

WORKING IN CONFINED SPACES

What Is 'Confined Space'

A confined space is any space that has any of the following characteristics

- Not designed for continuous occupation by worker
- Limited opening for entry or exit
- Has poor natural ventilation

Examples

Work in the 'confined space' include working in: -

- Boilers,
- Furnaces
- Pipelines
- Pits
- Reaction or Process Vessels
- Sewerage Digester

Pictures of Confined Space O&G Industry





Occupation by Worker

- Confined spaces are not designed for continuous worker occupation.
- They are not designed for workers to enter and work there on a routine basis
- Workers may enter them for the purposes of clean ups, routine inspection, maintenance, repair works, etc.

Limited Opening For Entry/Exit

- Openings of confined spaces are limited by size or location
- Confined spaces openings are normally small, making it difficult to enter/egress
- It may also make it difficult to pass needed equipment through.
- For example, it may be difficult passing with e.g. respirator needed for entry into a hazardous atmosphere

Limited Opening For Entry/Exit - Contd

- Access to some confined spaces may require the use of ladders, hoists, or other devices.
- Escape from such spaces may be difficult in the event of an emergency

Poor Natural Ventilation

- Air in a confined space cannot be refreshed by fresh air from outside
- 'Air' in confined space can be full of toxic gases
- There may not be sufficient oxygen to support life

Associated Hazards

Hazards associated with confined spaces include: -

- Hazardous atmosphere
 - Oxygen-deficiency atmosphere;
 - Flammable atmosphere; and/or
 - Toxic atmosphere

Oxygen-Deficient Atmosphere

- An oxygen-deficient atmosphere has less than 19.5% available
- O₂ deficiency can be attributed to work being done e.g. welding, cutting or brazing or chemical reaction (e.g. rusting) or through bacterial action as in fermentation process

O₂ Deficiency Contd

When O₂ level

- > 21% the atmosphere is considered to be O₂ enriched
- ≥ 19.5% minimum for safe entry
- ≤ 16% judgement as well as breathing are impaired
- ≤ 14% Faulty judgement coupled with rapid fatigue
- ≤ 6% results in difficulty in breathing and death is in minutes

O₂ Deficiency Contd.

- A lack of oxygen may also occur
- where there is a reaction between some soils and the oxygen in the atmosphere;
- following the action of groundwater on chalk and limestone producing carbon dioxide to displace normal air;
- in ships' holds, freight containers, lorries etc as a result of the cargo reacting with oxygen inside the space

Flammable Atmosphere

- This is the case when the space originally contained a flammable liquid/gas
- Two things are required to create a flammable atmosphere i.e. 1) oxygen and 2) flammable gas, vapour or dust in the right proportion
- The presence of a source of ignition may cause the mixture to explode
- Oxygen-enriched atmosphere ($O_2 > 21\%$) will cause flammable materials to burn violently

Toxic Atmosphere

This may arise from

- Product stored in the space
- Work being performed in the confined space
- Work being carried out in areas adjacent to the confined space

Unexpected Release of Hazardous Energy

- Confined space being flooded by liquids or solid materials while work was going on
- Release of gases into confined space while work is going on

Control Measures

Control measures include: -

- Identification of the hazard present
- Assessing the risk
- Determine precautionary measure(s) to be taken

Risk Assessment

In assessing the risk, consider the following

- Task to be performed
- The work environment
- Working materials and tools
- Skill/experience of persons performing the task
- Emergency preparedness

Risk Assessment - Contd

If the assessment indicates that the task to be performed is hazardous, one of the following may be done

- Avoid entry into confined space
- If entry is unavoidable follow a safe system of work
- Ensure adequate emergency in place

Avoid Entering Confined Spaces

- Check if confined space work can be avoided by doing the work another way. Better work-planning or a different approach can reduce the need for confined space working.
- “Is intended work necessary?”
- Could confined space be modified to eliminate entry
- Have work done from outside e.g. clearing blockages from outside

Avoid Entering Confined Spaces - Contd

- Clear blockages in silos by use of remotely operated rotating flail devices, vibrators or air purgers;
- Inspect, sample and/or clean vessels by using appropriate equipment and tools;
- Remote cameras can be used for inspection of internal parts of confined spaces

Other Factors

- Breathing apparatus
- Rescue harness
- Emergency preparedness
- Communication
- Rescue and resuscitation equipment