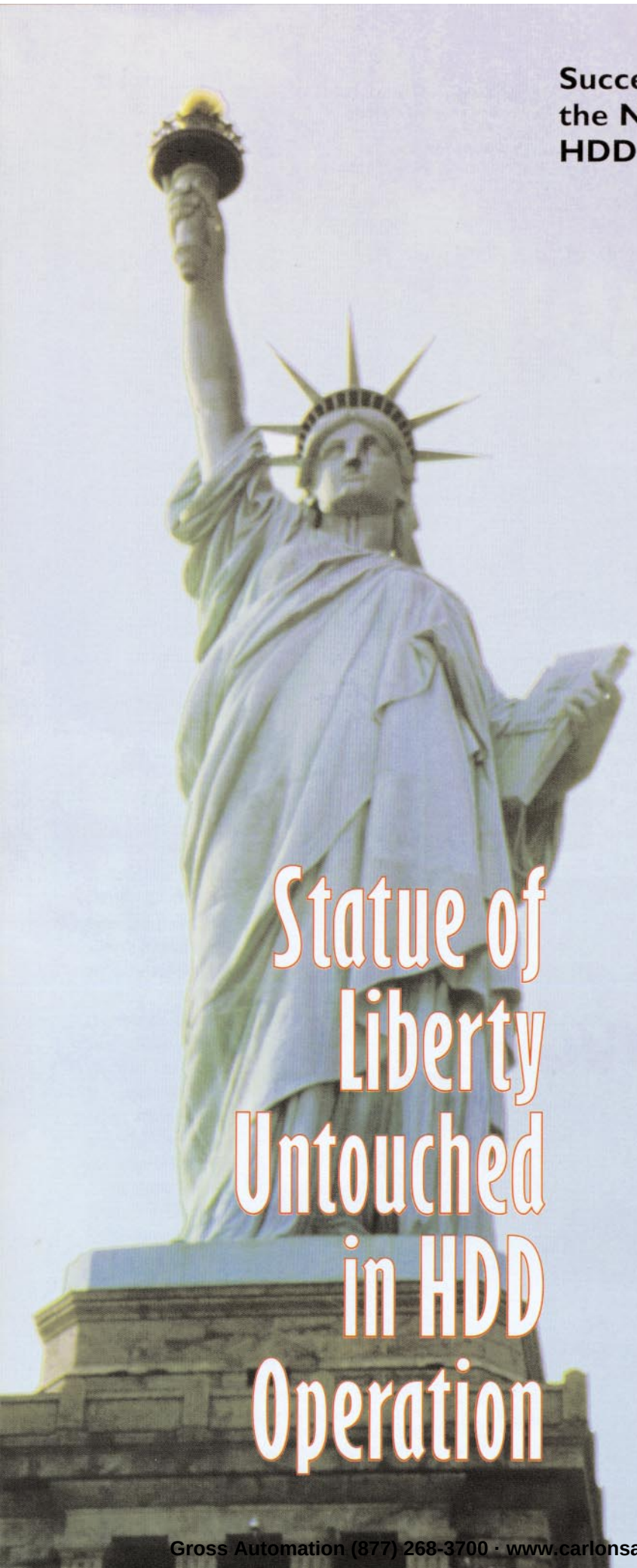


Statue of Liberty Untouched in HDD Operation

Success of this project could lead the National Park Service to employ HDD in future projects by Richard Yach

The Statue of Liberty had sprung a leak.

Underground lines piping fuel oil from holding tanks to the boiler in the base of the famous American national historic monument were deteriorating. Since 18,000 tourists take the ferry over to Liberty Island each day — 364 days a year in all sorts of New York harbor weather — heating of the visitor center and the statue could not be jeopardized.

It was a project where horizontal directional drilling made a big difference, not only in minimizing disruption to the on-going, high volume tourist traffic, but also in minimizing excavations to the landscape surrounding the world's best known monument to political freedom.

To assure this, the National Park Service had an archeologist and a horticulturist on-site during the drilling to advise the crew at each step of the way. Planning for the fuel line replacement started two months before the actual operation. Prestige Environmental was awarded the contract to replace fuel lines and add additional monitoring wells so that any future problems could be quickly detected. These new lines were to be placed in conduits that had to be buried underground so that the old fuel lines could be abandoned.

New York Trenchless, Inc., headquartered in Port Washington, N.Y., on Long Island, won the bid to bury the conduits on Liberty Island. Once Peter Kenny, owner of New York Trenchless, visited the site, he suggested using horizontal directional drilling in order to minimize "the footprint" of the installation over auger boring, which had been the original method in the specifications.

With horizontal directional drilling now confirmed up as the installation method, the project was split up into three separate bores. The first, three 6-in. (150-mm) conduits would be pulled in 150 ft (45 m). Inside one of the conduits would be four, 2-in. (50-mm) conduits. The second bore would be 190 ft (58 m) and would pull in two, 6-in. (150-mm) conduits. Inside one of these would be three, 2-in. (50-mm) ducts. The third bore would turn out to be 240 ft (73 m) pulling in the same duct configuration as the second bore.

A Little Background on the Statue

The reason for the separate conduits was for the fuel lines and electric lines for the monitoring systems. Despite the shortness of the three bores, it took the crews 10 days to complete the bore and pullbacks of the conduits. This was due to the tough drilling conditions and the care and concern everyone had for the existing above ground and below-ground structures.

The reasons for the tough subterranean drilling conditions are as old as Liberty Island itself. Even before the Statue of Liberty was erected on this site in 1886, Bedloe's Island, as it was called back then, had once been the site of an old fort. This may have explained the existence of a buried 18-in. (450-mm) solid granite wall that one of the bores ran into.

In the early 1980s, prior to the grand lady's 100th birthday, the National Park Service redesigned and rebuilt the landscape and all the brick walkways, breaking up and covering over the old ones and elevating the ground on which were erected the walkways that exist today. This raised the ground level in some places 3 ft (0.9 m) higher than what it once was. That made locating existing water, sewer and fuel oil lines more difficult. Add to this the broken concrete, brick and cinder that was used as fill when the centennial landscaping was done and you have some idea of the difficulties that the driller had to deal with.

All of the equipment for the installation of the new conduits had to be taken onto the island by barge. It wasn't a typical suburban fiber-optic installation where you could run to the hardware store for something.

All pipe and equipment were loaded onto a huge 10,000-sq ft (900-sq m) barge and pushed out to the island by a tugboat. Once on the island, all the equipment stayed until the end of the job with the crew leaving in the evenings, sometimes late. Because of the tourist boats using the docks during the day, the only time the equipment barge could go to the island and be off-loaded was after visiting hours.

On the equipment barge was a Vermeer D50x100 Navigator horizontal directional drill and its DT750 drilling fluid tank trailer, a front end loader with a backhoe attachment, a dump truck filled with pea gravel, a Vermeer TriHawk drill head, DCI Mark IV locating equipment, two fluted backreamers, a service truck, a vacuum unit, a skid steer unit, and a pallet of 450 ft (136 m) of schedule 40 special Carlon® Bore-Gard® PVC conduit.

"We knew beforehand that we would need a special type of conduit over and above what fused HDPE could offer," said Kenny. "These twenty-foot (six-meter) sections of restrained joint PVC that we used have locking rings or splines that fit into a mating groove on a pipe. We could put together two to three sections at a time at the most because of the limited space we had to work in.

"We knew beforehand that we would never have one hundred to one hundred and fifty (thirty to forty-five meters) of room to stretch out a fused string of HDPE pipe. In fact, this was a good horizontal directional

The drilling, in fact all the work, occurred during normal visiting hours at the popular tourist attraction in New York.

All of the equipment, including the Carlon Bore-Gard PVC conduit shown here, was loaded and unloaded at the job site from a barge.

Digital Control Inc. workers survey the area behind the Statue of Liberty. DCI provided the locating system for the logistically complex job.

drilling application for the Bore-Gard conduits since they were designed to handle the radius bending that we put them through."

Each of the three bores was a test of the equipment and the crew. The first bore called for the drilling machine to be tucked behind some 8-ft (2.5-m) hedges and bore 150 ft (45 m) from west to east under a bricked walkway to the corner of a gift shop. The crew attached the drill head so it could get through any below-ground obstacles.

"We weren't sure about what was underground," stated Kenny. "But our bore path was at a six-foot (two-meter) depth and when we ran into the buried granite wall and chunk rock fill on this first bore, we were glad we had brought in the TriHawk head."

The first bore took three hours. When they first hit this wall and tripped back out, they brought pieces of flint rock, quartz and granite, which gave them some clue as to what they were dealing with.

During the pilot bore through this tough spot, they used a Vermeer Navtec system that the D50x100 horizontal directional drilling machine had. When making steering corrections in rock, this computer assisted steering automatically takes over and cuts a ramp or zone for the drill rods to follow.

Subsequently, the crew pre-reamed the bore with a 10-in. (250-mm) fluted backreamer, then pre-reamed again with a 16-in. (400-mm) backreamer before pulling in the bundle of three six-in. (150-mm) conduits.

All throughout the drilling of the pilot bore and the pullback operations, the vacuum truck kept removing drilling fluid, making it a very clean and environmentally friendly operation.

The Second Bore

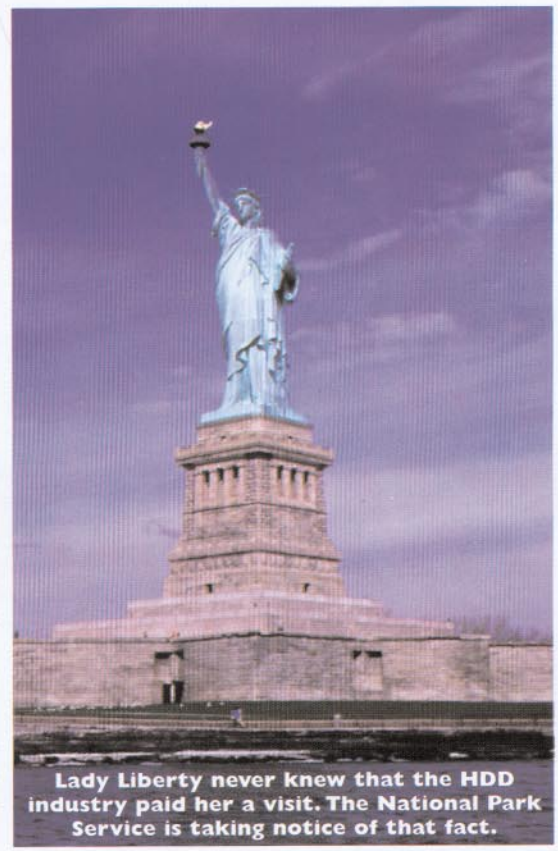
The plan called for the new fuel lines and monitoring lines to go into the basement of the gift store and be joined by the Prestige Environmental company to the start of the second 190-ft (58-m) bore, which was perpendicular to the first. This indirect route was largely influenced by the archeologist and his concerns about what lay beneath the earth and the existence of some old buried fuel tanks. This bore path was 13 ft (4 m) deep at times to avoid possible artifacts.

The path for the second bore was also dictated by the horticulturist who wanted the bore path to be at least 5 ft (1.5 m) to the right of the drip line of a row of oak trees. The locator also had to keep the path 3 ft (1 m) to the left of the existing sewer, water and fuel lines, which had been buried 3 ft (1 m) deep in a shared trench. This left a narrow easement for the new fuel line.

The bore and pullback went relatively smooth given the fill conditions that the backreamers had to pull through. The third bore of 240 ft (73 m) connected the previous exit point to a concrete bunker near the base of the statue. This bore path had to go below a recessed walkway that was at least a 3-ft (1-m) drop from ground level.

Ten days after they started, the conduits were all in the ground and ready for the installation crew to start putting in the carrier lines and the monitoring systems.

"The Vermeer dealership along with Chris McKay from Vermeer Manufacturing helped a great deal with the planning, equipment availability and directional drilling expertise," commented Kenny. "This project was so successful, it opened up the eyes of the National Park Service to the benefits of horizontal directional drilling. It's a method that gets the job done while the tourists can still visit and enjoy the public site." ◆



Lady Liberty never knew that the HDD industry paid her a visit. The National Park Service is taking notice of that fact.