

# Prevention through Design in Confined Spaces

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# Prevention through Design

- The “Prevention through Design” initiative at the National Institute for Occupational Safety and Health (NIOSH) began in 2007. NIOSH recognized one of the best ways to prevent and control occupational injuries and illnesses and fatalities is to anticipate and design out or minimize hazards and risks in the design phase.
- Confined spaces are just one example (of many!) of a hazard that can often be reduced or prevented in the design or redesign phase.

# Confined Space Definitions

“**Confined space** means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work; and
2. Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and
3. Is not designed for continuous employee occupancy.”

(8 CCR 5157 and 8 CCR 1915)

# Eliminate the space as a confined space

- **Criteria 1: The space is (a) large enough and (b) so configured to enter and perform work.**
- The easiest way to eliminate a space as a confined space is to design the space so that it is too small for anyone to physically enter. Inability to enter due to size keeps employees out of harm's way and eliminates coverage under the confined space definition.
- A space that does not need to be entered can be redesigned by welding permanent plates or grates in place or otherwise configuring the space to make it impossible to enter, eliminating the space as a confined space.

# Eliminate the space as a confined space

- **Criteria 2: The space has limited or restricted means of entry or exit.**
- The installation of a standard staircase with handrails rather than a spiral staircase or ladder reduces the likelihood that a space would be considered to have a limited or restricted means of entry or exit.
- Spaces can be designed so that workers don't have to contort their body to enter or exit, and by providing multiple entry and exit locations at regular intervals, the design of a space can ensure that employees' ability to exit is not restricted by distance.
- Designing equipment spaces above ground with a standard doorway access is another way to eliminate a space as a confined space.

# Eliminate the space as a confined space

- **Criteria 3: The space is not designed for continuous human occupancy during normal use.**
- Some spaces can be designed for continuous human occupancy by installing ventilation, lighting and standard width aisles.
- Mechanical equipment can be properly guarded and electrical equipment installed just as it would be for normally occupied spaces.

# Eliminate entry into the confined space - 1

Many confined space entries can be eliminated by modifying equipment and its installation:

- Install critical equipment (valves, gauges, etc.) that requires periodic operation, inspection, or maintenance outside the space so that entry will not be necessary.
- Extend valve handles so they can be operated from outside the confined space.
- Use flexible components and install retrieval systems for items such as sump pumps that are located at the bottom of the confined space so they can be removed and serviced without entry.

# Eliminate entry into the confined space - 2

- Install extension tubes and fittings to make lubrication possible from outside the confined space.
- Install catch baskets at the bottoms of tanks or other spaces that can be raised to retrieve fallen parts to prevent the need to enter the confined space.
- Use long-handled tools to reach into the space without entering it.



# Permit-Required Confined Space Definitions

**Permit-required confined space** means a confined space that has one or more of the following characteristics:

1. Contains or has a potential to contain a hazardous atmosphere; **or**
2. Contains a material that has the potential for engulfing an entrant; **or**
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; **or**
4. Contains any other recognized serious safety or health hazard.

(8 CCR 5157 and 8 CCR 1915)

# Eliminate hazards - 1

- **Criteria 1: The confined space contains or has a potential to contain a hazardous atmosphere.**
- The confined space can be designed (or redesigned) so that it no longer contains or has a potential to contain a hazardous atmosphere.
- Substitute or eliminate hazardous chemicals that present potential hazardous atmospheres.
- Combustible liquids with higher flash points can be used, as can chemicals that are less toxic or corrosive.

# (A Comment on “potential to contain a hazardous atmosphere”)

- This refers only to atmospheres that pose acute hazards, not chronic hazards.
- The regulation is intended to protect entrants against acute hazards, not exposures at or below the Permissible Exposure Limit.
- The regulation does not exempt employers from the responsibility to control harmful exposures to toxic substances at concentrations less than those immediately dangerous to life or health.

# Eliminate hazards - 2

- **Criteria 2: The confined space contains a material that has the potential for engulfing an entrant.**
- Prevent engulfment or entrapment hazards. Design pipes, valves, and line breaks to allow for blocking and bleeding of lines outside of the space.
- Design the space opening to allow for easy emptying of contents.
- Alter the configuration of the space to prevent entrapment.

# Eliminate hazards - 3

- **Criteria 3: The confined space has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.**
- Stairways or ladders can be placed inside the space to allow emergency exit.

# Eliminate Hazards - 4

- **Criteria 4: Contains any other recognized serious safety or health hazard.**
- Eliminate serious safety hazards by installing fixed guards or covers on mechanical and electrical equipment hazards; railings or fall protection points into the space; and energy isolation lockout points outside of the space.
- Removing or guarding against exposure to sharp, heated, or slippery surfaces is another way to protect workers from serious hazards.

# If All Else Fails, Design For Rescue

- Owners and operators of confined spaces, as well as contractors and subcontractors, can use Prevention through Design to facilitate rescue in confined spaces. Here are just a few examples:
- Modify the space to allow workers to be safely rescued in the event of an emergency.
- Provide two (or more!) openings for rescue.
- Allow unobstructed access of rescue and retrieval equipment both inside and outside the space.
- Permanently mount a davit arm (or a davit arm baseplate / socket) or a fixed anchor point at the space opening.

# So Now It's Not A Confined Space or a Permit-Required Confined Space...

You may still need:

- Personal Protective Equipment
- Air Monitoring
- Fall Protection
- ...but you won't need a permit



# Bibliography - 1

- “Prevention through Design: Eliminating Confined Spaces and Minimizing Hazards” - <https://aiha-assets.sfo2.digitaloceanspaces.com/AIHA/resources/Prevention-through-Design-Eliminating-Confined-Spaces-and-Minimizing-Hazards-Guidance-Document.pdf> (May 2014)
- “Thinking Outside The (Confined Space) Box” - <https://synergist.aiha.org/201609-thinking-outside-confined-space-box> (September 2016)
- “NIOSH Prevention through Design (PtD) update” - <https://www.ishn.com/articles/110524-niosh-prevention-through-design-ptd-update> (April 2019)

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- “Workforce Health and Safety: Prevention Through Design” - <https://wwttest.waterrf.org/ReportLibrary/4236.pdf> (2014)
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- “Prevention through Design” - <https://www.cdc.gov/niosh/topics/ptd/default.html> (2013)

# In Other Confined Space News...

- “Confined Space Guide for General Industry”, Cal/OSHA - [https://www.dir.ca.gov/dosh/dosh\\_publications/ConfSpa.pdf](https://www.dir.ca.gov/dosh/dosh_publications/ConfSpa.pdf) (Revised May 2019)

**Confined Space  
Guide for General  
Industry**

**DANGER  
CONFINED SPACE**  
PERMIT MUST BE  
COMPLETED AND AUTHORIZED  
PERSONS IN CHARGE

**Updated May 2019**

STATE OF CALIFORNIA  
**CAL OSHA**  
DEPARTMENT OF INDUSTRIAL RELATIONS

**Department of Industrial Relations  
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