

## CONFINED SPACES

### Employers must understand what constitutes a “permit-required confined space.”

By Randy DeVaul

Workers in the United States make more than 4.8 million confined space entries each year. Not all entries, however, result in success. Confined space entry is a leading cause of occupational fatalities within the United States! And in Canada, 60 percent of all confined space entry fatalities are the would-be rescuers! That is why both the United States and Canada require employers to evaluate and develop a written permit-required confined space program ( United States) or a Confined Space Hazard Assessment and Control Program ( Canada).

So that everyone understands where special precautions are needed, let’s define the term. A simple “confined space” must meet three criteria:

- Limited means of egress (one way in, same way out)
- Not designed for continuous occupancy (no HVAC, lighting and such)
- Space large enough for a body to fit in to perform work

There must also be a clear understanding of what a “confined space” is, or an employer’s or manager’s understanding of what constitutes a “permit-required confined space” will be skewed. Looking briefly at the above definition, the space must technically be at least 18 inches in diameter. There are not too many people who can fit in something smaller than that, anyway. Because of the size and/or shape of the entry, it may be difficult to remove an entrant from the space in an emergency and may be nearly impossible for a rescuer or employee to enter the space with a self-contained breathing apparatus (SCBA), if needed. Also, a larger opening may still be restricted by ladders, equipment, hoists or other components that impede a person’s ability to get into or out of the space.

To be considered a basic confined space, it must not be designed for continuous human occupancy. In other words, it is not designed for employees to work within that space on a continuous or regular basis. The space may, however, allow employees to occasionally enter to inspect, repair, clean, or maintain equipment or valves as needed. A confined space could also enclose materials or processes or even store products and may transport those products, such as in surge tunnels, conveyor transfer points, or small, unventilated, unlit storage rooms.

In one facility, an argument ensued about whether a small office with only one door was required to have a second means of egress. As the discussion continued, someone mentioned that without that second door, the office would have to be “tagged” as a confined space. The manager, engineer and office employee began figuring how to reconstruct the space to install another way out. They soon lost track that the office only held two people in the production area, employees did not congregate inside the office, and the office area did have its own ventilation and air conditioning system for the comfort of the employees working in the space. It was (and is) not a confined space!

Once a “confined space” is identified through these criteria, an employer must determine whether the space meets the criteria for being “permit required.” A “permit required confined space” must:

- Meet the definition of a confined space, then
- Contain or have the potential to contain a hazardous atmosphere, OR
- Contain or have the potential to contain an engulfment or entrapment hazard, OR
- Contain physical hazards, OR
- Other serious safety and/or health hazard not in any of the three above

A confined space, then, becomes a permit-required confined space when a serious or life-threatening hazard also exists. This requires special precautions and additional attention to ensure entrants are aware of and protected from the increased hazard(s).

So if the space has either real or potential hazardous atmospheres (oxygen deficiency, oxygen enrichment, presence of toxic vapors/fumes, presence of explosive vapors/fumes), presents engulfment by material, physical hazards (unguarded moving machinery, narrowing passages in ductwork, excessive heat, excessive noise or other hazards that pose a serious threat, there must be additional safety steps taken to ensure no one is injured or killed.

The most important factor is testing the atmosphere – the air quality in the space where work will be performed. Many air monitors now test up to four gases simultaneously. If a monitor does not check gases simultaneously but sequentially or if the monitor is limited in what it does read (such as oxygen level), the first check is the oxygen level.

Remember: This check is done before you enter the space. Be sure to check all levels where work is to be done for various hazards. For example, many flammable gases are lighter than air and will be near the top or ceiling of the space. Both carbon monoxide (which will remain close to the area where it is released) and hydrogen sulfide are heavier than air and will sink to the low places. Any of these can be deadly, so each area and height must be checked prior to entry.

The hazards of an oxygen-deficient atmosphere should be obvious. If there is not enough oxygen in the work area, the employee cannot work in that area. A factory-set air monitor is designed to alarm at oxygen levels of 19.5 percent concentration and below. What number actually displays on the monitor with the alarm sounding is not really important. When the alarm sounds, get out!

An alarm will sound if the monitor detects an oxygen-enriched atmosphere as well. That is any oxygen concentration greater than 23.5 percent (or 22.5 percent, depending on your location's regulatory requirements). Why is an oxygen-enriched atmosphere dangerous? Oxygen supports combustion, so any flame or spark-producing task in an oxygen-enriched atmosphere will burn brighter, hotter and faster.

A monitor that measures LEL (lower explosive limit) levels will normally read slightly different than for oxygen measured in percent concentration) or other gases such as carbon monoxide or hydrogen sulfide (measured in direct parts per million). The LEL monitor reads the concentration of the gas (generally methane) in percentage of the lower explosive limit. For example, methane's LEL is 5 percent concentration of methane in air. An LEL monitor that is set to alarm at 10 (generally the factory setting and also where it should remain) alarms when the concentration of the methane is 10 percent of the LEL, or in other words 0.5 percent concentration. Again, the principle of the monitor functions is clear: The number that shows up on the display is not important if the alarm is sounding – just get out!

Entrants, or those who will actually have direct exposure to the hazards identified in the permit-required space, must have additional training and knowledge to perform work in that space. Entrants must know the hazards to be encountered and what type of personal protective equipment will be necessary for the task. They certainly must have knowledge of the task to be performed and the amount of time expected for the task to take. And the entrants must know what special precautions, if any, must be taken to reduce or eliminate their exposure to the life-threatening hazards.



For example, does the space require purging or ventilating prior to entry? Is lockout required of electrical, pneumatic, hydraulic, chemical or other forms of energy? Are there physical hazards that can be addressed, such as high heat, high-level noise or unguarded moving machinery? And once these special precautions are taken, can the permit-required space be reclassified? In other words, by performing the special precautions, has the entrant eliminated the life-threatening hazard that made it a permit-required space in the first place?

The authorizing supervisor has a special responsibility. Too often, a supervisor simply looks at the permit application and signs off the work to be done without actually doing anything. This is dangerous for the supervisor as well as to the entrants.

The supervisor must ensure all precautions are actually taken by walking back through with the entrants and double-checking what has been done. This is not to question good employees on the job they have (or have not) done, but provides the last line of protection for the employees to ensure everything is correct prior to entering the space.

The supervisor also appoints an attendant – the person responsible for no other task than ensuring those in the permit-required space stay alive while they are in there. The attendant cannot be involved in other tasks or, for that matter, be assigned to the entry point of the space and curl up with a good book. The attendant is the communication link to the outside world for those in the space. The attendant ensures all entrants are accounted for and may also be responsible for recording those “periodic” air monitor readings if entrants are inside for prolonged times.

As a result, the attendant must also be knowledgeable of the hazards in the space, know the emergency procedures for getting help, if needed, and call for help if the situation mandates it. The attendant does NOT enter the space or perform any function of rescue for those in the space. While rescuers are on the way, the attendant can continue talking to the entrants if communication lines are working to reassure them that help is coming. The attendant can also find out more of the situation for the rescuers if a communication line remains open with the entrants. And, depending on the space and the procedures, the attendant may also function as a retriever with a retrieval system as long as the entry point plane is not broken.

One final thought on permit-required spaces. Similar to the office that soon became confused as to whether it was a confined space, there might be a work location that has carbon monoxide or other air quality hazards, unguarded machinery or other hazards that create exposures to employees when working in the area. Unless the space meets all three criteria as a basic confined space, the work area is not a permit-required space. The work location simply has a hazard to which an employee is exposed.

Some managers have decided to “play on the side of caution” and declare such a space to be a permit-required confined space. That may be a wise precaution, but think through how an employee must perform his or her task if such a location is misclassified. A perfect example is a warehouse with a propane-powered forklift. That forklift has the potential for creating carbon monoxide when operating, causing an exposure problem for employees working in the warehouse. But with roll-up doors, open interiors, heaters and fans to move and condition the air, windows to open or to let in light, this warehouse is not a confined space.

Always identify a permit-required space first by ensuring it meets the definition of a basic confined space. Once it meets all three criteria for a basic space, then identifying the space as “PERMIT REQUIRED – CONFINED SPACE” due to hazard exposures would be correct.

If you have permit-required confined spaces, be sure to follow all of your procedures, including the completion of the permit application, air monitoring and any special precautions that will help reduce or eliminate the hazard(s). People are killed every year making confined space entries just by becoming complacent or comfortable and taking the shortcut. Don't become that statistic! And as a manager, don't put yourself in a position where you spend the rest of your life living with the thought that you were responsible for that statistic. Make the choice to do it right every time.

Randy DeVaul (safetyprow@roadrunner.com) is a veteran safety professional/consultant, internationally recognized author, writer and speaker on Performance Safety principles and practices. Comments are always welcome.