



## HDPE Plays Key Role in Renovating National Landmark

Washington D.C. is home to some of the United States' most prized and revered memorials. To the nearly 24 million people who visited the National Mall in the last year, the Reflecting Pool was more science project than a iconic tourist stop.

Several key improvements were needed to keep the largest and most famous reflecting pool in the capital sustainable for years to come. The pool, originally constructed in the early 1920s, has been relatively untouched in terms of improvements over the years. The pool was prone to leaking, holding stagnant water, and called upon the city's drinking water resources to fill the pool to the tune of nearly 20 to 30 million gallons per year.

The Louis Berger Group, Inc. served as the consulting firm that offered engineering, architecture and other development resources for the project. When drafting the solutions to the reflecting pool's problems, engineers chose a series of unique solutions. The goals of the \$30.7 million project included replacing the leaking concrete pool; retaining the original coping stones of the pool; installing a high-density polyethylene (HDPE) pipeline and a filtration system for drawing water from the Tidal Basin rather than using the city water; installing a system for cleaning and recirculating the water; installing new, wider sidewalks adjacent to the pool to replace the dirt paths; resurfacing the Elm Walks on the north and south sides of the pool; adding new lights and benches; and improving accessibility and security measures. The project is the National Park Service's largest project using American Reconstruction and Recovery Act funds.



The project, which began in November 2010, revolved around approximately 2,400 wooden pilings that were driven into the ground until hitting the bedrock 40 to 50 feet below. The timber pilings were spaced apart every 12 feet, 9 inches throughout the 2,029-foot-long pool. The piles were used for the foundation design due to the presence of compressible fill materials beneath the Reflecting Pool, which was built on tidal basin sediments.

“The pile foundation was designed to accommodate the pool slab, water weight and crowd surge load,” said James Stroup, P.E. LEED AP, technical project manager for Louis Berger Group. “Previously, the Reflecting Pool slab was not supported on piles, and as a result had settled, cracked and separated from the pile-supporting coping stone.”

## Pipe Selection

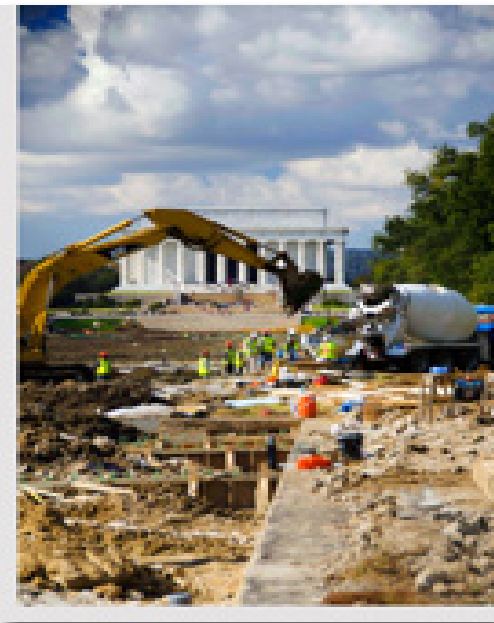
While the unique piling system solved the issue of supporting the 12,000 cubic yards of concrete for the new pool, the question remained of what infrastructure to install to support the water within the renovated design.

One of the key project requirements set forth by the National Park Service was sustainability. “It was not considered sustainable or environmentally sound to use water treated to drinking water quality to fill the Reflecting Pool, especially given the volume required,” said Stroup.

“Even with the reduced volume of the redesigned pool, this seemed like an avoidable waste of a valuable and limited resource. In order to design a more sustainable site, a primary design objective was to find alternate water sources to fill the Reflecting Pool. After performing a life-cycle cost analysis, Tidal Basin water with filtration and disinfection was found to be the most viable option.”

The water in the pool won’t be safe for human consumption, but by filtering and disinfecting the Tidal Basin water, the pool will achieve the clear water required to achieve the same reflection of the past.

Engineers also kept the piping connection between the Reflecting Pool and the city’s water supply should it be needed as an alternative source or for cleaning purposes.



HDPE was chosen for the water supply and circulation system for the Reflecting Pool after looking at several factors.

“Once correctly welded via butt fusion or electrofusion, HDPE joints are considered completely restrained,” stated Stroup. “This was particularly important as many of the lines will be located beneath the Reflecting Pool and will not be accessible.”

Other pipe materials were considered for the project, but HDPE was proven to be the best fit given the constraints of the project and environmental conditions. Looking at costs, the material and installation of HDPE was even with polyvinyl chloride (PVC) and ductile iron (DI).

One more site constraint was that the environment was once marshland, which lends itself to differential settlement on an unsupported infrastructure. HDPE’s flexibility was a key factor to combat this possibility, due to its ability to tolerate potential differential settlement without breaking.

The final factor in HDPE’s selection is that the pipe material will reportedly not tuberculate or support biological growth.

## Pipe Fusion

To fuse the more than 3 miles of HDPE pipe to be installed under the reflecting pool and to the Tidal Basin, Corman Construction enlisted the help of Ferguson Industrial Plastics. Ferguson recommended a range of McElroy pipe fusion products to be used on the project. Consultants from Ferguson also provided training and qualification testing of Corman Construction personnel to perform the pipe fusion process.

The two key fusion machines used were the Rolling 28 and Pit Bull® 14. The Rolling 28 offered Corman the flexibility to fuse pipes of any size between 2-inch IPS and 8-inch DIPS. The wheeled chassis of the 28 allowed workers to tow or pull the fusion machine from the pipe yard next to the reflecting pool into the work area each day.

The Pit Bull 14 is a compact and lightweight fusion machine capable of fusing pipes from 1-inch IPS to 4-inch DIPS. Without a chassis, the 14 is capable of going into ditches and tight confines to fuse lengths of pipe together, as well as fusing any tees, ells or other fittings that are coming off water lines.

Under the reflecting pool, 3- and 4-inch piping is most prevalent. Those pipes connect with larger diameter pipes to reach the water treatment building. A 10-inch line connects the Tidal Basin to the water treatment facility.

The Lincoln Memorial Reflecting Pool has been a sacred memorial to the American people since its original construction in the early 1920s. With the use of HDPE, a piping material capable of lasting more than 100 years, there's a reason to believe that the latest renovation will be sustainable for generations to come.

Through the American Reconstruction and Recovery Act and the diligent work of the National Park Service, Louis Berger Group, Corman Construction and many others, this memorial will be reinstated to its original glory.

Sincerely,

***Tyler Henning***

P.S. – Do you have an interesting job site that you would like to share? McElroy is always looking for fusion job sites where HDPE is being used and fused to solve an infrastructure problem. Contact Tyler Henning, public relations specialist at (918) 831-9286 or by email at [thenning@mcelroy.com](mailto:thenning@mcelroy.com)

