CONFINED SPACE ENTRY

Thousands of workers are exposed to possible death or injury in what are referred to as confined spaces. The standard on permit-required confined spaces defines a **confined space** as:

- A space that is large enough for an employee to enter,
- Has restricted means of entry or exit, **and**
- Is not designed for continuous employee occupancy.

A **permit-required confined space** (permit space) is a confined space that presents or has the potential for hazards related to:

- Atmospheric conditions (toxic, flammable, asphyxiating),
- Engulfment,
- Configuration, **or**
- Any other recognized serious hazard.

CONFINED SPACE HAZARDS

Let's look further at some of the dangers you might encounter in a permit-required confined space.

PHYSICAL HAZARDS

Physical hazards may result from mechanical equipment or moving parts like agitators, blenders, and stirrers. Dangers may also be present from gases, liquids, or fluids entering the space from connecting pipes. Before entering a permit space, all mechanical equipment must be locked out/tagged out. All lines containing hazardous materials such as steam, gases, or coolants must also be shut off.

Other physical hazards include heat and excessive noise. Temperatures can build up quickly in a permit space and cause exhaustion or dizziness. Sounds may reverberate and make it hard to hear important directions or warnings.

OXYGEN DEFICIENCY

In general, the primary atmospheric hazard associated with permit spaces is oxygen deficiency.

Normal air contains 20.8 percent oxygen by volume. The minimum safe level as is 19.5 percent; the maximum safe level is 23.5 percent. A low oxygen level can quickly cause death. Oxygen can be displaced by other gases such as argon, nitrogen, or methane. Oxygen can be consumed by chemical reactions such as rusting, rotting, fermentation, or burning of flammable substances.

COMBUSTIBILITY

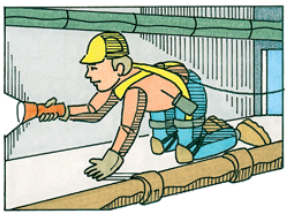
Flammable and combustible gases or vapors may be present from previous cargoes, tank coatings, preservatives, and welding gases. These built-up vapors and gases can be ignited by faulty electrical equipment, static electricity, sparks from welding, or cigarettes. The atmosphere is hazardous if tests show the presence of flammable gas, vapor, or mist that is more than 10 percent of its lower flammable limit.

TOXIC AIR CONTAMINANTS

These contaminants occur from material previously stored in the tank or as a result of the use of coatings, cleaning solvents, or preservatives.

BEFORE YOU ENTER

The hazards must be identified before anyone enters a permit-required confined space. A written entry permit must be used for entry into a permit-required confined space. The permit outlines the conditions that make the entry safe. The permit must be posted at the space during an entry, and it must be signed by the entry supervisor.



CONTROL ANY HAZARDOUS ENERGY

Use locks and tags to prevent accidental startup of equipment while you are working in the permit space. Cut off steam, water, gas, or power lines that enter the space.

TEST THE AIR

Use special instruments for testing the levels of oxygen, combustibility, and toxicity in confined spaces.

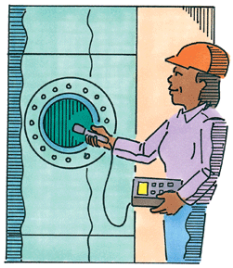
Test before you open the space by probing with test instruments near the entry.

Once the space is opened, test the air from top to bottom. Some gases like propane and butane are heavy, and they will sink to the bottom of the space. Light gases like methane will rise to the top. So you need to be sure to check all levels.

After you are sure that the oxygen level is adequate and there is nothing combustible in the space, test for toxicity. Periodic or continuous follow-up testing may be needed during the entry.

PURGE AND VENTILATE THE SPACE

Some confined spaces may contain water, sediment, hazardous atmospheres, or other unwanted substances. These substances generally must be purged, that is, pumped out or otherwise removed, before entry.



Use ventilating equipment to maintain an oxygen level between 19.5 percent and 23.5 percent. It also should keep toxic gases and vapors to within accepted levels prescribed by OSHA.

Use only safe, grounded, explosion-proof equipment and fans if a combustible atmosphere could develop in the space.

If ventilation does not eliminate the atmospheric hazards, you will need to wear appropriate respiratory protection. You might also need eye and hearing protection and protective clothing.

RESCUE PROCEDURES

Almost two-thirds of permit-required confined space deaths result from people attempting a rescue. When workers enter a permit space, at least one person must remain outside to summon help or offer assistance.

When the department designates this attendant to perform rescue procedures in addition to monitoring the safety of the confined space entrant, he or she should be equipped with the necessary PPE and rescue equipment and trained in first aid and cardiopulmonary resuscitation (CPR). He or she should maintain constant communication with those inside the space. If a situation arises that requires emergency rescue, the attendant must not enter until additional help arrives.

The entrant must wear a full body harness and lifeline so that he or she can be easily pulled from the space. It can be attached to a block and tackle or a winch system that a single rescuer/attendant can operate from outside the space.

The entrant must be trained to recognize hazardous situations so he or she knows when to exit a confined space before a rescue is needed.

WORK AT WORKING SAFELY

You should always follow safe procedures and the City's permit space program. Use the protective equipment provided by the City. Keep the following safety tips in mind:

1. Use prescribed personal protective and respiratory equipment at all times.
2. Test the air inside the permit space for safe oxygen levels and for flammable, explosive, and toxic vapors and gases before entry. Test periodically while work is in progress.
3. Always use non-sparking tools and explosion proof fans, lights, or air movers when working in permit spaces where there may be a combustible atmosphere.
4. Have trained, well-equipped workers available to rescue anyone who enters a permit space.

If you follow these rules carefully, you will be able to work safely in permit-required confined spaces.