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# Midwest Utility Continues With Conversion Process

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Edmond Electric, a municipal utility north of Oklahoma City, Oklahoma, has been converting residential areas that are in need of upgrades from overhead rear easements to underground front easements. Beginning in 2003, two major projects affecting more than 680 homes have been converted to a new underground conduit system.

From a pure dollars and cents perspective, the added cost of underground service was justified by targeting residential blocks that had the highest number of outages and trouble calls. With Edmond's system now 98 years old, many poles, conductors and hardware in some of the older parts of town are ready for re-investment with dollars already in the long-term capital improvements budget.

Outage statistics were used to pinpoint Clegern Place, a 50-year-old section in central Edmond, for the second conversion project, which commenced in August 2005. Similar to the Henderson Hills conversion in 2003 to 2005, some of the equipment in Clegern Place had become outdated and some poles needed to be replaced. Some conductors in the area were also placed in the master plan for upgrading.

## Trenchless Installation

The biggest line budget item in the overhead-to-underground conversion project has been installing the system. Distribution facilities are installed using horizontal directional drilling (HDD) to front-yard easements, with the underground cable encased in high-density polyethylene (HDPE) schedule-40 conduit. One of the practical advantages of encasing the cable (typically in 3-inch HDPE duct) rather than direct burial is accessibility for trouble calls and system testing and maintenance. The accessibility theory has been proven more than once during phase one. When a fault occurred, crews were able to quickly get their hands on the cable at transformers or pedestals, and if necessary, pull and replace faulty cable because it is housed in the conduit. In one case, on a secondary where there was a manufacturer's defect in the cable, the entire trouble call, including pulling new cable, took less than 30 minutes.

HDD was used almost exclusively to install the conduit in the Clegern Place addition in phase two. The cost to restore lawns, streets and sidewalks in mature neighborhoods, along with a number of driveways and road crossings, justified the more specialized HDD installation procedure.

Trenching and open-cut also creates added disruption to the community such as traffic problems,

and the risk of sinking trenches along ditch lines develops years after the installation. Edmond Electric used Doyle Webb Inc., an Edmond contractor who is familiar with the home turf and was an early adopter of HDD back in the late 1980s.

## More Rock

Doyle Webb Inc. owns and operates a fleet of drill rigs from mini (5000-lb pullback) to maxi (40,000-lb pullback). Typically, larger drill rigs with more thrust and torque enable contractors to drill more effectively in rock. But given the tight conditions and driveways, a larger drill would have done more damage than it was worth. Additionally, the contractor's larger drills would fill up the entire front easement of a typical home in the Clegern area. A bigger machine would probably drill more effectively, but the weight alone would preclude crawling over a standard driveway approach, not to mention going across a manicured lawn.

## Drilling Procedures

So Doyle Webb Inc. HDD crews, which humorously have referred to themselves as “amateur geologists,” developed a method for dealing with the rock. Drilling procedures included shorter bores and expecting to dig “pilot holes” midway through some of the bore path to manually redirect the drill head to the desired exit point. In many cases, several hours into a bore, when the drill head began to veer off course or kept going down, which was often the case, the crew would stop, pull back to a reasonable depth and dig up the drill head. Then they would either reposition the drill head in the desired direction or, most likely, bring the drill rig to the exposed pit area and start a new bore toward the desired target. This process was slower, but it provided the desired results.

Crews used Ditch Witch model JT920s with 10,000-lb (4536-kg) pullback, and model JT1720 and JT1220 to drill parallel runs in the front easement for primary and secondary distribution conduits. For the service pedestal to house service “drops,” a smaller model JT520 5000-lb (2268-kg) Ditch Witch was used. Its smaller footprint makes it easy to transport through a 36-inch (91-cm) yard gate.

“Manual navigation” became a key in completing the challenging job. HDD is known for its steerability — being able to navigate the drill head, using an aboveground drill-head-locating device, down, across and back up to the surface at the pedestal or house meter location. But in rock, steerability is greatly hampered. Crews reported that out of all the bores completed in phase two, only two sections had easy drilling soil conditions. All other sections required extra finesse to which HDD crews have become accustomed.

Rock is abrasive and can quickly destroy down-hole tooling. More aggressive titanium bits with hard-facing were used, but crews still wore out two complete racks of drill stem and downhole tools — about \$26,000 in materials. HDD crews used a 5-inch pilot bit, which was an adequate size hole for pulling back the 3-inch HDPE conduit. In a few cases, where the design called for two 3-inch conduits, an 8-inch fluted backreamer, with replaceable “tiger claws,” was used to expand the size of the hole.

BoreGel (Baroid), a bentonite derivative, was added to the drilling fluid mixture on all bores to lubricate the cutting tools and help carry the excess spoils out of the bore hole.

## Meter Cutovers

Edmond Electric excavation crews and the contractor spent as much time as possible on the project, but other maintenance duties meant that crews were only able to dedicate about 65% of their time on this project. This, along with the rock encountered, extended the 12-month deadline to November 2006, close to 18 months from start to finish.

Edmond's contractor personnel installed the HDPE conduit, wire, pedestals and transformer pads. An electrician, now hired under a five-year contract with the city, was then responsible for changing out the meter bases at the house. A per-unit price was established at no cost to the customer for the meter conversion.

Edmond Electric linemen then came back and made the connections and energized the new electric cable. Once the system was cut over, Edmond Electric crews removed the old poles and conductor.

It was satisfying to hear on a regular basis about a home-owner who came home from work, upset that the crews were in the neighborhood, only to find out that the conduit was already in the ground and crews were there to pull wire or connect to the meter. This is the beauty of HDD. These comments from customers reinforced the fact that using a trenchless method continues to be a strategic part of the success of the conversion program.

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