

## Workplace Health and Safety Queensland

## SAFETY ALERT

### Explosive conditions: grinding, cutting and welding (including pre-heating) from the inside or outside of confined spaces

The purpose of this safety alert is to provide practical guidance to minimise health and safety risks associated with the danger of grinding, cutting and welding in, on and around confined spaces and compartments such as tanks, containers, vessels and other enclosed structures, which have contained flammable or combustible liquids.

#### Background

A co-owner of an aluminium fabrication and repair workshop was fatally injured by an explosion while using welding equipment on a boat. Other incidents have occurred in which workers have conducted hot work on fuel tanks and containers causing explosions that have led to fatalities and serious injuries.

#### Contributing factors

##### *Vapours*

Flammable liquid vapours (e.g. petrol, ethanol and solvents) can cause an explosion when confined, for instance in a container, vessel or void, and ignited. Combustible liquids (e.g. diesel fuel and oils) can behave like flammable liquids when they are heated, by generating vapours that, when confined, can also cause an explosion when ignited.

##### *Ignition sources*

Activities such as grinding, hot cutting and welding, or even hot surfaces caused by these activities, are potential ignition sources for a flammable atmosphere. These activities

can provide enough energy to ignite a mixture of flammable vapour.

The blast wave and fireball produced by such an explosion can cause significant property destruction and personal injury or death.

#### Action required

The following control measures will need to be taken to reduce the likelihood of injury from grinding, cutting, and welding (including pre-heating) while working on the inside or outside of a confined or enclosed space, compartment or vessel where flammable vapours may exist.

- Analyse the hazards: identify the scope of work, potential hazards (e.g. flammable atmospheres or generation of toxic fumes) and risk control measures.
- Monitor the atmosphere: perform atmospheric testing for flammable or combustible gases, oxygen deficiency and for toxic gases before and during the activity, even in areas where a flammable atmosphere is not anticipated.
- Test the area: check for hidden voids or compartments that may share the same airspace. This may be a hidden source of flammable vapours. If tests demonstrate that flammable or combustible gases are present, these must be eliminated by cleaning, ventilating and/or inerting the

space before hot work activities can begin.

- Check there is no unidentified source of flammable liquids or residues that, when heated, can create an explosive atmosphere.
- Use written permits: ensure that safe work practices are followed, including all hot work permitting procedures in areas where flammable vapours may be present. This involves identifying the work to be conducted and the necessary precautions to be taken.
- Welding processes may generate toxic materials (e.g. ozone and metal fume) that may require additional risk control measures to ventilation, such as respiratory protection, particularly when conducted inside enclosed areas.
- If there is a possibility of fire, always have a fire watcher with appropriate fire fighting equipment on hand.

Getting the job done safely should always be your first consideration.

All hazards should be thoroughly assessed before anyone carries out the work. Evaluate the job requirements thoroughly and implement appropriate safety precautions. This process will reduce the risk of an incident and fatality.



#### Further information

For more detailed information on working safely in confined spaces and procedures to test the atmosphere within, refer to [A guide to working safely in confined spaces](#).

Further information is available in the [Workplace Health and Safety Regulation 2008](#), in particular Section 248.

*These procedures are based on AS/NZS 2865: 2009 – Confined Spaces, which should be consulted for a detailed description of the requirements for working in confined spaces. The standard is available by calling the Workplace Health and Safety Queensland Infoline on 1300 369 915.*

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