

MATERIALS & RESEARCH DIVISION

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RESEARCH UPDATE

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PAVETECH (KOCH) BRIDGE JOINT SYSTEM FAILURE-WATERBURY

REFERENCE: Work Plan 89-R-12; Research Report 90-2

HISTORY:

On December 15, 1989 a PAVETECH Bridge Joint System was installed in Bridge #44, US-2 over the Little River in Waterbury Vt.

The weather was severe with air temperatures of -8 degrees F at 7:30 A.M. The installation of this joint was described in detail in Research Report 90-2, Jan 1990.

Since the installation of this joint, KOCH Mfg. Co. of Stroud Oklahoma has acquired the rights for the system and it is now called the KOCH Bridge Joint System.

By January 1990 some deterioration of the binder/grit wearing course had been noted, probably due to snow plow damage.

On January 18, 1990, following heavy rainfall, water was noted dripping from a plastic trough, which had been previously installed below the joint. It was theorized at that time that the water might be coming from the unsealed curb.

On February 9, 1990 the joints in the vertical granite curb were sealed with bridge membrane and water was poured on the joint. AT 10:15 A.M. 95 drops per minutes were observed falling from the end of the trough and by 10:30 a steady stream of water was pouring from the end of the trough.

On May 8, 1990 another test was made. The bridge was dry and water was applied with a garden sprayer. The test began at 9:40 A.M. By 10:15 water was dripping from the trough at approx. 1 drop per second. By 10:40 A.M. a steady stream was running from the trough. Testing was completed at 1 P.M. It was concluded that the joint was leaking.

On May 15, 1990, three 4" diameter cores were taken from the joint. Evaluation of one taken at the joint/asphalt interface revealed a loss of bond between the pavement and the joint material. The other cores revealed that some aggregate was poorly coated with binder and there were many visible voids. One of the other two cores was taken in a crack at the edge of a distressed area on the surface of the joint. The crack was full depth.

STATUS:

On August 2, 1990 the entire joint was removed and replaced by the original proponent Davis & Swanson of Tilton New Hampshire along with the KOCH Technical representative Mr. Richard J. Baker.

**STATUS** Continued

During removal of the original joint it was noted that much of the aggregate was not coated (although it had appeared to have been coated when installed). There was water between the joint and the concrete slab in many areas. Some of the concrete surface was powdered and showed lack of bond to the deck although the dust and small particles were bound into the binder. The binder material was well adhered to the steel plates. One complete full depth cross section was removed intact. Even this complete section revealed uncoated stones, voids, and delamination between courses.

The jackhammering of the old joint caused some damage to the surface of the concrete.

Reinstallation of the joint proceeded in the same manner as the original installation.

**PROBABLE CAUSE:**

Even though it had previously been believed that the system could be installed in any weather, evaluation of the failure by the Manufacturer's (KOCH) personnel and Materials & Research division led to the conclusion that the probable cause of the failure was the severely cold (-8 to +20/- Degrees F ) and wet condition of the bridge during installation.

The bridge was frozen (December was a record cold month) and the attempt to dry the concrete with the 1200 Degrees F lance was unsuccessful although the surface appeared dry. Frost within the concrete was thawed but the moisture present in the air and deck immediately condensed and may have frozen causing a frost plane at the interface of the binder and the asphalt and concrete surfaces.

The lack of aggregate coating may have also contributed to the failure and occurred because the stone absorbed moisture while being heated. The binder may then have flowed around but not been absorbed into the surface of the stone. The process of flooding with binder to fill the voids was also partially unsuccessful, probably due to rapid cooling of the binder in the sub freezing air temperature.

The manufacture representative, the contractor and R&D are now in agreement that this system should not be installed where air and deck temperature are below 40 Degrees F and rising.

**FOLLOW UP:**

The evaluation will continue with observation and evaluation of the performance of the newly reinstalled joint.