

Is That Really a Confined Space?

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By [Dan Keener](#) | Nov 01, 2013

How many times have you heard the question asked, "Is that really a confined space?" This is asked a lot more than you might think. To truly understand what a confined space is, let's start with its definition. A confined space is an area that is large enough and configured such that an employee or person can bodily enter and perform some type of work; has limited or restricted means for entry or exit; and is not designed for continuous occupancy.

Some examples of confined spaces include storage tanks, sewers, manholes, tunnels, ship voids, pipelines, silos, wells, pits and trenches. These also require a permit for entry. In the United States, any pit or trench with a depth equal to or greater than 4 feet is classified as a permit-required confined space.

A permit-required confined space has to have one or more specific characteristics, the first being that it contains hazardous gases or has the potential to be a hazardous space. These are classified into three categories: toxic; asphyxiating; and flammable or explosive atmospheres. Depending on the chemicals, they can present multiple atmospheric hazards, depending on their concentration.

Methane, for example, is an odorless substance that is nontoxic and is harmless at some concentrations. Methane can displace all or part of the atmosphere in a confined space, and the hazards presented by such displacement can vary greatly, depending on the degree of displacement.

Employees might be exposed to these atmospheric hazards because their employer has not properly evaluated the work operations or the conditions within the permit space. Problems can occur when an employer has not selected the necessary atmospheric test instruments or failed to ensure their proper use. Problems have arisen because most of the instruments used to test the flammability of a permit space atmosphere do not identify oxygen-deficient atmospheres. In fact, because some of these instruments rely on the presence of oxygen, their readings can be inaccurate in oxygen-depleted atmospheres. Therefore, as a final thought on atmospheric hazards, it is recommended that employers test and monitor their entry spaces with instruments that will detect all aspects of hazardous atmospheres entrants could encounter in the spaces.

The second characteristic of a permit-required confined space is the containment of some type of material that has the potential to engulf a person. "Engulfment" refers to situations in which a confined space entrant is trapped, usually by dry bulk materials. The engulfed entrant is in danger of asphyxiation or of filling of the victim's respiratory system as the engulfing material is inhaled.

Another characteristic is the containment of a mechanism that could trap or asphyxiate a person. Many accidents have occurred in confined spaces because employers failed to isolate equipment within the space; thus, it was improperly guarded. Deaths have resulted from mechanical injuries, such as the crushing of the victim. All of the accidents that have occurred would not have taken place if the correct preventive action plan would have been to secure the machinery or equipment so that it would not have been activated while employees were exposed to it. This procedure is commonly called lockout/tagout.

CFR 1910.147 covers servicing or maintenance work being performed on machinery or equipment located in a confined space. CFR 1910.147 (O) was written to say that when work inside a permit space does not involve servicing or maintenance of machinery or equipment in the permit space, the standards on machine guarding require the equipment to be guarded to protect employees from any mechanical hazards posed by the machine. In any event, the rule on permit-required confined spaces, section 1910.146, requires employers to evaluate any mechanical hazards found in permit spaces and to take all steps necessary to protect entrants.

Atmospheric Sampling in Confined Spaces

This is why there are specific regulations when it comes to confined spaces. For example, regulation number CFR 1910.146 was created to regulate confined space entries. CFR 1910.146(c) subsection (d) states that "There may be no hazardous atmosphere within a space whenever an employee is inside the space." What does this mean? It means that when a person is performing atmospheric testing, he or she must accurately sample the atmosphere to ensure no hazardous gases are present. Only then will the person be able to acquire a permit for entry.

When it comes to confined space sampling, the operator performing the sample tests have, in my opinion, the most important job. This person is responsible for making sure that proper sampling techniques are performed due to the stratification of gases that may be present. To properly sample a confined space, the operator must sample prior to entry, prior to re-entry, and continuously while work is being completed. Also, depending on the gases, it is also important to sample at the top, middle, and bottom of a confined space exceeding four feet at any given time.

It is recommended to sample every four feet due to the weights of gases; some are lighter than air (methane), some are slightly lighter (carbon monoxide), and some are heavier than air (hydrogen sulfide). In these environments, the operator will be sampling for the oxygen content. If the oxygen content is between the levels of 19.5 percent and 23.5 percent, it would be safe to enter. The operator also will be sampling for combustible gas levels lower than 10 percent LEL, and last, to determine whether any toxic gas is present.

Pits and Trenches

Now that we've covered permit-required confined spaces and proper sampling of these environments, let's talk about open confined spaces such as pits and trenches. Most people would not consider these as confined spaces, but depending on conditions, they most certainly are. A trench excavation would certainly seem to meet the confined space criteria. A trench excavation means a narrow excavation (relative to its length) made below the surface of the ground. The depth is greater than the width, but the width of a trench (measured at the bottom) is not more than 15 feet.

Does this meet the requirements for a confined space? Let's see. Does it have the potential to contain a hazardous atmosphere? Oxygen deficient, toxic, or flammable atmospheres can occur in trenches, displacing the normal air. Some of the most common gases of concern are carbon monoxide, methane, and hydrogen sulfide. These gases should be suspected whenever trenches are near combustion engines, sewage lines, landfills, swamps, leaking underground storage tanks, or when anything in decomposition is nearby. Hydrogen sulfide is heavier than air and may fill the trench, starting from the bottom. Laws state that if hazardous atmospheres could reasonably be expected to exist, the atmospheres shall be tested before employees enter excavations greater than four feet in depth. So, the answer is yes.

Could an entrant become trapped or asphyxiated by converging walls or by a floor which slopes downward and tapers to a smaller area? Trenches without adequate sloping, or other protection from collapse, create potential for entrants to be engulfed in a cave-in of the surrounding earth. Excessive rainwater, groundwater, or liquid from leaking or damaged pipes also may create conditions for engulfing trench entrants. The answer is yes.

Can a pit or trench contain any other recognized serious safety or health hazard? Access into trenches more than four feet deep usually can be accomplished only by ladder,

which poses known risks of slipping and falling. Entrants also could be struck by excavation machinery or by falling materials from overhead. Again, the answer is yes.

By now, my hope is that you realize a trench excavation may indeed present many of the hazards of a permit-required confined space. In general practice, all trench excavations over four feet in depth should be considered confined spaces until a competent person has ruled out all of the potential hazards associated with it.

Proceed with Caution

Confined spaces always have been presented with a question mark. The only question you should be asking yourself is whether there is any doubt about whether or not it is a confined space. It is always best to err on the side of caution and find out by educating yourself on confined spaces and researching the laws regarding entrance. These laws were written to help companies implement safe practices to be used when conducting work inside a confined space.

About the Author

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