

CONFINED SPACES – DON'T GET STUCK IN A HOLE

CAMERON HUNTER BSc., GradDip (Occ.Hygiene), MSIA

Vital Safety Pty Ltd

ABSTRACT

The Permit Required Confined Space Standard is ranked highly in US Department of Labour Occupational Safety and Health Administration statistics for non-compliance and penalties. The manufacturing industry had the highest number of non-compliances and the highest number of confined space fatalities in the United States between 1980 and 1989. The Mining, oil and gas industry had the highest rate of fatalities compared to the number of people employed.

Many Australian workplaces also struggle to meet confined space regulations. Many sites attempting to implement a confined space plan start by working through the confined space definition and then become bogged down. It is recommended that the focus of the confined space plan should be on hazard identification.

Atmospheric hazards have claimed most lives in confined spaces. The atmospheric hazards most responsible are oxygen deficiency, hydrogen sulphide, methane and carbon monoxide. The likely presence of these gases in a confined space may be rarer than other general hazards but the consequence of a build up can be catastrophic. These high risk hazards should be identified through detailed investigation including consultation, research and monitoring.

INTRODUCTION

Developing a site confined space plan can be a frustrating process. The definition of a confined space varies between countries and even between states within countries. The definition of a confined space depends on the presence of particular hazards. It therefore follows that before an area can be defined as a confined space, detailed hazard identification is required.

FINDINGS FROM SITE AUDITS

U.S. Department of Labour Occupational Safety and Health Administration (OHS) statistics list the Permit Required Confined Space Standard highly for non-compliance and penalties.

Table 1: OSHA Standards cited for non-conformance October 2000 – September 2001

| Permit Required Confined Spaces | Ranking (from 381 Standards) |
|--|-------------------------------------|
| Cited for non-compliance | 27 th highest |
| Average cost of penalties | 13 th highest |

Manufacturing is listed as the industry with the highest number of cited non-compliances and the highest total penalties, more than five times higher than the next highest industry (OSHA 2002). Food and kindred products and chemicals and allied products are the groups within this industry that are listed as the main offenders. The manufacturing industry also had the highest number of confined space fatalities in the US between 1980 and 1989 (Suruda 1994). However, when these rates are normalised according to the number of workers employed in the industry, manufacturing was the fifth highest industry, behind by mining, oil and gas which was the worst industry.

Table 2: Industry Profile for OSHA Standard 19100146: Permit-Required Confined Spaces, Non-compliance

| Industry | #Cited | #Insp | Penalty (US\$) |
|--|---------------|--------------|-----------------------|
| Manufacturing | 849 | 309 | 1284150.95 |
| Services | 152 | 43 | 97600.00 |
| Transportation, Communications, Electric, Gas, and Sanitary Services | 126 | 36 | 98611.75 |
| Construction | 74 | 16 | 70950.00 |
| Wholesale Trade | 27 | 16 | 13653.00 |
| Public Administration | 18 | 13 | 112.50 |
| Non-Classifiable | 12 | 1 | 6000.00 |
| Agriculture, Forestry, And Fishing | 5 | 2 | 7875.00 |
| Mining | 5 | 1 | 13750.00 |

Table 3. Number of Confined Space Deaths by NTOF by Industry 1980 – 1989 (Suruda 1994)

| Industry | No. of Fatalities | Deaths / 100,000 workers |
|---|--------------------------|---------------------------------|
| Manufacturing | 152 | 0.09 |
| Agriculture | 128 | 0.32 |
| Construction | 90 | 0.21 |
| Transportation/communication/public utilities | 77 | 0.17 |
| Mining/oil/gas | 63 | 0.69 |

Specific data on confined space non-compliance and fatalities is not readily accessible for Australian workplaces yet site experience across a range of industries has found that many workplaces have incomplete confined space plans. The majority of these sites appear to struggle with the confined space definition.

FOCUS ON HAZARD IDENTIFICATION

In order to minimise the risk of confined space fatalities and to comply with confined space regulations sites should focus on hazard identification before attempting to classify spaces. Hazard identification for spaces should involve consultation, research and monitoring.

Most safety personnel are experienced in the process of hazard identification and many hazards for confined spaces are similar to those found in the workplace. Typical confined space hazards include falls from height, manual handling, entanglement, crushing, slips and trips, electrical hazards, heat stress, noise and hazards that may be introduced during a rescue. More thorough research may be necessary to identify the rarer, potentially catastrophic hazards.

Statistics reported by Suruda (1994) showed that most fatalities in confined spaces in the US between 1980 and 1989 were due to atmospheric hazards. Oxygen depleted atmospheres claimed most lives during this time. Hydrogen sulphide, methane and carbon monoxide were reported as the most likely toxic gases associated with confined space fatalities. These gases are commonly associated with decomposition of compounds by microbial activity or combustion. These decomposition gases may not be recorded in site material safety data sheets and may catch unsuspecting workers by surprise.

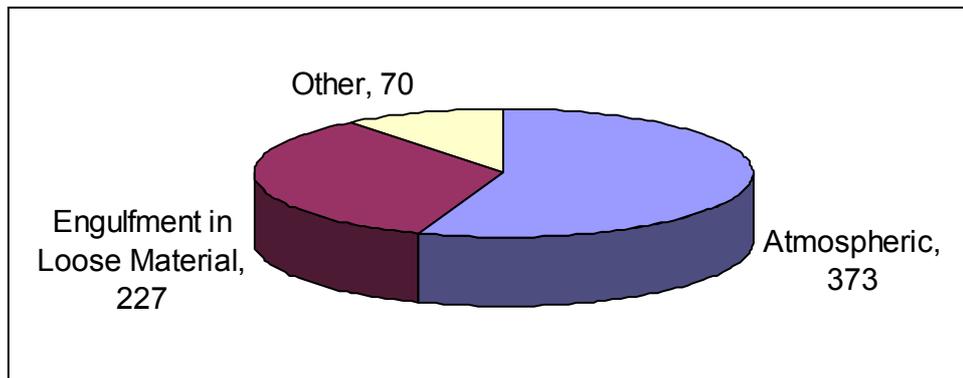


Figure 1: Circumstances noted on death certified for deaths in confined space identified by National Traumatic Occupational Fatalities (NTOF) 1980 - 1989 (Suruda 1994)

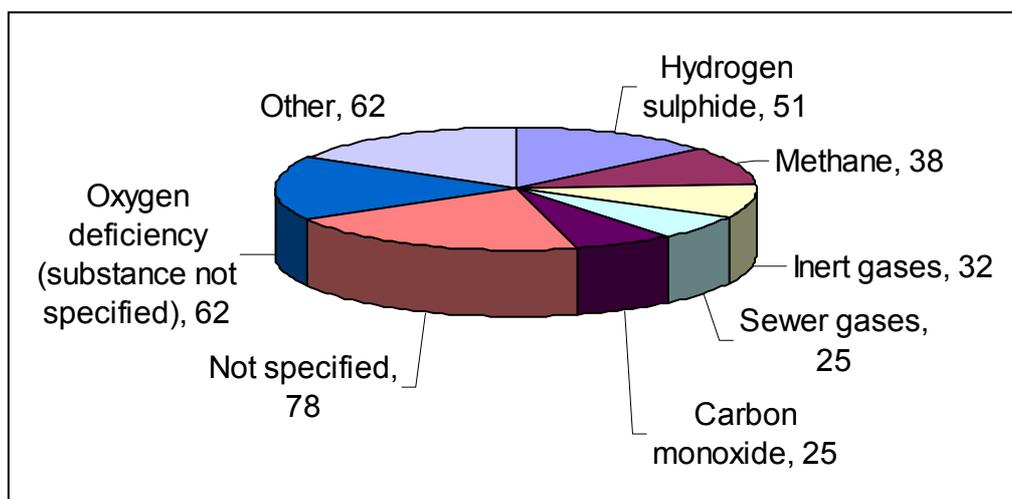


Figure 2: Atmospheric conditions noted on death certificates for deaths in confined spaces identified by NTOF 1980 - 1989 (Suruda et al., 1994)

To identify some of the rarer decomposition gases consultation with site personnel and allied safety professions, research and monitoring is critical. AS/NZS 2865:2001 recommends detailed research and management planning at senior levels for hazards with high risk level. This could include detailed occupational hygiene investigations.

Some of the other hazards that we have encountered during site confined space work are listed below. Other industry specific gases may be generated by chemical reactions from products held on site.

Table 4. Atmospheric hazards identified during site confined space work

| |
|---|
| HAZARD |
| Heat stress of workers |
| Methane under industrial floor space ground seepage |
| Methane in cable tunnel from leaking gas main |
| Ammonia and hydrogen sulphide in latex tanks |
| Oxygen displaced by gases leaked from underground services |
| Carbon monoxide in silos generated by dry stored grain |
| Carbon dioxide generated by grain respiration |
| Naturally occurring radioactive material from radon decay |
| Carbon monoxide generated by welding and arc gouging |
| Sulphur dioxide generated by drying iron sulphide (pyrophoric iron) |

NEXT STEPS IN THE CONFINED SPACE PLAN

Confined space classification can be made after the detailed hazard identification stage has been completed, a qualitative risk assessment conducted and practical controls selected based on the hierarchy of controls (AS2865:2001). The classification will be based on the confined space definition that is applicable for the region. If a space is classified as a confined space, other compulsory controls will be required such as signage, entry permits, documented procedures and training.

CONCLUSION

Many worksites do not manage confined spaces according to regulatory standards. Confined space fatalities occur each year, most caused by atmospheric hazards. When implementing a site confined space plan the initial focus should be on identifying all potential hazards. To identify some of the atmospheric hazards detailed consultation, research and monitoring is recommended.

6. REFERENCES

- Australian/New Zealand Standard AS/NZS 2865:2001, Safe Working in a Confined Space, Standards Australia/Standards New Zealand
- Suruda, A., et al, 1994, Epidemiology of Confined-Space-Related Fatalities — Worker Deaths in Confined Spaces, A Summary of NIOSH Surveillance and Investigative Findings 11-25
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- Whittle, C., et al, 1994, The Production and Accumulation of Carbon Monoxide in Stored Dry Grain, *Journal of Stored Products Research*, 30,1, 23 - 26