Structural Engineer:
Klepper, Hahn & Hyatt

Owner:
Dark Island Tours, Inc.

Location:
Dark Island, Chippewa, NY

Completed:
Fall 2012

Awards:
2012 ACI CNY Chapter:
Excellence in Masonry
Design & Installation,
Bronze Award

Singer Castle Cast Stone Restoration

Singer Castle is an impressive granite bearing wall structure located on Dark Island in the St. Lawrence River in Upstate New York (St. Lawrence County). The 28-room castle was constructed in 1904 as a hunting retreat for the Frederic Bourne family. The Scottish-inspired castle has been occupied continuously since its construction and is now owned by Dark Island Tours.

A sun room and a master suite, added circa 1912, was supported on decorative pre-cast columns and arches. The columns and arches supporting this addition were exhibiting serious deterioration around the sun room. The cast stone was delaminating in approximately two-inch thick sheets. These elements were suffering from extreme freeze-thaw damage due to the porosity of the cast stone. The deterioration of these elements threatened the structural integrity of the building. Since Singer Castle is open to the public, the owner wished to restore the facade in a manner that matched the original design of the historic property.

A petrographic analysis described the cast stone as a “simple cement mortar mixed with a low water content that is crudely mixed and poorly consolidated.” The cast stone had a relatively high compressive strength but was extremely porous, allowing it to absorb an excessive amount of moisture. The cast stone also did not contain air entrainment, which is typically used in exterior concrete to prevent freeze-thaw cracking and deterioration. Because of the continued freeze thaw damage to the inner cast stone, it was unrealistic to assume patching or waterproofing would eliminate moisture intrusion. Thus the cast stone elements at Singer Castle had to be replaced.

For this replacement, high-quality, natural limestone paired with standard type N mortar was used. To replace the cast stone, the masonry above the arches needed to be shored and supported. The contractor, working closely with Jay Saylor, P.E., of Herrick-Saylor Engineers in Pittsford, New York, created a method to do this using a tree-like mechanism with supporting branches that temporarily transfered the vertical load to the support. This allowed the masons to remove and replace the damaged cast stone while protecting both the interior and the exterior of the building from damage.