Confined Spaces

CODE of PRACTICE

Many workplaces contain areas that are considered "confined spaces" because while they are not necessarily designed for people, they are large enough for workers to enter and perform certain jobs.

A confined space also has limited or restricted means for entry or exit; is not designed for continuous occupancy and may contain potential or known hazards.

Some basics:

- → A confined space should be considered hazardous unless determined otherwise by a comprehensive hazard assessment;
- → Only workers who have completed a confined space entry program are permitted to work in a confined space;
- → Workers are not permitted to enter or remain in a confined space that contains or is likely to contain an explosive or flammable gas or vapor;
- → Do not enter s confined space if a new hazard is present that was not identified by the Initial Hazard assessment; and
- → Do not create an obstruction by storing anything near or adjacent to a confined space access/egress.

Pause for Safety

Hazards

- → flammable or explosive atmospheres
- → harmful gas, fume or vapour
- → free flowing solid or an increasing level of liquid
- → excess of oxygen
- → excessively high temperature
- → lack of oxygen

PPE

Additional PPE

Controls

- → Competence, training, supervision and suitability
- → Permit-to-work procedure
- → Gas purging and ventilation
- → Dangerous residue removal
- → Testing and monitoring of the atmosphere
- → Mechanical, electrical and process isolation (Lock Out)
- → Respiratory protective equipment

- → Other personal protective equipment (life line)
- → Communications
- → Added or improved access and egress

Strategies and Procedures

Training

All workers have access to adequate training with reviews specific to the work being performed. Areas to be focused on include:

- → Confined Space Entry Permits
  - familiar with specific requirements of the permit and safe work plans
- → Isolation
  - workers familiar with tagging and lockout and blinding requirements
- → Toxic Products
  - review of SDS's for hazard awareness and safe handling procedures
- → PPE
  - Proper use and fit testing of equipment and its limitations.
  - Information on SDS will refer to specific requirements
- → Fire Protection
  - Proper type of equipment for fire hazard.
  - Information on SDS will refer to specific requirements
- → Emergency Reporting/Rescue
  - All workers must be familiar with emergency reporting procedures and familiar with the use of any rescue equipment that may be required to use

Personal Protective Equipment (PPE)

If it is not practical to eliminate a hazard then PPE can sometimes be used to protect the worker against the hazard.

Some PPE that could be required for work in confined spaces are

- → hard hats
- → foot protection
- → eye protection
- → gloves
- → coveralls
- → harness and lifelines
- → hearing protection
- → respiratory protection.

Safety Watch

A safety watch is posted outside the confined space and in communication with the workers inside. The safety watch is identified by a distinguishing vest.

The safety watch responsibilities include:

- → Being familiar with the emergency reporting procedures
- → Assist with rescue if required
- → Ensure all necessary safety equipment required by the entry permit is in place and all required gas tests are current

- → Be familiar with the use of all PPE and rescue equipment required by the safe entry permit
- → Do not leave the area unless relieved by a qualified person
- → Ensure the area and accesses are secure prior to leaving the area.

Isolation

Some confined spaces may contain mechanical equipment or other moving parts that could pose a hazard to workers.

- → Electrical isolation of power driven equipment or other power sources is to be done in accordance with energy isolation procedures.

Lighting

Lighting requirements will vary according to work activities and products being used.

- → Explosion proof lighting is used where the potential for the presence of flammable products exist.
- → As a minimum, all 110 volt lighting is protected by ground fault interrupters.
- → Workers in confined spaces and safety watch personnel should carry portable lighting in case of a power failure.

Ventilation

Before entering a confined space consideration must be given to ventilation and the possible hazards when opening covers, doors and man ways.

- → Natural ventilation may be sufficient on large, open, new equipment but mechanical ventilation is recommended for all confined spaces.
- → Common types of ventilation are local fume extractors and general ventilation equipment such as pneumatic air movers and electric fans.
- → When a work activity involving welding, burning, cutting or use of a hazardous product is performed in the confined or enclosed space, ventilation must be maintained to ensure at least 2000 cfm/worker.
- → If there is any possibility of flammable substances present, all equipment must be explosion proof.
- → Equipment must be located so that contaminated air containing such substances as exhaust gases and welding fumes are not drawn into the confined space.

Air Testing

Testing of atmospheres for entry into confined spaces are done by a competent person trained and experienced in the use of testing equipment and entries into confined spaces.

- → Gas test results are attached to the permit's documentation.
- → Equipment used for testing must be calibrated weekly, after any readings are registered or in accordance with manufacturers specifications.
    - A record of calibration must be maintained.

→ Permits for entry into confined spaces will only be issued if oxygen levels are between 19.5% and 23%, and H2S (hydrogen sulfide), LEL (Lower Explosive Limit) and CO (carbon monoxide) levels are at zero.

In addition to initial testing, all confined spaces (with the exception of shallow excavations 5' or less) will be continuously monitored with gas detection tools operated by safety watch from outside.

→ Safety watches shall record gas test results on an hourly basis.

The facts

Potential Hazards

Toxic Atmosphere

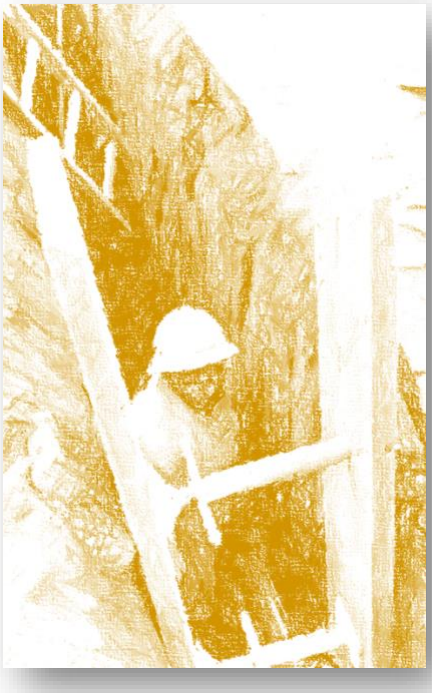
→ A toxic atmosphere may cause various acute effects, including impairment of judgement, unconsciousness and death.
→ A toxic atmosphere may occur due to the presence or ingress of hazardous substances.
→ These substances may be present in the Confined Space for various reasons such as:
- remaining from previous processing or storage
- arising from the disturbance of sludge and other deposits
- the presence of a fire or flames within the space
- seepage from improperly isolated adjoining plant
- formation during the work processes carried out in the space
- being released from under scale and in brickwork as a result of the work process

Oxygen Deficiency

→ Oxygen can be lacking a confined space for the following reasons:
- displacement of air by another gas
- various biological processes or chemical reactions (such as rotting of organic matter, rusting of metals, burning, etc)
- absorption of air onto steel surfaces, especially where these are damp

Oxygen Enrichment

→ An excess of oxygen, in the presence of combustible materials, results in an increased risk of fire and explosion.
→ Some materials, which do not burn in air, may burn vigorously or even spontaneously in an enriched oxygen atmosphere.



Flammable or Explosive Atmospheres

- → A flammable atmosphere presents a risk of fire or explosion.
- → Such an atmosphere can arise from the presence in the confined space of flammable liquids or gases or of a suspension of combustible dust in air.
- → If a flammable atmosphere inside a confined space ignites, an explosion may occur, resulting in the expulsion of hot gases and the disintegration of the structure.

Flowing Liquid or Free Flowing Solids

- → Liquids or solids can flow into the confined space causing drowning, suffocation, burns and other injuries.
- → Solids in powder form may also be disturbed in a confined space resulting in an asphyxiating atmosphere.

Excessive Heat

- → The enclosed nature of a confined space can increase the risk of heat stroke or collapse from heat stress, if conditions are excessively hot.
- → The risk may be exacerbated by the wearing of personal protective equipment or by lack of ventilation

Fire and Explosion

- → Can occur when a flammable substance combined with air comes into contact with a source of ignition.
- → Care must be taken during construction not to accidentally introduce flammable products into a confined space.
- → Some potentially hazardous areas are the use of oxy/acetylene equipment, fuel spills, and the use of flammable products.

Toxic Substances

- → Toxic substances can be produced from processes that can occur or has occurred in the confined space, work activities, waste material and sources outside the confined space.

Falling Objects/Material

- → Particular care must be taken when bringing material or equipment into confined spaces.
- → Limited space increases the problem of workers being able to stay from under suspended loads and consideration should be given to this when planning the work.
- → This hazard increases where other workers or an access way is located above work areas.

Mechanical Equipment

- → Equipment that may pose a hazard to workers in a confined space must be isolated to ensure it cannot be energized.
- → Some equipment may also have to be secured or supported if any potential for movement exists when it is de-energized.

Electrical

- → Electrical shock can result from permanent installations in the confined space or temporary power from defective cords and cables.
- → Temporary power cords and cables must be protected from mechanical damage and 110 volt circuits by ground fault interrupters.

Hazard Levels

Confined space hazards are divided into three hazard levels.

Level 1

A Level 1 confined space tests free of hazardous atmospheres.

A Level 1 confined space is entered only where:

- → There is easy egress from all accessible parts of the confined space.
- → Mechanical equipment in the confined space is disconnected from its power, de-energized and locked out.
- → All pipes and other supply lines whose connections are likely to create a hazard are blanked off, and their control valves closed and locked out.
- → The confined space is tested and evaluated by a competent person who records the results of each test in a permanent record. They must also certify in writing in the permanent record that the confined space is free from hazard. Finally, they must certify that the confined space will remain free from hazard while any worker is inside, having regard to the nature and duration of the work to be performed.
- → The worker entering the confined space is equipped with a safety harness and lanyard.

Emergency equipment is located near the access port, including:

- → An emergency alarm
- → A fire extinguisher
- → Extra self-contained breathing apparatus (SCBA)

Level 2

A Level 2 confined space may contain:

- → Hazardous gas, vapour, dust or fumes
- → Oxygen content of less than 19.5% or more than 23% at atmospheric pressure, but which can be purged and ventilated to provide a safe atmosphere

A Level 2 confined space is entered only when:

- → All of the procedures applicable to Level 1 have been completed
- → The space is purged and ventilated to provide a safe atmosphere
- → Measures necessary to maintain a safe atmosphere have been taken
- → Suitable arrangements have been made to remove the worker from the confined space should the worker require assistance
- → A person adequately trained in artificial respiration is readily available

Level 3

A Level 3 confined space may contain:

- → Hazardous gas, vapour, dust or fumes
- → An oxygen content of less than 19.5% or more than 23% at atmospheric pressure, but which cannot be purged and ventilated to provide and maintain a safe atmosphere.

A Level 3 confined space is entered only when:

- → All of the procedures applicable to Level 1 have been completed, with the exception of the permanent record stating that the confined space is free from, and shall remain free from, hazard.
- → The worker entering is using a suitable breathing apparatus and a safety harness, or other similar equipment. The safety harness or equipment must be securely attached to a rope, the free end of which is held by a trained worker standing by, outside the confined space. The standby worker must be equipped with an alarm in case of accident.
- → The worker entering the confined space uses any equipment necessary to ensure his/her safety.
- → The safety harness, rope and other equipment mentioned above have been inspected by a competent person, are in good working order and recorded in the permanent record.
- → A person adequately trained in artificial respiration is readily available.

Explosive or Flammable Atmosphere Procedures

Where the gas or vapour in a confined space is likely to be explosive or flammable, the confined space is entered only where:

- → The concentration of the gas or vapour has been tested by a competent person and found not in excess of 50% of the lower explosive limit of the gas or vapour

- → The concentration of the gas or vapour has been recorded in the permanent record
- → The only work performed is that of cleaning or inspecting, and of such a nature that it does not create any source of ignition

- → Cold work may be performed in a confined space that contains, or is likely to contain, an explosive or flammable gas or vapour, where the concentration does not, and is not likely to exceed, 10% of the lower explosive limit (LEL) of the gas or vapour.

Responsibilities

Corporate

As a company and employer, we are responsible to:

- → Facilitate and/or provide proper instruction to their workers on protection requirements including Confined Space Entry and Emergency Egress procedures and training;
- → Provide the permit system and monitor its usage; and
- → Ensure a comprehensive hazard assessment is completed.

Worker

As a conscientious and safety-minded individual, you will:

- → Ensure you are competent in confined space entry to identify the work procedures required to enter the confined space;
- → Not enter or remain in a confined space if more than 20% of the lower explosive limit (LEL) of an explosive substance is present in the atmosphere;
- → Complete a permit and have it authorized prior to entry;
- → Conduct a hazard assessment prior to the confined space entry;
- → Ensure there is a reasonable means exiting from all parts of the confined space;
- → Ensure that ventilation and purging is established and allows acceptable air levels to be achieved and maintained.
    - ○ If venting is not practical, the air space must be neutralized using an approved method;
- → Establish a method of communication to allow immediate contact with necessary personnel if rescue or assistance is required, confirm alarm system;
- → Be trained in H2S Alive or equivalent (if required);
- → Ensure that, before entry, the vessel or confined space is tested by a competent worker wearing breathing apparatus, for oxygen content, combustible gas (L.E.L.) and hydrogen sulphide if present;
- → See if Continuous monitoring is required of the confined space atmosphere.
- → Be conversant with Rescue Procedures and be familiar with the rescue plan prior to the entry of the confined space;
- → Lock out or isolate any energy sources prior to entry; and

→ Have a safety watch stationed outside of the confined space at all times.

Emergency Response

Before each confined space entry, a hazard assessment must be performed. A significant part of the hazard assessment should focus on how to rescue or evacuate the worker(s) if:

- → an alarm is activated;
- → the concentration of oxygen inside the confined space drops below 20 percent by volume or exceeds 23.0 percent by volume;
- → there is a significant change in the amount, size or danger posed by a hazardous substances or any other hazards inside the confined space.

All rescue personnel and rescue equipment must be readily available to respond to a confined space emergency

Rescue

Confined Space Entry rescue plans will be developed by the company prior to initial entry.

On site equipment includes:

- → Emergency conveyance vehicle
- → first aid supplies
- → Extrication/retrieval devices
- → Craneage, come-alongs, chain fall and ropes

The safety man should have as a minimum:

- → an air horn (to summon help in an emergency),
- → distinguishing colored vest
- → a means of communication with workers.

Other equipment that may be required by the safe entry permit:

- → lifelines
- → harnesses
- → respiratory protection
- → anklets
- → vertical retrieval tripods