

## Confined Space Work Activity

A confined area is defined as a vessel, tank, pipeline, pit or enclosed space where dangerous air contamination or lack of oxygen may be present due to a manufacturing process, a work procedure or the action of organisms. When employees work in this type of environment, the possibilities of a reduced oxygen level, flammable, combustible or toxic gases may be present.

A “permit-required” confined space has the following characteristics:

- Large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit.
- Is not designed for continuous employee occupancy.

A permit required confined space will also:

- Contain or may contain a hazardous atmosphere, such as lack of oxygen or the presence of toxic vapors.
- Contain a material that could engulf an entrant—for example, a liquid or a finely divided, foldable solid substance that can be aspirated or that can exert enough force to cause death by strangulation, constriction or crushing.
- Inward-converging walls or floors that slope downward and taper to a smaller cross-section.
- Contain any other recognized serious safety or health hazard (corrosive materials, flammable/combustible gases and vapors, extremely hot or cold materials, radioactive materials).

The Occupational Safety and Health Administration (OSHA) currently has two sets of regulatory requirements in place: one for “other confined-space operations” (new construction) and one for other types of permit-required confined-space operations” (new construction) and one for other types of permit required confined-space activities (tanks, silos, sewers, pipelines, vaults, etc.). Both regulatory requirements recognize the following atmospheric and physical legends:

### Atmospheric hazards

- **Oxygen Concentration** – Too much or too little oxygen in a confined space can be hazardous. The oxygen level in a confined space must be between 19.5 percent and 23.5 percent.
- **Flammable Gas, Vapor, Mist** – If the atmosphere contains flammable gas, vapor, or mist more than 10 percent over its Lower Flammable Limit (LFL), it is unsafe for entry.
- **Airborne Combustible Dust** – Airborne combustible dust at a concentration that meets or exceeds its LFL poses a serious fire or explosion hazard. An indication of its condition is if the dust obscures vision at a distance of 5 feet or less.
- **Toxic Air Contaminants** – Toxic air contaminants must be within their Permissible Exposure Limits (PEL) in a confined space. The most common toxic gases in confined spaces are carbon monoxide and hydrogen sulfide.
- **Immediately Dangerous to Life or Health** – Any other atmospheric condition that is immediately dangerous to life or health is a hazard. IDLH means any

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condition that poses an immediate or delayed threat to life; that would cause irreversible adverse health effects; or that would interfere with an individual's ability to escape a confined space unaided.

#### Physical hazards

- Engulfment
- Job functions
- Hot work (welding)
- Mechanical falls
- Burns
- Electrocution

#### Preplanning for confined space entry

- Formal, written entry procedures and permit program should be established, before any confined area entry.
- Responsible personnel should be thoroughly familiarized with program.
- Foreman or supervisor should be responsible for all aspects of confined area entry and work.
- Hazardous properties should be determined for all materials which were stored in or may enter the confined area through pipes and other connections while workers are inside.
- "Lock-out" procedures should be established to guarantee against equipment starting or materials entering confined area while workers are inside.
- Cleaning, purging and ventilating procedures should be established.
- Emergency rescue procedures should be established.

#### Area protection

- Pipes, hoses and ducts should be disconnected and valves closed and locked.
- Drive shafts and/or belts should be disconnected.
- Power switches should be locked "off".
- Confined area should be blown out with air or steam to remove vapors and gases. Several air changes are usually necessary.
- Confined area may be purged with detergent or water, which should be thoroughly drained before entry.
- Construction and physical shape of the confined area and the special properties of materials stored in it should be carefully considered.

#### Ventilation

- Quantity of air necessary should be calculated in advance by a qualified person.
- Air used should come from an air or steam powered source, or an electric blower or fan. Air intakes should be located where no contaminants may enter the air stream. Air should not be from a shop compressed air line, air compressor, or bottled compressed air, unless there is no other source available. Such air must be tested for the presence of oxygen and carbon monoxide before being used.
- Air may be either exhausted or blown into the confined area.
- Ventilation rates depend on size and shape of, type of work being performed in, and materials stored in confined area.

#### Testing

- Confined area atmosphere should be tested for absence of flammable and/or toxic gases and for presence of sufficient oxygen before entry and during work.
- Testing during work should be continuous, or at least every 2-3 minutes.

- Testing instruments should be calibrated and checked before each use.
- If contaminant concentration rises or oxygen concentration falls, workers should be removed until the cause(s) is/are found and eliminated.

**Protective equipment**

- Hard hats, safety glasses, safety shoes.
- Boots, gloves, aprons, face shields and coveralls, made of materials resistant to heat, corrosive substances and other physical hazards.
- Respiratory protective equipment should be used only if adequate ventilation is not possible. If its necessary to use respiratory protective equipment.
  - (a) Only NIOSH-approved equipment should be used.
  - (b) The use of self-contained breathing apparatus is preferable.
  - (c) If supplied-air respirators are used, they should be equipped with in-line filtration for carbon monoxide, oil mist and particulates, and a high temperature alarm connected to the compressor. Ideally, an oil-less compressor should be used. Compressor air intakes should be positioned away from contamination sources.
  - (d) Cartridge-type respirators should be used only for short periods of exposure to low concentrations (2% or less) of contaminants. Such equipment should never be used in oxygen deficient atmospheres.
  - (e) Written, formal respiratory protection program meeting OSHA 1910.134 requirements, should be maintained.

NOTE: Respiratory protective equipment should always be available for emergency use.

**Rescue and emergency**

- Formal procedures should be established before entry.
- Workers in confined area should be limited to an absolute minimum.
- Observer should be stationed at a point where all activity in the confined area can be seen at all times.
- Observer should be able to alert others outside the confined area in an emergency.
- Workers entering confined area should wear harnesses and life lines. Block and tackle or winch should be on hand to pull unconscious workers out the confined area.
- Self-contained breathing apparatus should be positioned with observer.
- First aid equipment, including oxygen bottle or resuscitator, should be available.
- Observer and someone outside confined area who is immediately available should be trained in first aid.
- Workers should be trained on all rescue procedures.

Contact your local Great American Loss Prevention Specialist for additional information.

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