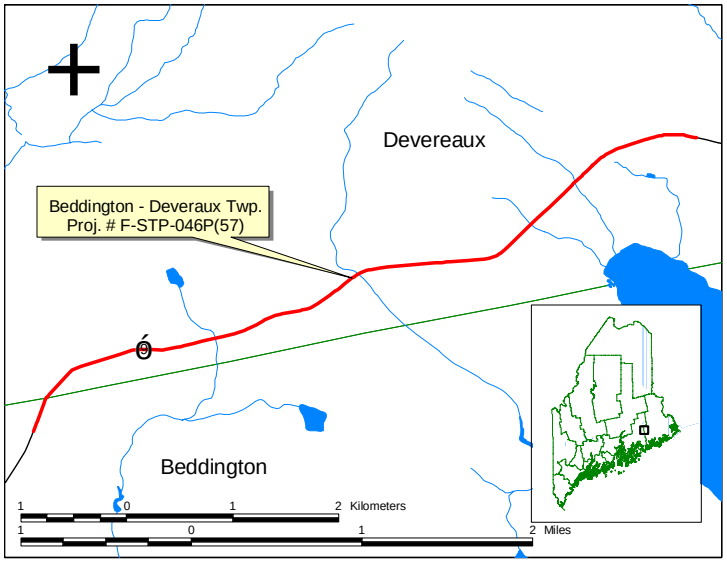
Saw and Seal technology has been experimented with for many years. Several states including Connecticut, Massachusetts, New York, Minnesota and Pennsylvania have used the Saw and Seal method. Although its primary use has been for bituminous over jointed concrete pavements, some states are using Saw and Seal on new construction and bituminous overlays of existing bituminous pavements. In the fall of 1997, the Maine Department of Transportation (MDOT) completed construction on two projects that included Saw and Seal technology in an effort to mitigate thermal and reflective cracking.

Project Location

Beddington-Deveraux Twp.

Project No. F-STP-046P(57)

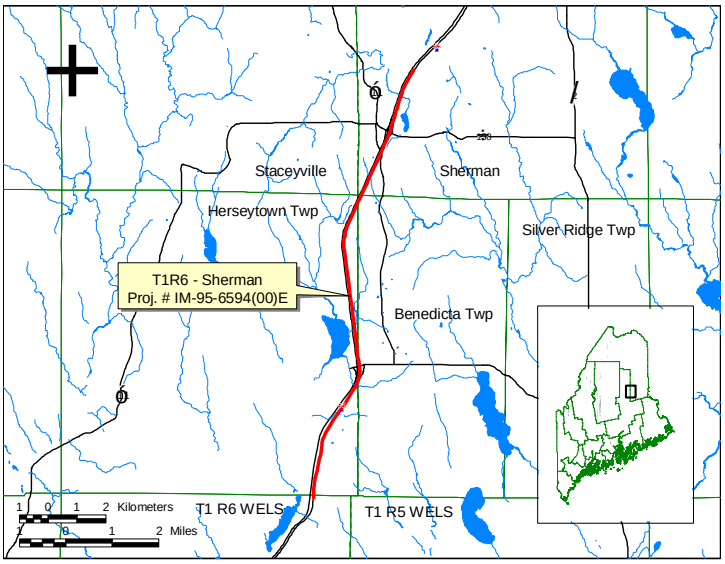
This project is a portion of State Route 9 located in the towns of Beddington and Deveraux Twp. The project begins 1.36 miles easterly of the T22 MD town line and extends easterly 4.60 miles (see map at right). This highway reconstruction included 9 ½ inches of bituminous material. The wearing surface consists of a ½ inch stone C-mix with an AC-20 grade asphalt binder.



The experimental feature of this project consists of three 1,000-foot sections two experimental sections and one control section. Full width sawed joints were introduced using a 30 foot spacing interval from station 70+00 to station 80+00. A 40-foot spacing was used from station 90+00 to 100+00. The control section is located between these two sections from station 80+00 to station 90+00.

T1R6-Sherman

Project No. IM-95-6594(00)E



This project is located on Interstate 95 of the northbound lane in the towns of T1R6, Herseytown Twp., Benedicta Twp. and Sherman (see map at left). This highway pavement rehabilitation included grinding and stockpiling of the existing 3 inch wearing surface, cold in-place recycling of approximately 8 inches and 4 ½ inches of bituminous overlay. The wearing surface is a ½ inch stone Superpave mix with an AC-20 grade asphalt binder. The project begins 0.06 miles southerly of the Herseytown Twp. town line and extends northerly 9.72 miles.

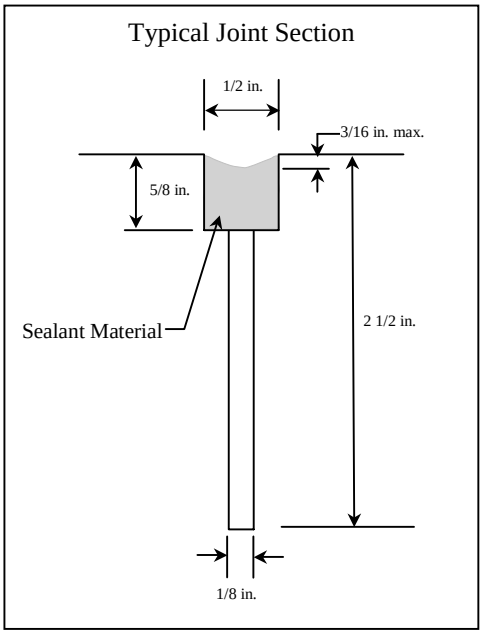
The experimental portion of this project consists of two 2,000-foot sections, one experimental section and one control section. Full width sawed joints were introduced using a 30-foot spacing interval from station 4150+00 to station 4170+00. The control section was established from station 4170+00 to station 4190+00.

Construction

Beddington-Deveraux Twp.

Project No. F-STP-046P(57)

The construction process, including the bituminous wearing surface was completed in the experimental area September 10, 1997. The Saw and Seal process began October 2, 1997 at station 70+00. Full width joints (including one foot into each paved shoulder) were sawed to a total depth of 2 ½ inches. A reservoir ½ inch wide by e inch deep was included to accommodate the sealant. This cutting was accomplished in a single pass using a "wet cut" pavement saw. The experimental feature was successfully completed October 23, 1998. Although air temperatures during this second phase of installation were below the 50-degree minimum, installation was allowed to continue. Bond breaker tape was used in each joint and in some instances a double layer was applied to assure the sealant remained in the reservoir.



T1R6-Sherman

Project No. IM-95-6594(00)E

The bituminous wearing surface in the experimental section of this project was completed October 1, 1997. The Saw and Seal procedure began October 16, 1997 at station 4150+00 and was completed October 17, 1997. Sawed and sealed joints were introduced using the same methods as the Beddington-Deveraux project with two exceptions. The contractor was not required to use a heat lance or bond breaker tape for acceptable completion of this projects experimental feature. Although air temperatures were also below the 50-degree minimum for the Saw and Seal portion of this project, work was allowed to continue.

Field Inspection

Beddington-Deveraux Twp.

Project No. F-STP-046P(57)

This project was inspected on November 14, 2001. The weather was partly cloudy and the temperature was 34°.

Section 1, 30 Foot Spacing

The sealant is pliable and there is no separation of sealant from the joint sidewalls.

Cracks have extended 12 to 24 inches into the shoulder on 14 out of 33 joints. There are no transverse cracks but there is a small amount of initial edge, centerline and load cracking.

Section 2, Control

There are no transverse cracks but there is a small amount of initial edge and load cracking. The centerline joint has opened along 1/3 of the section.

Section 3, 40 Foot Spacing

Sealant is pliable and adherence is good except at the roadway centerline (see photo at right) where it has separated from the sidewall along many of the joints.

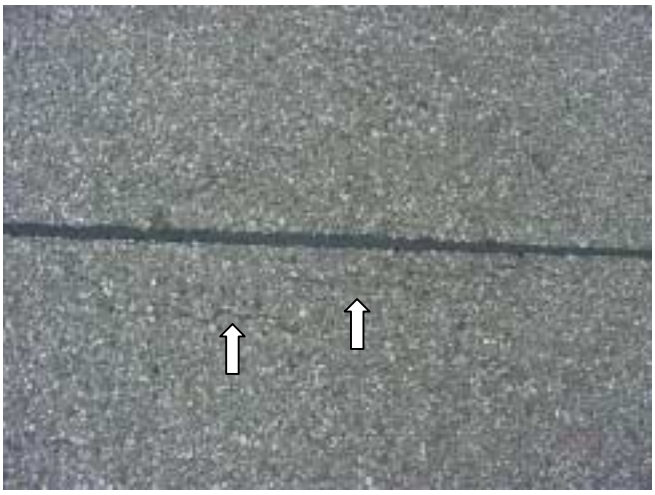
There are no transverse cracks but there is a small amount of initial load cracking in the wheel path. Initial edge cracking was observed along most of the section and initial centerline cracking thru 50% of the section. Fifteen of the 25 joints have cracks extending beyond the saw cut into the shoulder.

T1R6-Sherman

Project No. IM-95-6594(00)E

This project was inspected on November 15, 2001. The weather was partly cloudy and the temperature was 38°.

Section 1, 30 Foot Spacing



Sealant is pliable and adherence is good. Seven of the sealed joints are experiencing separation of the sealant from the sidewall. This is only occurring in the passing lane between wheel paths. These areas are also showing signs of ravel. It appears that the sealant has shrunk or insufficient material was applied during construction to seal the joint.

There are no transverse cracks. Centerline and edge joints have cracked throughout the length of the section. There are small areas of initial longitudinal cracking in the travel lane between wheel paths. Three sawed joints have cracks parallel to the sawed joint (see photo at left) in each wheel path of the travel lane. Cracks have extended into the shoulder on at least one end of each sealed joint (see photo below).

Section 2, Control

No transverse cracks were observed. There is a small amount of initial longitudinal cracking in the travel lane quarter point. Shoulder and centerline joint separation was observed throughout most of this section.

Summary

After four years exposure to traffic, both projects are performing well with no transverse cracks in the experimental sections or throughout each project for that matter.

Of concern are the parallel cracks on the T1R6 - Sherman project. These areas will be examined closely to monitor the extent and severity of this type of cracking. One possible reason for the cracking is “tenting” of the joints during the winter months. During this time, each side of the sawed joint rose to form a small

“tent”. The extent of the tenting could be felt as you drive over the joints. This tenting could be weakening the pavement causing load cracks parallel to the sawed joint. It is uncertain what is causing this tenting effect. One theory is that since the DOT went to salt priority for winter snow control, the salt brine may be seeping into and under the sawed joint. When this brine freezes, the pressure may be causing the HMA to rise on each side of the sawed joint. This action may be weakening the HMA making it vulnerable to cracking.

Another concern is cracking at the end of the sawed joint. These cracks have been extending further into the shoulder and may migrate to the other side of the shoulder over time. There are more end cracks on the T1R6 - Sherman project due to the saw cut ending at the shoulder joint, because of rumble strips at the edge of the travel and passing lane, and not extending into the shoulder as on the Beddington project.

The experimental sections will be evaluated in the fall of 2002 and a Final Report will be written with a detailed evaluation of the end and parallel cracking as well as a summary of the performance of the sawed joints.

Prepared by:
Brian Marquis

Transportation Planning Analyst

Reviewed By:
Dale Peabody

Transportation Research Engineer

For more information contact:

Brian Marquis
Maine Department of Transportation
P.O. Box 1208
Bangor, Maine 04402 - 1208
207-941-4067
E-mail: brian.marquis@state.me.us