US Army Corps of Engineers

ENGINEER UPDATE

One Team: Relevant, Ready, Responsive, Reliable

Corps repairs 1895 dam at West Point

By JoAnne Castagna
New York District

The history of the U.S. Army Corps of Engineers has always been intimately connected with the U.S. Military Academy at West Point, and remains so to this day.

In 1802, the Unified Corps of Artillerists and Engineers divided, and the U.S. Army Corps of Engineers was formed. At the same time, the U.S. Military Academy at West Point was founded under Corps supervision.

West Point left Corps control in 1866, but the Corps of Engineers remains a vital part of the academy as we build, upgrade, and maintain its facilities. This past winter, New York District began restoring a historic dam and reservoir, near the shore of the Hudson River on the campus to ensure a continuous fresh water supply, and to prevent a potential flooding hazard.

A contractor removes calcite build-up from Lusk Dam's masonry with a high-pressure spray of silica suspended in water.

In the late 1800s, the academy needed an additional source of drinking water. The Corps augmented the academy's drinking water system by building the Lusk Dam and Reservoir in 1895, now considered significant elements within West Point's National Historic Landmark property.

The dam was built under the direction of Captain James Lusk, a West Point graduate. Water is piped in from area ponds, creeks, and brooks into this reservoir, and the water is purified by the academy's water treatment plant.

The dam is a large arched masonry block structure, 225 feet long and 35 feet high. A few years ago a Corps inspection found leaks behind a build-up of efflorescence, which raised concerns that there could be a more serious future problem if the dam were left unmonitored.

Since the dam is upstream and beside several high-occupancy academy facilities, such as the Association of Graduates building, any potential structural problems are unacceptable.

Last winter, New York District, assisted by Baltimore and Philadelphia districts, performed the

dam's first cleaning in its 100 years of service. The joints on the downstream face of the dam were cleaned of efflorescence, which is crystallization that had accumulated on its surface. Leaks that had been covered by crystallization were located, cleaned, and sealed. The cleaning gave the Corps a "fresh face" to observe and categorize leaks currently present at the dam, and determine any further repairs that may be needed.

"Efflorescence is caused by calcium carbonate in the dam's mortar dissolving in the reservoir water," said Marty Goff, project engineer. "The water up there is slightly acidic so it reacts chemically with the mortar between the dam's stones. When efflorescence builds up on the stones, it becomes difficult to determine the location of leaks because water from the leak moves under the efflorescence crust and away from the leak source. By cleaning away the efflorescence we're able to see the actual location of the leak."

Goff said that it took a month to clean the dam, and that the cleaning technique they used was like cleaning a shower stall that has lime build-up. The dam's stones were cleaned by sandblasting with small coarse-grained silica (glass-like particles) under water pressure to remove the calcite build-up along the seams of the dam's stones.

Workers performed the cleaning by standing on a platform, similar to those used by high-rise building window washers, which was lowered over the side of the dam's stone balustrade and eight-foot wide brick walkway.

Leaks were found when the cleaning was completed, and are being repaired. In the near future plans include inspections of the structural condition of the dam's upstream face. A team of divers will perform this inspection. Goff hopes to correlate the leak locations on the downstream face with the upstream cracks, which will allow them to determine future work.

Suggestions for engineers who plan on performing similar dam restoration work include:

1. Work closely with your environmental and cultural resources staff on the project, because they can be invaluable in selecting the proper cleaning method. Even though the main focus of the project is dam safety, it's important to keep aware of the cultural and environmental resource impacts of the work.
2. Ensure you have enough time to perform the project. For example, if the dam is located in a cold climate avoid the fall timeframe, which may cut short your restoration time.

"If we didn't clean the dam, we wouldn't be aware of the severity of the seepage problem, which could be the result of a more significant problem," said Goff. "The location and hazard classification of this dam makes it essential that we monitor and maintain it on a regular basis. If the dam were to ever breach, the potential for loss of life would be high."