Australian Standard™

Site testing of protective coatings

Method 6: Determination of residual contaminants

PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee CH-003, Paints and Related Materials, to supersede AS/NZS 3894.6:1996. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

METHOD

1 SCOPE

This Standard provides practical test procedures for the on-site determination of the presence of chlorides (Method A), oil and water deposits (Method B), residual dust (Method C), soluble ferrous salts (Method D) and mill scale (Method E).

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS
1199 Sampling procedures and tables for inspection by attributes
1627 Metal finishing—Preparation and pretreatment of surfaces
1627.2 Method 2: Power tool cleaning
1627.4 Method 4: Abrasive blast cleaning

AS/NZS
2310 Glossary of paint and painting terms

3 DEFINITIONS

For the purposes of this Standard the definitions of AS/NZS 2310 apply.

4 GENERAL

Although the presence of some salts on surfaces that are to receive a protective coating may have a deleterious effect on the coating, it may often be impractical to remove all detectable salt deposits before coating. The acceptable level of salts remaining on the unpainted substrate will depend upon the type and thickness of coating being applied, the environment and the practicality and cost of subsequent repainting.

Tests to determine the presence of chloride salts and oils, in accordance with Method A in Clause 6 and Method B in Clause 7 respectively, may be performed before preparation of the steel surface and again after preparation of the substrate. The following tests to assess the presence of contaminants should be performed after abrasive blast preparation of the substrate:

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(a) *Method C* For detection of surface dust in accordance with Clause 8.

(b) *Method D* For detection of soluble salts of iron in accordance with Clause 9.

(c) *Method E* For detection of mill scale in accordance with Clause 10. This test is applicable only to steel that has been prepared to a very thorough clean in accordance with AS 1627.2 or to a Class 3 blast clean in accordance with AS 1627.4.

NOTE: Proprietary conductivity meters, which will indicate the presence of non-specific conductive salts, are available.

5 SAMPLING PROCEDURE

The tests in Clauses 6, 7, 8, 9 and 10 should be conducted in accordance with an agreed sampling plan. AS 1199 provides guidance on the selection of sampling plans.

NOTES:

1 It is recommended that at least one test be performed on each 50 m^2 of surface area prior to applying the coating.

2 The selection of the appropriate sampling plan should be agreed prior to commencement of the project.

6 METHOD A—DETERMINATION OF CHLORIDES

6.1 Principle

An area of substrate is masked, washed with distilled water and the washings are collected. A chloride concentration titrator is immersed in the washings and, using a calibration table, the resultant colour change is used to determine the chloride concentration in mg/m^2. Under Alternative 1, a wash bottle is used to generate the washings. Under Alternative 2, a plastic patch and liquid reservoir are used to produce the washings.

6.2 Equipment

6.2.1 *Chloride titrator*

6.2.2 *Distilled water or deionized water*

6.2.3 *Sterile swab (cotton ball)*

Required for Alternative 1 only.

6.2.4 *Tweezers*

Suitable for holding the swab.

6.2.5 *Plastic patch*

Consisting of a proprietary, self-adhesive plastic patch incorporating a hole and a bladder that will contain a known volume of water. *Required for Alternative 2 only.*

NOTES:

1 Information on suitable patches can be obtained from the Australian Corrosion Association (ACA), Clayton, Victoria, or the Blast Cleaning and Coating Association of Australia (BCCA-A).

2 Patches should be demonstrated to be chloride-free at the time of use.

6.2.6 *Syringe*

Of approximately 10 mL capacity. *Required for Alternative 2 only.*

6.2.7 *Beakers (2)*

Of up to 250 mL capacity.

6.2.8 *Graduated measuring cylinder*

Of 50 mL capacity.

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6.3 Swabbing procedure—Alternative 1

The procedure shall be as follows:

(a) Mask an area of the substrate to be tested, so that a surface area of 15×15 cm is visible.

(b) Using the graduated cylinder, measure out 22–23 mL of distilled or deionized water into one of the beakers.

(c) Dampen one of the cotton balls in the beaker containing the water and thoroughly swab the measured area using the tweezers to hold the swab. After swabbing, swirl the cotton ball in the water and squeeze it against the side of the beaker each time.

(d) Repeat Step (c) at least 4 times, then place the cotton ball in the beaker of water. Use a fresh cotton ball to dry off the test area and place it in the beaker as well.

NOTE: Plastic/rubber gloves need to be worn while handling the swab.

(e) Stir or swirl the contents of the beaker containing the water and cotton balls for at least 2 min to assure thorough mixing.

(f) Determine the chloride level as detailed in Clause 6.5.

NOTE: The test area and quantity of water specified above have been selected so that the measured chloride concentration (p.p.m.) is numerically identical to the surface contamination (mg/m^2). Other dimensions and quantities may be used provided Equation 6.1 is employed. Note that the titrator strips cannot detect concentrations below approximately 30–40 ppm.

6.4 Plastic patch procedure—Alternative 2

The procedure shall be as follows:

(a) Apply the plastic patch to an area of substrate to be tested, using sufficient pressure to mask and seal the hole area.

(b) Inject approximately 2 mL of distilled water into the bladder using the syringe, ensuring that no air is trapped between the latex film of the patch and the specimen surface.

(c) After 20 s, extract the water using the syringe, and then reinject the same fluid.

(d) Repeat Step (c) twice. Extract the solution using the syringe and transfer the fluid to the beaker.

(e) Inject approximately 2 mL of fresh distilled water into the patch, and after 20 s transfer it to the beaker.

6.5 Determination of chloride content

The procedure is as follows:

(a) Place the lower end of the chloride titrator strip in the washings.

NOTE: Immersion of the entire Quantab Titrator should be avoided as it will trigger the completion signal.

(b) Allow the washings to fully saturate the column. Saturation is achieved 2 min after the yellow strip across the top of the column begins to turn to dark blue.

(c) Read off the result within 0.5–5 min of final colour change of the signal strip. The presence of chlorides is indicated by a colour change of the low scale to white.

(d) Record the chloride titrator reading to the nearest half division on the numbered scale at the tip of the white colour scale.

(e) Convert the chloride titrator reading to p.p.m. chloride using the calibration table.

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(f) Convert the result to chloride content in mg/m^2 using the following equation:

$$N = V \times C \times \frac{1}{A} \quad \ldots 6.1$$

where

N = amount of chloride ions on the surface, in milligrams per square metre

V = volume of water used, in litres

C = chloride ion concentration, in p.p.m.

A = target surface area, in square metres

NOTE: For Alternative 1 using the dimensions given in Clause 6.3 and a volume of 22.5 mL, this equation becomes:

$$N = C \quad \ldots 6.2$$

6.6 Report

The test report shall include the following:

(a) Name of the testing authority or inspector.

(b) Date of test and report number.

(c) Description of substrate tested.

(d) Whether Alternative 1 or Alternative 2 procedure was used.

(e) Chloride deposits present in mg/m^2, rounded to the nearest whole number, and the acceptability of the level of deposits.

NOTE: Advice on acceptability or level of deposits should be obtained from the coating manufacturer.

(f) Reference to this Australian/New Zealand Standard, i.e. AS/NZS 3894.6, Method A.

(g) Any deviations from this test method.

7 METHOD B—DETERMINATION OF OIL OR WATER DROPLET CONTAMINATION

7.1 Principle

A clean absorbent paper product, such as a laboratory filter paper or a paper tissue, is pressed against the test surface. The presence of oil, grease or fat is revealed by visual examination of the absorbent paper against strong back lighting or under ultraviolet light.

The test relies upon the phenomenon that spots of oil or grease on thin absorbent white paper will appear translucent or will have enhanced brightness when the sheet of paper is viewed with a source of illumination behind it. Additionally, oils, either on the surface or absorbed by the paper, fluoresce strongly when viewed under reduced light and while irradiated by ultraviolet light.

This Method is used *after* performing other test methods for contaminants and surface preparation, as high-technology coatings are sensitive to droplet contamination that is not immediately evident to the viewer and because some tools and methods are liable to cause such contamination.

7.2 Equipment

7.2.1 *Light source*

An extended light source such as a skylight or window within a building on a sunny day, viewed from a shady position, is preferred. However, a hand held battery-operated torch may be used to provide oblique backlighting.

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7.2.2 *Absorbent white paper*

A supply of qualitative grade filter paper or a previously uncontaminated packet of white absorbent paper tissues.

7.2.3 *Disposable gloves*

Of rubber or plastic.

7.2.4 *UV light source*

An ultraviolet A source in a suitable viewing cabinet.

7.3 Procedure

The test procedure shall be as follows:

(a) Select the number and location of areas on the surface to be tested.

(b) Ensure that the test areas are free of dust contamination.

(c) With a gloved hand, press the sheet of absorbent paper firmly against the prepared surface and hold in position for a second or so at each test location.

NOTE: Discs of laboratory filter paper have an advantage in that they are stout enough to allow repeated use at succeeding test locations following an initial absence of oil contamination. A disadvantage of filter papers, not shared by paper tissue, is that more effort is required to penetrate troughs of pronounced surface profile.

(d) At a shaded location, hold the paper before the eyes at a comfortable viewing distance with the source of daylight illumination behind the paper.

NOTE: In the absence of daylight, a torch shining obliquely onto the back of the paper will suffice.

(e) Record the presence of translucent spots or areas on the absorbent paper.

NOTE: Water and organic solvents will produce a similar visual effect.

(f) Wave the paper to evaporate spots of water or other solvent.

(g) Observe and record the presence of spotting of the paper caused by both oil and volatile contamination.

(h) Place those papers to be tested for oil contamination into previously unused plastic bags. Transfer to a UV lamp fluorescence viewer and examine the test papers. Oil contamination is confirmed by fluorescence.

7.4 Report

The test report shall include the following:

(a) Name of the testing authority or inspector.

(b) Date of test and report number.

(c) Description of substrate tested.

(d) Presence or absence of water, oil or volatile contamination.

(e) Reference to this Australian/New Zealand Standard, i.e. AS/NZS 3894.6, Method B.

(f) Any deviations from this test method.

8 METHOD C—DETERMINATION OF SURFACE DUST

8.1 Principle

The level of dust or other residues present on an abrasive-blasted surface is determined by pressing a length of adhesive tape to the prepared surface. The tape is then removed and examined against a dark and a light background for adhering dust particles. The level of dust removed is rated by comparison with a visual standard.

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8.2 Equipment

8.2.1 *Adhesive tape*

A roll of transparent adhesive tape, or a contrasting coloured tape, of minimum width of 20 mm.

8.2.2 *Sheet protector*

Of clear plastic of at least 1 mm thickness, to protect the contrasting background during inspection of the tested tape.

8.2.3 *Contrasting background*

Nominally 300 × 200 mm.

8.2.4 *Visual standard*

Consisting of a selection of mounted dust level samples providing a 0 Rating for absence of dust, to Rating 5 for excessive dust.

NOTE: Figure 1 shows an example of a suitable visual standard.

8.3 Procedure

The test procedure shall be as follows:

(a) Select the area of blasted surface to be tested.

(b) Place a 60 mm length of adhesive tape on the surface with the sticky side against the surface leaving one end free for removal.

(c) Smooth the tape against the surface using a thumb then, while holding the free end of the tape with the other hand, immediately pull the tape from the surface.

(d) Place the tape against a previously cleaned sheet protector, and locate the contrasting background behind the protector.

(e) Examine the tape and determine the level of dust particles adhering to the adhesive tape.

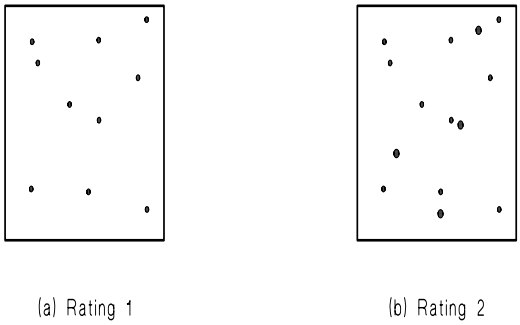
(f) Compare the tested tape against the visual reference standard giving a 0–5 rating.

NOTES:

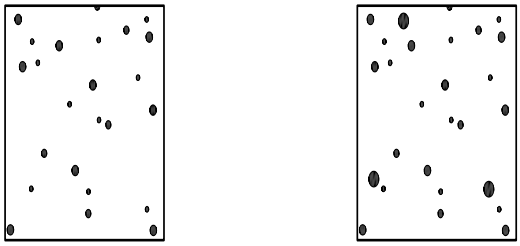
1 Rating 0—excellent, less than Rating 1.

2 Rating 5—gross contamination.

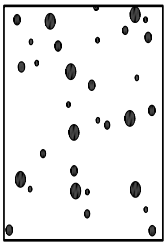
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(a) Rating 1 (b) Rating 2



(c) Rating 3 (d) Rating 4



(e) Rating 5

FIGURE 1 TYPICAL AREAS OF DUST ON METAL SUBSTRATE (FULL SCALE)
(See Method C)

8.4 Report

The test report shall include the following:

(a) Name of testing authority or inspector.

(b) Date of test and report number.

(c) Description of the substrate tested.

(d) The dust rating obtained, and whether it was acceptable.

(e) Reference to this Australian/New Zealand Standard, i.e. AS/NZS 3894.6, Method C.

(f) Any deviations from this test method.

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9 METHOD D—DETERMINATION OF SOLUBLE SALTS OF IRON

9.1 Principle

The test surface is wetted with water before a dried test paper impregnated with potassium ferricyanide is pressed to the surface. The test paper is then removed and inspected for a colour change to blue, which will indicate the presence of ferrous salt contamination.

9.2 Equipment and reagents

9.2.1 *Test paper*

Filter paper.

9.2.2 *Potassium ferricyanide solution*

A 5% solution (by weight) of technical grade potassium ferricyanide in distilled water.

9.2.3 *Plastic bags*

Of polythene, nominally 200 × 200 mm.

9.3 Procedure

The procedure shall be as follows:

(a) Soak the test paper in the 5% potassium ferricyanide solution and allow it to dry on a clean surface.

(b) Cut the prepared paper into suitable strips, nominally 10 × 50 mm, and store in a sealed plastic bag away from light until required for use.

NOTE: The cut strips should exhibit a strong yellow colour.

(c) Moisten the area of the substrate surface to be tested by spraying with distilled or deionized water, or by applying a suitable wetted pad.

(d) Press the test paper onto the wetted surface allowing a contact time of 20–30 s.

NOTE: If it is not practical to pre-wet the substrate surface, wet the test paper with distilled water and press it to the surface for 20–30 s.

(e) Remove the paper from the surface and observe any colour change. The degree and depth of blue discolouration of the paper will indicate the severity of soluble ferrous salt contamination of the surface.

(f) Assess whether the contamination level is acceptable by reference to a specified standard.

9.4 Report

The test report shall include the following:

(a) Name of testing authority inspector.

(b) Date of test and report number.

(c) Description of substrate tested.

(d) Whether the contamination is present and its acceptability.

(e) Reference to this Australian/New Zealand Standard, i.e. AS/NZS 3894.6, Method D.

(f) Any deviations from this test method.

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10 METHOD E—PRESENCE OF MILL SCALE

10.1 Principle

A pad carrying slightly acidified 4% copper sulfate solution is pressed onto a freshly blast-cleaned surface. Residual mill scale flakes are revealed as black patches against the resultant copper background. The treated substrate is examined to determine if residual mill scale contamination is present (see also Clause 4(c)).

10.2 Equipment and reagent

10.2.1 *Absorbent pad*

A sterile swab, cotton gauze, or clean cotton cloth.

10.2.2 *Copper sulfate solution*

Of 4% (v/v) strength, with the addition of 0.05 mL of concentrated sulfuric acid (1 drop) per 250 mL of solution.

10.3 Procedure

The procedure shall be as follows:

(a) Wet the pad with copper sulfate solution.

(b) Press the wet pad to the blasted substrate and lightly wipe the surface.

(c) Inspect the wetted surface nominally 60 s after removing the pad. Residual mill scale will appear as black patches against the copper background of the effectively blasted substrate.

10.4 Report

The test report shall include the following:

(a) The name of the testing authority or inspector.

(b) Date of test and report number.

(c) Description of substrate tested.

(d) The presence or absence of mill scale deposits.

(e) Reference to this Australian/New Zealand Standard, i.e. AS/NZS 3894.6, Method E.

(f) Any deviations from this test method.

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NOTES

NOTES

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The following are represented on Committee CH-003:

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National Association of Testing Authorities Australia
New Zealand Abrasive Blasting Association
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New Zealand Painting Contractors Association
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