Russ Research Paves Path to a Better Highway

ORITE engineers save state millions over five years

If you lined up a dollar bill for every one that researchers at the Ohio Research Institute for Transportation and the Environment (ORITE) saved the state of Ohio over five years, you’d almost be able to drive from Chicago to L.A. on Route 66.

ORITE engineers found that a material that the Ohio Department of Transportation (ODOT) used to build new roads in the state wasn’t improving pavement performance as expected—and was actually making it worse in some spots. Based on those studies, ODOT in 2001 stopped using a particular material in road bases, which are sandwiched between the asphalt or concrete pavement and the ground below.

Shad Sargand, professor of civil engineering at the Russ College and associate director of ORITE, said that at the time, ORITE’s recommendation to quit using the material—called free-draining base (FDB)—flew in the face of popular opinion.

“Our research allowed Ohio to be ahead of the curve during a time when there was widespread pressure to use them in road construction,” he said.

ODOT Pavement Engineer Roger Green affirmed, saying that FDBs were recommended as recently as 2001 by the National Cooperative Highway Research Program (NCHRP). “ORITE was one of the first research projects to question the cost effectiveness of the FDB,” he added.

The move by ODOT translates to an estimated $22 million saved on pavement construction in Ohio from 2002–2007. Line up those dollars and they reach 2,132 miles—just a bit short of Route 66’s original length of 2,448 miles.

Beyond those millions in savings, Sargand said taxpayers will continue to benefit from the hidden savings of reduced road repair costs and resultant traffic delays.

Cracks and ruts in the road can come from excessive moisture that causes the ground, or subgrade soil, to soften and sink under traffic loads. FDBs are used to move water off the roadway as quickly as possible—up to 25 times as fast as a standard base, according to Green.
ORITE’s studies, however, found that FDBs didn’t, in fact, increase pavement performance when compared with standard bases.

ORITE analyzed roadways around Ohio—including S.R. 2 in Vermillion, U.S. 33 in Bellefontaine, and U.S. 50 near Athens—and found that FDB had no effect on keeping the soil underneath the pavement dry. ORITE also led a collaboration of Case Western Reserve University, the University of Toledo, and Ohio State University in a project on U.S. 23 in Delaware that reached similar conclusions.

Engineers learned that existing base materials could drain the water effectively, but a significant amount of water was already present from the water table—so the FDB didn’t prevent moisture. In addition, ORITE learned that FDB can be porous, thus creating potential instability, or, it could be very stiff, making it difficult to put concrete pavement on top.

Recent studies, including reports by the NCHRP and the American Concrete Pavement Association, have confirmed ORITE’s findings.

Being able to separate road components and analyze them individually was key to ORITE’s research. According to Sargand, advanced monitoring and sensor technology now enables researchers to isolate parts of a roadway to measure environmental factors and pavement response.

“In the old days, you couldn’t single out each component. Now, with advanced technology, we’re capable of looking at the contribution of each,” he said. “We came to the conclusion that when you’re designing a base, you don’t focus only on drainage.”