

by Jeff Griffin ■ Senior Editor

Unique Building, Innovative HDD Approach

When completed in 2011, the Chicago Spire will be the tallest building in North America and the world's tallest all-residential building. With 150 floors rising to a roof height of 2,000 feet, the structure will rise higher than Chicago's Sears Tower, Toronto's CN Tower and the Freedom Tower to be built in New York City.

Located at the Chicago River's junction with Lake Michigan, the Chicago Spire will be a new focal point for the city's already impressive skyline.

Ground was broken for the structure in July 2007 when construction began on 34, 110-foot-deep caissons that will anchor the building. Even though the structure has yet to rise above ground level, there is plenty of activity on the job site.

Trenchless construction already has played a key role in bringing electrical power to the new building. Last fall, Mid America Underground completed two difficult horizontal directional drilling (HDD) river crossings to bring power cable to the site, said Adam Bosch, Mid America president.

"We call it our 'Power-to-the-Spire' project," Bosch said. "With each crossing, 700-feet long at a depth of 70 feet under the river, a 300-foot design radius was required. Pilot crossings were parallel 15 feet apart under the Ogden slip at the north branch of the Chicago River at Lake Shore Drive, crossing from Navy Pier to DuSable Island.

"Upon commencement of the pilot hole, fluid circulation was lost within the first 50 feet. Excavation down to the bore hole provided knowledge of the presence of building rubble and trolley tracks," Bosch said. "After removal of the obstructions and installation of a 10-inch HDPE surface casing approximately 40 feet in length, circulation was maintained through the majority of the four days of the pilot hole operation."

Second hole

The rig then was moved to the second pilot hole 15 feet away and drilling commenced. This second hole was completed in three days.

"The decision to drill both pilot holes prior to reaming was based on the fast-approaching Nov. 15 city of Chicago moratorium to close excavations and restore pavement prior to winter," Bosch continued. "We had a standby drill unit ready to permit the option of reaming both crossings simultaneously if necessary."

The project called for four, 5-inch HDPE conduits to be installed in each of the crossings.

"The pilot hole of first crossing was enlarged first. The 6-inch pilot hole was en-



Due to extremely tight space restriction, Mid America was forced to use a smaller HDD rig. However, the two bores were still accomplished on schedule.

larged in 4-inch increments to 18-inches in diameter," said Bosch. "It took nine days to pre-ream and pull the first crossing pipe. The rig was moved to the adjacent crossing site and the process was repeated. Rubble and building materials on entry and exit caused issues with circulation and reamed hole stability. Therefore, a second swab pass was implemented to ensure successful pullback. Eight days was required for completion."

Both bores were surface launched with the drill set up in one lane of Illinois Street and right-of-way belonging to the city park department, he added.

"Just a few feet from the entry point there was a buried foundation of an old foundry building," Bosch said. "There was sheet piling about 55-feet deep near the river's edge. We encountered a large amount of buried steel, tracks and miscellaneous building rubble. There were so many voids, it was impossible to maintain circulation because drilling fluid would fill the voids in the rubble until we excavated and put in the conductor barrel."

Both pilot holes exited at the surface in the park on DuSable Island.

Compact drilling

A relatively compact Vermeer D36x50 drilling unit developing 36,000 pounds of pullback and 4,995 foot pounds of spindle torque was used for both installations. Ten-foot rod stems were used.

"We would have preferred to use one of our two larger machines," Bosch said, "but the small footprint was better suited to the

A New Chicago Icon

When completed in late 2011, the Chicago Spire will bring a striking new skyscraper to the center of the skyline of Chicago, a city renowned for impressive architecture of many different periods and styles.

Situated on a 2.2 acre site where the Chicago River meets Lake Michigan, the Chicago Spire features a design with each floor rotating an average of 2.44 degrees from the one below with total rotation of 360 degrees to the top. The result, says skyscraperpage.com ". . . is a graceful spiral not unlike shells in the natural world. In addition, the character of the building's spiraled shape allows for better disbursement of applied wind forces which is an obvious advantage for any tall structure."

Spire developer, the Shelbourne Development Group, says the structure has a base-to-height ratio approaching one to 10, making it the most slender super-tall building in the world. The building and site plan designed by Spanish architect Santiago Calatrava incorporates DuSable Park and will create a new lakefront destination for Chicago residents and visitors to enjoy.

There will be approximately 1,200 condominiums in the Chicago Spire with seven unique units, including galleries, suites, and penthouses offering homes for individuals, couples and families with views of the city and lake.



Innovative HDD

The staging area for Mid America's underground infrastructure work on the Chicago Spire project.

first week of October to pour new sidewalks and complete other surface restoration the day before the Nov. 15 moratorium on street closings.”

During drilling, backreaming and pullback, maintaining control of the ever-curious public was a daily task.

Mid America subcontracted the two HDD installations from Evans Construction, Chicago. The Spire's developer is Shelbourne Development Group, Chicago.

Based in Aurora, IL, Mid America Underground focuses on all facets of horizontal directional drilling and trenchless construction, including sewer and water, electrical, pipeline and communications projects. The company operates 12 HDD drill rigs ranging in size from 7,000 to 500,000 pounds of pullback.

space available for set up, and a smaller diameter drill stem facilitated making the 300-foot vertical radius. However, opening such a large hole with a tight radius with the smaller machine was a challenge.

A wireline system was used to guide the path of the pilot bores, and GPS equipment was used to plot tie-in points.

In addition to installing conduits under the river, the project posed other challenges.

“Obtaining permitting was time consuming, cutting into valuable work time needed to finish the installations before the deadline to close temporary excavations and reopen streets,” said Bosch. “We had the responsibility of acquiring the numerous permits needed before work could begin. Our contractors, the city and the power company helped expedite the process. Our plan allowed seven and a half weeks to complete both installations. Work started the

FOR MORE INFORMATION:

- *Contractor: Mid America Underground, (630) 897-5882*
- *Drill rig: Vermeer Corp., (888) 837-6337, vermeer.com*