

Training Critical to Maximize Return, Minimize Risk

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The technology that I would like to specifically address is ground penetrating radar (GPR). GPR technology is being increasingly utilized to improve utility locating efforts and to investigate structures such as floors, walls, beams and columns in nondestructive ways. I believe that we are on the verge of a rapid expansion in the use of ground penetrating radar technology. It is non-destructive, safe-to-use and the only practical way to image into and through concrete and soil systems.

What is a ground penetrating radar instrument?

Ground penetrating radar, referred to as GPR, is an electronic instrument that uses

pulsed radio waves to investigate the internal structure of a non-metallic material. For utility locating application, this is generally a soil zone.

How does it work?

Buried objects that have a different composition than the surrounding material, generally soil for utility locating, will reflect a portion of the radio wave pulse back to the surface to be recorded by the GPR instrument.

The GPR instrument measures the strength of the radio wave reflection and the time that it takes for the radio wave pulse to travel from the instrument to the buried object and back. This is called two-way time.

Note that a GPR instrument does not directly measure the depth to a buried object. Depth estimates are made by using a measured or

assumed radio wave velocity for that soil zone and multiplying this velocity with the measured one-way travel time to arrive at an estimated depth. The instrument's computer can combine together the reflection records of many radio wave pulses taken along a traverse to generate a GPR image profile. This GPR image profile is what we see on the instrument's display panel.

What are the advantages of GPR?

The advantages of utilizing a GPR instrument to assist in the locating of utility lines are:

1) It can potentially

image non-conductive utility lines that cannot be located using standard EM locating technology.

2) It is self contained (the transmitter and receiver are contained within the instrument) and does not require that a separate transmitter be directly connected to a conductive utility line or tracer wire.

3) The GPR instrument can collect and save digital data as a form of documentation.

4) It is safe to use.

What are the limitations of GPR?

1) GPR reflections do not provide an exact identification of the utility line.

2) You will know that a utility line is there, but you generally will not know its exact identity.

3) The depth of investigation may be very shallow in wet, conductive clay-rich soils preventing the imaging of deeper utility lines.

4) The minimum size of the utility line that can be detected with a GPR instrument increases with increasing depth.

5) Because the GPR instrument requires the antenna to slide along the ground, obstacles such as curbs, fences, walls, trees etc. will restrict the areas that can be investigated.

6) If you want to change the depth of GPR investigation, or resolution of your imaging, you must change the antenna in the instrument. Individual GPR antennas with different imaging capabilities are available from the main manufactures of GPR instruments.

Why Is Training Important?

It is common sense that a chain is only as strong as its weakest link. The accurate characterization of underground utility systems requires the utilization of the proper technology, instrumentation and the knowledge to successfully conduct the investigation. In a simple way, we can think of utility locating as

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a three link chain that consists of a technology link, an instrument link and an operator knowledge link. I have asked numerous professionals in the locating business: What do they think is the weakest link in the chain required for successful locating? The vast majority without hesitation indicated that the lack of operator knowledge and experience is the biggest issue.

Instrument manufacturers have made great strides in designing and manufacturing durable electromagnetic locators and ground penetrating radar (GPR) instruments that can be mobilized quickly and be used to characterize underground utility systems. In my experience, modern EM locating and GPR instruments have many different design features that make them more or less suited

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for particular locating tasks, but their capabilities are generally similar. This is certainly not true with the skill set of utility locating professionals. I have found a wide variation in the skill levels. It is fair to say that the majority of improper locates is due to operator error, not from a technology or instrument failure. This leads me to conclude that the best investment a company can make in maximizing the return on their investment in instrumentation and personnel to locate utilities is to provide quality training for their locators.

It has been my experience that the most effective GPR training consists of interactive classroom sessions with hands on GPR field operations. The classroom sessions introduce and discuss the basic concepts of GPR along with presenting actual case studies. The GPR field operations provide the instrument operating experience that cannot be effectively addressed in the classroom. Learning

to make effective field decisions regarding the most effective operating parameters, effective search patterns and interpretation of the GPR reflection profiles are critical. The same skill set that is required for a good EM locator is also required for a good GPR professional. 1) Know the technology; 2) Know your instrument; 3) Be a problem solver; 4) Have the desire to always learn and ask questions; 5) Have the ability to be consistent with your GPR imaging procedures; 6) Have a strong desire to do a good job.

Where can you get training in GPR technology?

The main manufacturers of ground penetrating radar instruments provide some form of GPR training that is available to anyone that is interested. There is also an increasing number of trade shows that offer GPR presentations and seminars. Organizations such as Staking University offer GPR training courses that range from a short seminar to day- long classes. **UF**



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