

# CROWN POINT PIER RESTORATION

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**T**he Crown Point Pier, Crown Point, NY, is a 150 ft (46 m) long, T-shaped concrete structure located at the foot of the Samuel de Champlain Lighthouse monument. Although it is no longer used for ferry transportation, the pier is a significant piece of the Crown Point Historic Site and State Park, offering visitors access to the lake for recreational activities such as fishing and boating. The New York State (NYS) Department of Environmental

Conservation (DEC) noticed for some time that the concrete on the 79-year-old pier was in need of repair. The state was planning a Quadricentennial (400-year) anniversary for the discovery of Lake Champlain (1609) and hoped to hold festivities at the State Park and Samuel Champlain monument in early September. In early 2008, engineers for the state of New York put together plans and a specification to repair the concrete pier. The schedule was very aggressive, calling for completion of the repairs by June 2009, before the Quadricentennial celebration.

The concrete on the pier, which had never been repaired before, had large areas of spalls and cracks caused by the harsh winter climate and its location right on Lake Champlain. The specification called for the entire structure to be prepared by shot



*Crown Point Pier, Crown Point, NY*



*Severe deterioration of concrete due to location on Lake Champlain and harsh climates*



*Severe spalling and cracking of concrete columns with exposed reinforcing bar*

blasting and then the steel reinforcing bar to be coated with an anti-corrosion coating. The columns and beams were to be patched with polymer-modified repair mortars. Additional work included replacing sections of the concrete and railings and replacing the iron chains. Finally, the concrete structure was to be sealed using a silane/siloxane penetrating sealer.

In addition to a tight construction schedule that would require work during the harsh upstate New York winter, there was also the matter of the historic fort. Access to the pier could only be gained by moving equipment through the fort area; however, the challenge mandated by the DEC called for all fortifications to be completely protected and remain 100% intact. Historians for the DEC would oversee the entire project to ensure that no damage was done to any of the fortifications.

Because of the extremely tight repair schedule and the stipulations by the DEC, there was only one contractor who bid on the project.

## REPAIR PROJECT UNDERWAY

On July 30, 2008, the entire Point Crown Lighthouse and pier areas closed to the public so repairs could begin. The first and most important part of the project mobilization consisted of protecting the Crown Point fort redoubts made from stone and earth along the north side of the access road to the pier. Over 4000 sand bags and several 1 in. (25 mm) steel plates were installed to protect the embattlements. A large 200 ton (181.4 metric ton) crane was to be used during the repair and would be brought in right through the fortifications.

Next, the repair required the construction of two types of cofferdams. The first was a steel sheet piling in the deeper water (up to 15 ft [4.6 m]) around the pier and a portable fabric dam system in the shallower water. Access for the pile driving equipment necessitated the construction of a 75 ft (23 m) long stone causeway into Lake Champlain. Once the cofferdam was completed, around-the-clock dewatering using a 6 in. (152 mm) submersible pump was conducted so the substructure restoration could be carried out in the dry with maximum protection for the workers. Over 1,000,000 gal. (3,785,400 L) of water were initially pumped out of the cofferdam.

After the dewatering was completed, it became evident that a 2 in. (51 mm) layer of zebra mussels on the concrete structure had to be removed by water blasting and bagged before the restoration work could begin. On several occasions during the course of the project, breaches occurred, requiring dewatering before the restoration work could continue. Two of the breaches in the dam were caused when muskrats ate through the sheeting of the fabric dam system. Finally, scaffolding was



*Stone and earth walls of the historic fort redoubts being protected by sandbags*



*Erection of portable fabric cofferdam in shallow areas*



*Dewatering of the cofferdam*



erected underneath the entire structure to allow proper access for the workers.

The objectives of the first phase of the restoration were to complete the substructure work before the cold winter months and then finish the remaining repairs when the warm spring weather arrived. Although the original specification called for shot blasting of the concrete substrate, several types of concrete preparation were required, including chipping, sand blasting, shot blasting, and hot- and cold-pressure washing. This change in surface preparation was necessary because the strength of the concrete was weaker than expected, due in part to the age of the concrete and because there was more stone aggregate and less cement in the original concrete mixture design.

After the concrete substructure was properly prepared, the anti-corrosion coating was applied



*Concrete column after surface preparation. Note the large loss of concrete sections*



*Repairing the approach slab with new concrete*

to the original square steel reinforcing in the concrete beams and columns. Because of the lack of concrete strength, several of the support columns had to be rebuilt after losing large sections of concrete during the surface preparation. This was accomplished by forming new columns and pouring a polymer-modified repair mortar extended with aggregate. In addition, large areas of the concrete deck had to be replaced with new concrete that contained an integral corrosion inhibitor. Next, a polymer-modified repair mortar was applied to the columns and beams, and a penetrating corrosion inhibitor was applied to all sections of the concrete structure that were not replaced to protect the steel reinforcing bar.

The first phase of the project needed to be completed before the winter, so the contractor's goal was to complete all the repairs to the substructure in and around the water by the end of December. To complete this task when the temperatures dropped, the contractor had to use heat blankets with propane and forced-air oil heaters around the structure to properly maintain the correct temperature for curing the repaired concrete. The first phase of the project was completed on time and work was suspended in late December 2008.

Work resumed on the project in April 2009 with the goal of completing the project by the summer for the Quadricentennial celebration. The work now focused on repairing the superstructure. The approach slab was also replaced with new concrete and new sections of railings and chain were installed on the pier. The contractor then received approval from the engineers to replace the penetrating sealer with a spray-applied, polymer-modified cementitious waterproof coating to all concrete surfaces above and below the water line. This was chosen for its durability versus weathering and physical attack. The final finish and appearance of the waterproof coating had to be approved by the NYS DEC before the project could be completed.

The project was completed on time and the NYS DEC reopened the historic site on July 10, 2009, in time for public use and the September celebration.

The Crown Point Pier project was unique, not only for its historical significance to Lake Champlain, but also because of the measures the contractor had to go through to ensure that historical structures predating the French and Indian War were protected. There was a strict time line installed by the NYS DEC so the project could be completed for the important Quadricentennial celebration for the region. The project was completed successfully and on time, extending the service life of the pier for another 80 years.



**Richard P. Farnan Jr.** has been employed with DeBrino Caulking Associates, Inc. (DCA), for 12 years with over 25 years of construction and concrete/masonry experience. Farnan is a Project Manager and Estimator for DCA's Restoration Division. He is a graduate of Christian Brothers Academy, Syracuse, NY, Class of 1985, and attended Norwich University, Northfield, VT, where he studied Environmental Engineering. Farnan is a member of the International Union of Bricklayers and Allied Craftworkers local number two.



**Ronald L. Vogt** has been employed by DeBrino Caulking Associates, Inc., Specialty Construction Group, for the past 16 years as a Project Manager/Estimator. His history in the construction industry dates back to 1960, where he was first employed by The Penetryn Systems Inc., a restoration company, with offices in Albany, NY, and Cleveland, OH. The company specialized in the restoration of bridges, dams, and tunnels using gunite (shotcrete) and grouting methods.



**Michael Winge** is a Product Marketing Manager for sealants, adhesives, and façade coatings at Sika Corporation. He has more than 13 years of experience in the sealant, restoration, and waterproofing industry and has been a member of SWR Institute since 2004.



The finished pier, completed on time and on budget

## Crown Point Pier Restoration

**OWNER**  
**New York State Department of  
 Environmental Conservation (NYS DEC)**  
 Albany, NY

**PROJECT ENGINEER/DESIGNER**  
**NYS DEC Bureau of  
 Maintenance and Technical Services**  
 Albany, NY

**REPAIR CONTRACTOR**  
**DeBrino Caulking Associates, Inc.**  
 Castleton, NY

**MATERIAL SUPPLIER/MANUFACTURER**  
**Sika Corporation**  
 Lyndhurst, NJ