



City Safe

A Guide To Assist In Training
Employees About:

WORKING IN CONFINED SPACES

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During the winter months when the weather turns colder, many cities turn their attention to various maintenance projects in anticipation of the onset of spring projects. During these maintenance and inspection processes, it is often necessary to perform work in a confined space. Oftentimes, the potential for danger is overlooked because of the brief time it takes to perform many of these tasks. Whether it be inspecting the inside of a storage tank or running a small engine indoors, there are many dangers that present themselves. To identify these hazardous situations, we must first identify what constitutes a confined space. A confined space is any space that has the following characteristics:

A. It is large enough or so configured that an employee can bodily enter and perform assigned work.

B. It has limited or restricted means for entry or exit. Confined-space openings are limited primarily by size and location. Openings may be small in size and may be difficult to move through easily. However, in some cases openings may be very large; for example, open-topped spaces such as pits or excavations.



Entrance and exit may be required from top, bottom, or side. In some cases, having to access the work area by a fixed ladder may constitute limited or restricted entry or exit. Size or location will generally make rescue efforts difficult.

C. It is not designed for continuous employee occupancy. Most confined spaces are not designed for employees to enter and work on a routine basis. They may be designed to store a product, enclose materials and processes, or transport products or substances. Because they are not designed for continuous occupancy, frequently they will not have good ventilation or lighting. Therefore, occasional employee entry for inspection, maintenance, repair, cleanup, or similar tasks can be difficult and dangerous. The danger associated with entry may come from chemical or physical hazards within the space.

Some examples of confined spaces:

- Storage tanks, tank cars, boilers, silos, or other tank like compartments
- Pits or degreasers
- Pipes, sewers, sewer pump stations including wet and dry wells, shafts and ducts

When working in a confined space, various types of atmospheres may be present. Depending on which type of atmosphere is present and what type of work is being performed, the situation could be potentially life threatening. Always know what type of space you are entering and the dangers presented in each situation. Below are four dangers that may be present when working in a confined space.

Oxygen-Deficient Atmospheres

The normal atmosphere is composed of approximately 21% oxygen and 79% nitrogen. An atmosphere containing less than 19.5% oxygen is considered oxygen-deficient. The oxygen level inside a confined space may be decreased as the result of either consumption or displacement.

There are a number of processes that consume oxygen in a confined space. Oxygen is consumed during combustion of flammable materials, as in welding, cutting, or brazing. A more subtle consumption of oxygen occurs during bacterial action, as in the fermentation process. Oxygen can also be consumed during chemical reactions such as in the formation of rust on the exposed surfaces of a confined space. The number of people working in a confined space and the amount of physical activity can also influence oxygen consumption. Oxygen levels can also be reduced as the result of oxygen displacement by other gases.

Flammable Atmospheres

Flammable atmospheres are generally the result of flammable gases, vapors, dust mixed in certain concentrations with air or an oxygen-enriched atmosphere.

Oxygen-enriched atmospheres are those atmospheres that contain an oxygen concentration greater than 22%. An oxygen-enriched atmosphere will cause flammable materials such as clothing and hair to burn violently when ignited.



Combustible gases or vapors can accumulate within a confined space when there is inadequate ventilation. Gases that are heavier than air will accumulate in the lower levels of a confined space. Therefore, it is especially important that atmospheric tests be conducted near the bottom of all confined spaces.

The work being conducted in a confined space can generate a flammable atmosphere. Work such as spray painting, coating, or the use of flammable solvents for cleaning can result in the formation of an explosive atmosphere. Welding or cutting with oxyacetylene equipment can also be the cause of an explosion in a confined space. Oxygen and acetylene hoses may have small leaks in them that could generate an explosive

atmosphere and, therefore, should be removed when not in use. The atmosphere shall be tested continuously while **any** hot work is being conducted within the confined space.

Toxic atmospheres may be present within a confined space as the result of one or more of the following:

1. The Product Stored in the Confined Space

When a product is stored in a confined space, the product can be absorbed by the walls and give off toxic vapors when removed or when cleaning the residual material. The product can also produce toxic vapors that will remain in the atmosphere due to poor ventilation.

2. The Work Being Conducted in the Confined Space

Toxic atmospheres can be generated as the result of work being conducted inside the confined space. Examples of such work include: Welding or brazing with metals capable of producing toxic vapors, painting, scraping, sanding, etc. Many of the solvents used for cleaning and/or degreasing produce highly toxic vapors.

3. Areas Adjacent to the Confined Space

Toxic fumes produced by processes near the confined space may enter and accumulate in the confined space. For example, if the confined space is lower than the adjacent area and the toxic fume is heavier than air, the toxic fume may “settle” into the confined space.

Mechanical and Physical Hazards

Problems such as rotating or moving mechanical parts or energy sources can create hazards within a confined space. All rotating or moving equipment such as pumps, process lines, electrical sources, etc., within a confined space must be identified.

Physical factors such as heat, cold, noise, vibration, and fatigue can contribute to accidents. These factors must be evaluated for all confined spaces.

Excavations could present the possibility of engulfment. Employees shall be protected from cave-ins by sloping, benching, or shoring systems when the depth of the excavation is more than four feet, in accordance with 29 CFR 1926.652. In some circumstances, air-monitoring may also be required.

Additional Dangers

In general, over half of those who die in confined spaces would have been attempting to rescue colleagues who had gotten into difficulties. These are usually unauthorized rescues attempted by work colleagues who react instinctively to a colleague’s distress. But there is documented evidence to show that qualified rescue workers have also died because they have not followed established procedures.



The human instinct to assist colleagues in danger is very strong, often with fatal consequences. Effective confined spaces training aims to control these natural instincts by instilling in workers automatic emergency responses based on agreed procedures.

Ultimately, the safety of the individual is a personal responsibility but the onus to provide all the risk control measures necessary to inform and direct the employee rests with the employer. The employer must provide a suitable and sufficient level of supervision, which reflects the competence of the worker, to

ensure that correct decisions are being made, and safety procedures are being followed.



Ventilation

The easiest way to eliminate many of the dangers that are present in a confined work space is to provide proper ventilation. Although proper ventilation is a major component of safety in a confined space, it is not the only safety precaution necessary. In many situations, it will be necessary to ventilate a confined space before entry and to

maintain forced ventilation while the space is occupied. Forced ventilation is required to remove air contaminants, provide oxygen and to keep the air as clean as possible. The following is a guide to help ventilate confined spaces. Some confined spaces have a single opening, others have multiple openings, or are connected to tunnels, etc.

1. It is best to blow air into the confined space and draw it out simultaneously. This procedure generally requires two or more openings. For ventilation purposes, it is best to open as many of the adjacent entry points as possible.
2. With a confined space that has only a single entry point or when only a single fan is available, air should be blown into the confined space. A flexible hose is helpful in directing the air to the bottom of the confined space.
3. It is important that the fresh air intake not be contaminated. In some cases, a portable gasoline powered generator will be used to power the ventilation fan(s). The generator should be located as far as possible from the fan air intake. Motor vehicles or other internal combustion engines should not be allowed to operate with their exhaust pipes located near the air intakes.

If you are ever unsure about the conditions present within a confined space, do not enter. The human body can be quickly overcome by toxic fumes or a lack of oxygen. If you suspect the area is not safe to enter, take the necessary steps to ventilate the space or equip yourself with the proper breathing apparatus.

Although the information provided should give you a better understanding of the dangers that exist in confined spaces, it is by no means comprehensive. Seek the advice of a trained professional in any situation you are unsure of.

Regional Supervisor Training
February 2005



"Risk Management for Supervisors"
"Work Comp Management for Supervisors"

Morning and Afternoon Workshops
each taught at three sites:

Clay Center, February 10

Iola, February 17

Garden City, February 24

Brochures will be mailed and emailed mid January

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