

THE DIRT ON SAFE DIGGING

Take Safety to Mach 2 with an Air-Powered Excavation Tool

When it comes to underground utility lines, what you can't see can hurt you. The Common Ground Alliance, an association that promotes efforts to reduce damage to underground infrastructure, estimates that there are more than 20 million miles of gas, electric, water, sewer and telecommunication lines buried underground in the United States. That's the equivalent of more than one football field's length of buried utilities for every man, woman and child in the nation.¹

Digging without knowing the approximate location of underground utilities can lead to injuries and fatalities, property damage, service disruptions and costly repairs. Consequently, utility companies and contractors go to great lengths to ensure that their employees are taking the necessary safety precautions when working around underground utility infrastructure.

Still, incidents continue to occur. According to the U.S. Department of Transportation, there were 1,815 pipeline incidents caused by excavation damage between 1988 and 2014. These incidents resulted in 193 deaths, 757 injuries and nearly \$545 million in property damage.²

¹ Common Ground Alliance, <http://call811.com/before-you-dig/risk-reduction>

² Stacy Cummings, "Do You Know What's Below? Call 811 Before You Dig!", U.S. Department of Transportation "Fast Lane" blog, Aug. 6, 2015, <https://www.transportation.gov/fastlane/national-811-day-2015>



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Among the incidents involving underground utility strikes in recent years:



- On June 7, 2010, a truck-mounted power auger struck and punctured a 36-inch-diameter natural gas transmission line near Cleburne, Texas. The operator was using the auger truck to dig holes for the installation of new electric-service utility poles. The natural gas ignited and killed the auger operator and burned six workers. The total property damage and cleanup costs were estimated to be over \$1 million.³



- On August 20, 2014, a 38-year-old worker in Edmonds, Wash., died when the jackhammer he was using struck a 7,200-volt underground power line. On the day of the incident, the worker and two other employees were digging trenches and installing storm drains on a hospital campus. According to a news report, the incident temporarily cut power to the hospital and to some residents in the surrounding area. The Washington State Department of Labor & Industries levied over \$50,000 in fines to two contractors for safety violations related to the fatal accident.⁴



- On November 20, 2006, a cable TV technician on a routine service call at a home in Huntington, Ind., inadvertently drove a grounding rod through a natural gas pipeline. Gas began escaping from the pipeline, and the technician notified the local gas company. A responder from the gas company arrived quickly. However, within minutes of his arrival, the house exploded, killing the responder as well as a resident of the home.⁵

Call Before You Dig

To prevent accidental utility-line strikes, every state requires professional excavators and homeowners to call 811 at least two days before digging. The 811 operator will connect the caller with his or her state's one-call center, which will ask for information about the location of the intended dig and then contact the companies that might operate underground utilities in that location. By law, the companies must determine if their underground utilities could be affected by the excavation, and if so, they must mark the exact location of their utilities with flags or paint.



The Department of Transportation and the Federal Communications Commission launched 811 in 2007, establishing a toll-free nationwide hotline that replaced a patchwork of numbers that had been used to connect to one-call centers for utility-locate requests. According to the Common Ground Alliance, when excavators call 811 prior to digging, there's a less than 1 percent chance of striking a buried utility line.⁶

As part of its effort to promote the 811 hotline, the Department of Transportation has created a video that references the fatal 2006 accident in which a cable TV technician accidentally punctured a gas pipeline in Huntington, Ind. The video notes that the cable technician did not call 811 prior to digging, and the underground utilities were not marked. The title of the video is: "A Call to 811 Could Prevent a Call to 911."

"If the 'Call Before You Dig' service had been used, my dad would still be here today," says Brandon Dalrymple, whose father, Alan, died in the 2006 explosion. "I have no doubt about that."⁷

³ National Transportation Safety Board, pipeline accident brief, <http://www.ntsb.gov/investigations/AccidentReports/Reports/PAB1302.pdf>

⁴ Washington State Department of Labor & Industries, <http://www.lni.wa.gov/safety/research/face/files/711362015laborerelectrocuted.pdf>

⁵ Cynthia Quarterman, "An Easy Call to 811 Could Prevent a Call to 911," U.S. Department of Transportation "Fast Lane" blog, <https://www.transportation.gov/fastlane/easy-call-8-1-1-can-prevent-call-9-1-1>

⁶ Common Ground Alliance, 2014 DIRT Report

⁷ U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, "Safe Digging Testimonial: A Call to 811 Could Prevent a Call to 911," April 21, 2014, https://www.youtube.com/watch?v=_VaT0g-76bl#t=21



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and Supply Chain**Calling 811 Is Just the Start**

While calling 811 is a critical first step in any excavation project, it's just one element of a safe digging plan. OSHA requires employers to protect their workers from injury on any job site, and the agency notes that excavation is one of the most hazardous construction operations.⁸

In OSHA's "Trenching and Excavation Safety" guide issued in 2015, the agency notes that excavators can "proceed with caution" if the affected utility companies cannot respond within the time period required by state or local law or cannot establish the exact location of the underground installations. Proceeding with caution includes "using detection equipment or other acceptable means to locate utility installations," the guide explains.

"Determine the exact location of underground installations by safe and acceptable means when excavation operations approach the approximate location of the installations," the OSHA guide says.⁹

A safe approach to excavating near underground utility lines should include the use of digging equipment that minimizes the risk of puncturing or damaging underground pipes and cables, and minimizes the risk of creating a spark in the presence of combustible gas. Also, digging tools should feature insulated components to protect workers from electric shock.

Chicopee, Mass.-based Guardair Corporation developed the Utility AirSpade 4000 excavation tool with those concerns in mind. Designed to safely uncover buried utilities, the air-powered tool features an insulated fiberglass barrel rated up to 300 kilovolts to provide protection against electric shock, and a non-sparking brass nozzle to eliminate sparking.

Rick Sweet, AirSpade Product Specialist, notes that the Utility AirSpade 4000 is based on technology that the military developed to uncover landmines and unexploded ordnance – tasks that require the utmost care and precision. Powered by a portable tow-behind air compressor, the Utility AirSpade 4000 converts the

⁸ OSHA "Trenching and Excavation" Web page, <https://www.osha.gov/SLTC/trenchingexcavation/>

⁹ OSHA, "Trenching and Excavation Safety" guide, 2015, <https://www.osha.gov/Publications/OSHA2226.pdf>

THE HIDDEN COSTS – AND HAZARDS – OF HOMEMADE EXCAVATION TOOLS

Employers in every industry are under pressure to control their operating costs. Utility companies and contractors are no exception. With air compressors so common on job sites, some work crews take it upon themselves to fashion their own air-powered excavation tool out of spare parts – in hopes of finding a cheaper alternative to safe, commercially available excavation products such as the Utility AirSpade 4000.

People say, "All it's doing is blowing air so I'll make one of my own for \$50," explains Rick Sweet, AirSpade Product Specialist. "So they'll take a piece of pipe, put a ball valve on it, attach it to an air compressor and blow air."

While it might be cheaper to make a tool from spare parts and materials, there are hidden costs and hazards that should be considered.

For example, a homemade tool with a pipe nipple or crimped orifice functioning as the nozzle disperses air in an unfocused manner – making it far less efficient and precise than a commercially available tool. Typically, air exiting from a homemade nozzle diffuses outward three to four times wider than the air jet coming from the Utility AirSpade's nozzle.

Conversely, the Utility AirSpade's patented, supersonic nozzle

turns compressed air into a laser-like jet moving at Mach 2 – delivering significantly more kinetic energy and more focused momentum. This tight blast of air dislodges soil particles in a fraction of a second, enabling operators to do more work in less time compared to a homemade tool.

In addition to being inefficient at digging, a homemade tool lacks critical safety features such as a dead-man trigger.

"If you drop the Utility AirSpade, the dead-man trigger will release and the air will stop flowing," Sweet explains. "If you drop a homemade tool, air will continue to flow through it. Now you have a safety hazard, because you have a steel pipe whipping around and blowing air."

And unlike the Utility AirSpade – which features a non-sparking nozzle and connectors along with an insulated, fiberglass barrel – a homemade tool fashioned out of a steel pipe or other metal parts can create a risk of explosions or electric shock when working around buried gas or electric installations.

While it might be tempting to try to build a homemade tool as a cheaper alternative to commercially available equipment, the risks outweigh the temporary cost savings.

"If you hit a utility line, the human and financial costs can be enormous," Sweet says.



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power of compressed air into a laser-like jet moving at nearly twice the speed of sound. By aiming the nozzle at the surface to be excavated, and actuating the trigger, the operator unleashes a tightly focused, supersonic air jet that penetrates tiny voids in the soil and dislodges particles in a fraction of a second.

“Air exiting the tool at Mach 2 has to go somewhere,” Sweet explains. “So it goes into anything that has holes in it. Soil – even clay – is porous. The Utility AirSpade forces air into those pores and fractures the soil.”

Unlike the sharp edges of shovels, picks, blades and buckets, the focused air jet from the Utility AirSpade 4000 is harmless to non-porous items such as buried pipes, tree roots and underground utility lines. Consequently, the tool is a safe alternative for a number of excavation tasks, including utility locating, keyholing, potholing, valve-box cleaning and cable trenching.

Protecting Workers and Infrastructure

For AGI Construction, a Smithfield, R.I.-based underground-utility contractor, the possibility of an explosion is a daily concern. AGI, which installs pipeline for many of the major gas providers in the New England region, is well-aware that digging around gas lines can

be dangerous for its crews, nearby residents and the environment. The company makes safety a top priority and a requirement on every job site.

In the past, AGI workers used shovels to locate and verify the presence of buried utility lines – a process known as “potholing.” After a crew accidentally damaged a buried utility line (because the company received inaccurate information about the location of the underground infrastructure), AGI began looking for a safer and more effective way to dig verification holes.

Soon after the incident, AGI equipped each of its work crews with a Utility AirSpade 4000. Jamie Carpenter, Director of Safety for AGI Construction, notes that the AirSpade has become “a favorite tool among all the crews,” as workers no longer have to worry about damaging sensitive underground utility lines. And because digging with the Utility AirSpade 4000 is two to three times faster than shoveling, crews appreciate the efficiency gains as well.

“In the past, we did all our verification-hole digging by hand, which was tough on our crew members,” Carpenter says. “Not only does the AirSpade make for a safer environment on the job, but it also makes life easier for our crew members.”

Keeping Strains and Sprains at Bay

Explosions and electrocutions caused by accidental utility-line strikes aren’t the only safety concerns for excavators working around buried utility installations. Because of the physical and repetitive nature of excavation tasks, workers can be susceptible to musculoskeletal disorders, which the Department of Labor defines as injuries or disorders of the muscles, nerves, tendons, joints, cartilage and spinal discs. In 2014, musculoskeletal disorders accounted for 32 percent of all job-related injuries and illnesses that required days away from work in the United States, according to the most recent data from the U.S. Bureau of Labor Statistics.¹⁰

Excavation work also can lead to sprains, strains and tears – the most common type of job-related injury



¹⁰ U.S. Bureau of Labor Statistics, “Nonfatal Occupational Injuries and Illnesses Requiring Days Away from Work, 2014,” <http://www.bls.gov/news.release/pdf/osh2.pdf>



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requiring days away from work across all industries in 2014. According to the Bureau of Labor Statistics, workers who suffered sprains, strains or tears required a median of 10 days away from work in 2014.¹¹

To minimize operator discomfort and fatigue, the Utility AirSpade was designed with a lightweight, ergonomic handle featuring a full-size grip opening to accommodate protective gloves. The Utility AirSpade 4000 also has a retractable stabilizer bar, enabling the user to operate the tool with two hands, if desired.

"We developed the Utility AirSpade 4000 in conjunction with utility companies and contractors so we could

11 U.S. Bureau of Labor Statistics, "Nonfatal Occupational Injuries and Illnesses Requiring Days Away from Work, 2014," <http://www.bls.gov/news.release/osh2.pdf>

address their specific needs and concerns," Sweet explains. "The non-sparking and insulated components address their concerns about utility-line strikes, and the ergonomic design makes it physically easier and safer for the operator to use, with the goal of minimizing musculoskeletal injuries."

Because AGI crew members now use the Utility AirSpade 4000 – instead of a shovel – to uncover buried utility lines, Carpenter has seen fewer back sprains and strains, among other injuries.

"Using shovels to de-compact soil, gravel, rocks and roots put strain on employees' backs," Carpenter says. "Switching to the Utility AirSpade 4000 has definitely been a factor in reducing our injuries."



SAFE PRACTICES FOR EXCAVATION AND TRENCHING AROUND UTILITIES

OSHA 1926 Subpart P spells out the safety requirements for excavation and trenching operations. These include measures to protect workers from cave-ins, falls, hazardous atmospheres and underground utility-line strikes.

OSHA's 2015 "Trenching and Excavation Safety" guide highlights key elements of the standard, and recommends that employers emphasize the following safe work practices to minimize the risk of injuries at excavation sites:

- Know where underground utilities are located before digging.
- Keep excavated soil (spoils) and other materials at least 2 feet from trench edges.
- Keep heavy equipment away from trench edges.
- Identify any equipment or activities that could affect trench stability.
- Test for atmospheric hazards such as low oxygen, hazardous fumes and toxic gases when workers are more than 4 feet deep.
- Inspect trenches at the start of each shift.
- Inspect trenches following a rainstorm or other water intrusion.
- Inspect trenches after any occurrence that could have changed conditions in the trench.
- Do not work under suspended or raised loads and materials.
- Ensure that personnel wear high-visibility or other suitable clothing when exposed to vehicular traffic.

In addition, Guardair Corporation urges utility companies and contractors to follow these safety practices when operating the Utility AirSpade 4000:

- Wear appropriate personal protective equipment. This includes cut- and puncture-resistant gloves, approved safety glasses with side shields and/or face protection, and approved earplugs or earmuffs. Eye protection should comply with ANSI Z87.1-1989. Ear protection should provide a noise-reduction rating of at least 20 decibels.
- Wear approved, electrically insulated footwear and gloves if working near underground utility lines.
- Wear approved respiratory protection when working in extremely dusty conditions.
- Ensure that all personnel near the area being excavated are aware that the tool is being used and that they wear appropriate PPE as indicated.
- Protect surfaces that could be chipped or damaged by dislodged soil or rock particles adjacent to the excavation work area by using suitable drop cloths, screens or other means.
- Check the tool for loose or damaged parts prior to use. Tighten, repair and/or replace as necessary.
- Inspect hoses for leakage, kinking, abrasion, corrosion or any other signs of wear or damage. Immediately replace worn or damaged hose assemblies.
- Check that the air compressor is delivering the specified pressure to operate the tool.
- When using the 45-degree adapter anticipate that the nozzle will produce a force opposite in direction to the exiting compressed air. Grip the barrel tightly and brace accordingly.

