



ACCIDENT ALERT

Paint fumes ignite during vessel maintenance causing serious accidents

Two serious accidents involving workers engaged in maintenance work on vessels highlights the need for owners of vessels, contractors and employees to be aware of the dangers of working in confined spaces such as the holds of vessels.

A "confined space" is regarded as any chamber, tank, pipe or space in which a worker may be required to go or work, and in which certain specified hazards are present which may be likely to endanger the health of a worker.

Accident 1

Two employees were spray painting in the fore peak chain locker on a fishing vessel. The area they were working in was very confined. One of the employees left the vessel, the other started to pack up the gear. As he stepped over a hatch to switch the power off, a light he was using fell and broke, igniting the paint fumes causing serious burns to the worker's head and arms.

The Cause

The accident occurred because the worker had been spray painting in a confined area with no means of mechanical ventilation to extract paint solvent fumes or introduce fresh air.

It was disclosed that the composition of the paint had about 31% solvent mix consisting of four solvents with a flash point range of less than 0°C to 36°C with 64% of the solvent mix at less than 0°C flash point. If no additional solvents had been used to dilute the paint to a thinner mix, there would have been about 1.24 litres of solvent in a four litre mix. Of this, about 0.8 litres consisted of the low flash point solvents. The lower flammability level of this solvent mix is 0.5% volume and the upper explosive level was 6.5% volume. With no air

being extracted from the chain locker there would have been no dilution of the solvent in the atmosphere.

The average solvent concentration in the chain locker was calculated at about 0.2% volume. As the solvent vapour density was higher than air, it would have tended to settle nearer to the floor and the concentration would have varied with the distance from the floor

A hot source of ignition, i.e. a 75-100 watt light bulb breaking after about one hour's use would have been hot enough to ignite the fumes.

Accident 2

Two employees were spray painting in the hold of a fishing vessel. The area they were working in was very confined. The workers took five—minute intervals, to ensure that the fumes from the spray paint would not do any harmful damage to them. To help the workers, a portable light was used, this light was kept out of reach so as not to get in the way. However, it kept falling off its attachment. The skipper of the vessel then decided to hold the light where the worker had spray painted up to. It was at this stage that an explosion occurred, the worker was enveloped by the ensuing fire, and was burned to death.

The Cause

The inspector's report concluded that the accident was caused by the confined space being filled with solvent vapours, and that no mechanical ventilation or extraction was provided to vent the space.

When the vapours mixed with oxygen and the mixture was at the lower explosive limits it is most likely that a spark from a short-circuiting

light lead raised the mixture to local ignition temperature and ignited the vapours and an explosion/fire occurred.

Preventative Measures

In order to prevent a recurrence, there are several precautions which need to be followed:

1. Staff painting in enclosed spaces need to know the dangers of solvents from paints. These are:
 - a) The danger to the health, i.e. asphyxia and other health effects—skin damage, etc., and
 - b) The danger from a flammable mix occurring where adequate ventilation is not provided.
2. Electrical equipment such as light leads and cables need to be intrinsically safe, all other sources of ignition must be eliminated.
3. Mechanical ventilation must be provided to ensure fumes are diluted to the level that is well below the flammable limit. In the case of solvents that are heavier than air, the extraction system needs to remove vapours from floor level, allowing fresh air to be treated from above.
4. Use of a confined space entry permit system which takes into account all the possible problems which are likely to arise with work done in chain lockers or other confined spaces.
5. An entry permit system must be used for all work to be performed in confined spaces, i.e. welding.
6. Monitoring of vapour levels, while the work proceeds to determine the effectiveness of the venting and extracting procedures.
7. Provision and wearing of suitable protective equipment.
8. Suitable equipment to be on hand in the event of an emergency, i.e. fire extinguisher, rescue equipment.

Legal Obligations

The Health and Safety in Employment Act 1992 places responsibilities on employers, employees, people who hire contractors, and others.

If You Are An Employer

Under the law, if you are an employer then you must take all practical steps to:

- Ensure your employees are safe while at work;
- Identify all hazards in a place of work; and
- Where the hazards identified are significant—eliminate, isolate or minimise your employees exposure to the hazard.

You must involve your employees in the development of procedures for identifying and managing hazards in your business—including emergency plans.

If your employees are still exposed to significant hazards, you must provide protective clothing and equipment for them and monitor their exposure to the hazard.

In addition, you must inform your employees about the hazards in your business and the results of any monitoring of their health or the work environment. You must take all practical steps to train your employees to work safely, or have them supervised by someone with adequate qualifications and/or experience.

You must also take all practical steps to ensure that while your employees are at work they do not harm other people.

If You Are An Employee

You must not do anything at work that will harm yourself or other people.

If You Engage A Contractor

You must ensure that the contractor, the contractor's employees and any subcontractors are not harmed while doing any work (other than residential work) that the contractor was engaged to do.

SAFETY INFORMATION

The OSH booklet *Safety in Confined Spaces*, which sets out the hazards of working in confined spaces and the precautions to be adopted, is available from any OSH branch office.

Booklets setting out the legal obligations of employers, contractors and employees, are also available from any OSH branch office.