

EXCAVATION

SAFETY GUIDE™ 2005



***Your blueprint
to safe excavation***

Inside...

- Trench Safety & Rescue Tips
- Avoid Damaging Buried Facilities
- State Law & One-Call Center Directory



A New Chapter In Trench Rescue Operation

By Dave Adler

About the author

- Dave Adler, a Lieutenant and Technical Rescue Instructor, is a 26-year veteran of the Addison Fire Department, Illinois.
- He is a member the Illinois Task Force One Urban Search and Rescue Team, Addison Technical Rescue Team for 16 years, and MABAS (Mutual Aid Box Alarm System) Division #12 Technical Rescue Team.
- Dave has also been an Underground Contractor for 26 years and can be reached via e-mail at AdlerAFD@aol.

The fire service is employing safer and more efficient trench rescue operations developed through innovative technologies from Rescue Vac™ Systems. These new “rescue friendly” safety devices, equipment, and operating procedures facilitate an **80% decrease in rescue dig time**. The inspiration for this development is also based on findings and reports provided by OSHA relating to trench collapse incidents.

OSHA statistics are riddled with cases of would-be rescuers being killed in failed attempts to rescue buried or partially buried victims. As many as 65% of all deaths from trench cave-ins are of would-be rescuers. Trench collapses are one of the most time-consuming technical rescues as well as one of the most labor-intensive. The victim must be completely uncovered before he can be removed from the trench. As a single cubic foot of dirt can weigh as much as 145 pounds, **a typical small cave-in can involve about 1.5 cubic yards of dirt, or approximately 4000 pounds.**

*Don't let
this happen
to you!*



For victims of a trench collapse, time is the enemy. The longer the patient is trapped the higher the incident potential for developing Crush Syndrome. Many times in addition to internal traumatic injuries, hypothermia – which is considered a slow killer – may occur.

Ten to fifteen years ago, the Fire Service was using massive, heavy timbers for shoring operations at trench collapse sites. This equipment was difficult to work with due to the weight and inherent amount of required timbers. We then drew from the construction industry as we noticed they were utilizing hydraulic and pneumatic shores. These shores are much quicker, safer, not as labor-intensive, and are considered part of the conventional trench rescue equipment cache.



A transition in trench rescue occurred 10 – 15 years ago, “and it’s happening again”

Specifically Designed for Rescue Operations

Today, a new chapter is being written in trench rescue operations. Up to this point, we have been utilizing 5-gallon buckets, garden and army shovels. This process is obviously very slow, as the average trench rescue takes 4-10 hours. Rescuers need to be rotated a minimum of every 15-20 minutes since they may be digging on their hands and knees, for extended periods of time.

Additionally these rescuers are exposed to the potential of a secondary toe collapse.

The Rescue Vac™ System utilizes a two-phase procedure:

- 1) Soil Reduction Phase: these pneumatic tools and equipment reduce or fracture the soil into very small particles.
- 2) Soil Removal Phase: these specially designed tools, equipment and safety devices carry soil, water, sand, or gravel from the excavation by a high volume of air. Many lives can be saved by reducing the dig time up to 80%.

SOIL REDUCTION TOOLS

Pneumatic Tools
Pneumatic tools (e.g., Air Spade®, Angel Guard®), which have been utilized by arborists for years, are also used for landmine and unexploded ordinance removal and will not damage tree



roots, underground phone, electric, or gas lines. They operate from trailer-mounted air compressors, common to the construction industry, at 100 psi and 150-185 cfm.



The Air Spade from Concept Engineering

HYDRO-REDUCTION TOOLS

Pressure washers are another form of soil reduction tools and should only be used when there is no possibility of striking any victims/rescuers or any type of gas lines or underground cables, i.e. phone, fiber optic, energized electrical. The construction industry considers 2000 psi or greater to be destructive to underground cables. Some

manufacturers of pressure washers make available linemen's gloves and boots to protect the operator from electrocution.

SOIL REMOVAL PHASE - TOOLS & EQUIPMENT

Hand Digging & Hydraulic Equipment

In addition to hand digging and filling 5-gallon buckets, the next level of soil removal available is the utilization of backhoes and hydraulic equipment. This type of removal is dangerous for the victim as well as the rescuers, and should not be used. Even the most skilled backhoe operator cannot feel the difference between the human body and soil. Hydraulic equipment also causes vibration and undesirable superimposed loads.

Even skilled operators cannot feel the difference between skin and soil.



Vacuum Excavation

The Fire Service is now drawing from the construction industry in the area of rapid soil removal through Vacuum excavation. For years this technology has been utilized for cleaning sewers, digging piers, non-destructive utility

location, and the removal of slurries from directional boring operations.

Vacuums are considered air-conveyance equipment. The amount of air that is moving in cubic feet per minute (CFM) directly relates to the quantity of product that can be transported. Air is considered the transporting medium, consequently the vacuum tip cannot be immersed in the product to be transported. The air reduction tools fracture and aerate the soil into small particles, which enhances the vacuum excavation capabilities.

There are three types of vacuum systems available to the Fire Service. This first unit is hand-held and operates off of an air compressor. This device is lightweight, maneuverable, utilizes a 3-inch hose with a 265-cfm rating, and is manufactured by Angel Guard Products.



Utilizes a discharge hose or bag



Supersonic Air Vac in use



Trailer or skid mounted, & typically used for directional boring

The second unit is typically utilized with directional boring, is lightweight, and maneuverable with a 3 or 4-inch hose that has a 500-850 cfm rating. These units are manufactured by Vac-Tron Equipment and are equipped with 200-1000 gallon debris tanks.

Trailer or skid mounted, & typically used for directional boring. These two smaller units are ideal for sand, gravel, and hopper conditions; they do not work well with clumpy soil.

The final vacuum unit is the typical municipal sewer cleaning truck that utilizes an 8-inch hose and has a 2600-8000 cfm rating. This larger unit will move a substantial amount of dirt quickly and is available through most municipalities. This unit is manufactured by Vac Con., Green Cove, FL.

Serious injury has occurred with the utilization of straight open pipe, with pressures that may exceed 1,000 psi.

This SHOULD NOT be utilized in trench rescue operations.

This large sewer vacuum removes dirt at an exceptional rate and is an excellent adjunct to our arsenal of trench rescue equipment. However, it should only be utilized with the proper safety procedures and approved trench rescue kits.



This is a typical municipal sewer cleaner and air compressor



Rescue Vac™ Systems has developed an approved vacuum trench rescue kit, which includes trench rescue nozzles, vacuum relief valve, and specially designed static dissipating 8in - hoses that connect to the municipal sewer trucks. These trucks can be positioned and operate up to 600 ft away from the rescue site. Adapters make this kit compatible with all vacuum truck manufacturers. With the utilization of special procedures this becomes an efficient rescue operation.

GENERAL GUIDELINES

A 300-foot vibration-free zone should be initially established and enforced, and dig operations by rescuers in the trench should not begin until shoring operations are complete. The JURISDICTION having authority will dictate if vacuum excavation and vacuum truck placement is appropriate and safe. At this point, a vacuum truck may be brought up to a safe distance from the trench after shoring is in place.

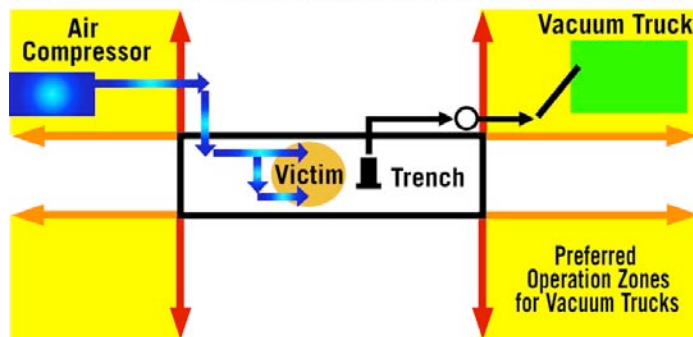
As these vacuum trucks can weigh over 60,000 lb it becomes obvious why distance from the trench is a vital issue. Care should be taken not to create an unwanted superimposed load at the lip of the trench. See Vacuum Truck Positioning Diagram.

As the Fire Service continues to develop, the Technical Rescue Teams also have the opportunity to employ new and innovative technologies. This technology can be utilized for trench rescues and should be considered for building collapse and parallel vertical shaft rescue operations. Before the emergency arises, training should be conducted between both rescue and private sector companies. Contact your local municipalities and fire departments and set up a resource list of vacuum trucks, air compressors and other similar equipment. Develop a positive; cooperative relationship by initiating twenty-four hour prearranged responses. The results will be a safe and efficient rescue operation.

Trench Rescue Vacuum Truck Positioning

Considerations

After the trench is shored, bring the Vacuum Truck into operational area set up Position the Truck as far away as possible from the trench to reduce Lip Surcharging



To Learn More

- Rescue Vac™ Systems can be reached via www.RescueVacSystems.com
- Visit Underground Focus Academy Trench Safety Workshop, April 19 & 20, 2005 www.UndergroundFocusEvents.com

UNDERGROUND FOCUS Academy

April 19 & 20 Sheraton Fairplex, Pomona, CA Trench Safety Workshop

State of the Infrastructure: Witness a trench collapse, and a full rescue response from the fire department

This course qualifies you for Competent Person Certifications

Register now for the most exciting and unique Conference and Trade Show in the industry. For more information call **866-279-7755** or visit www.undergroundfocusevents.com



SAFEX®, AIR-SPADE® and Air-Vac excavation equipment

- Fast, safe air excavation with supersonic nozzles
- Approved Trench Rescue Operator's Manual
- Easy maintenance
- Great for utility locating, pot holing and rescue operations



Concept Engineering Group, Inc.
412-826-8800 or 888-55-SAFEX
www.air-spade.com
"The Air Excavation Experts"