DEPARTMENT *of* INFRASTRUCTURE, ENERGY *and* RESOURCES, TASMANIA
BRIDGEWORKS SPECIFICATION
B24 - STRUCTURAL PROTECTIVE COATINGS OCTOBER 2006

Contents

This Specification now incorporates the requirements of Specifications MB22, MB23, MB25 and B24.

B24.1 SCOPE

This Specification sets out the requirements for the preparation for and application of protective coatings to bridge structures in accordance with this Specification and the Drawings. It includes the requirements for protection of steel, concrete and timber elements with provisions for skid resistant coatings and for the removal of lead or chromium paint systems.

For the removal of lead or chromium paint systems this Specification shall be read together with Australian Standard 4361.1 Guide to Lead Paint Management - Part 1: Industrial Applications, Worksafe Australia National Standard for the Control of Inorganic Lead at Work (NOHSC:1012) and Worksafe Australia National Code of Practice for the Control and Safe Use of Inorganic Lead at Work (NOHSC:2015).

B24.2 REFERENCES

The following standards apply to this Specification

AS 1580.408	Paints and related materials - Adhesion tests
AS 1627	Metal finishing - Preparation and pretreatment of surfaces
AS 2312	Guide to the protection of steel structures
AS 3894	Site testing of protective coatings
AS 4361	Guide to Lead Paint Management - Part 1: Industrial Applications
AS 4680	Hot dip galvanised (zinc) coatings
NOHSC:1012	National Standard for the Control of Inorganic Lead at Work
NOHSC:2015	National Code of Practice for the Control and Safe Use of Inorganic Lead at Work
APAS	various specifications

B24.3 RESPONSIBLE PERSON

On sites identified as containing lead or chromium the Principal will employ a Responsible Person (as defined in the Australian Standard) to ensure compliance with the environmental and health and safety aspects of the Contract. The Responsible Person will be qualified as a lead competent person from a course recognised by the Paint Contractors Certification Program. The Responsible Person will be on site whenever lead paint is being removed or the containment is being dismantled on a lead site.

B24.4 SITE MANAGEMENT

All sites shall be managed such that no contamination of the site results from the works.

Where the site has been identified as containing lead or chromium paint systems the site shall be sampled and tested prior to the commencement of works and the levels of lead contamination of the ground and background air lead levels shall be provided to the Contractor as they are received by the Principal.

B24.4.1 Air Monitoring

Air monitoring for TSP Lead shall be carried out in accordance with provisions of Appendix F of the Australian Standard. At least one high volume air sampler shall be run at each site during lead removal operations.

Visual monitoring of fugitive emissions to Level 1 of AS 4361.1 Appendix F shall be carried out and the nature and duration of all emissions recorded.

B24.4.2 Ground Clean Up

Ground clean up procedures shall include the collection, stabilisation and disposal of contaminated soil. A minimum depth of soil of 10 mm shall be removed to ensure the lead contamination is removed from the site.

The site shall be retested following clean up to ensure that contamination has been removed and residual lead levels are acceptable. If contamination is still present then the clean up procedure shall be repeated.

B24.4.3 Water Pollution

Work shall be suspended if spills or emissions are observed entering into the river or waterway. All wash down water that is contaminated by lead shall be collected, filtered, tested and disposed of to the satisfaction of the receiving authority.

B24.5 MATERIALS

B24.5.1 General

All structural steelwork-coating materials shall comply with the requirements of AS 2312 and shall be approved by the Australian Paint Approvals Scheme under Specification APAS 2900 for atmospheric exposures. Where members are subject to immersion in freshwater, approvals shall be to APAS 29XXF and for immersion in salt water to APAS 29XXS. Fence coating materials shall also be approved by the Australian Paint Approvals Scheme. For particular elements, all materials shall be from the same manufacturer and be fully compatible with each other. All coatings of a particular type for a particular structure shall be from the same batch.

Details of all coating systems, including manufacturer and brand names, to be used shall be included with the tender.

B24.5.2 Structural Steelwork Atmospheric exposure - New

The coating system to be used shall comprise:

(a) a coating of ethyl zinc silicate complying with Australian Paint Approval Scheme Specifications APAS 2908. The mean dry film thickness of the coating applied to the surface shall be not less than 75 µm. The maximum allowable spot dry film thickness of coating shall be 125 µm.

or

(b) a coating of alkali zinc silicate complying with Australian Paint Approval Scheme Specifications APAS 2908. The mean dry film thickness of the primer coating applied to the surface shall be not less than 120 µm applied in two passes.

The surface preparation and application of the coating system shall be carried out before delivery of the girder units and other bridge components to the site.

B24.5.3 Structural Steelwork Atmospheric exposure - Maintenance ♦

The coating system to be used for maintenance painting of structural elements, including beams, diaphragms, bracing and columns shall comprise:

(a) a zinc rich epoxy primer, complying with Australian Paint Approval Scheme Specifications APAS 2916 for blast prepared surfaces, of mean dry film thickness 75 microns followed by two coats of micaceous iron oxide epoxy paint over the full area of steelwork to a total mean dry film thickness of 125 microns per coat. The finish coat is to be AS N35 Light Grey, unless otherwise specified, with the first coat colour Natural Grey and second coat colour Mid Grey

For structures within 1km of salt water an additional 125 micron mid coat of micaceous iron oxide epoxy paint shall be applied.

or

(b) a high performance cold galvanising coating with a minimum 180 micron dry film. This coating shall contain at least 96% zinc in the dry film and be recoatable. Zinga is approved for this purpose. Zinga shall be mist sprayed with potable water once it has flash dried. If class 2.5 preparation has not been achieved Resene 167 pre-prime shall be used to stabilise any rust and shall be over coated with Zinga.

B24.5.4 Structural Steelwork - Immersed exposure

The coating system to be used for structural elements subject to immersion shall be:

(a) a high solids epoxy mastic coating using one or two coats as necessary, to a mean dry film thickness of 300 microns and two coats of micaceous iron oxide epoxy paint over the full area of steelwork to a mean dry film thickness of 125 microns per coat

or;

(b) a high build flake filled polyester coating to a mean dry film thickness of 1000 microns

The colour of the topcoat shall be light grey or white unless otherwise specified.

B24.5.5 Steel Fences

New fence components may be hot dip galvanised. If the specification requires new galvanising to be coated it shall be degreased prior to a brush blast to establish a profile followed by the maintenance paint coatings.

The maintenance coating system to be used for fences shall comprise the following system formulated to suit application by brush and roller:

(a) a zinc rich epoxy primer complying with Australian Paint Approval Scheme Specifications APAS 2916 for blast prepared surfaces and patch repair of damaged galvanising of mean dry film thickness 75 microns. If galvanising is >75 microns then no primer is required.

(b) a base coat over the full area to be coated of a high build epoxy mastic complying with Australian Paint Approval Scheme Specifications APAS 2973 to a mean dry film thickness of 150 microns. Each application shall be of a contrasting shade.

(c) a white top coat of polyurethane which conforms with Australian Paint Approval Scheme Specification APAS 2911 of mean dry film thickness 50 microns. Polyurethane coatings shall not be applied by spray methods.

B24.5.6 Bearings and Beam Seats ♦

Beam seating plates, sole and masonry plates, and steel bearings shall be coated with Zinga. This coating to be applied to a mean dry film thickness of 180 microns. Areas that can not be satisfactorily prepared shall be stabilised with Resene 167 pre-prime and over coated with Zinga.

B24.5.7 Timber Fences

Sawn timber shall be sanded to a smooth finish and painted with one coat of a wood primer, and two coats of heavily pigmented low gloss white latex ranch finish for exterior timber. The paints shall conform to Australian Paint Approval Scheme Specifications APAS 0183 and APAS 0280/5. The Manufacturer's instructions in regard to preparation for painting and the interval between coats shall be complied with.

B24.5.8 Concrete Fences

Where specified concrete kerbs and fences shall be cleaned with high pressure potable water and painted with two coats of white gloss exterior latex paint which conforms with Australian Paint Approval Scheme Specifications APAS 0280/1.

When penetrating sealers or carbonation coatings are required they shall be applied in accordance with the requirements of Specification B23.

B24.5.9 Skid Resistant Aggregate

Aggregate shall be 16-30 mesh silica. or aluminium oxide (bauxite)

B24.5.10 Skid Resistant Coating for Timber Decks (Foot Bridges only)

The skid resistant coating system for timber bridge decks shall comprise either:

Two coats of an epoxy based coating, containing a skid resistant aggregate, applied over a suitable primer and/or undercoat.

Or a methyl methacrylate based coating with aggregate applied in accordance with the manufacturers instructions.

B24.5.11 Skid Resistant Coating for Steel Decks

The skid resistant coating system for steel bridge decks shall comprise:

(a) for pedestrian traffic surfaces a methyl methacrylate based coating with aggregate applied in accordance with the manufacturers instructions.

(b) for vehicular traffic surfaces a base coat over the full area to be coated of a high build epoxy mastic of 150 microns with skid resistant aggregate broadcast on before the coating skins. or

(c) for vehicular traffic surfaces a methyl methacrylate coating with aggregate applied in accordance with the manufacturers instructions.

B24.6 CONTAINMENT

B24.6.1 Level of Containment

On all structures, unless otherwise specified, the Contractor shall provide a Level 1B containment for the surface preparation area. Impermeable containment materials with sealed joints and air handling using a simple dust sock, or equivalent, to prevent site contamination shall be provided.

On lead and chromium contaminated bridges the Contractor shall provide a Level 1A containment for the surface preparation area. Full air handling and dust filtration shall be provided

The containment shall be designed in accordance with Appendix E of the Australian Standard and shall:

- not compromise the integrity of the structure due to excessive dead or live loads or the method of attachment of the containment to the structure,
- have engineered air inlets to provide for sufficient and uniform air flow within the containment to maintain adequate working visibility and worker safety;
- have adequate light levels ie greater than 500 lux.
- Provide a safe workplace for workers.

B24.6.2 Regulated Area

Where the site has been identified as containing lead or chromium paint systems the Contractor shall establish a regulated area in accordance with Appendix F of the Australian Standard. The exposure standard for the regulated area shall be 30 µg/m^3 on an 8 hour time weighted average.

B24.6.3 Containment Decontamination

The containment shall be decontaminated prior to its relocation to prevent accidental discharge of dust and minimise risk to workers.

B24.6.4 Air Handling

Air evacuated from the containment area shall be filtered so that the air discharged to atmosphere contains less than 150 µg/m^3 of lead particles.

B24.7 PREPARATION

B24.7.1 General ♦

Where possible, surfaces being prepared and coated shall be protected from the weather.

Preparation shall commence with all dirt and debris being removed from decks, concrete surfaces, beam seats, bearings and structures in accordance with Specification R54.

All surface defects including cracks, laminations, deep pitting, weld spatter, slag, burrs, fins and sharp edges shall be removed. All sharp edges on flanges, braces and all steelwork, where not already rounded, shall be ground to a minimum radius of 2mm.

All surfaces to be coated shall be free of all oil and grease and such contamination shall be cleaned by solvent washing in accordance with AS 1627 Part 1 or degreasing in the case of galvanised surfaces. Any solvent or degreasing agent shall be approved by the coating manufacturer.

Soluble salts and contaminants shall be removed from all surfaces to be coated prior to blasting by high pressure potable water cleaning at 20 to 28 MPa (3,000 to 4,000 psi) minimum. Washing shall continue until the surfaces are free of soluble salts. If the protective coating is sound spot preparation of damaged areas shall precede the application of build and / or top coats.

Unsound surfaces, or where specified, shall then be abrasive blasted to establish a surface profile of at least 40 microns and to remove rust spots and all previous coatings. The surfaces shall be washed again, as above, to remove salts from pits which were under rust spots. Salt testing shall be repeated at this stage.

Abrasive blast cleaning shall be used to prepare areas where the paint film is unsound, loose or flaking or where surface corrosion is present. The soundness of coatings shall be determined in accordance with AS 1580 408.2 method B or approved equivalent method.

The edges of existing firmly bound coatings are to be abraded and feathered back by sanding. Fine powder remaining after the sanding shall be dusted off.

Where extensive flaking and loss of paint film has occurred on galvanised fences, all of the existing coating shall be removed.

Adjacent surfaces shall be masked so that they are not affected by overblast or over spray.

B24.7.2 Bearings and Beam Seats

Sliding surfaces, including teflon, stainless steel, and elastomers shall be masked before preparation and painting so that there is no ingress of dust, dirt, blast material or paint.

B24.7.3 Timber Surfaces for skid resistant surfacing

Timber surfaces shall be sanded to a flat coarse finish.

B24.8 BLAST CLEANING ♦

Cleaning shall be carried out in accordance with this Specification, AS 1627, Parts 4 and 9 and all relevant regulations.

Dry blasting shall be adopted, using clean, dry garnet or staurolite free of organic matter and less than 25ppm chloride contamination or steel grit. All blast material shall be clearly identified with a batch number for which a test certificate shall be provided.

The minimum surface preparation of all structural steel work surfaces, from which all coatings have been removed, shall be as1627.4 Class 2.5 (recognising that some standards no longer list this class) having a profile height of 40 to 70 microns.

Abrasive blast preparation to not less than Class 2.0 shall be used for ungalvanised fences.

Bare galvanised surfaces shall be whip or brush abrasive blasted to establish a surface profile of at least 30 microns using a fine grade garnet without damaging the galvanised surface.

B24.9 WASTE HANDLING

B24.9.1 Waste Collection

Spent blast media shall be recovered at least at the end of each days operation and stored in sealed bags or bins prior to removal from the site and disposal in accordance with the relevant Acts and Regulations.

The floor of the containment area shall be designed for the easy collection of blast and paint debris and water, if present. Vacuum or mechanical methods shall be used for all cleaning and debris collection within the containment. Use of compressed air or dry sweeping will not be permitted to clean down the bridge steelwork or for debris collection within the containment unless the ventilation system is operating and final cleaning is achieved by vacuuming.

B24.9.2 Abrasive Recycling

If a recyclable abrasive is used the Contractor shall propose the system he intends to use to achieve separation of spent abrasive material from the paint debris. Measures shall be taken to avoid release of dust during the separation process and worker protection shall be provided for workers handling the spent abrasive to avoid the ingestion, or inhalation, of dust and / or lead particles.

B24.9.3 Waste Documentation

Full documentation shall be maintained to record the source of waste in contaminated waste containers. All waste from contaminated sites shall be assumed to be contaminated until testing proves it otherwise. The documentation shall include details of transport to an approved site for the waste disposal or stabilisation and disposal. The documentation will be subject to audit.

B24.9.4 Waste Storage

Waste shall be stored in a secured area that shall not be subject to flooding.

Debris containers shall be labelled as follows:

DANGER - LEAD CONTAMINATED MATERIALS

Debris shall be handled in accordance with procedures outlined in Appendix J of the Australian Standard.

B24.10 CLEANING AFTER BLASTING

Before applying the protective coating, all surfaces shall be cleaned free of any traces of blast product by brushing with clean brushes or vacuumed clean.

If contaminants remain, the affected area shall be degreased or high pressure washed and reblasted in accordance with this Specification.

B24.11 APPLICATION OF COATINGS ♦

Application of coatings shall only take place when atmospheric and steel temperatures and humidity are in accordance with the coating manufacturer's Technical Data Sheet requirements.

Coatings for structural steelwork shall be applied by spray, unless otherwise approved or required by this Specification, in strict accordance with the manufacturer's instructions and Technical Data sheets. Level 3B containment may need to be retained in place to prevent overspray effects on the structure surroundings.

For bridge fences, coatings shall be applied by brush or roller using as many coats as required to achieve the specified film thickness, unless a Level 3B containment is provided for the work area to fully manage overspray.

The joint between the beam and the concrete deck shall be stripe coated with Resene 167 pre-prime after preparation and before application of the primer.

All welds and bolts and bare steel edges all shall be brushed with a primer stripe coat prior to the application of the first coat of primer. A stripe coat shall be applied to all edges, welds and bolts prior to the application of each subsequent coat.

The first coat shall be applied within a period of time that does not allow flash rusting or contamination to occur on the prepared surface and on the same day that the steel is blasted. Subsequent coats shall be applied within a period of time which does not permit contaminants to be deposited on the surface of the previous coating, after the required curing time for underlying coats and according to the time limits specified by the manufacturer. Where rusting or surface contamination occurs, or time limits are not met, surfaces so affected shall be reprepared in accordance with this Specification.

The resultant coating film thickness shall be free of runs, sags and curtains and shall present a uniform finish.

Application of Skid resistant coatings shall be by brush or roller only. Aggregate shall be applied by broadcasting prior to the coating forming a skin.

B24.12 GALVANISED COATING

(i) General

Expansion joint steelwork, bridge railing and posts, duct covers and angles, gully grates, kerb supports, side entry collectors and bolts shall be galvanised except for holding down bolt assembly plates.

All components shall be carefully inspected for likelihood of distortion during the galvanising process, particularly any "sealed" or "boxed-in" sections, which, through air-expansion, would buckle, swell or otherwise distort. Such section shall be drilled through (12 mm dia.), at suitable locations to permit the escape of expanding gases, and the free drainage of molten zinc and pre-treatment fluids.

(ii) Preparation

Rust, scale, paint, oil, grease and other surface contaminants, shall be removed from the steelwork, by degreasing and acid-pickling, in strict accordance with the requirements of AS 4680. Prior removal of burrs, rust and scale, by scabbling, dipping, brushing or grinding, will be required.

(iii) Galvanising

The steelwork shall be galvanised in strict accordance with the requirements of AS 4680.

The thickness of the galvanised coating applied in the process shall be not less than 85 µm or the equivalent mass of 600 g/m^2.

After the galvanising process is complete, the work shall be inspected for imperfections, including grey-coating, drip pimples, lumps, bare spots and deformation, and be tested for coat thickness.

If the galvanising does not conform to this Specification the Contractor shall be responsible for re-preparation and re-galvanising.

(iv) Repair of Damage to Galvanised Coating ♦

Where mechanical damage has occurred due to impact, etc., the affected area shall be carefully filed or ground smooth, and any rust formation removed. Areas damaged by welding shall have all traces of weld spatter and slag removed by scraping or chipping, and shall then be abrasive blast cleaned to a standard of not less than class 2 of AS 1627 Part 4.

Within four hours of completion of preparation, the affected area shall be coated with Zinga to 180 µm dry film.

B24.13 STEEL SURFACES NOMINATED FOR SPECIAL TREATMENT

For new structural steel the following areas shall not be intermediate or top coated but shall be abrasive blast cleaned and primer coated. Care shall be taken to ensure that the area designated is masked to prevent any intermediate or top coating contaminating these surfaces.

(i) The prepared ends for the field butt welds

(ii) The surfaces of all bearing plates in direct contact with elastomeric bearings

(iii) The top surface of the top flanges, except for 25 mm edge strips

(iv) Stud shear connectors

(v) That part of the diaphragms that are in bolted contact with the stiffeners

(vi) That part of the stiffeners that are in contact with the diaphragms.

The external elevation face of the exterior girders shall receive an additional topcoat following the completion of deck construction. It shall be applied to a mean dry film thickness of 50 µm.

Prior to the application of this coat the surfaces shall be cleaned by high pressure water wash to remove any traces of salt, dust, oil, dirt, spilt concrete etc. and other exposed surfaces shall be masked to prevent all overspray contamination. In the case of an overpass crossing a trafficked road the vehicular traffic using the road under the structure shall be managed, and care taken, to prevent overspray contamination of vehicles. Brush and roller application of the coating may be required to avoid overspray problems.

B24.14 COATING THICKNESS MEASUREMENT

Dry film thicknesses specified in this Specification assume that the readings taken are those read using a magnetic induction dry film thickness gauge calibrated without a correction for the depth of profile.

The mean resultant coating film thickness shall be determined in accordance with AS 3894.3.

The mean coating thickness for a structural element surface shall be within the range of 90% and 150% of the specified mean film thickness for each coating type and for the total protective coating. This mean shall be the average of at least five point readings for each $10m^2$.

No single point reading in any 10 m^2 shall be less than 80% of the specified mean coating thickness. A point reading may be the average of three closely spaced readings the lowest of which may be less than 80% of the specified mean coating thickness.

B24.15 WORKER HEALTH AND SAFETY

The Contractor shall ensure that the conditions and procedures as specified in Worksafe Australia's National Standards (NOHSC:1012 and NOHSC:2015) are maintained on the site to minimise worker exposure to lead contamination.

A decontamination unit shall be in place at every site for the duration of lead or chromium removal processes.

B24.15.1 Biological Monitoring

The Contractor shall provide for biological monitoring of all employees to work on the lead removal site and the monitoring shall be commenced before the employee enters the restricted area.

Biological monitoring shall be carried out at intervals no greater than two months for employees working in the lead containment enclosure unless more frequently required by the NOHSC Code of Practice.

B24.16 CONTRACT MANAGEMENT PLAN

The Contract Management Plan shall include:

- Details of any blast media recycling.
- Site set out plans for the regulated area.
- Details of the scaffold and containment design.
- Proposed methods of debris and contaminated material handling.
- Details of the proposed ventilation methods , equipment and filter efficiency.
- Details of the proposed Control Measures Program to limit worker exposure to lead in air.
- Details of proposed Worker Safety provisions including monitoring, training, medical surveillance and the nominated authorised medical practitioner.
- Details of Medical Removal and return procedures.
- Details of respiratory protection for workers inside the regulated area.
- Details of respiratory protection and clean air supply for workers in the containment enclosure.
- Details of protective clothing and equipment.
- Details of decontamination procedures for workers.
- Details of proposed contaminated waste transport, stabilisation, disposal methods and receiving Disposal Authority.
- Environmental Management Plan
- Safety Management Plan in a form approved by the Workplace Safety Division.
- Traffic Management Plan details.
- Other Quality Plan requirements

For lead or chromium contaminated sites a copy of the Contract Management Plan shall be submitted to DPIWE Environmental Division and DIER Workplace Safety Division as well as to the Superintendent.

B24.17 WASTE STABILISATION AND DISPOSAL

Waste from lead and chromium sites shall be handled and disposed of in accordance with procedures outlined in Appendix J of the Australian Standard.

The Contractor and Principal shall jointly sample containers of contaminated waste so that it may be tested to determine the level of contamination and process required for stabilisation and disposal.

Alternative methods of stabilisation and disposal will be considered subject to confirmation that the lead has been rendered non hazardous in perpetuity and that the waste will be accepted by the receiving Disposal Authority without future recourse to the Department of Infrastructure, Energy & Resources.

B24.18 EQUIPMENT CLEANUP

The Contractor shall thoroughly vacuum, wash or otherwise decontaminate all items and equipment prior to removal from the project site. If adequate cleaning is not possible the materials shall be treated as contaminated waste and disposed of accordingly.

B24.19 EVIDENCE OF COMPLIANCE

The Contractor shall provide records of works completed including:

- Australian Standard 3894.10 Daily Inspection Report forms.
- Australian Standard 3894.11 Daily Equipment Report forms.
- Australian Standard 3894.12 Daily Coating Inspection Report forms.
- Contractor's own coating thickness record measurements with notes indicating whether they are preliminary or final for the coating.

B24.20 PAYMENT

Maintenance painting: - Payment for surface preparation and protection shall be at the items as listed in the Schedule of Rates or Bill of Quantities.

Payment shall include the provision of all plant, labour and materials required for traffic control, access, scaffolding, surface preparation, protective coatings, protection from weather, shielding of traffic and pedestrians, any repairs and touch ups, containment, collection and disposal of waste and training and facilities for meeting the requirements of this Specification.

New work: - The rate in the Bill of Quantities for the surface preparation and protective coating of all steel work incorporated in the permanent works shall include full payment for blast cleaning, supply of protective coating, equipment, application, protection from the weather during application and drying, repair and touch up.