



C O N T I N U I N G E D U C A T I O N

The Invisible Killer

RESCUE FROM A CONFINED SPACE

Editor's Note: This article is the first in a two-part series.

by Greg Valcourt and John Gatland

Stations 3 and 5 are alerted to a call for a "man down" at a playground. Ambulance 3 and Engine 5 respond to the call from their quarters, and Medic 3 responds from the local hospital.

Ambulance 3 arrives on the scene first, and the EMTs are met by a telephone company employee, who states that her co-worker had gone down a manhole to take a reading in an underground vault and failed to reappear. She states that she repeatedly called down to her partner but received no answer. She then dialed 9-1-1 and waited for rescue personnel to arrive. According to the woman, her co-worker has been in the vault for approximately 10 minutes, and no one else has entered the manhole. The victim is known to have high blood pressure and some type of heart condition.

One of the EMTs from Ambulance 3 shines a flashlight down the manhole and sees the victim lying on the bottom of the vault next to the ladder. The victim appears to be unresponsive, but his complete condition cannot be determined.

Because of the victim's medical history, the responders assume that he collapsed from some type of cardiac problem. To further assess the patient, one of the EMTs enters the vault with a flashlight and an airway kit, while



Entry team descending into vault with SCBAs and lifelines. Note the tripod and rope rescue system above the hole.

the other EMT updates Engine 5 and Medic 3, which are still en route, about the situation. As the EMT who entered the vault reaches the bottom of the ladder, he calls up to his partner that he is having difficulty breathing. He starts to climb back up but collapses. Now there are two victims at the bottom of the vault.

Engine 5 arrives, and the lieutenant sizes up the situation. He determines

that since both the EMT and the original victim entered the vault without self-contained breathing apparatus (SCBA) and are now unresponsive, the atmosphere inside the vault must be untenable. He calls back to dispatch with an update and requests that Squad 5, Ladder 3 and an additional medic unit and ambulance be dispatched to the scene.

The lieutenant then instructs his crew to set up a tripod and rope rescue system above the hole. Next, he orders a team of two firefighters with SCBAs, class-3 full body harnesses and lifelines to enter the vault with the rope rescue system and a set of "quick-attach" wristlets.

The entry team's mission is to attach the wristlets to the fallen EMT and have personnel outside the vault hoist him to safety. Once he is safely above ground, the entry team will attempt to rescue the telephone company employee in the same manner. Two additional firefighters, outfitted with the same equipment as the entry team, stand by in case another emergency entry or rescue is needed.

Meanwhile, Medic 3 and Ladder 3 have arrived on the scene. The paramedic crew from Medic 3 sets up equipment for two potential cardiac arrest victims while Ladder 3's crew is assigned to help remove the victims.

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OBJECTIVES

After reading this article, the reader should be able to:

1. Define a confined space.
2. Identify the different types of confined spaces.
3. List the various hazards found in confined spaces.
4. Differentiate between the three primary types of atmospheric hazards found in confined spaces.
5. List the signs and symptoms of hypoxia.

The entry team signals that they have attached the wristlets to the EMT, who has now been down in the vault for approximately five minutes. The EMT is brought topside, where he is found to be apneic, unresponsive and cyanotic with an irregular carotid pulse of 110; his blood pressure is 100/64. An oral airway is placed, and he is ventilated with 100-percent oxygen via a bag-valve mask (BVM) at 26 breaths per minute.

Within a few minutes, the EMT develops spontaneous respirations and gradually regains consciousness. The oral airway is removed, and a non-rebreather mask is applied at 15 l/min. During transport, paramedics from Medic 3 provide advanced cardiac life support. At the emergency department (ED), he is further evaluated and is released the next day with no apparent injuries or side effects.

The telephone employee is rescued from the vault and is found to be in cardiac arrest. CPR is started with a BVM and 100-percent oxygen, and the patient is defibrillated once at 200 joules. Firefighter/EMTs then assist the paramedics in providing advanced life support and CPR en route to the hospital. After a 30-minute resuscitation effort by the ED team, the patient is pronounced dead. The cause of death is later determined to be severe brain anoxia caused by asphyxia.

When the air in the vault is tested, it is found to have an oxygen concentration of less than 10 percent.

What is a Confined Space?

According to the Occupational Safety and Health Administration's (OSHA's) proposed standard for permit-required confined spaces, 29 CFR 1910.146, a confined space is defined as:

"an enclosed space which:

1. is large enough and so configured that an employee can bodily enter and perform assigned work;
2. has limited or restricted means for entry or exit (some have an opening as small or smaller than 16 inches in diameter);
3. is not designed for continuous human occupancy; and
4. has one or more of the following characteristics:
 - a. contains or has known potential to contain a hazardous atmosphere;
 - b. contains material with the potential for engulfment of an entrant;
 - c. has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor which slopes downward and tapers to a smaller cross-section; and

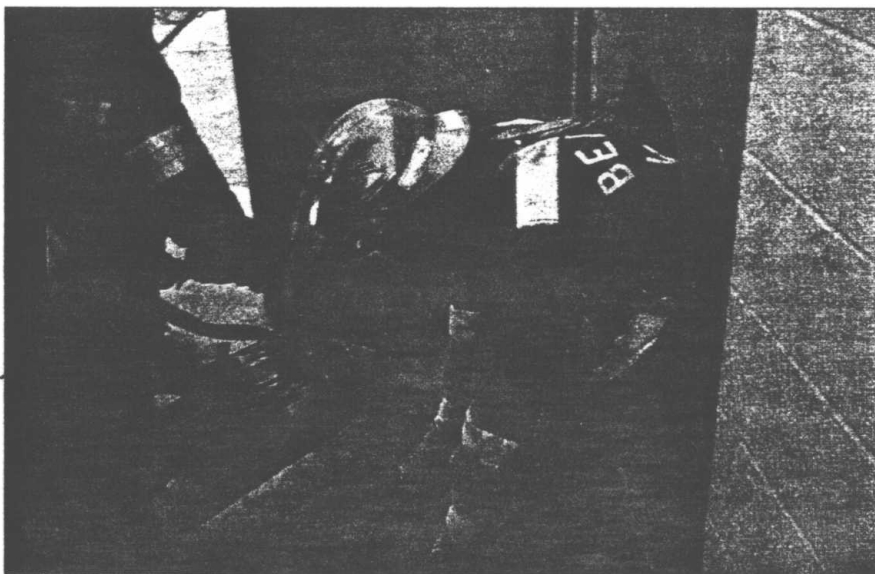
- d. contains any other recognized serious safety or health hazard."¹



Passing the stretcher or backboard into the space allows for rapid packaging of the patient prior to extrication.

Essentially, confined spaces come in many shapes and sizes, and they can be found in a multitude of configurations (see Table 1). Although many confined spaces are located below the ground, some are found above ground, inside buildings, on roads and railways and even on water.

According to OSHA estimates, more than 2 million employees enter permit-required confined spaces in almost 225,000 workplaces each year.² And according to the National Safety Council, 2.5 percent of all occupational fatalities are a direct result of work being performed in these confined spaces.³ Also, approximately 50,000 emergency responses and 300 fatalities occur per



Horizontal entry into small opening