

# Davis Barracks Sculpted Wall

By Jeff Bacon



In 2015, the U.S. Army Corps of Engineering began construction on the Davis Barracks at West Point, NY. The 172 million dollar barracks became a state-of-the-art facility. The new barracks was built to house 650 cadets, three in each room, consisting of 297,392 ft<sup>2</sup> (27,629 m<sup>2</sup>). The barracks building is located on the side of a mountain, below the cadet chapel, which in of itself is a famous landmark. The site for the barracks posed numerous challenges which included the removal of 285,000 tons (259,000 metric tons) of granite for the building's foundation. Between 2015 and 2017, during the construction, over 60 ft (18 m) of granite from the mountain side were removed.



The wall behind the barracks, which was exposed to a combination of exposure to the sun, as well as freezing and thawing, caused the rock to become weathered and brittle. This created the need for our work, because without an engineered solution the exposure would continue to erode the mountain side. The US Army Corps of Engineers (USACE) were tasked to provide a solution for this extensive exposed rock wall face. An elaborate sculpted shotcrete system was the answer.

Thorcon Shotcrete and Shoring LLC was awarded the opportunity to secure the wall as specified by the USACE. The multi-million-dollar project created many challenges, here are only a few:

- 110 ft. (34 m) or more working heights
- Tree and shrub removal
- Drilling into the granite
- Placing and securing two layers of reinforcing bar mats
- Ground water coming through the wall at an abnormal rate
- Shotcrete on the wall
- Detailed sculpted shotcrete finish

The wall was extremely large, approximately 825 ft (251 m) long, 100+ ft (30+ m) tall. The work was done with 125-ft



(38 m) articulating manlifts and personnel secured on ropes from topside for work operations. Specialized safety and training was required for this part of the project.

To start the project, the wall was cleaned of dirt, debris and shrubbery with several power washers, chainsaws, and miscellaneous hand tools. Due to the size of the wall, it took over a month to accomplish. Rock bars were also used to mechanically scale and remove loose rock and fragments from the wall.

Drain board was installed every 10 ft (3 m) to catch the ground water seeping through or coming over the edge of the wall. Because of the hardness of the granite, fasteners had to be drilled and epoxied to hold the drain board tight to the wall.

The specification called for a large amount of reinforcing bar to be attached to the wall. To achieve this Thorcon installed over 4000 L-shaped epoxy-set dowels every 4 ft (1.2 m) each way. While drilling into the granite, drill bits were burning up and becoming dull at an astonishing rate. Hilti Manufacturing Company recommended using specialized drill bits that helped eliminate these issues, allowing more productive installation of the dowels.





20 ft (6 m) mats using #4 (#13M) reinforcing bar spaced at a 12 in. by 12 in. (300 mm by 300 mm) spacing each way were formed on the ground. Then a large telehandler was used to raise the prefabricated reinforcing bar mats onto the wall. Because of the difficulty of bending the reinforcing bars around the ledges and curvature of the wall, personnel in manlifts were used to support the mat to the epoxied dowels. This was done twice in each location since a double layer of reinforcing was required by the design.

Due to the abnormal amount of water coming through the wall, there was major concern about the shotcrete bonding to the wall and water delaminating or coming through the shotcrete. A liquid rapid-set accelerator was introduced into

the shotcrete mixture at the nozzle. This did several things in our favor. It reduced the amount of rebound to about 5 percent. It provided greater workability and final strength, and greatly enhanced the adhesion. To address the water flow issues, permeability reducing admixture called Xypex, a crystalline waterproofing chemical, was added into the concrete mixture design to help stop the water from coming through the shotcrete.

Two crews with concrete pumps placed shotcrete pneumatically in thicknesses from 12 to 16 in. (300 to 400 mm), shooting anywhere from 60 to 100 yd<sup>3</sup>





## 2020 OUTSTANDING INFRASTRUCTURE PROJECT

### *Location*

**Davis Barracks Chiller Plant Wall**

### *Location*

**West Point, NY**

### *Shotcrete Contractor*

**Thorcon Shotcrete Shoring\***

### *Materials Supplier*

**Cranesville Block Company,  
United Rentals, HD Supply**

### *Equipment Manufacturer*

**Putzmeister\*, JLG Man Lifts**

### **General Contractor**

**Kokolakis Contracting**

### *Architect/Engineer & Project Owner*

**Army Corp of Engineers**

**\*ASA Sustaining Corporate or Corporate Member**

(46 to 80 m<sup>3</sup>) per day. When the last architectural layer was placed, six artists sculpted the wall by hand with trowels and other small miscellaneous carving tools using manlifts and ropes for ready access to the face of the wall. The intent of the sculpturing was to mimic the natural rockscapes of the surrounding New York region. Then, to make the sculpting look extremely natural, several different colors of acid-based mineral stain were applied to the wall surface completing the natural appearance sought by the designers.

The overall challenges of this project tested our talents, equipment, suppliers and team at every turn. Thorcon is proud to have been a part of this successful project and holds the values, lessons, skills and team building education we received from this project in high regard. It was a great honor to deliver this amazing piece of shotcrete art to the men and women that serve this great country.



**Jeff Bacon** is a Project Manager with over 16 years' experience in the geotechnical industry. Currently he is working alongside the executive team for Thorcon Shotcrete and Shoring. Jeff specializes in innovative designs for infrastructures of exterior walls.