

July 2005

water, sewer, gas & tele

# underground construction

Serving the construction, rehabilitation  
and remediation professional

[undergroundconstructiononline.com](http://undergroundconstructiononline.com)

## Rehabilitation Selection Guide

Rehab Technology  
in this issue!  
pg. 34



**Many Uses For  
Vac Systems**

**Central Plastics  
Celebrates 50 Years**

**Long Term  
Trenchless Quality**

**What Contractors  
Expect From Rentals**

# VACUUM EXCAVATION

by Jeff Griffin ■ Senior Editor

## Bess Testlab Finds Many Uses For Air Vac Systems

The versatile vacuum excavator is finding a place with a growing number of companies whose primary activities are not underground utility construction, allowing them to extend their services into new areas.

Vacuum excavators are portable, dual-purpose machines which are both powerful and “soft” excavation machines, able to dig small, precisely-controlled holes with high-pressure air or water and multipurpose vacuum systems.

For more than 20 years, Bess Testlab Inc., Santa Clara, CA, has served a broad range of clients providing independent testing laboratory and inspection services, including mechanical testing and analysis, chemical analysis, failure analysis and materials consulting, welding inspection and certification, concrete scanning and location of utilities.

Geovac, the company's vacuum excavation division is entirely dedicated to vacuum excavation services for uncovering buried utilities to confirm their exact locations – potholing in popular utility terminology – and general non-destructive excavation, says Jose Bohorquez, Bess Testlab president.

“Vacuum excavation is used every day on both public and private projects,” Bohorquez continues. “We service the majority of California. Our customers include civil and consulting engineers, federal agencies, underground construction contractors, public works departments, post and fence contractors, and private, commercial and residential property owners.”

### Equipment

The Geovac division operates two Vacmasters truck-mounted air excavation systems: a System 1000 and System 4000. High-pressure air penetrates porous soils, blowing particles apart, and the air system's self-contained compressor generates a limitless supply of air. When potholing, compressible air blows around pipe or cable being



uncovered without damaging them. Spoil remains dry and is immediately reusable.

Bohorquez says the company's technicians are highly-trained and experienced in all methods of locating underground utilities, including the use of radio frequency (RF) and acoustic pipe locators, ground penetrating radar (GPR) and what the company describes as PLU – positive location of utilities – by exposing them by vacuum excavation.

Every technology and technique has different strengths and weaknesses, Bohorquez says.

“For example,” he explains, “situations arise where access to a valve, meter box or drop inlet is restricted or not available near the digging zone, which would make RF location difficult. In this case, a GPR survey using a 400 MHz antenna could be the best choice to locate conductive and non conductive utilities to a depth of 10 feet for utilities over 4 inches in diameter. However, utilities 2 inches in diameter and smaller could only be detected up to a depth of 3 feet.

RF Locators and the GPR instruments are very effective in locating the horizontal position of utilities. However, the accuracy of the vertical depth will be affected by many variables such as soil conditions and access to valves, meter boxes and other factors. GPR is also affected by the absence of calibration with a known target for a particular site and shallow water levels. Adverse conditions can make the vertical depth determination nearly impossible.

“We believe,” Bohorquez continues, “that knowledge and experience in all these techniques is necessary before proceeding with

any underground utility location project. We feel that there are too many unique situations in the field to rely solely on any single technique to be effective for all possible situations, and that all three techniques must be available.”

### Reliability

He emphasizes that in situations where the exact location of utilities is crucial to a project, exposing the utility by potholing with vacuum excavation is the most reliable and efficient method.

After the one-call agency has been notified of pending construction and utilities are located and marked, Bess personnel reconfirm location marks and lay out areas to be potholed. If sites of potholes are covered with paving, a 12 by 12-inch square of paving is removed by air hammer or a 10-inch diameter hole is cut using custom coring equipment.

“The potholing process itself is very fast and efficient,” says Bohorquez. “Our System 4000 – the larger of the two units – is capable of digging a 12-inch-square hole five- to 6-foot-deep in minutes.”

After the utilities are exposed, depth, physical conditions and utility size and type are easily verified and documented. Backfilling is usually done by adding the native extracted material and compacting it with a pneumatic hammer. Restoration of paved surfaces is completed using an asphalt-polymer cold patching material or other material specified by the construction plans.

Non-destructive, soft excavation with air vacuum excavation equipment is used on many types of projects.

One recent example is digging 24-inch di-



iameter, 8-foot-deep pile holes for a concrete foundation located in close proximity to buried gas and electric utilities.

“Even though all utilities were properly marked and identified, the general contractor did not want to take any chance of hitting any utility by using a conventional auger rig,” explains Bohorquez. “Our crew vacuum excavated four holes in less than a day without any damage to the nearby utilities.”

### Long vac

An environmental firm in South San Francisco hired Bess to dig 6-inch diameter, 5-foot-deep holes inside an elevator pit, located approximately 200 feet from where the System 4000 truck could be positioned.

“Even though the digging location was a long distance away from our truck, our vacuum excavation System 4000 was strong enough to dig and vacuum the holes efficiently using one 220 foot, 4-inch diameter hose,” says Bohorquez.

“Every week,” he adds, “we complete several vacuum excavation projects, ranging from utility repair work in hard to reach areas to sign post installations near utilities.”

The System 1000 air vacuum excavation system is powered by a 68-horsepower diesel engine; 100 cfm at 150 psi compressor; 780 cfm at 15 inches of mercury, 4-inch positive displacement blower and a 0 to 3,000 psi, 3 gpm high-pressure water system. The unit can be mounted on a truck, trailer or skids.

The System 4000 is the world’s most powerful air excavation system. It is equipped with a 155-horsepower diesel engine; 300 cfm at 220 psi compressor, 1,000 cfm at 15 inches of mercury, 4-inch positive displacement blower; 0 to 3,000 psi high-pressure water system, self-purging filtration system; interceptor canister; and enclosed powerhead. The unit is designed for installation on a 26,000-pound GVW (non-CDL) truck.

### Growing needs

Bess Testlabs started vacuum excavation operations with the System 1000 model. “Initially we researched several different vacuum excavation systems, both hydro and pneumatic. We eventually choose the

System 1000 because of its efficient air digging capabilities and economical use,” Bohorquez explains. “We also factored in the lack of disposal facilities willing to take the mud by-product from hydro excavation when we made our selection.”

Recently the System 4000 was added. “The machine has expanded the potential for our company due to its increased capacity and wider range of applications,” Bohorquez elaborates. “The larger model has allowed us to reduce each crew to just two operators because much less physical effort is required per hole. The new system permits us to produce several more potholes per day than we were previously capable of. This is beneficial to our customers because the time and cost per hole has been reduced.”

Bohorquez believes there will be a growing demand for vacuum excavation services.

“In recent years,” he observes, “we have perceived a steady increase in the aware-

ness of the importance and benefits of vacuum excavation in the underground construction world. From underground utility locating to cathodic protection installation, there is not a better way. Vacuum excavation on utility locating projects is incredibly cost effective. The savings that come from vacuum excavation compared to alternate techniques are unbeatable.

“We believe,” Bohorquez concludes, “that the demand for vacuum excavation will continue to grow. It is becoming more and more common to see construction specifications and plans that mandate the verification of the horizontal and vertical location of utilities by potholing. We have no doubt that there is no better technique available.”

### FOR MORE INFORMATION:

#### Vacuum excavation services:

Geovac (Bess Testlab Inc.), (408) 988-0101

#### Air vacuum excavation units:

Vacmasters, (800) 466-7825

