

Project Capsule

24-1C



October 2024

Investigation of Piezoelectric and Other Advanced Sensors in Concrete

PROBLEM

Compressive strength testing of concrete has been the hallmark of portland cement concrete acceptance for over 100 years. Even with the advances in maturity sensors, compressive strength testing comprises the vast majority of acceptance testing for strength purposes, both in private and public sector placements. Advancements in sensor type and capabilities are rapidly evolving with two new commercially available sensors on the market that are reportedly able to measure the in-place compressive strength of portland cement concrete without the use of maturity, etc.

New non-destructive testing (NTD) of portland cement concrete has the potential to eliminate the need for cylinder casting, testing of hardened concrete, etc., potentially saving DOTD time and money.

OBJECTIVE

The overall objective of this study is to determine if these new sensors measure in-place compressive strength of concrete as stated. Other advanced sensors will be investigated as well.

The specific objectives of this research are as follows:

1. Review the state-of-the practice for piezoelectric and other NDT compressive strength sensors
2. Review the state-of-the practice for in-situ surface and bulk resistivity sensors
3. Laboratory testing of sensors
4. Field testing of sensors
5. Cost-benefit analysis of adopting new technology, providing it is feasible



Figure 2. Wavelogix REBEL Sensor



Figure 1. Giatech SmartRock Pro Sensor

Start Date

July 1, 2024

Duration

24 months

Funding

SPR: TT-Fed/TT-Reg - 6

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METHODOLOGY

To fulfill the objectives of this study, the research team will begin with a comprehensive literature review to determine the availability of NDT sensors and their applicability for use in measuring concrete properties. They will then conduct a laboratory evaluation of selected mixtures. Following this evaluation, the team will perform field testing of the selected sensors.

After performing field testing, the research team will conduct a data analysis, followed by a cost-benefit analysis. Finally, they will prepare a final report that will detail the findings of the study.

IMPLEMENTATION POTENTIAL

It is anticipated that the results of this study will greatly assist DOTD in determining whether to allow and implement various forms of non-destructive testing of concrete compressive strength and resistivity.



Figure 3. Wavelogix Sensor