Better designs mean longer pavement life

A lot has changed on our highways since the 1950s—traffic volumes, pavement materials, truck weights, and customer expectations. So when it came time for AASHTO to update its pavement design guidance to state DOTs, engineers needed a new approach.

NCHRP met that need in the early 2000s with Project 1-37A, which created the Mechanistic-Empirical Pavement Design Guide. The MEPDG software uses numerical models to analyze traffic, climate, subgrade composition, and laboratory measurements of materials properties to predict the performance of various pavement designs over their entire service life. This precise, scientific methodology will allow DOTs to build longer-lasting pavements more cost-effectively.

By contrast, traditional pavement design methods—including the 1972, 1986, and 1993 AASHTO design guides that many DOTs still rely on—are based on empirical equations developed using 1950s AASHO Road Test data. The guides have served the nation's DOTs well over the years, but the Road Test data has limitations in its application to today's truck traffic or to sites with varying climates and subgrade materials.

With its performance-based models, the MEPDG—completed in 2004 by a research team at Applied Research Associates—is helping pavement designers meet the challenges of the 21st century.

"We've always used 9 inches of concrete and 6 inches of gravel for all our concrete pavements," says Dan Hill, pavement design engineer at Montana DOT. "But some of our traffic is getting heavier, especially around the Interstates, and we're realizing that we need to use thicker slabs in those locations. The MEPDG has been very useful for those situations."

Calibrating the MEPDG software to local site conditions and materials is key to successful pavement design. Missouri was one of the first states to complete its local calibration and the first state to use the MEPDG to design its pavements, and Missouri DOT has now let more than $1 billion in construction contracts for pavements designed using the guide. The software's ability to predict localized pavement distresses has allowed the department to save money by using less material in areas where thicker pavements are not necessary.

"The fact that we can now design thinner pavements really provided us with the tangible benefits that we needed to justify the cost of doing the local calibration," says John Donahue, MoDOT pavement engineer.

Ohio DOT is completing its local calibration, and engineers there are looking forward to transitioning to the MEPDG software.

"The MEPDG should give us better predictions of pavement performance in our state, which will help with pavement management and budgeting," says Roger Green, a pavement research engineer at Ohio DOT.

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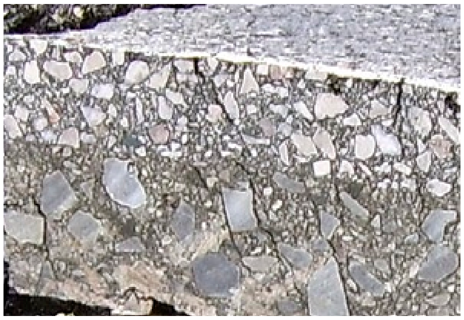
"One of the greatest impacts of the MEPDG is that states are starting to look very carefully at the data that goes into their designs," says Harold Von Quintus, a principal engineer at ARA who helped develop the guide. "It's been a wake-up call in making sure that the values they use to design pavements are accurate for each site."

Donahue can attest to that. "In some areas, we were designing 14-inch concrete pavements—we even had some 20-inch asphalt sections. We didn't have a justifiable reason not to do it," he says. "We didn't have a better design method at our fingertips. Now we do."

The MEPDG and the accompanying software are available for evaluation online at http://www.trb.org/mepdg/. The software and the manual have been provisionally adopted by AASHTO.



The MEPDG software helps designers select appropriate pavement layer thicknesses for specific site conditions.

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