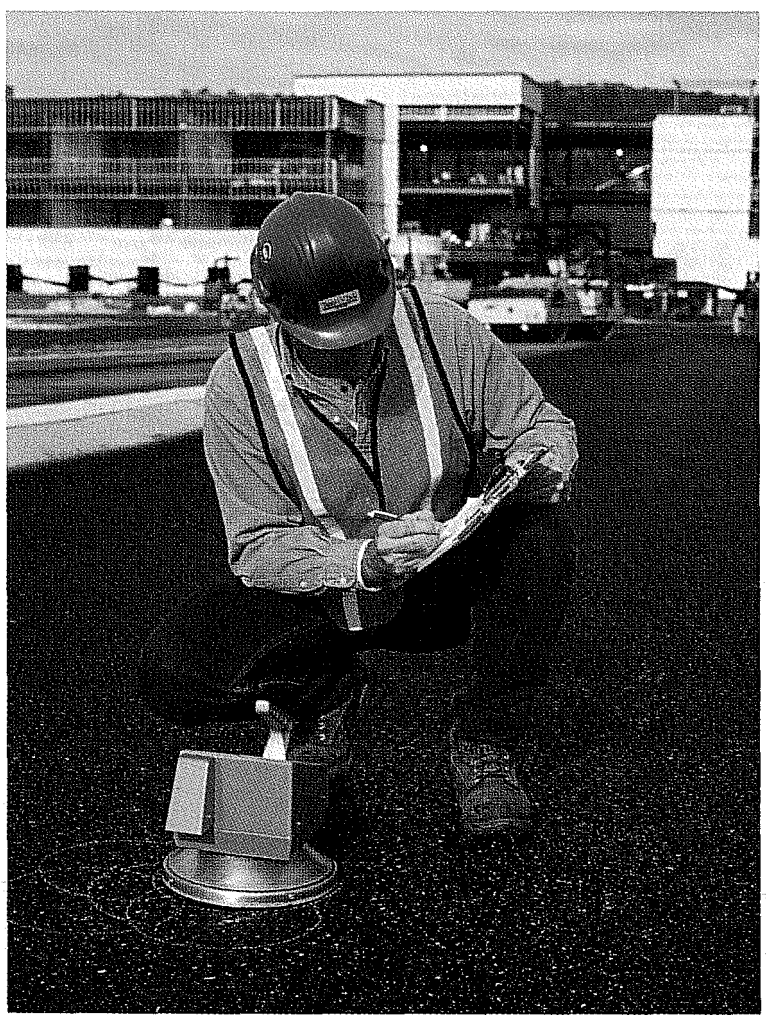
EQUIPMENT PROFILE
ELECTROMAGNETIC GAUGES

While it may not signal the start of a new nuclear non-proliferation treaty, Lafarge Canada has decided to make the switch to electromagnetic gauges for thin lift asphalt pavement measurements.

For years, nuclear gauges have been the standard for measuring moisture and density in asphalt pavements. Nuclear gauges, however, can be slow and cumbersome to operate and operators must have a licence from the Canadian Nuclear Safety Commission to operate them.

Electromagnetic gauges, introduced in 1995 by TransTech Systems of New York, are as accurate as nuclear gauges but provide readings in a matter of seconds rather than minutes so that contractors can keep the pavers rolling. Lighter than nuclear gauges, electromagnetic gauges are also completely safe to use. Operators do not need a license and in fact anybody on the construction site, with some introductory training, can operate the gauge if necessary.



An electromagnetic gauge works on the basis of electro-impedance, explains Joseph Zambito-Orazio of Hoskin Scientific Limited, which is marketing the TransTech PQI in Ontario.

"The dielectric constant of a material is a measure of how electromagnetic signals such as light or radio waves move through a material," he says. "If the property of a material, density for example, changes then so too does the dielectric constant."

"When asphalt is compacted, the volume of air in the mix is reduced and the dielectric constant of the pavement increases, which means that the dielectric constant is proportional to the level of compaction."

"The gauge develops an electromagnetic field that exists somewhere between the AM and FM radio frequencies so transmission safety is simply not an issue. Sensor plates detect the field as it passes through the asphalt; a small computer in the PQI calculates the dielectric constant and converts that into a measurement of the hot mix properties.

"The theory behind the testing equipment is highly complex but the gauge itself is relatively easy to use. All it takes is some quick introductory training and just about anyone can operate the gauge."

Paul Lum, Director of QA for Lafarge's eastern Canadian asphalt operations was more than just an interested observer when he attended a demonstration of the gauge's capabilities at a municipal paving project in Oakville in the Autumn of 2003. He had seen some early reviews of the gauge, which indicated some sensitivity to moisture and temperature and made it difficult to measure compaction when setting up a roller pattern.

"TransTech has upgraded the gauge since we purchased our first unit in western Canada and corrected some of the anomalies. Measuring compaction in the rolling pattern to set up the number of passes is so important for mat quality.

We needed to be convinced that the electromagnetic gauge would stack up against the traditional thin lift nuclear gauge before we invested in new equipment," he says.

Once assured of the gauge's accuracy, embracing some of its other advantages was an added bonus.

"By replacing nuclear gauges, we can reduce some of our federal licensing requirements and eliminate the storage, handling, and safety training that we had to do," says Lum. "But what we really like is the fact that once calibrated these gauges are very easy to operate. We want our roller operators to be responsible for ensuring compaction in the HMA mat and because they can use these gauges without any trouble it takes us one step closer to meeting that objective."

Lafarge Canada has two electromagnetic gauges in western Canada and recently bought its first electromagnetic gauge for Ontario. Its objective is to eventually replace all its asphalt nuclear thin lift gauges with electromagnetic gauges. ■