

Preserving Concrete on “The Rock”

By Kevin Wilcox

A team of students and veterans is working to preserve the storied history of Alcatraz Island, much of which is cast in concrete.

June 3, 2014—Alcatraz Island looms large in the San Francisco Bay. The rich history of “The Rock” stretches back centuries, to Native Americans who eyed it warily. It has been the site of an important U.S. Army Garrison with ties to the California Gold Rush and the Civil War, the oldest operating lighthouse on the West Coast of the United States, a military prison, and finally a maximum-security federal prison that is still infamous more than 50 years after it was closed.

An average of approximately 5,000 people visit the island each day, making it one of the most popular destinations in the National Park Service (NPS). Most are drawn by the historic prison, but the island is also home to an impressive array of wildlife, including rare herons, gulls, and cormorants. For civil engineers, what is especially interesting about Alcatraz is that much of the history is cast in concrete.

“It’s probably the best learning laboratory for concrete on the planet—as far as a collection of buildings in one location in a harsh environment,” says Tanya Wattenburg Komas, Ph.D., the founding director of the Concrete Preservation Institute (CPI), a nonprofit educational foundation. The CPI operates a program on Alcatraz to preserve and repair that concrete.

“Alcatraz has at least nine major concrete structures. The cell house was the largest reinforced-concrete building in the world when it was built,” Komas says. “The cornerstone is [from] 1909. There is every kind of construction out there having to do with concrete.”



The team prepares structural repairs for a beam, stair stringers, and stairs to the schoolhouse on Alcatraz Island. Image by Zac Fernandez © Concrete Preservation Institute



The team has found crushed bricks from an earlier structure used as aggregate in the main cell house. Image by Zac Fernandez © Concrete Preservation Institute

This summer, Komas will greatly expand the CPI program in which college students, vocational students, and military veterans work together on concrete preservation and repair projects. The program, operated in partnership with the NPS and the Golden Gate National Parks Conservancy, will move from a single summer session with eight students to a three-semester continuous model, with 24 students in each session. The CPI’s work has received generous support and material donations from such corporate sponsors as BASF, a global chemical company based in Ludwigshafen, Germany.

While the unique nature of concrete preservation on such a National Historical Landmark as Alcatraz is challenging, expanding the program helps further the NPS’s goals of continuous stewardship, says Komas, who has plans to expand the CPI’s efforts to other historic sites within the Golden Gate National Parks and other U.S. National Parks as well. “Because of the Island’s historic importance, we have an added level of concern with regard to our repair decisions,” Komas explains. “We often don’t remove as much historic material as we might on a typical repair project, and have to weigh the pros and cons of using advanced technology versus traditional practices.

“We choose the least intrusive methods and then commit to ongoing inspection and maintenance to ensure long-term durability of not only the repairs but the overall structures,” Komas says. And the students must also factor the long-term consequences of their actions into their decisions, she adds.

The complexity of the primary project has grown each year since its inception in 2010. Last year the team conducted structural repairs utilizing a form-and-pump approach for a beam, a set of stair stringers, and stairs over a walkway. Each project begins with structural engineering consultations, and progresses

to a repair scheme that has a bias of 51 percent preservation and 49 percent repair.

Once a repair begins, the team often makes startling discoveries connected to the island's past. "We're dealing with something that—when it was built—they weren't thinking 'this is going to be a landmark.' It's utilitarian," Komas says. Many of the structures were built by prison labor to less than exacting standards and using creative material choices. When a smaller structure was demolished early in the 20th century to make way for the existing cell house, for example, inmate laborers smashed the old bricks and used them as aggregate in the new concrete.

"They also used old prison cell bars as reinforcement in cast-in-place concrete in other structures," Komas noted. "All of those things that we wouldn't do in construction today are now a part of the history of that building. So, do you leave those prison bars in? Or do you take them all out?" she asks.

"Typically we leave them in," she explains. "They are part of the history. We clean them up; we add reinforcing if we need to. All these odd things done during original construction are now part of its history."

[16-School Hse stair stringer - deteriorated concrete removed]

So as not to detract from that history, the team has worked with concrete experts from the United States and Canada to better match any repairs to the existing historic elements.

"You have 100 years of patina on this concrete," Komas adds. "It has texture and color. How do you replicate that so it doesn't look like patches all over the place?" These aesthetic elements create another kind of learning experience. The team has used rough brush strokes, special form-liners, and pigmented microtoppings to match the historic concrete.

Logistics can also be a challenge for the program. Materials are brought to the island on barges that are scheduled weeks in advance. The teams also work around the nesting schedules of the island's bird population.



Image by Zac Fernandez © Concrete Preservation Institute

A variety of methods are used to replicate the appearance of the existing concrete, some of which has more than 100 years of patina and color. Image by Zac Fernandez © Concrete Preservation Institute



Image by Zac Fernandez © Concrete Preservation Institute

Each project is approached with a bias toward preservation. The goal is to remove as little historic concrete as possible for a safe and durable repair. Image by Zac Fernandez © Concrete Preservation Institute

Alcatraz captured Komas's interest from day one. "It's magnificent. It was on the first day I visited the Island, and it is now. The personalities that went into building it—all the quirks—I love that and enjoy that.

"It is the most amazing collection of construction types, layers of history, deterioration mechanisms, and logistical and preservation challenges," she adds. "It has everything that you would ever want to be able to show someone to educate them about heritage conservation and concrete preservation, all in one place."

COMMENTS