INNOVATIVE CEMENTS AND CEMENTITIOUS MATERIALS

As the composition of cementitious materials changes at rates far faster than in the past, a number of questions are raised. This document provides a brief review of some of these questions and discusses activities that the CP Tech Center is engaged in to develop and implement answers.

What properties and performance metrics do state agencies use to decide whether to add a new cement or supplementary cementitious material (SCM) to their approved materials lists?

We are developing a series of tech briefs to help agencies assess cements and SCMs under a cooperative agreement with the Federal Highway Administration (FHWA).

What tools can agencies and users use to monitor the acceptability and uniformity of cements and SCMs being delivered to a batch plant or site?

We are developing a suite of field tests that will help assure concrete producers, contractors, and agencies that a given delivery will perform similarly to the product approved during the preconstruction phase. A key factor is to understand how much variability in cements and SCMs will cause significant changes in mixture performance. This work is being conducted under the cooperative agreement with FHWA.

There is discussion regarding the variability in the composition of cements both between plants and between loads from a single plant. We are working with the National Concrete Consortium (NC^2) to survey cement manufacturers to understand the variability in limestone content between loads within a single plant. Another survey is being conducted among state agencies to gather and review data about locations where distress has been reported and to evaluate whether there is any correlation with cement composition or variability.

We are working with NC^2 to fund a research project to better understand the behavior of the range of portland-limestone cements (PLCs) available today and how they interact with SCMs and admixtures under different conditions.

How do structural designers accommodate the performance of concretes made with innovative cements and SCMs in their models?

Some factors such as modulus of elasticity, creep, and shrinkage may vary across different materials. Work is planned to investigate whether this is so and what changes in models or practices are needed. This work will be funded through a cooperative agreement with the Federal Aviation Administration (FAA).

How do concrete suppliers develop mixtures made with new cements that meet concrete performance requirements?

Changes in water demand are impacting mixture performance, and assistance is needed for batch plants to develop mixtures that meet all performance requirements. CP Tech Center staff are available to assist upon request. A future task under our cooperative agreement with FHWA is focused on developing an updated mixture design methodology.

How do concrete contractors work with mixtures made with innovative cements and SCMs?

It appears that changes in workability, along with set time, bleed, and finishing practices, are impacting the quality of concrete slabs on grade. The CP Tech Center is engaged in a rigorous forensic study of pavements built in an Iowa city in 2023 and 2024 to identify the causes of observed distress. This work is being conducted under the cooperative agreement with FHWA. We are also available to assist with reviewing reports and data that may be provided to us. Additionally, we are planning to develop and implement tools to aid finishing crews in doing their work well while allowing for changes in the properties of the mixtures they are receiving. This work is funded through the Performance Centered Concrete Construction (P3C) transportation pooled fund.

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