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Vacuum Trucks Key to Successful Trench Rescue

BY STEVE WHITE

On July 11, 2008, at 1830 hours, the Hamilton County (IN) Technical Rescue Team (HCTRT) was dispatched to assist the Anderson (IN) Fire Department (AFD) in Madison County to rescue a man trapped in a trench. The Fishers (IN) Fire Department (FFD), the Carmel (IN) Fire Department (CFD), and the Westfield (IN) Fire Department also responded.

While en route, I was in contact by cell phone with AFD Captain Todd Jordan, who was on scene. I requested a police escort and two vacuum trucks to facilitate the use of the rescue vacuum system carried on the HCTRT trench unit for faster removal of soil. Additionally, AFD members were instructed to secure utilities, place ladders in the trench, procure ground pads to begin making the lip of the trench safe, conduct air monitoring, and lower oxygen to the victim. Anderson's Department of Public Works' (DPW) compressor was also special-called to the scene. The Hamilton County Communications Center acquired current and future weather conditions in Anderson, since rainfall was moving in from the west.

As HCTRT units traveled outside of Hamilton County, a talk-around channel was used to communicate among the apparatus because of the communications limitations of the 800-mega-hertz (mHz) system. We used a cell phone to maintain communications with the Hamilton County Communications Center.

THE EMERGENCY SITE

On our arrival, we found that the victim was on oxygen, air monitoring was ongoing, ladders had been placed, some ground pads were down, and an initial perimeter had been established with scene tape. Power to one city block was turned off, and the gas company was en route.

Initial trench dimensions were 8 1/2 feet deep and 18 inches wide at the lip. An AFD medic had established and maintained voice contact with the victim. I conferred with the incident commander (IC) and assumed Operations.



(1) The victim trapped in the V-void. [Photos by Division Chief Jim Alderman, Fishers (IN) Fire Department.]

The 35-year-old private contractor (the only victim) was attempting to tap a residential sewer line when he became trapped by a slough-in collapse. The only visible part of the victim was his right hand. A large section of clay that formed a V-void between the wall and the floor, which was partially supported by a shovel, covered his torso. The remainder of his body was buried to the nipple line of his chest. The victim stated he was in the standing position.

The city vacuum truck arrived, and members of the CFD assembled the vacuum system. The remainder of the trench lip was made safe with sections of the spoil pile removed by the rescue vacuum. HCTRT members supported a one-inch water line at one end of the trench. The second vacuum truck arrived and was staged as a backup.

Note: This should be considered a standard operating procedure for trench rescue operations, even without access to the rescue vacuum system, because the open-butt vacuum hoses can still be used to remove vast amounts of soil much faster than by hand in most cases, and they can also be used to remove water in case of rain or a pipe failure. In fact, the Los Angeles County (CA) Fire Department typically requests three hydrovac trucks (one for primary operation, one set up to continue vacuuming when the first vacuum fills with dirt and must be unloaded, and the third in case of mechanical breakdown of either of the other two).



(2) A rescue medic starts an IV in a protected area.

FFD members oversaw the Rescue Logistics Group, managed by the Rescue Group, and assumed control of the Rescue Safety Division, accountability, and incident documentation, and served as a senior advisor to the Rescue Group.

THE OPERATION

The first set of panels was set next to the victim because of the large section of soil covering him. Our smallest air shores were used to secure the first set of panels. From the first set of secured panels that created the initial safe zone, the FFD rescue medic conducted an assessment, obtained baseline vitals, and established an IV. The victim answered questions appropriately and complained of back and leg pain.

Two additional panel sets were installed to gain working room. Since a section of the lip and the wall were missing, a buttress system was built to create a contact point behind one of the panels to ensure positive contact with the shoring system. The buttress was used in lieu of traditional “outside wales,” since the width of the trench was limited. Two 24-inch low-pressure air bags were used to take up void spaces between two separate panels and maintain positive contact in the shoring system.



(3) HCTRT members operate the rescue vacuum system.

A combination of folding shovels and an air knife was used to break up the soil to be removed by the rescue vacuum. Rescuers carefully removed the large section of clay positioned directly over the victim and creating the V-void. This section was estimated to be 300 pounds. Once this section was removed, rescuers were then able to focus on the soil trapping the victim to the nipple line.

While rescue efforts were in progress, AFD members set up lighting prior to nightfall; CFD set up a tower ladder with a mechanical advantage raising system to be used to vertically remove the victim.

The Rescue Group officer asked rescue entrants to monitor how far below the victim's panel they were digging. A plan was developed for supplemental sheeting/shoring, but rescuers discovered that the victim was in a crouched position, not in the standing position as the victim had initially reported. This negated the additional sheeting/shoring plan after Safety, Rescue, and I jointly decided to continue digging, as we were pushing the envelope of two feet below the victim's panel. We based our decision on the following: There was no evidence of water in the trench, soil conditions remained unchanged at the bottom of the trench, and rescue entrants operated in their protected panels on either side of the victim.



(4) The buttress system as part of the shoring plan.

At the three-hour mark, we requested the Indianapolis Fire Department (IFD) trench team to respond so we would have enough trained personnel during this long-duration incident under humid conditions. The victim was ready to be removed from the trench an hour later, shortly after IFD units arrived.

To achieve a vertical lift while maintaining C-spine support, a harness was placed on the victim and secured to the raising system. The remaining soil was removed, and the victim was raised to the surface with the rope system. The operation took just over four hours; the victim was airlifted to an Indianapolis trauma center, where he was treated and released.

This was one of the most complex trench rescues of the seven performed by the team. All departments and agencies worked together to make this an effective rescue in which we had to overcome various obstacles. Most importantly, this rescue was successful because there were no firefighter injuries—this can be attributed to proper training and equipment and the tactical decisions employed.

LESSONS LEARNED Training

Awareness-level technical rescue training is essential. With proper awareness training, first-arriving units, without entering the trench, can properly assess the scene while using on-scene resources to make the scene safe before a technical rescue team arrives. Through a partnership between the Indiana Department of Homeland Security and the Indiana Fire Chief's Association, the state released a global technical awareness training program. Covering all facets of technical rescue, this firefighter safety initiative was distributed to every fire department in the state at no cost.



(5) The rescuers remove soil from the victim with the rescue vacuum and the air knife

Communications

Our initial communications plan for response and operations included a county-to-county patch between HCTRT units and the AFD IC. When this plan was not successful, cell phones and a talk-around channel were used as a backup. Although limited, this option provided communications among HCTRT units to ensure information was shared while maintaining accountability. The patching capability has been corrected, and HCTRT is awaiting the delivery of new radios that will provide statewide coverage.

Interagency Cooperation

Partnering with public- and private-sector resources continues to show its worth. Anderson DPW's vacuum trucks, light stands, and compressor proved critical to the operation's success. Additionally, personnel support from the city's Police, Development, DPW, and Planning departments were essential. These entities quickly met the IC's requests for equipment, food, infrastructure information, escorts, and site control.

Incorporating Vacuum Trucks in TRT Operations

HCTRT members had cross-trained with local municipal and private-sector vacuum trucks during trench training while using the rescue vacuum system. This was the first time Anderson DPW had interacted with a TRT for use of its vacuum truck. The vacuum truck operator was given a quick on-scene overview of safety and operating procedures for using the rescue vacuum system. Although skeptical at first, the operator trusted rescuers and operated as asked. Although a competent operator, using his truck in this environment with the addition of this system was new to him. Rescuers and vacuum truck operators must understand each other's needs and procedures for safe and effective operations, as equipment and operations are not all the same..

STEVE WHITE is a 19-year veteran of and a battalion chief with the Fishers (IN) Fire Department. A former FDIC HOT instructor for heavy truck extrication, he is a co-chair to the Indiana Fire Chief's Association's Technical Rescue Branch. In addition to his shift commander responsibilities, he oversees his department's technical rescue program and is the Hamilton County TRT leader.

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