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Adding Materials to Concrete to Reduce Shrinkage Cracking

New method can eliminate or reduce cracking in concrete

What Is The Problem?

One of the fundamental characteristics of concrete is that it shrinks as it cures. This can lead to cracking if placements are not properly designed and planned. Another major issue with concrete shrinkage is that it is a major cause of cracking in concrete repair materials.

Reclamation needs crack-free concrete repairs to extend the life of our aging infrastructure. Thus, finding effective ways to make concrete repairs with cementitious materials that will not crack are vital to lengthen the life of a repair and ensure structural stability.

What Is The Solution?

The Missouri River Basin Project, Solomon Division, Glen Elder Unit in Kansas, with supporting funding from the Science and Technology Program, worked with the prime contractor to allow Premier Magnesia, LLC, to conduct a field test of their new shrinkage-reducing concrete additive.

Where Have We Applied This Solution?

In May 2011, we tested the additive at Glen Elder Dam, a dam across the Solomon River in north-central Kansas.

The repair consisted of removing deteriorated concrete from the approach apron using hydrodemolition methods and then placing new concrete—with and without the additive—back to the existing lines and grades. In most areas, damaged concrete was removed to a depth of about 6 inches, leaving about 12 inches of the original concrete. In some areas, due to the poor quality of the concrete, it was excavated down to the foundation. We compared results from concrete placements made with the additive to placements without the additive. The replacement concrete without the additive experienced extensive restrained shrinkage cracking. Observations indicated that the cracks appeared within one to two weeks after concrete placement without the additive. However, with the additive, cracking was about 90 percent less and two smaller test placements showed no cracking. Thus, results showed significant reductions in cracking with the new additive.

Who Benefits?

Reclamation can use this additive in many other concrete placements and repairs. We are developing specification language for its use in new concrete construction as well as concrete replacements and repairs. Premier Magnesia, LLC, is also looking into methods to include their product in pre-bagged cementitious repair mortars for smaller concrete repair jobs.



Measuring fresh properties of the concrete after adding the Premier Magnesia additive.

Future Development Plans

We are working to identify other projects that might benefit from using this product. We are also discussing standard concrete technology practices to help implement this technology to make it readily available for users across the country.

For More Information

Memorandum No. MERL 2011-34, Evaluation of New Concrete Shrinkage Reducing Additive for Glen Elder Dam Spillway Inlet Slab Repair.

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Partners

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