Subsurface Utility Engineering

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Avoiding Underground Utility Conflicts

Picture this. A military base begins construction of a new storage facility building. Records, not recent enough, fail to show a fiber optic cable (FOC) installed by the information technology department. A backhoe hits and cuts the FOC, causing work stoppage at the construction site, major communications shutdown on the base, and a costly construction delay while the FOC is repaired.

What if it had been a water main, cutting off water to the Bachelor Enlisted Quarters? Or a gas line, resulting in a dangerous explosion?

Experience has shown that relying on information from old plans and records regarding the location of underground utilities may not be the wisest decision. Often, these subsurface facilities are not where the records say they are. Once construction begins, the inaccurate information can result in costly conflicts, damage, delays, service disruptions, redesigns, claims . . . even injuries and lost lives.

Damage can be minimized by incorporating a technological procedure called subsurface utility engineering as a part of the design and/or pre-construction process.

What is Subsurface Utility Engineering?

Subsurface utility engineering (SUE) is an engineering process that incorporates civil engineering, surface geophysics, surveying and mapping, nondestructive vacuum excavation, and asset management technologies to identify and classify quality levels of existing subsurface utility data. The data allow for developing strategies and informed design decisions to manage risks and avoid conflicts and delays. If a utility conflict does exist, viable alternatives can be found to resolve the conflict before any damage is done.

While the SUE process itself is tailored to each project, it typically includes three major field activities:

- **Designating** – using geophysical prospecting techniques to determine the existence and mark the horizontal position of underground utilities.
- **Locating** – using nondestructive digging equipment, such as vacuum excavation, at critical points along an underground utility's path to determine the precise horizontal *and* vertical position, size and material composition of the underground utility line.
- **Data management** – surveying utility information obtained by designating/locating and entering it into a computer-aided design (CAD) system, allowing designers to examine project options and plan ahead to eliminate utility conflicts.

SUE Saves Money

The Federal Highway Administration (FHWA) has already demonstrated that the relatively inexpensive SUE process yields a high return on investment (ROI) for roadway construction. In a study completed in January 2000, the FHWA found that for every dollar spent on SUE by a state highway department, the department realized an average savings of $4.62. The FHWA and many other governmental transportation agencies now strongly advocate the use of SUE on highway construction projects.

Applications for SUE extend beyond highway construction. SUE makes good engineering and design sense for any type of construction project that requires excavation around existing underground utilities . . . including construction projects at military bases.

Naval Station Mayport

Naval Station Mayport, located in Jacksonville, Florida, is the third largest naval facility in the continental United States. It is host to more than 70 tenant commands, including the aircraft carrier USS John F. Kennedy, one of the last remaining conventionally powered carriers.

Mayport wanted to upgrade its underground utility facilities, including its electrical system, in order to service visiting nuclear-powered aircraft carriers, something its existing utilities did not allow it to do.

Carrier Wharf C2, located at the far end of horseshoe-shaped Mayport Basin, was designated for the upgrade. MIL-CON Construction Corporation, the prime contractor on this design-build project, decided to directional bore from the base side of the horseshoe out to Wharf C2, running the new electrical power lines under the basin. “This was a much shorter, less costly solution,” said Kerry Bentley, MIL-CON’s chief executive officer.

According to Bentley, numerous underground utility lines needed to be located and identified on both sides of the basin. “There were both active and inactive underground lines,” he said. “We had to be especially careful of the active lines, including fuel lines, during the drilling process.”

MIL-CON called on engineering and design firm TBE Group, internationally recognized SUE experts, to find those lines. “TBE found all of the utilities for us,” Bentley said. “Naval Station Mayport is like its own city, with many underground utility lines. TBE identified, located and mapped them all in just a few weeks. By the time we were ready to excavate, we knew where every underground utility was located. I was very impressed with the speed and accuracy of the SUE process.”

Speed was especially important on this project. The job was awarded to MIL-CON immediately following the terrorist attacks of September 11, 2001. USS John F. Kennedy was deployed soon after, and MIL-CON had to complete the utility upgrade before the carrier came home. “Because of the war on terror, we weren’t told when the carrier was returning,” Bentley said. “We just knew we had to finish the job before it came back. We did, with a few days to spare. Because of the confidence we had in the underground utility location information provided by the SUE process, we were able to work at a faster pace and complete the project on time.”

Hurlburt Field Air Force Base, Main Entrance

Located just west of Fort Walton Beach, Florida, Hurlburt Field, home of Air Force Special Operations, planned significant improvements to its main entrance to improve traffic flow, stormwater drainage and security. Plans included replacing a 4-inch underground water line with a 6-inch line for improved service to the surrounding facilities.

Nondestructive vacuum excavation revealed that the existing line already was a 6-inch PVC line, eliminating the need for replacement.

“Old plans showed a 4-inch line,” said O. M. “Chuck” Spangler, Jr., RA, chief of military design and construction at Hurlburt Field. “We saved thousands of dollars by not having to upgrade the line.”

According to Spangler, the 6-inch line was not the only underground utility identified through the SUE process. “We also found underground lines that we didn’t know were there because they were not recorded on our drawings,” he said. “Using SUE saved us from having to issue multiple change orders once construction had begun.

“What we spent on these SUE services more than paid for itself,” Spangler explained. “The SUE process provides us with a more accurate picture of what’s located underground before we begin construction. It gives us the opportunity to develop better cost estimates on our construction projects.”

Hurlburt Field, 505 th CCW Air Operations Center Formal Training Unit

The Air Force was looking to turn an eight-acre parcel of Hurlburt Field into an Air Operations Center Training campus for the 505 th Command and Control Wing, a unit of the Air Combat Command. Bullock Tice Associates, a Pensacola, Florida, architectural firm, was commissioned by the Mobile District of the Army Corps of Engineers to design the first two facilities, which represented the first phase of a two-phase project.

While the design included all new underground utility lines, designers knew it was important to locate existing underground lines to avoid conflicts. “This was especially important because there were numerous underground communication lines,” said Jon Molloy, AIA, Bullock Tice’s vice

president and project manager. “If one of these lines were damaged or completely incapacitated, it could take several days to restore vital base communications infrastructure.”

Bullock Tice called in TBE Group to find and identify the existing underground utility lines. “The SUE process identified numerous old, uncharted underground utility lines, many of which had been previously abandoned or not maintained,” said Molloy. “At potential conflict sites, TBE’s vacuum excavation process provided us with the horizontal and vertical locations, as well as sizes, of these lines.

“Although the new utility routings were already decided during the early design stages of the project, we were able to inform the contractor where to expect to find existing below-ground utilities to prevent conflicts during the construction stage,” Molloy said.

Phase two of the project is not yet funded. However, TBE Group has already designated all existing underground utilities for the entire eight-acre site. This data will aid the future design process.

ASCE Standard

In 2003, the American Society of Civil Engineers (ASCE) published its *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*. The standard formally defines the SUE process and establishes guidelines for collecting and depicting SUE information.

The ASCE standard is an emerging guideline among a growing number of engineering and construction professionals, and the SUE process is being incorporated in an increasing number of military construction projects.

Credits

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Publication(s)
The Military Engineer

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