

Australian Standard[®]

Guide to lead paint management

Part 1: Industrial applications

This Australian Standard was prepared by Committee CH/3, Paints and Related Materials. It was approved on behalf of the Council of Standards Australia on 26 August 1995 and published on 5 December 1995.

The following interests are represented on Committee CH/3:

Australasian Corrosion Association
Australian Chamber of Commerce and Industry
Australian Paint Manufacturers Federation
AUSTROADS
Building Research Association of New Zealand
Government Paint Committee
National Association of Testing Authorities, Australia
New Zealand Manufacturers Federation
Railways of Australia Committee
Retailers Council of Australia
Surface Coatings Association Australia
Telstra Australia
Works Consultancy Services, New Zealand

Additional interests participating in preparation of Standard:

Blast Cleaning and Coating Association of N.S.W.
Department of Land and Water Conservation, N.S.W.
Environment Protection Authority, N.S.W.
Road and Traffic Authority of N.S.W.
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This Standard was issued in draft form for comment as DR 94339.

AS 4361.1—1995

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Guide to lead paint management

Part 1: Industrial applications

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7337 0490 9
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CH/3 on Paint and Related Materials. This Standard is the result of a consensus among Australian and New Zealand representatives on the Joint Committee to produce it as an Australian Standard.

The objective of the Standard is to provide guidelines for the successful management of lead-containing paints on industrial steel structures, particularly when any paint removal is carried out. This document may be referred to in proposed State legislation dealing with the treatment of lead-containing paints. However, when preparing specifications for the removal of lead-containing paints, the assistance of suitable experts is necessary.

The recommendations of the Steel Structures Painting Council (SSPC) documents, Guide 6I (CON), *Guide for containing debris generated during paint removal operations*, and Guide 7I (DIS), *Guide for the disposal of lead-contaminated surface preparation debris* and other references* have been taken into account when preparing this Standard.

The term 'normative' has been used in this Standard to define the application of the appendix to which it applies. A 'normative' appendix is an integral part of a Standard.

* TRIMBER, K.A., *Industrial lead paint removal handbook*, Pittsburgh: KTA - Tator Inc, (Steel Structures Painting Council) 1991

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First published as AS 4361.1— 1995.

FOREWORD

Lead in the form of its various oxides has been used as a key ingredient in industrial paint primers for more than 100 years due to its excellent ability to protect steel from corrosion. These primers were found to be particularly tolerant to minimal surface preparation. Consequently, lead primers were employed for protective treatment of complex steel structures, particularly where difficulties of access and steelwork geometry prevented optimum surface preparation of the steelwork prior to painting. Further, lead in the form of yellow chrome and orange chrome pigments has been used in industrial finishes to produce strong yellow, orange and red colours due to the versatility and low cost of these pigments.

The widespread use of lead paints continued until the early 1980s when concerns about lead-based paint toxicity and the advent of less toxic protective coating systems significantly reduced their usage. Many industrial structures throughout Australia are painted with lead paint systems and, while these systems remain intact, they present no significant health hazard or environmental pollution hazard. However, in most instances these systems will require repair or replacement during the design life of the structure, and the owners will be confronted with potential health and environmental pollution hazards associated with lead paint removal during the course of surface preparation for painting.

Particular compounds of lead which were widely used in Australia on outdoor steel installations were the oxide (red lead), lead chromate and lead silico-chromate and, for galvanized steel, calcium plumbate. Calcium plumbate-in-oil primers were applied by brush to galvanized or zinc-sprayed steel to allow the retention of alkyd enamels. Red lead-in-oil primers were used because of their easy brush application, high build and effectiveness on hand-cleaned surfaces. Red lead-lead chromate primers, in oil or in alkyd and other binders, were considered to have superior corrosion inhibition on such surfaces. Traditionally these products contained at least 10 percent lead in the dry film of paint. A lower level of 1.0 percent (w/w) lead has been selected in this guide to define a lead-containing paint for which these procedures are recommended.

Lead in any form is toxic to humans when ingested and inhaled. In many cases the most cost-effective method of surface preparation for maintenance painting can involve the partial or complete removal of existing coatings by mechanical means which pulverize the paint into small particles that may be readily inhaled or ingested. Repeated inhalation or ingestion of lead-containing paint particles may produce the cumulative effects of lead poisoning (plumbism). A lesser intake may adversely affect a child's mental and emotional development. Thus, these methods give rise to two potential health problems, i.e. inhalation and ingestion of lead paint by the workers and public in the vicinity of the structure, and the deposition of lead paint particles on nearby footpaths, streets or soil where they may be resuspended, tracked into houses or buildings inhaled or ingested. In most instances workers may be simply and easily protected by protective equipment, and the public by preventing access to the work site; however, lead paint deposition may be much more complex and difficult to manage depending on the size, shape and location of the structure.

Many structures such as bridges are located in congested urban areas where paint removal operations may contaminate nearby residences, business properties or playgrounds. Other structures are located in rural settings where grazing or recreational areas in the vicinity of the structure may be contaminated. Further, most government regulatory bodies perceive lead paint pollution of soil and waterways to be a concern and direct its control.

There is a need for sound management of lead-containing paint coatings on structures. This Standard addresses the issues critical to such management for the purpose of facilitating selection and implementation of practicable, cost-effective maintenance programs which minimize health hazards to workers and the public, and pollution hazards to the environment.

In the absence of definitive local legislation dealing with the removal and treatment of lead-containing paint, the concept of properly managing a structure coated with lead-containing paint by means of the decision path and much of the information detailed in this Standard has been sourced from an overseas consultant to the Roads and Traffic Authority of New South Wales. Presenting these guidelines in this format facilitates consideration of all those aspects which are critical to the successful management of lead-containing paint. The practices and procedures detailed for completing each step of the decision path may require modification to accommodate different structures, locations and legislation; nevertheless, a mechanism for the proper management of industrial structures coated with lead-containing paints is documented.

STANDARDS AUSTRALIA

Australian Standard

Guide to lead paint management

Part 1: Industrial applications

1 SCOPE This document provides guidance for the management of lead-containing paint on industrial structures. It provides information on methods for determining whether lead is present on a structure and on the selection of an appropriate maintenance strategy. Guidance is given on implementing appropriate lead paint emission controls during paint removal to ensure that potential health risks to workers and public are reduced to an acceptable level, environmental pollution regulations are observed and a method of handling hazardous waste is selected which meets governing legislation.

Although this guide does not fully address requirements for the evaluation of worker health and safety, which should be in accordance with current regulatory requirements, it does provide guidelines to produce a safer working environment.

NOTE: These procedures may also be suitable for the management of hazardous coatings other than lead-containing paints, such as paints based on zinc chromate and other chromate-based material. Testing which reveals an absence of lead-containing paint on an industrial structure is not in itself justification for ignoring these procedures. The stress upon 'lead-containing' paints is occasioned by concern to reduce all forms of lead in the environment.

2 APPLICATION The successful management of an industrial structure coated with lead-containing paint requires consideration of the function, design life and service environment of the structure, condition of the existing coating system, coating systems which will be effective in the service environment, hazards associated with lead paint removal to workers, public and the environment and program cost. These factors and their many intertwined elements need to be judiciously dealt with in a logical and systematic manner for satisfactory painting program selection and implementation to take place. Thus, these guidelines are presented in the form of a decision path that may be used by an owner of an industrial structure painted with lead paint to manage the maintenance of that structure.

In some instances, the amount of lead residues produced during a paint removal project may be of such a low magnitude that it may be possible to reduce the level of control, either in monitoring or containment, after assessment of the risk (see Clause 9).

Clause 5 also provides information on small paint removal projects which may not require the full application of this Guide.

3 REFERENCED DOCUMENTS

AS

1324	Air filters for use in air conditioning and general ventilation
1580	Paints and related materials—Methods of test
1580.408.2	Method 408.2: Adhesion—Knife test
1580.408.5	Method 408.5: Adhesion—Pull-off test
1580.481.1.1	Method 481.1.1: Coatings—Exposed to weathering—General appearance
1580.481.3	Method 481.3: Coatings—Exposed to weathering—Degree of corrosion of coated metal substrates
1580.501.1	Method 501.1: Soluble lead content

AS	
1627	Metal finishing—Preparation and pretreatment of surfaces
1627.1	Part 1: Cleaning using liquid solvents and alkaline solutions
1627.2	Part 2: Power tool cleaning
1627.4	Part 4: Abrasive blast cleaning
1627.7	Part 7: Hand tool cleaning of metal surfaces
1627.9	Part 9: Pictorial surface preparation standards for painting steel surfaces
1715	Selection, use and maintenance of respiratory protective devices
1716	Respiratory protective devices
2106	Methods for the determination of the flashpoint of flammable liquids (closed cup)
2724	Ambient air—Particulate matter
2724.3	Part 3: Determination of total suspended particulates (TSP)—High volume sampler gravimetric method
2985	Workplace atmospheres—Method for sampling and gravimetric determination of respirable dust
3640	Workplace atmospheres—Method for sampling and gravimetric determination of inspirable dust
3894	Site testing of protective coatings
3894.3	Method 3: Determination of dry film thickness
4260	High efficiency particulate air (HEPA) filters
4260.1(Int)	Part 1: Performance and construction
NHMRC (National Health and Medical Research Council)	
SUSDP	Standard for the Uniform Scheduling of Drugs and Poisons
Worksafe Australia (National Occupational Health and Safety Commission)	
NOHSC	
1003	Exposure Standards for atmospheric contaminants in the occupational environment
1012	National Standard for the control of inorganic lead at work
2015	National code of practice for the control and safe use of inorganic lead at work
ASTM	
D 5064	Standard practice for conducting a patch test to assess coating compatibility
SSPC (Steel Structures Painting Council)	
Guide 6I(CON)	Guide for containing debris generated during paint removal operations
Guide 7I(DIS)	Guide for the disposal of lead contaminated surface preparation debris
93-02	Industrial lead paint removal handbook
94-18	Project design: Industrial lead-paint removal handbook Volume II
US EPA	
Method 1311	Toxicity characteristic leaching procedure (TCLP)
Method 3050	Acid digestion of sediment, sludges and soils

4 DEFINITIONS

4.1 Authorized medical practitioner—a qualified medical practitioner authorized by the relevant authority.

4.2 Chain-of-custody form—a form which is used to identify the movements of, and to ensure the security and integrity of, a sample.

4.3 Compliance program—a document prepared by the contractor performing the lead-containing paint removal giving a detailed description of engineering controls, work practices and safety precautions that will be adopted for the execution of the work.

4.4 Containment system—a system which minimizes or prevents the debris, generated during surface preparation or the removal of lead-containing paint, from entering into the environment, and which facilitates the controlled collection of the debris for disposal. It includes the cover panels, screens, tarps, scaffolds, supports and shrouds used to enclose an entire work area or paint removal tools. Containment systems may also employ the use of ground covers or water booms.

4.5 Contractor—the person or corporate body that is party to the contract and bound to execute the work under the contract and in accordance with the contract.

4.6 Discharge—accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of hazardous material or waste into or on any land, water or airspace.

4.7 Disposal—the discharge, deposit, injection, dumping, spilling, leaking or placing of any solid waste or hazardous waste into or on any land or water, so that no solid waste or hazardous waste, or any constituent thereof, may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

4.8 Employee—an individual who works under a contract of employment, apprenticeship or traineeship.

4.9 Exposure Standard—an airborne concentration of a particular substance in the worker's breathing zone, exposure to which, according to current knowledge, should not cause adverse health effects nor cause undue discomfort to nearly all workers. The exposure standard can be of three forms; time-weighted average (TWA), peak, or short term exposure limit (STEL). (See NOHSC:1003.)

4.10 Generator—usually the occupier or, if there is no identifiable occupier, the owner of the property on which hazardous waste which is subject to regulation, is produced.

NOTE: A contractor for lead-containing paint management or removal can at times be classed as the occupier.

4.11 Hazardous waste (lead paint)—wastes of lead-containing paint that are classed as hazardous by the Environmental Protection Authority (EPA), or the relevant statutory authority.

NOTE: Waste contaminated with lead is considered hazardous if TCLP testing indicates the presence of lead in the leachate ≥ 5.0 ppm.

4.12 HEPA vacuum—a vacuum cleaner fitted with a HEPA filter.

4.13 HEPA filter—a 'high-efficiency particulate air' (HEPA) Type 1, Class A filter as specified in AS 1324, which meets all requirements of AS 4260.1(Int) with a minimum performance of Grade 2 and a MILSPEC classification.

4.14 Impermeable—impervious to dust, water and wind.

4.15 Industrial structure—plant, structures and buildings located exclusively within the workplace of a manufacturing site and typically may include a bridge, pylon, pipeline, storage facility and similar structures.

4.16 Lead-containing paint film—a paint film or component coat of a paint system containing lead or lead compounds, in which the lead content (calculated as lead metal) is in excess of 1.0 percent by weight of the dry film.

NOTES:

1 Lead-containing paint is sometimes referred to as lead-based or lead paint.

- 2 The manufacture, sale and use of First Schedule Paints for buildings and structures, which are not used exclusively for industrial purposes, is prohibited by the *Uniform Paint Standard* in the *Standard for the Uniform Scheduling of Drugs and Poisons*. First Schedule Paints include paints that contain more than 0.25 percent (w/w) of elemental lead as lead compounds.

4.17 Occupier—the person in occupation or control (except an employee) of the premises; where different parts are occupied by different persons, the person in occupation or control (except an employee) of that part.

4.18 Overcoat—a top coat of paint consisting of lead-free material that effectively isolates from the environment a surface that is painted with lead-containing paint.

NOTE: The application of an overcoat is sometimes referred to as encapsulation.

4.19 Owner—the principal holding the title to the asset, or in whom the responsibility for the asset is vested.

4.20 Regulated area—an area established at the work site to identify areas, outside of which the airborne concentrations of lead can reasonably be expected **not** to exceed the Exposure Standard.

4.21 Representative sample—a single or composite sample which can be expected to exhibit the average properties of the stream or container.

4.22 Responsible person—a person who is capable of identifying hazards (by experience, degree or training) and has authorization to take prompt corrective measures to eliminate them.

4.23 Small project—a small-scale short duration project conducted on a single structure which involves the removal of less than 10 m² of lead-containing paint within any one 12 month period.

4.24 Temporary storage—holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere.

4.25 Time-weighted average (TWA)—the average airborne concentration of a particular substance when calculated over a normal eight-hour working day for a five-day working week.

4.26 Total suspended particulate (TSP)—the total of any particulate matter emitted into ambient air and analysed from samples collected, using high-volume air monitors.

4.27 Toxicity characteristic leaching procedure (TCLP)—a test for determining whether or not debris is hazardous based on an analysis of the leachate by either atomic absorption spectroscopy or inductively coupled plasma atomic emission spectroscopy.

NOTE: US EPA 1311 provides a method of determining TCLP. This test is employed on the premise that wastes will be consolidated with other rotting wastes which in time will produce organic acids.

4.28 Treatment—any method, technique, or process which changes the physical, chemical, or biological characteristics or composition of any hazardous waste so as to neutralize such waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store or dispose of; or amenable for recovery, storage, or reduction in volume.

4.29 Ventilation system—ventilation systems include both natural ventilation and artificial ventilation (mechanical fans, hoods, and ductwork), to provide air movement across the work area, and dust collectors to clean the discharged air.

5 SMALL PROJECTS This guide need not be applicable to some small-scale, short duration projects as defined in Clause 4.23 (see also Clause 2). Where such a project is not in the immediate proximity of sensitive receptors, such as a child-minding centre or an oyster bed, it need not comply with the provisions of this guide, but would be subject to all applicable regulatory requirements including, but not limited to, worker protection and waste management controls.

NOTE: Only one short duration project, as defined, should be performed on a particular structure within a 12 month period.

6 DECISION PATH The design of lead-containing paint management projects in industrial applications, other than projects covered by Clause 5, requires consideration of the following steps:

- (a) *Step 1* Determination of the presence of lead.
- (b) *Step 2* Selection of painting strategy.
- (c) *Step 3* Assessment of project risks to the public, environment and other workers.
- (d) *Step 4* Establishment of site-specific limitations on emissions.
- (e) *Step 5* Selection of the appropriate paint removal/containment system combinations consistent with the selected maintenance strategy and the necessary level of emission control.
- (f) *Step 6* Selection of the appropriate monitoring systems to verify that emissions are properly controlled.
- (g) *Step 7* Establishment of appropriate worker protection requirements.
- (h) *Step 8* Establishment of appropriate waste management requirements.
- (i) *Step 9* Determination of project completion requirements for releasing the contractor.
- (j) *Step 10* Preparation of project cost estimates.
- (k) *Step 11* Preparation of a comprehensive specification to address all of the above.

Figure 1 provides a decision path which depicts the relationship between the various project steps listed above. The stages of the decision path are discussed in Clause 7 through to Clause 17. For some projects each step in the above decision path may not be necessary.

7 STEP 1—ASSESSMENT OF THE PRESENCE OF LEAD Before selecting a maintenance strategy and deciding whether any methods of paint removal and control will be required, it is necessary to determine if lead-containing paint is present on all, or a portion of, the structure or facility.

The presence of lead can be established from historical project records, or through field and laboratory testing. These methods of assessment are described in Appendix A.

For the purposes of this Standard, a paint film is considered to be lead-containing if it has lead or lead compounds in excess of 1.0 percent (w/w) of the dried film. If the paint contains more than this amount, the project, or designated portions of the project, should comply with this Standard.

If lead is present in a paint film in concentrations of less than 1.0 percent (w/w), it may still be appropriate to adopt the work practices and measures to control the debris generated from project activities, and to protect the public and workers from dust and other hazards.

When the presence of lead is found to be sporadic across a structure, and if the specific lead-containing portions cannot be isolated for special control, work on the entire structure should comply with the provisions of this Standard.

8 STEP 2—PAINTING STRATEGY

8.1 Painting strategy alternatives The following maintenance painting strategies are available:

- (a) *No painting* When a lead-containing paint is essentially in good condition and tightly adhering to the substrate surface, there is no hazard and the option of leaving the coating alone and doing nothing may be appropriate. In such a case, consideration needs to be given to the remaining economic life of the structure and whether the paint system will provide adequate service during this time.

If the coating has poor film integrity or shows poor adhesion to the substrate, consideration should be given to potential structural problems due to further corrosion and the possibility of the surrounding area being contaminated by flaking and peeling paint. Again, the option of leaving the coating alone subject to carrying out periodic inspections to monitor coating deterioration may be appropriate.

- (b) *Overcoating* When a lead-containing paint or system is adhering tightly to the substrate and showing satisfactory film integrity, it may be contained on the structure for an extended period of time by overcoating it with another topcoat or paint system if the overcoat will not weaken or break the bond between the existing system and the substrate.

Prior to overcoating, the existing paint system should be cleaned to remove dust, dirt, grease, oil, loose paint and other contaminants to maximize adhesion. The overcoating material isolates the existing system from the environment thereby minimizing the hazard.

A number of systems, such as two-pack epoxy sealer with various topcoats or two-pack, high-build epoxy mastic, may be used for this application.

When considering this option, owners should be particularly cautious where the existing system's film integrity or adhesion to the substrate is suspect and should be guided by the recommendation of the manufacturer of the overpainting system. Appropriate tools should be used to prepare the surface; care should be taken to ensure worker protection and debris containment and disposal in accordance with legislation and this Standard.

- (c) *Spot or localized repair* Where a structure is exhibiting coating breakdown and steel corrosion products, surface preparation of localized areas, priming and application of one or more finish coats to the repaired areas or to the whole of the structure may be a cost-effective option depending upon the extent of surface area to be repaired. Tools may be used to prepare the surface and care should be taken to ensure worker protection and debris containment and disposal in accordance with legislation. Paint materials which are compatible with the existing system and provide the greatest possible longevity in the given environment should be selected. Risks associated with this method include the potential for future disbonding within the old paint system which remains, or between the new and the old system. Corrosion may also occur at the fractured edges of the old system at feathered edges. Spot and localized repair also allows lead-containing paint to remain in position but may create an unsightly finish unless given a new finish coat.
- (d) *Total coating removal and replacement* Surface preparation of the entire structure to the extent that all existing coatings are removed and a new protective system is applied, may be a cost-effective option depending upon the design life of the structure. The full removal of an existing coating and application of a new protective system will usually outperform overcoating systems. However, short-term costs are high due to the labour intensiveness of existing coating removal, worker protection, emission control, and waste disposal requirements.

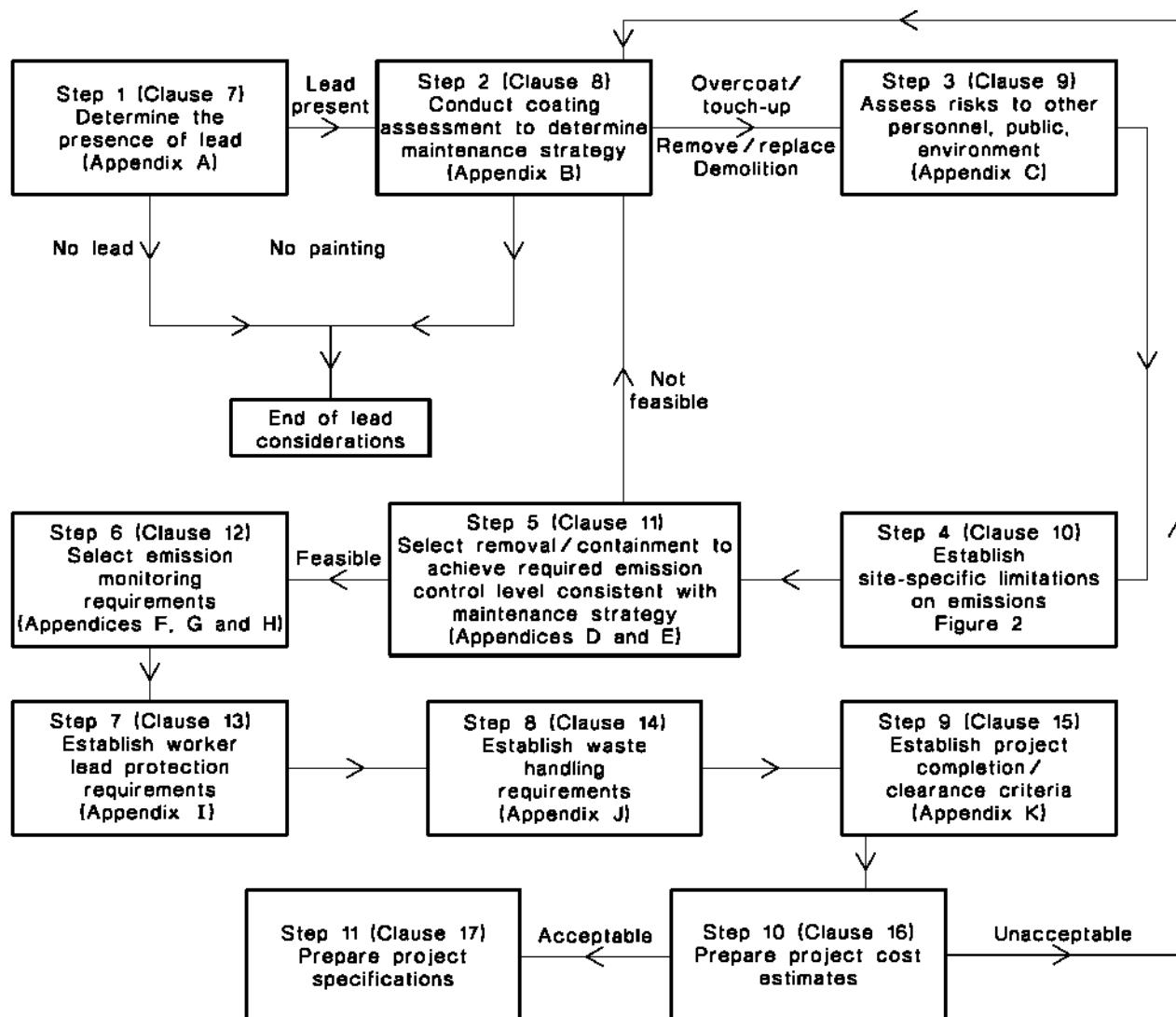


FIGURE 1 DECISION PATH LEAD PAINT MANAGEMENT—INDUSTRIAL APPLICATIONS

- (e) *Demolition and replacement of the structure* It may be cost-effective to replace the structure rather than removing and replacing the coating. Costs associated with the construction of a field containment, the controls over emissions and worker and environmental protection are instead applied to a tangible asset (i.e. a new structure). The risk of environmental, worker, or public contamination is very low, and the service life of the structure is optimized. The demolished steel, coated with the lead-containing paint, can be smelted and recycled. With this alternative, the lead is safely eliminated and a new long-lasting system can be applied on the new components during fabrication. A disadvantage is the potential disruption to plant processes or the travelling public while the structure is not available for use.

8.2 Coating condition assessment The selection of the painting option requires a thorough assessment of the condition of the existing coatings together with the evaluation of a series of project and cost factors described in Clause 8.3.

The procedures outlined in Appendix B provide a mechanism for determining whether the existing coating on a structure is a viable candidate for touch-up and overcoating or if it has sufficient integrity to be repaired. Appendix B provides test procedures for uniformly assessing the percentage of corrosion and coating deterioration on the structure, the physical characteristics of the coating adhesion and thickness and substrate concerns such as rust scale, underfilm corrosion, and flaking mill scale.

Data regarding the percent of corrosion and deterioration is fundamental to repainting decisions. The costs associated with preparing the surface (e.g. equipment and labour required for preparation, containment, worker and environmental protection and associated monitoring, and waste handling) represent the majority of the costs on a project. If the percentage of deteriorated paint or corrosion on a structure is extensive, the costs associated with spot preparation can approach or equal the cost of total coating removal. Thresholds are established in Appendix B for guidance as to when the percentage of deterioration is not conducive to spot repair.

Data on the physical characteristics of the existing coating is necessary in order to establish whether the paint, which will remain after spot preparation, is of adequate strength and integrity to support the additional weight and stresses imposed by a new paint film. Visual examinations of a paint film are not sufficient to make this judgement. Tests which destroy approximately 6.5 cm² of the paint film at each test location are required. Appendix B provides suggested thresholds for establishing whether the integrity of the existing film is suitable for overcoating.

If the visual assessments and physical tests indicate that a coating is a candidate for repair, test patches of candidate repair materials may be applied and evaluated as outlined in Appendix B, in order to further confirm that repair is a viable strategy for the specific coating system.

8.3 Other factors In addition to the condition of the coatings other factors may need to be evaluated when determining a painting strategy. These factors include, but are not limited to:

- (a) Assessment of the remaining service life of the structure (e.g. a clarifier tank that will be upgraded in 5 years will be viewed differently to a transmission tower with an additional 30 year design life).
- (b) Proximity of the work to the public or to environmentally sensitive areas (e.g. the painting strategy on a tank in a residential area will differ from a small conveyor in the centre of an industrial plant).
- (c) Proximity of the work to other facility personnel (e.g. work in a heavily-travelled corridor compared with a remote pumping station).
- (d) The effect that painting activities may have on other facility processes. Methods of repair which generate even trace amounts of dust may be unacceptable in facilities such as food or beverage processing.
- (e) The need to keep the structure operational during repainting work (e.g. bridge repair may necessitate keeping all lanes of traffic open).
- (f) The rigours of surface preparation required for the maintenance or repainting system (e.g. the longevity of a paint system requiring only hand tool cleaning compared with one requiring blast cleaning should be assessed with consideration of the impact that the method of surface preparation will have on the necessary level of site controls and monitoring).

- (g) Corporate or owner policies regarding the elimination of lead-containing paint from structures (e.g. company policy might require that lead-containing paint be completely eliminated during any painting activity).
- (h) Willingness to accept risks associated with various maintenance options. Spot touch-up may result in ongoing painting due to lifted edges and localized detachment.
- (i) Concerns over appearance. Spot repair may not provide an acceptable appearance due to the unsightliness of patch repairs.
- (j) Costs. The strategy should be affordable now and in the future. Life cycle costs need to be carefully analysed.

8.4 Reassessment As additional data is collected through the remaining steps of this Standard, the suitability of the proposed maintenance strategy should be continually reassessed and modified as required.

9 STEP 3—RISKS TO PUBLIC, OTHER WORKERS AND ENVIRONMENT It may not be possible to provide 100 percent control over emissions of lead-containing dust or paint chips during the maintenance of a structure.

The potential impact of lead-containing paint emissions on the health of the nearby public, adjacent workers other than workers performing paint removal, containment and debris collection, and the surrounding environment determines the degree of project emission control. Appendix C provides a procedure for assessing the following risks:

- (a) Public health risk based on the proximity of the public to the work site and frequency of their presence, designated as high, moderate, low, or nil.
- (b) Environmental risk, designated as high or low, based on the proximity of unprotected ground (e.g. soil or sand) and water (including storm sewers) to the project site.
- (c) Risk to adjacent workers or facility personnel, designated as high, low, or nil, based on the proximity to the work area and frequency of their presence. Risk to the worker actually performing the abatement work is addressed in Clause 13.

For some projects in remote areas, emission controls may be minimal and monitoring may be unnecessary (refer Appendix C, Paragraph C3).

10 STEP 4—CONTROL LEVEL FOR EMISSIONS The risk indicators from Clause 9 are combined in the matrix shown in Figure 2 to establish the level of emission control required for the project. The environmental risk (low or high) is first determined. This confines the remaining selections to the left half or right half of the matrix. The column which represents the risk to adjacent workers is then chosen followed by the row which represents the public health risk. The intersection of the three indicators represents the project-specific emission control level recommended as follows:

- (a) *Emission control Level A*—a high level of control where minimal emissions are allowed. Emission control Level A requires a high level of dust and debris containment to prevent emissions from escaping the work area. Elaborate containment systems are required to achieve this level of control when carrying out open abrasive blast cleaning.
- (b) *Emission control Level B*—a moderate level of control where limited emissions are allowed. Emission control Level B requires a moderate level of dust and debris containment which allows limited emissions to escape the work area.
- (c) *Emission control level C*—the lowest level of control where limited emissions are allowed. Emission control Level C requires a minimum level of dust and debris containment. Level C is intended for use where, by virtue of the remoteness of the location and the small scale of the work, risks to the environment and to the public from lead paint emissions are low.

Containment measures for Level C, such as those outlined in Table E1, should be capable of collecting most of the heavy fraction of lead paint particles removed in the process of surface preparation. Emissions of the finer dust particles may be permitted.

NOTES:

- 1 The emissions of finer dust particles may be in excess of specified limits for emissions to the environment and the acceptance of the relevant local authorities to the use of Level C emission controls should be obtained prior to commencing work.
- 2 Notwithstanding the use of Level C emission controls, the requirements of occupational health and safety shall still apply and monitoring of exposure levels is required to assure that working conditions are safe.

The combinations of paint removal methods and containment systems that are capable of achieving the site specific level of emission controls are discussed in Clause 11.

		RISK TO ADJACENT WORKERS					
		Nil	Low	High	Nil	Low	High
PUBLIC HEALTH RISK	High	A	A	A	A	A	A
	Mod	B	B	A	A	A	A
	Low	C	C	A	B	B	A
	Nil	C	C	A	B	B	A
		LOW			HIGH		
		ENVIRONMENTAL IMPACT					

FIGURE 2 PROJECT-SPECIFIC EMISSION CONTROL LEVEL

11 STEP 5—PAINT REMOVAL/CONTAINMENT SYSTEM COMBINATIONS

11.1 Paint removal considerations The method of paint removal which is appropriate for the project is based on a number of factors including:

- (a) Painting strategy as established in Clause 8 (e.g. overcoating, spot removal, total removal, demolition).
- (b) The degree of surface preparation needed for the maintenance or replacement of the coating system (e.g. chemical stripping or power tool cleaning may not provide an adequate degree of cleaning for long-term performance of the painting system).
- (c) The project-specific level of emission control as determined in Clause 10 above (e.g. Level A, Level B or Level C).
- (d) Productivity requirements for the method of removal (e.g. power tool cleaning generates emissions that are more easily controlled than abrasive blast cleaning, but productivity is substantially reduced).
- (e) Size and configuration of the structure (e.g. cleaning of a large truss bridge with intricate lacing bar construction may be more conducive to abrasive blast cleaning or high pressure water blasting rather than power tool cleaning).
- (f) The amount of work to be performed (e.g. the spot repair of corrosion on 1 percent of the structure may not warrant the use of abrasive blast cleaning).
- (g) Scheduling constraints or considerations.
- (h) Cost.

11.2 Emission categories Appendix D describes the various paint removal methods and places them into four categories based on the level of emissions potentially generated by each. The level of emissions affects the design of an appropriate containment system. Emissions categories are:

- (a) *Emissions Category 1 (very high emissions potential)* The methods in this category include open abrasive blast cleaning with expendable or recyclable abrasives.
- (b) *Emissions Category 2 (high emissions potential)* The methods in this category include all systems which employ water such as high or ultra high pressure water jetting (with or without abrasives), wet abrasive blast cleaning and sodium bicarbonate blast cleaning.
- (c) *Emissions Category 3 (moderate emissions potential)* The methods in this category include sponge jetting, blasting with a cryogenic medium, chemical stripping, vacuum blasting and power tool cleaning without vacuum attachments.
- (d) *Emissions Category 4 (low emissions potential)* The methods in this category include centrifugal wheel blast cleaning, power tool cleaning with vacuum attachments, and hand tool cleaning.

11.3 Containment systems The design of the containment for the specific method of paint removal is dependent upon the type and nature of the emissions that are generated by the method and the degree of control over the emissions as established through the analysis in Clause 10. Containment system components capable of achieving Level A, Level B or Level C degree of emission control for each of the four paint removal categories are shown in Appendix E and include:

- (a) Flexibility of the materials used to construct the containment cocoon.
- (b) Permeability of the materials used to construct the containment.
- (c) The type of support structure required.
- (d) The handling of joints between containment materials, and between the materials and the structure being prepared.
- (e) Control of the entryway into the containment.
- (f) The need for mechanical ventilation systems.
- (g) Need for negative pressure within containment.
- (h) The need for filtration of the exhaust air.

It should be recognized that although a Level A degree of emissions control is possible with any of the removal methods, when using Appendix E to establish the containment design criteria the feasibility of achieving such stringent controls decreases as the dust-producing nature of the removal method increases (e.g. it will be more difficult to achieve a Level A control emissions when abrasive blast cleaning compared with vacuum-shrouded power tool cleaning).

11.4 Reassessment of strategy After consideration of the above, if the method of removal and the containment selected for the project does not appear to be feasible, the painting strategy selected in Clause 8 or the risk (see Appendix C) should be readdressed.

12 STEP 6—EMISSIONS MONITORING REQUIREMENTS

12.1 General Project monitoring of emissions is performed to ensure that adequate controls are in place to protect the environment, the public, and other facility personnel.

A description of the various methods of monitoring together with the selection of test sites, the need for the collection of baseline data, and an interpretation of the results is given in Appendices F, G, and H. Monitoring may include the following:

- (a) *Air quality monitoring* Appendix F includes instrumental monitoring for total suspended particulate (TSP) lead, methods for establishing regulated areas around the work site for the protection of adjacent personnel, and assessments of visible emissions. The first two methods require laboratory analysis of filtered residue which may require a few days before results are received. The last method provides immediate feedback as to the suitability of the controls over emissions. It is not as accurate as the laboratory methods, nor does it provide quantitative results.
- (b) *Ground monitoring* Appendix G provides a procedure for the sampling and analysis of the ground (e.g. soil or sand) prior to project start-up and upon completion of work, to determine if the ground was contaminated from project activities. Although such analysis could be conducted on a periodic basis throughout the project, it is typically not used as an in-process quality control measure. Instead, it is used to verify overall adequacy of project controls, or to investigate the need for remediation upon project completion.
- (c) *Water and sediment monitoring* Appendix H provides a procedure for the sampling and analysis of water and sediment prior to project start-up, and upon completion to determine if the water or sediment was polluted from project activities. Although such analysis can be conducted on a periodic basis throughout the project, it is typically not used as an in-process quality control measure. Instead, it is used to verify the overall adequacy of project controls, or to investigate the need for remediation, upon project completion. An exception applies if the project activities are near a drinking water intake. In this case, frequent sampling is advisable, or arrangements with the water authority should be made to carefully track the water quality monitoring to determine if discharges are occurring.

12.2 Criteria for monitoring The project-specific methods of monitoring to be specified, as well as the frequency and duration of monitoring, are dependent upon:

- (a) The potential public health risk as established in Appendix C and Clause 9 (i.e. the greater the potential for public health risk, the greater the monitoring needs).
- (b) The potential risk of environmental impact as established in Appendix C and Clause 9 (i.e. the greater the potential for environmental impact, the greater the monitoring needs).
- (c) The potential risk to other adjacent workers as evaluated in accordance with Appendix C and Clause 9 (i.e. the greater the potential risk, the greater will be the need for routine monitoring to verify the adequacy of the regulated areas).
- (d) The emissions potential of the selected removal method as defined in Appendix D and Clause 11.2 (i.e. a removal method having the potential to generate more emissions may necessitate a higher level of monitoring than one having reduced emissions).

12.3 Monitoring requirements Figures 3–6 show suggested monitoring requirements for each of the removal method categories based on combinations of public health risk, environmental risk, and risk to other personnel or adjacent workers. The methods of monitoring include the following:

- (a) *Instrument monitoring of TSP lead*—an assessment of lead in total suspended particulate is collected using high volume ambient air monitors (see Appendix F).
- (b) *Evaluations of visible emissions*—the timing of visual emissions from the work activities (as described in Appendix F).
- (c) *Establishment of regulated areas*—instrument monitoring of emissions using personal monitoring pumps to establish zones around emission producing operations to ensure that unprotected personnel are not exposed (see Appendix F).

- (d) *Assessment of ground (soil) contamination*—a visual examination for the presence of paint chips or surface preparation debris, or laboratory analysis, or both, to determine whether an increase in soil lead content has occurred throughout the project site (see Appendix G).
- (e) *Assessment of water/sediment contamination*—a visual examination for the presence of paint chips or surface preparation debris, and laboratory analysis of water or sediment, or both, to determine if contamination from project activities has occurred (see Appendix H).

12.4 Review of monitoring requirements Where successful management of a project has provided assurance that the systems and procedure controls are effective in protecting the environment, public and other facility personnel, then some reduction in the level of, or the elimination of monitoring, may be considered. However, monitoring of visual emissions should be continued to detect any adverse changes in procedures or emissions.

13 STEP 7—WORKER PROTECTION REQUIREMENTS All personnel who may be exposed to lead on the project should be protected to avoid personal injury or harm, as well as to prevent lead dust or debris from being carried off the work site to potentially affect others.

Measures for the protection of workers involved in the removal of lead-containing paint shall be in accordance with the relevant State or Territory legislation. In the absence of appropriate State or Territory legislation, the *Worksafe Australia National Standard for the Control of Inorganic Lead at Work* (NOHSC 1012) and *National Code of practice for the control and safe use of inorganic lead at work* (NOHSC 2015) should be followed.

Worker protection requirements that will satisfy these objectives are outlined in Appendix I. The requirements include:

- (a) Project surveillance by a competent person.
- (b) Assessment of employee airborne exposure to lead, including specific protective measures required while the exposure assessment is being conducted.
- (c) A site-specific written compliance program which addresses methods used to reduce employee exposures to lead, such as engineering and work practice controls.
- (d) The use of appropriate respiratory protection.
- (e) The use of appropriate protective clothing and equipment.
- (f) Housekeeping programs.
- (g) The use of appropriate hygiene facilities.
- (h) The use of appropriate medical surveillance, including blood sampling before and while working on the project, analysis for lead and provision for physical examinations.
- (i) A medical removal protection program for employees who experience excessive blood lead levels during the course of the project.
- (j) Written employee information and training programs.
- (k) Establishment of regulated areas with signs at each entrance.
- (l) Provisions for maintaining records of the above assessments and evaluations.

14 STEP 8—WASTE MANAGEMENT CONTROLS All debris, whether hazardous or not, should be properly collected, handled, and disposed. Each of the paint removal methods will generate a waste, with subtle differences in management requirements (e.g. managing a chemical stripper waste is different than water or dry abrasive).

The management of the various waste streams that might be generated from a project is described in Appendix J. The requirements of this Appendix should be applied on all projects. Appendix J provides guidance on the following:

- (a) Project planning.
- (b) Responsibilities of facility owners and contractors.
- (c) Job site handling and storage of debris.
- (d) Worker training.
- (e) Contingency plans for responding to a spill.
- (f) Waste sampling, classification and analysis.
- (g) Hazardous waste transportation and disposal together with methods of waste stabilization.
- (h) Transportation and disposal of non-hazardous waste.
- (i) Management of waste water.

15 STEP 9—PROJECT COMPLETION CLEANING AND CLEARANCE Once the project is completed, it is necessary to ensure that environmental contamination has not occurred (through the monitoring described in Clause 12 above), or if it has occurred, the extent of remediation that may be required.

Re-usable equipment and materials removed from the project site should be properly cleaned of lead dust to avoid carrying the lead off-site to potentially contaminate other properties or personnel.

Lead dust should not be allowed to remain on equipment or structures adjacent to the work area.

Appendix K provides a procedure for undertaking the appropriate methods of site clean-up (with the exception of environmental remediation which is not within the scope of this Standard) and test procedures to assure that the clean-up is satisfactory (with the exception of environmental monitoring which is described in Clause 12). The Appendix includes:

- (a) Clean-up of containment structures and the surfaces contained within.
- (b) Clean-up and clearance criteria for the containment and surrounding structures.
- (c) Clean-up and clearance testing of equipment prior to transporting off-site.
- (d) Clean-up and clearance of consumables/supplies prior to removal off-site.

16 STEP 10—PROJECT COST ESTIMATES After the preliminary project design is established through Step 1 to Step 9, project costs should be evaluated. If the costs are outside of budget constraints, a project reassessment, beginning with the Step 2 maintenance strategy, should be undertaken.

17 STEP 11—SPECIFICATION Project specifications should be prepared to detail all worker and environmental issues associated with the project.

			RISK TO ADJACENT WORKERS					
PUBLIC HEALTH RISK	HIGH	Mon. Req	Nil	Low	High	Nil	Low	High
		TSP Visual Soils Water/Sed. Reg. Area	Full Level 1 Lab Lab Start	Full Level 1 Lab Lab Weekly	Full Level 0 Lab Lab Weekly	Full Level 1 Lab Lab Start	Full Level 1 Lab Lab Weekly	Full Level 0 Lab Lab Weekly
	MOD	TSP Visual Soils Water/Sed. Reg. Area	Start Level 1 Lab Lab Start	Start Level 1 Lab Lab Weekly	Start Level 0 Lab Lab Weekly	Full Level 1 Lab Lab Start	Full Level 1 Lab Lab Weekly	Full Level 0 Lab Lab Weekly
	LOW	TSP Visual Soils Water/Sed. Reg. Area	NR Level 4 Vis Vis Start	NR Level 4 Vis Vis Weekly	NR Level 0 Vis Vis Weekly	Start Level 1 Lab Lab Start	Start Level 1 Lab Lab Weekly	Start Level 0 Lab Lab Weekly
	NIL	TSP Visual Soils Water/Sed Reg. Area	NR Level 4 Vis Vis Start	NR Level 4 Vis Vis Weekly	NR Level 1 Vis Vis Weekly	Start Level 1 Lab Lab Start	Start Level 1 Lab Lab Weekly	Start Level 0 Lab Lab Weekly
			LOW			HIGH		
ENVIRONMENTAL IMPACT								

Definition of Symbols:TSP Lead (per Appendix F)

Full = Full-time monitoring
 Start = Start-up monitoring only
 NR = No TSP lead monitoring required

Water/Sediment (per Appendix H)

Lab = Laboratory testing and analysis
 Vis = Visual assessment only

Visual (per Appendix F)

Level 0 = Level 0 (no visible emissions)
 Level 1 = Level 1 (visible emissions <1% of work day)
 Level 2 = Level 2 (visible emissions <5% work day)
 Level 3 = Level 3 (visible emissions <10% work day)
 Level 4 = Emissions not restricted

Regulated Area (per Appendix F)

Weekly = Weekly verification monitoring
 Monthly = Monthly verification monitoring
 Start = Start-up monitoring only

Soils (per Appendix G)

Lab = Laboratory testing and analysis with a visual assessment
 Vis = No laboratory testing required—visual assessment only

NOTE: See Clause 12.4 for review of monitoring requirements

**FIGURE 3 PROJECT-SPECIFIC MONITORING REQUIREMENTS
 CATEGORY 1—REMOVAL METHODS (VERY HIGH EMISSIONS)**

			RISK TO ADJACENT WORKERS					
PUBLIC HEALTH RISK	HIGH	Mon. Req	Nil	Low	High	Nil	Low	High
		TSP Visual Soils Water/Sed. Reg. Area	Start Level 1 Vis Vis Start	Start Level 1 Vis Vis Monthly	Start Level 0 Vis Vis Weekly	Start Level 1 Lab Lab Start	Start Level 1 Lab Lab Monthly	Start Level 0 Lab Lab Weekly
	MOD	TSP Visual Soils Water/Sed. Reg. Area	Start Level 1 Vis Vis Start	Start Level 1 Vis Vis Monthly	Start Level 0 Vis Vis Weekly	Start Level 1 Lab Lab Start	Start Level 1 Lab Lab Monthly	Start Level 0 Lab Lab Weekly
	LOW	TSP Visual Soils Water/Sed. Reg. Area	NR Level 4 Vis Vis Start	NR Level 4 Vis Vis Monthly	NR Level 2 Vis Vis Weekly	Start Level 1 Lab Lab Start	Start Level 1 Lab Lab Monthly	Start Level 0 Lab Lab Weekly
	NIL	TSP Visual Soils Water/Sed Reg. Area	NR Level 4 Vis Vis Start	NR Level 4 Vis Vis Monthly	NR Level 2 Vis Vis Weekly	Start Level 1 Lab Lab Start	Start Level 1 Lab Lab Monthly	Start Level 0 Lab Lab Weekly
			LOW			HIGH		
ENVIRONMENTAL IMPACT								

Definition of Symbols:TSP Lead (per Appendix F)

Full = Full-time monitoring
 Start = Start-up monitoring only
 NR = No TSP lead monitoring required

Water/Sediment (per Appendix H)

Lab = Laboratory testing and analysis
 Vis = Visual assessment only

Visual (per Appendix F)

Level 0 = Level 0 (no visible emissions)
 Level 1 = Level 1 (visible emissions <1% of work day)
 Level 2 = Level 2 (visible emissions <5% work day)
 Level 3 = Level 3 (visible emissions <10% work day)
 Level 4 = Emissions not restricted

Regulated Area (per Appendix F)

Weekly = Weekly verification monitoring
 Monthly = Monthly verification monitoring
 Start = Start-up monitoring only

Soils (per Appendix G)

Lab = Laboratory testing and analysis with a visual assessment
 Vis = No laboratory testing required—visual assessment only

NOTE: See Clause 12.4 for review of monitoring requirements.

**FIGURE 4 PROJECT-SPECIFIC MONITORING REQUIREMENTS
 CATEGORY 2—REMOVAL METHODS (HIGH EMISSIONS)**

			RISK TO ADJACENT WORKERS						
PUBLIC HEALTH RISK	HIGH	Mon. Req	Nil	Low	High		Nil	Low	High
		TSP Visual Soils Water/Sed. Reg. Area	Start Level 1 Vis Vis Start	Start Level 1 Vis Vis Monthly	Start Level 0 Vis Vis Weekly	Start Level 1 Lab Lab Start	Start Level 1 Lab Lab Monthly	Start Level 0 Lab Lab Weekly	
	MOD	TSP Visual Soils Water/Sed. Reg. Area	NR Level 1 Vis Vis Start	NR Level 1 Vis Vis Monthly	NR Level 0 Vis Vis Weekly	NR Level 1 Lab Lab Start	NR Level 1 Lab Lab Monthly	NR Level 0 Lab Lab Weekly	
	LOW	TSP Visual Soils Water/Sed. Reg. Area	NR Level 4 Vis Vis Start	NR Level 4 Vis Vis Monthly	NR Level 2 Vis Vis Weekly	NR Level 1 Lab Lab Start	NR Level 1 Lab Lab Monthly	NR Level 0 Lab Lab Weekly	
	NIL	TSP Visual Soils Water/Sed Reg. Area	NR Level 4 Vis Vis Start	NR Level 4 Vis Vis Monthly	NR Level 2 Vis Vis Weekly	NR Level 1 Lab Lab Start	NR Level 1 Lab Lab Level 0	NR Level 0 Lab Lab Weekly	
				LOW			HIGH		
ENVIRONMENTAL IMPACT									

Definition of Symbols:TSP Lead (per Appendix F)

Full = Full-time monitoring
 Start = Start-up monitoring only
 NR = No TSP lead monitoring required

Visual (per Appendix F)

Level 0 = Level 0 (no visible emissions)
 Level 1 = Level 1 (visible emissions <1% of work day)
 Level 2 = Level 2 (visible emissions <5% work day)
 Level 3 = Level 3 (visible emissions <10% work day)
 Level 4 = Emissions not restricted

Soils (per Appendix G)

Lab = Laboratory testing and analysis
 Vis = Visual survey

Water/Sediment (Per Appendix H)

Lab = Testing and analysis
 Vis = Visual assessment only

Regulated Area (per Appendix F)

Weekly = Weekly verification monitoring
 Monthly = Monthly verification monitoring
 Start = Start-up monitoring only

NOTE: See Clause 12.4 for review of monitoring requirements.

**FIGURE 5 PROJECT-SPECIFIC MONITORING REQUIREMENTS
 CATEGORY 3—REMOVAL METHODS (MODERATE EMISSIONS)**

			RISK TO ADJACENT WORKERS					
PUBLIC HEALTH RISK	HIGH	Mon. Req	Nil	Low	High	Nil	Low	High
		TSP Visual Soils Water/Sed. Reg. Area	NR Level 1 Vis Vis Start	NR Level 1 Vis Vis Start	NR Level 0 Vis Vis Monthly	NR Level 1 Lab Lab Start	NR Level 1 Lab Lab Start	NR Level 0 Lab Lab Monthly
	MOD	TSP Visual Soils Water/Sed. Reg. Area	NR Level 1 Vis Vis Start	NR Level 1 Vis Vis Start	NR Level 1 Vis Vis Monthly	NR Level 1 Lab Lab Start	NR Level 1 Lab Lab Start	NR Level 0 Lab Lab Monthly
	LOW	TSP Visual Soils Water/Sed. Reg. Area	NR Level 4 Vis Vis Start	NR Level 4 Vis Vis Start	NR Level 2 Vis Vis Monthly	NR Level 1 Lab Lab Start	NR Level 1 Lab Lab Start	NR Level 0 Lab Lab Monthly
	NIL	TSP Visual Soils Water/Sed Reg. Area	NR Level 4 Vis Vis Start	NR Level 4 Vis Vis Start	NR Level 2 Vis Vis Monthly	NR Level 1 Lab Lab Start	NR Level 1 Lab Lab Start	NR Level 0 Lab Lab Monthly
				LOW			HIGH	
			ENVIRONMENTAL IMPACT					

Definition of Symbols:TSP Lead (per Appendix F)

Full = Full-time monitoring
 Start = Start-up monitoring only
 NR = No TSP lead monitoring required

Water/Sediment (per Appendix H)

Lab = Testing and analysis
 Vis = Visual assessment only

Visual (per Appendix F)

Level 0 = Level 0 (no visible emissions)
 Level 1 = Level 1 (visible emissions <1% of work day)
 Level 2 = Level 2 (visible emissions <5% work day)
 Level 3 = Level 3 (visible emissions <10% work day)
 Level 4 = Emissions not restricted

Regulated Area (per Appendix F)

Weekly = Weekly verification monitoring
 Monthly = Monthly verification monitoring
 Start = Start-up monitoring only

Soils

Lab = Laboratory testing and analysis per Appendix G
 Vis = Visual survey per Appendix G

NOTE: See Clause 12.4 for review of monitoring requirements.

**FIGURE 6 PROJECT-SPECIFIC MONITORING REQUIREMENTS
 CATEGORY 4—REMOVAL METHODS (LOW EMISSIONS)**

APPENDIX A
STANDARD PRACTICE FOR LEAD IDENTIFICATION
(Normative)

A1 SCOPE This Appendix describes methods for the determining of the presence of lead-containing paint on industrial structures and, if detected, the extent of its presence.

A2 HISTORICAL PAINTING RECORDS Historical records may provide ample documentation to establish the presence of lead on a structure. Such records would include project specifications, inspection reports, and paint manufacturers' product data sheets.

When reviewing historical records, it is necessary to determine the paint materials that were originally applied as well as the materials used throughout the entire maintenance painting history of the structure. If historical records are incomplete, field or laboratory testing or both should be undertaken to establish the presence of lead in the coating system.

A3 METHODS OF LEAD IDENTIFICATION

A3.1 Field tests Chemical spot tests for the field detection of lead in paint are described in A3.2 and A3.3. These test methods provide a rapid qualitative assessment of the presence of lead. While the precision of the techniques varies, they typically indicate the presence of lead if the paint contains 0.5 percent or more lead by mass. When employing chemical spot tests, confirmatory laboratory testing of representative positive and negative test results should be undertaken.

A3.2 Method 1—Lead detection by rhodizonate

A3.2.1 Principle A plastic tube containing several capsules of chemicals (including rhodizonate) is squeezed, allowing the chemicals to mix and moisten a porous swab on the end of the tube. The dampened swab is wiped over the test surface and produces a red colouration in the presence of leaded compounds in excess of 0.5 percent w/w, i.e. where lead exceeds 5000 ppm. A lack of colour change in the test area indicates that lead is not present, or lead is present at a level below the detection limit of the method. A positive test (colour change) is considered as an indication that lead is present and may be in excess of the 1 percent level referred to in this Standard.

A3.2.2 Materials The following materials are required:

- (a) Sandpaper or a clean, sharpened knife, chisel, or scraper.
- (b) Proprietary chemical spot test kits.
- (c) Disposable wipes or cleaning detergent and cloths.

A3.2.3 Procedure The procedure is as follows:

- (a) Remove all dust and surface dirt from the test area.
- (b) Sand or cut the paint film using a clean knife, chisel, or scraper to expose all paint layers down to the substrate. The removed area should cover approximately 2 cm, in length. The width of the exposed area is dependent upon the thickness of the paint film, but care should be taken to expose a minimum of 50 μm of each paint coat.
- (c) Mix the chemical in accordance with the manufacturer's instructions.
- (d) Rub the chemical onto the test area. A pink or red colour indicates that lead is present.

- (e) If a colour change does not occur within one minute, rub the swab onto a control that is known to contain lead. If a colour change does not occur, disregard the sample and repeat the test with a new swab. If a colour change on the control sample occurs, the sample area is either free of lead or it contains lead below the detection limit of the technique.
- (f) If a negative test occurs, confirmatory laboratory testing may be required.
- (g) On completion of testing, properly dispose of the sandpaper and spent chemicals. Wash the test surfaces to remove loose debris and clean any knives, chisels, or scrapers which were used.

A3.2.4 Report Record the following minimum information:

- (a) Project name and location.
- (b) Date of testing.
- (c) Test site identification/location. Assign a unique number to each test site and identify its specific location on the structure.
- (d) Test results.
- (e) Test areas selected for confirmatory laboratory testing if required.
- (f) Name of the technician conducting the testing.

A3.3 Method 2—Lead detection by sodium sulfide test

A3.3.1 Principle A cotton wool swab soaked with sodium sulfide solution is applied to the painted surface. A darkening of the surface indicates the possible presence of lead. The gradation of colour may provide an experienced user with a semi-quantitative assessment of lead content.

NOTES:

- 1 Ambiguous results may be obtained on wet steel substrates, or where iron oxides are present. Confirmatory laboratory tests may be used.
- 2 Sodium sulfide solution can lose effectiveness with age. The presence of a rotten egg smell will indicate that the solution is fresh.

A3.3.2 Materials The following equipment and materials are required:

- (a) Metal knife or scraper.
- (b) Aqueous sodium sulfide 5 percent w/v.
- (c) Cotton wool swabs.

A3.3.3 Procedure The procedure is as follows:

- (a) Scrape the surface of the paint with the metal knife or scraper to expose the successive layers of paint on the surface to be tested.
- (b) Apply the sodium sulfide solution by swab or as droplets on the surface. Leave for at least 5 min or until the colour darkens, whichever is the sooner.

NOTE: For vertical orientations it may be convenient to secure the swab in place with adhesive tape.

- (c) Examine the surface for darkening and record any darkening of the surface as evidence of lead.

NOTE: As a guide, it is likely that paint with a lead content exceeding 5 percent will turn black. Concentrations from 1–5 percent will change to various intensities of grey, with barely perceptible change of colour at a lead concentration of below 1 percent.

- (d) If a negative test occurs, confirmatory laboratory testing may be required.
- (e) On completion of testing, properly dispose of the sandpaper and spent chemicals. Wash the test surfaces to remove loose debris and clean any knives, chisels, or scrapers which were used.