Confined Space Safety: 1

Most confined spaces are hazardous. The most hazardous are those which:
- have limited access and exit ways
- contain hazardous or potentially hazardous materials
- mechanical devices, electrical and other service utilities feeding in and out of them.

Some confined spaces have open tops and are very deep; others are enclosed spaces with entrance-exit access as small as 45cm.)

A confined space is one with all or one of the following are present:

a) Limited openings for entry and exit
b) Unfavorable natural ventilation that could contain or produce dangerous air contaminants
c) Not intended for continuous occupancy.

Types of Confined Spaces:

- boilers
- cupolas
- degreasers
- furnaces
- pipelines
- pits
- pumping stations
- reaction or process vessels
- septic tanks
- sewage digesters
- sewers
- silos
- storage tanks
- ships holds
- tunnels
- underground utility vaults
- vats
- ventilation and exhaust ducts

Reasons for entering a Confined Space

To perform inspections.

To perform repairs.

To perform maintenance (cleaning or painting).

To perform new construction..

Hazards

Constructing or working in a confined space will involve dangers related to one or more of the following potential hazards:

a) **Chemical-Physical**: May contain explosive contents.
b) **Chemical:** May contain toxic gases, fumes, etc.
c) **Biological-Physical**: Lack of oxygen may result in asphyxiation
d) **Physical**: Potential for being crushed

Resource adapted from:
:Permit-required Confined Space. OSHA uses the term *permit-required confined space* (or *permit* space) to describe those spaces that both meet the definition of confined space and pose health or safety hazards.

Confined Space Safety : cont'd

Hazardous Atmospheres Space has limited natural air movement and results in:

a) **Oxygen-deficiency** – less than 19.5% oxygen and requires use of self-contained breathing apparatus (SCBA).
Welding, cutting or brazing, certain chemical reactions (rusting) or bacterial action (fermentation) can reduce oxygen levels.

b) **Flammability** – caused by an oxygen-enriched atmosphere (above 21 percent) and a flammable gas, vapor or dust in the proper proportion. If sparking, electrical tool or other source of ignition is used in this scenario, an explosion will occur.

c) **Toxicity** – created from toxic substances as a result of:
- **Stored products** in the space can be absorbed into the walls and give off toxic gases when removed. Toxic gases can be given off when cleaning the stored product.
- **Working in a confined space**. (e.g.: Welding, cutting, brazing, painting, scraping, sanding, and degreasing can create toxic atmospheres.
- **Areas close to confined space** can create toxicants that can enter and build-up in the confined space.

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General Physical Hazards

a) **Temperature extremes** – Extremely hot or cold temperatures can cause harm to workers.

b) **Engulfment** – Grain, sand, coal and other loose, granular material stored in bins and hoppers engulf, crush and suffocate a worker. It can also form a crust or bridge in a bin and break loose under the weight of a worker.

c) **Noise** – sounds louder in a confined space and can damage hearing and interfere with communications and shouted warnings.

d) **Slick or Wet Surfaces** – Slips and falls can cause injuries and deaths.

e) **Falling Objects** – are dangerous in confined spaces with topside openings or where work is being done above another worker.

Confined Space Safety: cont'd

Risk Management Strategies	**Date**	**Sign-off**	**Notes**
The Student is able to demonstrate safe and correct performance of the following:			
1. Atmosphere Testing (*Some gases and vapors are heavier than air and sink to the bottom of confined spaces, others are lighter than air and rise to the top of the spaces.*			
a) Tests top, middle and bottom of the confined space from the outside with a properly calibrated instrument.			
b) Ventilates and retests if oxygen deficiency or toxic gases or vapors are found before workers are allowed to enter.			
c) Provides everyone with appropriate respiratory protection if ventilation is impossible and entry is necessary (emergency rescue).			
2. Ventilation *(Method and equipment used depends on the size of the entry, the gases to be exhausted and the source of air replacement.)*			
a) Uses a blower or fan to remove toxic gases and vapors from the confined space.			
3. Isolation *(Remove confined space from service.)*			
a) Locks out (electrical sources)			
b) Blanks and bleeds (pneumatic and hydraulic lines)			
c) Disconnects (belt and chain drives, and mechanical linkages on shaft-driven equipment where possible)			
d) Secures (mechanical moving parts with latches, chains, chocks and blocks			
4. Respirators *(Personal protective equipment that allows workers to safely breathe without inhaling toxic gases or particles.)*			
a) **Air-purifying** – filters dangerous substances from the air.			
b) **Air-supplying** – delivers a supply of safe air from a tank or an uncontaminated area nearby.			
c) Is trained in the use and limitations of respirators before being allowed to use them in a confined space situation.			
5. Standby and Rescue *(More than 50 percent of workers who die in confined spaces are attempting to rescue others.*			
a) Rescuers trained to follow established emergency procedures, use proper equipment and techniques.			
b) Practices emergency evacuation procedures.			

Confined Space Safety: cont'd

Recommendations:	**Date**	**Sign-off**	**Notes**
a) Ventilates with normal air.			
b) Uses air-supplying respirators in confined spaces where there is not enough oxygen.			
c) Tests the air before entering a confined space and take appropriate precautions. - The amount of oxygen cannot be determined by any of the five senses.			
d) Empties confined space emptied of any corrosive or hazardous substances before entry.			
e) Considers relationship among hazards that may be in a confined space, e.g.: flammable vapor/gases, static electricity.			
f) A person must remain on standby outside a confined space and remain in communication with those inside. - The outside person should only enter the confined space after help arrives and only with the proper lifelines and respirators.			
g) Reports incidents/injuries involving confined space entry.			
h) Checks that all lines to a confined space containing inert, toxic, flammable, or corrosive materials are locked-out/tagged or disconnected before entry.			
i) Checks that all moving parts and equipment inside a confined space are locked-out.			

Confined Space Safety Checklist

The Student is able to demonstrate safe and correct performance of the following:	**Date**	**Sign-off**	**Notes**
1. Checks availability of adequate light for the work to be performed in the confined space.			
2. Ensures the atmosphere inside the confined space is frequently monitored while work is performed in the confined space.			
3. Ensures standby worker is trained and equipped to handle an emergency.			
4. Ensures standby person are prohibited from entering the confined space without lifelines and respiratory equipment.			
5. Provides respiratory equipment required if the atmosphere inside the confined space is unsafe.			
6. Ensures all portable electrical equipment used inside confined space is either grounded and insulated, or equipped with ground fault protection.			
7. Before gas welding or burning is started in a confined space: - ensures hoses are checked for leaks - torches are lit outside confined area - tests confined space is for explosive atmosphere.			
8. Ensures exhaust gases vented outside of confined space when combustion-type equipment,			
9. Checks confined space for decaying vegetation or animal matter which may produce methane.			
10. Checks confined space for possible industrial waste which could contain toxic properties.			