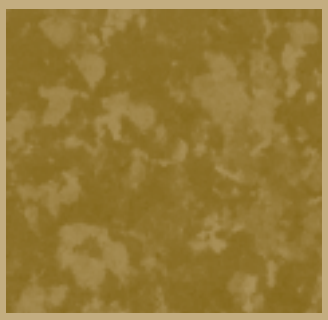
WorkSafe
Western
Australia
COMMISSION

Occupational Safety and Health Act 1984 and
Occupational Safety and Health Regulations 1996

CODE OF PRACTICE

SPRAY PAINTING

Amended June 2009



Foreword

The *Occupational Safety and Health Act 1984* established the WorkSafe Western Australia Commission which comprises representatives of employers, unions, government and experts. The Commission has the function of developing the legislation and any supporting guidance material and making recommendations to the Minister for implementation. To fulfil its functions the Commission is empowered to establish advisory committees, hold public enquiries and publish and disseminate information.

The Commission's objective is to promote comprehensive and practical preventive strategies that improve the working environment of Western Australians.

The Act

The *Occupational Safety and Health Act 1984* provides for the promotion, co-ordination, administration and enforcement of occupational safety and health in Western Australia.

With the objective of preventing occupational injuries and diseases, the Act places certain duties on employers, employees, self-employed persons, manufacturers, designers, importers and suppliers.

In addition to the broad duties established by the Act, it is supported by a further tier of statute, commonly referred to as regulations, together with lower tiers of non-statutory codes of practice and guidance notes.

Regulations

Regulations have the effect of spelling out the specific requirements of the legislation.

Regulations may prescribe minimum standards. They may have a general application or they may define specific requirements related to a particular hazard or a particular type of work.

Regulations may also be for the licensing or granting of approvals, certificates, etc.

Codes of Practice

A code of practice is defined in the Act as a document prepared for the purpose of providing practical guidance on acceptable ways of achieving compliance with statutory duties and regulatory requirements.

Codes of practice:

- should be followed, unless there is another solution which achieves the same or better result;
- and can be used to support prosecution for non-compliance.

Guidance Notes

A guidance note is an explanatory document issued by the Commission providing detailed information on the requirements of legislation, regulations, standards, codes of practice or matters relating to occupational safety and health.

Authority

This code of practice is approved by the Minister for Labour Relations pursuant to Section 57 of the *Occupational Safety and Health Act 1984* by the Hon Minister for Labour Relations on June 2000.

Scope

This code applies to all workplaces where spray painting is undertaken, and to all persons with potential for exposure to hazards resulting from spray painting in those workplaces and includes:

- all areas where paints are sprayed;
- all areas of a spray painting operation where associated processes such as mixing, pouring and tinting of paints is carried out;
- all areas of a spray painting operation where spray painting substances, such as paints and solvents, are stored; and
- some aspects of industrial and marine coatings.

Who should use this code of practice?

This code of practice should be used by all persons involved in any aspect of spray painting, including employers, contractors, employees, safety and health representatives, designers, manufacturers and suppliers of plant or materials used in spray painting.

Other legislation

The *Environmental Protection Act 1986* and *Regulations* have specific provisions relating to spray painting.

For further information on this code of practice, contact the Chamber of Commerce and Industry of Western Australia (Tel. 9365 7577), UnionsWA (Tel. 9328 7877) or WorkSafe Western Australia (Tel. 9327 8777).

This code of practice is based on the draft code of practice on the control of spray painting hazards developed by the Australian Paint Manufacturers' Federation (APMF). The WorkSafe Western Australia Commission gratefully acknowledges the assistance of the APMF in permitting the use of their draft document.

Contents

1.Purpose

The purpose of this code of practice is to provide practical guidance on meeting the requirements of the *Occupational Safety and Health Act 1984* and *Occupational Safety and Health Regulations 1996* as they apply to spray painting and enable a consistent approach to controlling the risks from spraypainting.

The code focuses on the spray painting process, providing practical guidance on how to achieve a safe working environment through a three step process – hazard identification, risk assessment, and risk control – followed by a review. This publication applies to all industries where spray painting is carried out, and can be used as a basis for guidance in particular sectors of industry, such as vehicle manufacture, panel beating and furniture manufacture.

While this publication primarily addresses the risks associated with the use of hazardous substances and plant, it also contains limited guidance on controlling the risks arising from other hazards in spray painting, such as manual handling and noise.

2. Spray Painting

Spray painting is a process by which air is driven across the mouth of a small outlet under such pressure as to draw the paint out and produce an air-paint mist from the jet of the spray-gun. In addition, the paint may be fed under pressure to the gun. Spray painting may be carried out by hand or automatically.

Airless spraying is a method by which pressure is applied directly to the paint, which is forced out of a nozzle. Nozzle pressures may be high and can cause injury if mishandled.

Electrostatic spray-guns have electrically charged nozzles which transfer the electric charge to droplets of paint which are then attracted to the edges and back of the workpiece, an effect known as the “wrap-around effect”. In some automatic painting processes the objects to be painted are charged. Direct current sources are used and hand guns may be designed with safe nozzles carrying a very low current at high voltage. Automatic guns carry much higher currents which are potentially lethal.

3. Hazards in Spray Painting Work

If the workplace and work activities are designed with safety and health in mind, hazards can be eliminated from the beginning. This is much easier than trying to minimise risks once hazards are present.

A hazard is anything that may result in injury to a person or illness of a person. Employers have a duty to identify the hazards at the workplace and consult with their employees on how to eliminate them.

There are a number of hazards to which employees engaged in spray painting may be exposed. Many paints that are sprayed are classified as hazardous substances because they contain potentially harmful ingredients. Exposure of employees to these paints can cause injury and illness through inhalation of toxic vapours and mists, or absorption of irritants through the skin. Other hazardous substances to which spray painting employees could be exposed include thinners, degreasers, resins, surface preparation products, dusts from sanding, rust converters and rust removers. Some hazardous substances used in spray painting are also a fire or explosion risk.

Other hazards in spray painting include plant, electricity, paint injection from airless spray guns, manual handling and noise.

This code applies primarily to the handling and storage of hazardous substances used in spray painting processes. These processes include:

- preparation e.g. preparing surfaces, tinting, mixing and pouring paints;
- spray painting;
- storage, clean-up and disposal; and
- the use of spray painting plant e.g. spray booths, compressors and ventilation systems.

In Australia, many workers in the vehicle finishing industry spray paint for at least part of their time at work. In addition to car refinishing, spray painting is used in car production, the furniture industry and in painting ships, aircraft, buildings, structures and machinery.

3.1 HAZARDOUS SUBSTANCES

3.1.1 What are hazardous substances?

Hazardous substances are substances that the manufacturer (or importer) has determined are hazardous, in accordance with the National Occupational Health and Safety Commission's *List of Designated Hazardous Substances* or *Approved Criteria for Classifying Hazardous Substances.* Normally, substances can be identified as hazardous by their labels.

Broadly speaking, hazardous substances are substances used or stored at the workplace that could damage a person's health.

3.1.2 Hazardous substances in spray painting

Many substances encountered in spray painting are hazardous. They include paints, solvents, dusts, powders, lacquers, paint removers, resins, adhesives, degreasers, surface preparation products, rust converters and rust removers.

The employers' obligations include:

- consultation with employees;
- providing information and training to employees;
- identifying the hazardous substances used or stored at the workplace;
- assessing the risks from hazardous substances;
- controlling the risks from hazardous substances;
- arranging atmospheric monitoring and heath surveillance where necessary; and
- record keeping.

Employers must make sure that all substances in the workplace are correctly labelled and that safety and health information (including a Material Safety Data Sheet (MSDS)), has been obtained from the supplier, manufacturer or importer.

Employees obligations include:

- complying, as far as they are able, with all instructions given by their employer in accordance with relevant hazardous substances legislation; and
- reporting promptly to their employer anything that they become aware of that could affect the employer's compliance with relevant hazardous substances legislation.

Employees must have easy access to a current MSDS for any hazardous substances at the workplace.

3.1.3 Health effects

Exposure to hazardous substances used in spray painting can have serious health effects. If exposure is not adequately controlled, health effects can include:

- occupational asthma;
- allergic contact dermatitis;
- lung cancer;
- 'painter's syndrome', which results from long term exposure to organic solvents and affects the brain;
- damage to the reproductive system; and
- kidney or liver damage.

Shorter term effects can include:

- irritant contact dermatitis;
- burns to the skin or eyes;
- vomiting and diarrhoea;
- irritation to the noise, throat and lungs; and
- headaches, dizziness, nausea and fatigue.

3.1.4 Inhalation and ingestion

The process of spray painting results in increased exposure to hazardous substances. People are exposed to vapours, dust, paint mists (aerosols) and solvents used in the clean up process. The route of entry to the body is generally through inhalation of dust or aerosols, however there is also potential exposure through swallowing. Exposure to hazardous substances may cause acute or chronic health effects. Short term effects may include respiratory tract irritation, shortness of breath, dizziness, influenza-like symptoms, tightness of the chest, nausea and headaches. Long term effects may include cancer, sensitisation of the respiratory system, asthma, abnormal reduction in lung function, emphysema and central nervous system dysfunction.

3.1.5 Exposure

Exposure of the skin and eyes to hazardous substances may result from the presence of airborne paint mist (aerosol) or dust, or through direct contact with paint or freshly painted surfaces. The health effect in these circumstances may be acute burning of the eyes. Skin contact with paint and solvents may result in acute irritant dermatitis, chronic allergic contact dermatitis or defatting of the skin.

3.2 Fire and explosion

Spray painting emits greater amounts of paint solvent than other application methods, such as brushing or rolling. The use of flammable materials in spray painting (eg. organic solvents), increases the risk of fire and explosion because of the amount of

solvent vapour in the air. Spray painting mists spread and rapidly fill airspace, and may come into contact with many potential sources of ignition, eg. static electricity, sparks, flames. These ignition sources could result in a fire or explosion, and should be eliminated from the spray painting work area.

The risk of fire or explosion from the following sources should be controlled before spraying commences:

- electrical sparks and arcs generated by the discharge of static electricity from poorly earthed equipment;
- electrical short-circuits;
- naked flames, such as burner flames, welding or cutting torches, matches, cigarette lighters, heaters and burning material;
- lit cigarettes and pipes;
- portable, battery powered equipment eg. radios, mobile phones etc.;
- hot surfaces, such as operating internal combustion engines, frictional sparks, heated wires, glowing metals, overheated bearings and broken electric light bulbs that expose the hot filament;
- equipment that produces sparks, such as abrasive grinding wheels;
- catalytic reactions, for example peroxide hardeners; and
- products which can be self-heating or result in spontaneous combustion.

3.3 Welding and gas cutting

Welding and gas cutting of painted surfaces generates hazardous gases, sparks and heat. Suitable respirators, hearing and eye protection and suitable protective clothing (including gloves and footwear) must be worn.

As welding is a potential ignition source, welding and allied processes should be carried out in an area isolated from paints, solvents and painting processes to prevent the risk of fire or explosion.

Protective screens should be provided to protect other persons in the vicinity. A torch using pressurised oxygen and a fuel gas, must be fitted with a flashback arrester.

3.4 Injection injury

Most injection injuries occur through the use of airless spraying equipment which involves high pressure.

Paint injected into the body may initially appear harmless but may cause a lack of blood supply to the area, or cause chemical or thermal burns. Solvents and other substances may be injected in sufficient quantities to cause symptoms affecting the whole body. All employees with injection injuries should be referred for immediate medical consultation to minimise the possibility of gangrene and tissue destruction, which could result in disability through amputation.

3.5 Manual handling

A spray painter can often be faced with complex equipment and a task which requires stretching, bending and twisting of the body, or holding the spray painting gun in a static position above shoulder height. This places the worker's body under stress and strain, and may result in manual handling injury.

The employer should identify and assess, in consultation with safety and health representatives and employees, all manual handling tasks which may be a risk to safety and health. The WorkSafe Western Australia Commission *Code of Practice for Manual Handling* should be referred to for further guidance.

3.6 Electricity

Electric shock or electrocution can be associated with electrostatic spray painting. Spray painting in general can involve electrical equipment which, if not properly earthed or not regularly maintained, can result in electric shock.

Static electricity charges can be generated in any spray painting process where two differently charged materials come into contact or are brushed together. A static electrical charge can be enough to ignite flammable materials.

Electrical installations and the use of electrical equipment are a hazard in spray painting areas, paint mixing and storage areas. Where such installations or equipment are necessary, special equipment and wiring precautions should be used to prevent a potential fire or explosion. An immediate hazard is created where electrical equipment that is damaged or equipment designed for "domestic use" is operated in these areas. Electrical installations must comply with *AS 3000* (known as the *SAA Wiring Rules)* which outlines the standards for wiring. Installations should be designed to be intrinsically safe for use in explosive atmospheres.

3.7 Noise

Spray painting equipment can be very noisy and if not controlled may result in workers suffering noise induced hearing loss. Noise affects concentration and makes communication difficult at noise levels well below the exposure standard. Sources of noise not associated with spray painting that are likely to affect persons at the workplace are sanding, grinding, welding, cutting and panel beating.

Sources of noise associated with the spray painting process include pumps, compressors, compressed air and spray booths. The *National Code of Practice for Noise Management and Protection of Hearing at Work [NOHSC: 2009 (1993)]* should be referred to for controlling noise emissions.

3.8 Grinding and sanding

Grinding and sanding of painted surfaces generates dust that can expose workers to hazardous concentrations of toxic substances such as lead, antimony, tributyltin oxide, nickel and hexavalent chromium. Sanding of polyurethane or epoxy paint that is not fully cured generates dust particles containing unreacted hardeners.

When practicable, wet sanding is the preferred work method.

Whilst dry sanding, mechanical grinders and sanders should have an integrated dust collecting system to provide local extraction, and all employees must wear a suitable respirator. For the correct selection of a respirator refer to *AS/NZS 1715 Selection, use and maintenance of respiratory protective devices* (see Appendix 2).

Hearing protection may also be necessary.

3.9 Heat

Heat may be a problem with spray painting. Spray painters should be aware of the symptoms of heat stress. The type of personal protective equipment required to be worn, such as helmets, protective suits or leather coveralls, sometimes for long periods in hot conditions, contributes to this problem. Personal protective equipment that is a comfortable fit can reduce heat build-up. Cotton garments worn underneath may also help.

Cooling devices fitted to the air supply of helmets can be used to reduce heat stress.

Work schedules aimed at countering the build-up of heat inside personal protective equipment should include job rotation to limit the time an operator works continuously or scheduling work in hours when temperatures are cooler.

Drinking water should be readily available and frequent breaks allowed.

4. Assessing the risk

Risk is the likelihood that a hazard will cause harm. Employers, in consultation with employees, must assess the risks of the spray painting hazards that they have identified. The purpose of this is to determine the level of risk and how well the risks are being controlled.

Assessment involves working out the level of risk from each hazard. The level of risk depends on both the nature of the hazard and the way people interact with the hazard.

4.1 The nature of the hazard

The nature of the hazard should be considered in terms of how it could do harm and how severe that harm would be. For example, could it do harm by crushing or cutting, being inhaled, becoming electrified, being noisy or exploding? How severe would that harm be – could someone be killed or suffer chronic health effects, or could it cause minor injuries such as cuts and bruises?

Hazardous substances used in painting and preparation processes can do harm if people are directly exposed to them. Exposure can occur through different 'routes of entry' into the body. Routes of entry include inhalation (breathing it in), skin contact, ingestion (swallowing it), eye contact and injection through high pressure equipment. Depending on the substance, the severity of the harm could range from minor to major, for example, from minor skin irritation to chronic lung disease.

Hazardous substances used in spray painting are volatile, that is, they evaporate quickly. The resulting vapours can then be inhaled. For example, the basis for the curing and drying of many paints is the evaporation of organic solvents.

In addition, the spray painting process converts substances to aerosol form. Aerosols are very small droplets of liquid in the air. Aerosols can be inhaled. This means that there is potential exposure through not only the vapours from evaporation but also the aerosols.

All potential types of harm from each hazard need to be considered. For example, some substances are a risk because they can cause diseases and also because they are flammable. Some items of plant are a risk because they are very noisy, produce sparks and are capable of cutting people.

4.2 The way people interact with the hazard

The way people interact with a hazard influences risk. Consideration of the interaction involves looking at:

- the number of people who could be exposed to the hazard;
- how often and for how long they could be exposed; and
- whether the existing methods of controlling the risks from the hazard are adequate, that is, whether people actually are being exposed.

The number of employees involved and the number of hours spent working with or near paint spraying activities increases the risk. However, if adequate control measures are in place, then the probability of severe effects is reduced.

For instance, if spray painting is always done in a properly designed, well-maintained spray booth, using safe and well-maintained equipment, following safety and heath procedures, and wearing suitable PPE, then employees are less likely to be directly exposed and the risk is reduced. On the other hand, if employees are regularly exposed to vapours and aerosols because adequate control measures are not in place, the probability of severe effects is increased.

4.3 Estimating the risk of injury or disease

The level of risk from each hazard is a combination of the nature of the hazard and the way people interact with it. The risk is greater when the harm is likely to be more severe. The risk is also greater if interaction with a hazard increases the likelihood of exposure.

Broadly speaking, risk levels can be low, medium or high.

	Level of exposure high	Level of exposure medium	Level of exposure low
Potential for harm HIGH	High risk	High risk	Medium to high risk
Potential for harm MEDIUM	High risk	Medium to high risk	Medium risk
Potential for harm LOW	Medium risk	Medium to low risk	Low risk

Table 1: *The level of risk can be estimated by 'combining' the potential harm from the hazard with the level of exposure*

While all risks need to be controlled, high risks should be the first priority. Results of the assessment are the basis for planning and putting in place an effective risk control program. The assessment will also show whether atmospheric monitoring of hazardous substances and employee health surveillance are required.

4.4 Risk assessment of work with hazardous substances

See Appendix 4
Regulations 5.15 and 5.18

4.4.1 Employer's responsibilities

Employers must ensure that an assessment, as described in Regulations 5.15 to 5.18 and in this code of practice, is made of all spray painting work involving potential exposure to any hazardous substance.

4.4.2 Exposure standards

Exposure to hazardous substances must not be greater than the standards listed in *Exposure Standards for Atmospheric Contaminants in the Occupational Environment* [NOHSC:1003(1995)]. The Guidance Note on the *Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environment* [NOHSC:3008(1995)] should be used to interpret the appropriate exposure standards. Exposure standards refer to airborne concentrations of substances, and represent conditions under which it is believed nearly all employees can be repeatedly exposed day after day without adverse effect.

Risk assessment therefore includes determining whether it is likely that exposure standards are being exceeded or approached. Air monitoring may be needed for this.

Exposure standards do not represent 'no effect' levels at which every employee can be guaranteed protection. So, as part of the assessment process, employers should consider how to:

- ensure exposure standards are not exceeded under any circumstances;
- keep the level of exposure to any hazardous substance as low as possible; and
- further reduce exposure in the future.

This includes exposure to hazardous substances that do not have declared exposure standards. The results of these considerations should be implemented as part of the risk control program.

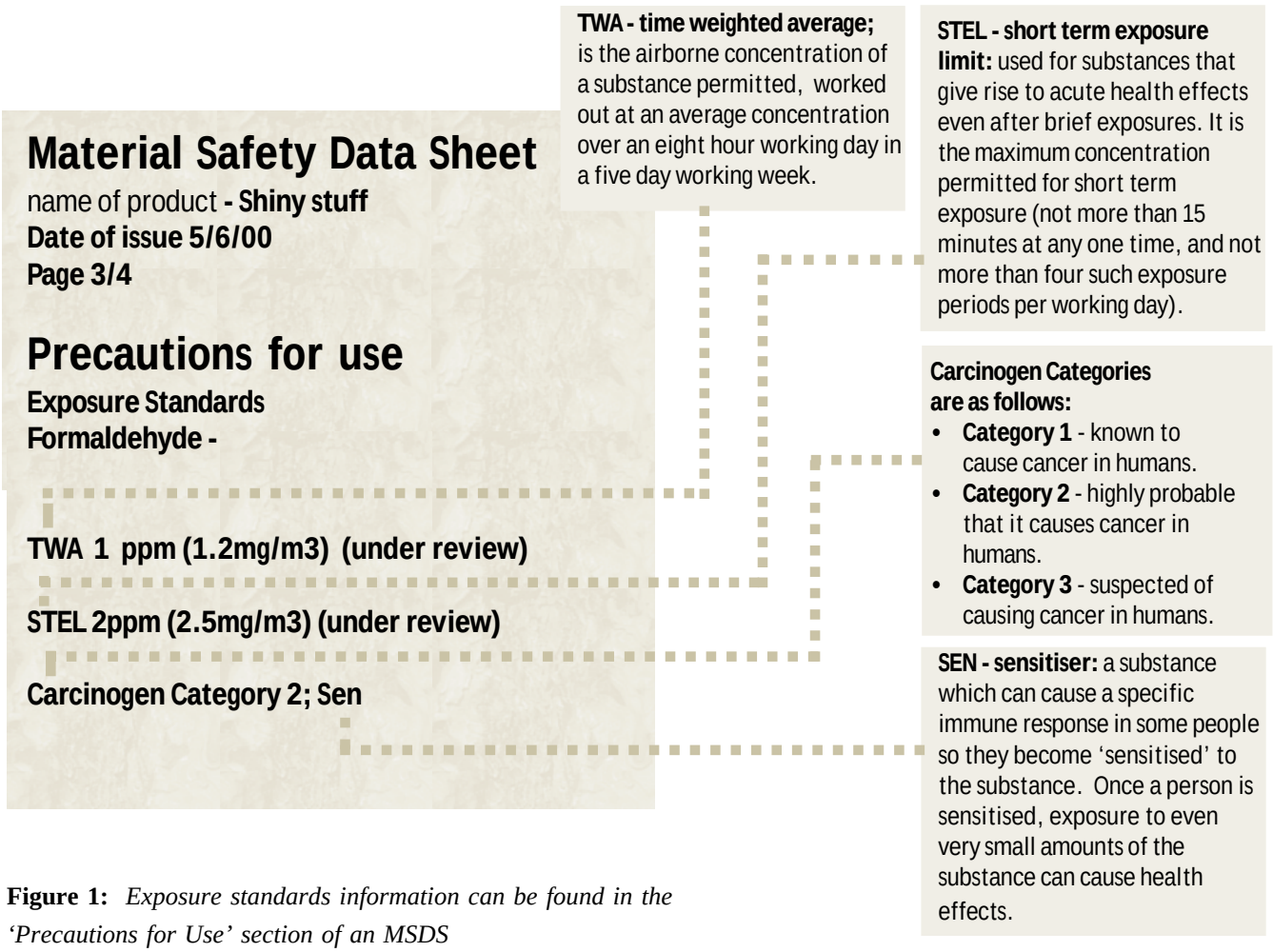


Figure 1: *Exposure standards information can be found in the 'Precautions for Use' section of an MSDS*

4.4.3 Who should do the assessment?

The person doing the assessment should have sufficient knowledge and skills to evaluate the level of risk from hazardous substances. This includes sound knowledge of spray painting activities, the requirements of hazardous substances regulations and this code of practice.

Employers may do the assessment themselves, in consultation with employees, or they might delegate the task to one or more employees with sufficient skills. If necessary, professional assistance can be sought from occupational hygienists or other relevant specialists.

4.4.4 Stages in the assessment of work with hazardous substances

A practical way to carry out assessments is to divide workplace activities into jobs, tasks or work areas and assess the risks involved in each. The assessment can then be completed in four stages.

First stage

The first stage is to list the hazardous substances used or produced in each job, task or work area.

As well as paint, hazardous substances could include solvents used for cleaning, resins, thinners, surface preparation products, powders, adhesives, paint removers, rust converters and rust removers.

Second stage

The second stage is to review the label and the Material Safety Data Sheet (MSDS) or equivalent information for each substance to determine the nature of the hazard.

The risk phrases on the label are a guide to the type and seriousness of harm a substance can do.

Figure 2: *Contents information and risk phrases can be found on the label*

More detailed information on possible harm from a substance can be found in the MSDS.

Using information from the label and MSDS, spray painting substances can be put into three hazard categories as follows:

- **Category 1 – High hazard** includes substances that contain or are;
  - cancer-causing chemicals, for example, coal tar;
  - skin or respiratory sensitisers, for example, isocyanates in polyurethane paints;
  - mutagens or reproductive hazards, for example, ethoxyethyl acetate;
  - substances which cause severe effects after repeated or prolonged exposure, for example, styrene;
  - metallic hazardous substances, for example, cadmium;
  - substances which cause acute lethal or non-lethal irreversible effects after a single exposure;
  - substances which cause acute irritant effects;
  - classified as Schedule 6 or 7 poisons;
  - corrosive substances or Dangerous Goods Class 8 products;
  - Dangerous Goods Class 5 products; or
  - two (or more) pack paints, for example, a polyurethane paint and its hardener.

- **Category 2 – Medium hazard** includes any substance that contains organic solvents, or is a Dangerous Goods Class 3 product, that is not already included in Category 1. This can include water-based paints. Except for water, which is an inorganic solvent, the vast majority of solvents used at work or contained in workplace substances are organic. 'Organic solvents' covers a broad range of different substances, for example, toluene, xylene, methyl ethyl ketone, acetone, benzene, ethylene glycol derivatives, turpentine and white spirit. Their potential health effects vary, with some being more hazardous than others. Most of them are flammable. It should not be assumed that water-based paints and other water-based products are non-hazardous, because many contain organic solvents or other hazardous substances.

- **Category 3 – Low hazard** includes any other substances not in Categories 1 and 2.

Determining which category a substance is in will help with assessing risk. It will also help with decisions about risk control.

Third stage

The third stage is to inspect the relevant work area/s to find out whether people are being exposed because of the way they are interacting with the substances being used.

This involves:

- discussion with employees about work practices and procedures;
- determining whether substances are being released into the work area. This includes noting:
  - evidence of contamination, for example, dust or fumes visible in the air or on surfaces, a substance visible on a person's skin or clothing, the odour of substances, visible leaks, spills, splashes or residues. (While odour can indicate a problem, if there is no odour that does not mean that there is no problem. Odour is not a reliable indicator of whether the amount of a substance present is above or below the exposure standard.);
  - employees' experience or symptoms of exposure. As well as ill health or injury, symptoms of exposure can include recurring irritations, for example, feelings of discomfort or respiratory problems. While these symptoms may not seem serious at the time, they can indicate, or become, long term health effects;
- consideration of all persons potentially exposed, including, for example, people who pass through the area, cleaners and maintenance workers;
- consideration of the effects of unusual or particular circumstances, such as staff shortages, environmental conditions, weather changes, equipment repair, very busy times and emergencies. For example, if there is smoke outside near the fresh air inlet, it could be drawn into the spray booth;
- consideration of the combined effects of two or more hazardous substances;
- estimation of the degree of exposure for all persons potentially exposed. The estimation should take into account the level, frequency, and duration of exposure,

as well as the different routes of entry. If the degree of exposure cannot be estimated with confidence, then monitoring or health surveillance may be required; and

- consideration of existing control measures, including whether:
  - controls are in place, effective and well maintained.
  - employees have been trained in the proper use and maintenance of the controls.

Influence on risk of the object being sprayed

The object being sprayed can influence risk. Factors that should be considered include:

- the position of the object in relation to the painter;
- the positioning of other employees;
- the direction of the stream of ventilating air;
- the size and shape of the object; and
- the ease of moving the object.

What must be avoided is positioning the object so that painters have to spray towards each other, towards other employees or up wind of other employees.

See Figures 3-10 on the following pages.

Influence on risk of the spray painting process used

The spray painting process used also influences risk. Characteristics of the different processes are as follows:

Conventional compressed air (low pressure) spray painting – Extensive overspray; bounce in cavities and at corners (rebound); high sound levels.

Airless (high pressure) spray painting – Less overspray, bounce and aerosol than conventional air spraying; relatively high viscosity paints can be used (less solvent is needed in the paint); higher capacity (flow rate) and faster application; risk of injection injury and static electricity that could cause a spark.

Air assisted airless (combined method) spray painting – Less aerosol and overspray than conventional air spraying; risk of injection injury.

Electrostatic spray painting – Spray guns heavier and more difficult to handle; static electricity.

Hot spraying – Uses very little thinner; reduced overspray; increased fire or explosion potential.

Pressure pots – Risk from overpressurisation (pressure must be released before opening to refill); damaged vessels and incorrectly fitted hoses and couplings; awkward manual handling; more solvents used in maintenance.

Fourth stage

The fourth stage is to evaluate the risks for each job, task or work area.

Risks of work with hazardous substances can be assessed as high, medium, low or uncertain. An explanation of these four risk levels is given below.

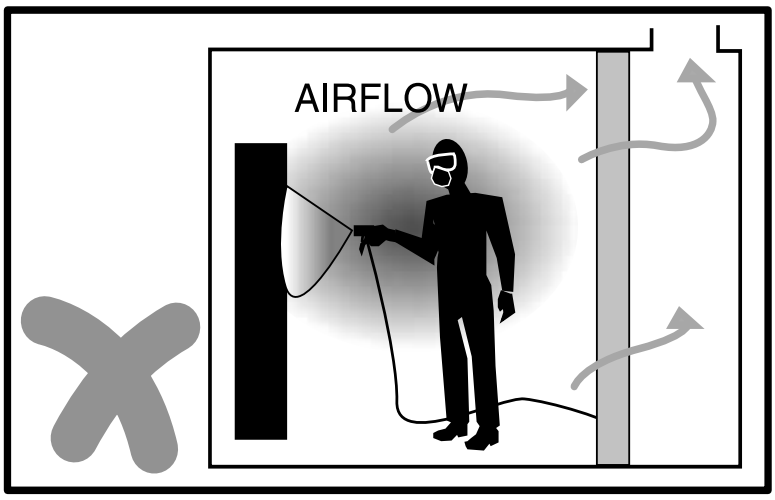


Figure 3:
The operator is exposed to overspray because of poor positioning in relation to the airflow.

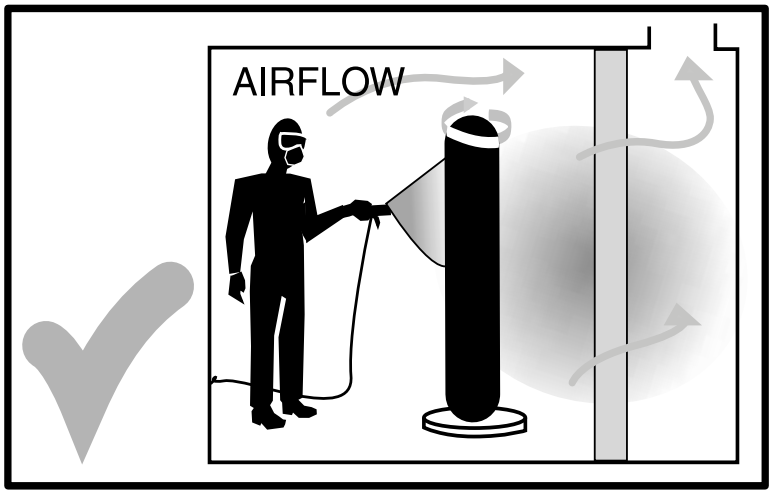


Figure 4: *To avoid overspray, the article should be rotated rather than the operator spraying against the airflow.*

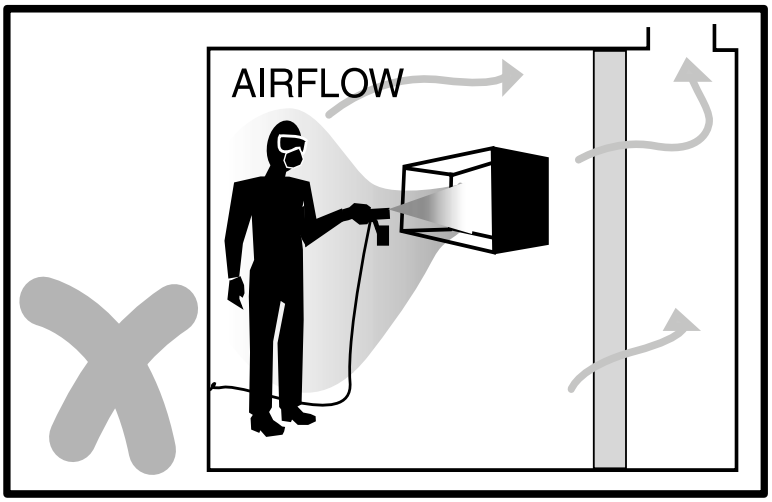


Figure 5: *Spraying with a 'short' nozzle may cause overspray of the operator.*

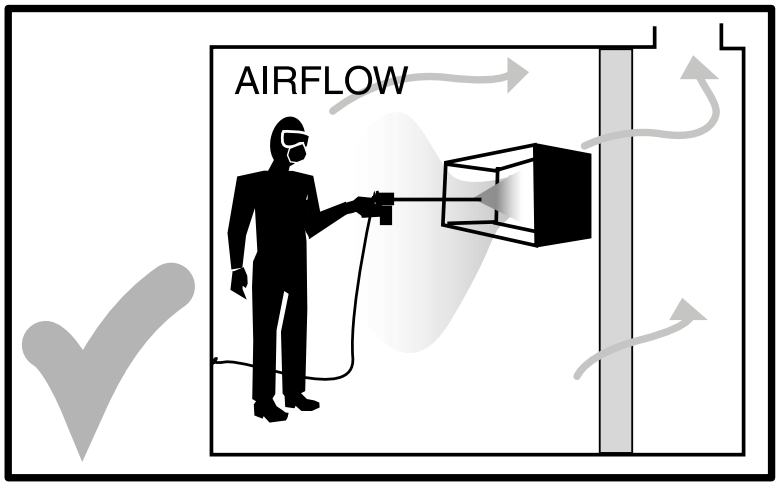


Figure 6: *Spraying with a 'long' nozzle avoids overspray of the operator*

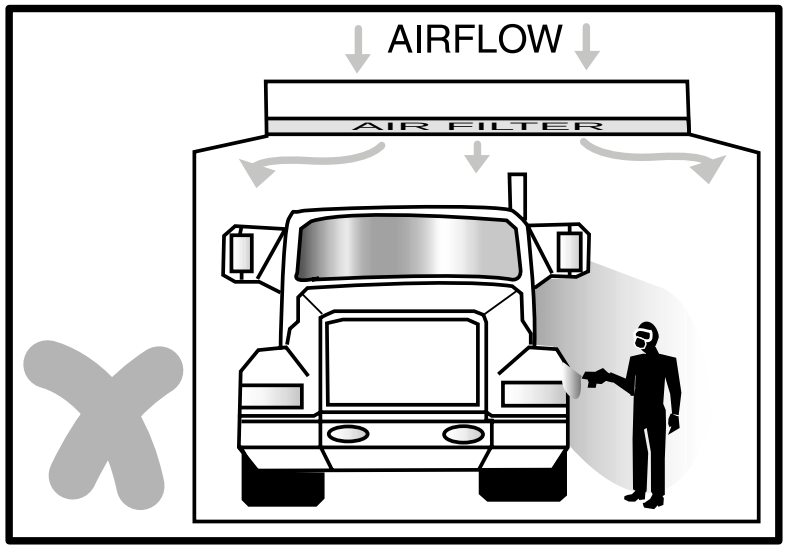


Figure 7: *The operator is exposed to overspray, and stretching and reaching can cause discomfort and injury*

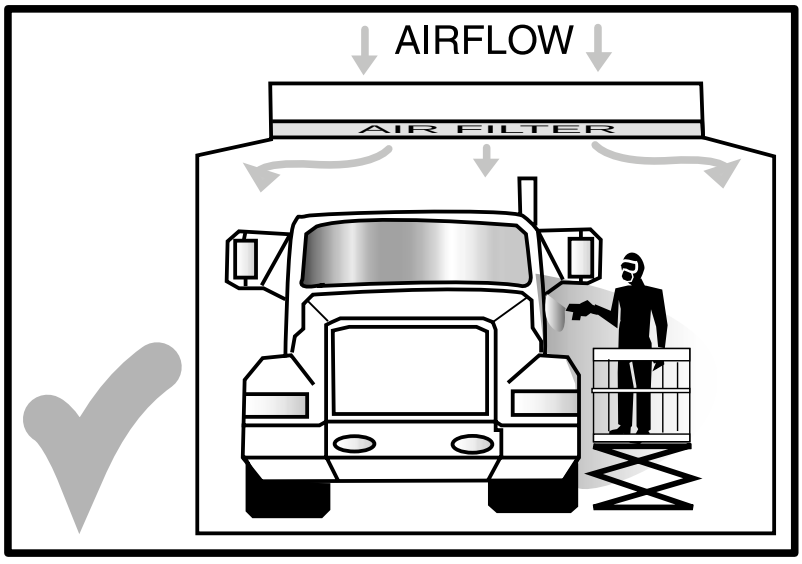


Figure 8: *The use of a gantry or lift avoids overspray of the operator and problems caused by stretching and reaching*

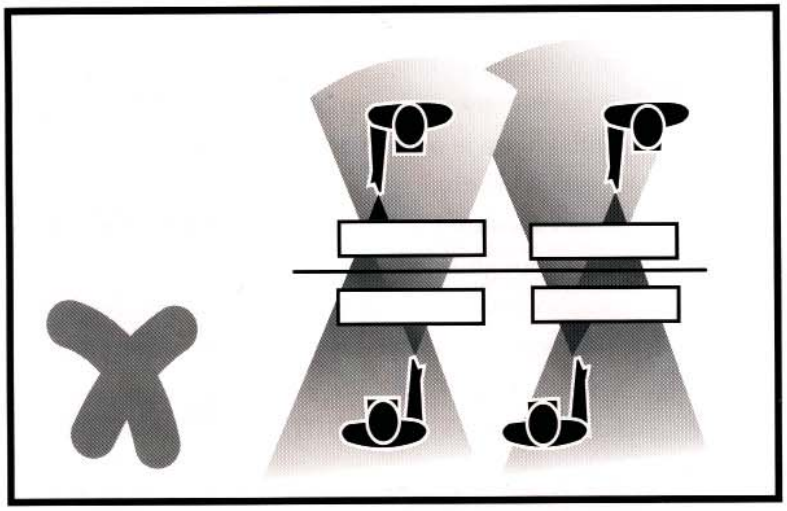


Figure 9: *Each operator is exposed to overspray because of their placement opposite each other*

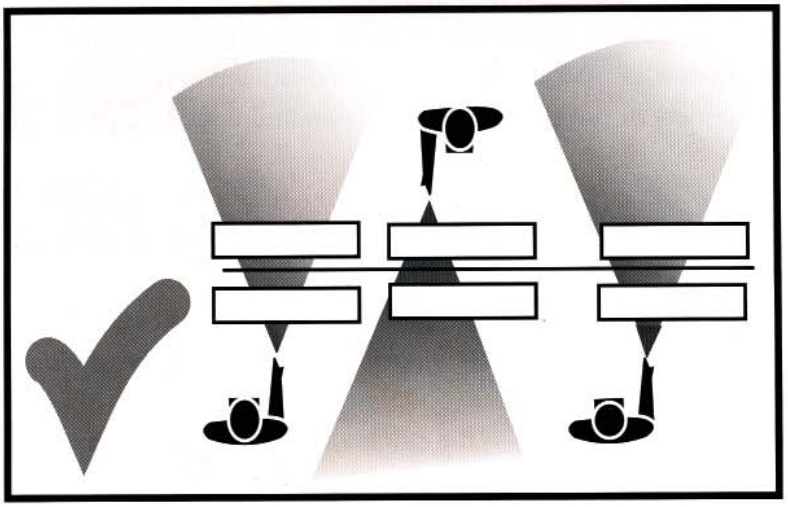


Figure 10: *The use of staggered work positions avoids overspray of the operators*

- Risk is, or could be, low and is unlikely to increase where:
  - the amounts of the substance used are too small to cause much harm, even if controls fail; or
  - the substance can cause minor effects, but its use is being strictly controlled in accordance with the MSDS (or equivalent information), and employees have been trained; or
  - the substance can cause minor effects, but its use can be readily controlled in accordance with the MSDS.
- Risk is medium where:
  - although the substance is in Category 2 and there are a number of people who could be affected on a daily basis, use of the substance is strictly controlled in accordance with the MSDS and through effective engineering controls; or evidence of exposure has been found during the assessment.
- Risk is high where:
  - the substance is in Category 1;

- dusts, mists or fumes are visible in the air;
- there are widespread complaints of illness, discomfort and irritation;
- splashes are present; and employees have not been trained; and
- the potential harm is serious and the likelihood of exposure is high.

- **Risk is uncertain where:**
  - the level of exposure cannot be estimated with confidence;
  - there is not enough information available about a substance; or
  - more complex processes and exposures are involved, for example, if there is potential exposure to a number of different substances.

See Appendix 3 Regulations 5.13, 5.15, 5.16 and 5.17

4.4.5 Action arising from the assessment

Following the assessment, further decisions will be needed to:

- plan and implement appropriate control measures;
- ensure the control measures are properly used and maintained;
- arrange induction and training;
- determine if monitoring or health surveillance is required;
- review or develop appropriate first-aid and emergency procedures; and
- review or develop appropriate standard operating procedures.

Simple and obvious assessments - If the risk is assessed as low, then the assessment is complete as soon as controls are implemented in accordance with the MSDS and employees are trained in use of the controls. For these simple and obvious assessments, the employer must ensure that completion of the assessment is recorded in the Hazardous Substances Register required under regulation 5.13.

Maintaining controls - If the risk is assessed as low, or medium, it is still important to make sure controls are maintained and that employees are trained in use of the controls. Control can deteriorate and this might not be apparent immediately. For example, plant could fail, control measures might not be used properly or there might be an increase in the amount of a substance used.

A longer term control program might aim to eventually reduce the medium level risks, for example, by using a less hazardous substance.

High risks and uncertain risks - If the risk is assessed as high, then control measures must be identified and implemented immediately. Consideration should be given to stopping the process until risk can be controlled. Monitoring and health surveillance may be required. A more detailed assessment may be needed. Longer term control requirements should be determined. A further assessment should be done when controls are in place.

If the risk is uncertain, then a more detailed assessment should be done. Interim control measures should be put in place, with the aim of reducing potential exposure as much as possible.

More detailed assessments - A more detailed assessment is needed if the risk level is uncertain. It may also be needed if the risk level is high.

A more detailed assessment could involve:

- obtaining more information about substances;
- a thorough evaluation of the work to determine exposures as accurately as possible (including monitoring and health surveillance, where appropriate); and
- examination or testing of existing control measures.

4.4.6 Generic assessments

See Appendix 3 Regulation 5.15

The same hazardous substance/s may be used in a number of different workplaces, or work areas within the one workplace. If the circumstances of use are the same or similar, then a generic assessment may be appropriate.

This means one assessment is done to cover the different workplaces or work areas involved. The individual employer is responsible for ensuring that the generic assessment is valid for those workplaces or work areas.

Generic assessments may be done where a single employer controls many similar workplaces, for example, several spray shops under the one management or by a trade association on behalf of a number of different employers with essentially identical workplaces.

4.4.7 Atmospheric monitoring

See Appendix 3 Regulations 3.38, and 5.22

Atmospheric monitoring is the sampling of workplace atmospheres to obtain an estimate of inhalation exposure to hazardous substances.

Monitoring indicates whether the recommended exposure standards are being exceeded or approached. Normally it is necessary for an occupational hygienist to do the monitoring.

Monitoring may be required:

- when there is uncertainty about the level of exposure;
- to help with the risk assessment process;
- to test the effectiveness of the control measures; and/or
- as a review measure.

The employer must arrange for monitoring if the assessment shows that it is necessary.

The procedures for monitoring should detail:

- when and how the monitoring is to be done;
- the sampling procedures and analytical methods to be used;

- the sites and frequency of sampling; and
- how the results are to be interpreted.

If monitoring shows that the level of contamination regularly approaches or exceeds the relevant exposure standard/s, then the control measures should be assessed and adjustments made to ensure exposure is reduced as much as possible.

Records of atmospheric monitoring – The employer must ensure that the results of monitoring are recorded. The records must be kept for 30 years after the date of the monitoring. Records must be kept for so long because some diseases, for example, cancers, take a long time to become evident.

The results of monitoring can be recorded in any convenient way, but the records should be easy to understand and to access. If health surveillance is being carried out, then the records of monitoring should be in a form that allows them to be compared with the health surveillance records.

The results of monitoring must be given to employees who could be exposed to the hazardous substances involved, and the records should be accessible to employees, employee representatives and the relevant public authorities.

See Appendix 3
Regulation 5.23

4.4.8 Health surveillance

Health surveillance means the periodic checking of employees' health. Health surveillance is an important tool in preventing adverse health effects from hazardous substances. It is used:

- to help with the risk assessment;
- to ensure risk control measures are working effectively; and
- as part of the review process.

Arranging for health surveillance is the employer's responsibility. Health surveillance is mandatory for some substances. (See Section 8).

4.4.9 Recording hazardous substances assessment reports

Completion of simple and obvious assessments must be noted in the Hazardous Substances Register. The note should state that the MSDS (or equivalent information) was reviewed, that control measures are in place, and the date.

Records for other assessments should reflect the detail of the assessment. They should contain sufficient information to show why decisions about risks were made.

Assessment records must be kept for at least five years. If monitoring or health surveillance results from the assessment, then the assessment records, together with the

monitoring or health surveillance records, must be kept for 30 years.

Assessment records should be readily accessible to all employees who could be exposed to hazardous substances through spray painting work and to their representatives.

4.5 Plant assessments

Employers, in consultation with employees or employee representatives, must assess the risk of the plant hazards they identified. The risk assessment for spray painting plant must take into account:

- systems of work associated with the plant;
- layout and condition of the work environment where the plant is used;
- capability, skill and experience of the person/s normally using the plant; and
- reasonably foreseeable abnormal conditions.

Factors to be considered include whether the plant is:

- suitable and safe for the job it is being used for;
- operated in accordance with the manufacturer's instructions or safety documentation;
- in good condition and well maintained; and
- safely and suitably located.

A skilled, trained spray painter knows how to select and use equipment to get the best finish with the least waste. More waste means more hazardous substances risk from vapours and aerosols.

Factors to be considered include:

- the greater the spraying distance, the greater the overspray;
- increased air pressure creates more overspray;
- selection of spray nozzles so that atomisation is no finer than necessary; and
- selection of the spray painting process to fit the job requirements without unnecessary overspray, bounce and dropout.

Assessing the level of risk from identified plant hazards should include one or a combination of the following:

- inspection of the plant and its components, including, for example, inspecting the filters in air lines of respirators, the filters in spray booths, and the lines and fittings of pressure equipment;
- inspection of the environment in which the plant operates to determine whether this is increasing the risk. For example, diesel-driven compressors should not be used in confined spaces;
- testing or technical evaluation, for example, testing compressor gauges, air flows and gas emissions;

- discussion with, or information from, designers, manufacturers, suppliers, importers, employers, employees or any other relevant parties;
- an analysis of injury, ill health and near-miss data; and
- an audit, that is, a full examination of all available information relevant to the safety and health of those people working with, or close to, the plant. Information sources for a full audit would include the results of the points above, as well as such things as training programs, communication procedures, operating and maintenance procedures, the results of air monitoring and health surveillance, task analyses, purchasing procedures and professional expertise.

Employers are legally obliged to register some items of plant. Employers should keep records of hazard identification, risk assessment and risk control for all items of plant.

Where multiple items of plant of the same design are installed and used under conditions that are the same (for all practical purposes), the risk assessment may be carried out on a representative sample. However, where risk may vary from operator to operator, a separate assessment of the risk to each operator should be carried out on each item of plant.

4.6 Revision of assessments

Hazardous substances assessments must be reviewed at least every five years, and it is also recommended that plant assessments are reviewed at least every five years. A total, new assessment may not be required, particularly if the operation and risk to employees are similar to that initially assessed.

Assessments should also be revised if:

- a process, plant or substance is altered or relocated;
- new health or safety information on a process, plant or substance becomes available;
- monitoring or health surveillance indicate inadequate exposure control;
- new or improved control measures become practicable; or
- a significant incident or accident occurs.

5. Controlling the Risk

See Appendix 3 The Act - Section 19 (in part) and Regulations 3.100, 3.101 5.20

Employers must ensure so far as is practicable that employees are not exposed to hazards at the workplace.

Risk control measures must be designed to reduce the risks to the safety and health of all employees involved in spray painting processes and those in the vicinity of the spray painting process.

The risk assessment will show where risks are not being controlled or not being controlled adequately. Information gathered during the assessment will help with the development of appropriate control measures which should be developed in consultation with employees and safety and health representatives, if any.

The first consideration in controlling exposure should be the complete elimination of the hazardous spray painting substance. Where the use of a hazardous spray painting substance is not essential, the substance must be eliminated.

Where it is not practicable to eliminate the use of a hazardous spray painting substance, or to use a less hazardous substance, consideration must be given to:

- using the same substance in a less hazardous spray painting process;
- replacing spray painting with rolling or brushing; or
- totally isolating the spray painting using a fully automated process.

If the hazard cannot be eliminated or the process fully automated, a spray booth must be used, other than where regulation 3.100(2) allows spray painting to be done outside a booth, to control the hazards associated with spray painting. Appropriate personal protective equipment must always be worn as an added control measure and the protective equipment must be appropriate to the tasks being performed.

Spray painting generally to be inside booth

5.1 Spray painting inside a spray booth

See Appendix 3 Reg 3.100

Spray painting must be carried out in a spray booth, except:

- where, by reason of its shape, size or weight, an article cannot readily be moved or cannot fit into a booth and must be sprayed where it has been assembled, eg. boilers, structural steel fabrications, ships, boats, aircraft;
- for infrequent spraying of heavy or bulky equipment; or
- for minor operations such as spotting or touching up.

The spray booth must be designed, constructed, installed and maintained in accordance with *AS/NZS 4114 Spray painting booths (AS/NZS 4114.1:1995 Design, construction and testing, AS/NZS 4114.2:1995 Selection, installation and maintenance).* The ventilation system should provide a continuous, uniform and evenly distributed supply of air flow throughout the spray painting area to the exhaust outlets. There should be no pockets of still air in the booth.

The source of air supply should be carefully selected to ensure an acceptable quality of air at all times.

AS 1668.2 Part 2: Mechanical ventilation for acceptable indoor air quality sets out the requirements for air handling systems which ventilate enclosures by mechanical means and the minimum requirements for preventing an excess accumulation of airborne contaminants.

A spray painting booth must be fitted with mechanical ventilation that provides a level of air velocity at any point within the breathing zone of the operator of:

- not less than 0.50 linear metres per second in side-draught booths;
- not less than 0.30 linear metres per second in down-draught booths; and
- not less than 0.40 linear metres per second where spray painting is done by an electrostatic process only.

The spray painter should never be positioned between the spray gun and the exhaust air outlet when working in any type of spray booth.

Fresh air should be drawn from an uncontaminated source and the contaminated air exhausted to a location which will not present a hazard or further contamination of the work area.

See Appendix 3 Regulation 3.100

5.2 Spray painting outside a spray booth

Where it is not practicable to do the spray painting in a booth and it is carried out in a building or structure other than a confined space, the building or structure should be of open construction or a mechanical exhaust system should be used to prevent the build-up of flammable or toxic fumes.

Adequate steps must be taken to protect the spray painters, other employees or persons in the vicinity, and the environment, from spray painting hazards. A spray paint exclusion zone, with restrictions on entry, should be designated around the area where the spray painting is being carried out. An exclusion zone in itself will not provide sufficient protection and must be used in conjunction with other control measures.

A spray painting process is not effectively isolated from another manufacturing process if paint from the spray painting can be inhaled by any persons engaged in that

other process. Neither is it effectively isolated from plant, machinery or equipment if there is danger of the plant being ignited by a source of ignition associated with the plant, machinery or equipment.

In general, the exclusion zone should be at least 6 metres horizontal and 2 metres vertical clearance above and below the place where the paint is being applied; however, in determining the size of the exclusion zone, the following factors need to be considered:

- the nature of the substance being sprayed;
- the work environment, including wind speed, ambient temperature and humidity;
- fire and explosion hazards;
- the location and physical conditions of the site; and
- whether other people are likely to be in the vicinity. Relocation of employees not involved in spraypainting activities to other parts of the workplace may be necessary.

Greater vertical clearance may be required when spray painting in stairwells and other areas which allow vertical movement of vapours.

Once a spray paint exclusion zone has been established, a number of procedures can be used to control risks. These include:

- physical barriers and warning signs to prevent unprotected persons from entering the exclusion zone;
- shrouding of the area where spraying is to occur;
- restricted entry of unprotected persons into the exclusion zone for a time period that ensures airborne concentrations of hazardous substances have reduced to below the relevant exposure standards;
- removal of hazardous substances that are not immediately needed for spray painting work, to reduce unnecessary exposure and fire or explosion risks;
- removal of stored wastes such as solvent-soaked rags and waste paint from within the exclusion zone to control fire or explosion risks;
- removal of electrical and ignition sources, including smoking, from within the exclusion zone to control fire and explosion risks;
- restriction of spraying when wind speed is greater than 15 kilometres per hour; and
- restriction of spraying within 50 metres of the boundary to adjacent premises or a greater separation where carparks and other sensitive property is located.

Consideration should also be given to ensure spray drift in walkways, public areas and air conditioning intake vents is also controlled.

Persons other than the spray painter should not enter the exclusion zone during a spray painting operation unless equivalent personal protective equipment is worn. A sign stating “SPRAY PAINTING AREA - AUTHORISED PERSONNEL ONLY” should be prominently displayed at the exclusion zone.

Where spray painting using two-pack paints containing isocyanates is carried out in the open air, all persons within 15 metres of the spraying operation should wear respiratory protection.

5.3 Spray painting in a confined space

See Appendix 3 Regulations 3.82, 3.87 and AS 2865 *Safe working in a confined space*

Fatalities have resulted from inhalation of vapours or as a consequence of fire or explosion due to inadequate ventilation in a confined space. Spray painting in a confined space must be carried out in accordance with Regulations 3.82 to 3.87.

Australian Standard *AS 2865 Safe working in a confined space* sets out the particular requirements and procedures for the safety of persons required to enter and work in a confined space and includes dealing with hazard identification and risk assessment, monitoring prior to entry, education and training, as well as rescue and first aid.

- **Ventilation**

  When spraying in a confined space where the ventilation is inadequate, toxic concentrations of vapours will be formed and a substantial volume of flammable vapour will accumulate.

  When spray painting is performed in a confined space, it may not be possible, even with the assistance of mechanical ventilation, to reduce the concentration of hazardous spray painting substances to levels that will not adversely affect the health of employees.

  Under these circumstances, the employer should ensure the concentration of the contaminants is reduced to the minimum practicable level and employees are provided with:

  - a full face hood continuous flow supplied air line respirator; and
  - overalls and appropriate chemically-resistant gloves where the substance being sprayed can irritate, sensitise or be absorbed by the skin.

  Toxic vapours in a confined space must be reduced as far as practicable. Ventilation is to be achieved by natural, forced or mechanical means to establish and maintain a safe atmosphere. This ventilation should be continued throughout the period of occupancy.

  Fresh air should be drawn into a confined space from an uncontaminated source and the contaminated air exhausted to a location which will not present a hazard or re-enter the confined space.

- **Ignition hazards**

  AS 2865 requires that entry into, and working in a confined space should not be permitted if any flammable or combustible contaminant in the atmosphere is above 5% of its Lower Explosive Limit (LEL).

It must also be taken into consideration that a flammable liquid is likely to be ignited at a temperature lower than the stated flash point when the paint is atomised.

Ignition sources listed in section 3.2 of this code of practice should be eliminated prior to the commencement of spraying.

5.4 Personal protective equipment

See Appendix 3 The Act - Section 19 (in part), 20 (in part) and Reg 3.34, 3.35, 3.38, 3.39 and 3.44. For further information see WorkSafe Western Australia Commission Code of Practice for Personal Protective Equipment

Appropriate personal protective equipment must always be worn as an added control measure during spray painting. MSDS provide the information needed to enable safe handling of hazardous substances at work. The MSDS should provide health hazard information and the precautions for the use of the substance. Employers must ensure all employees have ready access to the MSDS for any hazardous substance used in the course of their work.

The use of personal protective equipment as a control measure is limited to situations where other control measures are not practicable or where personal protective equipment is used in conjunction with other measures to increase protection.

Protective equipment must be:

- properly selected and fitted for the individual and the task;
- readily available;
- clean and functional;
- appropriately stored and not left in a spray booth; and
- properly maintained.

The relevant MSDS will provide information concerning the type of personal protective equipment required when using a hazardous substances and should be considered in the selection of personal protective equipment.

5.4.1 Standard of personal protective equipment

Suitable personal protective equipment is to be used in compliance with relevant Australian Standards, in particular:

- eye protection selection should comply with *AS/NZS 1337 Eye protectors for industrial applications*, and selection and use of such protection with *AS/NZS 1336 Recommended practices for occupational eye protection*;
- respiratory protection should comply with *AS/NZS 1716 Respiratory protective devices*, and used in accordance with *AS/NZS 1715 Selection, use and maintenance of respiratory protective devices*;
- hand protection should comply with *AS/NZS 2161 Occupational protective gloves*;
- foot protection should comply with *AS/NZS 2210 Occupational protective footwear*;
- head protection should comply with *AS/NZS 1801 Occupational protective helmets*; and
- clothing for protection against chemicals should comply with *AS 3765 Clothing for protection against hazardous chemicals*.

5.4.2 Confined spaces

When spraying any paint in a confined space, contaminant levels may be high and oxygen may be reduced to unsafe levels. The sprayer must wear:

- a supplied air respirator with an adequate protection factor. Full facepiece or hood, continuous flow or positive pressure respirators are generally necessary; and
- full length overalls, appropriate chemically resistant gloves and eye protection.

5.4.3 Two part polyurethane paint

When spraying two part polyurethane paint the sprayer must wear:

- a supplied air respirator with an adequate protection factor; and
- full length overalls, appropriate chemically resistant gloves and eye protection.

Alternative respiratory protection may only be used in situations where the use of supplied air respirators increases the risk of injury to the operator due to falling, tripping, etc.

The WorkSafe Western Australia Commission C*ode of Practice for Personal Protective Equipment* provides further guidance on personal protective equipment.

No person should use two part polyurethane paint without first considering the information provided in the MSDS for these paints.

5.4.4 Two part epoxy paints and two part catalysed acrylic paint

The respiratory protective equipment required will depend on the toxicity of the paint and the conditions under which the paints are applied. The respirators must be selected as part of the risk assessment and control process.

The following points need to be considered:

- exposure standards for the various paint components. Exposure standards have not been established for some of the hazardous components of these paints (eg. curing agents);
- the information provided in the manufacturer's MSDS;
- ventilation in the area where the paint is to be applied;
- the level and duration of exposure; and
- the protection factor of the respirator.

No person should use two part epoxy paint or two part catalysed acrylic paint without first considering the information provided in the MSDS for these paints.

When spraying two part epoxy paint or two part catalysed acrylic paint the sprayer must wear:

- respiratory protection that maintains exposures below the exposure standard. Where there is no exposure standard, exposures should be kept as low as reasonably achievable. Half face respirators with combined particulate/organic vapour cartridges may be used in well ventilated areas. Higher protection factors (eg. full face or powered air purifying respirators) will be required where ventilation is not adequate. When spraying in poorly ventilated or enclosed areas, particular care should be taken to ensure that appropriate personal protective equipment is worn in accordance with the recommendations contained in the manufacturer's Material Safety Data Sheet; and
- full length overalls, appropriate chemically resistant gloves and eye protection.

5.4.5 Organic solvent and water based paint

When organic solvent or water based paints are being sprayed and the exposure standard is likely to be exceeded, the sprayer must wear:

- a respirator with a combined vapour/particulate filter. The respirator must have an adequate protection factor. Where spraying is carried out in poorly ventilated conditions other types of respirators should be selected as described in 5.4.4 above; and
- full length overalls, appropriate chemically resistant gloves and eye protection.

If persons entering the spraying area are exposed to fumes and mist they must wear the same protective equipment as worn by the sprayer.

5.4.6 Spray painting in the open environment

When spraying two part polyurethane paint and two part epoxy paint in the open environment the requirements for respiratory protection are the same as 5.4.3 and 5.4.4 above, respectively. For other paints a respirator with a combined vapour/ particulate filter must be worn where the occupational exposure standard is likely to be exceeded.

The sprayer must also wear full length overalls, appropriate chemically resistant gloves and eye protection.

5.4.7 Maintenance program for personal protective equipment

The employer should ensure that proper maintenance is an integral part of the personal protective equipment program for his or her workplace. Failure to provide the proper cleaning and maintenance will not ensure the required level of protection is provided, possibly resulting in serious or fatal injuries.

In some cases, disposable protective equipment will remove the need for cleaning and maintenance, however the employer must take great care to ensure that such equipment offers the appropriate level of protection and is not chosen simply because it can be thrown away after a single use, and removes the need to provide maintenance facilities.

A proper maintenance program should include procedures for:

- regular cleaning and disinfecting of the equipment. Non-disposable respirators should be maintained in good working order and cleaned after use. Equipment or clothing which is not designated for the exclusive use of one person and could be used by another, must be cleaned and disinfected after each use;
- drying the equipment;
- inspection for any defects;
- identification and repair or replacement of any worn or defective components of equipment;
- clean storage of equipment when not in use. The cleaned respirator should be packed in a sealed plastic bag or a similar dust proof container to prevent contamination, and stored in a location where it will not be damaged; and
- employees to report damaged, defective or lost equipment to a nominated person responsible for repair or replacement.

Some items of personal protective equipment, such as eye protectors or gloves, are relatively easy for the user to clean and maintain if the employer provides the appropriate training, cleaning and storage facilities.

The employer should ensure that all respiratory equipment is used and maintained in accordance with *AS/NZS 1715 Selection, use and maintenance of respiratory protection devices*. Compressors used for supplying breathable air to spray painters should be well maintained, and the air quality checked by a person experienced and trained in the testing of breathing apparatus and air quality.

5.4.8 Respiratory protective equipment

When spraying in a confined space or when spraying two part epoxy or polyurethane paint, or some catalytic acrylic paints likely to cause respiratory sensitisation, the employer should ensure that the operator is provided with either a full facepiece supplied air respirator, or a half facepiece supplied air respirator and safety goggles in accordance with the Material Safety Data Sheet.

The employer should ensure that, where a combined organic vapour/particulate filter respirator is necessary, it is worn throughout the entire spraying or cleaning operation, and should also ensure that a record of the respirator usage is kept, and the combined organic vapour/particulate filter is replaced in accordance with the manufacturer's instructions.

Air supplies for supplied air respirators must conform with the requirements specified in Regulation 3.44. The employer should ensure that air compressors for air supply are located away from sources of contaminated air such as internal combustion engine exhausts and the discharge points of exhaust fans.

5.5 Fire prevention

Prior to commencing spray painting, controls to prevent fire and explosion by eliminating ignition sources, correctly earthing equipment and by eliminating short circuits need to be in place.

5.5.1 Sources of ignition

A source of ignition is an energy source with sufficient energy to ignite either a flammable or explosive gas or aerosol atmosphere.

AS 2430 Classification of hazardous areas (AS 2430.1 - Explosive gas atmospheres and *AS 2430.3 - Specific occupancies)* classifies the inside of a spray booth and adjacent spray painting area as a Zone 1 hazardous area. This means it is an area in which an explosive gas atmosphere is likely to occur in normal operation. The Zone 1 area of a booth is represented diagrammatically in Figures 15.1 and 15.2 in *AS 2430.3*.

When spraying is not conducted within a spray booth, the Zone 1 area is the area within 6 metres in any direction horizontally and up to 2 metres above and below the article being sprayed.

The employer should ensure no source of ignition is within the Zone 1 hazardous area at any time when spray painting is being performed.

The employer must ensure that at least two 9 kilogram dry powder type extinguishers mounted close to, but not in, the spray area are provided for each spray booth.

Extinguishers should be located apart to ensure that at least one will be readily available even if fire prevents access to the other extinguisher.

Foam extinguishers are suitable in areas where flammable liquids will be contained within a bund or similar area. Foam extinguishers should not be used near electrical equipment.

Carbon dioxide extinguishers should not be used in this application due to the potential for re-ignition of the flammable liquid after the extinguishing gas has dispersed.

BCF (yellow) fire extinguishers are unsuitable for fires resulting from flammable liquids and are no longer in use.

The employer must ensure:

- extinguishers are maintained in accordance with the manufacturer's recommendations and any requirement of the WA Fire and Rescue Service;
- the level of fire protection for the paint storage area meets the requirements of *AS 1940 The storage and handling of flammable and combustible liquids*; and
- where a fixed automatic fire fighting system is installed, it is serviced and regularly checked to ensure that its extinguishing capacity and reliability are maintained.

5.5.2 Electrical equipment for use in spray painting

Where the spray area is a Zone 1 hazardous area, then all electrical equipment installed or used in the area (eg., the interior of a booth and its exhaust ducts and the area within a radius of 2 metres in any direction from any entrance to a booth, the paint mixing area and the paint and flammable solvent storage area) should meet the requirements of *AS 3000 Electrical installations - Buildings, structures and premises* (known as the *SAA Wiring Rules).* This equipment includes fans, turntables, drying lamps, fixed lighting and switches, heating equipment, electrical appliances used during cleaning and repairing operations and appliances used to mix paint formulations.

The employer should ensure that where spray painting is performed outside a booth, all electrical installations and equipment used within a Zone 1 hazardous area meet the requirements of *AS 3000*.

Where electrical equipment or fittings including electric spray guns and electric airless spray guns are located less than 3.5 metres above the defined Zone 1 area, these items are to be enclosed or guarded as outlined in *AS 3000* to prevent any ignition sources falling into the area.

All portable electrically powered equipment, such as electrical hand-held power tools require earth leakage current protection by means of a residual current device (RCD).

Persons having control of a workplace should ensure RCDs are installed at the switchboard or at fixed sockets that may supply electrical power to portable equipment. A notice or sign should clearly indicate where an RCD is installed. If the employer is not satisfied that RCDs have been installed at the switchboard or at fixed sockets, the employer should provide portable RCDs and consult with employees when and where they should be used.

5.6 Work practices

The employer should ensure work practices are designed to minimise the health hazards of spray painting and eliminate fire hazards.

Work practices may cover the following areas:

- mixing and pouring;
- storage and handling;
- maintenance and cleaning;
- operations;
- emergency procedures; and
- hygiene and amenities.

5.6.1 Mixing and pouring

The employer should ensure:

- good ventilation is maintained;
- all containers are properly earthed;
- appropriate protective equipment is worn (refer to the relevant MSDS); and
- all spills are cleaned up immediately, especially those on personnel.

If spray painting substances are splashed on clothing or the body, the contaminated clothing should be immediately removed and the skin thoroughly cleaned with soap and water. Most solvents and thinners can be absorbed by the skin, and should not be used to clean the skin.

Unused or surplus liquid should always be returned to the container designated for that liquid. The unnecessary or accidental mixing of different liquids should be avoided. For example, a small amount of acetone accidentally mixed with kerosene could increase the risk of fire if the mixture is later taken to be kerosene.

Empty containers or cans may still contain vapour which could explode under certain circumstances. They should be decontaminated or closed and removed to a safe place while awaiting disposal in accordance with local government, environmental protection or waste management authority requirements.

5.6.2 Storage and handling

The following requirements relate to the safe storage and handling of hazardous substances:

- *Dangerous Goods Regulations 1992;* and
- *AS 1940 The storage and handling of flammable and combustible liquids*.

The employer should ensure:

- supplies of flammable materials are stored in tightly closed containers which are clearly labelled to show the nature of their contents;
- lids of containers are replaced after each use;
- storage areas for flammable substances are ventilated;
- containers are earthed accordingly whilst solvents are being decanted to control static electricity;

- the quantity of spray painting material in the spray area is kept to a minimum and does not exceed what is required for one day's spraying operations; and
- flammable liquids are stored in containers designated for that specific liquid.

Spray painting substances should not be stored or kept other than in their original containers. This does not apply to a container in actual use in spray painting or coating, or to a container used for mixing paint for immediate use.

Unnecessary plant and equipment should not be kept in spray booths or the spray area. Large items such as paint drums should not be stored in a booth as they can cause recirculation of contaminated air into the worker's breathing zone.

5.6.3 Maintenance and cleaning

- **General maintenance**
  A maintenance system should be implemented to provide early detection of any defect in control measures that could result in a reduced level of protection.

  Defects should be identified by routine examinations which include:

  - visual checks at appropriate intervals to ensure control measures are being properly implemented, eg. checking whether supplied air respirators are being used when two pack epoxy or polyurethane based paints are used;
  - periodic inspection of administrative and operational control measures; and
  - monitoring ventilation, eg. testing air movement in a spray booth.

  When a spray booth is placed in operation, it should be thoroughly examined and tested in accordance with *AS/NZS 4114.2 Spray painting booths - Part 2 Selection, installation and maintenance* at determined intervals.

  In accordance with Appendix A of *AS/NZS 4114.2* the interval between inspections should not exceed 12 months.

  Procedures for scheduling maintenance should be documented. These may include:

  - the control measures which require servicing;
  - the nature of the servicing needed;
  - frequency of the servicing;
  - who is responsible for the servicing;
  - how defects will be noted and corrected; and
  - performance testing and evaluation.

- **Maintenance of equipment**
  The employer should ensure:
  - all equipment is inspected and maintained in good working order and does not pose a health or fire hazard. Any defects in equipment or control measures should be corrected immediately;

- all spraying equipment is regularly cleaned and maintained in accordance with the manufacturer's instructions to safeguard the operator's health, minimise the fire hazard and to ensure optimum performance of the equipment. Such cleaning operations should only be performed within a booth with the exhaust ventilation operating; and

- safe procedures are used to test spray guns. Indiscriminate spraying in a booth or by spraying directly onto the walls of a booth to test a spray gun is not acceptable.

• **Cleaning methods**

Booth cleaning is simplified when the exposed booth surfaces are covered with a non-flammable material which collects the overspray. The cover may be a non-flammable plastic film applied to clean surfaces by brush or spray, or a mixture of soap or whiting (ground calcium carbonate and glycerine) applied by brush to clean surfaces. The deposited overspray is removed by peeling the plastic skin off the exposed surface or by hosing down the soap mixture containing the overspray. Absorbent material such as paper, sawdust, wood shavings or similar materials should not be used on exposed surfaces or for catching drippings from sprayed or coated articles, as they increase the risk of fire or explosion.

Where air filters are used, the filter medium should be replaced according to the manufacturer's instructions. More frequent replacement may sometimes be necessary to prevent deposits on the filter medium reducing the airflow to below the required level.

Pressurised paint pots and pressurised spray guns should be cleaned in accordance with the manufacturer's instructions. Pressure from the gun and the paint pot must be released prior to cleaning. The gun should not be cleaned by covering the nozzle with a cloth or other material held in the hand. This method of cleaning has resulted in paint injection injuries when used with airless spray guns.

All used cleaning rags and similar materials should be placed in metal containers with close fitting lids and dampened with water prior to proper disposal at the end of each day's work. The waste materials should be disposed of in accordance with local government, environmental and waste management authority requirements.

5.6.4 Operations

When spraying in a booth, the object to be sprayed should always be located between the operator and the exhaust air outlet so that a continuous supply of uncontaminated air is flowing through the operator's breathing zone and past the object to the exhaust air outlet.

If an object needs to be sprayed on all sides, it can be done by:

- rotating the object on a turntable or revolving hook;
- using an in-line spray booth; or
- using a down-draught booth.

Whenever possible, the spray should be directed towards the exhaust air outlet of a booth. For example, when spraying a tall object in a down-draught booth no spraying should be performed above shoulder height. Stepladders or platforms should be used so that the operator can get above the object and spray towards the air exhaust outlet in the floor.

Special care must be taken to prevent spray guns pointing towards other workers to ensure they are not exposed to the spray.

Where compressed air spraying is used, the correct balance of air and liquid is important to minimise the formation of very small droplets that are not deposited on the article and to minimise deflection of droplets with the "bounce back" air stream.

To obtain the required consistency of the paint for spraying, volatile thinners or heat can be used to obtain the required consistency of paint for spraying. Heating the paint is safer as it results in less overspray.

Spray booth ventilation control systems must operate a pre-purge cycle to remove any residue contaminants and also operate a minimum of a 5 minute post-purge period following spraying.

5.6.5 Emergency procedures

If a leak, spill or uncontrolled release of a hazardous spray painting substance occurs, emergency procedures, including procedures for safe disposal of the substance and sufficient suitable personal protective equipment, should be addressed.

The Material Safety Data Sheet should be referred to for instructions on the safe handling and disposal of spills.

The employer should ensure:

- all extinguishers are maintained in accordance with the manufacturer's recommendations and the requirements, if any, of the WA Fire and Rescue Service;
- the level of fire protection for the paint storage area meets the requirements of *AS 1940 The storage and handling of flammable and combustible liquids*;
- all employees know, understand and have practised emergency evacuation procedures, and have been trained in the correct use of extinguishers;
- eye wash and first aid facilities are available. Refer to the WorkSafe Western Australia Commission *Code of Practice for First Aid;* and
- emergency contact numbers are displayed in a prominent position.

5.6.6 Amenities and personal hygiene

Hand washing facilities and other amenities should be provided in accordance with the WorkSafe Western Australia Commission *Code of Practice for Workplace Amenities*. Amenity rooms should be kept free of contaminants and noise arising from the spray painting process.

Employers should ensure that food and drink are not kept, prepared or eaten in any spray booth, spray paint mixing or tinting area, or any area which may become contaminated with spray painting substances. Spray painters should wash their hands and face before eating, drinking or smoking and at the end of the day's work.

5.6.7 Special control measures relating to electricity in electrostatic spray painting

See Appendix 3
Regulation 3.101

Due to the electrical hazards associated with electrostatic spray painting, the equipment should only be operated by persons trained in accordance with *AS 2268 Electrostatic paint and powder sprayguns for explosive atmospheres.*

The following additional precautions should be taken:

- **location and construction of spray booths**
  Electrostatic spraying should be exclusively carried out in a separate area or a booth. The spray booth must be constructed according to *AS/NZS 4114 Spray painting booths.* The floor should be of electrically conducting material and be earthed.
- **installation**
  Only the spray gun and the cables connected to it should be sited in the spray area or booth. All other associated electrical apparatus, for example, the power pack, motor-driven compressor and mains connections should be located outside the booth or area, or be enclosed separately in a fire-resistant structure, unless the equipment is suitably designed for a hazardous area, and is installed in accordance with *AS 3000*. Such equipment should be protected against the depositing of paint residues.
- **earthing of equipment**
  All equipment and metal surfaces within a radius of 3 metres from the charged head of the spray gun should be earthed to avoid the build-up of static charges capable of causing ignition.
  The floor of the spraying area should be of a material that is an electrical conductor in order to earth the spray gun. Ordinary bare concrete is generally found to be suitable, but any permanent or temporary covering or coating on the concrete must itself be a conductor.
  The floor should be kept clean of any over-spray to avoid the build-up of an insulating layer.

The metal housing and handle of the gun or the metal areas of the handle of the spray gun and any metallic screen of the high voltage cable should be effectively earthed.

Each workplace should be efficiently earthed. Earthing is frequently made through metal suspension hooks. It is essential that such hooks are regularly and frequently cleaned to avoid the build-up of an insulating coat of paint.

- **earthing of personnel**
  - Clothing other than footwear

    As persons working in a spray area are liable to attain a static electrical charge in their normal work processes they must not wear metal articles. Finger rings are the only exception to this rule.

    Clothing of silk or synthetic fibres or other non-conductive materials is not recommended in areas where flammable materials are liable to be present unless the clothing is rendered conductive by commercially available antistatic solutions.

    If gloves are worn they should allow for electrical conduction between the hand and the earthed metal housing of the spray gun. One way of achieving this is to use gloves with the palm of the hand cut out.
  - Footwear worn in electrostatic spray process

    Two types of footwear, antistatic and conductive, are recommended for use in areas where it is necessary to prevent the accumulation of electrostatic charge in a person.

    AS/NZS 2210 Occupational protective footwear includes requirements relating to antistatic footwear manufactured from conductive rubber.

    Leather-soled footwear may not always be sufficiently conductive to give protection against build-up of static.

    All types of footwear can be adapted to provide a conductive path by incorporating a conductive garter which is strapped in contact with the skin of the wearer's leg and which makes electrical contact with a sufficiently large area on the sole of the footwear.

    Care should always be taken to ensure that the antistatic or conductive properties of footwear are not impaired, for example, by ageing or the formation of insulating material such as paint, oil or wax on the sole. The formation of insulating material is more likely to occur when the footwear is *also* worn outside the area where electrostatic spray painting is performed.

    The resistance of footwear should be tested at regular intervals. The resistance may be measured between electrodes placed on the inside and outside of the sole, the size and contact pressure of the electrodes being commensurate with conditions prevailing in normal use.

    Equipment is available for measuring resistance while the footwear is being worn. A description of such equipment, known as a personnel tester, is described in Section 21 of *AS/NZS 1020 The control of undesirable static electricity*.

    Dissipation of static electricity from a person by the use of any type of antistatic or conductive footwear is effective only if the person:

- stands on a conductive floor; or
- wears socks made from other than silk or synthetic fibres or has treated the silk or synthetic fibre socks with an antistatic solution as described above.

- **Cleaning electrostatic spray guns**

  Electrostatic spray guns should be cleaned with an appropriate cleaning solvent. The solvent should have a flash point greater than 23 degrees Celsius and above the potential ambient temperature.

  The cleaning solvent should be stored in a metallic solvent container and it must be earthed. Cleaning of the gun should not commence until all electrical equipment is switched off.

6. Powder Coating

6.1 Triglycidylisocyanurate (TGIC)

TGIC is used as a cross-linking agent in powder coatings in the metal finishing industry.

TGIC is classified as a hazardous substance and is:

- a skin sensitiser;
- toxic by ingestion and inhalation;
- genotoxic; and
- capable of causing serious eye damage.

Powder coatings containing TGIC are applied by electrostatic spraying.

6.1.1 Persons at risk

Workers who may come into direct contact with TGIC powder coatings include persons:

- filling hoppers;
- manually spraying powder coatings, including 'touch-up' spraying;
- reclaiming powder;
- emptying or cleaning industrial vacuum cleaners;
- cleaning spray booths, filters and other equipment; and
- cleaning up major spills of powder coating.

6.1.2 Controlling exposure

Exposure to TGIC can be controlled by a combination of engineering controls, safe work practices and personal protective equipment.

Engineering Controls

The most effective engineering controls for reducing worker exposure are enclosure, local exhaust ventilation and automation of the spray process. In particular:

- spray painting of TGIC powder coatings must be performed in a booth (see *Australian Standard AS 3754-1990 Safe application of powder coatings by electrostatic spraying*) where practicable;
- local exhaust ventilation must be used when spraying, during filling of hoppers, when reclaiming powder and during clean-up;

- automatic spray guns, feed lines and feed equipment should be used;
- spray gun air pressure must be minimised to prevent overspray as this could result in unnecessary powder build-up within the spray booth;
- the power supply and powder coating feedlines must be interlocked with the air extraction system so that if a fault develops in the ventilation system, the powder coating and power supplies are cut off;
- the spread of dust within the powder coating building must be minimised. Circumstances leading to draughts and air turbulence should be evaluated and controls implemented;
- opening powder coating packages, loading of hoppers and reclaiming powder are operations which must be contained to prevent or minimise the generation of dusts;
- the layout of the work station and the size of the hopper opening must be such that generation of dust is minimised in filling the hopper; and
- the following should be considered regarding the use of hoppers:
  - preference should be given to spray systems where the container in which the TGIC is supplied can be used as the hopper, thereby avoiding the need to transfer powder;
  - large hoppers should be used to avoid frequent refilling of smaller units; and
  - powder coatings supplied in drums, which allow mechanical transfer of the powder to hoppers, are preferred to manual transfer.

Safe Work Practices

Safe work practices are necessary to supplement the engineering control measures in order to minimise worker exposure.

Safe work practices must, where practicable, include:

- work practices designed to avoid the generation of dust;
- restricting access to spray painting areas;
- designing a safe workplace so that the spray painter is never between the object to be sprayed and the airflow of contaminated air,
- situating the articles to be sprayed sufficiently within the booth to avoid rebound;
- implementing good personal hygiene practices, for example, powder coating dust should not be allowed to collect on the face, exposed body areas should be thoroughly washed and overalls should be regularly cleaned;
- storing powder coating and waste powder in a designated area with restricted access;
- cleaning booths and surrounding areas on a regular basis;
- promptly cleaning-up spills of powder coatings to reduce the spread of TGIC;
- using a vacuum cleaner with a HEPA filter for clean-up operations and not using compressed-air or dry sweeping;
- using a spark-proof squeegee when a wet clean-up is required;
- emptying vacuum cleaners in the booth and under exhaust ventilation;

- taking care to avoid the generation of dust during disposal of waste powder;
- waste powder being baked in the original box for disposal to landfill as a solid;
- vacuuming as primary decontamination of work clothing;
- checking regularly the cleaning and maintenance of plant and equipment, including ventilation and spray equipment and filters; and
- proper induction training and general training of workers about the potential hazards of spraying with TGIC powder coatings and in the safe work practices necessary to minimise exposure.

Personal Protective Equipment

Control of worker exposure must be achieved, as far as is practicable, by means other than the use of personal protective equipment. However, when other control measures, such as engineering controls and safe work practices, do not adequately protect the worker, then personal protective equipment must be worn.

Personal protective equipment must include full protective clothing including overalls, gloves, head and eye protection and respiratory protection, selected and used in compliance with relevant Australian Standards. In particular:

- a powered air purifying respirator should be worn, which complies with *AS/NZS 1716-1994 Respiratory protective devices*, and used in accordance with *AS/NZS 1715-1994 Selection, use and maintenance of respiratory protective devices*;
- the respiratory protective equipment must provide head covering to avoid dust build-up around the edges of the facemasks. A ventilated full-head covering may also be more comfortable in a hot environment;
- during manual spraying, the gun-hand must not be insulated from the gun. Either a cover sleeve must cowl the gun hand or the palm of an insulating glove may be cut out. Operators standing outside a booth and spraying inside a booth through an aperture must wear this type of protective equipment; and
- anti-static and conductive footwear must be provided.

6.1.3 Electrical safety

Electrostatic spray painting brings with it electrical hazards and additional requirements for safe work practices are required. For example, all equipment, including spray guns and booths should be earthed. All hooks used to suspend objects to be sprayed should be cleaned prior to re-use in order to maintain effective metal contact.

Earthing of equipment, objects being coated and personnel ensures maximum coating efficiency, reduces free dust and prevents build-up of static charges capable of causing ignition.

6.1.4 Health surveillance

Health surveillance is required to be provided by the person in control of a workplace where:

- a workplace risk assessment identifies a person as being or likely to have been exposed to TGIC; and
- the exposure places the person's health at risk.

Regulation 5.23 requires that the person in control of the workplace appoint a medical practitioner to supervise the health surveillance. The duties of the Appointed Medical Practitioner are prescribed in Regulation 5.24.

See Appendix 3 Regulation 5.23 and 5.24 and Guidance Note for the Assessment of Health Risks Arising from the use of Hazardous Substances in the Workplace [NOHSC:3017(1994)]

7. Provision of information

The *Occupational Safety and Health Act 1984* requires the employer to provide employees with the necessary information, instruction, training and supervision to carry out work safely. All information, training and instruction should be provided in a way employees can understand the hazards that exist at the workplace, and the work practices necessary to perform the work safely.

7.1 Safe use of plant

The *Occupational Safety and Health Act 1984*, requires that people who design, manufacture, import or supply plant must as far as practicable ensure:

- the plant is designed and constructed, so employees who use the plant are not exposed to hazards;
- the plant is tested and examined so employees who use it are not exposed to hazards; and
- adequate information is provided when the plant is supplied to the workplace. The information must cover:
  - any dangers associated with the plant;
  - specifications of the plant;
  - data obtained from testing the plant;
  - conditions to be followed for safe operation; and
  - proper maintenance of the plant.

See Appendix 3
Reg 5.3, 5.4

7.2 Substances used at the workplace

Many substances used at work may be hazardous. Provided these hazards have been identified and assessed, and appropriate risk control measures are in place, the substances can be used at the workplace. The key to using these substances is the provision of information about each substance and the precautions for use.

The *Occupational Safety and Health Act 1984* (Section 23(3)) requires manufacturers, importers or suppliers of substances to provide information and toxicological data to the employer. This information will assist in developing a safe system of work to ensure employees are not exposed to hazards.

The information should cover the safe use, handling, processing, storage, transportation and disposal of the substance and details of appropriate first aid.

7.2.1 Material Safety Data Sheet

See Appendix 3 Regulations 5.5 and 5.8

Suppliers, manufacturers and importers must provide a current Material Safety Data Sheet (MSDS) containing information in relation to a substance that is required by the *National Code of Practice for the Preparation of Material Safety Data Sheets* [NOHSC:2011(1994)]. The MSDS provides information on the ingredients, properties and uses of the chemical product including details on the safe use, handling, processing, first aid, storage, transportation and disposal of the substance.

MSDS must be reviewed and, if necessary, revised:

- no later than five years after the last date the MSDS was issued; and
- where there has been a change in the information relevant to the MSDS.

Where a MSDS has been reviewed and revised, the manufacturer or importer should advise suppliers and users of the hazardous substance to replace the previous information with the revised MSDS. This is necessary where the health effects have changed and modification in safe working procedures are required.

7.2.2 Labelling

See Appendix 3 Reg 5.6

A label is defined as any information on a container which identifies the substance in the container and provides basic information about its safe use and handling.

Suppliers, manufacturers and importers must ensure all containers of substances or products supplied for spray painting are labelled in accordance with the *National Code of Practice for the Labelling of Workplace Substances* [NOHSC: 2012 (1994)].

Where a hazardous spray painting substance in a workplace is contained in an enclosed system, such as a pipe or piping system, it should be identified to persons liable to be exposed to the contents. Suitable means of identification include colour coding in accordance with Australian Standard *AS 1345 Identification of the contents of pipes, conduits and ducts* or signs in accordance with Australian Standard *AS 1319 Safety signs for the occupational environment.* Such identification should be used in conjunction with appropriate work practices, including permit to work systems, for enclosed systems and confined spaces.

If a container is not properly labelled, or if the label has been lost, the container should be labelled “CAUTION DO NOT USE: UNKNOWN SUBSTANCE”. Such a container should be stored in isolation until its contents can be identified and the container appropriately labelled. If the contents cannot be identified, the contents should be disposed of in accordance with local government, environmental protection or waste management authority requirements.

When an employee becomes aware of a missing or illegible label the employee should advise the employer immediately.

Where a substance is decanted from its original container to another container for thinning, mixing or tinting or any other reason, the employer should ensure the container into which the substance is decanted is labelled and remains labelled until it is cleaned to the extent that it no longer contains the substance. Where a substance is consumed immediately, no labelling is required.

Bulk containers must be placarded in accordance with the *Dangerous Goods Regulations* and the *Australian Code for the Transport of Dangerous Goods by Road and Rail.*

Any container in which a hazardous substance is held at the workplace must be labelled in accordance with the *National Code of Practice for the Labelling of Workplace Substances* [NOHSC: 2012 (1994)].

Paint, by its nature, covers or hides surfaces and labels may become illegible or otherwise damaged through paint spillage. Employees should be trained to:

- check labels before opening containers of spray painting substances;
- take reasonable care not to spill a substance so that the label is covered or destroyed; and
- report to the employer where a label is not legible and needs to be replaced.

See Appendix 3
Reg 5.13

7.2.3 Registers

The employer is required to ensure all hazardous substances used in spray painting processes are identified and a register of those substances is held at the workplace. The purpose of this register is to provide a source of information for both employer and employees, and to assist in the management of substances used or generated in spray painting processes. This list of hazardous substances should include:

- paints;
- coatings;
- solvents and thinners;
- cleaning products; and
- fillers, strippers and other chemicals.

The minimum information about any hazardous substance required in a hazardous substances register is the product name, the supplier of the product and a copy of the MSDS. Inclusion of any additional information to that required under the regulations should be determined after consultation with safety and health representatives, if any, and employees.

8. Health Surveillance

Where a valid biological monitoring procedure is available it should be used only to supplement, rather than replace, air monitoring. Air monitoring is covered in Section 4.

See Appendix 3
Regulations
5.23 and 5.24

8.1 Biological monitoring

This is done by measurement and assessment of the amount of a hazardous substance (or its metabolite) in the employee's blood, urine or exhaled breath. For example, biological monitoring for toluene in the blood measures the amount of toluene that employees have in their bodies as a result of spray painting exposures, by analysing a small sample of their blood. Biological monitoring tests are not available for all hazardous substances.

8.2 Medical tests

These are tests for specific health effects that may be the result of spray painting exposures. For example, respiratory function tests that test how well the lungs are functioning can reveal signs that the employee's health is affected by exposure to isocyanates in polyurethane paints.

8.3 Medical examination

A medical examination by a medical physician may reveal changes in normal health as a result of spray painting exposures. For example, a medical examination of employees who are exposed to hazardous substances that cause allergic contact dermatitis (e.g. epoxy resins in epoxy paints or chromates in chromate-based paints) should include a careful check of the skin.

Biological monitoring can be used to provide information on the amount of hazardous substances absorbed into the body. It can demonstrate routes of exposure other than air inhalation and the efficiency of personal protective equipment.

Biological monitoring should only be carried out by a person with appropriate training. Occupational health and occupational hygiene services are required to ensure proper planning and implementation of a biological monitoring program and correct interpretation of the monitoring results.

For further information on occupational health and hygiene services contact:

- The Chamber of Commerce and Industry of Western Australia (Tel. (08) 9365 7577),
- UnionsWA (Tel. (08) 9328 7877), or
- WorkSafe Western Australia (Tel. (08) 9327 8777).

9. Induction and Training

See Appendix 3
The Act - Section 19 (in part)

The purpose of induction and training is to provide employees with the skills and knowledge necessary to apply appropriate control measures, use personal protective equipment and follow emergency procedures to protect them from injury or harm to their health at their workplace. Induction and training should also enable employees to participate in decision making relevant to safety and health at their workplace.

Employers must ensure:

- all persons who carry out spray painting and paint mixing, supervisors and others involved in the spray painting process, storepersons, emergency personnel and safety and health representatives, if any, are adequately trained prior to commencing the process;
- a copy of this code of practice is available for perusal by employees at the workplace;
- training is:
  - organised and delivered as a normal part of employment and usually during normal working hours;
  - provided each time there are changes in spray painting substances and in the work practices;
  - developed in consultation with relevant employees and safety and health representatives; and
  - delivered by a competent person;
- training covers:
  - relevant provisions of the Occupational Safety and Health Act and Regulations;
  - the reasons for, and the nature of, control measures which are in use or are planned;
  - the work practices and procedures to be followed in the use, handling, storage, transportation, cleaning up and disposal of any hazardous substances;
  - safe and healthy work practices in operating the spray painting plant and carrying out spray painting processes;
  - how and where to access relevant information at the workplace, including MSDS;
  - the information in MSDS and labels;
  - the selection, use and maintenance of personal protective equipment;
  - first aid and injury reporting procedures;
  - the nature of, and reasons for, any health surveillance required, and the employee's rights in relation to health surveillance; and
  - emergency procedures.

Training should be evaluated and reviewed in consultation with relevant employees and safety and health representatives, if any, to ensure the content of the training programs is clearly understood by all employees and the overall objectives of the training programs have been achieved, as well as to identify what further training is required.

Employers should continue to provide information, instruction and training to experienced employees who have previously had relevant safety and health training.

The employer should document the training provided to employees. These records should be kept for five years.

APPENDIX 1: GENERAL PRINCIPLES FOR MANAGING OCCUPATIONAL SAFETY AND HEALTH IN WORKPLACES

1.1 LEGISLATIVE FRAMEWORK IN WESTERN AUSTRALIA

The *Occupational Safety and Health Act 1984* sets objectives to promote and improve occupational safety and health standards. The Act sets out broad duties and is supported by more detailed requirements in the *Occupational Safety and Health Regulations 1996*. The legislation is further supported by guidance material such as approved codes of practice. This legislative framework is depicted below.

OCCUPATIONAL SAFETY AND HEALTH ACT ⇦

Major provisions:

- The General Duties
- Resolution of Issues
- Safety and Health Representatives
- Safety and Health Committees
- Enforcement of Act and Regulations

supported by

OCCUPATIONAL SAFETY & HEALTH REGULATIONS ⇦

The *Occupational Safety and Health Regulations* set minimum requirements for specific hazards and work practices, including reference to National Standards developed by the National Occupational Health and Safety Commission and Australian Standards developed by Standards Australia.

and

GUIDANCE MATERIAL ⇦

- Codes of Practice approved for Western Australia in accordance with Section 57 of the Act
- Guidance Notes developed by the WorkSafe Western Australia Commission
- National Codes of Practice and National Standards developed by the National Occupational Health and Safety Commission
- Australian Standards developed by Standards Australia

1.2 ACCESS TO ACT, REGULATIONS AND OTHER RELEVANT DOCUMENTS

Employers are required to provide information to employees, to alert them to areas where hazards may exist and to improve their understanding of safe work practices. Regulations specify documents which must be made available for perusal by employees at the workplace.

1.3 THE GENERAL DUTIES - AN OVERVIEW

The Act contains general duties which describe the responsibilities of people who affect safety and health at work. Employers must, so far as is practicable,

- provide a workplace and safe system of work so that, as far as practicable, employees are not exposed to hazards;
- provide employees with information, instruction, training and supervision to allow them to work in a safe manner;
- consult and co-operate with safety and health representatives in matters related to safety and health at work;
- provide adequate protective clothing and equipment where hazards cannot be eliminated; and
- ensure plant is installed or erected so it can be used safely.

Employees must take reasonable care to ensure their own safety and health at work and the safety and health of others affected by their work.

Self-employed persons also must take reasonable care to ensure their own safety and health at work and, as far as practicable, ensure the work does not affect the safety and health of others.

Designers, manufacturers, importers and suppliers of plant must ensure the plant is safe to install, maintain and use at workplaces. Safety and health information must be supplied with all plant and substances used at work.

Designers or builders of a building or structure for use as a workplace must ensure, so far as is practicable, that persons constructing, maintaining, repairing, servicing or using the building or structure are not exposed to hazards.

The WorkSafe Western Australia Commission guidance note *The General Duty of Care in Western Australian Workplaces* provides detailed information on the 'duty of care'. The guidance note can be purchased from WorkSafe Western Australia, Westcentre, 1260 Hay Street, West Perth [Tel. (08) 9327 8777] or is available via the Internet Service on Safetyline [www.safetyline.wa.gov.au].

1.4 HAZARD IDENTIFICATION, RISK ASSESSMENT AND RISK CONTROL

Under Section 19(1)(a) of the *Occupational Safety and Health Act*, employers have a duty to ensure, as far as practicable, that employees are not exposed to hazards at the workplace. The *Regulations* require employers to identify hazards, and assess and control risks.

The regulation outlines three basic steps:

- **Identification of hazards**
  This involves recognising things which may cause injury or harm to the health of a person, for instance flammable material, ignition sources or unguarded machinery.
- **Assessing risk**
  This involves looking at the possibility of injury or harm occurring to a person if exposed to a hazard.

- **Controlling the risk of injury or harm**
  This involves introducing measures to eliminate or reduce the risk of a person being injured or harmed.

It is important to regularly review the steps, especially if there are changes in the work environment, new technology is introduced, or standards are changed.

Employers should consult with safety and health representatives, if any, and employees during these steps.

1.4.1 Identifying hazards

There are a number of ways of identifying potential sources of injury or disease. Selection of the appropriate procedure will depend on the type of work processes and hazards involved.

Procedures may range from a simple checklist for a specific piece of equipment or substance to a more open-ended appraisal of a group of related work processes. A combination of methods may provide the most effective results.

Methods of identifying workplace hazards include:

- developing a hazard checklist;
- conducting walk-through surveys;
- reviewing information from designers or manufacturers;
- analysing unsafe incidents, accident and injury data;
- analysing work processes;
- consulting with employees;
- examining and considering Material Safety Data Sheets (MSDS) and product labels; and
- seeking advice from specialist practitioners and representatives.

A HAZARD MEANS ANYTHING THAT MAY RESULT IN INJURY OR HARM TO THE HEALTH OF A PERSON

Some hazards, such as mechanical hazards, noise, or the toxic properties of substances, are inherent in the work process. Other hazards result from equipment or machine failures and misuse, control or power system failures, chemical spills, and structural failures.

The table on the next page lists some types of hazards together with some specific examples.

The table below lists some types of hazards together with some specific examples.

HAZARD	EXAMPLES	OUTCOMES (EXAMPLES OF INJURY OR HARM)
Manual handling	overexertion/repetitive movement	sprains, strains, fractures
Falls	falling objects, falls, slips and trips of people	fractures, bruises, lacerations, dislocations, concussion, permanent or fatal injuries
Electricity	electrical current, lightning	shock, burns, electrocution
Machinery and equipment	being hit, hitting objects, being caught in or between, over-turning vehicles	cuts, bruises, dislocations, fractures, amputation, permanent or fatal injuries
Hazardous substances	chemicals such as acids, hydrocarbons, heavy metals	toxic effects, dermatitis, respiratory illnesses, cancers
Extremes of temperature	effects of heat or cold	burns, frost bite, heat stress, heat stroke
Noise	excessive noise	permanent hearing damage
Radiation	ultra violet, welding arc flashes, lasers	burns, cancer, damaged eye sight, micro blindness
Biological	viruses, bacteria, fungi, toxins	Hepatitis, Legionnaire's disease, Q Fever, tetanus, HIV/AIDS, allergies
Vibration	hands and whole of body	organ, nerve and muscle damage
Psychological stress	intimidation, organisational change, violence, conflict, time pressure	high blood pressure, headaches and migraine, anxiety, depression, absenteeism

1.4.2 Analysing and assessing risks

Risk, in relation to any injury and harm, means the probability of that injury or harm occurring.

Risk assessment of the hazards identified in the first step should result in a list of potential injuries or harm and the likelihood of these occurring. The potential for fatal injury should be considered for each identified hazard. If hazards are listed they should be in the order of the most to the least serious, eg. from fatal to minor injury.

In assessing risks, consideration should be given to the state of knowledge about the frequency of injury or disease, the duration of exposure to injury or disease sources and the likely severity of the outcomes. Knowledge gained from similar workplaces or similar processes may be relevant to this risk assessment. Items to be considered include:

- **frequency of injury** - how often is the hazard likely to result in an injury or disease?
- **duration of exposure** - how long is the employee exposed to the hazard?
- **outcome** - what are the consequences or potential severity of injury?

Assessing these three factors will indicate the probability or likelihood of injury or harm occurring to workers involved in a particular work process. It also indicates the likely severity of this harm.

Risk assessment requires good judgement and awareness of the potential risks of a work process. Any person undertaking the risk assessment must have knowledge and experience of the work process. Risk assessment will be more complicated or difficult if the data or information regarding hazards of a work process is incomplete.

In some cases it may be necessary to break down the activity or process into a series of parts and assess each part separately.

Risk assessment should include:

- assessing the adequacy of training or knowledge required to work safely;
- looking at the way the jobs are performed;
- looking at the way work is organised;
- determining the size and layout of the workplace;
- assessing the number and movement of all people on the site;
- determining the type of operation to be performed;
- determining the type of machinery and plant to be used;
- examining procedures for an emergency (eg. accident, fire and rescue); and
- looking at the storage and handling of all materials and substances.

This step should provide information where and which employees are likely to be at risk of incurring injury or disease, how often this is likely to occur, and the potential severity of that injury or disease risk.

1.4.3 Identifying control measures

The final step in risk assessment is to determine the control measures that need to be taken and the ongoing review of those measures. There is a hierarchy or preferred order of control measures ranging from the most effective to the least effective. The preferred order is outlined in the table below.

The control of occupational injury and disease risks should preferably be dealt with by design, substitution, redesign, separation or administration. These controls generally eliminate, reduce or minimise risk in a more reliable manner than personal protective equipment.

Controls involve implementing measures which reduce the hazard and risk in the workplace.

Where regulations require specific methods to control the risk, these must be complied with.

TABLE 2 - HIERARCHY OR PREFERRED ORDER OF CONTROL

elimination	removing the hazard or hazardous work practice from the workplace. This is the most effective control measure;
substitution	substituting or replacing a hazard or hazardous work practice with a less hazardous one;
isolation	isolating or separating the hazard or hazardous work practice from people involved in the work or people in the general work areas from the hazard. This can be done by installing screens or barriers or marking off hazardous areas;
engineering control	if the hazard cannot be eliminated, substituted or isolated, an engineering control is the next preferred measure. This may include modifications to tools or equipment, providing guarding to machinery or equipment;
administrative control	includes introducing work practices that reduce the risk. This could include limiting the amount of time a person is exposed to a particular hazard; and
personal protective equipment	should be considered only when other control measures are not practicable or to increase protection.
	Control measures are not mutually exclusive. That is, there may be circumstances where more than one control measure should be used to reduce exposure to hazards.

In some instances, a combination of control measures may be appropriate. Control measures should be designed:

- to eliminate or reduce the risks of a hazardous work process and to minimise the effects of injury or disease; and
- to reduce the risk of exposure to a hazardous substance.

1.4.4 Control through personal protective equipment

Personal protective equipment (PPE) should be a last resort only, and be used in circumstances where other methods of control are not practicable. The factors which determine the appropriateness of using personal protective equipment include:

- the nature of the work or the work process concerned;
- the severity of any potential injury or disease;
- the state of knowledge about the injury or disease related to the work or process;
- information available to employers about methods of preventing injury or disease associated with a particular hazard or risk;
- the availability and suitability of methods to prevent, remove or mitigate causes of injuries or diseases associated with a hazard or risk; and
- whether the costs of preventing, removing or mitigating that injury or disease are prohibitive in the circumstances.

There are some situations where temporary use of personal protective equipment may be necessary. These include:

- where it is not technically feasible to achieve adequate control of the hazard by other measures. In these cases, the hazard should be reduced as far as practicable by other measures and then, in addition, suitable personal protective equipment should be used to secure adequate control;
- where a new or revised risk assessment indicates that personal protective equipment is necessary to safeguard safety and health until such time as

adequate control is achieved by other methods, for example, where urgent action is required because of plant failure; and
- during routine maintenance operations. Although exposure to hazards occurs regularly during such work, the infrequency and small number of people involved may make other control measures impracticable.

1.4.5 Review of control measures

Constantly reviewing control measures is important to ensure they continue to prevent or control exposure to hazards or hazardous work practices.

Engineering controls should be regularly tested to ensure their effectiveness. Performance testing and evaluation standards should be established.

Repair and maintenance programs should specify:
- where servicing is required;
- the extent of servicing required;
- the nature of the servicing required;
- the frequency of servicing;
- who is responsible for maintaining repair and maintenance programs; and
- how defects will be corrected.

In order to keep accurate records, a recording or reporting system should be developed, implemented and maintained.

1.5 THE MEANING OF PRACTICABLE

Some of the general duty provisions in the Act and some requirements in the Regulations are qualified by the words “so far as is practicable”.

“Practicability” applies to general duties for employers, self-employed people, people with control of workplaces, designers, manufacturers, importers, suppliers, erectors and installers, and to certain requirements in the Regulations.

These people are expected to take practicable and reasonable measures to comply with the requirements.

If something is practicable, it is capable of being done. Whether it is also reasonable takes into account:
- the severity of any injury or harm to health that may occur;
- the degree of risk (or likelihood) of that injury or harm occurring;
- how much is known about the hazard and the ways of reducing, eliminating or controlling it; and
- the availability, suitability and cost of the safeguards.

The risk and severity of injury must be weighed up against the overall cost and feasibility of the safeguards needed to remove the risk.

Common practice and knowledge throughout the relevant industry are taken into account when judging whether a safeguard is “reasonably practicable”. Individual employers could not claim that they did not know what to do about certain hazards if those hazards were widely known by others in the same industry, and safeguards were available.

The cost of putting safeguards in place is measured against the consequences of failing to do so. It is not a measure of whether the employer can afford to put the necessary safeguards in place.

While cost is a factor, it is not an excuse for failing to provide appropriate safeguards, particularly where there is risk of serious, or frequent but less severe, injury.

Where a regulation exists and is not qualified by the words “as far as is practicable”, the regulation must be complied with as a minimum requirement.

It is important to regularly review the steps, especially if there are changes in the work environment, new technology is introduced, or standards are changed.

Employers should consult with safety and health representatives, if any, and employees during these steps.

The WorkSafe Western Australia Commission guidance note *The General Duty of Care in Western Australian Workplaces* provides detailed information on the 'duty of care'. The guidance note can be purchased from WorkSafe Western Australia, Westcentre, 1260 Hay Street, West Perth [Tel. (08) 9327 8777] or is available via the Internet Service on Safetyline [www.safetyline.wa.gov.au].

APPENDIX 2: RESPIRATORY PROTECTION

This Appendix relates to section 5.4 of this code of practice.

The MSDS for any paint containing a hazardous substance must be referred to when selecting the respiratory protection.

ENVIRONMENTAL CONDITIONS	TYPE OF PAINT SPRAYED	RESPIRATORY PROTECTION
Open environment	• 2 part polyurethane • 2 part epoxy and 2 part catalysed acrylic paints • organic solvents and water based paints	• A supplied air respirator* with an adequate protection factor. • A respirator with a combined vapour/particulate filter. Respirator must have an adequate protection factor. • A respirator with a combined vapour/particulate filter. Respirator must have an adequate protection factor.
Indoors - No ventilation	• 2 part polyurethane • 2 part epoxy and 2 part catalysed acrylic paints • organic solvents and water based paints	• A supplied air respirator* with an adequate protection factor. • A respirator with a combined vapour/particulate filter. Respirator must have an adequate protection factor. • A respirator with a combined vapour/particulate filter. Respirator must have an adequate protection factor.
Indoors - Mechanical Ventilation	• 2 part polyurethane • 2 part epoxy and 2 part catalysed acrylic paints • organic solvents and water based paints	• A supplied air respirator* with an adequate protection factor. • A respirator with a combined vapour/particulate filter. Respirator must have an adequate protection factor. • A respirator with a combined vapour/particulate filter. Respirator must have an adequate protection factor.
Spray Booth	• 2 part polyurethane • 2 part epoxy and 2 part catalysed acrylic paints • organic solvents and water based paints	• A su pplied air respirator with an adequate protection factor. • A respirator with a combined vapour/particulate filter. Respirator must have an adequate protection factor. • A respirator with a combined vapour/particulate filter. Respirator must have an adequate protection factor.
Confined space (As defined in AS 2865 *Safe working in confined spaces*)	• 2 part polyurethane • 2 part epoxy and 2 part catalysed acrylic paints • organic solvents and water based paints	• For all types of paint, a supplied air respirator with an adequate protection factor. Full facepiece or hood, continuous flow or positive pressure respirators are generally necessary.

*Note: Alternative respiratory protection may only be used in situations where the use of air supplied respirators increases the risk of injury to the operator due to falling, tripping, etc. The respiratory protective equipment required will depend on the toxicity of the paint and the conditions under which the paints are applied. The respirators must be selected as part of the risk assessment and control process.

To determine an adequate protection factor, the following needs to be considered:

- exposure standards for the various paint components. Exposure standards have not been established for some of the hazardous components of these paints (eg. curing agents);
- the information provided in the manufacturer's MSDS;
- ventilation in the area where the paint is to be applied;
- the level and duration of exposure and;
- the protection factor of the respirator.

The WorkSafe Western Australia Commission *Code of Practice for Personal Protective Equipment* provides further guidance on personal protective equipment. Full length overalls, appropriate chemically resistant gloves and eye protection must be worn during spraying.