Research Project Name: Novel concretes made using supplementary cementitious materials and seawater (UM)

Improving the Durability and Extending the Life of Transportation Infrastructure

Principal Investigator:
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Project Partners: N/A

Research Project Funding:
Federal: $46,986 Match: $23,439 (UM)

Project Start Date: 01/01/2026 **Project End Date**: 12/31/2026

Project Description: The production and curing of concrete utilizes billions of tons of freshwater every year. This is a major concern, especially in regions with water shortfalls. We have previously explored seawater-mixed concretes, and shown promising performance of such concrete, as long as steel reinforcement is not used. The objective of this research project is to show a proof-of-concept of using supplementary cementitious materials (SCMs) and seawater.

Specifically:

- Cement pastes will be designed with 60% PLC, 20% limestone, and 20% fly ash as binder. Freshwater and seawater will be compared. Cement paste hydration will be studied using isothermal calorimetry (7 days), thermogravimetric analysis and Fourier-transform infrared spectroscopy (up to 91 days).
- Cement mortars will be made and the flow measured in fresh state; and strength and bulk resistivity will be measured up to 91 days.
- Concretes will be made and their slump, air content, and density measured in fresh state, and strength, and bulk resistivity will be measured up to 91 days.
- In total four mixtures with varying water types will be tested to develop concrete utilizing SCMs and seawater that maintains performance with respect to control concrete mixtures.

US DOT Priorities: *Section left blank until USDOT's new priorities and RD&T strategic goals are available in Spring 2026.*

Outputs: Suraneni has established collaborations with various start-ups and with the UM marine school. If the results are promising, it is expected that the major challenge would be logistical in nature: how can seawater be reliably supplied to concrete companies. We have organized previous workshops that were well attended. We will bring together cement and concrete companies to evaluate how such a technology can be scaled, and how to tackle the above logistical question.

Outcomes/Impacts: In this project, we combine two technologies: supplementary cementitious materials (SCMs) and seawater to develop durable concrete that is ideal for coastal regions. We expect to see synergies between SCM and seawater, thus allowing for large clinker replacements, without compromising performance. Additionally, seawater will act as an accelerating admixture, thus reducing costs while still providing durable concrete.

Final Research Report: URL to final Report will be provided upon completion.