

## **City of Charleston and Raven A6: 15 Years Later and Still Standing the Test of Time**

### **Business Situation:**

The City of Charleston, South Carolina experienced a drought in 1917-1918. The resulting water shortage, combined with the washing away of part of the Goose Creek dam in July 1916 forced the Charleston Commissioners of Public Works (CPW) to look for an immediate and long-term water source to supplement the Goose Creek Reservoir.

The decision was made to construct a 23-mile tunnel connecting the Edisto River to the Hanahan Pumping Station. The Edisto River became Charleston's primary source of water, continuing to provide raw water to the Hanahan Plant today.

In the mid-1940s, the Hanahan plant underwent a major expansion to keep up with the growing demand for water. The project included the addition of the Booker Filter Plant, a new pump station, and in 1963, the Stoney Filter Plant, which includes the 20 filter basins that are still in operation today.

### **Technical Situation:**

After 37 years of service, the 20 filter basins at the Stoney Filter Plant had experienced degradation of the concrete surfaces. Upon inspection of the facility, it was concluded that the plant showed signs of concrete degradation with exposed aggregate from the chemicals used in water treatment. To decrease the probability of building a new facility, it was decided to rehabilitate the current facility to save taxpayers' money.

In 2000, The City of Charleston and the Charleston Water System placed a call for bids. Dun-Right Services, Inc., a Raven Certified Applicator in Florence, SC, won the project. This would be Dun-Right's first application of Raven's AquataPoxy® A6 Thick. Being unfamiliar with the application procedures of A6 Thick, and the size of the job, Dun-Right requested the assistance of Raven Linings Systems' technical department.

### **Solution:**

After the City of Charleston assessed the facility, it was determined a 100% Epoxy product, which would be NSF ANSI 61 certified, would protect and reinforce the structure from further deterioration. The technology used by Dun-Right was a fluid applied plural component 100% solids epoxy at 60 mils. The cementitious underlayment at the time would be Quadex Hyperform PM with a ½" rebuild.

Once the basins were drained and all remaining filter media was physically removed, a 5000 psi hydro blast was performed over the entire structure with the goal of achieving a minimum concrete surface profile of a CSP3. After completing the surface preparation, a final low-pressure water rinse was conducted to wash away the loose dust and debris. On

the damp surface a ½” of Quadex hyperform PM was spray-applied using a standard grout/mortar pump. When the Hyperform PM cured, a secondary prep was performed using the 5,000 psi hydro blaster to remove any laitance or loose particles. With the surface dry to the touch the AquataPoxy A6 Thick was spray applied using a Graco Hydracat set-up 1:1. Any pinholes found after holiday testing were then repaired within the recoat window. Pinholes discovered, after the recoat window had expired, were prepared and then repaired, according to Raven recommended procedures

### **Upgrade: AquataPoxy Application Process**

In 2015, it was determined that an upgrade was necessary and new troughs would be installed. Garney Construction was the general contractor for the task of upgrading the 52-year old facility. Upon inspection, the City of Charleston and Dun-Right were pleasantly surprised to discover the 15 year coating of the AquataPoxy was still tightly adhered with only minor structural flaws. Areas to be repaired were due to the installation of new troughs and floors. It was estimated that only 32 sq. ft. per basin (approximate) would need repair, with some basins having unexpected repairs, ranging from structural movement to impact damage. It's the proper application process implemented in 2000 that resulted in very minimal repair; therefore, saving the City of Charleston, hundreds of thousands of dollars.

The upgrade would involve removing the existing concrete troughs and replacing them with new upgraded fiberglass troughs. The process involved demolishing the concrete troughs and saw cutting an opening in the existing wall for removal. Once Garney had removed and installed the new troughs, they would then re-pour the demolished wall. At that point Dun-Right would have access to that individual basin. Once Dun-Right was granted access to the basin, they would inspect and mark all needed repairs.

“Raven is pleased to offer, not only a quality product, but also a solution, that continues to stand the test of time,” stated DJ Wroble, Sr. Vice President, Raven Lining Systems. “To be able to stand here 15 years later seeing our product doing its job and protecting this city’s infrastructure is something to be proud of in this very competitive market.”

Once all repair areas had been marked and documented, Dun-Right could begin work. They would start by removing any existing A6 coating that was not tightly adhered. Since the entire surface was not being recoated, termination grooves and key ways were utilized at the edges of where the coating application ceased, to assure superior adhesion existed. In instances that needed a cementitious underlayment, Raven 755 was utilized. When the Raven 755 cured, an abrasive blast was performed on all surfaces that were to be top-coated with AquataPoxy A6 Thick with a goal of achieving a minimum concrete surface profile of CSP3. After completing the surface preparation, a final low-pressure water rinse was conducted to wash away the loose dust and debris. Once the substrate had dried, two coats of Raven 155 primer were applied to reduce moisture vapor transmission on the areas that had received the Raven 755 and new concrete. After the primer had time to properly cure, AquataPoxy application could begin. Areas that had received either new concrete repair or Raven 755 would also receive a minimum topcoat of 100 mils. Areas of A6 that received a top coat were coated with 60 mils. Any pinholes found after holiday

testing were then repaired within the recoat window. Pinholes discovered after the recoat window had expired were prepared and then repaired according to Raven recommended procedures.

Ryan Bauman, Technical Service Specialist, Raven Lining Systems said, “Once Dun-Right was granted access to the structure they would perform adhesion tests. This would provide the city with the peace of mind, knowing that the 15 year old coating was performing as expected. The process involved following the ASTM D 4541 standard, including coring around the dollies. The adhesion test was performed using a Defelsko Positest AT on Filter Basin #10.”

**Adhesion Testing:**

Adhesion testing was performed on the 15 year old AquataPoxy by gluing seven 20mm dollies to the coating surface with a fast setting, high strength epoxy. After allowing the glue to set for 24 hours, the dollies were then cored using a 20mm coring hole bit. The adhesion test was performed using a Defelsko Positest AT. All tests were performed in Filter Basin #10

*Pull 1: 619psi (95% substrate, 5% cohesive failure in coating)*

*Pull 2: 714psi (100% substrate failure)*

*Pull 3: 488psi (100% substrate failure)*

*Pull 4: 621psi (40% substrate, 60% adhesive failure between substrate and coating)*

*Pull 5: 251psi (75% substrate, 25% adhesive failure between substrate and coating)*

*Pull 6: 723psi (100% substrate failure)*

*Pull 7: 511psi (100% substrate failure)*



Wroble continued by saying, “It’s partnerships with applicators like Dun-Right that allow Raven to have continued success and pioneer innovative solutions in an ever-changing industry.”

**Benefits:**

Raven Lining Systems and AquataPoxy A-6 provided the following benefits to the Hanahan Water Treatment Plant:

- A product that was not moisture-sensitive.
- Strong and durable coating for the water treatment facility.
- All-weather resistant coating
- Peace of mind for 20+ additional years

**Company Profile:**

Raven Lining Systems has a proud and rich history as a leader in the water, wastewater and manhole rehabilitation industry. The confidence that our partners and staff have consistently placed in Raven over time is the foundation for the protection, strength, experience and commitment represented every day in our products, customer service and technical expertise. Raven has provided comprehensive solutions for the protection and renewal of wastewater and potable water infrastructure since 1988. It is this forward-thinking that allowed Raven to recently expand into the oil & gas and industrial markets, focusing on the delivery of environmentally-friendly protective coatings.

A cornerstone offering is the Raven Engineered System, which is a combination of high performance, environmentally-friendly protective coatings matched with specialized dispensing equipment and methods applied by a network of certified applicators. Our proven epoxy system offers superior adhesion, chemical resistance and structural renewal strength. Specially designed application equipment meets the demands of difficult access in underground structures, collection systems, treatment plants, tanks and storage. This system has performed for more than 28 years in infrastructure corrosion control, containment and renewal projects worldwide.



