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Staying safe in confined spaces

Safety on the job is important to everyone. Working in confined spaces has unique risks, but as with all jobs, most worksite injuries can be averted with foresight, planning and the proper equipment.

Defining “confined space”

“Confined space” is defined slightly differently in each province; Part XI of the Canada Occupational Safety and Health Regulations defines it as “an enclosed or partially enclosed space that

a. is not designed or intended for human occupancy except for the purpose of performing work;

b. has restricted means of access and egress; and

c. may become hazardous to an employee entering it due to

   i. its design, construction, location or atmosphere,

   ii. the materials or substances in it, or

   iii. any other conditions relating to it.”

Work done in confined spaces is generally regulated by the same governmental agencies that oversee other safety issues, such as personal protective equipment (PPE). Canada has these organizations across the country, from WorkSafeBC in the west to Service NFLD, Occupational Health and Safety Branch, in the east, to the Northwest Territory’s and Nunavut’s Worker’s Safety and Compensation Commission in Canada’s north. Each of these authorities advocate a similar approach.

Federal, provincial and territorial legislation requires companies to have a confined space management program that ensures hazards are proactively identified, and control strategies are put in place. These control strategies include approved work procedures, an entry permit system, an emergency response plan, training and PPE.

Examples of confined spaces include manholes; sewers; boilers; tunnels; pipelines; wells; fuel ballast, storage and septic tanks; tank cars and tank trucks; vats; process vessels; sewage lift stations; silos and grain elevator boots; trenches; and ventilation and exhaust ducts.

Confined spaces are typically classified by their hazards, whether they are physical, or a combination of physical and atmospheric hazards. A confined space is not necessarily small. A large space can be considered a confined space if anyone entering could encounter hazards such as toxic or flammable gases or vapours, a lack of oxygen or rising water.

Hazards, invisible and visible

The first of these – dangerous gases or vapours – can be treacherous in a confined space. Workers can underestimate the hazards they can't see or smell – and if they don't see or otherwise detect the danger, they may not take the proper precautions. Confined space entry (CSE) training helps workers anticipate, recognize, assess and control the hazards that can be encountered in a confined space. This is valuable knowledge, because workers can underestimate the swiftness of the effects of simple asphyxiants and toxic gases, including carbon monoxide (CO) and hydrogen sulphide (H_2S). A worker can be overcome in seconds and exposure can be fatal before help arrives. Good training and equipment can help workers prevent this type of tragedy.

Another serious potential hazard of working in a confined space is falls. Falls are dangerous, no matter the starting point, and confined spaces can exacerbate the dangers of falls. For example, there may be an increased risk of the worker hitting objects on the way down or becoming trapped or pinned within the space. Rescuing a fallen worker from a confined space may also be more complicated; the access to and from the space may be restricted, and it may be difficult to properly equip rescuers with the appropriate PPE in a tight space. Make sure workers are equipped with the correct fall protection gear.

Planning for work in a confined space:

anticipation, recognition, evaluation and control

Begin your work with a risk assessment to identify the hazards and assess the risks associated with the job. The ultimate goal is to help control, if not eliminate, any hazards, whether they're environmental or physical.

Next, **establish controls** for the hazards identified, whether these hazards currently exist, may develop, or be created by the work that will be conducted in the space. Eliminating the need to work inside the space is ideal, and companies can sometimes find ways to do the work from outside. However, if entry cannot be avoided, controls may also include an entry permit system to control who goes in, and document what they will do. If applicable, disconnect and block lines that might otherwise be capable of delivering liquids to the confined space. If there is a fall hazard, surround any vertical entry points with guard rails or other barriers, if practical, to help prevent someone from accidentally falling in.

Make sure workers are equipped with the correct PPE including proper respiratory protection. No matter the job, well-fitting and comfortable PPE will make the work easier and can help increase worker compliance.

Training is also important. To work safely in a confined space, workers need to know what hazards to look for, as well as when and how to wear PPE. Training records, including participants' names and training dates, must be kept. Appropriate fall protection and access/egress systems need to be used; they must comply with the relevant CSA Z259 standards, depending on the jurisdiction.

Workers must be competent to work in confined spaces. Refresher training may be required to maintain their competency, or driven by a mandated schedule in a standard. Training should be site specific and should not rely on calling 9-1-1 for assistance. Rescue exercises should be practiced regularly and reviewed before entering a confined space.

When appropriate – for instance, if the space could have toxic or flammable vapours, or a lack of oxygen **– test the atmosphere** before entering the space. It's essential that samples are taken at different levels; depending on the differing density of different gases and vapours, more harmful ones could be concentrated at the top or bottom of the space, or dispersed throughout. These tests must be performed by a trained worker with a calibrated detection device and the results recorded in a log book or entry permit.

Air purifying respirators and continuous-flow supplied air respirators may be used when the risk assessment and testing confirm that the working environment will not exceed the maximum-use concentration and will not become immediately dangerous to life or health (IDLH). Only self-contained breathing apparatuses (SCBA) and multi-functional respirators (also referred to as "pressure-demand, open-circuit, combination self-contained breathing apparatuses with Type C supplied air respirators") are suitable for use in atmospheres that are unknown and/or potentially immediately dangerous to life or health.

If the gas or vapour levels are unsafe because the space is a developing flammable environment or there is a build-up of a contaminant for which controls are not suitable, the worker must not enter. Purge and/or **ventilate the space**, then retest for safe atmospheric readings before entering.

While workers are in the confined space, continuous atmospheric testing may also be required, depending on the nature of the hazards. It's also important to have a trained **worker on watch** who can initiate rescue protocols in case of emergency.

Never forget that the harmful effects of an invisible or odourless gas or vapour can range from loss of coordination to loss of consciousness to loss of life, and it can happen incredibly fast. Seconds matter. **A rescue plan that works is absolutely essential**. Written site-specific rescue procedures must be in place before a confined space entry is made. (Read our white paper on fall rescue planning for more information.) Develop a set of procedures to follow, and provide education, training, and when needed, PPE such as SCBAs or pressure-demand airline systems with escape cylinders.

As a general requirement, employers must identify and take measures to reduce, control, eliminate or otherwise mitigate hazards associated with work in confined spaces, including modifying the work so that a worker is not required to enter the space, or changing the physical characteristics of the confined space to help ensure safe entry and exit. But when that's not possible – or even when it is – thorough training, good planning, including a written rescue plan, and appropriate, well-fitting PPE will help prevent tragedy.

Visit us online to learn more about confined space solutions or register for confined space safety training with 3M's Fall Protection Group.