This guidance note describes the measures required to control the risk to health and safety when spraying flammable liquids.

Flammable liquids

Flammable liquids are dangerous goods of Class 3. They are identified by a red diamond label on their container with the words FLAMMABLE LIQUID. Many flammable liquids are applied by spraying, including:

- Paints and hardeners
- Resins
- Lacquers
- Paint removers
- Adhesives
- Rust treatment chemicals

In addition, flammable solvents and thinners are often mixed with the above substances.

Spraying of flammable liquids is conducted in a number of industries such as vehicle refinishing and furniture manufacture. The common application methods include conventional compressed air, high volume low pressure (HVLP), airless and electrostatic.

Hazards of spraying flammable liquids

In many cases, employers and employees at these workplaces are not fully aware of the potential risks to the health and safety of their employees from exposure to chemicals used in the spray painting process. Without the proper control measures in place, prolonged exposure to these chemicals over a period of time may lead to serious injury or illness.

There are two main hazards associated with spraying of flammable liquids:

- **Fire and/or explosion** - due to the flammable nature of the substances used.
- **Hazards to health** - depending on the hazardous nature of the substance, the potential
health effects may be short term and/or long term.

**Fire risks**
Fire or explosion may occur if:

- Vapours of flammable liquids accumulate to high enough concentrations, and
- There is an ignition source present.

The ignition source can be:

- Static discharge from poorly earthed equipment.
- Sparks from electrical switches and equipment.
- Naked flames (e.g. welding or cutting, lit cigarettes, heaters).
- Portable battery powered equipment (e.g. radios, mobile phones).
- Hot surfaces, the hot filament from a broken light, etc.

**Health risks**
There may be various health effects associated with the use of flammable liquids. Depending on the substance being sprayed, the length of time exposed and frequency of exposure, these substances can cause:

- Difficulty in breathing
- Skin and eye irritation
- Drowsiness
- Nausea
- **Sensitisation**
- Long term damage to skin, nervous system, kidney, liver or respiratory tract.

Specific information on the health hazards of the flammable liquid being sprayed can be found in the Material Safety Data Sheet (MSDS) for that substance. The MSDS is available from the manufacturer, importer or supplier of the substance and should be read prior to the substance being used.

---

**Flammable liquids containing isocyanates:**

Two-pack paints containing isocyanates are often used in spray painting. This is a coating supplied in two parts that must be mixed before use. These coatings are primarily irritating to the eyes, throat and respiratory tract.

However the main hazard associated with isocyanates is respiratory **sensitisation**. Sensitisation may occur after a single high exposure or after long term exposure at lower concentrations. Once a person becomes sensitised, any exposure to isocyanates (even in small doses) is likely to result in asthma-like symptoms including chest tightness, breathlessness and wheezing. Such attacks have on rare occasions resulted in death.

Sensitisation of the skin is also possible, resulting in persistent rashes, although this is much less common.

**Spray painters who become sensitised usually can no longer work in the industry.**

---

**Eliminate the hazard**

The simplest way to avoid being exposed to a fire or health risk is to not use the potentially harmful product; i.e. eliminate the hazard. This might not be practicable in situations where there is no suitable method to eliminate the harmful substance.

However, hazards can still be eliminated by changing the process. For example, consider using a physical fastening system instead of a solvent-based glue.

If eliminating the hazard is not practicable, reducing exposure to harmful chemicals and reducing the risk of fire and explosion can be achieved by using effective control measures.
Controlling the risk

When developing and implementing risk control measures at a workplace, it is important to consult with health and safety representatives and employees, as they are a valuable resource for determining the suitability of control measures.

Employers should develop suitable risk control measures in the following order:

- Substitution or isolation or engineering controls.
- Administrative controls.
- Personal protective equipment.

Often effective control of the risks involves using a combination of the above measures.

Risk control through substitution
Substitution is a process of using a chemical that is less hazardous or using a chemical in a less hazardous form.

Consider:

- Applying the substance with a brush or roller in a sufficiently ventilated place.
- Using water-based paints instead of solvent-based paints.
- Using lead-free paints instead of lead-containing paints.

Before a new product is used, an assessment should be carried out to ensure that other hazards are not introduced.

Risk control through isolation
Isolation involves separating people from the substance being sprayed, usually by distance or using physical barriers. For example:

- Erecting a fully enclosed spray booth (also considered to be an engineering control).
- Designating a dedicated spray area, such as a shed or an isolated room.
  If a designated spray area is established, additional administrative controls will be required, such as:
  - Ensuring there is restricted access to spray areas.
  - Ensuring that the spray area is adequately ventilated after spray painting, before allowing any entry without respiratory protection.
  - Ensuring that no ignition sources are within the hazardous area, or electrical wiring/equipment has been installed to an appropriate standard (see Australian / New Zealand Standard AS/NZS 2381.1).
  In some circumstances, atmospheric monitoring will be required to ensure workers are not being exposed to airborne contaminants above the relevant exposure standards. More regular health surveillance may also be required (see Health surveillance for isocyanates box text below).

Hazardous Areas
An area where flammable liquid vapours build up leading to the risk of fire is known as a Hazardous Area. The table below briefly describes a few typical hazardous areas that may exist where flammable liquids are used.

<table>
<thead>
<tr>
<th>Work area</th>
<th>Description of Hazardous Area</th>
</tr>
</thead>
</table>

Summary of common hazardous areas for spraying of flammable liquids.
Risk control through administrative controls
Administrative controls include safe work practices or systems of work aimed at reducing the risk of using the flammable liquid. Examples of administrative controls include:

- Ensuring touch up work using a spray gun takes no longer than 5 minutes in any 60 minute period (where this work is performed outside a spray booth).
- Setting up safe working and emergency procedures (refer to the MSDS), such as restricting access to painting areas to staff who only need to be there and installing portable fire extinguishers appropriate to the products being stored and handled.
- Ensuring ignition sources are not introduced into close proximity where flammable liquids are handled or stored; e.g. not having electrical equipment such as scales, microfiche readers or computers in paint mixing and handling areas, or bringing radios into in spray booths.
- Maintaining good housekeeping practices, such as cleaning up spills immediately, keeping lids on containers of solvent-based products when not in use, and disposing of solvent-soaked rags promptly.
- Not storing flammable liquids in spray booths. Store only minimum amounts of flammable liquids on site and use proper fire-rated cabinets or, for larger quantities, fire-rated store rooms.
- Posting appropriate safety signs.
- Prohibiting eating, drink and smoking around chemicals.
- Developing a **health surveillance** program for certain substances.

Health surveillance for isocyanates
Health surveillance in itself is not considered a control measure, but it may give an indication of the effectiveness of the controls measures in place to minimise employee exposure to hazardous substances.

Under the Occupational Health and Safety (Hazardous Substances) Regulations 1999 health surveillance is required where flammable liquids containing isocyanates are manually sprayed.

The health surveillance must be performed under the supervision of a registered medical practitioner. Guidance on the health surveillance can be obtained from the National Occupational Health and Safety Commission's (NOHSC) Guidelines for Health Surveillance - Isocyanates.

Risk control through use of personal protective equipment
Personal protective equipment (PPE) is the least preferred option in the hierarchy of risk control and should never be solely used to control risk.

With any use of PPE:

- Employees should be trained and supervised in the correct wearing of the PPE.
- There should be a program of regular maintenance of PPE.
• Records should be kept of the above activities.

**Respiratory protection**

When spraying with highly hazardous products, such as flammable liquids containing isocyanates, air-supplied respiratory protection must be used. This includes situations where a well-ventilated spray booth is used.

**Respiratory protection** is essential when spraying with flammable liquids to protect against exposure to overspray. Always refer to the chemical manufacturer’s MSDS for the correct type of respirator required. Respirators should be of a type approved to AS/NZS 1716 or equivalent.

**Maintenance of controls**

Control measures need to be regularly assessed to ensure they continue to function optimally. A maintenance regime should include, but not be limited to:

• Conducting routine inspections on equipment, such as:
  • Spray booths (see AS/NZS 4114.2).
  • Respirators and compressors supplying breathing air (see AS/NZS 1715).
  • Electrical equipment (see AS/NZS 2381.1).
  • Spray guns.
  • Fire extinguishers.
  • Rectifying any deficiencies in control measures identified from inspections and testing.
  • Reviewing controls to determine if they need to be improved or replaced.
  • Keeping records of testing, maintenance and repair work.

**Information, instruction and training**

Employers need to provide the necessary information, instruction and training to employees to ensure that they are able to perform their work in a manner that is safe and without risks to health. Training will be primarily aimed at employees who handle the flammable liquids as well as their supervisors, but other employees who may be exposed should be made aware of hazards of the products used and the necessary measures required to avoid exposure.

Training should cover issues such as:

• Where to locate the register of MSDS.
• How to read and understand an MSDS and label.
• Understanding the hazardous nature of the substances used.
• The measures in place for controlling risk.
• Why employees need to use the controls provided.
• How to use controls correctly.

**Legislation relevant to spraying of flammable liquids**

Victorian occupational health and safety and dangerous goods legislation requires employers to provide and maintain, as far as practicable, a working environment that is safe and without risks to health. This duty extends to:

• Employees, including contractors, and
• People who are not employees, e.g. the public.

With respect to spraying of flammable liquids, the following legislation is applicable:
- Occupational Health and Safety Act 1985
- Occupational Health and Safety (Hazardous Substances) Regulations 1999
- Occupational Health and Safety (Lead) Regulations 2000 (where lead-containing paints are used)
- Occupational Health and Safety (Confined Spaces) Regulations 1996 (if spraying of flammable liquids occurs in confined spaces)
- Dangerous Goods Act 1985
- Dangerous Goods (Storage and Handling) Regulations 2000

Acts and regulations are available from Information Victoria on 1300 366 356 or order online at www.bookshop.vic.gov.au. If you only want to view the legislation you can use the Parliament of Victoria web site; go to www.dms.dpc.vic.gov.au, click on “Victorian Law Today” and scroll down to the “Search” window.

Further information:

**Standards Australia and Standards New Zealand**

AS/NZS 1715 - 1994: Selection, use and maintenance of respiratory protective devices
AS/NZS 1716 - 1994: Respiratory protective devices
AS/NZS 2381.1 - 1999: Electrical equipment for explosive atmospheres - Selection, installation and maintenance - General requirements
AS/NZS 2430.3 - 1997: Classification of hazardous areas - Examples of area classification (Parts 1 to 9)
AS/NZS 4114.2 - 1995: Spray painting booths Part 2: Selection, installation and maintenance

Copies of standards can be obtained by contacting Standards Australia on 1300 654 646 or by visiting the web site at www.standards.com.au.

**National Occupational Health and Safety Commission (NOHSC)**

Spray painting - National guidance material, 1999

Copies of publications can be obtained by contacting the Australian Government Info Shop on (03) 9670 4224 (Toll free 132 447), by visiting the NOHSC web site at www.nohsc.gov.au/OHSInformation/NOHSCPublications or email the Info Shop at mel.infoshop@finance.gov.au.

NOHSC also maintains a Practical Guidance Database that is a useful resource for finding further information on Spray Painting and other related topics; go to http://natindex.nohsc.gov.au/

**Worksafe Victoria**

Code of Practice for Lead
Code of Practice for Hazardous Substances
Code of Practice for Confined Spaces
Code of Practice for Dangerous Goods

Copies of publications, including Codes of Practice, can be obtained by contacting WorkSafe Victoria on 03 9641 1333, or your local WorkSafe Victoria office.

Other useful health and safety information is available on WorkSafe Victoria's web site; go to www.workcover.vic.gov.au or contact our Advisory Service on 9641 1444 or toll free 1800 136 089.