



Maine Department of
Transportation
**Transportation Research
Division**



Technical Report 97-21
Saw & Seal, Airport Pavement
May, 2009
Final Report

Transportation Research Division

Introduction

Due to extreme cold temperatures, hot bituminous pavements on Maine's airports are subject to transverse or thermal cracking. This can lead to poorly performing pavement structure causing heaving and settlement problems. Studies have shown that sawing transverse joints in new hot bituminous pavements and filling with hot poured sealant on highways is effective in minimizing effects of thermal cracks. This project will investigate the effects of sawing and sealing joints in a hot bituminous pavement along an airport runway.

Project Description/Experimental Feature

The project site is the Eastern Slope Regional Airport in Fryeburg, Maine, A.I.P. project No. 3-23-0022-08 (See Figure I). The construction sequence consisted of reclaiming a total of nine inches of existing bituminous pavement and gravel and overlaying with a total of three inches of hot bituminous pavement. The underlying soil is a gravely sand with good drainage characteristics.

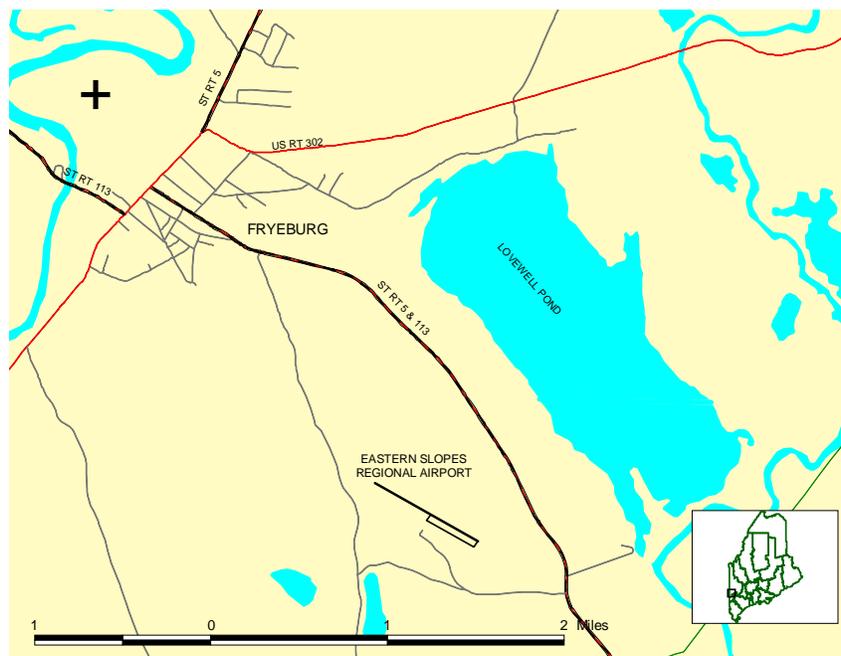


Figure I: Eastern Slope Regional Airport Location

For the Experimental Feature of this project, the runway was divided into four sections. Beginning at station 10+00 and extending to station 17+00 is the control section. This section was constructed in the same manner as the experimental sections, minus the Saw and Seal procedure.

Test section #1 begins at Station 17+00 and extends 1000 feet to Station 27+00. A sawed joint was constructed at 100 foot intervals. From station 17+00 to 22+00, bond breaker tape was applied and from station 22+00 to 27+00 no bond breaker tape was used.

Test section #2 begins at Station 27+00 and extends 1000 feet to Station 37+00. Sawed joints were constructed at 75 foot intervals. Bond breaker tape was used from station 27+00 to 32+00 and no tape was used for the remainder of the section.

The final section, test section #3, begins at station 37+00 and ends at station 47+00. Sawed joints were introduced at 50 foot intervals, with bond breaker tape used from 37+00 to 42+00. Bond breaker tape was not used from station 42+00 to the end of the section.

The typical joint detail consists of a 3/4"x 3/4" saw cut with a 1/8"x 2" saw cut down the center. The joint is filled with hot poured ASTM D-3405 joint sealant.

A typical detail is shown in Figure II.

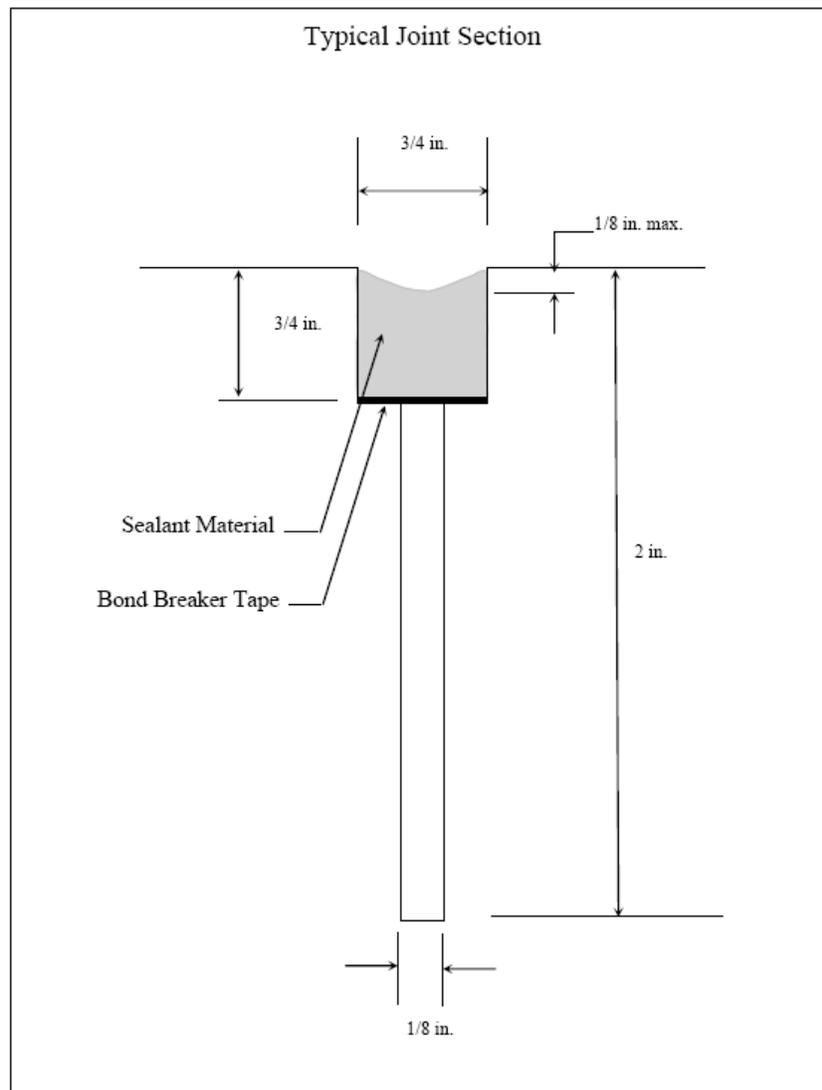


Figure II: Typical Sawed Joint

Construction

The reclaiming and hot bituminous pavement overlay was completed in June 1997. The joint construction was completed per specification in mid July. No problems were encountered. The joint spacing on test section #2 was altered between stations 30+00 and 31+50. A cold joint in the hot bituminous pavement had been constructed at approximately station 30+75 so the saw and seal joint was moved to approximately station 30+90. The next joint was placed at 31+50 as planned.

Total cost for the three inch hot bituminous pavement was \$223,000. This is based on the engineers estimate of 6400 tons at \$34.86 per ton. The total cost for saw and seal was \$9,288. This is based on the engineer's estimate of 3225 feet at \$2.88 per foot.

Initial inspection of the saw and seal joint was conducted on July 17, 1997. In general, the joints were acceptable. Some localized distresses were observed such as chipped and cracked areas along the saw cut. Although these distresses shouldn't affect the overall ability of the pavement to respond to thermal forces, they may affect the general performance of the joint to restrict water from entering the pavement structure. Distresses along the saw cut joints will be closely monitored. Only one saw cut joint required rework. This was joint #7, to which more sealant was added.

Final Project Inspection/Evaluation

The final project inspection was completed Friday May 29, 2009, almost 12 years after the completion of the Saw and Seal procedure. A representative of the airport facility indicated they were very satisfied with the results of the process and he considered the airstrip pavement to be in very good condition. A crack sealing project was completed during the summer of 2008 and the sawed joints were also re-sealed at that time (see Photo 1).

For this final evaluation, the crack sealing process made it necessary to measure the sealed cracks and consider the sealed area part of the total linear feet of transverse cracking. For example; the control section had a total of 226 linear feet of transverse cracking, most of which had been sealed (see Photo 2).

Test Section #1, which had been sawed and sealed at 100 foot intervals, was found to have 219 linear feet of transverse cracking. The majority of this cracking occurred between stations 17+00 and 21+00, nearest the control section.

Test Section #2 was constructed using 75 foot spacing between sawed joints. A total of 67 linear feet of transverse cracking was identified. This total was made up of mostly short cracks measuring less than 5 feet in length.

Test Section #3 had 50 foot spacing between joints and a total of 90 feet of transverse cracking was found to be present. 56 feet of this total was the result of a single transverse crack located at approximately station 46+90, near the end of the section (see Photo 3).

Minimal longitudinal cracking was present within each of the three test sections and the control section, but was not considered relative to the Saw and Seal feature of this project.

Resealing of the sawed joints made it impossible to determine if the bond breaker tape installed at each joint within the first 500 feet of each test section was of any benefit. The purpose of the bond breaker tape is to minimize settlement of the sealer material.

Sawed joints were in very good condition with little or no raveling or cracking at the edges.



Photo 1: Resealed Sawed Joint



Photo 2: Sealed Transverse Crack



Photo 3: Transverse Crack at Station 46+90

Conclusions/Recommendations

Overall, Sections #2 and #3 appeared to perform best at minimizing transverse, thermal cracking. Test Section #1 performed well from station 21+00 to 27+00, with the majority of the 219 feet of transverse cracking occurring from station 17+00 to 21+00. A small amount of longitudinal cracking was present in each of the sections, but not included in this evaluation.

A crack sealing project was completed in the summer of 2008. All existing cracks and the sawed joints were sealed at that time. This did not have a negative impact on the final evaluation.

Airport personnel were very satisfied with the results of the Saw and Seal procedure.

After 12 years of service, the Saw and Seal procedure is performing very well in Sections #2 and #3. For similar airports throughout Maine, it appears the Saw and Seal process, utilizing a 50 or 75 foot interval between sawed joints, will work well at minimizing transverse, thermal cracking.

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ITEM P-605 JOINT SAWING AND SEALING

DESCRIPTION

605-1.1 This item shall consist of sawing joints in bituminous pavement, providing and installing a resilient and adhesive joint sealing filler capable of effectively sealing joints and cracks in pavements.

MATERIALS

605-2.1 JOINT SEALERS. Joint sealing materials shall meet the requirements of ASTM D 3405 - Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements.

Each lot or batch of sealing compound shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, and the safe heating temperature and shall be accompanied by the manufacturer's certification stating that the compound meets the requirements of this specification.

CONSTRUCTION METHODS

605-3.1 TIME OF APPLICATION. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be above 50 degrees F. at the time of installation of the poured joint sealing material.

605-3.2 PREPARATION OF JOINTS. Immediately before sealing, the joints shall be sawn and thoroughly cleaned of all debris and other foreign material. Upon completion of cleaning, the joints shall be blown out with compressed air. The joint faces shall be surface dry when the seal is applied.

605-3.3 INSTALLATION OF SEALANTS. Sawn joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Hot Poured Sealants. The joint sealant shall be applied uniformly solid from bottom to top and shall be filled without formation of entrapped air or voids. A backing material shall be placed as shown on the plans and shall be nonadhesive to the concrete or the sealant material. The heating kettle shall be an indirect heating type, constructed as a double boiler. A positive temperature control and mechanical agitation shall be provided. The sealant shall not be heated to more than 20 degrees F. below the safe heating temperature. The safe heating temperature can be obtained from the manufacturer's shipping container. A direct connecting pressure type extruding device with nozzles shaped for insertion into the joint shall be provided. Any sealant spilled on the surface of the pavement shall be

removed immediately.

METHOD OF MEASUREMENT

605-4.1 Joint sawing and sealing shall be measured by the linear foot of sealed joint in place, complete, and accepted.

BASIS OF PAYMENT

605-5.1 Payment for joint sawing and sealing shall be made at the contract unit price per linear foot. The price shall be full compensation for furnishing all materials, for all preparation including joint sawing, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-5.1 Joint Sawing and Sealing - per linear foot

MATERIAL REQUIREMENTS

ASTM D 3405 Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements

END ITEM P-605