

NSF Research Experience of Teachers (RET) Site at UT Arlington: A summer STEM teacher project on concrete structures evaluation for sustainability

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Abstract

The 2022 Research Experiences for Teachers (RET) Program on Sustainable and Resilient Infrastructure for Urban Communities at the University of Texas at Arlington (UTA) included teachers from schools within the Dallas/Fort Worth Metroplex and included projects that focused on areas such as concrete structure corrosion, infrastructure sustainability, transportation technology, web-based power monitoring, green buildings, and materials production. The current study focused on determining if we can efficiently use rapid Non-Destructive Evaluation (NDE) scanning to quantify steel rebar corrosion in concrete structures. Deterioration of steel rebar reinforcements may not always be visible on the surface. NDE methods are required to reduce damage and calculating the health of the structure. Research goals included calculating the corrosion quantity and determining the impact rebar diameter, humidity, and period of accelerated corrosion has on steel within concrete structures. Procedures for the project included determining how to find the percent mass lost in a particular rebar over time after gathering sample data using Ground Penetrating Radar (GPR) and iCOR technologies. We scanned three different samples with the equipment and entered the resulting values into predictive corrosion loss equations. To account for both equipment parameters, we used a combined equation to calculate the true percent of rebar mass lost to corrosion. The iCOR device is a wireless corrosion measuring device that uses a grid pattern to read values into the iCOR software. Data can then be exported in a summary file for statistical analysis. One of the limitations with the iCOR device is that it requires the concrete sample to be wet but cannot have standing water on the sample for accurate data collection. Students will use data to calculate a regression line and use it to estimate the corrosion level for simulated humidity levels. This data will be used over the course of several lessons for high school students to learn new concepts while making predictions based on research.