

Guidelines for the

MANAGEMENT OF LEAD-BASED PAINT



Guidelines for the
**MANAGEMENT OF
LEAD-BASED PAINT**



Published by the Occupational Safety and Health Service
of the Department of Labour, Wellington, New Zealand,
and the Public Health Commission.
June 1995.

Revised April 2008 by the Ministry of Health
PO Box 5013, Wellington, New Zealand
and the Department of Labour
PO Box 3705, Wellington, New Zealand.

Contents

1. Aim of this Guideline	6
2. Hazards of Lead	7
2.1 Introduction	7
2.2 Lead in Paint	8
2.3 Hazard Management	9
3. Statutory Controls on Lead	10
3.1 Health and Safety in Employment Act 1992	10
3.2 Health Act 1956	11
3.3 Building Act 2004	11
3.4 Residential Tenancies Act 1986	11
3.5 Resource Management Act 1991	11
3.6 Hazardous Substances and New Organisms Act 1996	12
3.7 Real Estate Purchase Agreements	12
4. Responsibilities of Contractors and Employees	13
4.1 Duties Under the HSE Act	13
4.2 Duties of Employees	14
4.3 Lead Management Guidelines for Contractors	14
5. Responsibilities of Owners and Managers	15
5.1 Duties	15
5.2 Lead Management Guidelines for Landlords, Managers and Owners	15
6. Recommended Working Practices	16
6.1 Introduction	16
6.2 Before Working	17
6.3 Procedures for Paint Removal	17
6.4 Surface Coating	19
6.5 Special Precautions for Interior Paintwork	19
6.6 Special Precautions with Exterior Paintwork	20
6.7 Protective Clothing	21
6.8 Personal Hygiene	21
7. Personal Health Surveillance	27
7.1 Contractors	27
7.2 General Public	27

8. Environmental Surveillance	28
8.1 Introduction	28
8.2 Lead in Air (Occupational Exposures)	28
8.3 Lead in House Dust	29
8.4 Lead in Soil	29
9. Sampling, Analysis and Interpretation	30
9.1 Introduction	30
9.2 Tests for Lead in Paint	30
9.3 Lead in House Dust	31
9.4 Lead in Soil	32
Appendix 1: Lead in Paint	33
A1.1 Domestic Paints	33
A1.2 Other Paints	33
A1.3 Extent of the Problem	34
Appendix 2: Health Effects of Lead	35
A2.1 Uptake and Excretion	35
A2.2 Lead Poisoning Symptoms	36
A2.3 Hazard, Exposure and Risk	37
A2.4 Exposure Routes	38
A2.5 Children in the Home	38
A2.6 Adults in the Home	38
A2.7 Domestic Animals	40
A2.8 Commercial Painting Contractors	40
A2.9 Others	40
Appendix 3: Key Organisations	41
Ministry of Health	41
Department of Labour	41
District Health Boards (DHBs)	41
Local Authorities	42
Regional Councils	42
Environmental Risk Management Authority New Zealand (ERMA New Zealand)	42
Ministry of Consumer Affairs	43
New Zealand Food Safety Authority	43
Appendix 4: Hazard Assessment Sequence	44
Appendix 5: Useful References	46

Foreword

The use of lead-based paints on New Zealand buildings, a practice common until the 1980s, has left a legacy of problems for those involved in repainting and redecorating. Stripping off any paint containing lead can create a serious health hazard, not only for the person doing the job but for the building's occupants and neighbours – and particularly children.

Despite controls on other sources of lead contamination, such as petrol and food, lead in paint is still a significant public health and occupational health issue. It is for this reason that the production of the 1995 guideline, and an accompanying pamphlet, was jointly commissioned by the Occupational Safety and Health Service (now the Department of Labour) and the Public Health Commission. These guidelines update the 1995 guidelines.

The pamphlet, *Repainting Lead-Based Paint*, contains everything the “do-it-yourselfer” needs to know about doing the job safely.

This guideline, as well as dealing with safe working practices, contains comprehensive information on the health hazards of lead, the statutory responsibilities of the parties involved, health and environmental surveillance, and sampling and analysis techniques.

It is intended for three groups:

- Painting contractors,
- Property owners and managers,
- Safety and health practitioners.

The guideline has been developed specifically for the New Zealand situation, having regard to financial considerations, operational practicality and legal requirements. It outlines an effective management system, supported by basic analytical tools and common sense.

1. Aim of this Guideline

The aim of this guideline is to ensure the effective management of the hazards associated with the removal of lead-based paint from buildings. It describes the effects on the health of the person exposed to the dust from lead-based paint and also discusses the wider issues of soil contamination and safe disposal of residues.

The guideline covers the removal of interior and exterior paintwork, both by commercial contractors and by do-it-yourselfers engaged in home renovation.

It applies to any situation where lead-based paintwork is present, in occupied or unoccupied buildings. In addition to homes, this includes offices, schools, kindergartens, play centres, hospitals, halls, prisons and other institutions where occupants may be exposed to lead-based paintwork.

It is important to note that this guideline does not specifically address the removal of lead-based paint from structural steelwork such as bridges, pylons, pipelines and other situations where the painted structure is uninhabited. Nor does it specifically address lead hazards associated with other sources such as industrial exposure, hobbies and dietary intake, which can also contribute to the body burden of lead. However, the general principles of this guideline can be applied to such situations, to assist in the control of lead hazards. Guidance on the management and removal of lead based paint on industrial structures can be sought from Australian Standard AS 4361.1-1995 *Guide to Lead Paint Management – Industrial applications*.

While this guideline has no formal status under the Health and Safety in Employment Act 1992, it may be considered to constitute a preferred work practice and could be taken into consideration by the Department of Labour in determining whether the “all practicable steps” obligations in the Health and Safety in Employment Act 1992 (HSE) have been satisfied. Failure to follow its content could be admissible as evidence in a prosecution. It is a practical working document, developed in consultation with a cross-section of groups involved in the operational aspects and health effects of redecoration work.

2. Hazards of Lead

2.1 Introduction

Lead in paint, and the contaminated dust and soil it generates, is now recognised as a significant source of lead toxicity, and is an important occupational and public health issue. The prevention of health effects from this source is specifically addressed in this guideline.

Lead is both a poison and a persistent environmental pollutant, and is widely distributed throughout the built and natural environment. It causes a variety of symptoms, some of which are indistinguishable from other causes, and may ultimately result in death. Lead affects the developing brain and nervous system, and can result in mental retardation of young children. The health effects of lead are discussed in more detail in an appendix to this guideline.

Possible sources of lead in and around the New Zealand home might include:

- Dust and fragments from lead-based paint.
- Old lead plumbing and leaded solders.
- Nearby lead-related industry (e.g. smelter, battery manufacture).
- Lead dust-contaminated work clothing.
- Some hobbies and crafts (including fishing, modelling, leadlighting, and shooting).
- Tinned food from overseas (from lead in solder).
- Lead-contaminated soil on vegetables and fruit.
- Some alternative medicines and cosmetic products.
- Glazes on commercial or hobby pottery.
- Lead in food and beverage containers (e.g. pewter and crystal).
- Radiator repair work.
- Exhaust fumes and lead-contaminated dust beside busy roads (although with the removal of lead from fuel by 1996 airborne lead from exhaust emissions has virtually disappeared, however lead deposited in dust and soils may still be present).

As lead poisoning can cause a variety of health effects, including death, lead can clearly be considered a “significant hazard” as defined by the Health and Safety in Employment Act 1992 (i.e. exposure to lead may result in “serious harm” as prescribed in the First Schedule).

Where there is a risk of lead poisoning arising from a work activity or workplace, the hazard must be *eliminated*. Where elimination is not practicable, it must be *isolated* to control exposure to the hazard. If this is impracticable, the risk must be *minimised*.

Controls on the use of lead in industry as an insecticide, paint additive, petrol additive, and a means of sealing tin cans have been successful in reducing public and occupational exposure to lead. However, this has raised the relative importance of lead in paint on old buildings being renovated.

2.2 Lead in Paint

The domestic paints available today contain only very small quantities of lead, and are unlikely to be considered to be a hazard. However, the lead content of paints used in the past was generally much higher, and old paintwork can, under certain circumstances, present a risk.

Since redecoration generally covers earlier layers of paint, lead-based paint is likely to be present in most domestic properties, although not necessarily in the surface layer. When overcoating by a lead-free surface layer, the risk to health is negligible unless the surface deteriorates or is removed. Although properties built after 1970 are generally considered to have low lead content paints, there is evidence that some properties built between 1970 and 1980 were still being painted with lead-based paints.

Several paint removal methods, particularly power sanding and dry abrasive blasting, generate high concentrations of dust and fumes which are dissipated widely. A number of studies have established that exposure to lead from interior and exterior paint removal can be hazardous and can give rise to lead poisoning. The hazard may affect those doing the removal work, those in the vicinity at the time, or those exposed to dust and fragments long after the work is completed.

In 1984, the Building Research Authority of New Zealand (BRANZ) estimated that 251,000 properties in New Zealand had lead-based paint on them, and that each year up to 5,000 properties undergo work to remove paint containing lead pigments.

Primarily, the concern has been over lead in exterior paints, given their historically high lead content. However, interior paints used on fixtures, fittings, and building components such as doors and windows may also contain appreciable quantities of lead.

Properties where lead-based paint coatings are flaking or dusting present a potential source of elevated background levels in house dust and soil, and hence an increased risk of exposure for occupants. Young children and the foetus are particularly affected by lead poisoning and, in many cases, their condition goes unnoticed.

2.3 Hazard Management

The Health and Safety in Employment Act 1992 requires employers to take all practicable steps to ensure that their work activities do not harm their employees or other people. Management of the occupational health hazards associated with paint removal work is thus largely the responsibility of the contractor.

The function of health and safety inspectors from Department of Labour is to ensure that the identification and management of occupational lead exposure is carried out effectively by employers in accordance with the provisions of the Act.

Management of the public health hazard arising from lead-based paint in the home is a more complex issue, but may be the responsibility of both the owner and occupier, dependent upon the circumstances. Health protection officers (HPOs) from the public health units of the District Health Boards will assist with the identification of lead paint and provide advice on the management of non-occupational lead exposures.

A list of addresses and contact people for the Department of Labour and public health service providers is included at the back of these guidelines.

Effective hazard management requires hazards to be identified, assessed and managed, and then checked to ensure the method used is effective. The remainder of this guideline details how this may be achieved. The emphasis throughout is on preventing problems associated with the removal of lead-based paint.

3. Statutory Controls on Lead

The statutory controls which address the issue of lead contamination are summarised below.

3.1 Health and Safety in Employment Act 1992

Under the Health and Safety in Employment Act 1992, employers must take all practicable steps to protect their employees and other persons in the vicinity from hazards associated with their work. As exposure to lead in paint removal work is a recognised occupational hazard and can cause “serious harm”, an employer must take all practicable steps to eliminate, isolate or minimise the “significant hazard”.

Employers are required to monitor staff health and exposure to significant hazards where a “minimisation” method of hazard management is adopted. They must also notify the Department of Labour when occupationally-induced lead poisoning is identified in any of their employees.

The Act also requires a principal (who appoints a contractor) to take all practicable steps to ensure that the contractor is not harmed by hazards associated with the contracted work. As a competent contractor should be well aware of the hazard of lead-based paint, the duty of the principal is largely to ensure they select a contractor who is aware of the hazard, and capable of managing it effectively.

Where a property is managed on a commercial basis, the Act will also apply. It requires the person who controls a place of work (including plant in the place of work) to ensure occupants and others are not harmed by hazards arising from their management of the property. Although a domestic property may not normally be considered a place of work, it would be during those periods when contractors are active on site.

Although the Act does not apply to occupiers who do or engage contractors whose work falls under the definition of “residential work”, it does however apply to the contractors working in a domestic situation as they will be either an employer, principal, employee, a self-employed person or a person who controls a place of work. As such they have duties under the Act.

Lead poisoning is a “serious harm” illness of occupation and is notifiable under section 25 of the Act. Occupational health professionals may notify the Department of Labour where occupationally induced lead poisoning is identified or suspected (under the Notifiable Occupational Disease System [NODS]).

3.2 Health Act 1956

The Health Act 1956 is the prime statute controlling health hazards to the public at large. It identifies lead poisoning by absorption equal to or in excess of 0.48 $\mu\text{mol/l}$ from non-occupational sources as a notifiable disease (Section B of Schedule 2), which must be reported by a medical practitioner to the medical officer of health. The health protection officer or environmental health officer may inform occupants of the premises concerned of the precautions to be taken.

Under the Act, environmental health officers or medical officers of health may issue Cleansing Orders (section 41) or Closing Orders (sections 42 and 44) on a dwelling that is insanitary or likely to cause injury to any occupier. These sections could be applied to lead-contaminated properties.

3.3 Building Act 2004

The Building Act specifies design and performance criteria for new buildings, and regulates building work through a consent system for all buildings. Although paint removal falls within the definition of building work, a building consent would not normally be required.

The Building Act is administered by local authorities.

3.4 Residential Tenancies Act 1986

The Residential Tenancies Act 1986 provides for tenant health protection by requiring a landlord to:

- Provide and maintain the premises in a reasonable state of repair having regard to the age and character of the premises.
- Comply with all requirements in respect of buildings, health and safety under any enactments that apply to the premises.

Landlords are thus required to protect occupants and others from (among other things) lead contamination arising from paintwork in the tenant's property or its fixtures and fittings. However, this would not apply to the tenant's own painted furnishings.

3.5 Resource Management Act 1991

The Resource Management Act 1991 is the main controlling statute dealing with the sustainable management of natural and physical resources, and includes the management of environmental contaminants. The Act prohibits the discharge of any contaminant to land or water. Commercial activities may not discharge contaminants into the air. For example, a resource consent may be required for the removal of paint by abrasive blasting contractors given the significant emission of dust and particulates to the atmosphere and surrounding environment, or a regional plan may prohibit such activities in a residential area.

3.6 Hazardous Substances and New Organisms Act 1996

The Hazardous Substances and New Organisms Act (HSNO) and its associated regulations places controls on the import, manufacture or use (including disposal) of chemicals that have hazardous properties. This includes house paint or industrial paint containing lead. The Act requires lead-containing paint (manufactured or imported after 2006) to be labelled with warning and hazard information. The labelling required will depend on the chemical form in which the lead is present in the paint and the amount present.

Hazardous Substances and New Organisms Act 1996 - Group Standards for Surface and Coatings and Colourants

Under the Group Standards for Surface and Coatings and Colourants, any substance permitted that is intended for use as a paint must comply with the restrictions as set out in the Australian Uniform Paint Standard, as per Appendix 1 of the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) No. 20. The SUSDP prohibits the manufacture, sale, supply or use of any paint with a lead content greater than 0.1 percent and 0.2 percent (percentage based on the non-volatile content of the paint) for lead and lead compounds and lead and lead compounds occurring as an impurity in zinc-based paint, respectively. The restrictions on application apply to: (1) a roof or for any surface to be used for the collection or storage of potable water; or (2) furniture; (3) any fence, wall, post, gate, building (interior or exterior), bridge, pylon, pipeline, storage tank or any similar structure; or (4) any premises, equipment or utensils used for the manufacture, processing, preparation, packing or serving of products intended for human or animal consumption. Also, under SUSDP it is prohibited to manufacture, sell, supply or use a paint for the application to toys unless the paint complies with the specification for coating materials contained in Part 3 of the Australian Standard 1647 for Children's Toys (Safety Requirements).

3.7 Real Estate Purchase Agreements

The contractual agreement governing the sale and purchase of domestic property would normally require the vendor to inform the purchaser of any outstanding statutory notices served on the property. This would include Closing Orders and Cleansing Orders served under the Health Act 1956 to remedy a lead-based paint risk.

4. Responsibilities of Contractors and Employees

The following section summarises the responsibilities of contractors and employees involved in surface preparation and the removal of lead-based paintwork.

4.1 Duties Under the HSE Act

Under the Health and Safety in Employment Act 1992, a contractor may have duties under *one or more* of the following categories: employer, self employed person, principal, person who controls a place of work. The following summarises the duties of those persons under the Health and Safety in Employment Act.

An employer must:

- Provide and maintain a safe working environment for employees.
- Provide and maintain facilities for employees safety and health while at work.
- Ensure plant is safe for employees to use.
- Ensure employees are not exposed to hazards in or near the place of work.
- Develop emergency procedures for possible work-related emergencies.
- Systematically identify existing hazards to employees at work.
- Systematically identify new hazards to employees at work.
- Regularly assess hazards identified.
- Ensure the work does not harm others, including occupants and neighbours.
- Provide information, supervision and training for employees as necessary to effectively recognise and manage hazards.
- Give employees the opportunity to be involved in the development of health and safety procedures.

A self-employed person must:

- Ensure their action or inaction while at work does not harm themselves or any other person.

A principal must:

- Take all practicable steps to ensure contractors and their employees are not harmed by hazards arising from the contracted work. Note that this duty is complementary to (but does not replace) an employer's duties.

A person who controls a place of work must:

- Take all practicable steps to ensure people in and near the place of work are not harmed by the work.

4.2 Duties of Employees

An employee must:

Ensure their action or inaction while at work does not harm themselves or any other person.

4.3 Lead Management Guidelines for Contractors

These are the guidelines contractors should follow in removing paint from any building:

- Assume that paintwork on pre-1980 buildings is lead-based, unless it is proven otherwise by records or testing.
 - Undertake the contracted work in such a way as to protect employee health and safety, in addition to that of tenants and the general public.
 - Comply with the relevant sections of the Health and Safety in Employment Act, and follow the contents of this guideline.
 - Provide employees with sufficient information, supervision and training in recognising and managing the hazards associated with lead-based paint removal work.
 - Provide employees with suitable and sufficient apparatus and protective clothing to do their work in a safe and healthy manner.
 - Inform occupants of the hazards associated with redecoration work as necessary.
 - Plan the work beforehand, to ensure optimum control of risk to employees and occupants.
 - Where lead contamination of a property is identified or suspected, inform the health protection officer of the local District Health Board, or the environmental health officer of the Territorial Authority (City or District Council).
-

5. Responsibilities of Owners and Managers

The following section summarises the responsibilities of those who own or manage occupied property.

5.1 Duties

A landlord must:

- Ensure paint removal contractors commissioned are (among other things) informed of the presence of lead-based paint where known or suspected.
- Ensure paint removal contractors commissioned are sufficiently competent to recognise and manage the hazards associated with the removal of lead-based paint.

If a landlord engages the tenant to carry out removal of lead-based paint, they must ensure the tenant is sufficiently competent to recognise and manage the hazards associated with the removal of lead-based paints.

A Property manager:

As a property manager is, in effect, an agent of the owner or landlord, they must assume the same responsibilities.

5.2 Lead Management Guidelines for Landlords, Managers and Owners

These are the guidelines that landlords, managers and owners must follow:

- Assume paintwork on pre-1980 buildings to be lead-based, unless it is proven otherwise by records or testing.
 - Use only competent contractors for redecoration work, who understand the hazards associated with lead-based paint and follow the procedures outlined in this document.
 - Monitor contractor performance to ensure specifications are met, and that occupants or others are not harmed as a consequence of the work.
-

6. Recommended Working Practices

6.1 Introduction

If lead-based paint is present in a house, it is not necessarily a danger to health. Indeed, removing it is likely to cause a greater risk of exposure than leaving it in place and monitoring its effects.

Basically, where lead-based paint is identified, there are two options:

- If it is in good condition, overcoat it using a non-hazardous surface coating or lining.
- If it presents a danger to health due to its position or condition, remove it and redecorate with a non-hazardous surface coating or lining.

It must be stressed that overcoating with a non-hazardous surface coating is not a permanent solution. It is unsuitable for situations where the lead-based paint layer may be flaking due to loss of adhesion or has been damaged. It is also unsuitable in situations where surfaces can be chewed by children or animals (e.g. door architraves, window sills, door handles or items that children can reach or put into their mouths).

NOTE: For the purposes of this guideline “overcoating” is defined as a process that reduces access to lead-based paint by providing a barrier between the lead-based paint and the environment. This barrier can be formed by a surface coating (or lining) which is bonded to the surface by itself or through the use of an adhesive.

The most common overcoating will be paint which meets current requirements as to lead content. Where paint is used, it is essential that the new top coat is light in colour to prevent undue thermal stress on the underlying coats.

Overcoating should be effective in preventing exposure to lead in paint, but only as long as the new coating remains intact. For this, good surface preparation is essential. As the coating will eventually deteriorate, it should be maintained and replaced when necessary, otherwise the hazard of exposure to lead-based paint will recur.

The precautions required when preparing a painted surface for repainting are essentially the same as those for lead-based paint removal, although the amount of waste generated is likely to be less.

The only way to eliminate the hazard of lead-based paint is to remove the paint completely. This involves stripping the paint back to the underlying surface and redecorating with a non-hazard surface coating.

This is a permanent solution. Alternatively, building components painted with lead-based paint, such as windows and doors, can be replaced during renovation or remodelling.

NOTE: While most paint removal processes will effectively remove the paint from a wooden surface, lead contamination will remain in the timber.

The following sections describe safe surface preparation and redecoration methods for the overcoating and removal of lead-based paint. The overall task sequence for indoor and outdoor operations is summarised in Figures 1 and 2. Specific information about the different paint removal methods is given in Tables 1 and 2.

6.2 Before Working

Assume that the paint to be removed is lead-based unless it is known not to be. Use the sodium sulphide test (described in section 9.2 of this guideline) if necessary. For lead-based paint removal, use the following safe system of work:

- Ensure occupants, particularly children and pets, are not exposed in any way to the hazard. It may be necessary to arrange for the house to be vacated before work proceeds.
- Keep children and pets away from the work area and make sure they do not eat or play with paint debris.

6.3 Procedures for Paint Removal

The risks of lead contamination depend on the extent of surface preparation, the scale of the work, and the paint removal method to be used. Power sanding devices, unless fitted with high-efficiency filters or dust collection systems, will produce considerable dust which has to be controlled and the use of open flame methods to remove paint, such as LPG or blow torches, will produce lead fume, a hazard to the operator. Neither of these methods is recommended unless strict safety measures are taken.

Preparation for repainting or overcoating requires roughening the surface and removing flaking paint. This involves the use of sandpaper or scrapers, both of which produce paint debris. A good alternative is to use a scraper with a tungsten blade (e.g. Linbide), which will remove the paint in large particles which are more easily managed. If sanding by hand, wet sanding will help reduce dust. This involves simply dipping the sanding block and sandpaper in a bucket of water before sanding or spraying the surface with water before sanding. A ground sheet will still need to be used to collect pooled or dripped water containing lead dust.

The following are the measures to be taken. Some of these measures may not be necessary when removing small areas of paint or preparing a surface for recoating.

1. Use a ground sheet large enough to contain all the paint debris generated. If working on a scaffold, tie a sheet underneath to catch falling paint debris. The sheet should be clean (i.e. not contain lead contamination from previous lead-based paint removal). Disposable polythene sheeting is recommended.

NOTE: Disposable polythene sheeting is recommended in preference to reusable dust sheets because of the tendency not to clean dust sheets, which may lead to cross-contamination. It has been suggested that polythene sheeting may increase the fire hazard but this problem is not evident in the United States, where polythene sheeting is extensively used in paint removal operations.

2. Work in such a way as to minimise dust and fume generation and the transfer of debris away from the immediate work area. Avoid working when wind or draughts could cause debris to be blown away from the work area containment or inside the building.
3. Wear a filter respirator appropriate for the airborne contaminants produced. A toxic dust respirator is required for abrasive removal work, but this will not protect against fumes where lead-based paintwork is heated, or where solvents are used. Guidance in the purchase, use and maintenance of filter respirators is provided in AS/NZS 1715:1994 *Selection, use and maintenance of respiratory protective devices*. A free publication, *A Guide to Respirators and Breathing Apparatus* is available from any Department of Labour office.
4. Remove accumulated dust as often as is necessary to prevent it spreading from the immediate work area. As a minimum, do this on a daily basis where practicable, using a vacuum cleaner fitted with a high-efficiency particulate air (HEPA) filter for dust and particulate removal. HEPA filters are capable of filtering out 99.97 percent of particles of 0.3 µm diameter or larger. The filter on a standard domestic vacuum cleaner is *not* capable of doing this.

NOTE: Vacuum cleaners that operate in “wet” conditions will generally be safer to use than a “dry” cleaner. Make sure the exhaust from the vacuum cleaner is positioned to prevent the disturbance of material in its path.

5. After vacuum removal, there are still likely to be dust traces remaining. Remove these by wiping surfaces with a damp cloth, and disposing of it after use. It is important to use a detergent in the water as this improves cleaning efficiency. Most common laundry powders which contain tri-sodium phosphate detergents are suitable for this purpose.

6. Place lead-based paint debris and contaminated cloths directly into polythene bags and seal them prior to disposal.
7. Small amounts of paint debris can be disposed of in the household refuse collection, or directly to the rubbish tip. For larger quantities, or if in doubt, check with the local city or district council. It may be necessary to arrange disposal at a controlled landfill.
8. Never burn or bury lead-based paint debris or lead-based painted wood or use the timber for firewood as this may cause further hazards or spread the contamination.

6.4 Surface Coating

1. Select an appropriate surface preparation method (see Tables 1 and 2).
2. Select an appropriate coating, given the condition of the surface to be covered and the likely use of the property.
3. Select necessary personal protective clothing and equipment (see Tables 1 and 2).
4. Prepare the surface to accept the coating. This is essentially a cleaning and buffing process, but also requires the removal of all loose substrate and grease from the surface, as this will reduce adhesion of the new coating.
5. Apply the coating.

6.5 Special Precautions for Interior Paintwork

Preparation

1. Seal windows, doors, ventilators and other openings as necessary to ensure that dust generated does not leave the room. Adhesive tape should suffice.
2. Remove all soft furnishings (including curtains and carpets where practicable) from rooms to be treated. Cover furnishings which cannot be removed with polythene sheeting, and seal it to prevent dust entering the fabric.
3. Remove other furniture from the room as necessary before beginning the job.
4. Remove all food and medicines which cannot be put in sealed cupboards or containers.
5. Install polythene covers, taped down if necessary, to prevent paint fragments and dust from contaminating the carpets and remaining fittings. A polythene groundsheet beneath the work area is a minimum requirement.

Decontamination

1. Remove accumulated dust as often as is necessary to prevent it spreading from the immediate work area. As a minimum, do this on a daily basis. Use a HEPA vacuum cleaner to remove dust traces from the work area and surroundings, and wet-mop the polythene dust sheets after removal of gross dust.
2. When the surface preparation work is complete, wet-wipe the prepared surface and other affected surfaces with a disposable cloth to remove any dust traces. Wipe all shelves, walls and windows where dust may have settled. Dispose of the cloth along with the paint debris.
3. If soft furnishings have been contaminated, clean them thoroughly before replacing. If grossly contaminated, there may be no option but to dispose of them.

6.6 Special Precautions with Exterior Paintwork

Preparation

1. Where contaminated dust may escape from the work area or enclosure, seal windows, doors, ventilators and other openings (including eaves) of the building and nearby buildings (or rooms), to prevent dust contamination entering occupied areas.
2. Use a groundsheet to catch paint debris and prevent soil and vegetation being contaminated by lead.
3. Where wind is likely to scatter or spread dust, it may be necessary to use a wet sanding or chemical stripping method instead of a “dry” removal method, or delaying preparation until conditions are improved.
4. If removing paint by water blasting, ensure the waste water goes through a filter or earth dam before passing into the stormwater drain or ground soakage. This will filter out the paint fragments, which should then be disposed of as a contaminated waste. For larger jobs, settlement and filtration of the waste water may be necessary prior to its disposal in the stormwater drain.

NOTE: The disposal of waste water in a stormwater drain would only be acceptable if there were no adverse effects on the environment. Normally it is not practicable to divert waste water to the foul sewer. In either case, lead in the waste water is likely to enter the environment. The emphasis should be on removal of lead contaminants at source and proper disposal of the concentrated contaminated waste.

Decontamination

1. Remove accumulated dust as often as is necessary to prevent it spreading from the immediate work area. As a minimum, do this on a daily basis.
2. Use a vacuum cleaner fitted with a HEPA filter for removing the remaining dust and particulates from the surrounding area. Dispose of the polythene sheeting or wash it down, collecting the residue for safe disposal.
3. Remove the paint dust on ledges, windows and walls with a damp cloth, and dispose of this along with other paint debris.
4. Where soil or vegetation is contaminated by paint dust or fragments, it may be necessary to remove and dispose of the affected layer. Contamination on concrete or other impermeable surfaces may be rinsed away with water but only if the wash water goes through an earth dam or filter into a drain. The earth and filtered material must be disposed of safely.

6.7 Protective Clothing

- Wear a good-quality, properly fitted, toxic dust filter respirator when sanding, making dust, or burning off lead-based paint. If using a disposable type, only those with double head straps are suitable.
- Respirators must meet the requirements of the New Zealand/ Australian Standard AS/NZS 1716-1994 *Respiratory protective devices*. A free publication, *A Guide to Respirators and Breathing Apparatus*, is available from all Department of Labour offices.
- Replace respirator filters as required and ensure that all protective equipment is cleaned and stored properly.
- Wear overalls and a hat (especially when dry-sanding) to prevent dust accumulation in clothing and hair. Disposable coveralls are recommended for dusty work. Do not wear contaminated overalls or boots home as this can spread lead contamination and put family members at risk.
- Wear boots and gloves. Clean boots at the site or leave boots at the site so that lead dust is not carried to the vehicle or home.

6.8 Personal Hygiene

- Do not smoke while removing paint, as hand to mouth contact may increase the risk of eating or inhaling lead paint dust.

- Wash hands before eating, drinking or smoking. Do not eat or smoke in the work area.
 - Place contaminated overalls in clean polythene bags before removing them from the work area, as they are a significant source of contamination to others.
 - Non-disposable overalls should be changed twice weekly (or more frequently, if necessary) and laundered separately from other domestic clothing and linen. When laundering contaminated overalls, store them away from other clothes. Do not shake prior to laundering. Disposable overalls provide a simple and safe method of protection.
 - Clean equipment thoroughly of dust and paint fragments before it leaves the work area. A vacuum clean followed by a wet-wipe is normally sufficient.
 - Wash or wipe clean boots and gloves with a damp cloth at the end of each work day.
 - Replace or change filters on respirators according to manufacturers' instructions or as circumstances dictate.
-

Fig 1. Indoor Paint Removal

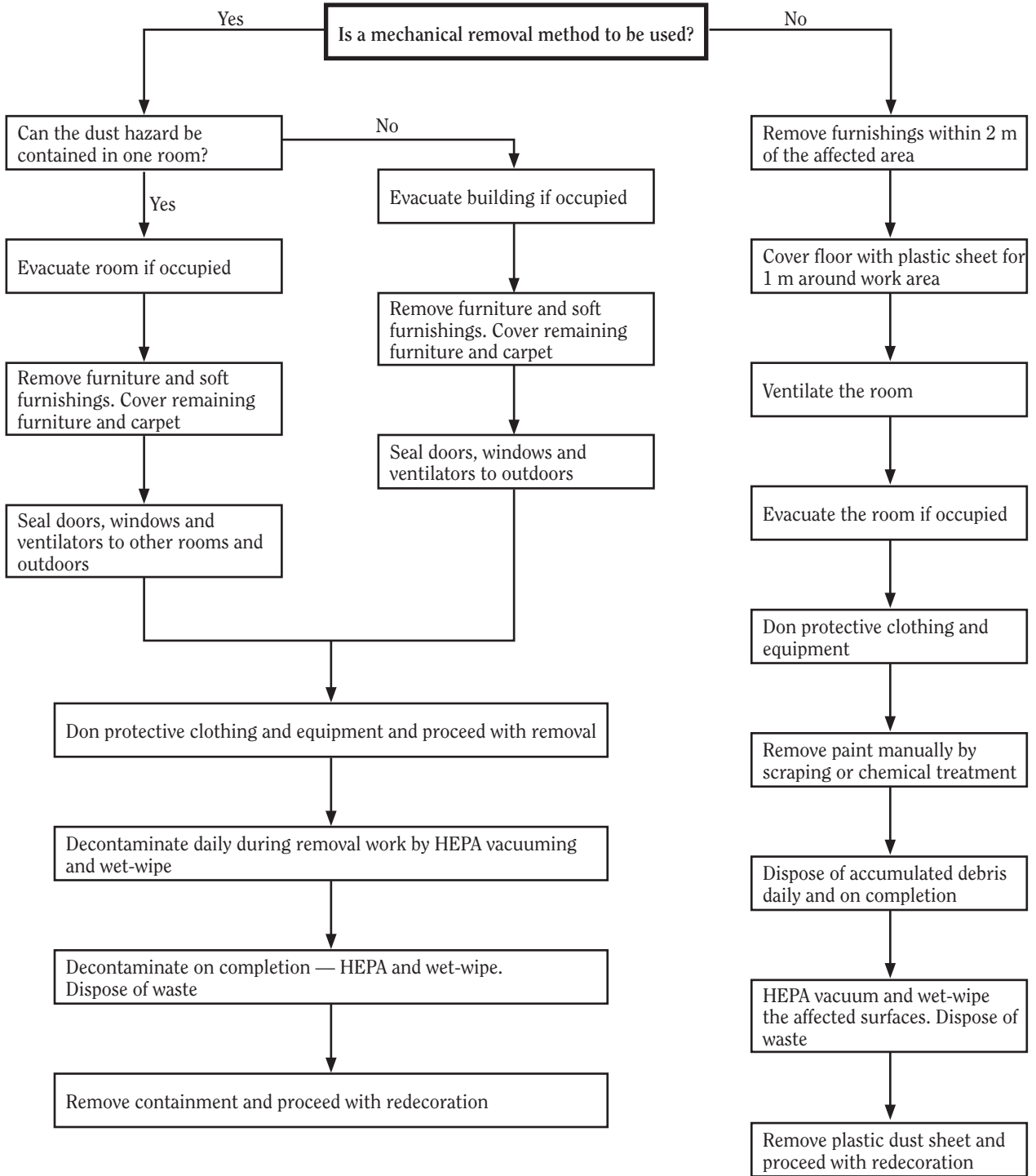


Fig 2. Outdoor Paint Removal

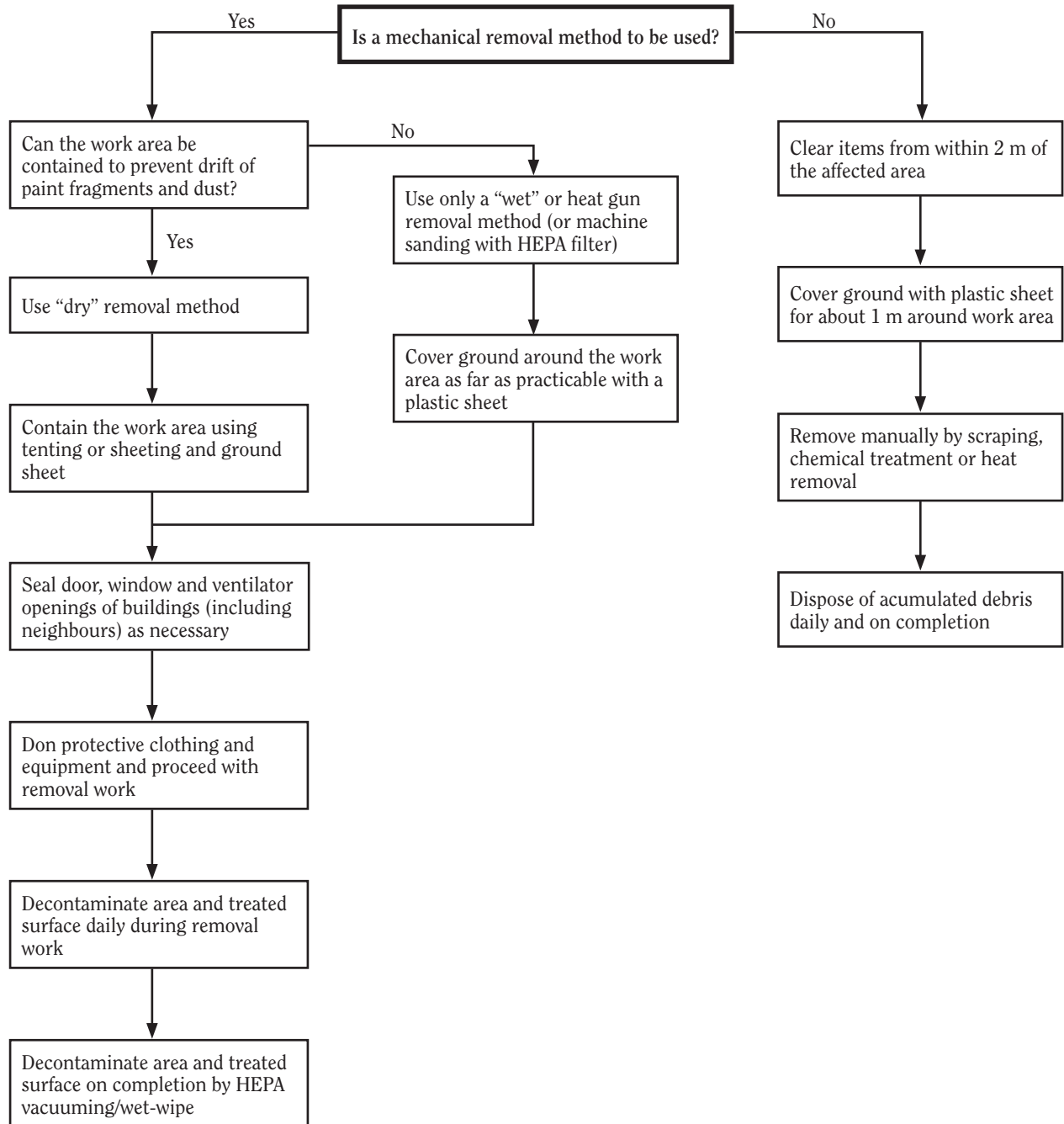


Table 1: Manual Paint Removal Methods

	HAND SCRAPING/SANDING	CHEMICAL STRIPPER	HEAT TREATMENT
Options	Dry sandpaper Wetted sandpaper may be used to suppress dust Rasp, wire brush, shave hook, scraper	Solvent-based paint stripper Alkaline paint stripper Brush for application Scraper for treated paint removal	Infra-red (recessed flame) Hot-air blower Electric paint stripper Blowtorch (direct flame) (<i>Not recommended due to release of lead fumes</i>)
Hazards Present	Dust inhalation Dust ingestion from contaminated hands Cross-contamination from overalls Dust contamination of carpets, etc.	Solvent fume inhalation Skin irritation and eye burn Respiratory irritation Cross-contamination from overalls	Skin and eye contamination Cross-contamination from overalls Fire hazard Fume inhalation from flame contact methods (>450°C)
Personal Protective Equipment	Toxic-dust filter respirator Gloves Boiler suit Hat (covering hair) Safety goggles	Toxic-dust filter respirator Organic vapour respirator if solvents used Safety goggles Gloves Boiler suit Hat (covering hair) Other precautions as per the Safety Data Sheet Fire extinguisher where flammable chemicals are used	Lead-fume, dust and mist filter respirator Gloves Boiler suit Hat (covering hair) Safety glasses
Other Safety Measures	Polythene dust sheet to collect debris Soft bristle brush to gather debris Wet-wipe treated and nearby surfaces	Keep the work area well ventilated Polythene dust sheet to collect debris Soft bristle brush to gather debris Wet-wipe treated and nearby surfaces Beware of skin and inhalation hazard	Keep the work area well ventilated Polythene dust sheet to collect debris Soft bristle brush to gather debris Wet-wipe treated and nearby surfaces Have a fire extinguisher available.
Waste Management	Place paint debris in a sealed polythene bag marked "lead-based paint debris" Dispose of contaminated wash water to sewer (see section 6.6.4)	Place paint debris in a sealed polythene bag marked "lead-based paint debris" Dispose of contaminated wash water to sewer (see section 6.6.4)	Place paint debris in a sealed polythene bag marked "lead-based paint debris" Dispose of contaminated wash water to sewer (see section 6.6.4)

Table 2: Other Paint Removal Methods

	MACHINE SANDING	WATER BLASTING	ABRASIVE BLASTING
Application	Only HEPA filter-fitted machines should be used particularly when sanding indoors All machines used outdoors should have dust collection systems	Outdoor application only Must not be used for domestic paint removal as this method can spread paint chips and dust significant distances into the surrounding environment	Must not be used for domestic paint removal or in other situations where people may be exposed
Options	Orbital sander Disc or belt sander Disc grinder Flap wheel, wire brush or disc rasp (drill attachments)	High-pressure water lance Steam generator with chemical dosing apparatus Compressor	
Hazards Present	Dust inhalation Dust ingestion from contaminated hands Cross-contamination from overalls	Dust ingestion from contaminated hands Cross-contamination from overalls	
Personal Protective Equipment	Toxic-dust filter respirator Disposable coverall Disposable boot covers Gloves Hat (covering hair)	Waterproof gloves Barrier cream Water resistant boiler suit Hat (covering hair)	
Other Safety Measures	Others in the dust-affected area to wear toxic-dust filter respirators and overalls Polythene containment to prevent debris loss from the work area Daily dust removal by vacuum cleaner with HEPA filter Wet-wipe treated and nearby surfaces	Polythene containment to prevent debris loss from the work area Daily debris removal by pressure hose Remove paint particles washed onto adjacent land Wet-wipe treated and nearby surfaces	
Waste Management	Place paint debris in a sealed polythene bag marked "lead-based paint debris" Dispose of contaminated wash water to sewer (see section 6.6.4)	Place paint debris in a sealed polythene bag marked "lead-based paint debris" Dispose of contaminated wash water to sewer (see section 6.6.4)	

7. Personal Health Surveillance

Blood lead content is accepted as a measure of recent lead exposure, and can be easily measured by having a blood sample tested. Whether the blood lead level is deemed to be satisfactory or unsatisfactory depends on whether the person concerned receives their exposure as an employee (contractor) or as a member of the general public. Current New Zealand standards are summarised below.

7.1 Contractors

Occupational blood lead level surveillance is discussed in detail in the *Guidelines for the Medical Surveillance of Lead Workers* (Department of Labour) 1993. A summary of blood lead thresholds is presented in Table 3.

Table 3: Blood Lead Levels (Occupational)

Action Criteria	Blood Lead level
Maximum recommended level * ¹	1.5 µmol/litre (whole blood)
Notification level to DOL * ²	≥2.6 µmol/litre (whole blood)
Suspension level * ³	≥3.2 µmol/litre for a single test, or ≥2.6 µmol/litre for 3 consecutive tests

Notes:

*1: The objective is to ensure that the blood lead level of all workers is maintained below 1.5 µmol/litre.

*2: Result must be notified to the Department of Labour.

*3: A worker will normally be suspended by the Department of Labour medical practitioner at these levels.

The frequency of blood testing for employees is dependent on their exposure characteristics, and should be determined by an occupational health nurse or other suitably qualified medical professional.

Irrespective of the test frequency, where employees experience the symptoms of acute lead poisoning, they should approach their employer and arrange a blood lead test with their medical practitioner.

7.2 General Public

Second Schedule of the Health Act 1956 was amended in 2007. Lead absorption equal to or in excess of 0.48 µmol/l is notifiable to the Medical Officer of Health under the Health Act.

Table 4: Blood Lead Levels (General Public)

Criteria	Blood Lead Levels (General Public)
Notifiable level	≥ 0.48 µmol/l (whole blood) or 10 µg/dl

8. Environmental Surveillance

8.1 Introduction

There are many forms of lead in the environment. However, the exposure to lead from paint is only significant in the following cases:

- Inhalation of lead-based paint dust and fume.
- Ingestion of lead-based paintwork.
- Ingestion of lead in house dust.
- Ingestion of lead in soil.

The following sections describe the acceptable and unacceptable concentrations of lead in air, paint, dust and soil. Methods of measurement and interpretation of results are also considered.

8.2 Lead in Air (Occupational Exposures)

The New Zealand Workplace Exposure Standards (WES) published by the Department of Labour (2002) set guidelines for exposure (via inhalation) for hazardous substances in occupational settings.

The WES are not intended as a boundary between safe/dangerous exposures as individual susceptibility and pre-existing medical conditions can make a person more/less susceptible at the same concentrations. As such the intention should not be to aim for 'just below' the WES but to keep airborne exposure as far below the WES as is practicable. It is good occupational health practice to take steps to reduce exposure when levels are more than 25% of the WES-TWA.

The WES that applies to lead from lead-based paint is the WES-Time Weighted Average (WES-TWA). The WES-TWA is designed to protect the worker from the effects of long term exposure to the substance.

Table 5: Airborne lead concentration

WES-TWA (8-hour shift)	0.1 mg/m ³
WES-TWA (12 hour shift)	0.05 mg/m ³
Action level	25% of WES-TWA

It should be noted that:

- The WES-TWA applies to 8 hour exposure. If work shifts are longer than 8 hours, the WES-TWA must be reduced to adjust for the longer period of exposure.
- In all instances the WES relates to exposure that has been determined by personal exposure monitoring whereby a worker wears the monitoring equipment so that airborne lead levels in the breathing zone can be measured.
- These guidelines are designed for interpretation by persons in occupational health practice.

8.3 Lead in House Dust

Lead in house dust comes from many possible sources, outdoor and indoors. The amount is thus dependent on a number of factors, such as the amount of painted wood present, property age, property condition, distance from a major road and residents' occupations and hobbies.

Once in the home, dust accumulations are affected by their location, surface texture and cleaning routines. Consequently it is not possible to state a single value for the "normal" lead content of house dust. Refer to the *Environmental Case Management of Lead Exposed Persons Guidelines for Public Health Units*, Ministry of Health 2007 for further information.

8.4 Lead in Soil

Children between the ages of one and five years are the group most likely to be exposed to lead in soil. At a conservative estimate, children may ingest up to 100mg/day of soil. Thus, a stricter standard is required for soil in which children may play than for other soil. Investigation levels are those at or above which a risk assessment and contaminant source investigation should be initiated. Action levels are those at or above which there is potential for harm, and remedial action is necessary.

Table 6: Lead in Soil

Criteria	Lead level
Background level (Bare soil)	<200mg/kg (ppm)
Investigation level (Bare soil)	300mg/kg (ppm)
Action level (Bare soil)	1000mg/kg (ppm)
Action level (Children's play area)	300mg/kg (ppm)

Source: Environmental Case Management of Lead Exposed Persons Guidelines for Public Health Units, Ministry of Health 2007

9. Sampling, Analysis and Interpretation

9.1 Introduction

When doing any sampling, it is essential to ensure that the sample taken is representative. This is often extremely difficult, particularly where monitoring low concentrations. For example, when sampling soil, the presence or absence of a single paint fragment in a sample may have a significant influence on the overall result. A flake of lead-based paint in one sample of soil can result in an elevated level of lead which is not representative of the entire area.

For sampling to be considered representative, it is rarely sufficient to take a single sample. Where multiple samples are taken, it is, of course, essential to ensure that the same collection and analytical method is used. Otherwise it is not possible to compare results from the different samples. Sampling over a “grid” pattern is the usual method.

The sodium sulphide test described below for surfaces is quite basic but give reliable qualitative results when done correctly, indicating whether lead is present or not. Where necessary, the results may be confirmed by more accurate quantitative analysis in a laboratory.

The correct interpretation of results is also important. When considering results, it is important to consider possible sampling error and the accuracy of the analytical method. The results must also be considered in perspective. For instance, a lead concentration in soil may not present a risk to adults, but may present a significant risk to preschool children who live and play there, especially children with a habit of eating soil, a behaviour known as pica.

Standardisation of sampling and analysis methodology is also essential where results are to be compared against an agreed reference. It is incorrect to compare two or more values which were obtained by different sampling methods, or analysed by different methods.

9.2 Tests for Lead in Paint

The simplest test for lead in paint is the sodium sulphide solution. A drop of 5% sodium sulphide solution is applied to the paint and if it turns brown/black it means lead is present in the paint.

Paint shops, some pharmacies, and other suppliers sell sodium sulphide solution. Some paint shops will also test paint flakes in store (often for free). Public health units will test paint flakes for free.

Method:

Clean surface.

Use a clean knife to make a 1 cm notch in the painted surface, to reveal bare wood. This will expose paint layers in the diagonal face of the notch.

Rub sodium sulphide solution onto the freshly exposed paint, using a clean cotton bud (or apply as per instructions).

Alternatively, use sandpaper to expose each layer of paint, testing with the solution at each change.

Results:

Positive result if the exposed surface turns brown/black i.e. lead present in paint.

Negative result if there is no black colour

NOTE:

1. Sodium sulphide solution deteriorates with time and elevated temperature. Store in a cool place and do not use if it is older than about three months.
2. Ensure skin and eyes are protected when using the solution as it may cause irritation. Also use in a well ventilated place.
3. As a positive result turns brown/black it can be hard to determine if the colour change has occurred on dark paint.
4. This test cannot be used to assess airborne exposure for workers and therefore cannot be compared against the Workplace Exposure Standards.

The sodium sulphide test is qualitative only, and indicates only whether lead is present in paint or not. It is a basic tool, and as such can only be used in the preliminary appraisal of a paint film, to ascertain whether it is lead-based or lead-free. Quantitative lead testing can be carried out by analysis of paint flakes at a recognised laboratory.

9.3 Lead in House Dust

To determine if lead is present in house dust, samples of bulk dust or wipe samples of surfaces can be analysed by recognised laboratories. Bulk dust sampling involves collecting dust in a clean (lead-free) container or bag, and wipe sampling involves using a lead-free filter or similar material to wipe a measured surface area.

It is suggested that expert advice be sought before any dust sampling is undertaken.

It would not normally be considered representative to take only one sample in a house, given the way in which dust concentrations vary. Several samples should be taken, although the emphasis should be on sampling those surfaces where children may play (and hence be exposed to contaminated dust). Window sills, in particular, are an important sampling location. Dust is likely to arise from the paintwork abrasion of window opening and closing, while the window is often an attractive place for children to play.

Lead levels in house dust can be utilised in two main ways:

1. To determine whether house dust contains lead or not.
2. For clearance assessment (determining whether a contractor has left contaminated residues behind after a paintwork removal project).

It is important to realise that house dust is not steady-state, in that it is continually being added to or carried away. A freshly cleaned surface is likely to register negative for lead contamination immediately after cleaning. One month later, however, lead may be present, having been transferred from nearby contaminated sources.

Surveys have shown that once carpet has been contaminated by lead paint dust it is difficult to remove, even with a vacuum cleaner. It has been suggested that the small heavier particles tend to move deeper into the carpet. This means beating carpets may not be a safe practice.

9.4 Lead in Soil

To determine if lead is present in soil a bulk soil sample can be analysed by a recognised laboratory. Ideally multiple samples will be taken, and visible paint flakes will be removed from the sample before analysis. A single particle of lead-based paint in a sample will give a spurious high result which will not be indicative of the average soil levels. It is suggested that expert advice be sought before any soil sampling is undertaken.

Appendix 1: Lead in Paint

A1.1 Domestic Paints

It should be noted that the concentration of lead in domestic paints has declined dramatically in the past decades. It may thus be assumed that pre-1970 interior or exterior domestic paintwork is almost certainly lead-based, while pre-1980 paintwork may be lead-based. Post-1980 paintwork may generally be assumed to have a very low lead content unless old stock or industrial specification paint was used inappropriately.

Paint formulations contain a variety of materials, several of which (such as lead, chromate and solvents) may be harmful to health under certain conditions. However, research has indicated that lead is presently the predominant public and occupational hazard associated with paint removal work in New Zealand.

Prior to 1945, white lead was extensively used as a pigment in paint, but after this date it was progressively replaced by titanium dioxide. Recognition of the hazards to health associated with lead in paint has since led to strict controls on paint lead content, and other forms of lead have since been withdrawn from paint formulations.

The following are estimates of when various forms of lead were controlled:

- White lead (basic lead carbonate) and lead sulphate were used as white pigments in domestic paints until the mid-1960s.
- Lead chromate (yellow pigment) was an ingredient in domestic paint until the late 1970s.
- Red lead paint (steel primer) is known to have been used as a wood primer until the 1980s.
- Calcium plumbate has been widely used as a roof coating for iron roofs from 1958 until the present time. It is now no longer manufactured and few stocks presently remain.

It is important to realise that the potential still remains for old or industrial specification paints to be used inappropriately in domestic situations.

A1.2 Other Paints

Paints are widely used in other situations for protective and decorative purposes, and their formulations are many and varied. Ships and steel infrastructure such as pylons, towers, bridges and pipelines, often have high specification paints to provide corrosion protection. Some formulations may have appreciable lead content, but may also contain other materials which under certain circumstances may also give rise to a health hazard or environmental contamination.

Given the large surface areas involved, and the absence of occupants or residents, abrasive blasting and mechanical paint removal methods are often appropriate for such situations. However, this introduces a significant potential for operator exposure to hazardous materials. Furthermore, where the resulting debris is inadequately contained, collected or removed, localised environmental contamination may result.

It is beyond the scope of this guideline to address such occupational exposure and environmental contamination issues, although the general principles described in the following pages may be applicable.

A1.3 Extent of the Problem

Despite the very low lead content of today's household paints, there remains a significant accumulation of lead in painted surfaces in the built environment. Lead-based paintwork in occupied properties may present a hazard where:

- Paintwork is being removed using an inappropriate method, generating lead-contaminated dust or fume.
 - Paintwork was in the past removed using an inappropriate method, resulting in high lead content in household dust and adjacent soil.
 - Paintwork is in an advanced state of deterioration (i.e. chalking or flaking).
 - Flaking paintwork has contaminated adjacent soil or vegetation.
 - Paintwork is in a situation or condition where it may be consumed (directly or indirectly) by children or animals.
 - Paintwork is continually scratched, scraped, rubbed or otherwise worn, particularly on windows, doors and shelves.
-

Appendix 2: Health Effects of Lead

Lead and its compounds are highly toxic, causing health effects which vary widely in their type and severity. Lead poisoning is a notifiable disease under the Health Act 1956.

The risk of lead poisoning only arises where:

- The lead is available for biological uptake.
- Exposure is such that a sufficient quantity of lead enters the body.

In the majority of situations, occupants and others are not normally exposed to the hazards associated with lead in paint. However, poor management of redecorating practices can create a risk for contractors, occupants, family pets and even those in neighbouring properties.

A2.1 Uptake and Excretion

Since the effective controls on lead in foodstuffs and petrol, the uptake of lead in the domestic environment is predominantly from dust or fume inhalation, and the ingestion of paint fragments or dust (directly or via contaminated foodstuffs).

Ingestion of lead particles or lead-contaminated material is the primary route of intake for young children, and particularly preschool children who tend to eat, chew, lick or suck non-food items (including contaminated fingers).

By contrast, inhalation is the primary exposure for adults, as they tend to be more discerning about what they put in their mouth (although poor personal hygiene prior to smoking or eating may result in appreciable exposure via ingestion where hands are contaminated). Inhalation of dust typically arises during domestic cleaning and renovation activities

Once in the body, lead may pass into the bloodstream or be excreted mainly via faeces and urine. The rate of uptake depends upon many factors, not least the chemical and physical form of lead. It is thus important to distinguish “total lead” from “bio-available lead”. Once in the bloodstream, lead tends to accumulate rapidly in hard tissues such as bones and teeth, from which it may be slowly released back into the bloodstream. Indeed, up to 95 percent of body lead burden may be found in bones.

The rate of release is largely governed by the blood lead concentration relative to that of the accumulation sites. Excretion of lead from blood and soft tissue takes around a few months, however only a few percent

of the body burden of lead may be in the blood. Lead bound in the bone may take decades to eventually be excreted. Excretion from the body is primarily via urine. When the uptake rate exceeds the excretion rate, there is a net accumulation of lead in the body and the symptoms of lead poisoning will ultimately occur.

A2.2 Lead Poisoning Symptoms

The early stages of lead poisoning are non-specific and affect the gastrointestinal and nervous system. In later stages, symptoms may develop in the blood, kidneys, bones, heart and reproductive system and may, in extreme cases, result in death. One of the most important manifestations of lead exposure is developmental impairment in young children.

Symptoms of lead poisoning involving the nervous system can include:

- Mood changes such as depression or irritability
- Memory impairment
- Sleep disturbance
- Concentration difficulties
- Headaches
- Tingling and numbness in fingers and hands
- Muscle weakness and wrist drop (heaviness of limbs)
- Fits (rarely).

Symptoms of lead poisoning involving the stomach and intestine can include:

- Lack of appetite
- Nausea
- Diarrhoea
- Constipation
- Stomach pains
- Weight loss.

Other effects may include:

- Kidney damage and increased blood pressure
- Decrease in numbers and quality of sperm
- Miscarriage
- Anaemia.

If any of these symptoms are present, seek medical advice immediately, particularly if young children are affected.

NOTE: The above are reproduced from the Department of Labour publication *Guidelines for the Medical Surveillance of Lead Workers*.

Most young children suffering from elevated lead levels have no clear symptoms. The effects of mildly elevated lead levels can include reduced IQ, increased school failure, impaired neuro-behavioural development, cognitive deficits, irritability, and aggression. The general state of health may influence the severity of symptoms, as lead already in the body may be mobilised during pregnancy or due to health upsets, infections or excessive alcohol consumption. It should be noted also that lead can cross the placental barrier and affect the unborn child.

The intensity of exposure may vary greatly, and the effects of exposure may thus be acute (resulting from intense, short-term exposure) or chronic (resulting from prolonged low-intensity exposure).

As lead is a biocumulative toxin (a poison which can build up in the body), prolonged exposure to a low level of contamination can lead to an appreciable concentration in the body over time, sufficient to give rise to adverse health effects.

A2.3 Hazard, Exposure and Risk

Although lead is a poison, certain conditions must exist before the exposure to lead creates the risk of lead poisoning. The main factors which affect the degree of risk include:

- Personal habits/hygiene
- The concentration of lead
- Its physical form (particle size)
- Its chemical form (bio-availability)
- The intensity of exposure
- The frequency of exposure
- The duration of exposure
- Existing body lead burden
- Rate of excretion
- Body lead burden relative to body mass
- Personal health status
- Age of exposed person
- Diet of exposed person.

The risk may thus vary greatly, and the same source of lead can present different degrees of risk for different individuals. Furthermore, where lead does not constitute an immediate risk to health, it may have other long-term effects.

A2.4 Exposure Routes

Exposure to lead in paints occurs at all stages in its life cycle, from mining the lead and using it as an ingredient in paint, through to its application, removal and weathering to dust. Exposures during this life cycle will vary dramatically by virtue of its physical or chemical form, and its location relative to people. These guidelines refer to exposures from lead paint removal and the resulting dust/fume.

A2.5 Children in the Home

The primary exposure for young children is by ingestion of contaminated dust, soil or paint fragments. Preschool children are particularly susceptible to poisoning from lead-based paint because:

- They may play on surfaces which contain contaminated dust, and transfer the contamination from hand to mouth.
- They may chew items containing lead-based paints.
- They may eat lead-contaminated material such as paint fragments or soil (a behaviour known as pica).
- Their small body mass means that even tiny amounts of lead can cause poisoning.
- They absorb proportionally more lead from their gastrointestinal tract than adults.

A2.6 Adults in the Home

The primary exposure route for adults is inhalation of lead-contaminated dust. Although it is unlikely that adults will suffer serious poisoning as a consequence, pregnant mothers may pass sufficient lead to their unborn babies to cause the foetus to suffer lead poisoning.

Adults who may be exposed to dangerous amounts of dust include:

- Those involved in paint removal operations (“do-it-yourself” or commercial contractors).
- Those living where dust residues contain high lead levels arising from historical or ongoing paint removal operations.
- Those involved in routine cleaning operations which raises dust into the breathing zone.

- Those whose work or hobbies expose them to other sources of lead (e.g. radiator repairers, users of lead solder, rifle shooters).

Table 7: Exposures to Lead in the Paint Life Cycle

Life Cycle Phase	Exposure Category	Sources of Exposure
Paint Application	Occupational	Inhalation if sprayed. Ingestion (via poor personal hygiene in conjunction with eating or smoking).
	Environmental	Spillage to land. Liquid waste disposal from cleaning.
	Public	No significant exposure.
Paint <i>in situ</i>	Occupational	No significant exposure.
	Environmental	Accumulation of weathered paint fragments in soil.
	Public	Ingestion of weathered paint fragments. Ingestion of lead-contaminated soil. Inhalation of lead-contaminated house dust. Ingestion of lead-contaminated house dust (directly or indirectly).
Paint removal (and surface preparation)	Occupational	Fume from flame removal. Dust from paintwork removal (sanding, scraping, abrasive blasting). Ingestion via poor personal hygiene in conjunction with eating or smoking.
	Environmental	Solid waste accumulation on land. Liquid waste disposal from cleaning. Fume discharge from air. Accumulation on vegetation.
	Public	Ingestion of displaced paint fragments. Inhalation of fume/dust during and after removal. Consumption of vegetation with surface (dust) contamination.

A2.7 Domestic Animals

Domestic pets tend to suffer from domestic lead poisoning more readily than humans because:

- They are generally much smaller than humans.
- They wash and groom themselves by licking dirt from their fur.
- They tend to be less discerning in what and where they eat.
- They may eat food off the floor, or food which has been buried.
- They may chew items coated in lead-based paint.

Consequently, domestic pets (particularly cats and dogs) are often a first indicator of lead toxicity in the home. As with humans, lead poisoning symptoms are variable. Common indicators of lead poisoning include fits, behavioural change, deteriorating eyesight and gastrointestinal upset. It is not uncommon for domestic pets to die as a consequence of lead poisoning.

A2.8 Commercial Painting Contractors

Those whose work involves paint removal are likely routinely to encounter lead-based paint. Consequently, they must take steps to control even minor exposures, as they may be exposed frequently or for long periods.

Exposure primarily occurs during surface preparation, where the existing paint is either buffed or removed prior to repainting. The dust generated by such preparatory activities is close to the operator's breathing zone, and so is easily inhaled unless a filter respirator is worn. The greater the amount of dust generated, the greater the potential risk.

In addition to the personal risk for the operator, residents of the building must also be considered. Risks may occur where people are present during the work, or are exposed to lead dust from contaminated overalls and equipment.

A2.9 Others

As paint fragments, dust and fumes are easily blown away from the point of work, people in the vicinity of paint removal work may also be affected, including residents, observers and assistants. Under windy conditions, even neighbouring properties may receive sufficient dust from outdoor removal work to present a risk to their occupants.

Appendix 3: Key Organisations

There are a number of regulatory agencies with a brief to address the hazards associated with lead in the community, and they may have a policy, service, regulatory, monitoring, educational or research role.

Ministry of Health

The Ministry has had an historical role in the identification and management of health hazards which affect the public at large. The Director-General of Health appoints designated officers in public health units to carry out investigations and regulatory enforcement roles. The regulatory component underpins some public health service provision, and medical officers of health and health protection officers are the designated officers to carry out these functions. The Ministry has taken the leading role in co-ordinating general policy issues on lead.

Department of Labour

The Department of Labour is responsible for administering and enforcing the Health and Safety in Employment Act 1992 and other statutes relating to workplace safety, and associated regulations and codes of practice.

In administering this legislation, the Department undertakes regulatory, advisory and policy activities. Health and safety inspectors and occupational hygienists are the main contact people with respect to lead-based paint issues.

They regulate industrial-type exposures to lead, such as battery manufacturing, welding and paint removal. In addition, the Department offers advice and education on safe work practices to contractors and members of the public who may be exposed to hazards associated with workplaces or work activities.

The Department of Labour administers the Notifiable Occupational Disease System (NODS) which records and investigates cases of lead poisoning occurring in the workplace.

District Health Boards (DHBs)

DHBs are responsible for providing, or funding the provision of Government-funded health care services for the population of a specific geographical area. There are 21 DHBs in New Zealand.

The statutory objectives of DHBs include improving, promoting and protecting the health of communities, promoting the integration of health services, especially primary and secondary care services, and promoting effective care or support of those in need of personal health services or disability support.

Public Health Units

The public health units are contracted by the District Health Boards to provide public health services to the Crown. One aspect of this is the provision to the public of a screening test for lead-based paint which will determine whether paint contains a high level of lead. Health protection officers are the field staff of the public health units and are the first point of contact.

The public health service providers do not undertake routine screening of blood lead levels. However, general practitioners would initiate blood screening for diagnostic purposes where a patient exhibited the symptoms of lead poisoning or on patient request. Health protection officers from the public health units have a co-ordination role between agencies on risk assessment, management plans, and cleanup operations in the public arena.

Local Authorities

Local district and city councils enforce the provisions of the Health Act 1956 in their areas. This enables environmental health officers to take steps to prevent activities or close premises which may be “injurious to health”. Details of lead-contaminated properties may be entered into property files for noting on Land Information Memorandums.

Regional Councils

Regional councils are the authority charged with controlling discharges to air, water and land, and may use the Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines in formulating their Regional Plans. Any activity that has a potential to pollute the air, waterways, or land may be subject to controls under the Resource Management Act.

Environmental Risk Management Authority New Zealand (ERMA New Zealand)

The Hazardous Substances and New Organisms Act (HSNO) was enacted to protect the environment and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms. The HSNO Act is administered by the Ministry for the Environment but is implemented by the Environmental Risk Management Authority New Zealand (ERMA New Zealand). The Environmental Risk Management Authority (the Authority) was established under HSNO to make decisions on the controls required on hazardous substances. Various government agencies enforce the HSNO Act. These include the Department of Labour (in relation to hazardous substances in the workplace) and the Ministry of Health (where it is necessary to protect public health).

Ministry of Consumer Affairs

The Ministry of Consumer Affairs (MCA) is responsible for administering the Consumer Guarantees Act 1993 and the Fair Trading Act 1986. The purpose of standards developed under the Fair Trading Act is to prevent or reduce the risk of injury. In addition, MCA can: suggest modifications to make a product safe; request that unsafe products be removed from sale; and assist companies to recall unsafe products.

As a measure of last resort MCA can: recommend mandatory standards for products or services, ban unsafe products, and order a compulsory recall of an unsafe product.

In 2007, under the Fair Trading Act, the Ministry of Consumer Affairs issued an “Unsafe goods notice” which bans children’s toys with excessive lead levels. The notice is enforced by the NZ Customs Service at the border and the Commerce Commission in the market place.

New Zealand Food Safety Authority

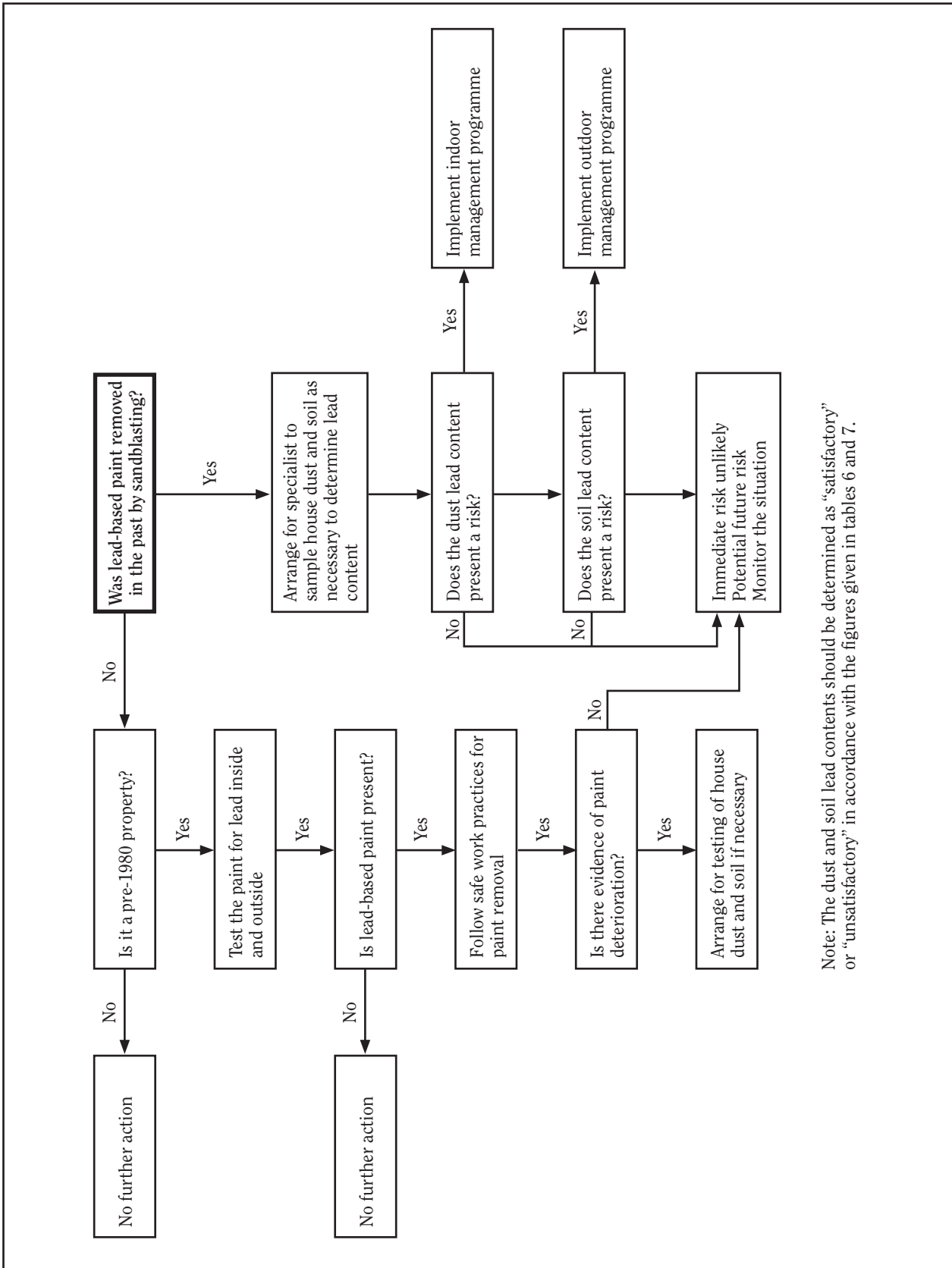
The New Zealand Food Safety Authority (NZFSA) protects consumers through the application of a risk management framework that involves risk assessment, risk management and risk communication. The NZFSA is responsible for setting standards, providing advice and monitoring of both food and feed. They systematically monitor human exposure to a range of contaminants, including lead, via the periodic Total Diet Survey. Systematic monitoring of animal products for a range of contaminants, including lead, is augmented by occasional surveys of imports and locally produced fruit and vegetables.

Appendix 4: Hazard Assessment Sequence

Irrespective of whether lead contamination in a property has arisen as a consequence of a contractor's paint removal activities, the risk to occupants must be assessed and managed. The following flow diagram summarises the sequence involved in making a provisional risk assessment and initiating remedial action where necessary.

The initial stages of the risk assessment may be conducted by members of the public, although the sampling and analysis of house dust and soil requires expert assistance. Environmental health officers or health protection officers may be able to assist with the sampling, analysis and interpretation of results. They would also be involved in the coordination of subsequent risk management programmes.

Fig 3. Outdoor Paint Removal



Note: The dust and soil lead contents should be determined as “satisfactory” or “unsatisfactory” in accordance with the figures given in tables 6 and 7.

Appendix 5: Useful References

- Lead in the Environment in New Zealand. *Report of the Royal Society of New Zealand Committee on Lead in the Environment*, June 1986.
 - *Guidelines for the Medical Surveillance of Lead Workers*, Department of Labour, 1994.
 - *Lead-Based Paint Policy and Code of Conduct*, Housing New Zealand, 1994.
 - *Guidelines for the Assessment and Management of Contaminated Sites*, Australian and New Zealand Environment and Conservation Council, 1992.
 - Hinton D. *Influence of the Home (Environment, Construction, Location and Activities) on the Body Lead Burden of the Family and Their Pets*. Proc NZ Trace Elements Group Conference, November/December 1988, Lincoln College, Canterbury.
 - *Workplace Exposure Standards*, Department of Labour, 1994.
 - *Risk Reduction Monograph*, No. 1 Lead, Environment Directorate, OECD, 1993.
 - Bates M, Read D et al, *Lead in New Zealand Children: A Pilot Study*, 1994.
 - *Environmental Case Management of Lead Exposed Persons Guidelines for Public Health Units*, Ministry of Health, 2007.
-

**See telephone book for your nearest Department of Labour branch, or contact national office;
phone 0800 20 90 20**

Contact your local Medical Officer of Health through your public health units

This resource is available from www.healthed.govt.nz
or the Authorised Provider at your local DHB.

ISBN: 978-0-478-19281-0 (print)
ISBN: 978-0-478-19282-7 (online)



MANATŪ HAUORA

Revised April 2008. Reprinted May 2008. Code HE6018