Longfellow Drilling Installs Drilled Shafts for Multiple Transmission Line Projects

by Donald Grant, Kelly Tractor Co.

Mats installed to protect sensitive environment.

Occasionally you run across projects that can rightfully be called "some of the largest foundation jobs in the United States." These projects have come about as a result of an unprecedented expansion and replacement program for the North American electric energy transmission grid. The national program started five years ago and will likely continue for the next ten years.

Transmission grid expansion and replacement addresses two situations. The first is transmission lines throughout the U.S. that are in need of upgrades in order to handle today's higher electrical demand. Second are new sources of power such as wind farms and solar installations that frequently require transmission lines run long distances to connect to the existing power grid.

ADSC Contractor Member **Longfellow Drilling**, Clearfield, Iowa has been one of the most active drilling contractors working in this industry segment. They recently finished the "Middletown–Norwalk Connecticut Bulk Transmission Project,"

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which consisted of the $1.1 billion portion of a $1.4 billion program. The project scope for Longfellow Drilling included a substantial portion of the foundations for nearly 70 miles of new 345-kV transmission line. This was the largest transmission capital project on the east coast.

Current projects undertaken by Longfellow include the "Rhode Island Reliability Project – Woonsocket to Warwick, Rhode Island" and the "Greater Springfield Reliability Project" in western Massachusetts and north-central Connecticut. Both projects are large and complex, requiring drilling techniques that provide safe, efficient working conditions in limited access areas along side live high tension transmission lines.

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Rhode Island Reliability Project

The Rhode Island Reliability Project, owned by National Grid, spans approximately 21 miles in an existing right-of-way. Foundation installation start date was mid-October 2010 with planned completion August 2012. Longfellow's project scope is to build foundations for a new 345kV line and for two existing 115kV lines that are being reconfigured. Numerous transmission lines in the right-of-way are required to be energized at any given time.

To do this job Longfellow selected a combination of IMT drill rigs, predominantly AF 180 and AF 220 LCA rigs supplied by ADSC Associate Member Kelly Tractor Co. According to Kelly Tractor, "these drill rigs are manufactured and designed with the reliability and torque to be able to utilize rock tooling such as low profile cluster drills."

Working in the energized right-of-way requires reduced headroom and minimum clearances between a rig and live wires. If a clear distance to live wires becomes less than the minimum, the transmission line must be temporarily de-energized.

"With 11 rigs on the job at any one time, this difficult and potentially dangerous site requires the right equipment with highly skilled operators and work crews," said Ed Nickel, Operations Manager for Longfellow Drilling. "This is where Kelly Tractor's

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Working under active power lines.

experience proved to be so valuable to us. They provided additional operator training onsite to help keep the job moving forward."

On this project a variety of soil conditions created additional challenges. Some shafts encountered granite rock at the surface. Others began in sand or soil and led to boulders or very hard New England rock. ADSC Technical Affiliate Member Dan Brown and Associates, provided geotechnical engineering consulting services for the project.

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To date, Longfellow has drilled 607 foundations, all in high ground water conditions, with 81 remaining to complete the project. A construction schedule averaging 7.6 shafts per day has been maintained throughout.

On a good day, drilling time for a shaft runs about 4 – 6 hours. For example, using ADSC Associate Member Center Rock's low profile canister drills, a 6-foot diameter 20-foot deep shaft in solid granite could be completed in approximately eight hours.

A "bad day" on this kind of job however, is drilling a 10-foot diameter shaft for 54 days to reach the required depth. Geological conditions encountered in Rhode Island included boulders on top of fractured rock which made it difficult to seal out water. Such conditions hinder the use of air tools and therefore require the use of conventional rock tools. This adds significant additional drilling time.

Work to date has involved excavating 4,900 yards of granite, at an average of 8.72 yards per shaft. In addition 7,000 yards of boulders have been excavated at an average of 12.46 yards per shaft. Over the course of drilling, 29% of the spoil has been rock, 42% boulders and 29% sand or soil.

Shaft diameters range from 6' to 12' with lengths from 15' to 50'. Shaft configurations depend on the height of each tower, which based on terrain, might be taller or shorter than adjacent towers. Approximately 1,695 tons of reinforcing steel has been installed with 35,000 cubic yards of concrete placed in 607 completed foundations.

A variety of tools are being used on this project, including Center Rock's low profile canister drills and hole openers with multiple high pressure/volume air compressors, temporary casing, permanent casing, slurry with additives, dirt augers, rock augers, core barrels and air tools.

While a drilling contractor might expect to be permitted to work in existing transmission line right-of-ways at their own pace, this has not been the case for this project. Right-of-ways traverse both public and private properties, many of which have been developed over the years. In addition, natural wetlands to be crossed have special environmental controls that include protecting endangered species and not contaminating the wetland's waterways. As a result, work in certain areas has been restricted or not permitted at all. Mitigation procedures have frequently required that equipment be dismantled and carefully moved from site to site. At times this has occurred within the same right-of-way. Longfellow reports that, "IMT rigs have proven to be easy to transport and therefore has aided in the progress of the work."

Greater Springfield Reliability Project

Longfellow Drilling is also constructing shafts for the Greater Springfield Reliability Project. This is one of three major projects comprising the "New England East West Solution (NEEWS) Program" for owner, Northeast Utilities. The Greater Springfield Reliability Project runs for 23 miles through western Massachusetts and 12 miles through north-central Connecticut.

While this undertaking has presented a normal set of challenges, a separate non-NEEWS project passing through a damned beaver pond added a new wrinkle to the construction procedure.

The "Montague Leverett Beaver Pond Project," which is 45 minutes north of Springfield, Massachusetts, is located in a pristine rural setting. A large and intricate beaver dam was "built" sometime during the existence of the current transmission line. While this created a beautiful environment for the neighbors' enjoyment, it also created a situation whereby state and federal environmental regulations, as well as safety and reliability issues had to be addressed.

Towers that were originally constructed on dry land were now

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Low clearance live power lines and placing mats added to the project's challenges.

in the middle of the pond. These towers had to be removed and new tower foundations built. The new construction required the use of heavy equipment, therefore, Northeast Utilities had to provide 10,000 crane mats to construct an access road that was 5-7 mats deep. Over 600 flatbed tractor trailer loads of matting was delivered by rail and truck. In order to satisfy environmental regulations drill spoil had to be trucked offsite. If that weren't enough of a challenge, work in the area was scheduled for winter with the expectation that frozen water and ground would assist in supporting the equipment. The winter turned out to be the fourth warmest December-through-January on record, creating soft, sloppy conditions. These conditions added a good deal of time to the work.

Longfellow's Operating Principles

Longfellow Drilling's employees have always taken great pride in their ability to solve problems on the job in real time. These difficult transmission line projects put their resolve to the test. The company, employing IBEW workers, maintains strict quality control standards in the field and in all aspects of their operations.

Over the years the company has developed a culture of safety and "production" that has allowed large projects to move forward on time and within budget. In the case of the Rhode Island Reliability Project, the company has had 70 employees onsite logging 220,000 man hours with no lost time!

The success of difficult projects such as those reported above can be attributed to the combination of an experienced company such as Longfellow Drilling under the strong leadership of past ADSC Director **Mike Kemery**, and the entire onsite team. This combination, along with equipment provided by Kelly Tractor who approaches working with ADSC Contractor Members as a "partner," has resulted in successful projects throughout the company's regional markets. In this case, the result is projects that will provide power resources to millions of residents and businesses for many years to come.

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