Jeff Sohlstrom (left) and Reid Davis stand before the ground penetrating radar (GPR) unit that they use to conduct subsurface scans. The cart's front wheel has been replaced with the GPR antennae used to send and receive electromagnetic waves.

CONCRETE RESULTS

Concrete GPR's Subsurface Scans Speed Construction, Reduce Delays

by Jay Landers

Project owners typically employ ground penetrating radar (GPR) after unexpected conditions interrupt construction. The proactive application of GPR imaging services can prevent costly delays and change orders, and increase safety on the job site. Such goals comprise the mission of Concrete GPR, LLC, a small business founded approximately a year ago, in Albany, Ore., to provide expert GPR imaging services in the Pacific Northwest and beyond.

TRUSTWORTHY TWO-MAN TEAM

Concrete GPR consists of its two founders, Reid Davis and Jeff Sohlstrom, who combined have 18 years of experience with GPR. The two previously worked together at another GPR provider before forming their own company last fall. "We felt that there was a void in the regional market for high-level providers that were focused on the customer first," Davis says.

COURTESY OF SANDRA DAVIS

"We're experts at what we do. ... There are very few providers nationwide that have both top-tier 2D and top-tier 3D [GPR] expertise and can smoothly integrate both for a client's benefit, to reach the most cost-effective way to solve a specific problem."

Reid Davis, Founder,
Concrete GPR, LLC

Reid Davis of Concrete GPR, LLC shares that proactive use of GPR technology, especially 3D scans, can go a long way toward keeping projects on track.

Jeff Sohlstrom of Concrete GPR, LLC says that his company has the ability "to work with any obstacle and get data collected in a timely, efficient manner."

COURTESY OF SANDRA DAVIS (TOP); CONCRETE GPR, LLC (BOTTOM)

Although Concrete GPR currently operates predominantly in Oregon and Washington, the company is ready and willing to go farther afield. "We will happily go anywhere that somebody wants to take us," Sohlstrom says. "All it takes is one phone call and we can be off to who knows where."

In dealing with customers, Sohlstrom and Davis draw on their formative experiences and lessons learned from their days as Boy Scouts. In particular, as teenagers, they both worked as counselors at Boy Scout summer camps, an experience that "really has shaped how we approach things as adults," Davis says. "It shapes our ethics and business approach."

The scouting "mindset," Sohlstrom says, entails "being honest with everybody." For Sohlstrom and Davis, this philosophy carries over to their approach to customer service. The goal is to "make sure that your customers get everything that you tell them and make sure that everyone is trustworthy and honest," Sohlstrom says. "If we say we can do something, we can do it," he says.

SCANNING BENEATH THE SURFACE

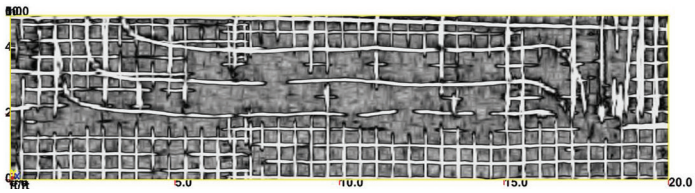
Much like sonar, GPR technology sends electromagnetic waves into concrete or soil, depending on the application, and records the waves as they bounce back. By analyzing the waves, a GPR system "lets us see a representation of what's happening inside the concrete or soil," Davis says.

Developed by NASA in the 1960s as part of the Apollo moon landing program, GPR initially was used primarily in archaeological applications. During the past 15 years, the miniaturization of computers has enabled GPR units "to become much more powerful and much more deployable for construction and industrial applications," Davis says. "We're very well positioned in these areas," he says.

As its name implies, Concrete GPR specializes in analyzing concrete to locate such items as post-tension cables, steel rebar, conduits and voids. However, the company also performs such services as locating utility lines, concrete-encased utility banks, previous excavations, backfilled trenches, underground storage tanks, tree roots, sinkholes, and safe boring locations. Additional services are available in the fields of geotechnical, archaeological and forensic investigations.

DIFFERENT DIMENSIONS FOR DIFFERENT NEEDS

Depending on a client's needs, Concrete GPR can conduct two-dimensional (2D) line scans or three-dimensional (3D) grid scans. For the more straightforward 2D line scans, the technician interprets the reflection files from the GPR unit directly and marks the findings in real time as a scan is underway. A common example of this approach involves indicating on the scanned area the positions of post-tension cables and steel rebar in reinforced concrete, so as to denote safe core drilling locations. "Typically, 2D line scans are best suited for projects that already have begun and a rapid assessment is needed to solve a specific problem quickly," Davis says.



The results of a 3D scan of a 20-foot by 5-foot area of a concrete slab show the presence of reinforcing mesh and radiant floor heating tubes near the surface. For this project, Concrete GPR, LLC inspected a concrete floor for electrical conduits and other hazards before demolition.

As part of a 2D scanning operation, Reid (left) marks on the surface in real time, indicating where the ground penetrating radar unit has identified a particular subsurface feature.

The 3D grid scans are ideal for evaluating larger areas, particularly as part of projects that have yet to begin construction. These are significantly more detailed scans. They require post-processing that involves assembling a high-density grid data set and interpreting the data set as a single unit. This approach generates a comprehensive overview of the findings, which are delivered digitally to the customer. Armed with this data, engineers, architects and pre-construction teams can design around existing conditions even when as-built drawings are inaccurate or do not exist. In effect, the 3D models amount to a re-creation of as-built documentation based on existing conditions.

PUTTING THEIR EXPERTISE TO WORK

The ability of Concrete GPR to conduct 2D and 3D scans equally well is what sets it apart from the competition. Having the two skill sets amounts to a "huge differentiator for us," Davis says. "There are very few providers nationwide that have both top-tier 2D and top-tier 3D expertise and can smoothly integrate both for a client's benefit, to reach the most cost-effective way to solve a specific problem. We're experts at what we do."

At the same time, many providers of 3D scans offer only a "canned product" that is limited to a set size, such as a two-by-two-foot grid, Sohlstrom says. By contrast, Concrete GPR can scan anywhere from small grids up to large areas that encompass hundreds of feet and feature complex terrain. "We have the ability to work with any obstacle and get the data collected in a timely, efficient manner," Sohlstrom says.

PHOTOS COURTESY OF SANDRA DAVIS

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Typical clients include contractors constructing high-rise concrete buildings, engineers who need to know more about an existing structure's condition before renovating it, and owners looking to upgrade an older building to improve its seismic performance. In all these cases, "we can go in and give them as-built comprehensive re-creations without having to do any destructive testing," Sohlstrom says.

"Construction can vary dramatically within the same building," Davis says. As a result, destructive testing can provide a glimpse into the construction practices used in a small section of a building, but such findings may have little relevance for the rest of the structure. GPR technology, on the other hand, can be used to evaluate the entire building and determine whether different construction methods were used in different locations. For these reasons, the findings of Concrete GPR's scans are especially useful in the case of older buildings.

AVOIDING UNPLEASANT SURPRISES

Proactive use of GPR technology, especially 3D scans, can go a long way toward keeping projects on track. For example, a developer planning to convert an old warehouse into mixed-use units can benefit greatly from 3D grid scans of the structure's concrete slab, Davis says. "We can scan the floor slabs and map out everything inside, before they get too far into their design-build process," he notes. Concrete GPR can provide a model depicting existing features in the slab, ensuring that potential conflicts are known in advance of construction and can therefore be accommodated during design.

Worker safety is another key benefit of Concrete GPR's imaging services, Sohlstrom says. By pinpointing the locations of post-tension cables and live conduits, the firm's imaging helps to ensure that workers drilling through concrete avoid such hazards.

Ultimately, Reid and Sohlstrom view themselves as "damage prevention specialists," Reid says. "We're trying to save the customer money," he adds. "Whatever the customer is paying us, we're doing our best to make sure that it's a whole lot less than what would be spent through any other route."

Affixed at the top of the ground penetrating radar unit, a computer module is used to digitize the returning electromagnetic wave signals.

During the past 15 years, the miniaturization of computers has enabled ground penetrating radar (GPR) units to become more powerful and easier to deploy for construction and industrial applications.

Author Bio: Based in Austin, Texas, Jay Landers is a writer and editor who specializes in reporting on design, construction and infrastructure.