Exhibit D

Research Project Submission Template

Recipient/Grant (Contract) Number: University of Illinois Urbana-Champaign / Louisiana State University / Grant No.: 69A 355 234 8333

IMPROVING TEMPORARY TRAFFIC CONTROL SYSTEMS IN HIGHWAY CONSTRUCTION ZONES WITH PRECAST CONCRETE INSTALLATION STRATEGIES USING TRAFFIC FLOW SIMULATION OF LANE CLOSURES

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

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

Principal Investigator(s): Bhaba Sarker

Project Partners: N/A

Research Project Funding: $105,000 ($70,000 Federal and $35,000 Non-Federal)

Project Start and End Date: 01/16/2026 – 01/15/2027

Project Description:

Highway construction zones often cause traffic congestion, safety risks, and delays, especially when work is rushed or poorly timed. In many cases, construction is scheduled at night to avoid daytime traffic, but this can lead to safety concerns due to low visibility, tired workers, and increased risk of mistakes. Current planning methods often rely on fixed schedules and do not adapt well to real-world traffic conditions or the challenges of handling, manufacturing and/or assembling large precast components used in modern roads and highways projects. The goal of this research is to improve how construction is planned and carried out during the project duration by using smarter scheduling and better coordination of tasks. The specific objective of the study is to develop a smart planning approach that helps schedule road construction activities related to precast installation more efficiently by minimizing the need for night shifts which will focus on understanding how traffic builds up near construction zones and finding ways to reduce delays and improve traffic flow along with worker's and driver's safety. The project will deliver practical strategies and guidelines to help transportation agencies plan safer, faster, and more reliable road construction with minimal disruption to the public.

US DOT Priorities:

Highway construction zones are among the most critical points of disruption in modern transportation networks, often leading to significant traffic congestion, elevated crash risks, delays in project delivery, and potential compromises to the durability of transportation infrastructures constructed using various precast components, due to inefficient handling, storage, or installation practices during periods of high congestion and rushed operations. In Baton Rouge and much of Louisiana, it is common to keep at least two lanes open next to construction zones. While this helps traffic flow, it makes site logistics more complex and reduces space for safe and efficient work. Many projects are also shifted at night to avoid peak traffic, but night work introduces risks such as poor visibility during precast installation, worker fatigue, and drowsy driving, all of which can compromise construction quality and safety. Despite efforts by agencies like FHWA (Federal Highway Administration) and state DOTs (Department of Transportation), current work zone practices often rely on static assumptions and lack integration with real-time traffic and optimized construction modeling. This research addresses these inefficiencies through data-driven models and aims at enabling well-coordinated, high-quality daytime construction to improve safety, reduce disruptions, and enhance long-term infrastructure performance. Furthermore, accurate zoning and phase-specific coordination will reduce worker exposure to live traffic and help agencies comply with safety and quality regulations, while extending the lifespan of transportation infrastructure constructed with precast concrete. This approach supports the broader goal of transitioning toward smarter, safer, and more sustainable construction practices for highways and interstates.

Outputs:

- TCM model simulates traffic congestion at lane closures using probabilistic delivery and installation timelines to identify critical delays affecting both flow and precast quality.
- PCS model optimizes the coordination of precast deliveries and installations to minimize on-site congestion, avoid traffic peak periods, and enhance safety and reliability.
- WPS model uses simulation tools like VISSIM, CORSIM and Simio to evaluate how coordinated strategies of assembling precast impact traffic flow, work-zone operations, and overall infrastructure performance.

Outcomes/Impacts:

1. The TCM phase will enable improved lane closure scheduling to reduce peak-hour queuing and rushed precast installations, enhancing the durability and safety of transportation infrastructure.
2. The PCS phase will deliver just-in-time coordination strategies for precast delivery and installation, minimizing on-site risks and supporting structurally reliable and safe infrastructure.
3. The WPS phase will produce validated simulation-driven guidelines for optimizing traffic flow and construction logistics, directly improving the long-term safety and durability of precast-based transportation systems.

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