

# Waterproofing and Concrete Restoration at Blackwater Dam

by David Jamieson

One of the oldest dams in New England, the Blackwater Dam in Webster, NH, is located approximately 8.6 mi above the confluence of the Blackwater and Contoocook Rivers. It is part of a network of five flood-control dams in the Merrimack River Basin that work together to control flood waters during heavy rains and storms until rivers begin to drop and the stored water can be slowly and safely released. The reservoir has a storage capacity of 15 billion gal. of water.

The U.S. Army Corps of Engineers (USACE), who oversees the property, engaged The Aulson Company to complete major concrete repairs and waterproofing to restore the dam and pedestrian walkway to peak condition after 60 years of deterioration. The USACE had made previous attempts at restoration but was not satisfied with the results.

## The Restoration Challenge

When the Blackwater Dam was built in 1941, the technology used to mitigate expansion and contraction was to install horizontal and vertical joints. No weepholes were provided in the original design to allow drainage back to the channel, so

the flow followed the path of least resistance into and through the joints. Without proper air entrainment, the concrete deteriorated due to years of freezing-and-thawing damage in many of the joints. The challenge was similar to the one Aulson solved at the Franklin Falls Dam for the USACE.

Also, as was a common practice in the 1940s, lime was added to the dam's original concrete mixture. Over the years, this free lime changed to calcium carbonate, a natural chalk substance. This contamination prevented a proper bond with concrete repair materials.

## Restoration Solution

For over 2 years, David Jamieson, Aulson's Vice President of Concrete Repair, worked with



Fig. 1: On the upstream side of Blackwater Dam, cementitious waterproof coating is spray-applied and backrolled with two-coat application by Aulson crewmen



Fig. 2: Aerial view of Blackwater Dam

Joe Colucci, Senior Structural Engineer for the USACE—New England District to extensively test products, preparation, and application methods that would achieve a successful repair bond.

The entire dam was sounded to locate areas of failed concrete. Areas requiring repair were saw-cut at the perimeter and the deteriorated concrete was removed to the depth of sound concrete.

The surface was prepared by heavily sand-blasting and washing to remove the free lime, or efflorescence, from the face of the aggregate and concrete. Different types of repair mortar were immediately applied before carbon dioxide in the air could cause any further carbonation, using either shotcrete or form and pour methods as described as follows.

On the west side of the dam, Aulson's ACI Certified Nozzlemen completed wet-mix shotcrete repairs with Master Builders' Masterpatch 21 repair product.

On the dam's limited-access east side, a form and pump process was used to apply Master Builders' Masterpatch 240 CR bag mixture into the forms. Bag mixture was chosen (versus truck mixture) because the confined area prevented truck entry. Twenty-four pallets (1440 bags) of bag mixture were individually lowered to the area and placed in just 8 h. This fast application saved time and money while achieving the desired results.

The dam's pedestrian walkway was prepared by removing 2 in. of unsound concrete and replacing it with Master Builders' Masterpatch 240 CR. This

repair was moist cured for 28 days. The hot, dry weather posed a major challenge for crews to keep the burlap-covered areas wet for proper curing. Once the area was cured, it was sealed with a waterproof and skid-proof urethane coating from Neogard.

## Dam Good Results

Testing by either coring or hammer testing revealed excellent bond between the substrate and repair mortar. Joe Colucci, USACE Senior Structural Engineer, noted, "The Aulson Company delivered results through a group of professionals who understood the challenge, had the expertise to perform the project, and took satisfaction in delivering quality work. This solution has achieved a long-lasting repair that will keep Blackwater Dam in peak operating condition for many years."



*David Jamieson is Vice President of Concrete Repair and Restoration for The Aulson Company, a full-service specialty environmental and industrial contracting company based in Methuen, MA. Jamieson has over 30 years of industry experience with the products, processes, and techniques of concrete repair—both as owner/operator of a contracting company and as senior project manager for manufacturers and contractors.*

*He is an ACI Certified Shotcrete Nozzleman and an active member of the ASA, currently serving as Co-Chair of the Publications Committee. He may be reached at [djamieson@aulson.com](mailto:djamieson@aulson.com).*