Florida Department of Transportation Research

Using High-Speed Ground Penetrating Radar for Evaluation of Asphalt Density Measurements
BDK05

The layers of pavement on a roadway must meet certain construction specifications to ensure public safety and provide the expected level of service to the roadway user. Verifying the proper placement and compaction of an asphalt mixture can be a challenge. The traditional method for testing the final product includes sampling five randomly located 6-inch diameter roadway cores from every 500 to 1,000 tons of pavement. This technique is not only tedious and destructive, but density measurements only include the locations where the cores are taken.

An alternative method has been investigated utilizing ground penetrating radar (GPR) in the hopes of reducing the amount of coring required and providing continuous density measurements. GPR is growing in acceptance among highway agencies and industry as a means of providing continuous pavement information in a nondestructive manner.

The Florida Department of Transportation (FDOT) has been at the forefront of GPR research, initially investigating GPR in the 1990s as a tool for obtaining pavement data. FDOT also has used GPR technology to assist with forensic investigations, determine the extent of sinkhole activity, locate subsurface voids, and identify buried utilities. Recently, FDOT implemented a high-speed GPR system to determine the surface layer thickness of pavement.

Researchers from Applied Research Associates, Inc. evaluated the capabilities and limitations of the FDOT GPR system at two new construction sites and one resurfacing project. The study found the system accurately estimated the density of the asphalt pavements. Density contour plots were developed to provide a visual presentation of the data and assist with identification of areas with low and high densities. Researchers also developed optimal steps for operating the GPR system.

The GPR system operates 12 to 20 inches above the pavement surface allowing data collection from a moving vehicle.

Initially, the GPR system will require site cores for calibration purposes although a reduction in the coring frequency may be possible in the future. GPR technology has numerous benefits to assist FDOT and contractors. The GPR system can more efficiently target core locations. Collecting a larger sample of measurements provides a more accurate representation of asphalt densities, and contour plots offer a visual illustration. The plots also provide a better understanding of the variability of asphalt compaction.

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For more information, visit http://www.dot.state.fl.us/research-center.