

OSHA[®] FactSheet

Confined Spaces in Construction: Crawl Spaces and Attics

Confined spaces can present conditions that are immediately dangerous to workers if not properly identified, evaluated, tested, and controlled. This fact sheet highlights many of the confined space hazards associated with crawl spaces and attics and how employers can protect their workers in these environments.

OSHA has developed a new construction standard for Confined Spaces (29 CFR 1926 Subpart AA) — any space that meets the following three criteria:

- Is large enough for a worker to enter it;
- Has limited means of entry or exit; and
- Is not designed for continuous occupancy.

A space may also be a **permit-required** confined space if it has a hazardous atmosphere, the potential for engulfment or suffocation, a layout that might trap a worker through converging walls or a sloped floor, or any other serious safety or health hazard.

Fatal Incidents

Confined space hazards in crawl spaces and attics have led to worker deaths. Several tragic incidents in crawl spaces and attics have included:

- Two workers died while applying primer to floor joists in a crawl space. They were burned when an incandescent work lamp ignited vapors from the primer.
- A flash fire killed a worker who was spraying foam insulation in an enclosed attic. The fire was caused by poor ventilation.

Training

The new Confined Spaces standard requires employers to ensure that their workers know about the existence, location, and dangers posed by each permit-required confined space, and that they may not enter such spaces without authorization.

Employers must train workers involved in permit-required confined space operations so that they can perform their duties safely and understand

the hazards in permit spaces and the methods used to isolate, control or protect workers from these hazards. Workers not authorized to perform entry rescues must be trained on the dangers of attempting such measures.

Safe Entry Requirements

The new Confined Spaces standard includes several requirements for safe entry.

Preparation: Before workers can enter a confined space, employers must provide pre-entry planning. This includes:

- Having a competent person evaluate the work site for the presence of confined spaces, including permit-required confined spaces.
- Once the space is classified as a permit-required confined space, identifying the means of entry and exit, proper ventilation methods, and elimination or control of all potential hazards in the space.
- Ensuring that the air in a confined space is tested, before workers enter, for oxygen levels, flammable and toxic substances, and stratified atmospheres.
- If a permit is required for the space, removing or controlling hazards in the space and determining rescue procedures and necessary equipment.
- If the air in a space is not safe for workers, ventilating or using whatever controls or protections are necessary so that employees can safely work in the space.

Ongoing practices: After pre-entry planning, employers must ensure that the space is monitored for hazards, especially atmospheric hazards. Effective communication is important

because there can be multiple contractors operating on a site, each with its own workers needing to enter the confined space. Attendants outside confined spaces must also make sure that unauthorized workers do not enter them. Rescue attempts by untrained personnel can lead to multiple deaths.

Crawl Spaces and Attics as Confined Spaces

Crawl spaces and attics can be both confined spaces and permit-required confined spaces



under the new standard. For instance, working in an attic and applying a large amount of spray foam (or another chemical) in a short period of time can expose a worker to low oxygen levels or a hazardous atmosphere.

In addition, changes to the entry/exit, the ease of exit, and

air flow could create a confined space or cause the space to become permit-required.

Hazards in Crawl Spaces and Attics

Crawl spaces can present many confined space hazards, including:

- Atmospheric hazards (e.g., flammable vapors, low oxygen levels)
- Electrocution (e.g., using electrical equipment in wet conditions, unprotected energized wires)
- Standing water
- Poor lighting
- Structural collapse
- Asbestos insulation

Working in attics can also present confined space hazards, such as:

- Atmospheric hazards (e.g., poor ventilation)
- Heat stress

- Mechanical hazards (e.g., attic ventilators, whole house fans)
- Electrical hazards (e.g., damaged or frayed wires, open electrical boxes)
- Slip, trip and fall hazards
- Asbestos insulation

Personal protective equipment: Employers should assess the work site to determine what personal protective equipment (PPE) is needed to protect workers. Employers should provide workers with the required PPE and proper training on its use and about any related hazards before the work starts.

How to Contact OSHA

For questions or to get information or advice, to find out how to contact OSHA's free on-site consultation program, order publications, report a fatality or severe injury, or to file a confidential complaint, visit www.osha.gov or call 1-800-321-OSHA (6742).

Additional Information

[OSHA's Confined Spaces in Construction Standard \(29 CFR 1926 Subpart AA\)](#)

[Confined Spaces: OSHA Construction Industry Topics by Standard](#)

[OSHA Fact Sheet: Procedures for Atmospheric Testing in Confined Spaces](#)

[Confined Spaces: NIOSH Workplace Safety and Health Topics Page](#)

State Plan Guidance: States with OSHA-approved state plans may have additional requirements for confined space safety.

Help for Small and Medium-Sized Employers: OSHA's On-site Consultation Program offers free and confidential advice to businesses nationwide.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: 1-877-889-5627.

For assistance, contact us. We can help. It's confidential.



Occupational
Safety and Health
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www.osha.gov (800) 321-OSHA (6742)



U.S. Department of Labor

More Eyes on the Invisible Danger in Confined Spaces

Wireless gas monitoring adds a greater degree of protection by providing a remote line of sight.
Mar 4, 2016 By Thomas Negre

Last year, two workers died from asphyxiation while repairing leaks in a manhole. In an all too frequent narrative, the second worker died after he went down to rescue the first worker.

The tragedy again exposed the need for real-time information gathering prior to confined space entry and in taking appropriate action based on an understanding of atmospheric conditions.

In 2015, OSHA passed a confined space rule that offers additional protection to construction workers. In filling what it identified as a vital gap, OSHA estimates that as many 800 construction workers a year will be protected from serious injuries. The new ruling signals that today, more than ever, regulatory bodies have the worker's back.

In step with the regulatory advances, instrumentation manufacturers are creating new wireless monitoring tools that make compliance easy, instrument operation nearly automatic and critical data accessible in real time across the enterprise.



This illustration shows how the information collected from the wireless gas monitors appears on a visual display in a remote location. Both location and environmental conditions are displayed on the monitor. In this particular case, the information is being monitored in a HAZmat truck, which is commonly operated by the local municipal fire department.

The latest advancement in confined space monitoring is wireless gas monitoring systems that operate across multiple communication platforms. Wireless gas monitors provide the advantage of offering additional insight into atmospheric readings to more people, such as safety or plant managers who are located offsite.

Readings from the wireless monitor worn by the worker in a confined space can be relayed not only to the required attendant, but instantaneously to any part of the operation via Wi-Fi or a dedicated mesh radio network. Environmental readings from the confined space can be viewed on a laptop or smart phone with an Internet connection, and automatic emails or SMS text messages can be sent to key stakeholders who are not on the software viewing platform, ensuring rapid response to critical events.

What's more, in the event of a failure between mobile communications, the wireless monitoring system offers a greater degree of safety redundancy, or backup protection. The wireless system is protected on a secure network and may be able to switch from Wi-Fi to a dedicated mesh wireless protocol when a signal is weak. This particularly can be important to operations where work is performed remotely by a small staff or lone worker – something common in the mid-stream oil and gas industry, maritime industry, utilities and other industries.

Going Wireless

Wireless gas monitoring solutions and biometric sensing devices, weather monitors and other wireless-enabled tools are adding more data for remote analysis and actionable intelligence than ever before. These monitors remotely can detect and present real-time data on gases, worker stress, heart rate, posture and more.

Industrial hygienists, plant safety managers, crew leaders and confined space attendants all can benefit from the new wealth of wireless data. Portable, personal and wireless technology can provide 24/7 monitoring and intelligent data collection, adding an actionable basis of intelligence for better protecting workers, assets and the community.

Rescue missions can be carried out with a greater assurance of success because the information acted on is reliable and always available as conditions change. The real-time readings from wireless monitors can help responders make informed PPE decisions – such as calling for respiratory protection – or can warn against false alarms, which can save them from making unnecessary, costly rescue attempts.

In addition to detecting hazardous gases, some devices have a man down alarm, which alerts the remote monitoring personnel or maintenance command station if someone goes down.

Confined space rules long have called for an attendant to be watchful of the confined space entrant, but safety cannot be assured when the worker is out of sight. Wireless gas monitoring solutions provide an additional line of sight – a remote visibility.

An Advanced Strategy for Confined Spaces

There's no getting around it: A confined space environment is a dangerous one. Confined spaces enclose dangerous VOCs, low oxygen levels, toxic substances and other unknown threats.

About 92 workers have lost their lives in confined spaces for each of the last five years, according to Guy Colonna, manager of the NFPA's industrial and chemical engineering division.

The paramount goal when it comes to confined space entry is to ensure the safety of personnel. Organizations that do not post confined-space-entry warnings or teach safe practices risk heavy fines from regulatory bodies, as well as injury or death of personnel and the resulting loss of revenue, worker productivity and absenteeism.

The use of wireless, real-time gas detection solutions that are maintained and calibrated, combined with safety training and implementation of safety practices, is the most advanced strategy to avert the risks inherent in confined space entry. Wireless gas, biometric, radiation and area-monitoring solutions reduce overall risks and response time, increase productivity and revenue and help keep workers safe.

Thomas Negre is the global marketing director of portable solutions for Honeywell. An engineer by training, he has more than 12 years of experience in wireless technology development from technical and marketing perspectives.

Checklist: Preparing for Confined Space Entry

- ✓ Review applicable data and documentation to understand any hazardous substances known to affect the space. Review safety data sheets and chemical hazard response information.
- ✓ Has an industrial hygienist or other competent person verified safe access into the space? In the case of maritime shipping practices, review the system or database for entries related to the last three cargos or materials carried in the cargo space (or the adjacent space) that is to be entered. Consult the marine chemist certificate and competent person log to verify that the space has been tested for oxygen, flammability and toxic atmospheres and that the toxic tests are consistent with the last three cargos carried.
- ✓ Ensure the space is adequately ventilated. Verify that air in the space has been exchanged a minimum of three times prior to entry.
- ✓ Review and consider the use of proper tools and technologies upon entry. Carry a multiple-gas meter when entering a confined space and a broadband detector such as a PID, if you're unsure of the threats.
- ✓ Check the calibration and operation of the oxygen or multiple-gas meter. Carry an emergency escape breathing device if there is a potential for a dynamic change in the environment, such as a valve being opened and cargo entering the space, pumps running in an engine room, compressors operating in a compressor room, etc. If the space is a telecom vault, was work such as welding performed there recently? Workers walking through muck in the bottom of the space may introduce hydrogen sulfide or other gases, vapors or inert gas. Ensure the breathing device is maintained and certified.
- ✓ Review egress procedures. Discuss emergency rescue procedures, and verify that egress is readily available. Evacuate the space if your personal monitor sounds an alarm, if you feel dizzy or light-headed, if forced-air ventilation stops or apparently is ineffective or if you sense any unexpected chemical through smell or dermal sensation that causes concern.