

Occupational Health and Safety Act 1985

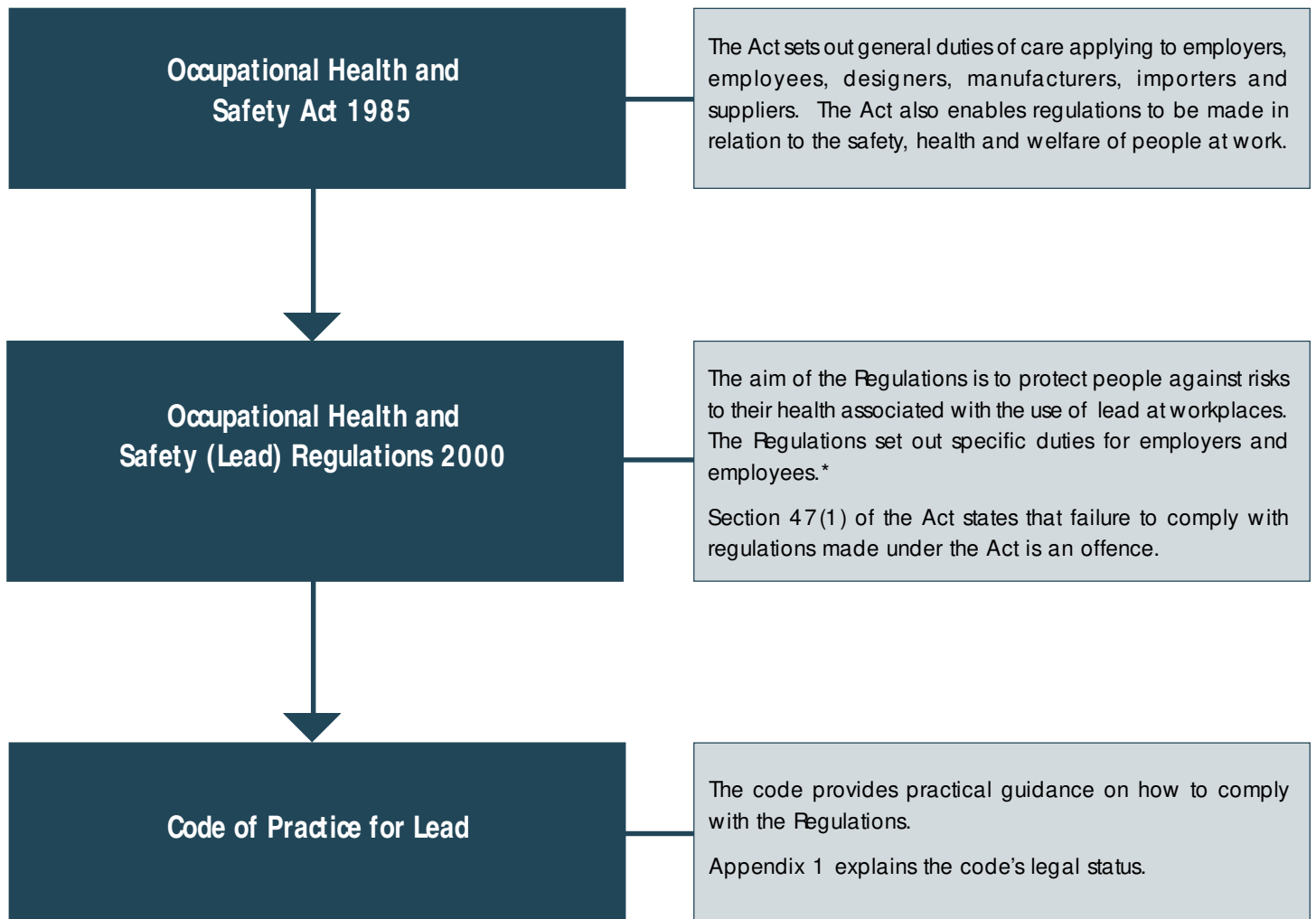
Code of Practice for

Lead

No. 26, 29 June 2000

This code of practice is approved under section 55
of the Occupational Health and Safety Act 1985

The Legislative Framework



* Note: Manufacturers, importers and suppliers of lead-containing substances should also refer to the *Occupational Health and Safety (Hazardous Substances) Regulations 1999* and the supporting code of practice.

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Part 1 – Introduction

1. What is lead?

Lead is a naturally occurring metal. Pure lead can combine with other substances to form various lead compounds. Under the *Occupational Health and Safety (Lead) Regulations 2000*, lead means pure lead, lead alloys such as solder or brass, inorganic lead compounds such as lead oxide, and lead salts of organic acids.

The Regulations do not apply, however, to organic lead compounds such as tetraethyl lead or tetramethyl lead which are found in petrol. Organic lead compounds are covered by the *Occupational Health and Safety (Hazardous Substances) Regulations 1999*.

2. What are lead processes?

The duties contained in the lead regulations only apply to workplaces where lead processes are undertaken. This is because the risks involved in using lead depend on the way the lead is handled. For example, lead in solid ingot form, solders containing lead, and lead-coated substances will present little or no risk to workers. However, lead in these forms can present a risk when it is processed in a way that produces lead dust, mist or fumes (e.g. grinding or heating).

According to the Regulations, a lead process is a process that generates lead dust, fumes or mist.

These processes are the following:

- listed in Schedule 1 or Schedule 2 (b-d) of the *National Standard for the Control of Inorganic Lead at Work* produced by the National Occupational Health and Safety Commission (NOHSC). See next column.
- exposes a person to lead dust or fumes arising from the manufacture or testing of detonators or other explosives
- exposes a person to lead dust or fumes arising from the firing of weapons at indoor firing ranges
- involves the melting of lead or alloy containing greater than 50% lead by weight where the exposed surface area of the molten material is greater than 0.1 m², and the temperature of the molten material does not exceed 450°C
- involves a power tool, including those that utilise abrasive blasting and a high pressure water jet, to remove any surface coating containing greater than 1% by dry weight of lead and the handling of waste from this process
- involves the melting or casting in a foundry of lead alloys containing greater than 1% by weight of lead in which the temperature of the molten material exceeds 450°C
- involves the use of power tools in a foundry for dry machine grinding, discing, buffing or cutting of lead alloys containing greater than 1% by weight of lead.

Processes listed in Schedules 1 and 2 of the National Lead Standard

- Any work which exposes a person to lead dust in air or lead fumes arising from the manufacture or handling of dry lead compounds, except galena (lead sulphide) when its character or composition remains unchanged.
- Any work in connection with the manufacture, assembly, handling or repair of, or parts of, electric accumulators (batteries) which involves the manipulation of dry lead compounds, pasting or casting of lead.
- Breaking up or dismantling of lead accumulators and the sorting, packing and handling of plates or other parts containing lead removed or recovered from those accumulators.
- Spraying with molten lead or alloys containing greater than 5% by weight of lead.
- Melting or casting of lead alloys containing greater than 5% by weight of lead 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.
- Dry machine grinding, discing, buffing or cutting by power tools lead or alloy containing greater than 5% by weight of lead.
- Machine sanding or buffing of surfaces coated with paint containing greater than 1% by dry weight of lead.
- Any process whereby electric arc, oxyacetylene, oxy gas, plasma arc or a flame is applied, for the purposes of welding, cutting or cleaning, to the surface of any metal which is coated with lead or paint containing greater than 1% by dry weight of lead.
- Radiator repairs where exposure to lead dust or fume may occur.
- Fire assay where lead is used.
- Hand grinding and finishing of lead or alloy containing greater than 50% by weight of lead.
- Spray painting with lead paint containing greater than 1% by dry weight of lead.
- Working with galena (lead sulphide) when its character or composition remains unchanged.

Source: The lead processes listed in Schedules 1 and 2 were sourced from the 1994 edition of the *National Standard for the Control of Inorganic Lead at Work* [NOHSC:1012(1994)]. Because the national standard may be amended from time to time, the most recent edition of this document should always be consulted.

WorkCover can also determine any process at a workplace to be a lead process if, after taking into account blood lead levels or airborne lead levels, WorkCover believes that the health of employees at the workplace is at risk¹.

Lead processes are carried out in a variety of industries. Common examples of lead processes include:

- manufacturing PVC pipes where lead-based UV stabiliser is used
- recovering and refining lead from scrap metal
- manufacturing lead-based ceramic glazes and pigments
- repairing copper core radiators and heaters using a lead-based solder
- casting and milling of brass fittings
- manufacturing leadlight windows where wire brushing is involved

3. How does lead get into the body?

Lead can get into your body when you:

- breathe in lead dust, fume or mist
- swallow any lead, for example if your food or hands have been contaminated by lead, and you then eat, drink, smoke or bite your nails

Lead is not absorbed through the skin except in the case of some organic lead compounds such as tetraethyl lead and tetramethyl lead which are found in petrol. These compounds are not covered by the Regulations.

4. What are the health effects of lead?

Once absorbed into the body, lead can cause both immediate and long-term health effects. With continued exposure, the amount of lead stored in the body increases.

If the level of lead in your body gets too high, it can cause:

- headaches
- tiredness
- irritability
- constipation
- nausea
- stomach pains
- anaemia
- loss of weight

Continued exposure could cause far more serious symptoms such as:

- kidney damage
- nerve and brain damage

There are some reports which suggest that lead may adversely affect the reproductive systems of both males and females.

A developing unborn child is particularly at risk from exposure to lead, especially in the early weeks before a pregnancy becomes known.

1. Notice of this will be published in the Government Gazette.

Part 2 – Employers' duties

If you are an employer, you have duties under the Regulations to protect your employees from excessive exposure to lead.

These duties extend to any contractors and their employees that you hire to work for you.

If other people are carrying out tasks on your behalf, you have a responsibility to ensure that the person has the appropriate training, education or experience to carry them out correctly.

5. Information for job applicants

As an employer, you must provide applicants for jobs in lead processes with information about the health risks and toxic effects of lead exposure. You must also tell them why medical examinations and biological monitoring are needed and what they involve.

You should provide prospective employees with the following information:

- lead is a toxic substance that can accumulate in the body over time
- lead can affect the nervous system, the kidneys, and can interfere with the body's ability to make haemoglobin
- there are some reports which suggest that lead may adversely affect the reproductive systems of both males and females
- foetuses and infants are particularly susceptible to the effects of lead, therefore employees who are pregnant or breastfeeding may need to be excluded from working in a lead-risk job if their blood lead levels exceed prescribed limits; lead-risk jobs are jobs that may expose employees to high levels of lead (see section 14)
- employees performing lead-risk jobs must periodically receive blood tests and medical examinations to confirm that they are not exposed to lead at excessive levels

This information must be provided in verbal or written form to all job applicants, not just those interviewed or offered a job. The information could, for example, be incorporated into the job specification sent to people expressing interest in the job. If all applicants are to be interviewed, you could provide the information at the interview.

The information should be easy to understand. If a large proportion of the people applying for employment at your workplace come from particular non-English speaking countries, you should consider providing the information in those languages².

6. Consulting your employees

The Regulations require you to consult your employees' health and safety representatives when assessing and controlling risks arising from the use of lead.

If you don't have a health and safety representative it's a good idea to consult directly with your employees.

Consultation should take place as early as possible when planning to introduce new lead substances or lead processes into the workplace.

Make sure that you provide your health and safety representatives with access to all relevant information, including copies of Material Safety Data Sheets (MSDS) and incident records, and that you allow enough time for health and safety representatives to confer with employees and feed their concerns back to you.

By drawing on the experience and knowledge of your employees you are likely to be more effective in assessing and controlling risks arising from the use of lead in your workplace.

You should also consider the needs of those from non-English speaking backgrounds.

7. Information, instruction and training

Why is information, instruction and training necessary?

Information, instruction and training should provide employees with the skills and knowledge they need to perform their jobs safely. It should help them to understand:

- the hazards and risks of using lead in the workplace
- how to follow health and safety procedures
- the reasons risk controls have been set in place and how to use them
- why medical examinations and biological monitoring may be necessary

It is important to remember, however, that while training can be effective, it is not a substitute for effective risk control measures.

² Refer to the *Code of Practice for Provision of Occupational Health and Safety Information in Languages Other than English* for guidance on providing information, instruction and training in multilingual workplaces.

Who should receive information, instruction and training?

The Regulations require you to provide information, instruction and training to any employee who works in a lead process, and to any employee who is likely to be at risk from exposure to lead dust or fumes. Anyone who supervises employees working in a lead process should also receive training.

When developing and providing training programs you should consider any special needs your employees may have, including, for example, their work experience, skills, gender, language and literacy.

Consider using oral or visual training methods to complement written information. It may also be appropriate to conduct some training in languages other than English. Where signage is to be used as a method of instruction, consider using standard signage such as that shown in Australian Standard AS 1319 – *Safety Signs for the Occupational Environment*.

What type of information, instruction and training needs to be provided?

The amount and type of information, instruction and training that should be provided depends on the risk involved. You should also take into account the complexity of the work procedures and control measures when deciding what is required.

Issues that should be covered include:

- 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 should be paid to the effects on the nervous and reproductive systems, and the risks to unborn children
- the labelling of containers of lead-containing substances
- the use of an MSDS
- the measures used to control exposure to lead
- 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 personal protective equipment (including its limitations)
- the importance of identifying any defects in control measures or respiratory protection

- the reasons for atmospheric monitoring (if required), the type of monitoring used, and how to find out about the results of monitoring
- the reasons for exclusions which apply to employment in a lead-risk job
- the importance of maintaining a high level of personal hygiene, and of not smoking or eating in lead process areas in the workplace

Before employees commence work in a lead process they must also receive information on the reasons for medical examinations and biological monitoring, and what is involved in these procedures.

Employees already working in jobs for which medical examinations and biological monitoring is provided should be informed of any changes to requirements under the Regulations (for example, a change in the frequency of blood lead level tests).

Reviewing and evaluating information, instruction and training

To ensure that information, training and instruction remains effective, you should continually review your procedures to take account of changes occurring in the workplace.

Further information, instruction and training should be provided when:

- there is a change in the nature of the hazard – for example, when a new lead-containing substance is brought into the workplace
- there are changes in work practices or control measures for a lead process
- new information on the health hazards of a lead-containing hazardous substance becomes available – for example, through a revised MSDS

You should evaluate information, instruction and training to ensure that the content is clearly understood by employees. Refresher training should also be provided as required.

8. Providing information on lead-containing substances

Under the Regulations, it is your duty as an employer to make information available to your employees about any lead-containing substances used in your workplace.

This information can be obtained from various sources including a Material Safety Data Sheet (MSDS), labels, technical data sheets and other information provided by the manufacturer, importer or supplier, Australian Standards and industry associations.

Where a substance is a lead-containing hazardous substance, the information will be available in the form of an MSDS and label. See sections 8.1 and 8.2 below.

For other lead-containing substances e.g. lead-containing surface coatings and lead alloys, you will have to obtain information from other sources such as those referred to above.

8.1 Material safety data sheet (MSDS) for lead-containing hazardous substances

An MSDS contains information about the hazards of a substance and how to use it safely. It also states whether the substance has been classified as a hazardous substance under the *Occupational Health and Safety (Hazardous Substances) Regulations 1999*. If the lead-containing substance is a classified hazardous substance, you have a duty under the lead Regulations to obtain an up-to-date MSDS before bringing the substance into the workplace. You also have a duty to ensure that your employees have access to it.

An MSDS must contain the following information:

- date of preparation or review
- manufacturer or importer details, including Australian address and contact numbers
- product name
- chemical and physical properties of the substance
- identity of the ingredients
- proportion (or proportion ranges) of the ingredients in the substance
- health hazard information
- first aid information
- precautions for safe use
- exposure standards
- a statement that the substance is a hazardous substance

Manufacturers and importers have an obligation to provide current and accurate information in the MSDS prepared for a hazardous substance. The MSDS should be easy to understand and take into account all the normal uses of the substance. If you are not happy with the MSDS provided, raise your concerns with the manufacturer or importer. The same or similar substance may also be available from a manufacturer or importer who does provide a good MSDS.

Only an MSDS prepared by the manufacturer or importer of the lead-containing hazardous substance is acceptable.

The hazardous substances Regulations require manufacturers and importers to review and revise an MSDS regularly, so make sure that you always ask for the most recent copy. An MSDS for a lead-containing hazardous substance should have an issue date within the last five years.

You don't have to purchase a substance to obtain an MSDS. Manufacturers, importers and suppliers have an obligation to provide you with a copy on request if the substance is a hazardous substance. When you are thinking about using a new lead-containing substance, it is a good idea to obtain an MSDS before ordering it. After reading the information you may decide to use an alternative form of the substance. If you do decide to use it, the MSDS will help you to plan for its safe use in your workplace.

Providing employees with access to an MSDS

An MSDS must be easily accessible to any employee who could be exposed to the lead-containing hazardous substance.

A copy of the MSDS should be kept near the work area where the substance is used. Make sure that all employees likely to be exposed to a lead-containing hazardous substance know where to find the MSDS.

Access to an MSDS may be provided in hard copy form or through a computerised MSDS database. Computerised MSDS databases supplied by another party are acceptable provided they contain the manufacturer's or importer's current MSDS.

Ensuring that information in the MSDS is not altered

You must not alter information in an MSDS prepared by the manufacturer or importer for a lead-containing hazardous substance. Additional information may be attached to the MSDS, but it must be marked clearly to indicate that it is not part of the original. You may also reformat or summarise the information contained in the MSDS as long as it is attached to the original and clearly marked as a reformatted version.

8.2 Labels for lead-containing hazardous substances

Ensuring that containers are labelled

As an employer, you must make sure that all containers of lead-containing hazardous substances used in your workplace are labelled with the manufacturer's or importer's label. Typically, the label should contain the following information about the product:

- the product name of the substance
- name, address and telephone number of the Australian manufacturer or importer of the substance
- information about its ingredients
- relevant health and safety information about the substance (including risk and safety phrases³), except where the container is so small it is not practical to provide such information
- the word "hazardous" (or signal words such as "dangerous poison", "warning" or "caution" that indicate the severity of the hazard)

Containers must remain labelled until they are emptied and thoroughly cleaned.

The label must not be defaced, altered or removed from the container. If a label on a container is illegible or incorrect, you should stop using the container until it is appropriately labelled.

Labelling of decanted substances

A container into which a lead-containing hazardous substance has been decanted must be clearly labelled with the product name of the substance, unless the decanted substance is used up immediately, and the container is cleaned immediately after use.

"Immediately" means as soon as possible. Labelling, therefore, is not needed provided the container remains in the control of, or within sight of, the person using the decanted substance.

When labelling decanted substances, you do not have to label the container with stick-on labels. Written or painted labels are acceptable as long as they can be easily read, and are durable. You may also be able to obtain spare copies of container labels from the manufacturer, importer or supplier of the lead-containing hazardous substance.

If it is not practical to label the container because, for example, it is too small, you may choose to use some other means to identify the contents such as a laboratory sample number. Make sure though that the employees likely to be exposed to the substance are aware of the identification method used.

Identifying lead-containing hazardous substances in enclosed systems

In some workplaces, a lead-containing hazardous substance may be contained in an enclosed system such as a pipe, piping system, process vessel, reactor vessel or other plant that forms part of a manufacturing process. Under the Regulations, you have a duty to make sure that employees who may be exposed to the substance (for example, when carrying out maintenance or cleaning the system) are aware of the existence of the substance.

A suitable means of identification may include some form of colour coding system in keeping with a published technical standard such as Australian Standard AS 1319 – *Safety Signs for the Occupational Environment* or AS 1345 – *Identification of the Contents of Piping, Conduits and Ducts*. Whatever the system of identification used, make sure your employees are aware of, and can understand, the coding.

³ Risk phrases briefly describe the hazards of the substance – for example, "irritating to skin", "very toxic if swallowed", "toxic by inhalation". Safety phrases describe the safety precautions to be taken when using the substance – for example, "keep container dry", "avoid contact with eyes", "wear eye/ face protection".

9. Risk Assessment

9.1 What is risk assessment?

To work out whether there is a risk to health from exposure to lead in your workplace, you must carry out a risk assessment.

When carrying out a risk assessment, the Regulations require you to consider:

- the form of lead used
- any information having regard to the state of knowledge about the health effects of lead
- any past blood lead levels of your employees
- the specific tasks or processes required to be performed with lead
- the frequency and duration of exposure
- possible routes of exposure
- any information regarding incidents, illnesses or diseases associated with the use of lead at the workplace

9.2 Who should carry out the risk assessment?

As an employer, you are responsible for ensuring that the risk assessment is carried out.

Wherever possible, the assessment should be started in-house even if outside specialists are called in after a preliminary assessment is performed⁴. In any case, you should ensure that any person carrying out the assessment is familiar with the requirements of the Regulations, and has a practical understanding of what actually happens, or what might happen, in your workplace.

A person such as the works manager or works chemist may be competent to carry out simple assessments. In more complex cases, such as those involving multiple tasks, several people representing a variety of skills may need to be involved in collecting and assessing the information.

Remember that health and safety representatives need to be consulted whenever you do a risk assessment in your workplace.

9.3 How do I carry out a risk assessment?

When carrying out a risk assessment, the Regulations require you to consider the following factors.

The form of lead used

You should look at all the forms of lead used in your workplace. In some cases, the lead may be in a dangerous form such as a dusty compound that could be inhaled by your workers. In other instances the risk is created when the lead is processed. For example, metal sheeting coated with paint that contains a lead-based pigment presents minimal risk when handled, but if it is welded or cut with a torch flame, dangerous lead fumes can be generated.

What is known about the health effects of lead?

MSDS and labels for all lead-containing hazardous substances should be reviewed to obtain information on the health hazards of the substance. Even if the lead-containing substance is not classified as a hazardous substance, it may come with an MSDS or other information about its health effects.

The manufacturer or supplier of the lead-containing substance could be contacted for further information if necessary.

The specific lead tasks and processes being undertaken

You need to identify all lead processes carried out in your workplace (see Part 1 for a description of a lead process).

The risk assessment should focus on work situations rather than individual substances. A practical way to carry out the assessment is to divide the work up into jobs or tasks and assess the risks involved in each of these.

If it is not practical for the workplace to be assessed as a whole, divide it into smaller units (departments, buildings, locations or processes) to make risk assessment more manageable. Walking through the workplace and looking at floor plans or process plans will help you decide how to divide up the workplace.

It is important to observe and consult with employees and health and safety representatives to find out how the job is actually done. People do not always work 'by the book', and may devise their own methods of work. Also, find out what happens during cleaning, maintenance and breakdowns, and during staff absences or shortages.

⁴ Information on the selection and effective use of an occupational health and safety consultant can be obtained from the WorkCover publication *Selecting an Occupational Health and Safety Consultant – A Guide for Workplaces*. Professional associations, such as the Australian Institute of Occupational Hygienists may also be able to provide information on professionals qualified to perform workplace assessments.

Level of exposure

The amount of lead that enters the body is likely to increase the more often and longer an employee is exposed to a lead-containing dust, fume or mist.

An estimate of the amount of exposure to lead can be made by considering:

- information obtained about the lead-containing substance or lead process
- the quantities of lead used
- how long and how often an employee is working in the lead process
- the effectiveness of the controls already in place
- whether employees are working directly with the substance

A rough approximation of the amount of exposure can sometimes be made by observation. For example, you might look for the presence of dust, mist or fume in the air (e.g. in light beams) or evidence of deposits on people and surfaces, or the presence of odours.

If you are uncertain about the level of exposure, you should carry out atmospheric monitoring. This will provide information about the amount of lead in the air that could be breathed in by your workers. Information on atmospheric monitoring can be found in Appendix 2 of the code.

Biological monitoring, however, is the most effective way of measuring the amount of lead actually absorbed by an employee. Biological monitoring measures the amount of lead in a person's body, and therefore takes account of lead exposure through both inhalation and ingestion. Section 15.2 of the code provides further information about biological monitoring.

Possible routes of exposure

Look at how your workers could be breathing in or swallowing lead.

Keep in mind that employees can come into contact with lead if they:

- work with it directly
- are in the vicinity of where it is used
- enter an enclosed space where it might be present
- come into contact with contaminated surfaces

Any information about incidents, illnesses or diseases that have occurred

You need to take account of any information about incidents, illnesses or diseases that may be related to the use of lead in your workplace. Check your accident/ incident records. Ask those doing the work if they have experienced any of the symptoms listed on the MSDS.

Lead-risk jobs

After conducting a risk assessment, you will need to identify whether the lead process is a lead-risk job. Refer to section 14 for guidance on how to do this.

Case Study:

Handling dry lead compounds in a PVC manufacturing plant

A small PVC parts manufacturing plant uses lead-based UV stabilizers in some PVC formulations.

An operator handles the stabilizers during batch mixing. The stabilizer is weighed out by scooping the powder from 25 kg bags into a plastic drum on a set of scales. Once all the raw ingredients are weighed, they are tipped into a dry blender. After mixing, the batch is transferred into hoppers which feed the extruders. Approximately 8-10 batches are prepared per 8-hour shift.

The operator has access to a disposable half-face piece respirator but he prefers not to wear it, especially on hot days, as he finds that the combination of dust and sweat around the rim of the respirator irritates his face.

The operator wears his own street clothes at work and does not change out of the clothes or wash when eating or leaving work.

The weighing and blending areas are swept clean at the end of each shift.

Assessing the risk

Form of lead: the stabilizer is a white dusty powder. It contains 8% lead by weight.

Routes of exposure: the MSDS states that the main route of exposure to the stabilizer is through inhalation of the airborne dust, and that good housekeeping and personal hygiene need to be maintained to control the risk of inhalation and ingestion exposure.

Level of exposure: NOHSC's atmospheric exposure standard for inorganic lead is 0.15 mg/m³. Biological monitoring of the operator showed that his blood lead level was 2.2 µmol/L indicating that there is a significant risk of lead exposure in the process. The biological monitoring results identify the process as a lead-risk job.

Tasks undertaken: The operator's hands and forearms are covered with powder when he scoops the stabilizer out of the bags and airborne dust is being generated by the weighing and blender loading tasks. Dry sweeping of the process area generates airborne dust.

Is there a risk?

The process is a lead-risk job and there is a significant risk to the operator from lead inhalation and ingestion. Because there is a risk, control measures need to be put in place.

9.4 Generic risk assessment

If you use similar lead-containing substances or lead processes in a number of different work areas or workplaces, you may only need to do one risk assessment.

A single, or generic, risk assessment will only be appropriate however if the hazards and risks for the work areas being covered by the assessment are the same or similar.

For example, if you were the owner of a chain of radiator repair workshops, you would need to make sure that ventilation systems, personal protective equipment and the work practices and conditions associated with them were similar in all the workshops to which you intended to apply the generic assessment.

Similarly, if a generic assessment is undertaken by a trade association as a model to be used by a number of different employers with essentially identical workplaces, the individual employer is responsible for ensuring that the assessment is valid for his or her own workplace.

As with risk assessments generally, you must, if practicable, consult with health and safety representatives when carrying out generic risk assessments.

9.5 Recording the outcomes of risk assessments

Once you have done a risk assessment you must record the outcomes. Risk assessment records should include:

- the name of assessor
- the date of the assessment
- the workplace/ lead process
- controls in place to prevent a risk to health
- the degree of exposure or nature of risk identified
- why decisions about the risk were made
- the results of any monitoring that may have been used to determine risk

The record of the assessment must be accessible to any employee who could be exposed to the lead risk

An extensive record of the assessment is not required if you have identified that the use of lead does not result in a risk to health.

9.6 Reviewing and revising risk assessments

If things change in your workplace, or if it appears that either your risk assessment or controls are no longer adequate, you need to review the risk assessment to ensure that it is still accurately assessing the risk.

The assessment needs to be reviewed if:

- a new lead-containing substance or lead process is introduced into the workplace
- the lead process or lead-containing substance is modified, resulting in a significant change in the potential exposure (e.g. a substance with a higher lead content)
- medical examination or biological monitoring indicates inadequate exposure control (e.g. an employee is found to have increasing blood lead levels, approaching the removal level)
- atmospheric monitoring or observation indicates inadequate controls
- new or improved control measures become available or practicable

In any case, a risk assessment must be reviewed at least once every five years. If there have not been any changes since the last time you did an assessment, and that assessment is still relevant, simply record the date of the review on the record of that assessment and write that the review found that the assessment is still relevant.

If you find that the assessment is no longer adequate, you need to revise it or do a new assessment. Remember to record any changes that you have made to the assessment.

10. Risk control

10.1 What is risk control?

Risk control means adopting effective measures to eliminate or reduce the lead exposure risk. Under the Regulations, your main duty is to eliminate any risk to health caused by exposure to lead. Where elimination of the risk is not practicable, you must reduce the risk as far as practicable.

In some circumstances it will be necessary to use two or more control measures to eliminate or reduce the risk.

Risk controls should be considered when planning any new workplace, or modifications to an existing workplace. They should not be treated as something that can be added later. Make sure you consult your health and safety representatives when controlling risks. If there is no health and safety representative, it's a good idea to discuss risk control directly with your employees.

10.2 What does practicable mean?

Practicable does not just mean the cost in dollar terms. To determine what is practicable, you must take into account:

- *severity of the hazard or risk*
How likely is it that employees will suffer adverse health effects or elevated blood lead levels from lead exposure? How serious are the health effects likely to be, and how many people are likely to be affected?
- *state of knowledge*
What is known about the hazard and the ways of controlling the risk? What does the MSDS say about the risk of lead exposure? What does the manufacturer, importer or supplier say? How do similar workplaces control the risk of lead exposure? What information can OHS professionals, industry organisations, unions and government agencies (such as NOHSC and WorkCover) provide?
- *availability and suitability of ways to remove or mitigate the hazard or risk*
Are the risk controls you have identified available? Are the proposed risk controls suitable for the workplace, the task and the employees involved?
- *the cost of removing or mitigating the hazard or risk*
What are the costs of eliminating or reducing the hazard or risk, now and in the future?

10.3 Can the lead process be eliminated?

Eliminating the use of the lead substance or process that creates the risk is the most effective way of protecting the health of your employees. Think about how you could do the work without using a hazardous lead process. Examples of elimination include:

- using aluminium radiators with plastic tanks rather than copper-core car radiators with soldered tanks
- using a calcium/ zinc based PVC stabilizer instead of a lead-based stabilizer

10.4 How to control risks

The Regulations set out a ranking of control methods that you must follow when controlling lead risks in the workplace. You must first consider using one or a combination of the following control measures to eliminate or reduce the risk:

- substitution
- isolation
- engineering controls

When you can demonstrate that these control measures have been applied as far as practicable, you must reduce any remaining risk by using:

- administrative controls

Once you have considered all of the control measures listed above, any remaining risk must be controlled by using:

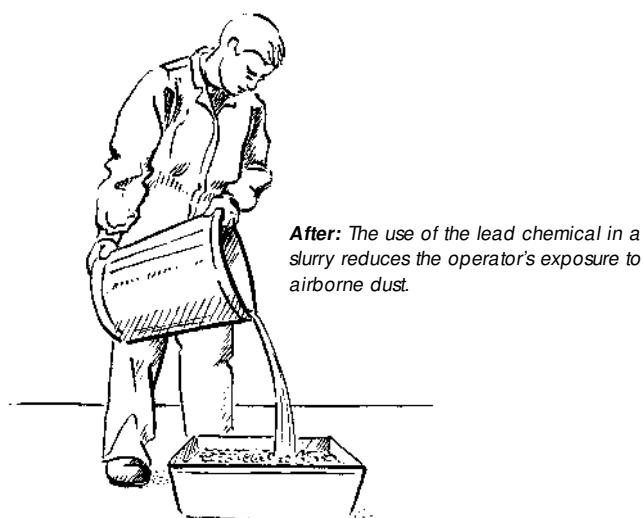
- personal protective equipment

These control measures are explained in more detail below. The case study at the end of this section demonstrates how the ranking of control measures, and the practicability test can be applied to eliminate or reduce the lead risk in the workplace.

Substitution

You may be able to use a less hazardous lead-containing substance, or a lead-containing substance in a less hazardous form. Examples of substitution include:

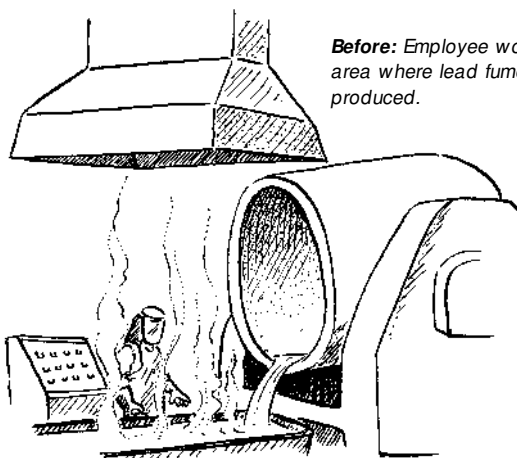
- substituting a paint containing 20% lead with one that contains 2% lead
- using a lead-based glaze in a water slurry form instead of a powder form to reduce the generation of lead dust



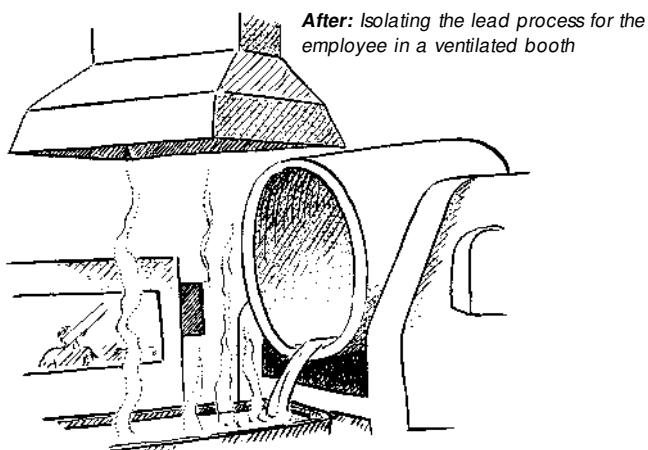
Isolation

Isolation involves separating people from the hazard to prevent or reduce exposure. Examples of isolation include:

- controlling a process from a filtered air control room rather than from a position next to where lead fumes are generated
- enclosing a conveyor belt carrying a powdery lead product to stop airborne dust being spread into the workplace



Before: Employee working in an area where lead fumes are being produced.



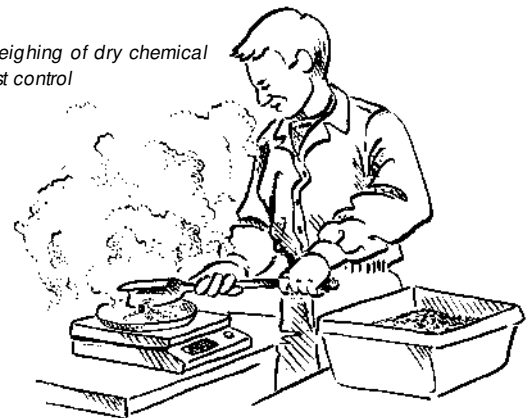
After: Isolating the lead process for the employee in a ventilated booth

Engineering controls

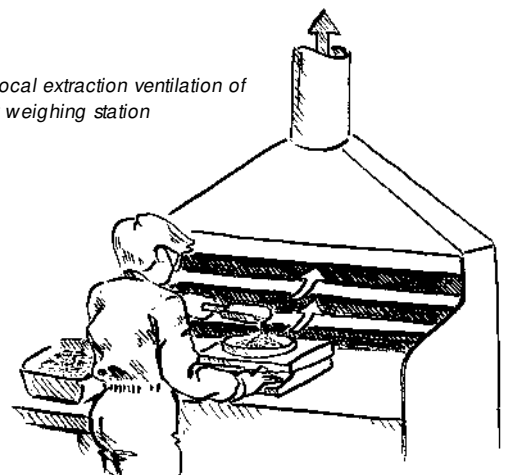
Engineering controls are physical controls, such as plant, that prevent or reduce the risk of lead exposure. They do this by suppressing lead dust, fumes or mists at the source, or by minimising the level of airborne lead in the working environment. Engineering controls often involve partial enclosure, exhaust ventilation or the automation of processes. Examples of engineering controls include:

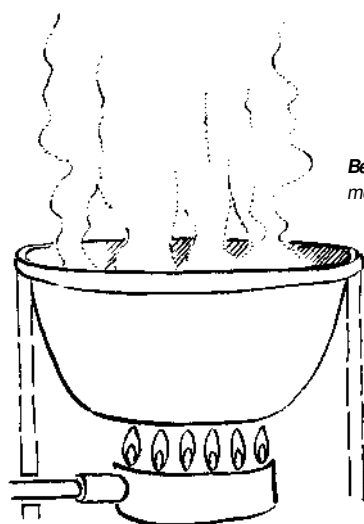
- providing local extraction ventilation at a lead pigment weighing station
- placing a temperature regulator on a molten lead bath to ensure that the temperature is kept below 450°C
- providing a partial enclosure with local exhaust extraction for a wire brushing process

Before: Weighing of dry chemical without dust control

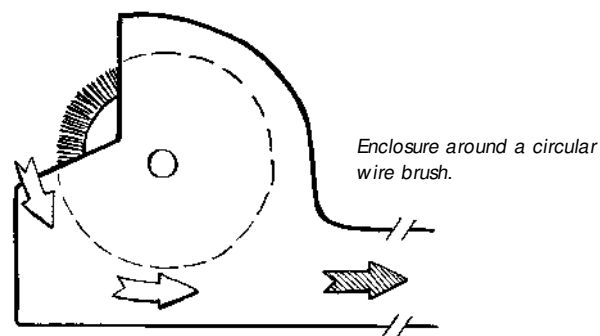


After: Slot local extraction ventilation of the powder weighing station





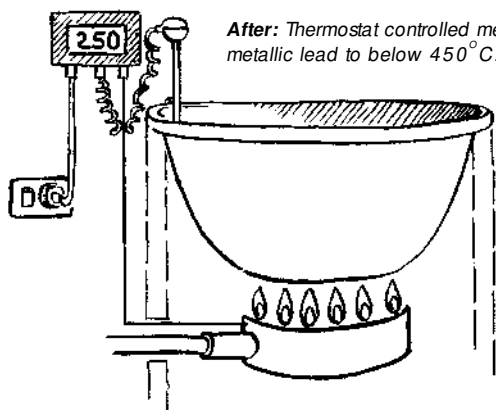
Before: Uncontrolled melting of metallic lead.



Administrative controls

Administrative controls are systems of work which are put in place to help to prevent or reduce the risk of lead exposure. You should only look at using administrative controls if an exposure risk remains after you have done everything practicable using the control methods listed previously. Examples of administrative controls include:

- rotating employees through a lead process to reduce the exposure time
- restricting employee access to areas where lead processes are carried out
- banning eating, drinking and smoking in a lead process area

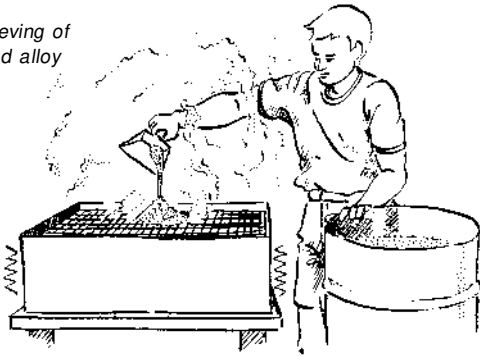


After: Thermostat controlled melting of metallic lead to below 450°C.

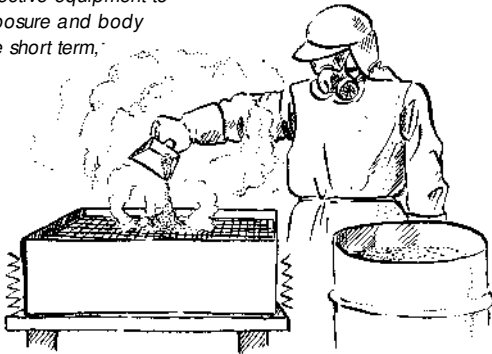
Personal Protective Equipment (PPE)

Personal protective equipment (PPE) includes respiratory protective equipment (RPE) and personal protective clothing such as overalls, aprons, footwear, gloves, chemical resistant glasses and face shields.

Before: Dry sieving of powdered lead alloy



After: Personal protective equipment to control operator exposure and body contamination in the short term, infrequent task.



It is not a good idea to depend on PPE to control risks because it relies heavily on employees following instructions and procedures correctly. Employees tend to avoid using PPE if it has to be worn for long periods, if dexterity, comfort and clear vision are needed for the task, or if they haven't been trained in fitting and using it properly. As a result, you may need to provide a greater level of supervision than is required by other risk controls to ensure that the PPE is correctly used.

For these reasons, you must control any risk arising from the use of lead, as far as practicable, by means other than PPE alone. PPE should 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 practicable.

Make sure that when PPE is used, employees have been trained to fit and use it properly.

Equipment must be:

- properly selected for the type and level of contaminant, the individual and the task
- easily accessible
- clean and functional
- maintained by appropriately trained staff in keeping with relevant standards

Respiratory Protective Equipment (RPE)

RPE includes a range of devices that can be worn to filter breathing air or supply clean air in a contaminated environment. Respiratory protection may be necessary:

- when it is impracticable to use other control measures
- to supplement other control measures
- as an interim control measure

When RPE is required at a particular workstation, the workstation should be marked with appropriate warning signs (such as those listed in AS 1319 *Safety Signs for the Occupational Environment*).

How to select RPE

The selection, use and maintenance of RPE should be based on the recommendations in AS 1715 *Use and Maintenance of Respiratory Protective Devices*.

RPE should be selected by a competent person such as an experienced occupational hygienist. RPE suppliers may also be able to assist. Before selecting RPE, the level of airborne contamination in the employee's breathing zone should be determined so that the required nominal protection factor for the equipment (outlined in AS 1715) can be determined.

The effectiveness of the equipment often depends on achieving a close fit against the face of the wearer. This can be assessed by conducting facial fit checks or by a qualitative face seal test as described in Appendix C of AS 1715.

As an employer, you are responsible for ensuring that PPE is cleaned and maintained. Non-disposable respiratory protective equipment needs to be cleaned at least at the end of every shift.

You should provide all users of PPE with information, instruction and training about:

- why PPE must be worn
- how to fit the equipment
- how to routinely test the fit
- the importance of good facial fit
- how to detect failure of the equipment
- how to maintain and replace equipment

When not in use, make sure PPE cannot be contaminated by lead. Store it in a clean place away from the lead process area.

Protective Clothing

The type of protective clothing required will depend on the nature and amount of lead to which employees are exposed. The presence of other hazards (for example, molten metal, corrosives or wet processes) should also be taken into account when choosing protective clothing.

All protective clothing should be issued, maintained and replaced at no cost to the employee.

The following factors should be considered when selecting protective clothing:

- the ability of the materials to resist penetration by lead dust
- the design of the protective clothing – it should be close fitting at the neck and arm and should not have any pockets which may trap lead dust
- the effectiveness of the proposed laundering methods in removing lead dust from the clothing

Protective clothing and footwear should be issued on a personal or job basis, and should be clearly identified so that it can be easily sorted and correctly allocated after cleaning or repair. At least two sets should be provided: one to wear and one for cleaning or repair. (Section 12.5 provides guidance on laundering of protective clothing.)

Case Study: Handling dry lead compounds in a PVC manufacturing plant

Control Measures

After having assessed the lead exposure risk (see page 13), a number of control strategies were considered by the employer.

Elimination and substitution of the stabilizers with less toxic substances were rejected as control measures because this would alter the properties of the PVC and make it unsuitable for use.

Engineering controls were looked at, and it was decided that the most efficient method of controlling the airborne lead dust in the operator's breathing zone was to install local extraction ventilation around the scales and at the mixer loading point. This was done with the use of a system with a flexible arm so that the same extractor could be used for weighing and loading by simply swinging the flexible duct arm into the right position. The extraction system allows for a connecting flexible hose which can be used to vacuum the floor area around the scales and mixer. This eliminates the sweeping task.

In order to reduce the contamination of the operator's clothing and body, the employer provided the operator with personal protective equipment in the form of overalls with long sleeves and elbow length rubber gloves. Two sets of lockers are provided in the change room and the operator is instructed that he must use one locker for his street clothing and the other for his overalls.

An administrative policy is introduced that requires the operator to remove his overalls and wash before eating or leaving the plant at the end of the shift.

11. Maintaining Controls

As an employer, you have a duty to ensure that control measures are properly used and maintained. You should ensure that:

- frequent inspections are carried out
- your workers are using the controls properly
- equipment is tested regularly
- engineering controls and PPE are serviced as required

12. Additional requirements to control risk

In addition to the general duty to control risks associated with the use of lead, the Regulations place a duty on you to adopt a number of specific risk controls. You must ensure that lead contamination is confined to the lead process area; use cleaning methods that do not spread lead contamination; prohibit eating, drinking and smoking in lead process areas; provide changing and washing facilities for employees; and provide for the laundering and removal of protective clothing. These requirements are explained in more detail below.

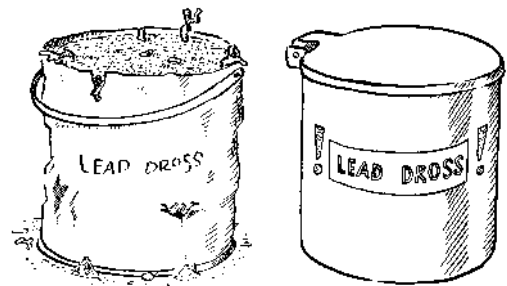
12.1 Containment of lead

The Regulations require you to ensure that lead is confined, so far as practicable, to the area where the lead process is carried out.

Some ways of preventing the spread of lead are:

- keeping lead dross and lead waste in enclosed containers
- using ventilation systems fitted with collection units
- taking steps to ensure that employees do not carry lead outside premises on their bodies or clothing
- locating, washing, showering and changing facilities so that employees leaving work do not have to pass through lead contaminated areas after using these facilities

Keeping lead dross in enclosed containers reduces the spread of lead contamination.



12.2 Cleaning lead process areas

Regular cleaning will reduce the risk of inhalation and ingestion of lead. You must, so far as is practicable, ensure that any lead process area is kept clean. Areas that can be contaminated with lead should be cleaned frequently.

Clean at least once daily:

- floors and workbenches
- washing and changing rooms
- eating and drinking facilities

Where possible, external plant surfaces such as chemical reactors and machines should also be cleaned daily.

Overhead ledges, inside walls, ceilings and fixtures should be cleaned as often as necessary to prevent the accumulation of lead deposits.

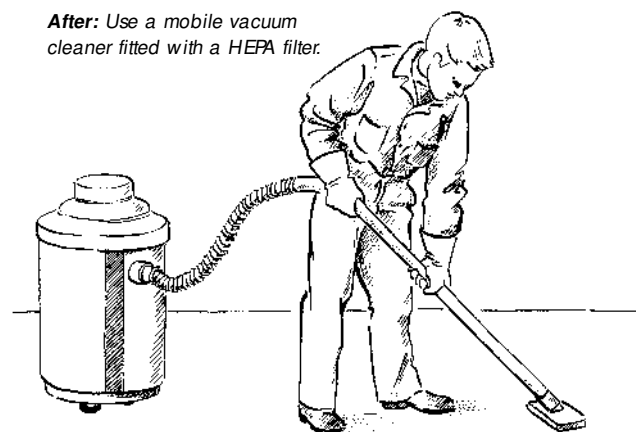
Accidental leaks and spillages should be cleaned up immediately.

You must also make sure that the methods you use to clean a lead process area do not spread the contamination of lead, or expose cleaners or anyone else to a lead risk. Compressed air or dry sweeping should not be used for cleaning. Acceptable cleaning methods include:

- the use of fixed vacuum cleaning apparatus or a mobile, portable vacuum system fitted with a HEPA (high efficiency particulate arresting) filter
- wet cleaning methods, such as mopping and wet wiping



Before: Dry sweeping can create airborne lead dust in the breathing zone.



After: Use a mobile vacuum cleaner fitted with a HEPA filter.

12.3 Eating, drinking and smoking

The Regulations prohibit eating, drinking, chewing gum and smoking in any lead process areas to prevent ingestion of lead-containing materials (see section 3). You must also ensure that employees do not carry their cigarettes, tobacco etc. into these areas. To protect your workers, you must, so far as practicable, provide an eating and drinking area which cannot be contaminated with lead.

The dining area should be located close to washing and changing facilities and away from lead process areas. Walls, floors and furniture in dining and changing areas should have smooth, resistant surfaces for easy cleaning. There should also be suitable facilities for storing food, drink or cigarettes. Food should not be stored in lockers that are used for protective clothing or PPE.

12.4 Changing and washing facilities

When working in a lead process, employees will often get some lead on their bodies. The Regulations, therefore, require you to provide and maintain changing and washing facilities, so far as practicable, for your employees.

This should help to:

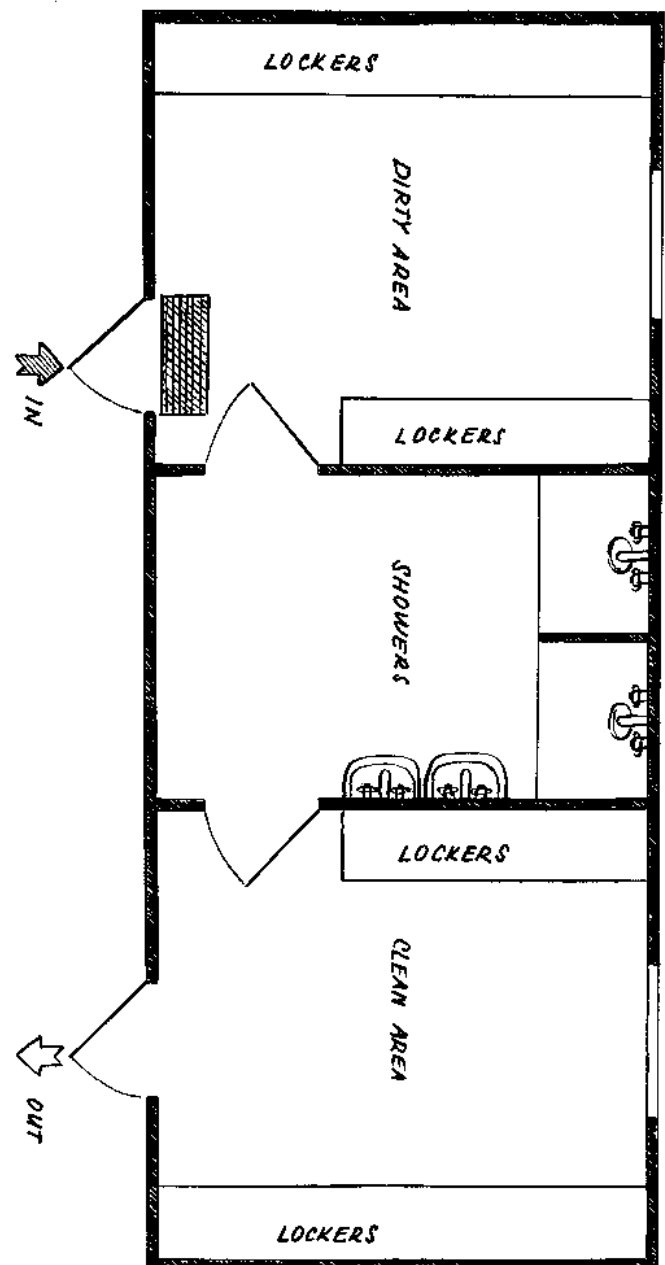
- minimise the ingestion of lead
- minimise secondary exposure from contaminated clothing
- avoid the spread of lead contamination to the employee's family

The type of washing and changing facilities required will depend on the exposure risk involved. For example, where a process is carried out infrequently, and PPE such as disposable overalls are used, body and clothing contamination will be limited, requiring only basic washing and changing facilities.

Similarly, where a risk assessment shows that contamination is restricted to the hands and arms, you may only need to provide a wash basin, soap and a nailbrush as well as a means of segregating work and personal clothing (e.g. separate lockers).

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.

Particular care should also be taken in locating washing and changing facilities within the workplace where lead processes are carried out. Change facilities should be located so that employees do not have to walk through a lead process area after changing into personal clothing.



Example of changing room layout for a high risk lead process.

12.5 Laundering and removal of protective clothing

When it is likely that the protective clothing worn by your employees can be contaminated by lead dust, you must arrange for the laundering of this clothing.

Laundering should be carried out at least weekly where contamination is minimal and more often where there is substantial contamination.

The contaminated clothing may be cleaned at the workplace or sent to a laundry. If you have protective clothing laundered externally, make sure the agency involved is aware that the clothing is contaminated with lead, and that it should be cleaned without risking the health of employees or anyone else.

When sending lead-contaminated protective clothing out for cleaning, make sure it is placed in impermeable containers or bags and labelled "lead contaminated clothing".

Contaminated clothing must not be removed from the workplace except when it is to be laundered or disposed of.

Under no circumstance should an employee take protective clothing home.

13. Ensuring the lead exposure standard is not exceeded

Employers must ensure that their employees are not exposed to an atmospheric concentration of lead above the exposure standard.

The exposure standard for a lead-containing hazardous substance can be found on the MSDS. Exposure standards are also listed in the *Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment* (*National Exposure Standards*) published by NOHSC⁵.

In many situations, biological monitoring can give a reasonable indication of exposure levels. However, where PPE is used as the primary form of exposure control, biological monitoring may not give an accurate indication of the atmospheric concentration of lead. In such situations, atmospheric monitoring may be required to accurately measure exposure levels. For more information on atmospheric monitoring, see Appendix 2.

It is important to remember that exposure standards do not represent a totally safe exposure level for every worker.

The Regulations state that an employee's exposure to airborne lead must not exceed the exposure standard. They also state that any risk associated with the use of lead at the workplace must be eliminated, or if this is not practicable, reduced so far as is practicable. This means that even if employee exposure is below the exposure standard, you must reduce exposure further, if this is practicable. Control must be achieved using the measures discussed in section 10.4.

⁵ At the time of publication of this code, the exposure standard specific for lead dust and fumes in the national exposures standard was 0.15 mg/ m³ (calculated as a time-weighted average). A time-weighted average (TWA) standard represents an atmospheric concentration averaged over an eight-hour working day and applies to a 40 hour week.

14. Lead-risk jobs

The Regulations require you to identify lead-risk jobs in your workplace.

A lead-risk job is one in which it is reasonably likely that the employees engaged in the lead process will have blood lead levels exceeding:

- a) 1.45 $\mu\text{mol/L}$ (30 $\mu\text{g/dL}$); or
- b) 0.48 $\mu\text{mol/L}$ (10 $\mu\text{g/dL}$) for females of reproductive capacity

Under the Regulations, any female working in a lead process is deemed to be of reproductive capacity unless the female employee provides a written statement to the contrary. The written statement should be a statement from a medical practitioner or a statutory declaration made by the employee. Prior to the employee signing a statutory declaration, the employee should consult with the employer's nominated medical practitioner on the health risks and toxic effects of lead exposure.

When identifying whether a job is a lead-risk job, you must take into account:

- past biological monitoring results (if available)
- information about the level of exposure to lead gathered as part of the risk assessment process
- whether the airborne lead level is greater than half the exposure standard

Remember, an estimate about blood lead levels must be made without taking into account the effect of PPE. This means you need to determine what your workers' blood lead levels would be if they did their work without using any sort of PPE. This is because you cannot totally rely on the effectiveness of PPE (e.g. PPE may not be functioning properly).

Similarly, the use of PPE will mean that biological monitoring results may not accurately reflect the exposure risk. Atmospheric monitoring may therefore be required to determine if the process is a lead-risk job or not.

If your workers are carrying out lead-risk jobs, you must notify WorkCover in writing of this fact as soon as possible.

When making a notification, state:

- the employer's name, address and telephone number
- date of notification
- the type of lead process being undertaken
- a statement that a lead-risk job is carried out in the workplace

15. Medical examinations and biological monitoring

You have a responsibility under the Regulations to arrange medical examinations and biological monitoring for your employees who work in a lead-risk job to ensure that they are not being adversely affected by exposure to lead.

You must ensure that medical examinations are performed by a registered medical practitioner. Generally, the medical practitioner should be appropriately trained in occupational medicine. Biological monitoring must also be carried out under the supervision of a registered medical practitioner.

The medical practitioner should also have an understanding of the employees' work activities and should be provided with:

- a copy of the MSDS, if applicable
- access to relevant risk assessment reports
- details of work practices and work cycles to assist in establishing appropriate time frames for monitoring

Rather than have every employee go to their own doctor, it will be easier if one doctor is used for the whole workplace. This means that it will be a good idea to consult your employees before selecting a medical practitioner.

As an employer, you must also ensure that:

- WorkCover is provided in writing with the name, address and telephone number of the medical practitioner that has been selected
- the medical practitioner is provided with a copy of the form in Schedule 2 of the Regulations
- a copy of medical examination results is given to the employee as soon as possible
- the results of all medical examinations and biological monitoring are kept for 30 years

15.1 Medical examinations

A medical examination must be performed before an employee begins work in a lead-risk job for the first time.

The main purpose of a medical examination is to monitor the health of employees exposed to lead. Medical examinations should never be used as an alternative to implementing risk controls and maintaining them properly.

Medical examinations help to minimise the risk of adverse health effects of lead by:

- identifying individuals who should be monitored more closely because they are pregnant or are more susceptible due to a medical condition such as anaemia, or kidney disease
- confirming that the biological monitoring results are below the removal levels
- early detection of health effects of lead which require the employee to be removed from exposure

Guidance on medical examinations for occupational exposure to hazardous substances is provided in the NOHSC publication *Guidelines for Health Surveillance*. The Australasian Faculty of Occupational Medicine's brochure *Health Assessment for Work – A Guide* also provides useful information about health surveillance methods.

15.2 Biological monitoring

Where your employees are working in a lead-risk job, the Regulations require you to arrange for biological monitoring. This means you must arrange for blood tests to be carried out in order to determine the amount of lead in the blood (blood lead levels).

You must arrange biological monitoring for all employees before they begin work in a lead-risk job for the first time. It's a good idea to provide for biological monitoring and the medical examination at the same time. You must also arrange for biological monitoring of these employees to be undertaken again, one month after they commence work. The results will help you determine when biological monitoring will next need to be undertaken.

The Regulations require biological monitoring to be undertaken at regular intervals as listed in the table below, unless a different frequency is specified by WorkCover and published in the Government Gazette.

Some processes pose a significant risk of short term excessive lead exposure requiring more frequent biological monitoring to determine the level of exposure. The Regulations require that where employees are carrying out an activity in which the nature, duration and frequency of lead exposure is likely to significantly increase their blood lead level, you must increase the frequency of biological monitoring. An example where this might be appropriate would be abrasive blasting of structures coated with lead-based paint.

Frequency of biological monitoring

Employee	Most recent blood lead level	Frequency of monitoring
Males, and females not of reproductive capacity	Less than 1.45 $\mu\text{mol/ L}$ (30 $\mu\text{g/ dL}$)	Once every six months
	At or above 1.45 $\mu\text{mol/ L}$ (30 $\mu\text{g/ dL}$)	Once every two months
Females of reproductive capacity	Less than 0.48 $\mu\text{mol/ L}$ (10 $\mu\text{g/ dL}$)	Once every six months
	At or above 0.48 $\mu\text{mol/ L}$ (10 $\mu\text{g/ dL}$)	Once every two months

Note: 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: 0.25 $\mu\text{mol/ L}$ = 0.25 x 20.72 $\mu\text{g/ dL}$

= 5.18 $\mu\text{g/ dL}$

15.3 Medical removal and return to lead-risk jobs

You must remove an employee from a lead-risk job if the results of biological monitoring reveal that the employee's blood lead level is at or above:

- 2.41 $\mu\text{mol/L}$ (50 $\mu\text{g/dL}$) – for males, and females not of reproductive capacity
- 0.97 $\mu\text{mol/L}$ (20 $\mu\text{g/dL}$) – for females of reproductive capacity
- 0.72 $\mu\text{mol/L}$ (15 $\mu\text{g/dL}$) – for females who are pregnant or breast feeding

If an employee is removed from a lead-risk job because the above removal levels have been reached or exceeded, you must arrange a medical examination within seven days. A copy of the medical examination form must be then forwarded to WorkCover as soon as possible.

Under some circumstances, an appointed medical practitioner may decide that an employee should be immediately removed from a lead-risk job. An example of this may be where the employee has anaemia or kidney dysfunction that makes them more susceptible to the effects of lead exposure. The Regulations require that you remove the employee from a lead-risk job if, following a medical examination, the medical practitioner is of the opinion that the employee must be removed.

The Regulations also require you to remove an employee from a lead-risk job if there is an indication that the risk controls have failed and, as a result, it is likely that the employee's blood level will reach or exceed the removal levels listed above. You must arrange for the employee to have a medical examination within seven days and only return the employee to the lead-risk job if the examination reveals that the employee's actual blood lead level is less than the removal level and the medical practitioner agrees.

Breakdown of the control measures used to reduce exposure in a high risk process is a circumstance where removal may be required. For example, using a power tool for an entire shift in an enclosed, poorly ventilated area to remove paint from a surface containing greater than 1% by dry weight of lead. At the end of the shift it is found that the PPE used by the employee was faulty and as a result he inhaled unfiltered air.

Where removal is required, a copy of the results of the employee's biological monitoring must be forwarded to WorkCover within seven days of receiving it.

Because unborn children and infants are particularly susceptible to the toxic effects of lead, women who are capable of having children are at a greater risk from exposure to lead. As a result, the medical removal levels that apply to women in this position are set at a lower level than for other workers. At the same time, equal opportunity legislation requires that no employee be discriminated on the basis of their age, sex or health status.

In most cases it should be possible, after consultation, to transfer employees to other areas or tasks without loss of pay, status or career opportunity – without breaching anti-discrimination legislation.

However, in some circumstances, you may need to seek an exemption from certain requirements of both federal and state anti-discrimination legislation if you exclude workers from lead-risk jobs in accordance with the lead regulations. Before removing an employee from a lead-risk job be sure that you understand anti-discrimination issues and legislation⁶.

An employee who has been removed from a lead-risk job because of high blood lead levels must not be permitted to return to the lead-risk job until a medical practitioner certifies that the employee is fit to return to work, and the employee's blood lead level has fallen to less than:

- 1.93 $\mu\text{mol/L}$ (40 $\mu\text{g/dL}$) for males, and females not of reproductive capacity
- 0.48 $\mu\text{mol/L}$ (10 $\mu\text{g/dL}$) for females of reproductive capacity

⁶ Generally (unless the employer is a state instrumentality) the federal *Sex Discrimination Act 1984* operates concurrently with the *Victorian Equal Opportunity Act 1995*.

Note: The Sex Discrimination Act applies to the hiring, promotion, terms and conditions of work and dismissal of employees generally in relation to lead-risk and non lead-risk jobs.

Part 3 – Employees' Duties

As an employee, you have a responsibility to work safely. The Regulations list a number of specific duties that you must fulfil if you're working in a lead process. They include:

- using the risk control measures put in place by your employer, including wearing any PPE that has been provided and following any procedures for removing contaminated clothing and washing or showering before leaving work (you may need to use shower facilities to completely remove lead contamination from your skin and hair)
- not eating, drinking, chewing gum, smoking or carrying cigarettes, tobacco etc. in any lead process area
- removing any lead-contaminated clothing or PPE you are wearing, before entering an area designated for eating or drinking
- washing your face and hands in the facilities provided before eating, drinking or smoking to prevent ingestion of lead (as explained in section 3)

You should also help to make your workplace safe by participating in the consultation process if you are asked to do so. This may be done through your health and safety representative, or directly with your employer.

If you discover a defect in any risk control, label or item of PPE, you should report this promptly to your employer.

Appendix 1

What is a code of practice?

The *Occupational Health and Safety Act 1985* (the Act) empowers the Minister to approve codes of practice.

An approved code of practice gives practical guidance on how to comply with a general duty under the Act or a specific duty under the Regulations. Compliance with the provisions in an approved code of practice, where relevant, may constitute compliance with the provisions of the Act or Regulations to which the code is giving practical guidance.

Generally, an approved code of practice contains various courses of action which are designed to achieve health and safety standards required by the Act and Regulations. Codes usually contain a number of options for meeting standards.

Who does it apply to?

A code of practice may be written to provide practical guidance for any person placed under obligation by the Act or its Regulations, for example, employers, manufacturers and employees.

Each approved code of practice will state the persons for whom the guidance is intended.

What is its legal status?

The provisions in a code are not mandatory. A person may choose to comply with the relevant provision of the Regulations in some other way, provided that the method used also fulfils the requirements of the Regulations. A person or company cannot be prosecuted simply for failing to comply with an approved code of practice.

However, in legal proceedings, failure to observe a relevant approved code of practice can be used as evidence that a person or company has contravened or failed to comply with the provisions of the Act or Regulations. If a person has not adopted the method described in the code, it is up to that person to show that the legal requirement has been met by an alternative method. Therefore, an approved code of practice should be followed, unless there is an alternative course of action that would also fulfil the requirements of the Act or Regulations.

A WorkCover inspector may cite an approved code of practice as a means of remedying alleged non-compliance when issuing an improvement notice or a prohibition notice. Similarly, a health and safety representative may cite an approved code of practice in a provisional improvement notice when providing directions as to how to remedy an alleged non-compliance.

Appendix 2

Atmospheric monitoring

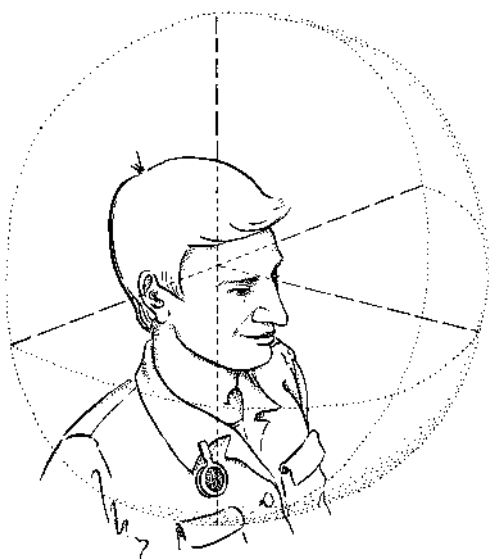
What is atmospheric monitoring?

Atmospheric monitoring can be used to estimate the level of airborne lead (usually in the form of dusts containing lead, or lead vapour or mists) inhaled by your employees. Air sampling techniques and strategies for estimating atmospheric lead concentrations are set out in the *National Code of Practice for the Control and Safe Use of Inorganic Lead at Work* produced by NOHSC.

Personal monitoring, i.e. monitoring the lead level in a worker's breathing zone through the use of a sampling device is the most appropriate monitoring technique. The results of personal atmospheric monitoring should be compared with the lead exposure standard to determine if an employee's exposure to lead is excessive.

Other techniques such as static or area monitoring may be useful for determining the effectiveness of engineering controls or to quantify the spread of lead contamination outside the lead process area, but are not suitable for the purposes of risk assessment and cannot be compared against the exposure standard.

Be aware that atmospheric monitoring only tests for potential exposure through inhalation and may not always represent a worker's actual total exposure to lead, particularly where ingestion is a significant route of exposure or where respiratory protective equipment is used to reduce inhalation exposure.



The breathing zone – a hemisphere of 300 mm radius extending in front of a person's face measured from the mid-point of an imaginary straight line joining the ears.

When is monitoring required?

The Regulations do not impose a duty to undertake atmospheric monitoring. However, estimating the degree of exposure to lead is an integral and important part of the risk assessment process. Atmospheric monitoring should be carried out if you are not sure whether the exposure standard has been exceeded, or if you cannot confidently determine the risk by simply reviewing the information about the lead-containing substance and the nature of the work.

Here are some examples of situations in which atmospheric monitoring may be needed:

- the process or hazardous substance is new and there is insufficient information available to determine the exposure risk
- the process is carried out sporadically or the exposure varies in level, frequency or duration
- it is not clear whether new or existing risk controls are effective
- the risk to health is largely controlled through the use of respiratory protection
- the risk to health is largely managed through administrative controls (i.e. safe work practices or systems of work such as job rotation)
- symptoms that may be related to the use of lead have been reported or biological monitoring results above acceptable levels have been found
- there is evidence (such as fine deposits of lead dust in the work area) that the risk controls have deteriorated as a result of poor maintenance
- process modifications or changes in work practices have occurred that may affect exposure

If it is obvious that there is a risk to health, priority should be given to controlling the risk rather than carrying out atmospheric monitoring just to confirm the presence of that risk. However, once controls have been put in place, you may need to check their effectiveness by performing atmospheric monitoring.

Atmospheric monitoring may also help you to work out the type and level of risk control needed. For example, if biological monitoring reveals that an employee has a high exposure to lead, but atmospheric monitoring indicates that exposure to lead through inhalation is low, then controls may need to be targeted at reducing exposure via ingestion.

Who should undertake atmospheric monitoring and interpret results?

Atmospheric monitoring and the interpretation of the results (including comparison with the relevant exposure standards) should be undertaken by a competent person with appropriate training and experience, such as an occupational hygienist or other safety professional.

Atmospheric contaminants in a workplace are rarely evenly distributed and are likely to vary from day to day. How and where to sample, how long to collect samples and how often to sample are all important factors in ensuring that the results of atmospheric monitoring are a good representation of the potential lead inhalation risk. Interpretation of the results of monitoring requires a good understanding of why the exposure standard for lead has been set. The interpretation process may also have to take into account working shifts other than eight hours in duration⁷.

⁷ The National Code of Practice for the Control and Safe Use of Inorganic Lead at Work published by NOHSC is one source of information on air sampling strategies.

Appendix 3

Case studies: Risk assessment and control

Handling lead-based glaze

A ceramic tile manufacturer uses a lead-based glaze during the manufacturing process. The glaze is applied to the tiles in a powder form as the tiles move along a conveyor line. Two male operators stand at the end of the line removing the tiles from the conveyor and topping up the small hopper containing the glaze.

The manufacturer's MSDS states that the glaze is classified as a hazardous substance.

The major routes of exposure are listed in the MSDS as being inhalation of the fine airborne dust and ingestion from contaminated hands and food.

The atmospheric exposure standard for lead is 0.15 mg/m^3 .

A half-face piece disposable respirator is worn by the operator who tops up the feed hopper.

Operators wear full-length cotton overalls which they remove prior to eating and leaving work. The operators are provided with separate lockers for their street clothes and overalls.

A vacuum cleaner is used to clean up any glaze dust which accumulates under the conveyor.

Assessing the risk

It was decided that the use of the glaze is a risk to health through inhalation because:

- Fine puffs of dust are generated as the glaze strikes the tile
- There is a deposit of glaze dust on horizontal surfaces of machinery around the glaze applicator
- Atmospheric monitoring of the operators showed that the airborne lead concentrations were between 0.2 mg/m^3 and 0.3 mg/m^3 . (These levels exceed the exposure standard)
- During topping up of the glaze applicator, the operator carries a bucket of glaze up a set of steps and tips the contents into the feed hopper. This creates significant airborne glaze dust.

Identifying whether there is a lead-risk job

The handling of the glaze is a lead-risk job because the airborne lead concentrations exceed half the exposure standard and therefore it is reasonably likely that the operators' blood lead levels will exceed $1.45 \text{ } \mu\text{mol/L}$.

Controlling the risk

Elimination

Elimination of the lead-based glaze was considered but rejected as previous trials had shown that the quality of the tile finish was inferior when non-lead glazes were used.

Substitution

Substitution of the dry glaze application with a glaze slurry spray method will reduce the generation of lead dust in the workplace, and reduce inhalation exposure and contamination of work clothes and the surrounding area.

Engineering controls

The use of a glaze slurry spray application will still require overspray to be captured. Enclosure of the spray and extraction ventilation will reduce the risk of the spray escaping into the workroom and becoming an inhalation or ingestion risk.

Administrative controls

The administrative controls in place (e.g. procedure for removing overalls before eating and leaving work) are considered appropriate and effective and will be maintained.

Personal protective equipment

The use of full length overalls will be continued to reduce the risk of contamination of street clothing and bodies.

Until the alternative application method is introduced and local extraction ventilation is installed, respiratory protection will provide temporary protection from inhalation of lead dust.

Appendix 3

Case studies: Risk assessment and control

Radiator Repair

A radiator repair workshop uses an oxyacetylene torch to dismantle and repair radiators. The torch is used to melt the old solder joints. A circular electric wire brush is used to clean the area where the components are to be resoldered. The solder used contains 60% lead.

When consulted, the manufacturer of the solder advised that if the solder is heated to a temperature of over 450°C, lead fume can be generated which may result in a risk of lead inhalation. There is also some risk of ingestion of lead from contaminated hands.

Information supplied by the radiator repair trade body indicates that radiator repair can pose a significant risk of exposure to lead, primarily from inhalation during dismantling and wire brushing.

General ventilation is provided in the workshop but no local extraction ventilation is used.

Gloves are sometimes worn by the operator when handling the radiators.

Assessing risk

From the information obtained it was observed that:

- some fume is generated when the radiator solder joints are heated with the oxyacetylene flame
- the wire brush generates dust in the breathing zone of the operator
- the operator smokes in the workshop while repairing the radiators
- the radiator repair is done for approximately 50% of the operator's time

It was determined that there is a risk to the health of the operator through inhalation of lead fume and dust, and ingestion of lead dust from contaminated hands when smoking.

Identifying whether there is a lead-risk job

The risk assessment indicated that there is a significant risk to the health of the operator carrying out radiator repairs in the workshop. This is confirmed by the information provided by the radiator repair trade body which also informs that workers carrying out these types of operations in similar conditions in other workshops have been found to have blood lead levels above 1.45 µmol/ L.

Controlling the risk

Elimination

Elimination of the solder or the soldering process was determined not to be practicable.

Substitution

No suitable substitute for lead-based solder is currently available.

Substitution of the oxyacetylene torch for one with a cooler flame such as air-propane or air-LPG will reduce the possibility that the solder will be heated to the point of producing lead fume.

Engineering

An extraction fan installed in the wall next to the jig which holds the radiator during dismantling will draw any lead fumes away from the operator and reduce the inhalation exposure.

An local extraction ventilation hood around the wire brush will capture the fine solder dust which is generated.

Administrative

Prohibition of eating, drinking and smoking in the workshop will reduce the potential ingestion of lead transferred from lead contaminated hands.

Personal protection

Until the local extraction ventilation is installed, respiratory protection will provide adequate protection from inhalation of lead dust and fume.

Impervious gloves and full length overalls are to be worn by the operator to reduce contamination of hands and street clothing. A procedure is implemented that requires overalls to be removed, and hands washed before eating, drinking or smoking.

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