

6 – Warning signs. Signs warning of a confined space hazard should be posted near its entrance. When work is in progress, the stand-by person should ensure that unauthorized persons do not enter the restricted area. When work is not in progress, the entrance should be blocked to outside entry.

Attention to the protective and precautionary measures outlined above is essential for ensuring workers' health and safety within confined spaces.

For additional information and assistance, contact:

- » Your local MSHA office
- » **Metal/Nonmetal Mine Safety and Health**
Arlington, Virginia
202-693-9630
- » **Coal Mine Safety and Health**
Arlington, Virginia
202-693-9510
- » **Pittsburgh Safety and Health Technology Center**
Pittsburgh, Pennsylvania
412-386-6901

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Working in Confined Spaces



Health Hazard Information Card HH-11

A confined space has these features:

- » a space or structure which has limited or restricted openings for entry and exit
- » its size, shape, or use may injure workers entering it
- » it isn't meant or designed for continuous occupancy of workers
- » it has poor (or no) natural ventilation

Confined spaces include storage tanks, pits, silos, vats, boilers, ducts, sewers, mills, and other structures found at metal/nonmetal and coal mines. Hazardous areas may include those with oxygen (O₂) deficiency, explosive or flammable atmospheres, or high concentrations of toxic substances. Any operation which generates toxic contaminants within a confined space, without proper control measures and precautions, may be dangerous to life within a short period of time.

Before beginning work in a confined area, the supervisor and employee(s) should review the operation, hazards, and control measures. A work permit which contains this information in writing is highly recommended.

Protective and precautionary measures for working in or around a confined space should involve, as a minimum, the following features:

1 – Training. Employees who work in and monitor confined spaces should be well trained. According to statistics, the two leading reasons for persons entering confined spaces and losing

their lives are “maintenance” and “attempting a rescue.” Those who were killed had little or no proper and thorough training. Such training should include:

- » the hazards involved
- » entry and exit procedures
- » safety equipment
- » emergency first aid
- » control measures such as ventilation
- » use of appropriate respiratory protection
- » proper work practices

2 – Testing and monitoring. Before entering a confined space, workers need to test – from the outside – the air inside the space. Such tests should include those for oxygen content, flammability, and toxic contaminants. MSHA standards state the oxygen (O₂) content of air must be at least 19.5%. O₂ content **above** 21% greatly increases the risk of explosion, so that must be watched as well.

3 – Purging and ventilating. Purging a confined space to remove contaminants should be done before entry. The main environmental, or engineering, control of suspected or known contaminants during operations is *dilution ventilation*. This may be supplemented or replaced by *local exhaust ventilation*. Continuous dilution ventilation is recommended for most operations where contaminants are generated.

Before allowing entry, testing needs to be conducted to be sure the purge was successful. Monitoring contaminants during operations is indicated if there is doubt about effectiveness of controls or there is work being done that could change the composition of the air (for example: welding).

Should the O₂ content drop below 19.5%, more purging and ventilating are called for as well as further testing.

In some emergencies, a worker may have to enter a confined space before the atmosphere is at a safe level. In these instances, the worker must have a supplied-air or self-contained breathing apparatus.

4 – Safety equipment and clothing. Employees working in confined spaces must use appropriate safety equipment and clothing – such as eye and face protection, proper gloves, protective clothing (where indicated), and safety belt or harness with lifeline.

Hearing protection in the form of ear plugs or muffs is required where noise levels exceed MSHA standards.

Personal respiratory protection may be necessary if ventilation is not sufficient to control contaminants. A supplied-air or self-contained breathing apparatus is recommended where contaminants from welding, painting, solvent cleaning or other operations generating toxic contaminants are involved.

5 – Standby person. When a worker is wearing respiratory protection in an atmosphere that's immediately harmful to life, MSHA requires at least one other person tending the lifeline while outside the space. This person needs:

- » training in emergency rescue procedures
- » first aid procedures training and supplies
- » communication equipment necessary for contact with those working inside
- » methods for immediate contact with medical and other rescue personnel if needed
- » appropriate respiratory protection and other safety gear