Safe work in confined spaces

Toolbox Talk

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Definition & Examples

A confined space is a work location that:

- usually has one entry point difficult to enter to work and so also for rescue
- is not designed for permanent work
- is poorly ventilated, cramped, often dark and there are few possibilities of escape

Examples of work that is carried out in these spaces include maintenance and cleaning work, repairs and inspections.

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Risks of working in confined spaces

The poor accessibility for rescue workers and the poor ventilation make working in confined spaces hazardous. Hazards that can arise during the work include:

- risk of asphyxiation
- risk of fire and explosion
- risk of intoxication or poisoning by emissions
- risk of electrocution
- risk of entrapment
- risk of injury through falling, falling objects or moving machine parts

Recognising hazards

Is there a risk of asphyxiation, intoxication, fire or explosion?

- A normal atmosphere is composed of approximately 21% by volume oxygen (O2), 78% by volume nitrogen (N2) and the remaining 1% by volume consisting of traces of noble gases and carbon dioxide, among other gases.
- In the Working Conditions Decree it is defined that there is a hazard in case of an atmosphere with >21% by volume O2, <18% by volume O2, >10% LEL and/or the exceedance of limit values.
- In a space or a location with insufficient ventilation a hazardous atmosphere can arise. Spaces can also be deliberately filled with a gas thus presenting a hazard.

Examples

Examples of such spaces or locations include:

- Crawl spaces beneath buildings
- Slurry pits and slurry tanks at agricultural companies
- Sewer systems
- Trenches when laying or working on cables and pipes
- Reaction and reactor vessels
- Storage tanks
- Tanker vehicles
- Ship double hulls like (bow) propeller rooms and cofferdams
- Beer cellars
- ULO (Ultra Low Oxygen) cells at fruit-growing companies
- (Fumigated) sea containers
- Work locations on contaminated soil

Harmful atmospheres

On entering such spaces or locations there can be a direct hazard for the health of employees. This is also the case when a person places their head in or even near the space, e.g. when opening hatches. Harmful atmospheres can be present in these spaces or surroundings due to:

- Deliberately introduced gases with toxic/intoxicating properties, for example methyl bromide (fumigated containers)
- Oxygen consumption as a consequence of ripening, rotting or oxidations (e.g. grain silos, rusting reactor vessels)
- Oxygen displacement by actively introduced oxygen-displacing gases such as nitrogen and argon (e.g. gas extinguisher installations, beer cellar installations)
- Oxygen enrichment by leakage or the deliberate introduction or generation of oxygen (e.g. leaking oxygen tubing during welding)

Harmful atmospheres

(continued)

- Leakage of gases or fumes of leaked liquids with hazardous properties
- Generation of flammable and/or toxic gases through rotting processes, such as methane gas and hydrogen sulphide (e.g. biodigesters, slurry pits and water purification installations)
- Generation of flammable and/or toxic gases through reactions of components (e.g. application of polyurethane in crawl spaces)
- Generation of flammable and/or toxic gases through incomplete combustion
- Evaporation of flammable and/or toxic gases from chemical substances in waste water
- Evaporation of (residues) of contents (e.g. an empty oil tank is never completely gas-free)
- Harmful fumes released by work activities (e.g. welding, cutting, preservation (paints/varnishes) and the application of insulation material whereby gases are generated)

Organisational Measures - Procedures

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These might include the following:

- Risk assessment
- Safe working in a confined space
- Gas measurements/ Recording
- Clearance of a confined space
- Maximum allowable duration in a confined space
- Equipment maintenance
- Use of electrical equipment in confined conductive spaces
- Emergency procedure – Rescue Teams
- Use of a permit-to-work system

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Hazard Control Measures Implementation

The measures that are taken to control hazards can be divided into:

1. the clean delivery of the space/location, safety monitoring
2. Emergency provisions for unforeseen situations

The basic principle is to prevent risks, preferably by tackling the problem at its source. The occupational health and safety strategy is adhered to in this.

Hazard Control Measures

- Are fall/slip hazards due to the content or the layout of the confined space prevented (both inside and outside of the confined space) in setting up the workspace?
- Has a safe and stable workspace been created, or is personal protective equipment (PPE) used to prevent falls?

- In the event of a fall hazard and in spaces that are difficult to access, do persons wear a harness and are they attached to a line? NB: this can also apply to the manhole attendant (positioning) if no other measures against the fall hazard can be taken
- Has work equipment been adapted to environmental factors such as humidity, temperature, biological agents, flammable substances (including fumes and gases), corrosive substances etc (watertight or dust-tight, ATEX, safe voltage levels etc.)?

Protective equipment

If hazards arise the space or the workplace must be left immediately in a safe way (escape route). In exceptional circumstances where this is not possible (for example in spaces or locations that are small or difficult to access) additional measures can remedy the situation in order to gain time.

- In the event of a fall hazard and in spaces that are difficult to access persons wear a harness and are attached to a line
- The person carries an escape mask and if an alarm is sounded leaves the space making use of the mask

Attention

In an emergency situation in manholes/pits it is often very difficult to get a worker out of the space unless special equipment is present and the employees must know how to use it.

The people whose task it is to carry out the emergency procedure and a possible rescue in an emergency situation must be trained, otherwise, self-declared “rescuers” may compromise their own lives.

Clear instructions with respect to emergency situations must be available to the manhole attendant.

- Rescue equipment, such as a tripod must be present at the location
- The manhole attendant raises the alarm immediately in the event of an emergency (the emergency procedure comes into force)
- The rescue team is trained for the task
- The rescue team has the proper equipment, such as self-contained breathing apparatus, a backup air cylinder in case the self-contained air supply fails, escape masks, appropriate flashlight etc.

PPE

The following personal protective equipment is a recommended list only:

- Harness belt; wearing this is compulsory (ensure that they keep a hand on the line)
- Respiratory protective equipment (not filter masks) if there is a risk of asphyxiation, intoxication or poisoning
- Protective clothing
- Gloves
- Safety shoes or boots
- Safety helmet
- Eye protection equipment
- Hearing protection
- Flashlight (Ex in ATEX spaces)

Life-saving Advice

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Learn to eliminate risks!

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