

Pavement

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Project Title:
PPRC20: Sustainability

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2024

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Further Development Towards Implementation of Likely Supplementary Cementitious Materials

Enhance implementation readiness and mainstream use of likely Supplementary Cementitious Materials in California and other states for concrete pavement

WHAT IS THE NEED?

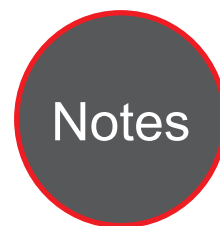
Supplementary cementitious materials (SCMs) from industrial by-products can partially replace high-carbon Portland cement and improve the durability of concrete by consuming calcium hydroxide and producing secondary calcium-silicate-hydrates that refine the pore system and reduce the permeability of concrete. However, supplies of fly ash, the most used SCM, are declining due to regulatory restrictions on coal-fired power plants. Another accepted SCM is ground granulated blast furnace slag from steel making, but its insufficient supply does not support the US and global demand. Therefore, there have been efforts to find alternative SCMs such as calcined clay, volcanic ashes, and ash from waste biomass. However, these materials vary in chemical composition depending on location and source material, and some are local to certain areas and thus are expensive or not available. In an ongoing study, likely SCMs are identified in California and other regions for mainstream use in concrete pavements. A parallel study will be looking at remined fly ash from historic deposits and recycled glass. A follow-on study to the review of calcined clay, and volcanic and biomass ashes is required to advance likely SCMs' readiness through testing and characterization for mainstream implementation in concrete pavements, culverts, pipes, curbs and gutters, and flatwork associated with vehicle and active transportation.

WHAT ARE WE DOING?

- Extend information gathering and practice survey to newly identified likely alternative SCMs (ASCMS) beyond those assessed in 4.84



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- Continue the sample collection, material characterization and determination of suitable fineness
- Preliminary concrete performance evaluation beyond those to be tested in 4.84
- Preliminary environmental and economic assessment on more ASCMs than those assessed in 4.84

WHAT IS OUR GOAL?

The goal of this project is to enhance implementation readiness and mainstream use of likely SCMs in California and other states for concrete pavements, including performance engineered mixture design and field testing and validation.

WHAT IS THE BENEFIT?

Identify sources of SCMs from California and other states for concrete pavement construction in lieu of diminishing standard fly ash and slag.

WHAT IS THE PROGRESS TO DATE?

As of February 2023, the research team has made the following progress:

- Completed literature and practice surveys. Prepared report and submitted to UCPRC editor.
- Continued to collect samples of ashes and alternative SCMs for testing. Continued reactivity testing and characterization of ashes including available alkalis and ASR evaluation.