LEAD-BASED PAINT MANAGEMENT ON ROADING STRUCTURES

SECTION IV MODEL SPECIFICATION

Transfund New Zealand Research Report 116

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TRANSFUND NEW ZEALAND
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AN IMPORTANT NOTE FOR THE READER

The research detailed in this report was commissioned by Transfund New Zealand.

Transfund is a Crown entity established under the Transit New Zealand Act 1989. Its principal objective is to allocate resources to achieve a safe and efficient roading system. Each year, Transfund invests a portion of its funds on research that contributes to this objective.

The material contained in this report is the output of research and should not be construed in any way as policy adopted by Transfund New Zealand but may form the basis of future policy.

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EXECUTIVE SUMMARY

This is Section IV of a report on a Research Project that had the objective to develop "environmental and health and safety guidelines, procedures and policies for the management and risk assessment of lead-based paint coatings on bridges and other roading structures in order to minimise the adverse impacts on the environment and thus to provide a consistent approach nationwide".

This report (Section IV) contains a *Model Specification for the Cleaning and Coating of Steelwork.* This is a generic standard specification that can be used as a base document for a steelwork maintenance contract where lead-based paint is to be removed, and which sets out information to be supplied by the owner, and requirements to be met by the Contractor.

Guidance is given on the selection and specification of coating systems, and requirements covering the safety of contractors and the public, environmental protection, monitoring and inspection of the work are recommended. Also included are standards for paint materials, surface preparation and containment structures where required for lead abatement.

Section I (Transfund New Zealand Report 113) reports on the results of a nationwide survey of road controlling authorities. This found that there is wide variation in their level of knowledge as to the extent of lead based paint on their highway structures. From the data supplied it has been estimated that there are approximately 2300 road and state highway bridges in New Zealand with major steel components that may be protected with lead based paint. With these bridges there is a potential for adverse impacts on the environment and public health to occur during maintenance painting.

Regional Councils who issue resource consents for the cleaning and painting of road structures coated with lead-based paint were also surveyed. This survey found that the conditions of consent imposed by Regional Council's varied widely, and that the standards required were often non-specific and not as rigorous as those required by AS 4361.1 and regulatory authorities both in Australia and the United States. The potential liabilities of owners of these structures and managers of maintenance work under the Resource Management Act 1991 (RMA) and Health and Safety in Employment 1992 (HSE) Act are discussed.

Section I Appendix 4 contains a *Model Policy Statement for Removal of Lead-based Paint* which is recommended for adoption by owners of these structures to minimise potential detrimental effects both to the environment and to their contractors. This will assist the owners of bridges and other roading structures to meet their statutory obligations with respect to paint removal projects.

Section II (Transfund New Zealand Report 114) is a *Code of Conduct for Contractors.* This is a plain language guideline for contractors who undertake maintenance of roading structures containing lead-based paints, which will help them meet their legal requirements under the RMA and HSE Act.

Section III (Transfund New Zealand Report 115) contains the *Guidelines for the Management of Lead-based Paint on Roading Structures*. This document provides information for owners of these structures and their maintenance engineers, consultants and contractors which will assist them to utilise the risk management process outlined in AS 4361.1 and so identify the most cost-effective maintenance strategy while minimising environmental, and health and safety risks during the maintenance work.

ABSTRACT

This report is Section IV of four "stand alone" documents that can be used by road controlling authorities, maintenance engineers, and industrial painting contractors when carrying out removal or maintenance of lead-based paints on steel roading structures. It will enable them to comply with their statutory obligations, and minimise effects on the environment and risks to workers and public health. Section IV contains a generic standard specification for the cleaning and coating of steelwork. It sets out information to be supplied by the owner, and requirements to be met by the contractor; and includes standards for coating materials, surface preparation and contamination containment.

SPECIFICATION NO:..... *(INSERT)*

DATE: ..... *(INSERT)*

MODEL SPECIFICATION

FOR
THE CLEANING AND RECOATING OF STEELWORK COATED WITH LEAD-BASED PAINT

ON .....
(INSERT NAME OR ID OF HIGHWAY STRUCTURE)

AT .....
(INSERT LOCATION)

1. CONTRACT INFORMATION

1.1 DESCRIPTION OF WORK

This specification covers the maintenance painting of structural steelwork, on

.....
(INSERT DESCRIPTION AND LOCATION OF HIGHWAY STRUCTURE AND EXTENT OF PAINTING REQUIRED)

Refer to the Locality Plan in Appendix 1 *(ADD PLAN AS APPENDIX 1)*
Drawings and photographs are contained in Appendix 2. *(OPTIONAL BUT RECOMMENDED, ESPECIALLY TO INDICATE SCOPE OF WORK IF ONLY PART OF THE STRUCTURE REQUIRES REPAINTING)*

1.2 STANDARDS

The following specification sets out the requirements for the protection of steel surfaces from atmospheric corrosion by the reinstatement of a protective coating system, including the standards to which the materials and work must conform, and the procedures to be followed for the on-site application of paint coatings. **This Specification shall be read in conjunction with AS 4361.1-1995 *Guide to Lead Paint Management Part 1: Industrial Applications.*** The latest editions of the following standards and test procedures are also relevant:

NZS/AS 1627.1	*Cleaning using liquid solvents and alkaline solutions.*
NZS/AS 1627.2	*Power tool cleaning.*
NZS/AS 1627.4	*Abrasive blast cleaning.*
NZS/AS 1627.7	*Hand tool cleaning of metal surfaces.*
NZS/AS 1627.9	*Pictorial surface preparation (ISO 8501-1 or SIS 05 5900).*
AS/NZS 1716	*Respiratory protective devices.*
AS/NZS 2310	*Glossary of paint and painting terms.*
AS/NZS 2312	*Guide to the protection of iron and steel against exterior atmospheric corrosion.*
AS 2800	*Ambient air-Determination of particulate lead-High volume sampler gravimetric collection.*
NZS/AS 3894.3	*Site Testing of Protective Coatings. Method 3: Determinations of dry film thickness.*
AS/NZS 3894.6	*Method 6: Determination of residual contaminants.*
NZS/AS 3894.10	*Part 10: Inspection report - Daily.*
NZS/AS 3894.12	*Part 12: Inspection report - Coating.*
NZS 3910	*Conditions of Contract for building and civil engineering construction.*
NZS 4203	*General structural design and design loadings for buildings.*
NZS/BS 4800	*Schedule for paint colours for building purposes.*
NZS 6703	*Code of practice for interior lighting design.*

See also Clause 5.2.1 for paint material specifications

1.3 DEFINITIONS

Contained Area	the area of the structure fully enclosed to contain hazardous dust and debris.
Regulated Area	the area established at the work site to identify areas, outside of which airborne concentrations of lead are not expected to exceed 30 $\mu g/m^3$ TWA.
Bunded Area	an area enclosed by a wall, moat or other device designed to prevent the escape of spilt materials - generally liquids, into the environment.
Hazardous Waste	any debris where TCLP testing produces leachate containing lead or chromium in concentrations greater than 5.0 ppm, or the pH is <2.0 or >12.5.
TPI	Independent Third Party Inspector. Refer to Clause 4.1.

1.4 EXISTING COATING SYSTEM

The existing coating system contains concentrations of lead greater than 1% by weight, and therefore presents environmental and health risks when the coating system is removed. This may necessitate the use of containment and other special procedures to ensure satisfactory collection and disposal of blast media and debris, in order to comply with the Resource Consent issued for this work (Refer to Appendix 3) and relevant Health and Safety legislation. .....

.....

(INSERT ANY INFORMATION KNOWN ABOUT THE EXISTING SYSTEM FROM RECORDS OR A SITE ASSESSMENT).

1.5 RISK ASSESSMENT

Using the criteria given in the Transfund New Zealand *Management of Lead-based Paints on Roading Structures - Section III Guidelines: -*

The public health risk has been designated as *(CIRCLE AS APPROPRIATE)*:
HIGH MODERATE LOW NIL

The environmental risk as:
HIGH LOW

The risk to adjacent workers as:
HIGH LOW NIL

The minimum project-specific emission control level required is therefore Level.... *(INSERT A, B, OR C)* which will govern the combination of paint removal methods and containment systems to be used on this project. *(REFER TO APPENDIX C OF AS 4361.1 FOR ADDITIONAL GUIDANCE IN ASSESSING THESE RISKS AND ESTABLISHING THE CONTROL LEVEL.)*

1.6 ON-SITE WORK CONDITIONS

1.6.1 Site Visit

The Contractor is deemed to have visited the site to determine the extent of the work, local conditions, hours of operation etc, and assessed all difficulties prior to submitting their Tender. The Principal will not consider any claims arising from failure to inspect the site.

1.6.2 Labour and Materials

The Contractor shall provide all labour, plant (including protective equipment, scaffolding and debris containment), together with all paint, abrasive media, and consumables (including brushes, rollers, cleaners and thinners) required to prepare and coat surfaces in accordance with this specification.

1.6.3 Inspection Equipment and Personnel

The Contractor shall provide experienced supervisors including a coatings inspector and all equipment necessary to accurately measure wet and dry bulb temperatures and steel surface temperatures, wet and dry film thicknesses, coating adhesion and chloride levels. The Contractor shall be responsible for the calibration and maintenance of all measuring and inspection equipment, and that personnel are trained in their proper use.

1.6.4 Signage of Hazards

The regulated area shall be sign posted to show that hazardous work is taking place. Outside this area the TWA shall not exceed 30 $\mu g/m^3$ of lead dust in air or other maximum level set by the Regional Council.

Signs, clearly warning of the dangers of airborne dust, shall be erected at the entrances to the site and at the blast site area to redirect vehicular traffic and personnel away from the area when blasting is in progress.

1.6.5 General Duty of Care

When undertaking this work, the Contractor must ensure that no damage will occur to the Principal's property, employees and/or any Third Parties, plant, equipment or personnel. The Contractor shall be held responsible to make good any such damage. In particular, the Contractor shall ensure that all drains and water ways are kept free of spent abrasive and paint debris during the work.

1.6.6 Clean-Up of Site on Completion

All equipment and containment enclosures shall be thoroughly cleaned with a HEPA vacuum cleaner prior to dismantling and removal from the site *(Hold point (i) in clause 4.2)*.

On completion of the project, all surplus and waste materials shall be removed from the site, which shall be left clean and tidy to the satisfaction of the Engineer.

1.7 STATUTORY REQUIREMENTS

The Contractor shall comply with the following:

a) Health and Safety in Employment Act 1992 and Health and Safety in Employment Regulations 1995. Construction work notifiable under these regulations (including work at height exceeding 5 metres and where scaffolding is erected or dismantled from which falls of 5 metres or more are possible) must be notified to OSH 24 hours prior to commencement of the work.

b) The Resource Management Act 1991 and any consents issued under this Act.

c) Hazardous Substances and New Organisms Act 1996.

d) Health Act 1956.

1.8 RESOURCE MANAGEMENT ACT

1.8.1 Regional Council Approval

Prior to the commencement of works, the Contractor shall submit to the Engineer evidence that the proposed methods of surface preparation, containment, collection and disposal of debris have been approved in principle by the ..... *(INSERT NAME)* Regional Council, as methods which will comply with the requirements of the Resource Consent appended to this Specification. This submission will be a pre-requisite before permission to commence cleaning operations is granted (Refer also to clause 1.10).

1.8.2 Containment

Where containment is required to meet the specified emission control level, it shall comply with the requirements of Appendix 6, unless otherwise agreed with the Engineer.

1.8.3 Waste Disposal

All contaminated liquid and solid waste material, including blast debris, paint, rust, mill scale etc. associated with the work must be collected, and held in an approved quarantine area prior to disposal, in such a way:

(a) That it is protected from stormwater intrusion or flooding,

(b) That no contamination of local soil, air or water occurs, and

(c) It is regularly removed to a waste disposal site approved to accept waste of this nature.

All site washing water shall be securely stored, in a bunded location within the regulated area. It must be tested for lead contamination, and treated as necessary, prior to disposal. The Contractor shall ensure that disposal meets the conditions of the

Resource Consent for the project and/or any relevant local authority discharge requirements.

The contractor will be responsible for the management of all waste. This includes arranging for:

(d) Preparation of a Waste Management Plan;

(e) Any treatment of the waste that may be required;

(f) Removal by a contractor to a site authorised to accept waste of this nature by the relevant Local Authority; and

(g) Providing documentation of disposal acceptable to the engineer (e.g. a Disposal Verification Form signed by the Contractor and waste receiver).

The Contractor will be responsible to meet any claims arising from poor management and/or control of all waste generated during the removal or refurbishment of the existing coating.

The Principal will reimburse the Contractor, at cost, for:
(DELETE FOLLOWING OPTIONAL SUBCLAUSES - IF NOT REQUIRED)

h) The cost of transporting the waste from the project to the treatment plant/ disposal site.

i) The cost of treating and/or disposing of the waste.

NOTE: As the quantity of lead contaminated waste, and hence the cost of its treatment and disposal, may not be known at the time of tender; this can be treated as a provisional sum item. This will also ensure that the Contractor will not be tempted to cut corners in disposal of waste, or build a large risk element into the tendered price. On the other hand, if waste disposal is included as a priced scheduled item, there is incentive for the Contractor to minimise waste and be more innovative regarding its treatment.

1.9 HEALTH AND SAFETY IN EMPLOYMENT ACT

1.9.1 Health and Safety Plan

The Contractor shall provide to the satisfaction of the Engineer a project health and safety plan. This plan will specify the measures the Contractor will undertake for this contract, with respect to managing health and safety hazards as required in the above Act. The plan must specify as a minimum:

(a) Washing facilities that will be provided at the site;

(b) Protective equipment and clothing that will be issued to employees;

(c) A nominated contact person at the site who is responsible for health and safety management;

(d) Measures to be taken to minimise exposure to lead dust, including full details of any containment system, ventilation and frequency of site inspections;

(e) Measures taken to minimise any other health and safety hazards (such as a traffic safety management plan); and

(f) Results of employee blood lead tests taken before and after any abrasive blasting, or confirmation from an OSH medical practitioner (or Occupational Physician) that blood lead tests are not required for a contract of this nature.

1.9.2 Evidence of Training

The Contractor shall provide evidence of training given to employees with respect to the hazards of lead, importance of personal hygiene, correct use and care of respirators, and measures required to minimise exposure to lead. Evidence shall also be provided of other health and safety training given to employees that is relevant to this contract. This shall includes dates of training. (The NZ Painting Contractors Association run a half day training course for their members.)

1.10 PRE-COMMENCEMENT MEETING

The Contractor's Site Manager will be required to attend a meeting, one week prior to commencement of work, to discuss aspects of this Contract considered critical to a successful outcome. An agenda will be provided prior to the meeting. The items identified in the Tender Documents (e.g. Work programme, coating application plan, health and safety plan, waste management plan) shall be submitted to the Engineer at least two working days prior to this meeting.

NOTE: It is expected that many other contractual issues such as hours of work, traffic control, protection of the public, site accommodation & security, quality systems, information to be supplied on award of contract etc, will be covered under a separate standard preliminary and general section.

2. PERSONNEL REQUIREMENTS

2.1 GENERAL

Due to the presence of the lead-based paints at this site, a number of special precautions to ensure safety of personnel shall be adopted.

In all instances, compliance with the requirements of Occupational Safety and Health Service of the Department of Labour, the local Regional Council or relevant Local Authority, and any Acts or Regulations relevant to this contract shall be mandatory.

2.2 Personnel Monitoring

All employees who are likely to enter the regulated area should be encouraged to take tests in accordance with the requirements of the OSH *Guidelines for the Medical Surveillance of Lead Workers,* unless confirmation has been received by an OSH medical practitioner or occupational physician that blood lead testing will be of no benefit for a contract of this nature or duration.

2.3 Protective Equipment

All personnel entering the regulated area shall be provided with, trained to use and shall use, respiratory protection equipment that offers suitable protection against lead dust and other contaminants. Respirators shall be rated for use against toxic lead dust and shall comply with AS/NZS 1716. Where disposable respirators are used these must be rated for toxic dusts and must have a double head strap.

Suitable overalls and head protection (or disposable coveralls) shall be provided to prevent dust accumulation in clothing and hair. Boots and gloves shall be provided.

All protective clothing, once used, shall remain on the work site until disposed of, or sent for laundering. Contaminated clothes shall be laundered separately from domestic clothing.

2.4 Personnel Hygiene

Amenities and facilities shall be provided in accordance with Part 1 of the *Guidelines for the Provision of Facilities and General Safety in the Construction Industry.* All facilities shall be sited in an area where contamination by lead dust is not possible and shall be regularly cleaned during the course of the contract.

The Contractor should ensure all personnel understand the need for personal hygiene and observe the instructions in Transfund's *Lead-based Paint Management on Roading Structures, Section II, Code of Conduct for Contractors.*

A decontamination unit incorporating hot and cold showers for both dirty and clean applications shall be provided. A supply of fresh clean water and 240V/10A minimum electricity supply will be required. The unit shall be made available to the Engineer, TPI, and any other personnel associated with the works.

All site washing water shall be securely stored, in a bunded location. It must be tested for lead contamination, and treated, as necessary, prior to disposal, in accordance with the requirements of clause 1.8.3.

2.5 Lighting

Within any containment structure, the minimum average illuminance over the floor area shall be 40 lux and at the work surface, a minimum of 200 lux (see hold points). Where

necessary, artificial lighting shall be provided as a supplement to any natural lighting present and shall be designed in accordance with NZS 6703.

2.6 Vacuum Cleaning

Personnel and equipment, involved in blast cleaning shall be cleaned down by vacuum before exiting the contained area. The vacuum cleaner must be fitted with a High Efficiency Particulate (HEPA) filter.

3. ENVIRONMENTAL CONSIDERATIONS

3.1 General

Monitoring of the lead levels in soil, water and air shall be undertaken in accordance with the method given in the relevant Appendix to AS 4361.1, and as required under the conditions of the Resource Consent issued for the work. The type and extent of monitoring required should be related to the risk potential identified for the project.

If at any time during the Contract, the lead levels increase above what is specified as acceptable, work shall cease until the cause of the increase is identified and rectified to the satisfaction of the Engineer. The Contractor shall bear the costs of any rectification required and any delay to the programme.

Sampling, testing and monitoring shall be arranged by the Third Party Inspector (TPI) or Engineer and all associated costs shall be reimbursed by the Contractor. All sample analysis shall be carried out by an independent IANZ accredited testing laboratory. Soil and water samples shall be analysed in accordance with the Australian and New Zealand Environment and Conservation Council (ANZECC), *Guidelines for the Analysis of Contaminated Soils* (Methods 14 or 15), the US EPA Method 3050, or other approved equivalent method.

3.2 Soil Testing

Prior to the commencement, and following the completion of the Contract, samples of soil will be taken for analysis by the TPI (or staff from the testing laboratory) in accordance with Appendix G of AS 4361.1. An increase of more than 50 ppm or 10% (which ever is the greater) over the initial level will be considered contamination resulting from the work. Any soil that is above 1000 ppm lead and has been contaminated as a result of the project work, shall be removed at the Contractor's expense. (This level may need to be reduced to 300 ppm in areas of high public health risk or environmental sensitivity.)

Visual assessment of ground contamination by paint flakes or other debris shall be maintained throughout the project. Unless otherwise agreed by the Engineer, all such contamination shall be removed without recourse to laboratory analysis.

3.3 Water Testing

Testing of sediment and surface water may be required depending on the circumstances of the project. In fast-moving and/or deep water bodies, water and sediment testing is likely to be difficult and of limited value. For slow moving, shallow bodies of water, sampling of sediment and water may provide meaningful data. In these situations, samples should be taken prior to commencement and following the completion of the contract by the TPI (or Engineer) in accordance with Appendix H of AS 4361.1. If the project activities are in the vicinity of a drinking water intake or sensitive environmental receptors such as mussel or oyster beds, additional samples should be taken at intervals during the Contract.

Samples shall be tested by an independent IANZ accredited laboratory in accordance with the methods listed in Section 3.2. The water body will be considered to be contaminated by the project activities if:

(a) Paint chips or debris are visually evident in the water or sediment;

(b) The lead level of the water increases by 0.5 µg/litre or 10% (whichever is the greater) over the initial level measured; or

(c) The lead level of the sediment increases by 50 ppm or 10% (whichever is the greater) over the pre-project measured level.

3.4 Air Monitoring

If air sampling is required by the Resource Consent, it shall be undertaken by a third party testing organisation. Samples shall be collected and tested in accordance with AS 2800. Air quality monitoring shall be carried out in accordance with procedures given in Appendix F of AS 4361.1.

Where visible dust emissions are not permitted under the Resource Consent, the Contractor shall continuously monitor visually for any emissions from any contained area, and where evident, shall cease operations and effect any modification or repairs necessary to prevent any recurrence. The results of all visual monitoring shall be documented.

3.5 Minimum Level of Monitoring

In all cases the minimum level of monitoring undertaken shall be visual monitoring for air emissions and the presence of paint flakes or dust, or other surface preparation debris on the ground, or adjacent water surfaces or in associated sediment.

NOTE: Where the engineer wishes to be directly responsible for environmental monitoring, rather than the TPI, his section and Clause 4.1 will require amendment.

4. INSPECTION REQUIREMENTS

4.1 General

4.1.1 Third Party Inspection

Unless otherwise agreed (e.g. for minor or remote works with a low environmental or public health risk) the Contractor shall employ an independent third party inspector (TPI) that holds an approved qualification in coatings inspection (e.g. from the NZ Certification Board for Inspection Personnel (CBIP), or the Australasian Corrosion Association (ACA), who shall be present for the periods specified during the Contract with the following responsibilities:

a) To audit daily inspection records maintained by the Contractor.

b) To sample soil, water and air, as required by this specification.

c) To observe and report to the Engineer unsafe work practices or deviations from the health and safety plan.

d) To report to the Engineer any deviation from the Specification or accepted industry practice.

e) To advise the Engineer of any problems experienced with the coating system.

NOTE: On some projects the owner may prefer to hire the TPI directly.

4.1.2 Attendance by TPI

The Contractor shall allow for the TPI to be on site (continuously/daily/alternate days/weekly) during surface preparation and (continuously/daily/twice weekly/ weekly) during coating application. The Contractor shall be liable for the costs of any additional inspections due to access or lighting not being available, or inspection of rework. *(AMEND AS REQUIRED TO SUIT SIZE OF PROJECT AND ASSESSMENT OF RISK. PAYMENT SHOULD BE MADE AS A SEPARATE SCHEDULED ITEM AGAINST A PROVISIONAL SUM.)*

4.2 Hold Points

Work shall not proceed beyond mandatory hold points unless approved by the Engineer. Such hold points for the purpose of the Contract, are as follows:

a) Supply of all information required by the Tender documents (e.g. details of traffic management, scaffolding, containment, safety plan etc.) prior to the commencement of works.

b) At the completion of the scaffolding and screening or containment, prior to blasting proceeding.

c) Initial blood tests being taken and results forwarded to the Engineer prior to work commencing on site or confirmation of an exemption. Where an operator has

history of blood lead level monitoring, the most recent test result shall be supplied.

d) Lighting must be shown to comply with clauses 2.5 and 4.4 prior to commencement.

e) Surface preparation methods and the paint system must be approved as per clauses 1.8.1 and 5.1.8 prior to any surface cleaning or painting respectively.

f) Following the completion of any blast cleaning and prior to the application of primer *(OPTIONAL)*.

g) When any dust emissions are observed coming from the contained area during blasting.

h) After curing of any primer/paint coat and prior to overcoating *(OPTIONAL)*.

i) Vacuuming prior to removal of scaffolding and screening or containment.

j) Inspection following clean up of the site, prior to issuing completion certificate.

4.3 Blow Down

Freshly blast-cleaned areas shall be thoroughly blown down or vacuumed prior to an inspection by the Engineer or TPI.

4.4 Lighting

The minimum average illuminance over the area under inspection shall be 200 lux. Artificial lighting shall be provided by the Contractor where necessary to facilitate inspection.

4.5 Application Plan

The Tenderer shall provide a coating Application Plan for discussion at the Pre-commencement Meeting. This plan shall be coating manufacturer-specific and shall include: contact details of their local technical representative, Material and Safety Data Sheets, details of cleaning, application and inspection equipment to be used, sequence of operations, and procedures for the repair of any defects or damage.

Throughout the duration of the Contract the paint manufacturer's nominated representative shall be available to attend meetings and also to visit the site should problems occur.

4.6 Site Testing

The dry film thickness shall be measured in accordance with AS 3894.3. Measurements

shall be taken in accordance with a Sampling Plan which shall be submitted one week prior to the commencement of works for approval by the Engineer. *NOTE: Guidelines for Sampling Plans are detailed in AS 3894.3.*

When the structure is located in a marine or severe marine macro-environment as defined by AS/NZS 2312, add the following: Before priming, representative surfaces shall be checked for salt contamination in accordance with Method A of AS/NZS 3894.6, and chloride ion levels shall be less than 100 mg/m^2 or other maximum value recommended by the coating manufacturer and agreed in writing by the Engineer.

4.7 Scaffolding

The Contractor shall be responsible for the provision of all necessary scaffolding to allow for the structure to be safely prepared, coated and inspected. The scaffolding shall be erected and constructed in accordance with Regulation 22 of the Health and Safety in Employment Regulations and the OSH Approved Code of Practice for the Safe Erection and Use of Scaffolding. Scaffolding must be erected by a certified scaffolder. Scaffolding must be designed to resist all expected load combinations including wind on any screens or containment.

The Tenderer shall submit at the Pre-commencement Meeting a detailed Scaffolding Plan and drawings, showing dimensions, clearances, and the access arrangements for the proposed method of scaffolding.

A Scaffolding Register must be maintained and inspections undertaken as stated in the OSH Code of Practice.

Scaffolding shall not be removed until all the final coat surfaces have cured sufficiently to enable the dry film thickness readings to be checked by the TPI.

4.8 Documentation

4.8.1 As-built Report

Prior to any maintenance painting commencing, the Contractor shall document the location of areas requiring spot priming. Prior to abrasive blasting the rusted areas shall be recorded on a sketch, together with dry film thicknesses measured after final preparation and prior to the spot priming of all areas requiring maintenance. On completion of painting, final coating thicknesses in these same locations shall be measured and added as an "as-built" record of maintenance. *(DELETE THIS CLAUSE IF NOT REQUIRED)*

4.8.2 Daily Inspection Report

The Contractor shall complete a daily inspection report of an approved format (e.g. AS 3894.10) detailing the type of surface preparation and environmental conditions for each work area. A report (e.g. AS 3894.12) shall also record paint system, dry film thicknesses, paint batch numbers and quantities used. Copies shall be supplied to the TPI at the end of each week, and forwarded to the Engineer at the end of each month.

5. MAINTENANCE PAINTING

5.1 Coating System Required

The coating system to be applied shall be System No. ..... as specified in Appendix 5. *(INSERT THE MOST APPROPRIATE SPECIFICATION NUMBER FROM APPENDIX 5, OR OTHER SYSTEM SPECIFICATION AS AGREED WITH THE PRINCIPAL).*

5.2 Coating Materials

5.2.1 Material Specifications

Paint shall comply with the requirements of the relevant specification as listed below. Unless otherwise agreed with the Engineer, material supplied shall have been approved by the NZ Paint Approvals Scheme (PASS) or the Australian Paint Approval Scheme (APAS), formerly known as Australian Government Paint Committee (GPC).

Generic Type	**Standard Spec.**	**PASS/APAS Spec.**
Inorganic Zinc Silicate (IOZ)	AS/NZS 3750.15/4	C-29/8A
Inorganic Zinc Silicate ('High ratio')	AS/NZS 3750.15/6	C-29/8A
Zinc Rich Epoxy (ZnE)	AS/NZS 3750.9/2	C-29/16A
Epoxy Primer (ZPA)	AS/NZS 3750.13	C-29/7A
Zinc Phosphate Alkyd Primer (ZPA)	AS 4089	P-162
HB Epoxy (HBE)	AS/NZS 3750.14	C-29/7A
Alkyd MIO (MIOA)	AS/NZS 3750.12	C-29/10A
Epoxy Mastic (EM)	AS 3750.1	C-29/7A
Polyurethane (PU)	AS/NZS 3750.6	C-29/11
Acrylic Latex *(if required)*	AS/NZS 3750.5	L-28/1

Until an Australian or New Zealand Standard is published for single component Moisture Cured Urethanes (MCU), refer to the material specification attached as Appendix 4.

5.2.2 Packaging and Labelling

All paints and thinners used in a system shall be from the one paint manufacturer. Materials shall be delivered to the site in the manufacturer's containers, unopened and with the label intact. The following information shall be legibly and durably marked on each container:

a) The name or registered mark of the manufacturer.
b) The paint or thinner type.

c) The colour identification.

d) Product identification together with appropriate description of each component, eg. base, hardener, reducing solvent, etc.
e) Production or batch numbers on packs of 4 litre capacity and above.

f) Information required by statutory regulations.

In addition to the project coating specification, the Contractor shall have on site available for reference by the Engineer and the Contractor's employees the following information for each product used (including thinners):

g) The manufacturer's technical data sheet with instructions for use, including (where relevant) the mixing ratio of the component parts, the induction time, the pot life, and recommended methods of storage, mixing, and application.

h) The manufacturer's Material Safety Data Sheet (MSDS).

5.2.3 Safety Precautions

The Contractor shall comply with all recommendations provided on the paint manufacturer's Safety Data Sheets.

5.2.4 Deviations from Manufacturer's Data Sheets

Any deviations from the manufacturer's printed data sheet(s) or their project coating specification shall first be authorised in writing, by the paint manufacturer. Copies of such authorisation shall be forwarded to the Engineer.

5.2.5 Sampling and Quality Assurance

Not later than two weeks prior to the commencement of coating application, the Contractor shall submit to the Engineer:

a) A list of proposed coatings to be used including brand names and generic type.

b) Name of the coating manufacturer and their nominated local representative with contact details.

c) Evidence of approval of the proposed brands by PASS or APAS.

The Engineer reserves the right to take any samples, including samples from the painter's pot, that the Engineer may require for testing purposes during the Contract.

Where non-PASS or non-GPC approved products are proposed for use, the Contractor shall provide documentary evidence (e.g. an IANZ or NATA endorsed test certificate) that each batch of paint supplied complies with the relevant material specification (refer clause 5.2.1).

5.2.6 Bunding

Unless otherwise agreed with the Engineer, all hazardous substances shall be stored in accordance with the Hazardous Goods Regulations within one or more bunded areas. These shall be provided with an impervious floor and should be covered to prevent collection of rainwater. The capacity of each bunded area shall be equal to the volume of hazardous substances stored, plus 20%. The volume of stored material must not exceed this calculated volume.

The Contractor shall submit details of the bunding and volumes of materials to be stored (or his alternate hazardous materials storage proposals) at the Pre-commencement Meeting.

5.2.7 Mixing and Thinning

All paints, thinners, solvents and any other liquids likely to contaminate land or water shall be stored and mixed within bunded areas.

All paints shall be thoroughly mixed before use and if required shall be agitated during application to keep the paint homogeneous. Catalysts, curing agents or hardeners which are separately packaged, shall be added and mixed with the base paint in accordance with the manufacturer's written recommendations. All two part material shall be folded in from the outer edge of the container with a flat spatula during mixing to ensure it is fully catalysed.

Only sufficient paint for prompt use shall be catalysed at one time. Unused portions of mixed catalysed paints shall be discarded at the end of the manufacturers recommended pot life and shall not be added into freshly mixed paint.

Any paint which has exceeded the manufacturer's recommended shelf life or is in anyway suspect shall not be used, unless suitability of that batch is confirmed in writing by the manufacturer's representative.

Thinning of paint and cleaning of equipment shall be carried out strictly in accordance with the manufacturer's written recommendations. Re-refined solvent (e.g. "gunwash") shall not be used unless in a cleaning procedure specifically approved by the coating manufacturer. Cleaning solvents shall be thoroughly flushed from all lines and equipment with the recommended thinner prior to application.

5.2.8 Tinting

Where successive coats of the same colour have been specified, alternate coats shall be tinted off shade sufficiently to produce enough contrast to indicate complete coverage of the surface. No site tinting of the finish coat will be permitted - it shall be factory tinted using milled pigments.

5.3 Surface Preparation

5.3.1 Preliminary Cleaning

Weld spatter, surface irregularities and sharp edges shall be removed by mechanical means to provide a minimum radius of 2 mm. Heavy deposits of contaminants or encrustations of rust shall be removed by chipping, scraping or use of impact tools. Any re-entrant pits shall be opened out with a suitable grinder.

Deposits of oil and grease shall be removed by solvent cleaning in accordance with AS 1627.1 or by washing using a non-ionic detergent. After any cleaning with detergent, the treated surface shall be thoroughly rinsed with clean water.

All surfaces to be painted shall first be thoroughly cleaned by high pressure water blasting with clean water to remove all remaining surface contamination. Surface contamination is deemed to include soluble chloride salts, weld fluxes, bird droppings, fungal growth, soot, dirt, deteriorated and loose paint, loose scale, embedded iron particles and corrosion products. The cleaning pressure and flow rate shall be sufficient to reduce residual levels of chloride to below that specified (refer clause 4.6). Use of a chloride solubilising agent (e.g. 'Chlor*Rid') in the washing water is recommended in marine or severe marine environments.

Washing water shall be collected as detailed in the Waste Management Plan and passed through a 250 micron filter or sediment trap before being discharged, or treated as required by the conditions of the Resource Consent.

5.3.2 Final Cleaning

Where required by the specification for the selected coating system, corroded steelwork shall be thoroughly cleaned back to the metal, removing all mill scale, weld slag, poorly adherent paint (<1.5MPa), contaminants or any other extraneous material in accordance with the relevant part of NZS/AS 1627 and to the standard of cleanliness specified for the coating system.

All electrical or telecommunication cables and fittings, data plates, and galvanized steel items shall be adequately protected to ensure they are not damaged during any abrasive blasting.

All waste material including blasting media, rust, paint debris and mill scale shall be contained and disposed of in accordance with the requirements of the Resource Consent, the Waste Management Plan for the project, and the relevant trade waste/landfill discharge standards of the local authority concerned.

Cleaning after abrasive blasting shall be carried out as specified in AS 1627.4, clause 2.4.5. The first coat of the protection system, shall be applied within six hours of final preparation or before deterioration occurs, whichever is the sooner. In the event of the surface becoming contaminated between final cleaning and applying the first coat, it shall be re-prepared.

5.3.3 Abrasive Media

The abrasive blast media to be used shall be clean, dry and free from extraneous material such as dirt, gravel and organic matter. For dry blasting, the media shall contain less than 5% free silica, with a maximum permissible level of total dissolved salt in the media of 0.015% when determined in accordance with BS 812: Part 117.

Where media used in dry blasting needs to be cleaned and recycled this shall be carried out on site, and all waste extracted shall be contained for later disposal.

5.3.4 Blast Cleaning Equipment

The compressed air supply used for blasting shall be free of water and oil. Adequate separators and traps shall be provided and these shall be kept emptied of water and oil.

Accumulations of oil and moisture shall be removed from the air receiver by regular purging.

Where specifically approved (to control the generation of dust), potable water may be injected into or sprayed from the blasting nozzle. Approved corrosion inhibitors (e.g. 0.1% ALFLOC 918) may be used with the agreement of the Engineer and the coating manufacturer, and approved by the Regional Council.

Unless otherwise specified or approved, the surface profile after blast cleaning shall be a minimum of 25 microns and a maximum of 75 microns, when measured to AS/NZS 3894.5 (specifier to confirm).

5.4 Coating Application

All paints shall be applied in accordance with the manufacturer's written recommendations.

5.4.1 Climatic Conditions

Unless expressly permitted by the manufacturer's written recommendations (Clause 5.2.2g), paint shall not be applied when:

a) The steel surface temperature is less than 3°C above dew point or more that 35°C;

b) The ambient air temperature is below 5°C;

c) The relative humidity (RH) exceeds 85% (unless special precautions are taken to ensure that the steel surface is at least 3°C above the temperature of the surrounding air), except for ethyl silicate based inorganic zinc silicate when up to 95% RH will be permitted;

d) There is moisture or ice visible on the surface of the steel;

e) The wind speed exceeds 7m/sec (for spray application); or

f) The environmental conditions are expected to deteriorate.

All atmospheric measurements shall be taken in the paint application area.

5.4.2 Priming

On surfaces not cleaned by abrasive blasting or where pit depths exceed 2 mm, the first coat of priming paint shall be applied by brush and well worked onto the steel surface. Subsequent coats may be applied by brush, roller or spray.

5.4.3 Spray Painting

Before spraying the intermediate and final coats, all areas such as corners, edges, welds,

small brackets, bolts, nuts, rivets, and crevices shall be precoated by brush as a stripe coat (to ensure that these areas have at least the minimum specified film thickness).

Painters shall be provided with wet film gauges which shall be used to ensure that the specified film thicknesses are achieved.

The Contractor shall take all reasonable precautions to prevent damage by drifting spray to other property, buildings and vehicles. Any such damage shall be fully and promptly repaired at the Contractor's expense. The Engineer may require that the remaining paint be applied by brush or roller, rather than spray if "overspray" damage occurs. In this event, the Contractor will not be entitled to any additional payment. Any conditions required by the Resource Consent shall also be complied with.

5.4.4 Cover Coats

Whenever wind speeds have exceeded 10 km/hr from a seaward direction, all newly prepared or painted external surfaces within 5 km of the coast shall be washed with potable water prior to applying the next coat.

Cover coats shall be carried over adjacent painted surfaces to give a minimum overlap of 25mm.

5.5 Repair of Defects

5.5.1 General

Before the application of any further coat of material, all damage to the previous coat shall be repaired. Sagging, dimpling, or curtaining not exceeding 1% of coated surface areas that are visible to the public, or 5% of "hidden" areas, shall not be considered as a defect requiring repair.

5.5.2 Incorrect Thickness

Areas with an inadequate coating thickness, shall be thoroughly cleaned and where necessary additional coats applied until the specified thickness for each layer or area is achieved. Underthickness of inorganic zinc silicate shall be repaired with zinc rich epoxy. Areas of excessive inorganic zinc thickness which results in 'mudcracking', shall be totally removed by abrasive blasting. When not used as a single coat system, the specified IOZ primer thickness may be re-established with zinc rich epoxy where less than 5% of the primed surface is affected. Larger areas shall be completely reprepared and reprimed with inorganic zinc silicate.

5.5.3 Contaminated Surfaces

Surfaces to be overcoated which become contaminated shall be thoroughly cleaned by washing with water to remove soluble contaminants (e.g. salt), solvent to remove organic material, and/or hand sanding or lightly brush blasting as required before application of the overcoat.

5.5.4 Damaged Surfaces

After cleaning, the coating around the damaged area shall be feathered to ensure continuity of the patch coating and the full system reinstated.

5.6 System Identification *(OPTIONAL - DELETE IF NOT REQUIRED)*

Information on the coating system applied shall be recorded by neatly painting in contrasting colour (and with compatible paint) onto the steel work in 50mm high letters so it is easily visible. If possible this should be done near an abutment (e.g. on the left-hand side when looking with route distance) and in a position difficult to deface with graffiti. The information should include:

a) Date of completion of paint application, e.g. DEC. 1998.

b) Surface preparation, e.g; S/W = Scrape and wirebrush, WB = High pressure water blast.

c) Priming coat(s) and dry film thickness (DFT) specified.

d) Cover and finish coats with DFT, *(Refer Table in Appendix 5 for Coating Abbreviations)* e.g. System No. 1 with two build coats would be shown as:

St2
ZPA 1/50
MIOA 2/50

APPENDIX 1

LOCALITY PLAN

APPENDIX 2

SITE DRAWINGS AND PHOTOGRAPHS

APPENDIX 3

RESOURCE CONSENT

APPENDIX 4
MCU PAINT MATERIALS SPECIFICATION

APPENDIX 4

MATERIAL SPECIFICATION FOR A MIO PIGMENTED MOISTURE CURED URETHANE SYSTEM FOR REFURBISHMENT OF STEELWORK COATED WITH LEAD-BASED PAINT AND SUBJECT TO EXTERIOR ATMOSPHERIC EXPOSURE

1. MATERIAL REQUIREMENTS

1.1 Where requested by the Engineer, the Manufacturer shall submit a Certificate of Compliance for the protective coatings stating that the Contractor may apply each coating at relative humidity up to 98%, temperatures down to minus 5 degrees Celsius, with no restriction on dew point temperature differential when the surface is free of condensed moisture.

1.2 All paint shall be prepared at the factory ready for application. The addition of thinner or other material to the paint after the paint has left the factory shall not be permitted, except as recommended by the manufacturer and by permission of the Engineer. All tinting materials required shall be added to the paint at the time of paint manufacture.

2. PHYSICAL PROPERTIES

Coating materials shall conform to the following minimum requirements:

2.1 Surface Tolerant Primer

Generic Type: Micaceous Iron Oxide (MIO)*/Zinc-rich, single component, moisture-cure aromatic polyurethane
Volume Solids: 60% minimum
Pigment Type: Minimum 65% zinc dust in dry film and 420 gm/litre of MIO
Wet Density: Minimum 2.5 kg/litre

2.2 Primer

Generic Type: Zinc-rich, single component, moisture-cure aromatic polyurethane
Volume Solids: 60% minimum
Pigment Type: Minimum 83% zinc dust in dry film
Wet Density: Minimum 2.7 kg/litre

2.3 Tie Coat

Generic Type: MIO pigmented, single component, moisture-cure aromatic polyurethane
Volume Solids: 60% minimum
Pigment Type: 470 gm/litre MIO*
Wet Density: Minimum 2.0 kg/litre

2.4 Intermediate Coat

Generic Type: MIO* pigmented, single component, moisture-cure aromatic polyurethane
Volume Solids: 60% minimum
Pigment Type: 720 gm/litre MIO*
Wet Density: Minimum 1.5 kg/litre

2.5 Matt Topcoat

Generic Type: MIO pigmented, single component, moisture-cure aliphatic polyurethane
Volume Solids: 51% minimum
Pigment Type: 420 gm/litre MIO*
Finish: Matt
Colour: To be specified by the Engineer
Wet Density: Minimum 1.4 kg/litre

2.6 Semi-gloss Topcoat

Generic Type: Single component, moisture-cure aliphatic polyurethane
Volume Solids: 51% minimum
Finish: Semi-gloss
Colour: To be specified by the Engineer
Wet Density: Minimum 1.2 kg/litre

* Micaceous Iron Oxide pigment shall conform to ASTM D5532, Type 1, at 80% minimum lamellarity and 85% minimum Fe_2O_3 content.

3. PERFORMANCE PROPERTIES

The three coat system of primer/intermediate or tie coat/finish coat, each of 75 microns, shall meet or exceed the following test requirements:

3.1 Corrosion Resistance

The paint system when applied to cold rolled steel panels with a minimum thickness of 3 mm and having Class 2½ (Near White) abrasive blast with 50 - 75 microns angular surface profile, must pass 5000 hours minimum exposure time in a Salt Spray Test to ASTM B 117, with less than 2 mm creep from scribe.

3.2 Accelerated Weathering

The paint system must pass 4000 hours exposure to a QUV B bulb to ASTM G53 with no chalking, no cracking, and no gloss loss greater than 20 percent.

3.3 Forward impact

The paint system must pass minimum 68kg impact when tested to ASTM D2794.

3.4 Abrasion Resistance

The paint system must have less than 90 mg loss on CS-17 wheel, 1000 gm/load,

after 1000 cycles testing to ASTM D4060.

3.5 Moisture Resistance

The paint system must pass 1000 hours with no change in appearance when tested to ASTM D4548.

3.6 Flexibility

The paint system must pass a 12 mm conical mandrel bend test to ASTM D522 with no cracking.

3.7 Adhesion

The paint system must have a minimum tensile strength of 3.5 MPa when tested to ASTM D4541.

4. INFORMATION TO BE SUBMITTED

4.1 The proposed MCU paint system shall be based on standard, regularly produced product of a single manufacturer, which shall be submitted to the Engineer for approval together with the manufacturer's relevant published literature that states generic type, instructions for use, volume solids, application rates, environmental considerations and chemical description of solvents, resins and pigments. This literature also shall include a reference list of equivalent structural projects where the paint systems were used and the contractor who applied them (with contact details).

4.2 The proposed paint system must have a minimum of two years' field exposure on similar structures. Details must be submitted to and accepted by the Engineer at least 7 days prior to tender closing date. Within 28 days of acceptance and/or 7 days prior to application of coating, the Contractor shall supply certificated test results from an approved third party test laboratory that verify that the paint system and components meet the specified physical and performance properties.

4.3 The above information need not be submitted for products that have been pre-approved by the Engineer on the basis of independent testing and approval by other highway authorities.

NOTE: MCU systems are widely used in the USA and many state departments of transportation maintain qualified product lists. This generic specification is based on the formulation of a proprietary MCU coating system that has met the Northeast Protective Coatings Committee (NEPCOAT) acceptance criteria for bridge painting.

APPENDIX 5

APPENDIX 5
SELECTION AND SPECIFICATION OF COATING SYSTEMS

Selection of the most suitable and cost effective coating system depends on:

a) The amount of pitting of the steelwork found once abrasive blasting has been completed;

b) The proximity of the structure to the coast and windborne salts;

c) Whether encapsulation, a spot repair, or total replacement is required;

d) The generic type and adhesion of the existing coating to be overcoated;

e) The required time until next maintenance;

f) Aesthetic requirements (e.g. colour, gloss levels, anti-graffiti resistance);

h) The prevailing weather conditions (e.g. temperature and humidity);

I) The time available for repainting (e.g. rapid cure system);

j) The presence of crevices (e.g. from rivetted or bolted joints); and

k) The degree of surface preparation (e.g. if abrasive blasting is not used).

The Engineer should insert a detailed specification for the paint system to be used on the work into the main specification. This should be in a generic format to allow competitive tendering of different brands that can be shown to comply with the material specification. As a general rule, the better the standard of surface preparation, the longer the coating system will perform. However the higher standard of preparation may increase the quantity of hazardous material to be contained and disposed of. It is recommended that for major works, a detailed job specific coating specification be prepared by a reputable coating manufacturer or independent coating consultant after an assessment has been made of the existing coating condition (refer Appendix B of AS 4361.1).

Typical systems used for the maintenance painting of highway structures are summarised in the following Table and may be specified where appropriate for minor works, as discussed below. In some situations it may be desirable to invite tenders for more than one of the following outline specifications to obtain comparative prices. Note that *NCHRP Synthesis 251: Lead-Based Paint Removal for Steel Highway Bridges* reported in 1997 that US roading authorities "had a strong preference for MCU systems".

Outline Coating System Specifications

No.1 Power tool clean rusted areas to St2 and prime with a zinc phosphate alkyd applied by brush to give a minimum dry film thickness (DFT) of 50μm. Apply one spot coat and one full finish coat of micaceous iron oxide (MIO) pigmented alkyd enamel to give a minimum total dry film thickness (TDFT) of 150μm.

No.2 Power tool clean rusted areas to St2 and prime with a 100% solids low viscosity epoxy penetrating sealer applied by brush to give a minimum DFT of 25μm, Apply one full finish coat of MIO pigmented epoxy mastic to give a minimum TDFT of 150μm.

No.3 Power tool clean rusted areas to St2 and prime with an aluminium pigmented aromatic moisture cured urethane (MCU) penetrating sealer applied by brush to give a minimum DFT of 50μm, Apply one full finish coat of MIO pigmented aliphatic MCU to give a minimum TDFT of 100μm

The above three spot repair systems may be suitable to extend the life of an existing lead-based system (5 -10 years) in a moderate environment where the structure is to be replaced or existing coating system is to be fully removed in the future. They may also be suitable for use in mild environments as encapsulation systems with water washing as the only preparation (i.e. no hazardous waste material generated).

No.4 Clean rusted areas by wet slurry blasting or hyperbaric waterblasting to Sa2 and prime with 50μm of brush applied zinc phosphate pigmented epoxy. Spot paint with 125μm of MIO epoxy mastic and apply a 50μm tie coat of epoxy mastic to remaining surfaces. Apply a 100μm finish coat of MIO pigmented epoxy.

No.5 Clean rusted areas by wet slurry blasting or hyperbaric waterblasting to Sa2 and prime with 50μm of brush applied zinc/MIO pigmented MCU. Spot paint with 75μm of MIO MCU and apply a 50μm tie coat of MIO aromatic MCU to remaining surfaces. Apply a 50μm finish coat of MIO aliphatic MCU.

Systems 4 & 5 may be suitable to extend the life of a generally sound existing lead-based coating system in a moderate environment and where full removal is not warranted. Systems 2, 4 & 10 should be confirmed as suitable by applying a test patch 12 months prior to repainting and check for possible delamination.

No.6 Remove all previous coating by abrasive blasting to Sa2½. Prime with 75μm of zinc rich epoxy and apply a 125μm build coat of MIO pigmented epoxy mastic (or high build epoxy). Apply a 100μm finish coat MIO high build epoxy.

No.7 Remove all previous coating by abrasive blasting to Sa2½. Prime with 75μm of zinc rich MCU and apply a 75μm build coat of MIO pigmented aromatic MCU. Apply a 75μm finish coat of MIO aliphatic MCU.

No.8 Remove all previous coating by abrasive blasting to Sa3. Apply a single 125μm coat of inorganic zinc silicate (Type 4 or Type 6 to AS/NZS 3750.15).

Systems 6, 7 & 8 may be suitable for use in moderate environments where full removal and replacement of the existing lead-based system is required.

No.9 Power tool clean rusted areas to St2 and prime with 75μm of brush applied zinc/MIO pigmented MCU. Spot paint with 75μm of MIO MCU and apply a 50μm tie coat of MIO aromatic MCU to remaining surfaces. Apply a 75μm finish coat of MIO aliphatic MCU.

No.10 Clean rusted areas by wet slurry blasting or hyperbaric waterblasting to Sa2 and prime with 75μm of brush applied zinc phosphate pigmented epoxy. Spot paint with 125μm of MIO epoxy mastic and apply a 50μm tie coat of epoxy mastic to remaining surfaces. Apply a 125μm finish coat of MIO pigmented epoxy.

No.11 Clean rusted areas by wet slurry blasting or hyperbaric waterblasting to Sa2 and prime with 75μm of brush applied zinc/MIO pigmented MCU. Spot paint with 75μm of MIO MCU and apply a 50μm tie coat of MIO aromatic MCU to remaining surfaces. Apply a 75μm finish coat of MIO aliphatic MCU.

Systems 9, 10 & 11 may be suitable to extend the life of a generally sound existing lead-based coating system where full removal is not warranted. System 10 should be confirmed as suitable by applying a test patch 12 months prior to repainting.

No.12 Remove all previous coating by abrasive blasting to Sa2½. Prime with 75μm of zinc rich epoxy and apply a 175μm build coat of MIO pigmented epoxy mastic (or high build epoxy). Apply a 150μm finish coat MIO high build epoxy.

No.13 Remove all previous coating by abrasive blasting to Sa2½. Prime with 75μm of zinc rich MCU. Apply a full 75μm intermediate coat of MIO aromatic MCU and a 75μm finish coat of MIO aliphatic MCU.

No.14 Remove all previous coating by abrasive blasting to Sa2½. Prime with 75μm of inorganic zinc silicate. Apply a full 150μm intermediate coat and 150μm finish coat of MIO high build epoxy.

No.15 Remove all previous coating by abrasive blasting to Sa3. Apply a single

150µm coat of inorganic zinc silicate (Type 6 to AS/NZS 3750.15).

Systems 12, 13, 14 & 15 may be suitable for use in marine environments where full removal and replacement of the existing lead-based system is required.

Additional Notes

In severe marine environments, systems 12 13, or 14 may be used but apply an additional intermediate coat to all surfaces sheltered from rain washing. On other surfaces apply an additional intermediate coat to all edges, welds, fasteners and downward facing surfaces.

Where a colour finish and/or graffiti resistance is required, the MIO HBE finish coat in systems 4, 6, 10,12, & 14 should be replaced with a 75µm coat of catalysed two-pack polyurethane conforming to AS/NZS 3750.6. MCU is available in a range of colours, in flat with MIO or semi-gloss without MIO.

Systems 8, 14 & 15 should only be used where steel is in good condition (i.e. not badly pitted and on relatively smooth large sections (e.g. large I-beams and not rivetted or bolted plates, or lattice steelwork). A system of arc-sprayed zinc metal that has been sealed, could also be considered for these members where very long life is required and a suitable base profile can be achieved.

Surface preparation cleanliness standards are in terms of the widely known Swedish Standard SIS 05 5900 (which has been incorporated into ISO 8501-1 and NZS/AS 1627.9). Sa2½ is an abrasive cleaned surface which is the same as Class 2½ to NZS/AS 1627.4 and is similar to SSPC SP10. Sa2 = Class 2 = SP6, and Sa3 = Class 3 = SP5. St2 is a tool cleaned surface equivalent to Class 2 in AS/NZS 1627.7. Note that it is important not to burnish the surface when power wire brushing as this will reduce adhesion of the primer.

The job specification should include maximum as well as minimum DFT's permitted for each coat in the system. (This is particularly important when overcoating with epoxy material.) Also check that the blast profile specified in clause 5.2.4 is appropriate.

Bibliography

For further information refer to the following;

- AS/NZS 2312:1994 *Guide to the protection of iron and steel against exterior atmospheric corrosion* (under revision).
- *Guide for Painting Steel Structures*, published by AASHTO (1997).
- NCHRP Synthesis 251: *Lead-Based Paint Removal for Steel Highway Bridge.s*
- *Industrial Lead Paint Removal Handbook* (2nd Edition) by K A Trimber (SSPC 93-02).
- *Steel Structures Painting Manual*, Volume 2, published by SSPC (1995).

TABLE OF PAINT MAINTENANCE SYSTEMS

Ref No.	Life	Environment	Prep. Std.	Primer Coat	DFT µm	Build/Tie Coat	DFT µm	Finish Coat	DFT µm	TDFT µm
1	Short	Moderate	St2	ZPA	50	MIOA	50	MIOA	50	150
2			St2	EPS	25	-		MIO EM	125	150
3			St2	Al MCU	50	-		MIO-MCU	50	100
4	Medium		Sa2	ZPE	50	MIOEM	125	MIO HBE	100	275
5			Sa2	Zn/MIO MCU	50	MIO MCU	75	MCU	50	175
6	Long		Sa2½	ZnE	75	MIOEM	125	MIO HBE	100	300
7			Sa2½	Zn MCU	75	MIO MCU	75	MIO MCU	75	225
8			Sa3	IOZ	125	-		-		125
9	Medium	Marine	St2	Zn/MIO MCU	75	MIO MCU	75	MIO MCU	75	225
10			Sa2	ZPE	75	MIO EM	125	MIO HBE	125	325
11			Sa2	Zn/MIO MCU	75	MIO MCU	75	MIO MCU	75	225
12	Long		Sa2½	ZnE	75	MIO EM	175	MIO HBE	150	400
13			Sa2½	Zn MCU	75	MIO MCU	75	MIO MCU	75	225
14			Sa2½	IOZ	75	MIO HBE	150	MIO HBE	150	375
15			Sa3	IOZ-HR	150	-		-		150

EM = Epoxy mastic EPS = Epoxy penetrating sealer HBE = High build epoxy IOZ = Inorganic Zinc Silicate
IOZ-HR = 'High-ratio' IOZ MIO = Micaceous iron oxide MCU = Moisture cured urethane
ZnE = Zinc epoxy ZPA = Zinc phosphate alkyd ZPE = Zinc phosphate epoxy

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APPENDIX 6

APPENDIX 6
CONTAINMENT REQUIREMENTS

1. General

The containment design shall be such that all dust and debris generated during the Contract is sufficiently contained to meet, at all times, the conditions given in the Resource Consent and this Specification. The design of scaffolding and work platforms shall be such that the floor area is sealed to prevent uncontrolled leakage of washing water and/or dust and debris. (Guidance on the design of containment and ventilation systems is given in Appendix E of AS 4361.1.)

2. Structural Integrity

The containment shall be designed to NZS 4203, taking into consideration such factors as limiting wind loading and structural loads on the bridge. Design limitations may be obtained on request from the Engineer.

3. Containment Material

Unless otherwise agreed, the containment material used shall be reinforced clear plastic such as Monarflex®, and where required to meet the specified emission category, shall be fully sealed at all joints.

4. Drainage

Where bridge drains are located within the containment, temporary drainage pipe or hose must be used to direct water away from the work area.

5. Containment Entry and Ventilation

Where a fully sealed containment method is required, the contained area shall be fitted with an airlock entryway. This shall consist of an inner area equipped with vacuum equipment (HEPA filters) for cleaning of personnel's clothing prior to exit from containment.

The entryway shall be fitted with internal and external doors that cannot be opened at the same time by a single person.

The ventilation system shall ensure that the all following criteria are met:

a) The containment shall be provided with a mechanical dust collection system to collect and remove airborne dust and debris generated during the paint removal process;

b) The ventilation system shall provide an average air movement of greater than 0.5 m/sec. in the area immediately surrounding operators within the containment;

c) The dust collector shall be greater than 95 percent efficient for particles of 0.3 micrometre in diameter; and

d) The ventilation system shall provide sufficient air movement to provide a continuous concave shape to unsupported containment material.

7. Compliance with Statutory Requirements

This appendix provides requirements for containment design considered to be essential to the successful control of contamination resulting from this work. The Contractor must ensure that the design and operation of the containment system complies with all OSH requirements and any other relevant statutory requirements.