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CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION
TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

Further Development and Piloting of Supplementary Cementitious Materials in Concrete

Evaluating and advancing new supplementary cementitious materials for durable, sustainable concrete.

Pavement

November 2025

Project Title:
Partnered Pavement Research Center (PPRC) 23: Recycling

Task Number: 4258

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WHAT IS THE NEED?

Traditional supplementary cementitious materials (SCMs) such as coal fly ash and blast-furnace slag are essential for reducing Portland cement content and improving concrete durability. However, fly ash supplies are declining with coal-plant closures, and slag availability cannot meet growing demand. California and other regions may offer alternative SCMs – calcined clays, volcanic ashes, biomass ashes, recycled glass, and historic deposits – but their chemical properties vary by source. This study seeks to identify, test, and characterize these local materials so they can reliably replace conventional SCMs in pavements, flatwork, and concrete structures.

WHAT ARE WE DOING?

The work breaks down into four main areas:

- Identifying and sourcing SCM candidates from California and other regions, including biomass ashes and glass.
- Laboratory testing and characterization of each material's reactivity, durability, and optimal replacement rates in concrete mixtures.
- Constructing and instrumenting trial slabs to gather field performance data for pavement, curbs, pipes, and flatwork designs.
- Updating life cycle cost and environmental assessments to compare new SCM options against existing materials and formulating recommendations for pilot projects.

WHAT IS OUR GOAL?

The main goal of this study is to develop clear guidance and

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specification language for using alternative SCMs in concrete pavements and related applications, ensuring performance, sustainability, and cost-effectiveness match or exceed the current standard materials.

WHAT IS THE BENEFIT?

By validating locally available SCMs, the California Department of Transportation (Caltrans) can reduce reliance on dwindling fly ash and slag supplies, lower the carbon footprint of concrete, and maintain or improve durability. This supports California's sustainability goals and helps keep concrete production both green and resilient.

WHAT IS THE PROGRESS TO DATE?

The research team has made the following progress:

- Established and maintained a comprehensive library of SCM samples from multiple suppliers.
- Screened new SCM samples for pozzolanic reactivity.
- Completed most concrete performance testing, including Alkali-Silica Reaction testing and mechanical testing for natural pozzolans, biomass ashes, and other SCMs.
- Constructed and instrumented the first set of SCM test cells and began ongoing field performance monitoring, with planning underway for additional placements.
- Advanced coordination with Materials Engineering and Testing Services and the Office of Concrete Pavements toward incorporating updated SCM testing and acceptance criteria into Caltrans specification frameworks.