

Fort Mott State Park— Rehabilitation Phase I

By Warren Cruz

Fort Mott was part of a three-fort defense system designed for the Delaware River during the post-Civil War modernization period, situated on the Delaware River in Pennsville, NJ. Troops were regularly stationed there from 1897 to 1922. Construction started in 1872 and stopped in 1876 with only two gun emplacements and two magazines in the mortar battery completed. Plans were originally for 11 gun emplacements with 20 guns and a mortar battery with six emplacements, but construction never reached that point.

Shortly after World War I, Fort Mott and this three-fort system became obsolete as newly constructed Fort Saulsbury in Delaware became the principal defense on the Delaware River.

The federal government maintained a caretaking detachment at the fort from 1922 through 1943. New Jersey acquired this reservation as a historic site and State Park in 1947. It was then opened to the public in June of 1951 and remains open today for guided tours and walking tours.

Fort Mott held massive cannons to protect the mouth of the Delaware River from invaders. It was no wonder that the fort was originally constructed of solid, 20 ft (6 m) thick concrete walls and buried on one side of a huge earth berm. The interior walls were severely spalled and with deteriorated concrete ranging from 4 to 20 in.

(100 to 500 mm) deep (refer to Fig. 1 and 2). The repair specification called for all deteriorated concrete to be removed. No. 5 (No. 16M) epoxy-coated steel reinforcing bars 18 in. (450 mm) long were doweled 2 ft (0.6 m) on center to anchor the new No. 5 (No. 16M) reinforcing bar cage with bars 18 in. (450 mm) on center (refer to Fig. 3 and 4). The repair method originally called for a “form-and-pour” repair approach. Cruz Concrete and Guniting Repair, Inc., proposed a dry-mix shotcrete approach instead and was accepted by the New Jersey State Parks Department. Four to 18 in. (100 to 450 mm) of shotcrete was placed over everything and restored back to the original lines, while recreating the original finish. Cruz Concrete was contracted to place the dry-mix shotcrete on 3520 ft² (327 m²) of vertical walls, sloped walls, and columns. The shotcrete portion of the project lasted 3 weeks (refer to Fig. 5 and 6).

As a historic site, a major challenge on this project was providing 3000 psi (21 MPa) concrete to match the existing concrete. With all the common concrete technology of today using admixtures and additives, it was an accomplishment to match this lower strength level of the past and match the existing walls. Many mockup test panels were made using different colors and textures. Finally, one was chosen and Cruz Concrete was able to proceed.



Fig 1: Cannon pit before

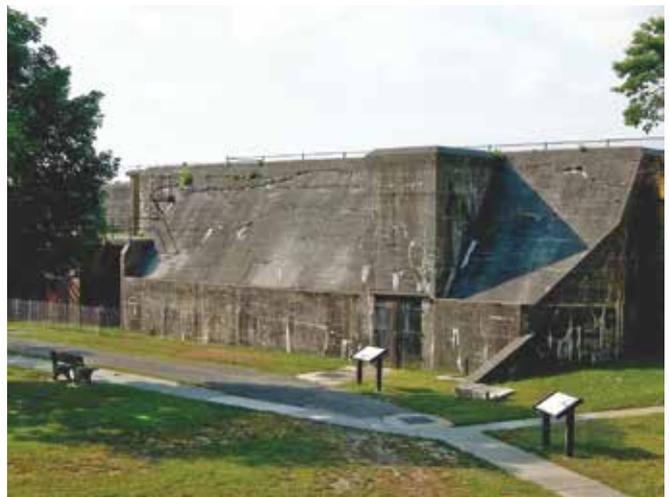


Fig 2: Exterior Fort Mott before

The original construction also called for the use of natural cement, which the state wanted to match. Widespread in the past, natural cement is currently only manufactured in England. Cruz Concrete was able to offer a portland cement 4:1 grout mixture as an alternate to meet LEED sustainability requirements and match the requested finish.

At the completion of Phase I, the owner was so pleased with the results that the Phase II rehabilitation bid documents specified shotcrete as the concrete application method. This is another example where the flexibility and speed of shotcrete placement in the hands of a qualified contractor with experienced nozzlemen and crew produced a success story for the state of New Jersey and the industry.



Fig. 5: Nozzleman placing shotcrete in the cannon pit



Fig. 3: Fort Mott top wall templates



Fig. 6: Preparing the Fort Mott ground floor gutter



Fig. 4: Fort Mott water cistern

2012 Honorable Mention

Project Name

Fort Mott State Park—Rehabilitation Phase I

Project Location

Pennsville, NJ

Shotcrete Contractor

Cruz Concrete & Guniting Repair, Inc.*

General Contractor

Paragon Restoration Corporation

Architect/Engineer

Lammy & Giorgio Architects

Material Supplier/Manufacturer

Penn Jersey Concrete Ready Mix

Project Owner

State of New Jersey

*Corporate Member of the American Shotcrete Association