# Exhibit D

**Research project name: Design and Implementation of Digital Twin Models for Continuous Monitoring and Performance Prediction of Precast Concrete Bridges**

**Recipient/Grant (Contract) Number:** University of Illinois Urbana-Champaign / 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):** Volodymyr Kindratenko, Bassem Andrawes

**Project Partners:** none

**Research Project Funding:** $97,500.00 ($65,000.00 Federal and $32,500.00 Non-Federal)

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

**Project Description:**

This research project aims to design and validate a digital twin model of a precast concrete bridge structure, subsequently integrating this model with sensor data derived from a real-world bridge. This integration will serve as the foundation for driving the simulation and analysis of the bridge model. The digital twin model will be constructed utilizing NVIDIA Omniverse, an innovative platform that facilitates the creation of collaborative and immersive 3D objects, equipped with real-time simulation capabilities. Once developed, this model will play a focal role in the monitoring of bridge structures. It will empower researchers with the ability to rapidly assess infrastructure and conduct predictive analysis. This will be achieved by combining sensor and environmental data with the simulation, thereby fostering a comprehensive understanding of the bridge's structural integrity and potential future scenarios.

**US DOT Priorities:**

This research project is addressing the requirements and attempts to overcome the challenges highlighted in the Transformation priority area, particularly within the realm of Data-Driven Insight research. The development and implementation of digital twin models for transportation infrastructure is a central component of this project, aiming to leverage advanced data collection and processing capabilities. This will facilitate the generation of timely, accurate, and credible information that is easily accessible, thereby supporting informed decision-making in transportation. The digital twin model, once developed, will play a crucial role in evaluating, forecasting, and strategizing for potential changes within the transportation system. This approach aligns with our commitment to harnessing data-driven insights to optimize and future-proof our transportation infrastructure.

**Outputs:**

In the course of this research project, we will construct a digital twin model for a precast concrete bridge structure and establish a connection with sensor data gathered from an existing bridge. Additionally, we will incorporate environmental data (including weather conditions) from the region where the bridge is located, as well as transit data sourced from platforms such as Google Maps or equivalent resources. This model will serve as the basis for developing methodologies for virtual monitoring of the bridge structure. Furthermore, it will be instrumental in predicting the bridge's performance and maintenance requirements over time, thereby enabling proactive and data-driven infrastructure management.

**Outcomes/Impacts:**

The proposed research is expected to facilitate the exchange and analysis of data crucial for evaluating safety risks associated with transportation systems. It will provide support for investment decisions, enhance system operations, and monitor the long-term performance of the transportation system. In essence, this project aims to leverage data-driven insights to improve the safety, efficiency, and longevity of our transportation infrastructure.

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