What is a confined space? Simply put, a confined space is an area that is not intended for continuous worker occupancy and has limited means of entry or exit. Within agriculture, there are many things that are considered confined space that many are not aware of. Tankers, silos, grain bins, pits, water tanks and wells are all common confined space hazards you may encounter in your operation. Take the time now to ensure your employees know and understand the dangers associated with working in confined spaces.

What Employers Must Know About the Dangers of Working in Confined Spaces

Feb. 6, 2025 Gen Handley

Benjamin Franklin famously once said, "By failing to prepare, you are preparing to fail" but nowhere is this statement clearer—or riskier—than when it comes to worker safety. The more employers can prepare and plan their workers' safety now, the more successful their safety programs will be down the road. The more updates that employers can make on their existing safety plans and protocols, the more peace of mind they—and their workers—will have when work is being performed.

This applies to working safely in confined spaces. It also applies to the most significant hazard that threatens workers in confined spaces: the lack of preparation and awareness of important occupational procedures and protocols. This encompasses all industries in which its people are required to perform tasks in these high-risk areas or permit-required confined spaces, or spaces that both meet the definition of a confined space and present significant health and safety hazards to those working there.

This is what happened to an Oklahoma worker who died of asphyxiation while trying to make repairs inside a water tank in 2023. The worker was only 30 years old. The Occupational Safety and Health Administration (OSHA) found the worker's employer failed to evaluate the water tank for hazardous conditions, including testing the atmosphere, and did not use protective systems to prevent worker injuries.

"This preventable tragedy must serve as a reminder of the importance of complying with safety and health standards," said Steve Kirby, OSHA area director for Oklahoma City, in a statement. "OSHA has specific requirements for operations such as drilling, servicing and storage to protect people employed in this high-hazard industry.

OSHA issued the company 16 serious citations, which faces more than $100,000 in proposed penalties.

According to the U.S. Bureau of Labor Statistics, at least 100 workers die each year from injuries involving confined spaces, such as tanks (of all kinds), ditches and trenches, tunnels and crawl spaces, among others.

The Need for a Confined Space Safety Program

OSHA defines confined spaces as areas that are not designed for people but are large enough for people to enter and perform specific tasks, also stating that "a confined space also has limited or restricted means for entry or exit and is not designed for continuous occupancy."

Working in confined spaces can be dangerous because the configuration and composition limits the activities of people working in those spaces, as well their entrance and exit. These tight spaces can present a comprehensive range of occupational hazards that can include toxic chemicals and gases, asphyxiation and the falling or collapse of heavy equipment and bulk materials.

Employers need to develop a confined space safety program if work is being done regularly in confined spaces. Such a program must outline all related protocols and policies for safe work, such as personal protective equipment (PPE), entry and exit training, rescue procedures, communication requirements and all identified confined spaces where employees are currently working.

The program should also include essential documents, such as entry permit forms required for permit-required confined spaces in work areas that present one or more of the following occupational hazards:

- contains or has the potential to contain a hazardous atmosphere;
- contains material that has the potential to engulf an entrant;
- has walls that converge inward or floors that slope downward and taper into a smaller area which could trap or asphyxiate an entrant; or
- contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires or heat stress.

A compliant confined space safety program outlines policies and procedures that track and limit workers' time in these spaces, with requirements and reminders for regular breaks and hydration; wearables and smart PPE can measure biometrics, such as hydration levels, helping monitor these breaks and the person's safety. Also, the employer must provide the proper training to the workers and provide permission to only certain employees who are known as authorized entrants.

What employers and employees should know is that working in confined spaces can present two types of hazards: physical and atmospheric.

Physical hazards include the following:

- falling equipment and debris;
- heavy, collapsing materials, such as grain and soil;
- drowning and flooding; and
- uncomfortable and cramped working conditions.

Atmospheric hazards on the other hand, cannot be seen. These include dangers such as:

- oxygen deficiency which can cause the person to pass out; and
- flammable and toxic gases, such as hydrogen sulfide.

Even though they are invisible, atmospheric hazards can still be identified through gas detection and documented before they hurt anyone.

All worksite hazards—both physical and atmospheric—should be regularly assessed, and training materials should also be regularly updated to ensure workers' safety.

5 Considerations for Confined Safety Programs

As you work to write, or update, your confined safety program, here are some things to keep in mind:

1. Determine where your confined spaces are located.

On top of these existing hazards of confined spaces, an important step often missed during risk and hazard assessments is identifying the worksites of existing confined spaces that may require employees to enter and perform work. The worker's well-being is put at risk when they are not aware that they are going to work in a confined space and therefore do not take the proper precautions beforehand. That's why it's crucial to have a confined space plan to manage and monitor all identified confined spaces, including any training provisions and safety controls.

2. Remember that these people are working alone.

Along with missing confined spaced documentation, it is a major misconception that because an employee is working in a small structure and confined space with co-workers located nearby, they are not alone. However, due to the constraints of the confined working space, the employee could be considered a lone worker because they may not be able to request help if they need it in an accident (including communication with workers outside of the structure) and are separated by a physical barrier that could impact emergency response.

3. Plan both the entry and exit.

Working alone is not the only factor that could impact emergency response. When preparing for safe confined space work, most employers focus on the work and activity itself. However, the dangers of confined space work also include any potential challenges with entry and exit, especially if emergency aid is needed.

It is important to plan at least one, if not multiple, entry and exits for both the worker and emergency contact, as well as to provide training to both parties. During an emergency response or rescue, seconds matter; having a well-planned exit could be the difference between life and death.

4. Recognize that extreme temperatures are a serious threat.

A major physical hazard of working in tight spaces is extreme fluctuations in temperatures, both hot and cold. After assessing and identifying the confined spaces, it is important to determine the eventual working temperatures in these spaces so that the proper safety measures can be prepared.

In the case of hot temperatures, workers should wear lightweight, breathable clothing. Employers can provide temporary makeshift stations or rooms where workers can cool down. There should also be proper ventilation, such as fans and cooling systems, which can be used to increase air flow in the small space. In spaces with toxic gases where fans cannot be used, workers may require cooling packs and towels.

In the case of cold temperatures, workers should wear warm and dry clothing and, as appropriate, heating packs. There may also need to be heat sources, such as temporary heaters set up either where the work is occurring or in makeshift stations or rooms where workers can go to warm up.

5. Anticipate and adapt your plans.

Regardless of the temperatures workers face, ultimately, the key to successful confined-work safety is to anticipate future challenges and hazards as much as possible. This includes evaluating the workplace of confined spaces and occupational hazards and using that information to protect these people who are putting themselves in dangerous work environments or potentially uncomfortable situations.

Combat Complacency

By having a well-thought plan and leveraging technology, safety managers can enhance confined space programs, making operations safer, more efficient—and more responsive to potential hazards.

Leverage automation and innovation to improve confined space safety

To help anticipate future hazards, technologies such as artificial intelligence (AI), can be leveraged to identify dangerous patterns or issues with confined space work. Safety managers have several other ways to employ innovative technology to enhance confined space safety programs, such as:

Use of real-time monitoring and sensors

- Atmospheric monitoring: Install wireless sensors that continuously monitor oxygen levels, toxic gases and flammable gases. This allows for immediate alerts when unsafe conditions arise.
- Wearable devices: Equip workers with wearable technology that tracks their location, heart rate and exposure to hazardous conditions. Real-time data provides immediate insight into potential risks or health issues.
- Online integration: Online devices can transmit data from confined spaces to a centralized monitoring system, enabling remote observation and automated alerts.

Enhanced ventilation systems

- Automated ventilation controls: Implement ventilation systems with sensors and automated controls that respond dynamically to changes in gas levels or temperature.
- Portable ventilation units: Use portable, sensor-controlled ventilation units to improve air quality on demand, particularly for spaces with sporadic entry needs.

Digital permit-to-work systems

- Automated Permits: Use digital permits with checklists for confined space entry, automating processes and ensuring that all necessary procedures are documented.
- Permit tracking: Digital systems enable tracking of permit status in real-time and can alert managers if entries exceed scheduled times or if permits need renewal.

- Integration with mobile apps: Workers and managers can access and complete permits through mobile apps, ensuring they're readily available and easy to review in the field.

Improved communication technology

- Two-way communication devices: Implement two-way messaging or hands-free communication devices that operate well within confined spaces. Noise-canceling options can help in noisy environments.
- Emergency communication systems: Some wearable devices offer panic buttons or automated distress alerts if a worker stops moving, allowing rapid response to emergencies.

Proactive safety data analysis

- Safety management software: Use software to track confined space incidents, inspections, training records and equipment maintenance. Many systems can automate alerts for overdue items.
- AI and data analytics: Use AI to analyze data collected from sensors, inspections, and incident reports to identify trends, predict risks and refine safety practices over time.

Smart PPE with sensors

- Connected gas detectors: Personal gas detectors connected to a central system can alert both the wearer and the safety manager to hazardous conditions in real-time.
- Smart helmets and vests: Some helmets and vests come equipped with temperature, gas or motion sensors, helping to monitor environmental and physical conditions continuously.

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