# Exhibit D

**Research Project Requirement Template**

**Research project name: Exploring Fungal-Induced Carbonate Precipitation (FICP) for Healing Concrete Cracks**

**Recipient/Grant (Contract) Number:** University of IllinoisUrbana-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):** Hai Lin

**Project Partners:** NA

**Research Project Funding:** $97,502 ($64,999 Federal and $32,503 Non-Federal)

**Project Start and End Date:** 01/01/2024 – 12/31/2024.

**Project Description:**

Concrete structures can develop cracks during early-stage curing and long-term aging processes, reducing load-bearing capacity and affecting the service life of concrete structures. This research aims to explore fungal-induced carbonate precipitation (FICP) to heal cracks and improve the durability of concrete. FICP is a natural biomineralization process involving calcifying fungi's metabolic activities to induce CaCO3 precipitation. This research investigates the performance of several fungal strains (e.g., their growth behavior and efficiencies of FICP versus time) on the surface of cement mortar. The optimal fungal strain will be used to assess its healing capability on concrete cracks.

**US DOT Priorities:**

Most literature papers on fungal-induced concrete self-healing studied the effect of concrete environment (i.e., high alkaline condition) on the livability of fungal mycelium. No studies have experimentally investigated the crack-healing ability of fungal mycelium, which will be explored in this project. This research will advance FICP for healing concrete cracks, which holds promise in improving the durability of the precast concrete (PC). This research will also have a high potential to minimize the life-cycle costs for maintaining PC transportation infrastructure for state DOTs.

**Outputs:**

The research results will evaluate the feasibility of fungal-induced carbonate precipitation (FICP) for healing concrete cracks. The processes, methods, and test results will be published in one journal and one conference paper submitted to the Cement and Concrete Composites and/or Transportation Research Board.

**Outcomes/Impacts:**

The ultimate goal of this research is to commercialize the FICP treatment process for concrete crack healing. If successful, a patent, including the description and method of the technique, will be filled. This research is closely aligned with TRANS-IPIC'S research priority area, which is improving the durability of the precast concrete (PC).

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