

Purchase of Light Weight Deflectometer (LWD)

Recipient: Concrete Masonry & Hardscapes Association

Grant: \$10,000

Completion: 2022

Project Summary: 33



Background and Need

Lightweight deflectometers (LWDs) have been around since the 1980s. They are seeing increased use by state DOTs (e.g., Indiana, Minnesota, Nebraska, Florida, etc.) and by municipal road agencies to measure the stiffness of compacted soil subgrades and aggregate bases. ASTM test methods govern their calibration and use. LWD use is becoming the preferred test method because measured deflection relates directly to pavement base and subgrade stiffness whereas the current standard of practice is to use a nuclear density gauge to measure density, to indicate stiffness and the potential for deflection. Open-graded aggregates (OGA) used in permeable pavements present additional problems for the use of a nuclear density gauge. It is almost impossible to insert the radiation source rod into OGA. This requires the operator to use the gauge in backscatter mode, which provides highly variable readings caused by irregular voids, odd angled faces, and particle shapes in the aggregate.



Figure 1- LWD used to verify compaction on the ICP on Open-graded base research project, Fact Sheet 29.

For these reasons, the Foundation funded research (~\$150,000) by Oklahoma State University (OSU) for developing an LWD test protocol and a draft ASTM test method for open-graded bases for permeable pavements. See Fact Sheet 30 for more information on the Developing Deflection Acceptance Criteria for Compacted Open-graded Aggregate (OGA) Bases for Permeable Pavements Using LWD research project.

Objectives

Given this research investment, the objective is to show the industry that LWDs are affordable and simple to use especially compared to the complexities and limitations associated with nuclear density gauges. This can be accomplished by communicating this technology to as many different venues as possible. These include the following:

- CMHA contractor education programs for ICP and PICP including instructor training and student manual upgrades
- Create short instructional videos – include in DOT PICP web resources now underway
- Demo at Hardscape North America...before and after vibrating plate compaction
- Demo at ASCE and at other stormwater and pavement

conferences

- Correlate deflections of ICP and PICP installations to pattern, age and traffic, joint widths and other condition indicators
- Measure deflection differences in jointing sands (saturated or not) and polymeric jointing sands.
- Use on Foundation research and construction projects.
- Allow members to borrow for demos at member sponsored training events.

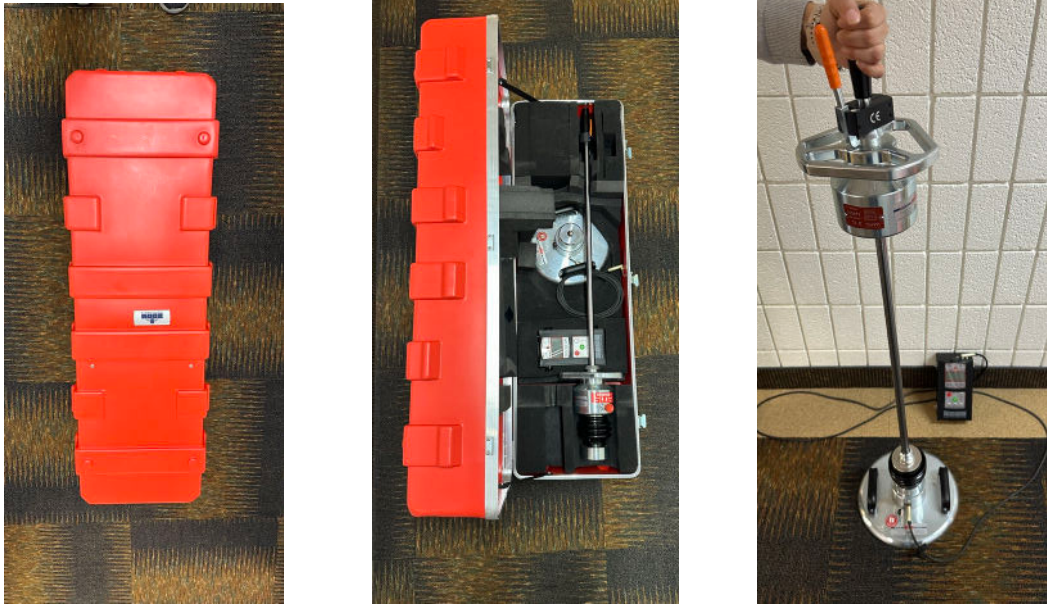


Figure 2: Zorn Lightweight Deflectometer purchased by the ICPI Foundation

Outcomes

The acquired Light Weight Deflectometer (LWD) is ready for deployment and has been utilized in numerous demonstrations and Foundation Research projects including those detailed in Fact Sheet 18: Winter PICP Deicing Study, Fact Sheet 19: PICP Restoration Study, Fact Sheet 24: ASCE PICP Retrofit and Fact Sheet 29: ICP on Open Graded Base. LDW's are well on their way to meet the goal of elevating the standard of pavement base construction by establishing a correlation between measured deflections and outcomes, rather than relying on complex testing using a nuclear density gauge or subjective and inherently variable techniques such as "two passes of a 10-ton vibratory roller compactor".

Members have the opportunity to borrow the equipment for showcasing at their individual events or utilizing it on demonstration projects. The unit remains readily available, and it is our intention to encourage members to make full use of it for their various needs and endeavors.

For further information on borrowing the Light Weight Deflectometer please contact Bryan Horr at bhorr@masonryandhardscapes.org.