



# OKLAHOMA Transportation

## Office of Research and Implementation FFY2027 Request for Proposals

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**Reference SPR Item # 2505**

*Research Problem Statement Title:*

### **Evaluating Strength Sensors in Concrete**

*Problem Statement:*

Technology for temperature-based maturity sensors has been around since 1980 but there is little data about the sensors and how their results compare to compressive strength testing.

We are looking to determine if the sensors can accurately predict in-place concrete strength at 1 and 3 days for early opening to traffic to help reduce traffic delays for new construction and also evaluate the accuracy in compressive strength between the lab tested cylinders and the data being reported by the sensors at 7, 28 and 56 days.

We are hoping this will reduce the amount of compressive strength testing needed on a project and provide more accurate results as cylinders do not have the same conditions as in-place concrete.

*Proposed Research:*

This research will evaluate two emerging in-place concrete strength sensing technologies: WaveLogix Rebel Sensor, which measure changes in the concrete by measuring the stiffness of the concrete, and Giatec + Smart Rock Sensor, which measure changes in the concrete by using resistivity and temperature. As there is little independently published data on either of the sensors, this research project aims to collect lab and field data for side-by-side validation and cross-comparison to true in-

place strength (cores vs cylinders vs sensors). A range of concrete mix designs will be evaluated to assess sensitivity to mix design variables (w/c ratios, SCMs, admixtures). In addition to accuracy, this research will evaluate data reliability (including signal stability, data completeness, and sensor variability) and ease of deployment (including installation complexity, durability, and data accessibility). These factors will be quantified to assess the practicality of implementing each technology.

#### *Suggested Tasks (to include but not limited to):*

To achieve the project objectives, the following tasks are proposed:

Task 1: Conduct a literature review on sensor technology.

Task 2: Perform laboratory testing using pavement and bridge deck mixtures.

Task 3: Conduct field testing to compare embedded sensors with cylinders and core samples.

Task 4: Evaluate the effectiveness and reliability of the sensors.

Task 5: Provide recommendations to ODOT.

#### *Implementation:*

If successful, this research could lead to the use of the sensors in road and bridge projects to predict the strength of the concrete. This would lead to better decision making for opening of new roads and bridges, protecting ODOT's assets and benefitting the driving public.

#### *Benefits:*

This work will examine the use of non-temperature-based sensors to predict the strength of concrete. If these sensors are found to be valuable, then this can reduce testing costs and provide valuable information to ODOT. Testing two different sensors will provide ODOT with more choices to implement the technology.

#### *Deliverables:*

All projects require submission of the following reports:

- Monthly Progress Reports

- Year-End Annual Report (for multi-year projects)
- Draft Final Report (Microsoft Word and ADA-accessible Adobe Acrobat .PDF formats)
- Final Report (Microsoft Word and ADA-accessible Adobe Acrobat .PDF formats)

The Year-End Annual Report, Draft Final Report, Final Report, and Color Article must comply with all federal and state accessibility requirements, including but not limited to:

- Oklahoma State Statute 62 § 41.5e
- The Americans with Disabilities Act (ADA) of 1990, 42 USC § 1201 et seq.

The Principal Investigator (PI) is also required to participate in the following project meetings:

- New project initiation meeting
- Semi-annual project meeting
- Close-out project meeting
- Continuing project meeting

Estimated project duration: Twelve (12) months.