

Compliance code

Lead

Edition 1

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This compliance code (**Code**) provides practical guidance for those who have duties or obligations under the *Occupational Health and Safety Act 2004* (**OHS Act**) and the Occupational Health and Safety Regulations 2017 (**OHS Regulations**), in relation to exposure to lead in the workplace.

The Code was developed by WorkSafe Victoria (**WorkSafe**). Representatives of employers and employees were consulted during its preparation. It was made under the OHS Act and approved by Ingrid Stitt MP, Minister for Workplace Safety.

Duty holders under the OHS Act and OHS Regulations should use this Code to assist them in complying with their duties under the OHS legislation.

While the guidance provided in the Code is not mandatory, a duty holder who complies with the Code will – to the extent it deals with their duties or obligations under the OHS Regulations or OHS Act – be taken to have complied with those duties or obligations.

If conditions at the workplace or the way work is done raise different or additional risks not covered by the Code, compliance must be achieved by other means. WorkSafe publishes guidance to assist with this at **[worksafe.vic.gov.au](https://www.worksafe.vic.gov.au)**.

Failure to observe the Code may be used as evidence in proceedings for an offence under the OHS Act or OHS Regulations. However, a duty holder will not fail to meet their legal duty simply because they have not followed the Code. A WorkSafe inspector may cite the Code in a direction or condition in an improvement notice or prohibition notice as a means of achieving compliance.

A health and safety representative (**HSR**) may cite the Code in a provisional improvement notice when providing directions on how to remedy an alleged contravention of the OHS Act or OHS Regulations.

Approval for the Code may be varied or revoked by the Minister. To confirm the Code is current and in force, go to **[worksafe.vic.gov.au](https://www.worksafe.vic.gov.au)**.

Part 1 – Introduction

Purpose

1. The purpose of this Code is to provide practical guidance to duty holders on how to comply with their duties under the OHS Act and Part 4.3 (Lead) of the OHS Regulations in relation to managing health and safety risks associated with lead exposure in the workplace.

Scope

2. This Code provides information for duty holders about meeting their obligations under Part 4.3 (Lead) of the OHS Regulations, and specific duties under the OHS Act, where relevant (eg, an employer's duty to consult with employees).
3. This Code also provides information about how to identify hazards and control the risks associated with exposure to lead in the workplace.
4. It is not possible for this Code to deal with every risk associated with lead exposure that a duty holder may encounter at their workplace. The guidance in this Code needs to be considered with regard to the particular activities undertaken and the characteristics and circumstances of the workplace.

Application

5. This Code applies to employers, employees including independent contractors, self-employed persons and persons with management or control of a workplace. Additionally it may also be useful for HSRs.
6. A workplace is a place, whether or not in a building or structure, where employees or self-employed persons work. [OHS Act s5](#)

Note: The word **must** indicates a legal requirement that has to be complied with. The words **need(s) to** are used to indicate a recommended course of action in accordance with duties and obligations under Victoria's health and safety legislation. The word **should** is used to indicate a recommended optional course of action.

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How to use this Code

Step 1: Determine if a lead process is being undertaken in your workplace

Lead processes are specific activities that involve a high risk of lead exposure. To determine if a lead process is being undertaken in your workplace, see **Part 1 – What are lead processes?**

Step 2: Understand lead process duties

If a lead process is being undertaken, specific employer duties apply. For more information on these duties, see **Part 2 – Duties of employers** and **Part 3 – Controlling risks associated with lead processes**.

Step 3: Determine if the lead process is lead-risk work

If a lead process is being undertaken, the employer must determine if this is lead-risk work.

Lead-risk work is a lead process that is reasonably likely to cause an employee's blood lead level to reach a certain threshold.

To determine if a lead process is lead-risk work, see **Part 1 – What is lead-risk work** and **Part 2.4 – Identify lead-risk work**.

Step 4: Understand lead-risk work duties

If lead-risk work is being undertaken, health monitoring duties apply. Health monitoring helps to minimise the risk of adverse health effects caused by lead by regularly checking employee's blood lead levels.

For more information on health monitoring, see **Part 4 – Health monitoring for lead-risk work**.

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What is lead?

7. Lead is a naturally occurring metal, which can combine with other substances to form various lead alloys and compounds.

How does lead get into the body?

8. While solid lead presents little or no risk to people, it becomes a health risk when it is processed in a way that makes it more likely to be taken into the body.
9. It can be inhaled through dust, fumes or mist. It can also be swallowed, for example when a person's hands come into contact with lead (such as through touching lead dust on surfaces or contaminated clothing in the work environment) and then they eat, drink or smoke.
10. Any lead absorbed will circulate in the blood where it is both slowly excreted in the urine and stored in the bones. The body can get rid of lead naturally over time, however the levels of lead may increase if it enters the body faster than it can get rid of it.

Note: Lead is not absorbed through the skin, except for some organic lead compounds that are not covered by Part 4.3 (Lead) of the OHS Regulations. For more information about working with organic lead compounds, see the *Hazardous substances compliance code*.

Health effects of lead

11. Lead can stay in bones for years without causing any health effects. However if the level of lead absorbed into the body gets too high it can cause both immediate and long-term health effects.
12. Early signs and symptoms of high lead levels can include:
 - headaches
 - tiredness
 - irritability
 - nausea
 - stomach pains
 - anaemia.
13. Continued exposure can cause far more serious symptoms such as:
 - kidney damage
 - nerve and brain damage
 - lead palsy
 - death.
14. A developing unborn child is particularly at risk from exposure to lead, especially in the early weeks of pregnancy.

Measuring lead in the body

15. The amount of lead present in a person's body is measured using a blood test. Employers have a legal duty to arrange for regular biological monitoring for employees who perform work that is reasonably likely to result in their blood lead level reaching certain thresholds, known as lead-risk work. This is to keep track of the amount of lead in the employees' blood. For more information on biological monitoring, see Part 4 of this Code.

What are lead processes?

OHS Regulations r178

16. Specific duties under Part 4.3 (Lead) of the OHS Regulations apply to all workplaces where lead processes are undertaken.
17. Lead processes are specific activities that involve a high risk of lead exposure, and are outlined in regulation 178 of the OHS Regulations.
18. If one or more of the following items are applicable, the activity is a 'lead process' and carries a potential health risk:
 - work that exposes a person to lead dust or lead fumes arising from the manufacture or handling of dry lead compounds
 - work in connection with the manufacture, assembly, handling or repair of, or parts of, batteries containing lead that involves the manipulation of dry lead compounds or the pasting or casting of lead
 - breaking up or dismantling of batteries containing lead, or sorting, packing and handling of plates or other parts containing lead removed or recovered from those batteries
 - spraying with molten lead metal or alloys containing greater than 5% by weight of lead metal
 - melting or casting of lead alloys containing greater than 5% by weight of lead metal in which the temperature of the molten material exceeds 450°C
 - recovery of lead from its ores, oxides or other compounds by a thermal reduction process

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- dry machine grinding, discing, buffing or cutting by power tools of lead containing greater than 5% by weight of lead metal
 - machine sanding or buffing of surfaces coated with paint containing greater than 1% by dry weight of lead metal
 - a process in which electric arc, oxy-acetylene, oxy gas, plasma arc or a flame is applied, for the purposes of welding, cutting or cleaning, to the surface of metal that is coated with lead or paint containing more than 1% by dry weight of lead metal
 - radiator repairs if exposure to lead dust or lead fumes may occur
 - fire assays, if lead is used
 - hand grinding and finishing of lead or alloy containing more than 50% by weight of lead metal
 - spray painting with lead paint containing more than 1% by dry weight of elemental lead
 - melting of lead metal or alloy containing greater than 50% by weight of lead metal if the exposed surface area of the molten material is greater than 0.1 square metres and the temperature of the molten material does not exceed 450 °C
 - use of a power tool, including abrasive blasting and high pressure water jets, to remove any surface coated with paint containing greater than 1% by dry weight of lead metal and the handling of waste containing lead resulting from that removal
 - a process that exposes a person to lead dust or lead fumes arising from the manufacture or testing of detonators or other explosives that contain lead
 - a process that exposes a person to lead dust or lead fumes arising from the firing of weapons at an indoor firing range
 - foundry processes involving –
 - > the melting or casting of lead alloys containing more than 1% by weight of lead metal in which the temperature of the molten material exceeds 450 °C, or
 - > the dry machine grinding, discing, buffing or cutting by power tools of lead alloys containing more than 1% by weight of lead metal
 - a process at a workplace determined by WorkSafe to be a lead process.
19. For more information about the duties that apply to lead processes, see Parts 2 and 3 of this Code.

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What is lead-risk work?

20. If performing a lead process is reasonably likely to cause an employee's blood lead level to reach a certain threshold, that process is lead-risk work.
- OHS Regulations r193** The current levels for determining lead-risk work are:
- 0.97 $\mu\text{mol/L}$ (20 $\mu\text{g/dL}$) for female employees not of reproductive capacity and male employees, or
 - 0.24 $\mu\text{mol/L}$ (5 $\mu\text{g/dL}$) for female employees of reproductive capacity

For information about converting blood lead levels in micromoles per litre ($\mu\text{mol/L}$) to micrograms per decilitre ($\mu\text{g/dL}$) see Appendix B.

Note: A female employee is assumed to be of reproductive capacity unless she provides her employer with a written statement advising the contrary. **OHS Regulations r179**

21. Not all lead processes will be lead-risk work. The nature of the work and risk controls, including personal hygiene, will determine whether a lead process becomes lead-risk work.
22. When lead-risk work is undertaken, employers have specific duties under Part 4.3 (Lead) of the OHS Regulations that apply in addition to the duties for lead processes.
23. For more information about the duties that apply to lead-risk work, see Parts 2 and 4 of this Code.

Who has duties?

Note: The OHS Act sets out general duties that apply to employers, employees, manufacturers, importers and suppliers. The OHS Regulations specify the way in which duties imposed by the OHS Act must be performed. Duty holders must ensure they are complying with their obligations under both the OHS Act and the OHS Regulations. For information about the compliance framework see Appendix A.

Employers

24. Employers must provide and maintain, so far as is reasonably practicable, a working environment for their employees that is safe and without risks to health. **OHS Act s21**

For information about what reasonably practicable means, when complying with Part 3 of the OHS Act or the OHS Regulations, see the WorkSafe Position *How WorkSafe applies the law in relation to reasonably practicable* at **worksafe.vic.gov.au**.

25. To ensure that employers provide a working environment that is safe and without risks to health, they must eliminate risks to health and safety so far as is reasonably practicable, and if it is not reasonably practicable to eliminate the risks to health and safety, reduce those risks so far as is reasonably practicable. **OHS Act s20**

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26. Employers must, so far as is reasonably practicable, monitor conditions at any workplace under the employer's management and control. [OHS Act s22\(1\)\(b\)](#)
27. Employers must also, so far as is reasonable practicable, ensure that persons other than employees are not exposed to risks to their health or safety arising from the business activities undertaken by the employer. [OHS Act s23](#)
28. An employer's duties under sections 21 and 35 of the OHS Act, and regulations that set out the way an employer complies with their duties to employees under those sections of the OHS Act, extend to independent contractors engaged by the employer and any employees of an independent contractor working at the workplace. However, these extended duties are limited to matters over which the employer has control. [OHS Act s21\(3\) and 35\(2\)](#), [OHS Regulations r8\(1\)](#)

Specific employer duties: Lead processes

29. Employers also have a number of specific duties under Part 4.3 (Lead) of the OHS Regulations when lead processes are undertaken in their workplace. These duties include:

- informing job applicants of the health risks and toxic effects of lead exposure, and the need for, and details of, medical examinations and biological monitoring [OHS Regulations r182](#)
- ensuring that before an employee first starts work in a lead process, they have been informed of the need for and details of medical examinations and biological monitoring [OHS Regulations 183](#)
- ensuring that any risks associated with exposure to lead in the workplace are eliminated, or if this is not reasonably practicable, controlled in accordance with the hierarchy of controls, so far as is reasonably practicable [OHS Regulations r184](#)

For more information about the hierarchy of controls, see Part 3 of this Code.

- reviewing and, if necessary, revising any measures implemented to control risks associated with exposure to lead at the workplace as outlined in [OHS Regulations r185](#)
- ensuring that employees are not exposed to an airborne concentration of lead dust, lead mist or lead fumes above the relevant exposure standard [OHS Regulations r186](#)

For more information about the lead exposure standard see Part 2.3 of this Code.

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- ensuring atmospheric monitoring OHS Regulations r186 and health monitoring is carried out when required OHS Regulations r196 and r197
- ensuring, so far as is reasonably practicable that any lead contamination is contained OHS Regulations r188
- ensuring, so far as is reasonably practicable, that lead process areas are kept clean and that appropriate cleaning methods are used OHS Regulations r189
- ensuring the prohibition on eating, drinking and smoking in lead process areas is complied with OHS Regulations r190
- providing and maintaining, so far as is reasonably practicable, changing and washing facilities for employees OHS Regulations r191
- providing for the laundering or disposal of protective or work clothing contaminated with lead dust OHS Regulations r192

For more information about complying with these duties see Parts 2 and 3 of this Code.

Specific employer duties: Lead-risk work

30. Employers have a duty to identify if a lead process is lead-risk work. OHS Regulation r194
For more information about how to identify if a lead process is lead-risk work, see Part 2.4 of this Code.
31. Where lead-risk work is identified, employers must notify WorkSafe in writing within seven days. OHS Regulation 195
The notification of lead-risk work form is available from **worksafe.vic.gov.au**
32. Employers also have specific duties to provide health monitoring to employees engaged in lead-risk work. OHS Regulations 196 – 204
For more information about complying with health monitoring duties see Part 4 of this Code.

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Employees

33. Employees while at work must take reasonable care for their own health and safety and that of others who may be affected by their acts or omissions in the workplace. Employees must also cooperate with their employer's actions to make the workplace safe, for example, by following any information, instruction or training provided. [OHS Act s25\(1\)](#)
34. Specific duties apply to employees engaged in lead processes. These include:
 - Do not eat, drink, chew gum, smoke or carry food, drink, gum or materials used for smoking in any lead process area. [OHS Regulations r205\(1\)](#)
 - Remove any lead-contaminated clothing and equipment used before entering an area designated for eating or drinking. [OHS Regulations r205\(2\)](#)
 - Wash face and hands after leaving the area where a lead process is undertaken and before eating, drinking or smoking. [OHS Regulations r205\(3\)](#)
35. Employees also need to use the risk-control measures put in place by the employer, including wearing any personal protective equipment (PPE) that has been provided and following procedures for removing contaminated clothing and washing or showering before leaving work (employees may need to use shower facilities to completely remove lead contamination from their skin and hair).

Consultation

36. Employers must, so far as is reasonably practicable, consult with employees and HSRs (if any) on matters related to health and/or safety that directly affect, or are likely to directly affect them. This duty to consult also extends to independent contractors (including any employees of the independent contractor) engaged by the employer in relation to matters over which the employer has control. [OHS Act s35](#)
37. An employer has a duty to consult with employees (including HSRs, if any) and independent contractors when, for example, identifying or assessing hazards or risks to health or safety at the workplace, making decisions about measures to control such risks and proposing changes that may affect the health or safety of employees at the workplace. [OHS Act s35](#)

Note: The characteristics of the workplace will have an impact on the way consultation is undertaken. For example, consider:

- the size and structure of the business
- the nature of the work
- work arrangements (such as shift work)
- characteristics of employees (such as language or literacy).

Go to [worksafe.vic.gov.au](https://www.worksafe.vic.gov.au) for more information on consultation.

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38. Where employees are represented by an HSR employers must:
- provide the HSR with all information they provide, or intend to provide, to employees
 - where possible, provide information to the HSR a reasonable time before providing the information to employees
 - invite HSRs to meet to consult about the matter
 - meet with HSRs, if requested to do so
 - give HSRs a reasonable opportunity to express views about the matter
 - take into account the HSR's views about the matter. [OHS Regulations r21](#)
39. It is important to consult with employees as early as possible when planning to:
- introduce new work or change existing work
 - select new plant
 - refurbish, renovate or redesign existing workplaces
 - carry out work in a new environment.
40. Employers who are required to consult on a matter must share information about the matter with employees, including independent contractors and HSRs (if any). Employees must be given a reasonable opportunity to express their views, and those views must be taken into account before a decision is made. If employees are represented by an HSR, the consultation must involve that HSR (with or without the involvement of the employees directly). If the employer and the employees have agreed to procedures for undertaking consultation, the consultation must be undertaken in accordance with those procedures. [OHS Act s35](#)
41. Employees and contractors may have practical suggestions or potential solutions that can be implemented.

Part 2 – Duties of employers

2.1 Provision of information to job applicants and employees

Providing information to job applicants

42. Employers have a duty to inform applicants for jobs involving lead processes of the health risks and toxic effects of lead exposure, as well as the requirements for medical examinations and biological monitoring. [OHS Regulations r182](#)

Providing information, instruction, training and supervision

43. Before employees first start work in a lead process, employers must inform them of the need for and details of medical examinations and biological monitoring. [OHS Regulations r183](#)
44. Employers must provide employees with any necessary information, instruction, training or supervision to enable them to perform their work in a way that is safe and without risks to health. This duty also extends to independent contractors (including any employees of the independent contractor) engaged by the employer in relation to matters over which the employer has control. [OHS Act s21\(2\)\(e\)](#)
45. The mix of information, instruction, training or supervision required will depend on the frequency and type of hazards in the workplace, and how much employees already know about the risks and necessary risk control measures.
46. Information, instruction and training needs to cover the nature of the hazards associated with lead used in the workplace, including the need for risk control measures and how to properly use and maintain them.
47. Where employees undertaking the work are new and inexperienced, such as young workers, it is often necessary to provide additional supervision.

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48. When providing information, instruction and training to employees and independent contractors it is important to include information about:
- the type of lead hazard that the employee is being exposed to
 - how lead enters the body
 - the potential risks to health from exposure; special attention needs to be given to the effects on the nervous and reproductive systems, and the risks to unborn children
 - control measures, including information on the correct use and maintenance of risk controls
 - the work practices and procedures to be followed when using lead in the workplace, including handling, processing, storage, clean up and disposal of lead containing substances
 - the importance of minimising lead dust or fumes in the workplace atmosphere
 - the use of PPE (including its limitations)
 - the importance of identifying any defects in the control measures or respiratory protection
 - the purpose and results of air and health monitoring
 - the importance of maintaining a high level of personal hygiene, and of not smoking, eating or drinking in lead process areas
49. The structure, content and delivery of the training needs to take into account any special requirements of the employees and independent contractors being trained. For example, information, instruction and training may need to be provided in a language other than English. Other considerations for how training is delivered include specific skills or experience, disability, literacy and age.
- For more information on providing information, instruction and training in culturally and linguistically diverse workplaces, see the *Communicating occupational health and safety across languages compliance code*.
50. Employers need to review their training programs regularly and also when:
- there is a change to work processes, plant or equipment
 - there is an incident
 - new control measures are implemented
 - there is a request by an HSR
 - changes are made to relevant legislation, or
 - any other issues may impact the way work is performed.
51. Employers need to keep records of induction and training given to employees.
52. Refresher training needs to be provided as appropriate for the workplace. The frequency of refresher training should be determined having regard to the complexity of the work, the skills required and the frequency with which tasks or work are carried out.

Part 2 – Duties of employers

2.2 Control of risk

53. Where a lead process is carried out in a workplace, employers must, so far as is reasonably practicable, eliminate any risk associated with exposure to lead. If the risk cannot be eliminated, they must reduce the risk, so far as is reasonably practicable, according to the hierarchy of control set out in Part 4.3 of the OHS Regulations:
- substituting lead with:
 - i. a substance that is less hazardous, or
 - ii. a less hazardous form of lead
 - isolating the source of exposure to lead
 - using engineering controls to reduce exposure to lead
 - combining any of these risk control measures.
54. When these control measures have been applied, so far as is reasonably practicable, any remaining risk must be reduced by using administrative controls. If a risk still remains, it must be controlled by providing appropriate PPE to employees at risk.
55. Employers also have a duty to review, and if necessary, revise any measures implemented to control risks associated with exposure to lead in certain circumstances.
56. For more information on the hierarchy of control see Part 3.1 of this Code.
57. Employers also have specific duties relating to certain control measures, such as workplace and personal hygiene. For more information on these duties see Part 3.2 of this Code.

2.3 Lead exposure

58. The amount of lead that enters the body is likely to increase the more often and longer an employee is exposed to lead containing dust, lead mist or lead fumes.
59. Undertaking regular assessments of the workplace to look for signs of lead exposure can help employers estimate how much lead employees are being exposed to through inhalation or accidental ingestion. This can include a visual assessment, looking for the presence of lead mist, fume or dust in the air or lead dust on surfaces, clothing or employees' hands.
60. Employers also need to consider the quantities of lead used in the workplace, how often and for how long employees are working in lead processes, the effectiveness of control measures and the possible routes of exposure to lead, including inhalation and ingestion.
61. Employers must ensure employees and contractors are not exposed to an airborne concentration of lead dust, lead mist or lead fumes above the exposure standard. This is the maximum airborne concentration of lead that a person may be exposed to in their breathing zone, averaged over an 8 hour work day and 40 hour work week. **OHS Regulations r186(1)**
62. The current exposure standard for lead is 0.05 mg/m³ calculated as a time-weighted average over an 8 hour work day and 40 hour work week. **OHS Regulations r186(1A)**

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63. Employers must monitor the airborne concentration of lead dust, lead mist or lead fumes if there is uncertainty (based on reasonable grounds) as to whether the lead exposure standard is or may be exceeded, or to determine whether there is a health risk. [OHS Regulations r186\(2\)](#) The results of any monitoring of the airborne concentration of lead dust, lead mist or lead fumes must be provided to any employee who has been, or may be, exposed to them, as soon as is reasonably possible. [OHS Regulations r187](#)
64. Monitoring the airborne concentration of lead can enable an employer to understand how much lead employees are exposed to through inhalation. It can also assist in determining the effectiveness of the engineering controls in place, such as local exhaust ventilation. This information should be used along with visual assessments of tasks and blood test results to gain an overall understanding of employees' exposure and risk.
65. Exposure standards for airborne lead dust, lead mist or lead fumes do not represent a totally safe exposure level for everyone, and only take into account exposure through inhalation. Any risk associated with exposure to lead must be eliminated, or if this is not reasonably practicable, reduced so far as is reasonably practicable, even if the exposure standard is not exceeded. [OHS Regulations r184](#)

2.4 Identify lead-risk work

66. If lead processes are being undertaken in the workplace, the employer must determine whether the lead process is lead-risk work.
67. Employers must identify a lead process as either:
- reasonably likely to cause blood lead levels of employees to exceed those set out below; or
 - not reasonably likely to cause blood lead levels of employees to exceed those set out below.

[OHS Regulations r194\(1\)](#)

Blood lead levels for lead-risk work

0.97 µmol/L (20 µg/dL) for female employees not of reproductive capacity and male employees, or

0.24 µmol/L (5 µg/dL) for female employees of reproductive capacity

Note: A female employee is assumed to be of reproductive capacity unless she provides her employer with a written statement advising the contrary. [OHS Regulations r179](#)

Part 2 – Duties of employers

68. The employer must take into account the following:
- past biological monitoring results of employees
 - whether the airborne lead level is more than half the lead exposure standard
 - the form of lead to be used
 - the specific tasks or processes required to be undertaken with the lead
 - the likely frequency and duration of exposure to lead
 - possible routes of exposure to lead
 - any information about incidents, illnesses or diseases associated with the use of lead at the workplace.
- OHS Regulations r194(2)
69. If employee blood lead levels are likely to exceed the levels above, the lead process is lead-risk work.
70. If an employer is unable to identify whether a lead process is lead-risk work or not, it must be treated as lead-risk work until the employer establishes otherwise.
- OHS Regulations r194(4)
71. When lead-risk work is identified, employers must notify WorkSafe in writing within seven days using the notification of lead-risk work form, available from [worksafe.vic.gov.au](https://www.worksafe.vic.gov.au).
- OHS Regulations r195
72. Employers have specific duties to provide health monitoring to employees engaged in lead-risk work. For more information about these duties see Part 4 of this Code.

2.5 Lead-containing hazardous substances

73. Some lead-containing products, such as powders, are classified as hazardous substances. Hazardous substances are substances that have the potential to harm human health.
74. A hazardous substance means a substance that satisfies the criteria for hazard classification set out in Part 3 (Health Hazards) of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), but does not include a substance that satisfied the criteria solely for one of the hazard classes identified in regulation 5 of the OHS Regulations.
75. Reference should be made to pictograms on product container labels or Safety Data Sheets to assist in determining whether a lead-containing product is classified as a hazardous substance.
76. Where hazardous substances are used in the workplace, specific employer duties apply under Part 4.1 (Hazardous substances) of the OHS Regulations.
77. For more information about working with hazardous substances, see the *Hazardous substances compliance code*.

❖ Part 3 – Controlling risks associated with lead processes

78. Employers have a duty to control the risk of lead exposure using risk control measures that are ranked from the highest level of protection to the lowest in Part 4.3 (Lead) of the OHS Regulations. This ranking is known as the hierarchy of control. OHS Regulations r184

79. Employers must work through this hierarchy by first eliminating any risk to health associated with lead exposure, so far as is reasonably practicable. If it is not reasonably practicable to eliminate the risk it must be reduced, so far as is reasonably practicable, by:

- substituting lead with a substance that is less hazardous, or a less hazardous form of lead
- isolating the source of exposure to lead
- using engineering controls to reduce exposure to lead, or
- using a combination of these risk control measures.

80. When these control measures have been applied, so far as is reasonably practicable, any remaining risk must be reduced by using administrative controls. If a risk still remains, it must be controlled by providing appropriate PPE to employees at risk.

81. It is often necessary to use a combination of control measures to reduce the risk.

82. In addition to applying the hierarchy of control, employers in lead processes must also comply with the specific risk control duties relating to cleaning and hygiene set out in the OHS Regulations. More detail on specific risk control duties for lead processes can be found in Part 3.2 of this Code.

Diagram 1 – The risk management process



Part 3 – Controlling risks associated with lead processes

3.1 Hierarchy of control

Elimination

83. Eliminating the use of lead, or the lead process that creates a risk of exposure, is the most effective way of controlling risks.
84. Examples of elimination include:
- using aluminium radiators with plastic tanks rather than copper-core radiators with lead soldered tanks
 - using a calcium/zinc-based stabiliser as part of PVC manufacture instead of a lead-based stabiliser
 - using lead-free paints and specifying lead-free paints be used on items to be painted.

Substitution

85. It may be possible to use a less hazardous lead-containing substance or a lead-containing substance in a less hazardous form. For example, by using a lead-based glaze in a water slurry form instead of a powder form to reduce the generation of lead dust.
86. Processes that create lead dust, lead mist or lead fumes can be substituted for less hazardous processes. For example, removing lead-containing paint using a chemical stripping process rather than dry powered tools.



Figure 1(a): Before – dispensing dry lead chemical into a raw material creates airborne dust



Figure 1(b): After – The use of the lead chemical in a slurry reduces exposure to airborne dust

Part 3 – Controlling risks associated with lead processes

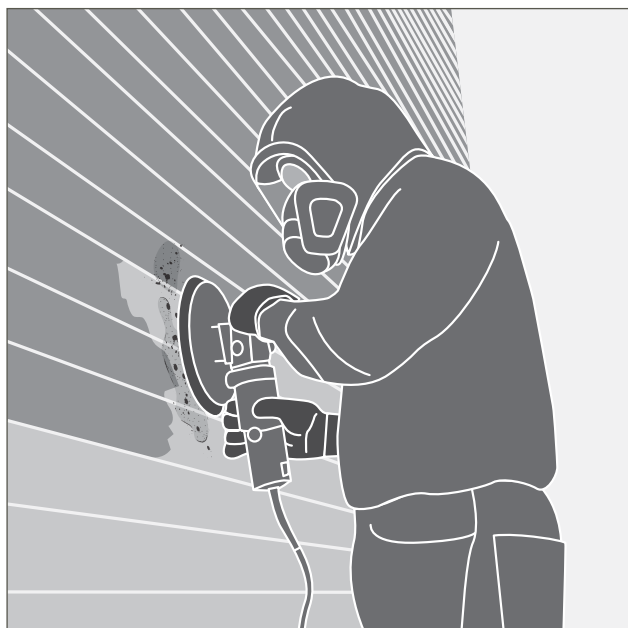


Figure 2(a): Before – using dry powered tools to remove lead-containing paint creates airborne dust

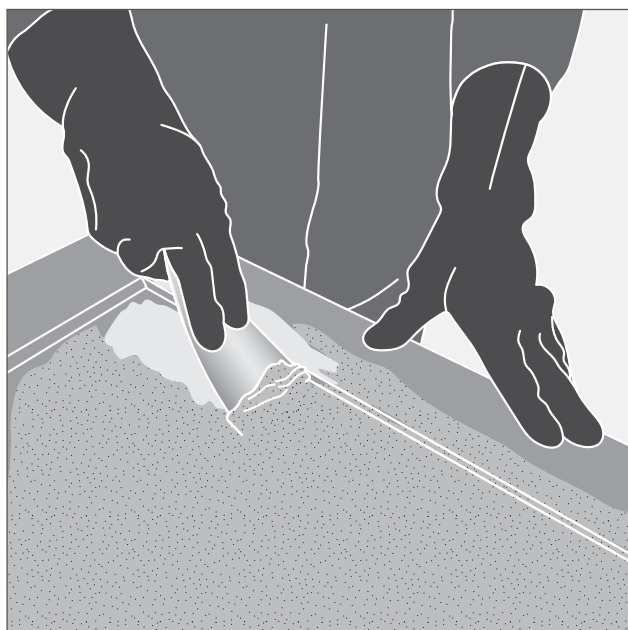


Figure 2(b): After – chemical stripping processes reduce exposure to airborne dust

Isolation

87. Isolation involves separating employees and contractors from a hazard to prevent or reduce exposure. For example, controlling a process from a filtered-air control room rather than from a position next to where lead fumes are generated.

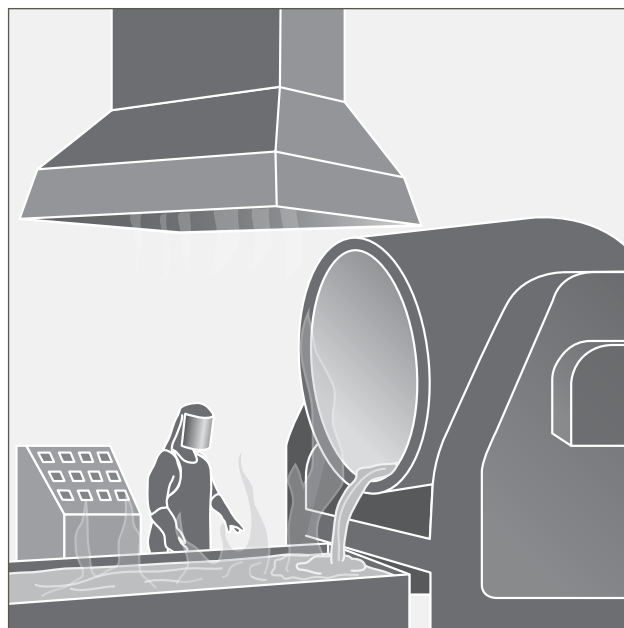


Figure 3(a): Before – Employee working in an area where lead fumes are being produced



Figure 3(b): After – Isolating the employee from the lead process in a ventilated booth

Part 3 – Controlling risks associated with lead processes

Engineering controls

88. Engineering controls are physical controls, such as plant, that prevent or reduce the risk of lead exposure. For example, by suppressing lead dust, lead fumes or lead mists at the source, or by minimising the level of airborne lead in the working environment.
89. Engineering controls often involve partial enclosure, exhaust ventilation or the automation of processes. Examples of engineering controls include:
- providing local extraction ventilation at a lead pigment weighing station
 - placing a temperature regulator on a molten lead bath to ensure that the temperature is kept below 450°C (after which significant lead fume can be released)
 - providing a partial enclosure with local exhaust extraction for a wire brushing process.
90. Any risks associated with using plant to prevent or reduce the risk of lead exposure need to be considered. For more information on identifying and controlling plant-specific risks, see the *Plant compliance code* at worksafe.vic.gov.au.



Figure 4(a): Before – Weighing of dry chemical without dust control

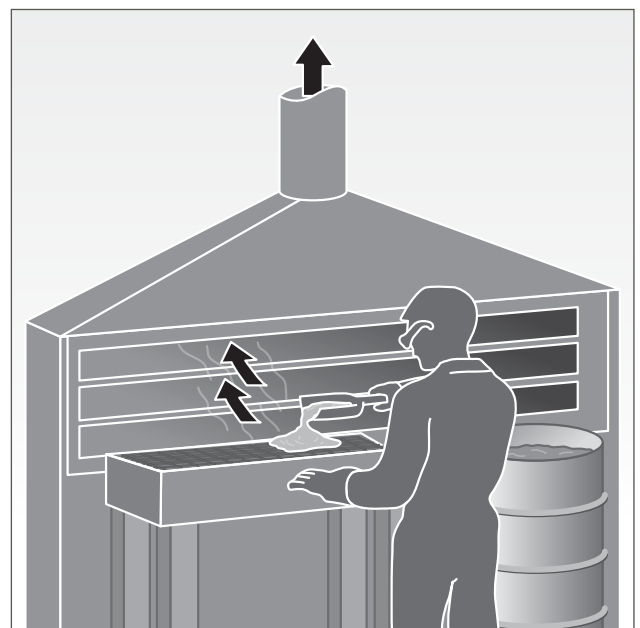


Figure 4(b): After – Local extraction ventilation of the powder weighing station

Part 3 – Controlling risks associated with lead processes

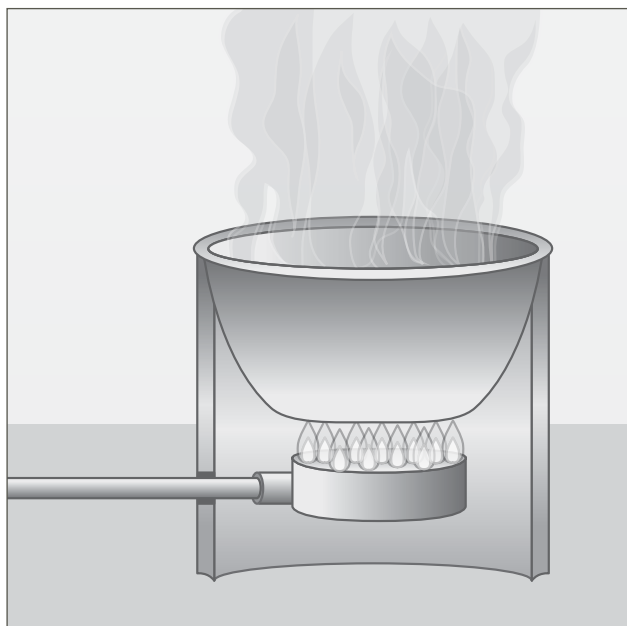


Figure 5(a): Before – Uncontrolled melting of metallic lead

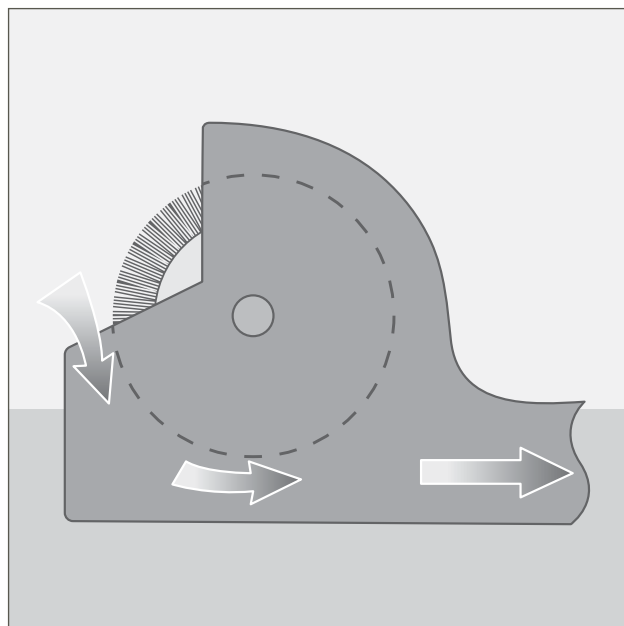


Figure 6: Enclosure with local exhaust ventilation around a circular wire brush

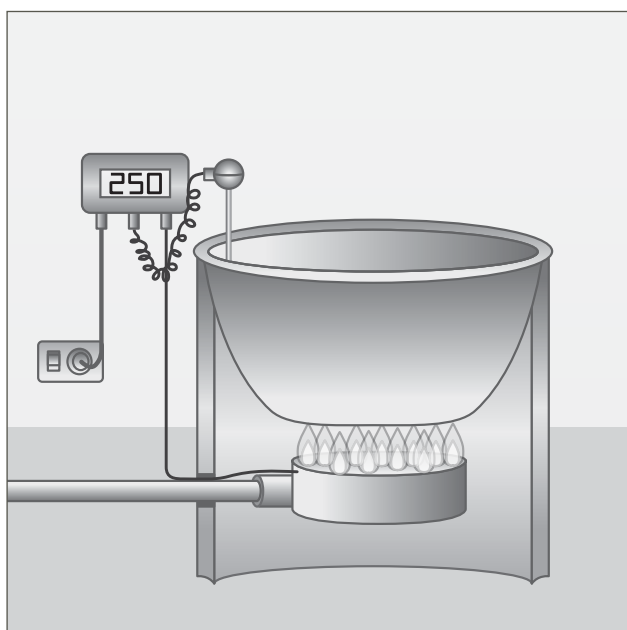


Figure 5(b): After – Thermostat-controlled melting of metallic lead to keep the temperature below 450°C

Part 3 – Controlling risks associated with lead processes

Administrative controls

91. Administrative controls are systems of work that are put in place to reduce the risk of lead exposure. Administrative controls must only be used if a risk remains after everything reasonably practicable has been done to reduce risk using higher order control methods. Examples of administrative controls include:
 - rotating employees working in a lead process to reduce the exposure time
 - restricting employee access to areas where lead processes are carried out.
92. Employer duties apply for specific administrative controls, such as cleaning, prohibiting eating, drinking, chewing gum and smoking in lead process areas, and the provision of changing and washing facilities. For more information see Part 3.2 of this Code.
93. Employee duties apply for specific administrative controls, such as washing their hands and face after leaving a lead process area and prior to eating. For more information see Part 1 of this Code.

Personal protective equipment

94. PPE includes respiratory protective equipment and personal protective clothing such as overalls, aprons, footwear, gloves, safety glasses and face shields.
95. The type of PPE required will depend on the nature and amount of lead employees are exposed to. The presence of other hazards (for example, molten metal, corrosives or wet processes) should also be taken into account when choosing appropriate PPE.
96. When selecting protective clothing, the following factors need to be considered:
 - the ability of the materials to resist penetration by lead dust
 - the design should be close fitting at the neck and arms and not have any pockets which may trap lead dust
 - the effectiveness of the proposed laundry methods in removing lead dust from the clothing.
97. PPE needs to be regarded as a temporary measure, or a last resort, to be used only where other risk controls do not adequately control exposure, or are not reasonably practicable.
98. Employers must provide the necessary information, instruction and training to enable employees to do their work safely (including training them on how to wear and remove PPE correctly and keep it clean and maintained). Employers also need to supervise employees to ensure that PPE is correctly used.

Part 3 – Controlling risks associated with lead processes

99. Respiratory protective equipment only provides protection if it is:
- properly selected for the type and level of contaminant, the individual and the task
 - fit tested for the wearer
 - cleaned after use and stored in a sealed container away from contaminants
 - maintained by implementing a program to ensure no damage or degradation of the mask and cartridge replacement.



Figure 7: PPE controlling operator exposure and body contamination during short term and infrequent tasks

3.2 Specific risk-control duties

Making sure lead does not leave the work area

100. Employers must ensure that any lead contamination is confined, so far as is reasonably practicable, to the area where the lead process is carried out. [OHS Regulations r188](#)
101. Some ways of preventing the spread of lead contamination are:
- keeping lead dross and lead waste in enclosed containers
 - using ventilation systems fitted with collection units
 - taking steps to ensure that employees and contractors do not carry lead outside the workplace on their bodies or clothing
 - locating washing, showering and changing facilities so that employees and contractors leaving work do not have to pass through lead-contaminated areas after using these facilities.



Figure 8: Keeping lead dross in enclosed containers reduces the spread of lead contamination

Part 3 – Controlling risks associated with lead processes

Cleaning lead process areas

102. Employers must ensure, so far as is reasonably practicable, that any lead process area is kept clean. OHS Regulations r189 Regular cleaning reduces the risk of inhalation and ingestion of lead.
103. Areas that could be contaminated with lead need to be cleaned frequently, for example at the end of each shift. At a minimum, cleaning should be undertaken daily to ensure there is no build-up of lead-contamination on plant, equipment, working surfaces or the floor. Cleaning should include:
- floors and workbenches
 - washing and changing rooms
 - eating and drinking facilities
 - where possible, external plant surfaces, such as chemical reactors and machines.
104. Cleaning needs to be undertaken more frequently than daily if it is necessary to control risks to health and safety.
105. Overhead ledges, walls, ceilings and fixtures need to be cleaned as often as necessary to prevent the accumulation of lead deposits.
106. Accidental spills and leaks need to be cleaned up immediately.
107. Employers must, so far as is reasonably practicable, ensure that the methods used to clean an area where a lead process is carried out do not create a risk to the health of people in the immediate vicinity of that area and do not have the potential to spread the contamination of lead. OHS Regulations r189
108. Compressed air or dry sweeping are not appropriate cleaning methods in lead processes areas. Acceptable cleaning methods include:
- the use of a vacuum cleaner rated for hazardous dust Type M or H that complies

with Australian Standard 60335.2.69: Household and similar electrical appliances – Safety– Particular requirements for wet and dry vacuum cleaners, including power brush, for commercial use

- wet cleaning methods, such as mopping and wet wiping.



Figure 9(a): Before – Dry sweeping can create airborne lead dusts in the breathing zone



Figure 9(b): After – A hazardous dust class vacuum cleaner

Part 3 – Controlling risks associated with lead processes

Eating, drinking, chewing gum and smoking

109. Eating, drinking, chewing gum, smoking or carrying food, drink, gum or materials used for smoking are prohibited in any lead process area, to prevent ingestion of lead-containing materials. Employers must ensure that employees comply with this prohibition. [OHS Regulations r190\(1\)](#)
110. To protect employees, employers must, so far as is reasonably practicable, provide an eating and drinking area that cannot be contaminated with lead from any lead process. [OHS Regulations r190\(2\)](#)
111. The dining area needs to be located away from lead process areas. Walls, floors and furniture in dining and changing areas should have smooth, non-porous surfaces for easy cleaning. Suitable facilities for storing food, drinks, chewing gum and smoking materials need to be provided. These items are not to be stored in lockers that are used for personal protective clothing or respiratory protective equipment.

Changing and washing facilities

112. Ensuring a high standard of personal hygiene plays a critical role in controlling lead exposure.
113. When working in a lead process area, employees will often get some lead contamination on themselves and their clothing. Employers must, so far as is reasonably practicable, provide and maintain changing and washing facilities for employees to:
 - minimise secondary lead exposure from contaminated clothing
 - minimise ingestion of lead, and
 - avoid the spread of lead contamination. [OHS Regulations r191](#)
114. The type of washing and changing facilities required will depend on the level of exposure. For example, where contamination is restricted to the hands and arms, employers may only need to provide a wash basin, soap and a nailbrush, as well as a means of segregating work and personal clothing, such as separate lockers.
115. However, if there is a serious risk of lead contamination, special facilities may be required to prevent exposure. Such facilities may include fully segregated 'clean' and 'dirty' change rooms with washing and showering facilities in between the two rooms.
116. Washing and changing facilities need to be appropriately located within the workplace where a lead process is carried out. For example, change rooms need to be located so that employees are not required to walk through a lead process area after changing into clean personal clothing.

Part 3 – Controlling risks associated with lead processes

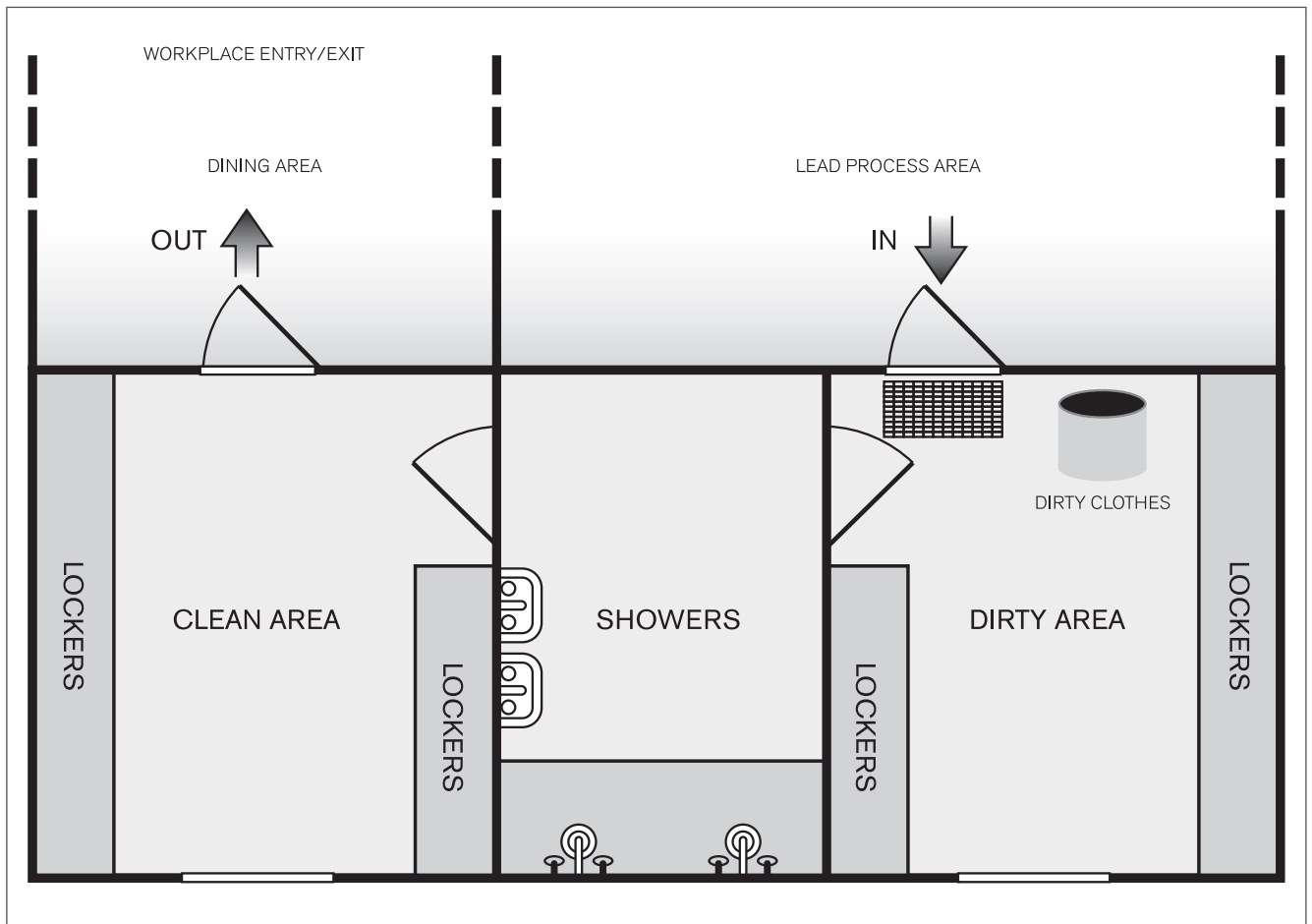


Figure 10: Example of changing room layout for a high-risk lead process

Part 3 – Controlling risks associated with lead processes

Laundering, disposal and removal of protective clothing

117. Where protective clothing worn by employees is likely to be contaminated with lead dust, employers must arrange for the clothing to be disposed of or laundered. **OHS Regulations r192(1)** Regular laundering prevents lead deposits from building up on protective clothing.
118. At a minimum, laundering needs to be done weekly where contamination is minimal, and more often where there is substantial contamination.
119. Contaminated protective clothing can be laundered onsite at the workplace, or sent to a commercial laundry.
120. Employers must ensure that protective clothing that requires laundering or disposal is bagged and labelled to indicate that the contents may be contaminated, for example 'lead-contaminated clothing'. **OHS Regulations r192(3)**
121. Employers must ensure that contaminated clothing is not removed from the workplace except when it is to be laundered or disposed of. **OHS Regulations r192(2)**
122. If a laundering service is used, employers must ensure the contaminated clothing is placed in impermeable bags and labelled, 'lead contaminated clothing'. **OHS Regulations r192(3)** Employers also need to ensure the service provider is informed of the presence of lead-contaminated clothing, and that they are equipped to deal with the contamination.

3.3 Maintaining effective risk-control measures

123. Employers must ensure that control measures are properly installed (if applicable), used and maintained. **OHS Regulations r18**
124. The purpose of maintaining control measures is to ensure that they perform as originally intended and continue to prevent or adequately control exposure of employees and contractors to lead.
125. Maintenance of control measures need to include, for example:
 - frequent inspections
 - visual checks to ensure risk controls that rely on human behaviour are being properly applied by employees
 - testing of equipment
 - preventative maintenance of engineering controls and PPE
 - any necessary remedial work to ensure physical controls continue to operate effectively.
126. Employers should have a maintenance procedure in place to ensure that any defects in control measures are detected as early as possible.

Part 3 – Controlling risks associated with lead processes

Review and revision of risk-control measures

127. Employers must review risk controls in the following circumstances to make sure they are working as planned and revise them as necessary:
- before any significant change is made to a lead process, or system of work related to a lead process
 - if an employee has been removed from lead-risk work as a result of health monitoring
 - following a notifiable incident involving lead. For more information on notifiable incidents see **[worksafe.vic.gov.au](https://www.worksafe.vic.gov.au)**
 - if for any other reason, the risk control measures do not adequately control the risks, or
 - after receiving a request for review from an HSR. An HSR can make a request if they believe, on reasonable grounds, that:
 - > any of the circumstances listed above exist
 - > the employer has failed to properly review the risk controls, or
 - > in conducting a review or revising the risk controls, the employer has failed to take into account any of the circumstances listed above (eg the HSR believes that the employer has failed to consider a change to a work system, during their review of risk controls).

OHS Regulations r185

128. Employers should also review risk controls if the results of any monitoring of airborne concentration of lead dust, lead mist or lead fumes, or biological monitoring of employee blood lead levels, are higher than expected, but still within acceptable limits.

Part 4 – Health monitoring for lead-risk work

129. Health monitoring includes a medical examination and biological monitoring.
130. If a lead process is identified as lead-risk work (see Part 2 of this Code) employers must arrange health monitoring for employees who will be engaged in the work, before they start. [OHS Regulations r196\(1\)](#)
131. They must also arrange follow up biological monitoring for employees within a month of the work starting, and ongoing at regular intervals that are specified below (see Frequency of biological monitoring). [OHS Regulations r196\(2\) and r198](#)
132. If the work is not identified as lead-risk work until after it has started, employers must arrange health monitoring for employees engaged in the work as soon as reasonably possible. [OHS Regulations r197](#)
133. Employers must consult with employees and HSRs (if any) when making decisions about the procedures for monitoring the health of employees. [OHS Act s35\(1\)](#)

Purpose of health monitoring

134. Medical examinations help to minimise the risk of adverse health effects caused by lead, by:
 - identifying individuals who need to be monitored more closely
 - enabling early detection of health effects
 - confirming that the biological monitoring results are below the levels that require removal
 - identifying when employees are required to be removed from lead-risk jobs.
135. Biological monitoring means the measurement and evaluation of a substance, or its metabolites in the body tissue, fluids or exhaled air of a person exposed to the substance.
136. For employees engaged in lead-risk work, this means measuring the amount of lead in the blood.

Note: Under Part 4.3 (Lead) of the OHS Regulations, biological monitoring must involve testing of the venous blood by a pathology service accredited by the National Association of Testing Authorities (NATA). The testing must be performed under the supervision of a registered medical practitioner. [OHS Regulations r181](#)

Part 4 – Health monitoring for lead-risk work

Arranging medical examinations and biological monitoring

137. Medical examinations must be done by a registered medical practitioner (preferably trained in occupational medicine), and biological monitoring must be done under the supervision of a registered medical practitioner. [OHS Regulations r181](#)
138. Employers need to consult with employees and HSRs (if any) when selecting a medical practitioner.
139. An employer must provide the medical practitioner who is to conduct a medical examination with details of:
- the name and address of the employer
 - the name and date of birth of the person to be examined
 - the lead process the person is engaged in, and
 - the period the person has been engaged in that process.
- [OHS Regulations r202\(1\)](#)
- Note:** Employer duties in relation to medical examinations and biological monitoring for employees extend to independent contractors who engage in lead-risk work.
140. Employers must also ensure that the medical practitioner provides a report setting out:
- the dates of medical examinations and blood sampling
 - the results of biological monitoring and any other tests undertaken
 - the name of any pathology service used
 - the details of any opinion formed by the medical practitioner after the medical examination as to whether the employee:
 - > is suitable on medical grounds to perform lead-risk work; or
 - > has excessive lead absorption and must not perform lead-risk work; or
 - > shows symptoms or signs of clinical lead poisoning and is unfit to work; or
 - > is fit to return to lead-risk work; or
 - > is fit to continue performing lead-risk work [OHS Regulations r202\(2\) and \(3\)](#).
141. This report must be kept by the employer for 30 years. [OHS Regulations r204](#) Medical examination results, and the privacy of an individual's health information, are subject to the requirements of the *Health Records Act 2001*.
142. A copy of the medical examination results must be provided to the employee as soon as possible.

Part 4 – Health monitoring for lead-risk work

Refusal to participate in health monitoring

143. Employees must take reasonable care for their own health and safety, and cooperate with their employer's actions to comply with their duties under the OHS Act and the OHS Regulations. [OHS Act s25](#)
144. Some employees may be reluctant to participate due to anxiety about medical results or the impact of the results on their job. Employers should encourage employees to participate in health monitoring, as early detection of high lead levels can prevent serious health effects from occurring.
145. Employers should support employees in these circumstances by:
 - ensuring they understand how health monitoring will benefit them
 - making the process easy to follow
 - making sure interpreters are available to assist employees who speak English as their second language
 - reminding employees that their workplace, family and community want them to be as safe and healthy as possible
 - ensuring HSRs (if any) are involved in supporting the health monitoring process
 - encouraging employees to participate.
146. If employees are still not willing to participate, employers can request WorkSafe to attend the workplace and speak with their employees about the importance of health monitoring. Employers can also arrange for the medical practitioner to speak to employees about their concerns.
147. If the steps above are taken and still do not result in employees agreeing to take part in health monitoring, employers may need to consider removing the employee from work that will expose them to lead.
148. Employers should have procedures in place to manage a refusal to participate in health monitoring. These procedures must be developed in consultation with employees and HSRs (if any) [OHS Act s35](#), and made known to all employees prior to commencing lead-risk work.

Part 4 – Health monitoring for lead-risk work

Frequency of biological monitoring

149. Employers must arrange for biological monitoring of employees engaged in lead-risk work at regular intervals as set out in tables 1A and 1B. OHS Regulations r198(1A)
150. Where lead processes are being undertaken that are likely to significantly change the nature or increase the duration or frequency of lead exposure, an employer must arrange for biological monitoring to be done more often. OHS Regulations r198(2)
151. For example, when employees occasionally remove lead-containing paint from structures as part of their work, they will be exposed to a higher concentration of lead for short periods.
152. This increased exposure must be factored into the frequency of biological monitoring.

Table 1A: Most recent blood lead level determining frequency of monitoring – females of reproductive capacity

Frequency of monitoring	Employee blood lead level	
Once every three months	Less than 0.24 $\mu\text{mol/L}$	Less than 5 $\mu\text{g/dL}$
Once every six weeks	At or above 0.24 $\mu\text{mol/L}$ but less than 0.48 $\mu\text{mol/L}$	At or above 5 $\mu\text{g/dL}$ but less than 10 $\mu\text{g/dL}$

Table 1B: Most recent blood lead level determining frequency of monitoring – females not of reproductive capacity and males

Frequency of monitoring	Employee blood lead level	
Once every six months	Less than 0.48 $\mu\text{mol/L}$	Less than 10 $\mu\text{g/dL}$
Once every three months	At or above 0.48 $\mu\text{mol/L}$, but less than 0.97 $\mu\text{mol/L}$	At or above 10 $\mu\text{g/dL}$, but less than 20 $\mu\text{g/dL}$
Once every six weeks	At or above 0.97 $\mu\text{mol/L}$	At or above 20 $\mu\text{g/dL}$

Note: For information about converting blood lead levels in micromoles per litre ($\mu\text{mol/L}$) to micrograms per decilitre ($\mu\text{g/dL}$) see Appendix B.

Part 4 – Health monitoring for lead-risk work

Removing employees from lead-risk work

153. An employer must immediately remove an employee or independent contractor from lead-risk work if:
- biological monitoring reveals blood lead levels are at or above (or likely to be at or above) the levels in table 2
 - following a medical examination, the medical practitioner is of the opinion the employee must be removed
 - there is an indication that risk control measures have failed and it is likely that blood lead levels will reach or exceed the levels specified in table 2.
- OHS Regulations r199

Table 2: Blood lead levels requiring immediate removal from lead-risk work

Employee blood lead level		
Females of reproductive capacity	0.48 µmol/L	10 µg/dL
Females not of reproductive capacity or males	1.45 µmol/L	30 µg/dL

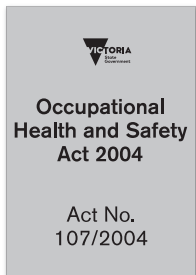
154. An employer must arrange a medical examination within seven days if an employee is removed from a lead-risk job because:
- their blood lead level was at or above the specified levels for removal, or
 - their blood lead level was likely to be at or above the specified levels for removal, due to a failure of risk controls.
- OHS Regulations r200

155. A copy of the biological monitoring results must be forwarded to WorkSafe as soon as is reasonably possible after the employer receives it. OHS Regulations r203(2)
156. An employee who has been removed from a lead-risk job must not be permitted to return until their blood lead levels have decreased below the levels specified in table 3 and a medical practitioner certifies that they are fit to return to work. OHS Regulations r201
157. If an employee was removed due to a failure of risk controls, they may return to lead-risk work if:
- the medical examination shows their blood lead level is below the specified levels for removal, and
 - the medical practitioner agrees with their return to lead-risk work.
158. Where an employee is not allowed to return, the employer must ensure that a copy of the medical examination report is forwarded to WorkSafe as soon as is reasonably possible after the employer receives it. OHS Regulations r203(3)
159. If an employee has been removed from lead-risk work, the employer must review the risk control measures in place at the workplace. OHS Regulation r185(1)

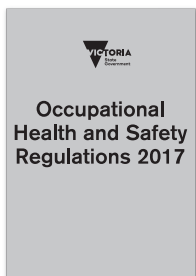
Table 3: Blood lead levels for returning to lead-risk work

Employee blood lead level		
Females of reproductive capacity	0.24 µmol/L	5 µg/dL
Females not of reproductive capacity or males	0.97 µmol/L	20 µg/dL

Appendix A – The compliance framework



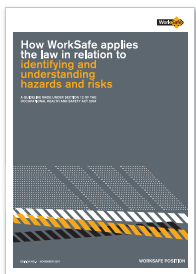
The Occupational Health and Safety Act 2004 (OHS Act) sets out the key principles, duties and rights in relation to occupational health and safety.



The Occupational Health and Safety Regulations 2017 (OHS Regulations) specify the way in which a duty imposed by the OHS Act must be performed, or prescribe procedural or administrative matters to support the OHS Act (eg requiring licences for specific activities, the keeping of records or giving notice).



Compliance codes provide practical guidance to duty holders. If a person complies with a provision of a compliance code, they are deemed to comply with the OHS legislative duty covered by the code provision. However, compliance codes are not mandatory, and a duty holder may choose to use some other way to achieve compliance.



WorkSafe positions are guidelines made under section 12 of the OHS Act that state how WorkSafe will apply the OHS Act or OHS Regulations or exercise discretion under a provision of the OHS Act or OHS Regulations. WorkSafe positions are intended to provide certainty to duty holders and other affected parties.



Non-statutory guidance includes information published by WorkSafe aimed at building people's knowledge and awareness of OHS issues, risks to health and safety, and the disciplines and techniques that can be applied to manage and control risks. Non-statutory guidance is not mandatory, nor does it provide any *deemed to comply* outcomes for duty holders. This guidance does, however, form part of the *state of knowledge* about OHS.



Appendix B – Conversion chart: Blood lead levels in micrograms per decilitre/micromoles per litre

Blood lead levels in micromoles per litre ($\mu\text{mol/L}$) can be converted to micrograms per decilitre ($\mu\text{g/dL}$) by multiplying by 20.72. For example, $0.48 \mu\text{mol/L} \times 20.72 = 9.95 \mu\text{g/dL}$.

Micrograms per decilitre		Micromoles per litre
5 $\mu\text{g/dL}$	=	0.24 $\mu\text{mol/L}$
10 $\mu\text{g/dL}$	=	0.48 $\mu\text{mol/L}$
15 $\mu\text{g/dL}$	=	0.72 $\mu\text{mol/L}$
20 $\mu\text{g/dL}$	=	0.97 $\mu\text{mol/L}$
30 $\mu\text{g/dL}$	=	1.45 $\mu\text{mol/L}$
40 $\mu\text{g/dL}$	=	1.93 $\mu\text{mol/L}$
50 $\mu\text{g/dL}$	=	2.41 $\mu\text{mol/L}$



WorkSafe Agents

Agent contact details are all available at
worksafe.vic.gov.au/agents

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and Interpreting Service (TIS National)
on **131 450**.