

Protecting Workers from Physical Hazards in Confined Spaces

There are two classifications of confined space hazards: atmospheric and physical. Workers in confined spaces often think about atmospheric conditions. However, in the maritime sector, there are also many physical hazards typically found in confined spaces that can increase workers' risk of injury. Workers are exposed to slippery and sloping surfaces, corroded ladder rungs, moving or rotating equipment, obstructions, and elevated walking-working surfaces. These hazards are further amplified by hot or cold conditions, poor lighting, and physically restrictive work areas. Workers also tend to work alone in these spaces, which can increase risk to operations.

Prior to any work activity, employers must conduct a job hazard analysis (or hazard assessment) to determine whether there are hazards present, or likely to be present that necessitate the use of personal protective equipment (PPE) ([29 CFR 1915.152\(b\)](#)). A hazard assessment is also beneficial for identifying potential physical hazards in the space that may need to be addressed before entry. [Shipyard competent persons](#) are a valuable resource when evaluating worker exposure to unsafe conditions and determining the necessary precautions to ensure the safety of workers.

Identifying, Evaluating, and Controlling Hazards

Hazard assessments identify hazards that require the use of PPE, such as respirators, fall protection, or personal flotation devices. To protect workers, OSHA recommends that employers:

1. **Collect, organize, and analyze information** on confined space hazards. This information may be available through operating manuals, safety data sheets (SDS), previous injury and illness records, safety committee findings, loading manifests, or workers' compensation reports.
2. **Visually inspect the confined space and observe operations taking place** to identify hazards that may be encountered during confined space work. The inspection may include falling objects, skin exposure to chemicals, noise, drowning, falls to a lower level, uneven or slippery surfaces, corroded equipment, and hazardous energy from pipelines or other sources.
3. **Determine control options** for identified hazards. Each hazard should be classified by type, level of risk, and the seriousness of any potential injury. Use input from workers,

OSHA standards and guidance, industry consensus standards, National Institute for Occupational Safety and Health (NIOSH) publications, National Fire Protection Association (NFPA) guidance, and manufacturers' instructions to determine potential control measures.

4. **Select and implement** the most effective and feasible control measures. Control measures should not introduce new hazards. Following the hierarchy of controls, the use of elimination, substitution, or engineering controls should be explored first, followed by safe work practices, administrative controls, and PPE. Safety meetings help communicate relevant information to employees.
5. **Conduct surveillance (follow up)** to confirm that the control measures implemented are effective. Ensure required PPE is being used properly.

Workers Get Hurt When Hazards Are Not Addressed

OSHA standards outline requirements for the protection of workers from physical hazards, with the training of workers being a key part. All workers whose jobs require them to enter confined spaces must be trained in potential hazards, the procedures for entering, how to work safely, and measures to follow in the event of an emergency ([29 CFR 1915.12\(d\)](#)). However, when these standards are ignored, workers continue to be injured and killed on the job.

EXAMPLE 1: A worker climbing on a non-traditional ladder on a tank bulkhead fell to his death while performing quality control checks in a confined space. This employee was not wearing fall

protection. The configurations of confined spaces can make work difficult. However, fall protection is required when working more than 5 feet above a solid surface.

EXAMPLE 2: Two workers and a tank watch were working on the upper level inside a poorly lit confined space. The two workers had their backs to each other about 10 feet apart when one of the workers fell through a two-foot by four-foot unguarded access hole while power washing and was knocked unconscious. Neither the coworker nor the tank watch on duty observed the fall due to the poor lighting in the space. The worker was later found face down

in standing water, having fallen approximately 20 feet. He was extracted from the space by a crane and hospitalized with injuries that included a laceration to the back of his head and pneumonia from the inhalation of water.

OSHA standards call for all work areas and walkways to be adequately lighted whenever workers are present, requiring a minimum of 5 lumens where work is being conducted. Additionally, openings must be covered or guarded to protect workers from falls. These mandatory protections were not in place.

Safety Measures

Safeguard workers from commonly encountered physical hazards in confined spaces.

Areas of Concern	Safety Measures
Protect workers from falls by:	- Selecting and requiring the use of adequate fall protection (29 CFR 1915.152(b)(1)). Body belts are prohibited. (29 CFR 1915.159(a)). Nor should ropes be tied around the waist. - Inspecting fall protection systems for any mildew, wear, damage, and other deterioration, and removing any defective components from service. (29 CFR 1915.159(c)(5)) - Identifying all fall hazards and, where possible, use handrails, chains, and ropes to eliminate the potential of falls from unprotected deck openings/edges and stairwells. (29 CFR 1915.73(d) and 1915.152(b)) - Practicing good housekeeping. Equipment, including cords and tools, must be maintained and kept out of walkways and work areas, as well as slip hazards (e.g., oil, grease, water, snow, and ice) eliminated. (29 CFR 1915.81) - Ensuring work platforms at least 20 inches wide are available in restricted areas, such as behind boilers and in between congested machinery units and piping. (29 CFR 1915.77) - Supplying and making sure workers use personal flotation devices when there is the potential of falling into the water and drowning. (29 CFR 1915.73(e))
Provide safe access by ensuring that:	- Ladders are inspected for any defects or potential for structural failure prior to use. (29 CFR 1915.72(a)(1)) - Portable ladders are used in place of defective ship's ladders. - All ladders are secured and stabilized before climbing them. (29 CFR 1915.72(a)(3)) - Workers never stand on the top two rungs or steps of portable ladders. - Workers face the ladder when climbing and always maintain three-point contact. (29 CFR 1910.23(b)(11) and (b)(12)) - Ladders are free of oil, grease, and other slipping hazards. - Only one worker is on a ladder at a time unless the ladder is designed for additional workers.
Maintain adequate lighting for access to spaces and tasks by:	- Ensuring lighting is a minimum of 5 lumens in areas where work is being performed on vessels and vessel sections, and a minimum of 3 lumens for general areas such as access ways, exits, gangways, stairs, and walkways when workers are present. (29 CFR 1915.82(a)(2)) - Using temporary lighting where permanent lighting sources are insufficient. Temporary lighting may be used in combination with permanent lighting to achieve the minimum required lighting levels. (29 CFR 1915.82(a)(4)) - Supplying workers with and ensuring they carry emergency lighting, such as flashlights, head lamps, glow sticks, and clamp or magnetic portable lights for unexpected lighting failures. (29 CFR 1915.82(c))

Areas of Concern	Safety Measures
Verify safe working conditions by:	- Regularly inspecting confined spaces for physical hazards. (29 CFR 1915.11(b) and 1915.12(a)(1)) - Identifying and restricting employee access to hazardous areas. (29 CFR 1910.22(d)(2)) - Documenting and consulting with qualified persons when making repairs involving structural integrity. (29 CFR 1910.22(d)(3)) - Correcting unsafe conditions, such as sharp or protruding objects, corrosion, and broken or missing components. (29 CFR 1915.81(a)(1)) - Being aware of potential hazardous energy sources (e.g., mechanical, pneumatic, hydraulic, electrical, chemical, and thermal energies) and implement lockout/tags-plus procedures to safeguard workers from exposure. (29 CFR 1915.89)
Account for employees working alone by:	- Checking on each worker regularly by sight or verbal communication (e.g., camera, in-person, two-way radio (walkie-talkie), intercom system). (29 CFR 1915.84) - Whenever possible, using a buddy system.

Other OSHA Resources:

- Shipyard eTool
- Safe Lighting Practices in the Shipyard Industry Fact Sheet
- Control of Hazardous Energy Lockout/Tags-Plus and Shipboard Electrical Safety and Health Injury Prevention Sheet
- Safety While Working Alone in Shipyards Fact Sheet
- Personal Protective Equipment; Guidelines for Assessment, Selection, and Training Fact Sheet

Workers' Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.
- Review records of work-related injuries and illnesses.
- File a complaint asking OSHA to inspect their workplace if they

believe there is a serious hazard or that their employer is not following OSHA's rules. OSHA will keep all identities confidential.

- Exercise their rights under the law without retaliation, including reporting an injury or raising health and safety concerns with their employer or OSHA. If a worker has been retaliated against for using their rights, they must file a complaint with OSHA as soon as possible, but no later than 30 days.

For additional information, see OSHA's Workers page (www.osha.gov/workers).

How to Contact OSHA

Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to help ensure these conditions for America's workers by setting and enforcing standards, and providing training, education and assistance. For more information, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.



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Administration**

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.



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