

# Confined SPACE Entry



## A Review of Confined Space Standards Applicable to Contractors

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*When Sally kissed her husband, Bruce, goodbye on Tuesday morning, little did she know it would be the last time she would see him alive. Later that day, Bruce, a construction worker, was pronounced dead after he was removed from a sewer line that was in the process of being constructed. The cause of death was determined to be carbon monoxide poisoning due to a gasoline-powered pump that was placed inside the new sewer line used to remove seepage from an adjacent line. Another worker also died as he attempted to rescue Bruce.*

According to the Occupational Safety and Health Administration (OSHA), one million construction workers are exposed to the hazards of confined space entry each year. However, OSHA's general industry regulation, 29 CFR 1910.146, *Permit-Required Confined Spaces*, specifically states that this regulation does not apply to the construction industry due to the differences in the nature of the work sites. Does this mean that contractors do not have to follow stringent confined space rules? This question as well as pertinent construction-related confined space regulations and standards are discussed below.

### Is the Work Maintenance or Construction?

This is the first question that needs to be answered when determining whether or not the Federal OSHA general industry applies to work performed by a construction contractor. If the work is considered "maintenance," the contractor is bound by law to comply with 29 CFR 1910.146. However, if the work is considered "construction," the general industry standards do not apply to the contractor. Maintenance, repair, or refurbishing of existing equipment falls under the general industry confined space regulations. Examples of "maintenance" operations include cleaning, inspecting, repainting, and/or replacing components similar to the existing tank, vessel, or structure.

Whereas, "construction" operations consist of the reconfiguration or installation of substantially new equipment. However, prudent facility owners incorporate specific confined space requirements into the contract with their maintenance and construction contractors to ensure the parties involved have a clear understanding of the confined space requirements that apply to the project.

### OSHA's Rules for Construction

Currently, there are five paragraphs within the Federal OSHA construction regulations that reference working in confined spaces and/or enclosed spaces:

- **1926.21(b)(6)(i)** – This citation requires instructions and training to employees who enter confined or enclosed spaces. Such instruction must include the nature of the hazards, the necessary precautions, use of personal protective equipment, and emergency equipment that may be required.
- **1926.21(b)(6)(ii)** – This citation defines a confined or enclosed space, which requires instruction. According to this standard, a confined space is any space having a limited means of egress, which is subject to accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Some examples of confined spaces include storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than four feet in depth such as pits, tubs, vaults, and vessels.
- **1926.352(g)** – This paragraph describes fire prevention measures associated with the use of fuel gas and oxygen in enclosed spaces. Whenever the torch is left unattended for a substantial period of time (e.g., lunch), the gas supply must be shut off at a point located outside the enclosed space. The purpose of this practice is to minimize the possibility of flammable gas

accumulating in the enclosed space due to leaks in the hoses or fittings. Also, the torch and the gas hose must be removed from the enclosed space at the change of shifts and overnight.

- **1926.353(b)(1)** – This paragraph states that mechanical ventilation must be provided whenever welding, cutting, or heating is performed in confined spaces.
- **1926.353(b)(2)** – This paragraph states that airline respirators and standby persons are required whenever the means of access to the confined space is blocked by ventilation equipment.

In addition, OSHA's construction regulations also contain requirements dealing with confined space hazards in underground construction (Subpart S), underground electric transmission and distribution work (1926.956), and excavations (Subpart P). There are also six states (i.e., California, Kentucky, Michigan, Minnesota, Virginia, and Washington) that have confined space standards that apply to construction. A synopsis of these state-specific confined space regulations are provided in **Figure 1**.

Federal OSHA began development of a confined space standard for the construction industry in 1994 as the result of litigation between the United Steelworkers of America and OSHA over the agency's confined space standard for general industry. The litigation produced a settlement that included an agreement by OSHA to develop a separate standard for construction. On November 28, 2007, OSHA published a Notice of Proposed Rulemaking titled, "Confined Spaces in Construction." The definition of "confined space" for construction operations will likely be similar to the definition in the general industry standard. However, the draft language is different than the general industry standard. There are four classifications (i.e., continuous-system permit-required confined space, permit-required confined space, controlled-atmosphere confined space, and isolated hazard confined space) defined in the proposed standard for confined spaces in construction. This standard continues to be in the proposed rule stage. The public comment period ended on February 28, 2008. Many stakeholders hope that OSHA will finalize the rule in a quick fashion.

#### **ANSI Standards**

It is easy to understand that if any of the promulgated standards are violated then OSHA may issue a citation. But, can OSHA cite a contractor for confined space issues in those situations not covered by the above rules? The answer is yes. In those cases where a confined space hazard is observed and not addressed by an existing OSHA construction standard but is addressed in a recognized consensus standard, such as the American National Standards Institute (ANSI) Z117.1-2003, *Safety Requirements for Confined Spaces*, OSHA may cite under 5(a)(1) of the OSH Act provided the conditions for citing the "general duty clause" are present. Section 5(a)(1) of the OSHA Act requires each employer provide a workplace that is free of recognized hazards.

ANSI Z117.1-2003 provides minimum safety requirements to be followed while entering, exiting, and



working in confined spaces at normal atmospheric pressure and is a recognized consensus standard. A summary of ANSI Z117.1-2003 is provided in **Figure 2**. Another ANSI committee (i.e., ANSI's A10, Construction and Demolition Committee) has been in the process of drafting a standard, ANSI A10.43, *Confined Spaces in Construction and Demolition*, for the past several years but the standard has yet to be completed. If the ANSI A10.43 standard is ever completed and approved, it will likely preempt ANSI Z117.1 for confined spaces pertaining to construction operations since the scope of ANSI A10.43 specifically covers construction operations, whereas, ANSI Z117.1 does not apply to "tasks that have established national consensus standards."

In summary, although construction operations are specifically excluded from the Federal OSHA's general industry confined space standard, there are situations in which this standard may apply to work performed by a contractor. In any case, contractors should follow recognized consensus standards (such as the applicable ANSI and/or OSHA standards or equivalent) to reduce the chance of receiving OSHA penalties, but more importantly, to minimize the risk of serious injury or death. Also, due to various standards that may or may not be applicable to contractors, facility owners should specify the confined space requirements in their contract documents.



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**Figure 1: State-OSHA Confined Space Construction Standards**

State-OSHA	Confined Space Definitions	Synopsis
<b>California</b>	<p>A space that:</p> <ul style="list-style-type: none"> <li>• Is large enough and so configured that an employee can bodily enter and perform assigned work; and</li> <li>• Has limited or restricted means for entry or exit; and</li> <li>• Is not designed for continuous employee occupancy.</li> </ul>	<p>Cal/OSHA classifies a confined space as either a non-permit confined space (NPCS) or a permit-required confined space (PRCS) where a PRCS has the potential to contain a hazardous atmosphere, potential for engulfing an entrant, has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or contains any other recognized hazard. A PRCS requires the employer to implement measures to prevent unauthorized entry, identify and evaluate hazard of the permit space, and establish a written procedure for preparing and issuing permits for entry and for returning the space to service following termination of entry (similar to 29 CFR 1910.146). See <a href="http://www.dir.ca.gov/Title8/sb7q16a108.html">http://www.dir.ca.gov/Title8/sb7q16a108.html</a> for more information on Cal/OSHA's confined space requirements.</p>
<b>Kentucky</b>	<p>A space having the following characteristics:</p> <ul style="list-style-type: none"> <li>• Limited means for exit and entry; and</li> <li>• Ventilation of the space is lacking or inadequate, allowing the potential accumulation of toxic air contaminants, flammable or explosive agents and/or depletion of oxygen.</li> </ul>	<p>For non-emergency and non-rescue operations, the confined space must be isolated from hazards; fixed mechanical equipment capable of causing injury shall be placed at a zero mechanical state and electrical equipment locked/tagged out; the internal atmosphere shall be tested; the space shall be ventilated until unsafe condition(s) are eliminated; appropriate respiratory protection shall be worn if the atmospheric hazards cannot be eliminated; attendant with constant communications must be maintained with the entrants; rescue provisions, including written procedures, and emergency equipment and trained personnel must be readily available; and ladders or other safe means of entry and exit must be used for confined spaces exceeding four feet in depth. See <a href="http://www.lrc.ky.gov/kar/803/002/200.htm">http://www.lrc.ky.gov/kar/803/002/200.htm</a> or more information on KY OSHA's confined space requirements.</p>
<b>Michigan</b>	<p>Any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere.</p>	<p>Michigan OSHA requires training for the entrant, atmospheric testing, adequate ventilation, attended emergency rescue equipment, and appropriate warning signs. There are also some specific requirements related to entry into a street opening, such as a manhole or unvented vault. See <a href="http://www.michigan.gov/documents/CIS_WSH_part622_44023_7.pdf">http://www.michigan.gov/documents/CIS_WSH_part622_44023_7.pdf</a> for more information on MI OSHA's confined space requirements.</p>
<b>Minnesota</b>	<p>A space that is large enough and so configured that an employee can bodily enter and perform assigned work and has limited or restricted means for entry or exit and that could result in one or more of the following characteristics:</p> <ul style="list-style-type: none"> <li>• Contains or has the potential to contain a dangerous air contamination, an oxygen deficiency, or an oxygen enrichment;</li> <li>• Contains a material that has the potential for engulfing or asphyxiating any entrant; or</li> <li>• Contains any other recognized serious safety or health hazard.</li> </ul>	<p>Minnesota OSHA's confined space standards applies to construction (by reference) and has the following three classes of confined spaces and lists specific requirements for each:</p> <ul style="list-style-type: none"> <li>• <b>Class I:</b> Confined spaces where an atmosphere with dangerous air contamination, oxygen deficiency, or oxygen enrichment is unlikely to develop;</li> <li>• <b>Class II:</b> Confined spaces where an atmosphere free of dangerous air contamination, oxygen deficiency, or oxygen enrichment has been verified.</li> <li>• <b>Class III:</b> Confined spaces where an atmosphere free of dangerous air contamination, oxygen deficiency, or oxygen enrichment cannot be verified.</li> </ul> <p>See <a href="http://www.revisor.leg.state.mn.us/arule/5207/0304.html">http://www.revisor.leg.state.mn.us/arule/5207/0304.html</a> for more information on MN OSHA's confined space requirements.</p>
<b>Virginia</b>	<p>Any space not intended for continuous employee occupancy, having a limited means of egress, and which is also subject to either the accumulation of an actual or potentially hazardous atmosphere.</p>	<p>Virginia OSHA requires a qualified person ensure that the confined space has been isolated from hazards; fixed mechanical equipment are placed in a zero mechanical state and electrical equipment have been locked out; the confined space has been emptied, flushed, purged, etc.; atmospheric testing and mechanical ventilation provided until the atmospheric concentration is at a safe level; entry permit system; training; and retrieval equipment and/or special equipment used under certain circumstances. See <a href="http://www.doli.virginia.gov/vosh_enforcement/pdfs/16vac25-140.pdf">http://www.doli.virginia.gov/vosh_enforcement/pdfs/16vac25-140.pdf</a> for more information on VA OSHA's confined space requirements.</p>
<b>Washington</b>	<p>Has all of the following:</p> <ul style="list-style-type: none"> <li>• Large enough and arranged so an employee could fully enter the space and work.</li> <li>• Has limited or restricted entry or exit.</li> <li>• Not primarily designed for human occupancy.</li> </ul>	<p>The Washington Safety and Health Administration (WISHA) classifies confined spaces as either a PRCS or a NPCS and has specific requirements for confined spaces that are PRCS; entered by a contractor; NPCS; and/or never entered. See <a href="http://www.lni.wa.gov/WISHA/Rules/ConfinedSpace/default.htm">http://www.lni.wa.gov/WISHA/Rules/ConfinedSpace/default.htm</a> for more information on WISHA's confined space requirements.</p>

## Figure 2: A Summary of ANSI Z117.1-2003, *Safety Requirements for Confined Spaces*

ANSI Z117.1 provides minimum safety requirements to be followed while entering, exiting, and working in confined spaces at normal atmospheric pressure but does not apply to underground mining, tunneling, or caisson work, intentionally inert confined spaces, or other similar tasks that have established consensus standards.

ANSI defines a confined space as an enclosed area that is large enough to bodily enter and has both of the following characteristics:

- Primary function is something other than human occupancy.
- Has restricted entry and exit (i.e., requires the use of the hands or contortion of the body to enter or exit from a confined space).

After a confined space has been identified, the next step is to identify and evaluate the hazards. Each hazard shall be examined with respect to exposure (i.e., number of employees), magnitude of hazard, likelihood of the hazard occurrence, consequences of the hazard occurrence, and potential for changing conditions or activities. Existing or potential hazards in the space may include the following:

- Oxygen deficient or enriched atmosphere
- Flammable/explosive atmosphere
- Toxic atmosphere
- Biological hazards
- Mechanical hazards such as moving machinery
- Physical hazards (e.g., electrical, thermal, radiological, noise, or engulfment)

Based on the evaluation of the hazards, the confined space may be classified either as a **non-permit confined space (NPCS)** or a **permit-required confined space (PRCS)**. A NPCS is a space that meets the definition of a confined space but is unlikely to have potential hazards or has the hazards eliminated by engineering controls. A PRCS is a confined space having actual or potential hazards, thus, requires written authorization for entry. If employees will enter any confined spaces, the employer must develop and implement a written confined space entry program.

Entry requirements for a NPCS include:

- Written confined space entry program
- Training as needed to maintain competence in entry procedures and precautions
- Periodic re-evaluation of the space to ensure proper classification
- Atmospheric testing as determined and performed by a qualified person

Entry requirements for a PRCS include:

- Written confined space entry program
- Entry permit procedure
- Atmospheric testing as determined and performed by a qualified person
- Attendant(s) stationed outside the PRCS who maintains constant two-way communication with entrants
- Retrieval/rescue equipment
- Training for the entrants, attendants, and rescue personnel

Other confined space provisions addressed in ANSI Z117.1 include:

- Isolation and lockout/tagout procedures – All energy sources, which are potentially hazardous, must be de-energized, isolated (e.g., blanking, blinding, etc.), and locked out/tagged out.
- Acceptable atmospheric test limits – ANSI defines acceptable limits as an oxygen level between 19.5% to 23.5%, lower flammability limit less than or equal to 10%, and toxicity concentrations below recognized exposure limits (e.g., Threshold Limit Values established by the American Conference for Governmental Industrial Hygienists, Manufacturer's Material Safety Data Sheets, 29 CFR Subpart Z, etc.). However, any toxic level above zero should be investigated. **Note: Under the 29 CFR 1910.146 regulation, an exceedance of the OSHA permissible exposure limit established solely to prevent long-term adverse effects is not considered to meet the definition of "hazardous atmosphere."**
- Ventilation – When mechanical ventilation is used to control atmospheric hazards, the space should be ventilated until the atmosphere is within acceptable limits. Ventilation should also be maintained if there is potential for atmospheric conditions to become unacceptable during entry procedures. Also, consideration should be given to bonding or using intrinsically safe air movers when moving flammable vapors.
- Personal protective equipment (PPE) – A hazard evaluation shall be done to determine the PPE needed by all personnel entering the confined space including rescue teams. Consideration should be given to head protection, eye and face protection, hand protection, foot protection, protective clothing, respiratory protection, and hearing protection.
- Safe access and egress must be considered. The use of retrieval equipment must be used if a person enters a PRCS unless the retrieval equipment increases the overall risks of entry and does not contribute to the rescue procedures. Also, electrical equipment used in hazardous locations must conform to Article 500 of the National Electrical Code.
- Warning signs and symbols – PRCS that can be entered without the use of tools, special equipment, or key(s) shall have appropriate warning signs in legible condition.
- Emergency response – A written plan of action with provisions for timely rescue must be established.
- Medical suitability – The physical and psychological limitations of personnel involved with confined space entry procedures must be considered.