



Government of **Western Australia**
Department of **Commerce**

Guidance note

Controlling hazards in the electroplating industry

Foreword

This guidance note is issued by the Commission for Occupational Safety and Health (the Commission) under the provisions of the *Occupational Safety and Health Act 1984* (the OSH Act).

The introduction of the OSH Act enabled the establishment of the tripartite Commission, which comprises representatives of employers, unions and government, as well as experts. It has the function of developing the occupational safety and health legislation and supporting guidance material, and making recommendations to the Minister for Commerce for their implementation. To fulfil its functions, the Commission is empowered to establish advisory committees, hold public inquiries, 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. This guidance note has been developed through a tripartite consultative process and the views of employers and unions, along with those of government and experts have been considered.

Scope and application of this guidance note

This guidance note applies to all workplaces in Western Australia covered by the OSH Act. It provides guidance for employers and workers on the management of safety and health risks that may arise in relation to hazards in the electroplating industry and some of the legislative requirements in the OSH Act and the Occupational Safety and Health Regulations 1996 (the OSH regulations).

It is not possible to deal with every situation that may be found at workplaces. Therefore, the practical guidance in this document should be considered in conjunction with the general duties in the OSH Act, as well as specific requirements in the OSH Act and the OSH regulations.

Legislative framework for occupational safety and health

Occupational Safety and Health Act 1984

The OSH Act provides for the promotion, co-ordination, administration and enforcement of occupational safety and health in Western Australia. It applies to all industries with the exception of mining and petroleum.

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

The broad duties established by the OSH Act are supported by a further tier of statute, commonly referred to as regulations, together with non-statutory codes of practice and guidance notes.

Occupational Safety and Health Regulations 1996

The OSH regulations have the effect of spelling out specific requirements of the legislation.

They may prescribe minimum standards and have a general application, or define specific requirements related to a particular hazard or type of work. They may also allow licensing or granting of approvals and certificates etc.

Regulations and codes of practice

If there is a regulation about a risk in the OSH regulations, it must be complied with.

If there is a code of practice about a risk, either:

- do what the code of practice says; or
- adopt and follow another way that gives the same level of protection against the risk.

If there is no regulation or code of practice about a risk, choose an appropriate way and take reasonable precautions and exercise proper diligence to ensure obligations are met.

Guidance notes and guidelines

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

Disclaimer

Information in this publication is provided to assist people in meeting occupational safety and health obligations. While information is correct at the time of publication, readers should check and verify any legislation referenced in this publication to ensure it is current at the time of use.

Changes in law after this document is published may impact on the accuracy of information. The Commission provides this information as a service to the community. It is made available in good faith and is derived from sources believed to be reliable and accurate at the time of publication.

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What is electroplating?

Electroplating is the coating of a metal object with another metal, using an electrical current passed through a chemical solution.

Metals used in coatings include:

- zinc;
- copper;
- brass;
- chromium;
- nickel;
- gold;
- silver;
- cadmium; and
- lead.

Most electroplating in Western Australia is done in small factories and workshops.

What gets electroplated?

There are two main areas of electroplating business in WA. One provides heavy coatings of hard metal such as chromium to machine parts.

The other provides light coatings to personal and domestic items, such as jewellery, ornaments, hobby items, motor vehicle parts and electronic components. The items may be new or second hand.

A smaller and more specialised industry uses electroplating in the manufacture of electronic circuit boards.

What is the law?

The OSH Act says employers must provide and maintain a work environment in which workers are not exposed to hazards.

The OSH regulations set down specific requirements for workplaces that use hazardous substances. These cover such things as:

- labelling of containers;
- Material Safety Data Sheets (MSDS);
- induction and safety training;
- record keeping;
- risk reduction; and
- health surveillance.

The OSH regulations say employers, main contractors and self employed persons must:

- identify hazardous substances;
- assess the risk of injury or harm; and
- control the risk by:
 1. preventing exposure to the hazardous substance;
 2. means other than personal protective equipment; and
 3. where 1 and 2 are not practical, by the use of personal protective equipment.

The OSH Act says employees must take reasonable care of their own safety and health and avoid adversely affecting the safety and health of others. They must comply with safety instructions, use personal protective equipment provided and report hazards or injuries.

Suppliers of hazardous substances must ensure containers are adequately labelled. They must also provide a current MSDS to the workplace when first supplying a hazardous substance, and thereafter when requested.

Designers, manufacturers, importers and suppliers must ensure, as far as practical, that people installing, maintaining or using their plant are not exposed to hazards.

Manufacturers or importers of hazardous substances
must prepare a MSDS.

Are you at risk?

Workers at electroplating workplaces may be exposed to hazardous substances.

These substances are mainly in the form of:

- fumes;
- vapours or mists; and
- metal dusts.

Other hazards in electroplating involve the use of:

- electricity;
- mechanical plant; and
- manual handling.

What are the risks?

Workers exposed to electroplating chemicals can develop:

- **short term** health problems such as throat, lung, sinus, skin and eye irritation and burns; and
- **long term** health problems such as asthma, skin, heart, lung and nerve disorders and, in some cases, cancer.

The risk of developing health effects depends on how much chemical is absorbed into the body.

In addition, electrolysis releases hydrogen bubbles which, unless safely contained or ventilated, can:

- **become explosive;** or
- **carry other chemicals** in a toxic mist.

What hazardous substances may be present?

Hazardous substances in electroplating may include:

- **solvents** such as methylene chloride, phenol, cresylic acid (a chemical similar to phenol);
- **gases** such as hydrogen cyanide;
- **acids** such as chromic and dichromic acid, sulphuric acid and hydrochloric acid;
- **alkalis** such as sodium hydroxide (also known as caustic soda);
- **cyanides** such as sodium and potassium cyanide;
- **heavy metals** such as nickel, chromates and dichromates, chromium, cadmium and lead; and
- **toxic wastes.**

These substances are commonly used or produced in the:

- preparation;
- coating; and
- polishing of metal items.

When can chemical exposure occur?

People working in electroplating can be exposed to chemicals when:

- containers leak or spill during transport, storage, decanting or disposal;
- explosive or toxic gas or fumes build up during storage in confined or poorly ventilated areas;
- operators are splashed by items being lifted in or out of plating tanks;
- excessive bubbling or fuming occurs in acids, caustic or other chemicals;
- dust is breathed in during buffing or grinding of plated items;
- excessive hydrogen or oxygen is emitted during electrolysis or anodising, causing an explosive or flammable atmosphere;
- local exhaust ventilation fails, or is inadequate to handle escaping gases, fumes and mists;
- overhead gantry cranes, hooks or slings fail when lowering or lifting items from dip tanks;
- residue liquid and sludge is removed from dip tanks;
- poor housekeeping (for example, substances dripping onto handrails) causes skin contact with plating solutions;
- maintenance and repair work is done to tanks;
- chemical wastes are disposed of in sewers before being properly neutralised; and
- chemical wastes are disposed of at tipping sites without Department of Environmental and Conservation approval and procedures.

How can hazardous substances enter the body?

Hazardous substance can enter the body through:

- the skin or eyes, following contact with liquids or droplets;
- the lungs and nasal passages, when fumes, droplets, gases or dusts are inhaled; or
- the mouth, when eating or smoking with contaminated hands.

How can hazards be identified?

Workplace hazards can be identified through:

- reading packaging or container labels and MSDS;
- regular communication between workers, supervisors and employers about likely hazards, such as toolbox meetings;
- frequent inspection of workplaces, plant and equipment;
- regular review of tasks and procedures; and
- checking previous incident and injury records for recurring situations.

How can risk be assessed?

General hazards:

The risk of injury or harm from general workplace hazards can be assessed by:

- assessing the likelihood of the hazard causing injury or harm;
- assessing the likely severity of injury or harm;
- checking records of previous incidents and injuries where hazards have caused injury or harm; and
- checking plant and equipment to make sure hazards are properly controlled, for example, whether it is guarded in accordance with the manufacturer's specifications or Australian Standards.

Hazardous substances:

In addition, the risk of injury or harm from hazardous substances can be assessed by:

- obtaining information about the hazards, such as MSDS, labels, operating manuals, and Australian Standards;
- checking work processes to make sure hazards are adequately controlled, for example, whether chemicals are used in accordance with their MSDS;
- conducting atmospheric monitoring to determine levels of inhalation exposure to chemicals such as chromic acid; and
- conducting health surveillance to detect any adverse health effects from chemicals at an early stage.

How can risk be reduced?

Risk can be reduced by using control methods, in the following order of priority:

- eliminate or remove the hazard, for example by eliminating the use of a chemical or item of plant if it is not required;
- substitute or replace the hazard with safer plant, equipment or substance;
- isolate the hazard from workers, for example by using enclosed systems for chemicals, relocation of workers or physical barriers;
- introduce engineering controls, such as guarding or exhaust ventilation;
- administrative controls, for example by limiting workers' time spent near the hazard; and
- personal protective equipment.

Safety goggles and respirators, while essential for some work procedures, should be last in the list of priorities.

What information and training is required?

All workers must be informed of hazards in the workplace. Workers must be given information, instruction, training and supervision in safe procedures, including use, storage and maintenance of personal protective clothing and equipment. This information should be provided to workers in a manner that is readily understood with special consideration given to language and literacy issues.

Workers should know how to identify hazards, and to report them to a supervisor.

Training should be ongoing, with regular revision of safe procedures.

Workers who may be at risk of exposure to hazardous substances must receive training before commencing work. This training must include:

- the potential health risk and any toxic effects associated with the hazardous substance;
- the control measures used to minimise the risk to safety and health;
- the correct use of methods to minimise adverse effects of exposure to the hazardous substance;
- the correct care and use of personal protective clothing and equipment; and
- the need for, and details of, health surveillance.

Records of information and training in relation to hazardous substances must be maintained. For other types of training, records are recommended as the most practical way of establishing the need for refresher training and demonstrating that appropriate training has been held.

What is Health Surveillance?

Health surveillance is the monitoring of individuals to identify changes in their health due to exposure to hazardous substances. It must be supervised by a medical practitioner, appointed by the employer, who is adequately trained to conduct health surveillance for the hazardous substance in question.

It is mandatory to conduct health surveillance for workers where their exposure to specified chemicals, such as chromium, cadmium and inorganic mercury, presents a health risk. The full list of these chemicals may be found in the OSH regulations. For other chemicals, health surveillance may be required if a risk assessment has:

- identified that there is a reasonable likelihood that workers may contract an identifiable disease or health effect; and
- the disease or health effect can be detected by a scientifically recognised technique.

Health surveillance must be provided at no cost to the worker.

What first aid facilities?

First aid facilities should be appropriate for the hazards in the workplace and should comply with the Commission for Occupational Safety and Health's *Codes of Practice for First Aid Facilities and Services, Workplace Amenities and Facilities, and Personal Protective Clothing and Equipment*.

First aid methods vary depending on the substance and the nature of the exposure. The MSDS provides information on the first aid methods that are appropriate to use for a particular hazardous substance. Electroplating workplaces usually use acids and alkalis, which generally require a plumbed eye wash and safety shower to ensure adequate decontamination in the event of eye or skin contact.

As far as practical, employers must ensure that there are people trained in first aid available to give first aid, with consideration given to the types of hazards, their risks and the number of people at the workplace.

What other facilities?

Suitable facilities must be provided for workers who eat their meals at work, to minimise the risk of accidental ingestion of a hazardous substance. Meals should be consumed in an uncontaminated area that is kept clean and hygienic.

All areas should be kept as clean as practical to avoid the risk of accidental contamination.

Hand rails near electroplating tanks should be cleaned on a regular basis. Hand washing facilities should be kept stocked with soap and non-reusable towels at all times.

Safe storage

General principles should involve:

- storing hazardous substances in a cool, lockable, enclosed area with adequate ventilation;
- storing incompatible substances separately, such as cyanides away from acids, and avoiding risk of mixing or cross contamination;
- ensuring all labels remain intact on containers and packaging;
- limiting access to chemical storage areas to authorised people only;
- ensuring flammable, explosive or toxic substances are stored away from possible sources of electrical spark, heat or flame, and that smoking in storage areas is prohibited;
- checking all containers against leakage or seepage – keeping lids and caps tightly sealed;
- ensuring there is a method to collect and treat any spilled chemicals, such as using pallets with bunds or concrete bunds;
- ensuring forklift and other mobile plant operators are formally trained in safe procedures for chemical containers;
- appropriate fire fighting and emergency equipment; and
- monitoring atmospheric contamination and temperature levels in storage areas where a risk assessment indicates there could be a problem.

Chemicals that are dangerous goods must be stored in accordance with the Dangerous Goods (Storing and Handling of Non-Explosives) Regulations 2007 administered by the Resources Safety Division of the Department of Minerals and Petroleum.

Register of hazardous substances

A current register of hazardous substances used in the workplace must be kept and made readily available to everyone who might be exposed to the substance, including emergency services personnel. As a minimum, the register must contain a list of the hazardous substances used, the MSDS for each hazardous substance, and reference to the risk assessment carried out for each hazardous substance.

Controlling plating tank hazards

General principles should include:

- substitute hazardous substances with less hazardous ones;
- where possible, pump chemicals into plating tanks rather than pouring manually from containers;
- pumps need to be cleaned before use with a different chemical;
- use local exhaust ventilation along one or more sides of the tank to remove mists and vapours;
- use a suppressant to minimise the amount of mist generated during electroplating;
- attach items to lifting equipment securely and train operators in safe procedures to minimise the risk of items accidentally dropping into tanks and splashing operators;
- ensure that tanks do not overheat by using monitoring systems or procedures; and
- ensure overhead cranes, hooks and slings are regularly maintained.

Controlling cyanide hazards

Acids and cyanides are an explosive combination, and should be clearly labelled and stored in locked, dry places, well away from each other.

Articles treated in acid baths should be thoroughly rinsed with water before being placed in plating tanks.

Drainage should be designed so there is separation of acid spillage from cyanide spillage or effluent.

Buffing, grinding and polishing

Newly electroplated surfaces on heavy machinery parts are usually finished with portable or fixed grinding machines.

Finer finishes on personal, hobby or household items are achieved with buffing and polishing wheels, containing various polishes and waxes.

These processes generate large amounts of metal dusts, some of which are hazardous if inhaled.

Local exhaust ventilation should be fitted to grinding and buffing machines to remove dust as it is generated. Where there is still a hazard, respiratory protection must be selected and worn in accordance with the Australian/New Zealand Standard 1715:1994 *Selection, Use and Maintenance of Respiratory Protective Devices*.

Where carcinogenic substances are used, exposure levels should be kept as low as reasonably possible.

Controlling waste hazards

Electroplating produces substantial amounts of chemical waste such as metal salts, acids, alkalis and cyanides.

Ensure all containers of waste are labelled correctly and labels are kept intact. Where hazardous substances are decanted into smaller containers for storage, the new container must be adequately labelled. As a minimum, the label must contain the name of the product, risk phrases and safety phrases in full text.

Unless safely disposed of, hazardous substances can cause health risks to people at the workplace or to others, such as workers conducting sewer maintenance. They can also harm the environment and interfere with sewerage treatment.

Wastewater disposal into sewers must be in accordance with Water Corporation requirements. An industrial waste permit is required from the Water Corporation. Any discharge must be treated to meet Water Corporation acceptance criteria, and comply with all conditions of the industrial waste permit. For further information contact the Water Corporation's Commercial and Industrial Services Section.

Solid chemical waste is disposed of at landfill sites. This must be done in accordance with requirements of the Department of Environment and Conservation.

Disposal of toxic liquid wastes into storm water drains is illegal.

Stockpiling of hazardous wastes increases the risk of spills, hazardous reactions, label damage resulting in lack of information, and fire. Wastes should be disposed of on a regular basis.

Controlling electricity hazards

A combination of electricity, water, and damp, corrosive conditions increases the risk from electrical hazards in electroplating.

Conductive and corrosive fluids may be spilled on floors. People may have to work close to electrical systems and exposed conductors.

Injury from electric shock, electric burn, electrical arcing, fire or explosion caused by electrical energy may occur unless adequate controls are in place.

Electrical hazards in electroplating may be associated with:

- pumps;
- filters;
- blowers;
- centrifuges;
- heaters;
- grinding and buffing machines; and
- hand held electrical tools.

The design and maintenance of electrical systems are critical. The system and items such as transformers and heaters should be checked regularly for problems such as:

- damaged insulation;
- exposed live high voltage conductors; and
- corrosion of system parts.

Electrical equipment in a workplace must be subject to appropriate checks, tests and inspections necessary to reduce the risk of injury or harm occurring to a person at the workplace.

Portable electrical tools must be protected by a residual current device (RCD) to minimise the risk of shock.

Electrical equipment, including RCDs, must be regularly checked, tested and inspected by a competent person.

Controlling machinery hazards

Machinery used in electroplating workshops includes forklifts, overhead travelling cranes, hoists, buffing and grinding machines and portable tools such as angle grinders.

To reduce the risk of injury employers need to ensure that:

- plant has been properly designed;
- plant is used in accordance with manufacturers' instructions;
- workers are trained in safe use of the plant;
- plant is properly maintained; and
- moving or hazardous parts are adequately guarded.

In relation to machinery and equipment at the workplace:

- as far as practical, dangerous moving parts such as gears, pulleys and belts must be guarded;
- a safe work system must be implemented for forklifts, as far as practical; and
- cranes must be maintained, inspected and operated in accordance with written instructions developed at the time of design or manufacture or, if these cannot be obtained, with ones approved by the WorkSafe Western Australia Commissioner or, if it is not practical to obtain either of these, with Australian Standard AS 2550.1 and relevant parts of Australian Standard AS 2550 and Australian/New Zealand Standard AS/NZS1418.

Controlling manual handling hazards

Manual handling hazards in electroplating may include pushing, pulling, lifting or carrying heavy chemical containers, plant and items being electroplated.

They may also involve prolonged or awkward holding of heavy objects during grinding, or use of portable power tools such as angle grinders. Buffing and grinding on fixed machines may require excessively repetitive movement.

These activities can result in strain injuries, and wet floors and stairs can increase the risk of strain injuries from slipping.

Controlling manual handling hazards involves:

- identifying all hazards associated with manual handling;
- assessing the risk arising from the hazards; and
- deciding on and using appropriate control measures.

Control measures may include using:

- smaller containers;
- trolleys;
- cranes;
- safe manual handling procedures; and
- safety training in manual handling tasks.

Further information

Further information may be obtained on the matters covered in this publication from:

WorkSafe
Department of Commerce
1260 Hay Street
WEST PERTH WA 6005
Tel: 1300 30 78 77
Email: safety@worksafe.wa.gov.au

Chamber of Commerce and Industry WA
180 Hay Street
EAST PERTH WA 6000
Tel.: 9365 7555
Email: info@cciwa.asn.au

Department of Environment and Conservation
The Atrium
168 St George's Terrace
PERTH WA 6000
Tel: 6467 5000

Department of Health (Environmental Health Directorate)
Grace Vaughan House
227 Stubbs Terrace
SHENTON PARK WA 6008
Tel: 9388 4999
UnionsWA
Level 4
445 Hay St
PERTH WA 6000
Tel: 9328 7877
Email: unions@unionswa.com.au

For advice regarding requirements for discharge of electroplating wastewater to sewers, contact:

Water Corporation
Tel: 13 13 95
Email: cust_centre@watercorporation.com.au

ISBN: 978-1-920836-37-5