# Exhibit D

**Research project name: Evaluating Scanning Technology for Process Monitoring and Quality Control in Precast Concrete Fabrication**

**Recipient/Grant (Contract) Number:** University of Illinois Urbana-Champaign / Louisiana State University / Grant Number 69A3552348333

**Center Name:** Transportation Infrastructure Precast Innovation Center (TRANS-IPIC)

**Research Priority:** Improving the Durability and Extending the Life of Transportation Infrastructure

**Principal Investigator(s):** Isabelina Nahmens and Laura Ikuma

**Project Partners:** Tindall Corp and FARO Technologies

**Research Project Funding:** $101,993.00 ($64,985.00 Federal and $37,008.00 Non-Federal)

**Project Start and End Date:** 09/01/2023 – 08/31/2024

**Project Description:**

Precast concrete (PC) elements are used throughout construction, including transportation. PC is one of the most efficient, versatile, and reliable construction materials manufactured today. The fabrication of PC products offers an ideal controlled environment to manufacture consistently defect-free products. This strategy also helps to eliminate weather delays, lost productivity claims, and other disruptions. Transportation developers, owners, and general contractors demand complete and accurate project documentation, proof of progress, and quality throughout the lifecycle. Quality control (QC) must be integrated into the PC fabrication process to ensure efficiency and a high-quality product that is mistake free at the construction site.

The proposed work addresses construction and transportation industry needs with large-scale experimental testing of QC protocol with three-dimensional scanning. This represents the first time where this advanced technology is being investigated for widespread use in the PC industry. The team has partnered with Tindall Corp. to test the new strategy.

**US DOT Priorities:**

This work aligns to TRANS-IPIC/USDOT priorities in Construction Methodologies and Management by improving the durability and extending the life of transportation infrastructure using technologies within the PC fabrication. An efficient QC method that ensures consistent high quality PC products delivered to site will have an impact in the PC and transportation industry by reducing cost and time constraints. Furthermore, use of PC products will be expanded within the transportation industry.

**Outputs:**

The major implementable outcome will be a guide for QC processes using state-of-the-art scanning technologies on PC components prior to leaving the fabrication facility, thus reducing unnecessary costs from transporting defective pieces to the site. Automation further reduces time and personnel required at the facility and provides an objective, consistent measure of quality.

The guide will include a rationale for selecting the measurement technology, steps of the QC process, and description of how to analyze and interpret the resulting data. This guide can be used by other PC companies to improve quality in PC components used in transportation infrastructure systems.

**Outcomes/Impacts:**

By improving quality of PC components, this research contributes to the durability and lifespan of transportation infrastructure. The major implementable outcome will be a guide for QC processes using state-of-the-art scanning technologies on PC components prior to leaving the fabrication facility. The processes can reduce unnecessary costs from transporting defective pieces, and automation further reduces time and personnel required at the facility and provides an objective, consistent measure of quality. The guide, which can be used by other PC companies, will include a rationale for selecting the measurement technology, steps of the QC process, and steps for analyzing and interpreting the data.

**Final Research Report:** URL link to the project's final report will be provided upon the completion of the project.