



## Hot Work in Confined Spaces

### NATURE OF THE HAZARD

Many different places require welding, cutting, and other hot work. Some of these places lack room and become “confined spaces.” Confined spaces have some of the following characteristics:

- Are large enough for workers to enter
- Limited space, entry, or exit.
- Poor ventilation – lack of safe breathing air and possible buildup of hazardous gases, fumes, and particles.

### EXAMPLES OF CONFINED SPACES

Small utility rooms	Process vessels
Pits	Tunnels
Vats	Furnaces
Storage tanks	Pipelines
Sewers	Silos
Degreasers	Boilers
Reactor vessels	Utility vaults
Compartments of ships	Ventilation ducts
Unventilated room areas	Conveyers
Bins	Hoppers

### REASONS FOR DEATHS AND SERIOUS INJURIES FROM HOT WORK IN CONFINED SPACES

- Fire
- Electric shock
- Exposure to hazardous air contaminants
- Explosion
- Asphyxiation

### ACTIONS REQUIRED BEFORE APPROVING HOT WORK IN A CONFINED SPACE

- Special training is required for personnel to be qualified to enter confined spaces to complete hot work. Training is also required for supervisors of such operations, and other personnel who are required to work outside of the space to provide for communication and assistance.
- Open all covers and doors (or remove them when feasible) and secure them from closing.
- Test atmosphere for:
  - (1) suitable oxygen content
  - (2) combustibles or reactives
  - (3) toxics

*Note: The testing requires special equipment and training.*

- Isolate lines by capping or double blocking and bleeding. Keep vents open and valves leak-free.
- Lockout/tagout/tryout all systems to isolate energy sources not required during hot work.
- Provide means for readily turning off power, gas, and other supplies from outside the confined space.

- Protect or remove any hazardous materials or materials which may become hazardous when exposed to hot work

## REQUIRED ACTIONS DURING HOT WORK IN A CONFINED SPACE

- Continuously ventilate and monitor the oxygen concentration to ensure safe breathing levels are maintained. Also monitor contaminant levels to ensure fumes and gases do not exceed their respective safe exposure levels. Be aware that gases such as nitrogen, carbon dioxide and argon can act as asphyxiants, displacing air, and rendering the atmosphere in the space Immediately Dangerous to Life and Health (IDLH). Most confined space deaths result from asphyxiation.
- OSHA 29 CFR 1910.252(c) and 1926.353(c) require the use of local exhaust ventilation or supplied air respiratory protection when hot work is performed in a confined space where there is a potential for exposure to fluorine compounds (fluxes and rod coatings), zinc, lead, cadmium, or mercury. When beryllium is present, use both local exhaust and a supplied-air respirator.
- OSHA 29 CFR 1926.353(c) requires the use of local exhaust ventilation or supplied air respiratory protection when hot work is performed in a confined space where there is a potential for exposure to chromium or when Gas Metal Arc Welding is performed on stainless steel.
- Use NIOSH/MSHA (National Institute for Occupational Safety and Health/Mine Safety and Health Administration) approved breathing device when required by code.

- Keep unnecessary persons and equipment out of, and away from, the confined space.
- Do not allow equipment to block exit or rescue efforts. Place as much equipment as possible outside the confined space.
- Do not enter a confined space unless a watchperson, properly equipped and trained for rescue, is outside. Maintain continuous communications with the worker inside.
- When possible, provide means for readily turning off power, gases, and fuel from inside the confined space, even if outside turn-off means are provided.

## INFORMATION SOURCES

American National Standards Institute (ANSI). *Safety in Welding, Cutting, and Allied Processes* (ANSI Z49.1), published by the American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166; telephone 800-443-9353; Web site: [www.aws.org](http://www.aws.org).

Occupational Safety and Health Administration (OSHA). *Code of Federal Regulations*, Title 29 Labor, Parts 1910 and 1926, available from the U.S. Government Printing Office, Washington, DC 20401; telephone: 800-321-6742; web site: [www.osha.gov](http://www.osha.gov).

Mine Safety and Health Administration (MSHA). *Code of Federal Regulations* Title 30 Mineral Resources, Parts 1 to 199, available from the U.S. Government Printing Office, Washington, DC 20401; telephone: 202-693-9400; web site: [www.msha.gov](http://www.msha.gov).

American National Standards Institute (ANSI).  
*Safety Requirements for Confined Spaces*  
(ANSI Z117.1), available from ANSI, 25 West  
43<sup>rd</sup> Street, New York, NY 10036; telephone:  
212-642-4900; web site: [www.ansi.org](http://www.ansi.org).

National Institute for Occupational Safety and  
Health (NIOSH) Respirator Rule. *Code of  
Federal Regulations*, Title 42 Public Health,  
Part 84, available from the U.S. Government  
Printing Office, Washington, DC 20401;  
telephone: 800-356-4674; web site:  
[www.cdc.gov/niosh](http://www.cdc.gov/niosh).

International Association of Oil & Gas  
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*Fatality during confined space entry.*  
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[http://safetyzone.iogp.org/HighPotentialEvent  
s/detail.asp?inc\\_id=2721](http://safetyzone.iogp.org/HighPotentialEvents/detail.asp?inc_id=2721)

International Association of Oil & Gas  
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s/detail.asp?inc\\_id=2645](http://safetyzone.iogp.org/HighPotentialEvents/detail.asp?inc_id=2645)