Australian/New Zealand St

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Hot-dip ga vanized (zinc

coatings on

fabricated ferrous article

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

REGISTRATION OF AS/NZS 4680:2006

Hot-dip galvanized (hot-dip zinc) coatings on fabricated ferrous articles

REGISTRATION NOTICE

This Standard was published on 31 August 2006.

The following amendments have been registered against this Standard:

Australian Steel Institute
Australian Steel Manufacturers
Bureau of Steel Manufacturers of Australia
Galvanizers Association of Australia
Galvanizers Association of New Zealand
New Zealand Steel Roofing Manufacturers

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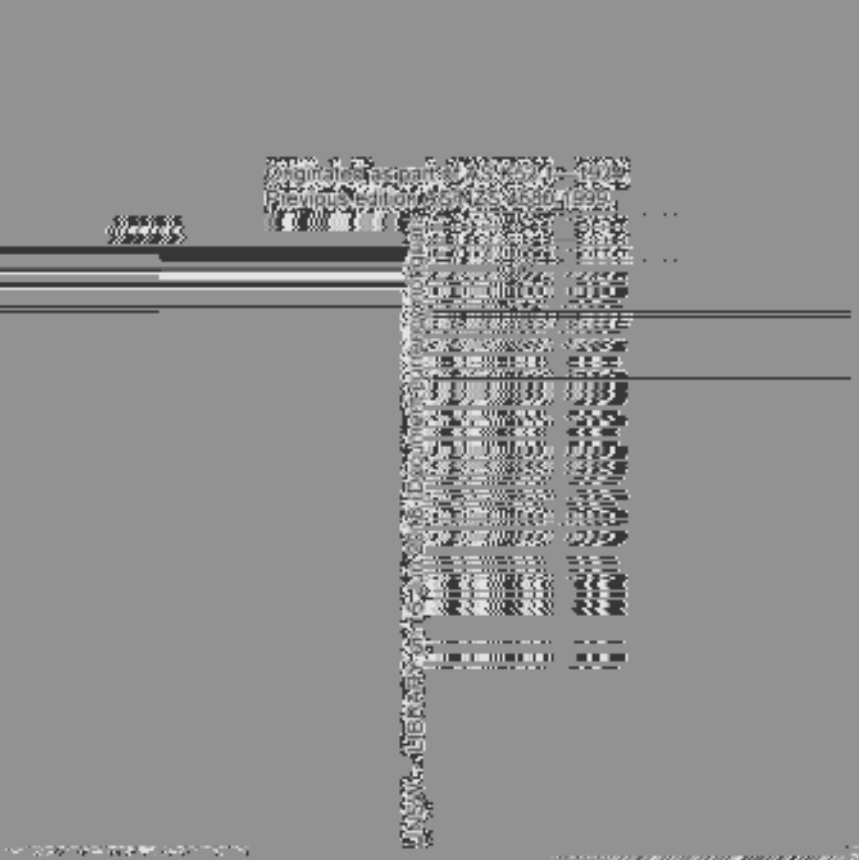
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AS/NZS 4680:2006

Australian/New Zealand Standard™

Hot-dip galvanized (zinc) coatings on fabricated ferrous articles





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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard

Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

1 SCOPE

2 REFERENCED DOCUMENTS

AS
Sampling procedures for inspection by attributes
Part 0: Introduction to the ISO 2859 attribute sampling system
Part 1: Sampling schemes indexed by acceptable quality level (AQL) for lot-by-lot inspection
Series)
Steel structures painting
Metallic materials—Preparation and pretreatment of surfaces
Abrasive blast-cleaning of steel
Metallic materials—Rockwell hardness test (scales)
Metallic materials—Brinell hardness test (series)
Metallic materials—Vickers hardness test (series)
Methods of test for metallic and related coatings
Method 3: Coating thickness tests—Magnetic method
Method 10: Coating thickness tests—Magnetic induction and eddy current methods
Method 15: Test for embrittlement of steel parts by metallic coatings using notched bar tensile specimens
Method 16: Test for ductility of metallic coatings by strip bending
Method 21: Test for adhesion of metallic coatings by burnishing
Method 23: Measurement of coating mass per unit area—Inductively coupled plasma optical emission spectrometric method
Method 24: Measurement of coating mass per unit area—Strip methods
Method 25: Measurement of coating mass per unit area—Gravimetric method

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AS
3894.1 Methods of corrosion and related phenomena—Neutral salt spray (fog) test

3894 Supplementary test methods

3894.3 Method 3: Determination of dry film thickness

AS/NZS
2312 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings

Part 1: Paints for steel structures

Part 2: Organic zinc rich primer

Part 3: Inorganic zinc silicate paint

Zinc and zinc alloy coatings on steel wire

Hot-dip galvanized (zinc) coatings on fabricated ferrous articles and for general engineering purposes

Hot-dip galvanized coatings on ferrous hollow sections, tubes and pipes

AS/NZS 9000
9001 Quality management systems—Requirements

9004 Quality management systems—Guidelines for performance improvements

Guide to specifying assessment procedures for third-party certification systems or schemes

SO
1461 Hot dip galvanized coatings on fabricated iron and steel articles—Specifications and test methods

3 DEFINITIONS

For the purposes of this Standard, the definitions below apply.

3.1 Coating mass

The total amount of hot-dip galvanized coating present on the surface area of steel (base metal), expressed

3.6 Coating thickness: local

3.7 Galvanizer

3.8 Hot-dip galvanizing

3.9 Hot-dip galvanizing

3.10 Reference area

3.11 Significant surface

4 DESIGN REQUIREMENTS

NOTES

5 BASIS METAL

NOTES

6 GALVANIZING PROCESS

6.1 Pretreatment

6.2 Bath composition

The molten metal in the working area of the galvanizing bath shall contain not less than

3 Threaded components

7 APPEARANCE AND FREEDOM FROM DEFECTS

8 REPAIR AFTER GALVANIZING

8.6 Extent of repairable damaged or uncoate

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8.2 Repair requirements

[illegible]

8.3 Repair after site handling and installation

[illegible]

8.4 Site repair

[illegible]

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9 COATING MASS AND THICKNESS

9.1 Coating mass

The coating mass shall be determined on specimens or surfaces in accordance with Appendix A, Clause A2, A3 and A4 and shall comply with the relevant requirements of Table 3.1, 3.2, 3.3, 3.4 or 3.5. The number of tests to be carried out shall be as specified in the purchase order and the galvanizer.

[illegible]

[illegible]

[illegible]

[illegible]

9.2 Coating thickness

[illegible]

10 ADHERENCE OF COATING

[illegible]

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TABLE 5[illegible]

REQUIREMENTS FOR COATING THICKNESS AND MASS OF ARTICLES THAT ARE NOT CENTRIFUGED

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

TABLE 6[illegible]

REQUIREMENTS FOR COATING THICKNESS AND MASS OF ARTICLES THAT ARE CENTRIFUGED

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

PURCHASING GUIDELINES

(Informative)

GENERAL

2 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser should supply the following minimum information when enquiring or ordering:

Reference to this Standard, i.e. AS/NZS 4680.

(a) The nature, chemical composition and mechanical properties of the specified grade.

(b) Any mechanical work required, whether it is to be done after or before galvanizing.

(c) Any special requirements for freedom from defects.

(d) Any special requirements for frequency of testing.

(e) Whether a protective coating is required.

(f) Whether removal of surplus zinc on threads is required (see Clause 6.3).

(g) Whether certification is required, and if so, what form it is to take.

(h) Test and retest requirements, if not as specified.

(i) Whether test reports covering each galvanizing mass or thickness is required.

(j) Requirements for independent testing, if applicable.

(k) Whether it is the intention of the purchaser to inspect the galvanizing process.

(l) Any special finish required.

(m) Any special pre- or post-galvanizing requirements.

(n) Any special coating thickness required.

(o) Instructions for repair of damaged coating.

(p) Requirements for marking.

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APPENDIX B

MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD

(Informative)

B1 SCOPE

This Appendix sets out the following different ways of demonstrating that the requirements of this Standard are met:

(a) Type testing.

(b) Batch testing.

(c) Demonstrating the acceptability of the supplier's quality system.

(d) Other methods approved by the manufacturer responsible and acceptable to the customer.

B2 STATISTICAL SAMPLING

Statistical sampling is appropriate as the basis for selecting samples from batches, lots, items after manufacture or assembly of parts and materials. Any procedure adopted should be in accordance with the requirements of AS 1199.1 and AS 1199.2 (see Clause 1.4).

Type testing is carried out by testing a population of products known to comply with the requirements of this Standard. Batch testing is carried out by testing samples from a batch of product to demonstrate that the batch complies with the requirements of this Standard.

Compliance with the requirements of this Standard may be demonstrated by testing samples from a batch of product to demonstrate that the batch complies with the requirements of this Standard.

B3 PRODUCT CERTIFICATION

Product certification is a system whereby a certification body, operating independently of the manufacturer and the purchaser, certifies that a sample or samples of the product conform to the requirements of this Standard.

8.7 SUPPLEMENTARY ASSESSMENT

[illegible]

8.8 OTHER MEANS OF ASSESSMENT

[illegible]

APPENDIX C

(normative)

APPLICATION OF ZINC COATINGS

C1 SCOPE

This Appendix contains advice for the application and interpretation of this Standard to the hot dip galvanizing process.

C2 SIZE AND SHAPE

NOTE: Information regarding the suitability of various steel compositions for hot dip galvanizing is available from the galvanizer.

C5 WELDING

(As recommended welding procedures may be used, it is important that the supplier removes all welding flux and spatter prior to delivery to the galvanizer.)

C6 VENTING AND DRAINING

C6.1 General

Structures that incorporate enclosed sections should have adequate venting and draining (or welding procedures) to avoid explosion hazards during galvanizing. Accidental explosions have occurred when enclosed sections were rapidly converted to superheated steam capable of generating explosive pressures sufficient to distort the structure.

The purchaser should provide the galvanizer with the information necessary to determine the design and fabrication requirements for the galvanizing of the structure. Where assistance is required in the design of venting and draining holes, the galvanizer should be consulted. Where assistance is required in the location of vent holes and drain holes, and in the method of welding, the galvanizer should be consulted before fabrication commences.

C6.2 Enclosed sections

[illegible] preferable to use full open-ended [illegible] enclosed sections [illegible] with vent holes.

NOTE: Example [illegible] are given in AS/NZS [illegible]

C7 ASSEMBLIES

3.10 HANDLING

Items delivered to the gate or site shall be handled to avoid damage. Special handling instructions

3.11 CASTINGS

Inspection of castings shall be made as follows:

(a) Wherever possible, castings should be designed so that they can be inspected visually.

(b) Large [Weight of] and large quantity castings shall be subject to the processes, methods and tests agreed upon between the purchaser and the supplier.

(c) Large steel castings should be subject to ultrasonic inspection, as agreed upon between the purchaser and the supplier.

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This document is an American National Standard
It is subject to periodic review and users are cautioned to obtain the latest edition.

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APPENDIX D

PREPARATION OF STEEL SURFACES FOR HOT-DIP GALVANIZING

D1 BASIS METAL

D2 Surface conditions

D3 The influence of the steel surface on the hot-dip galvanized coating thickness

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D1.4 Stresses in the basis metal

Some stresses in the basis metal will be relieved during the hot-dip galvanizing process, whereas others will be introduced.

Whether a steel article that has been cold worked, cut or pierced, embrittles during galvanizing is dependent on the type of steel and the level of cold work that it has undergone. [illegible]

[illegible]

[illegible] DUPLEX ADDED PROTECTION FOR GALVANIZING PLANT PIPING

[illegible]

11. SCOPE

[illegible]

E2 PAINTING PROCEDURES

E2.1 General

[illegible]

E2.2 Preparation

[illegible]

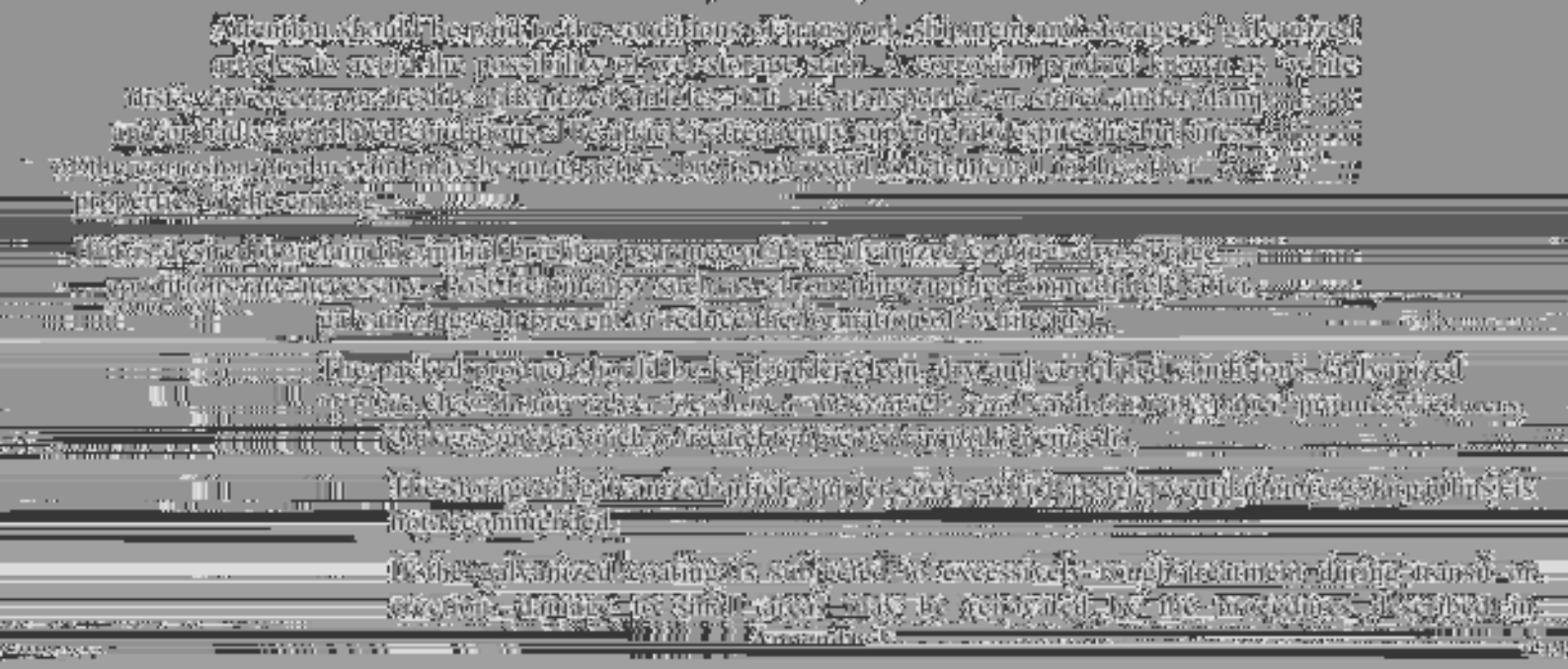
E2.3 Painting system

[illegible]

ANNEX II

TRANSPORT AND STORAGE OF CONTAMINATED ARTICLES

(Schematic)



APPENDIX G

DETERMINATION OF COATING MASS AND THICKNESS

(Normative)

G1 GENERAL

This Appendix sets out procedures for determining the mass of coating per unit area and coating thickness as follows:

(a) Gravimetric method (see Paragraph G2).

(b) Volumetric method (see Paragraph G3).

(c) Mass-per-mass method (see Paragraph G4).

(d) Magnetic method (see Paragraph G5).

NOTES

1 The gravimetric method is the most accurate method for determining the mass of coating per unit area.

G3 ADFT METRIC METHOD

G3.1 Method

The method used shall be the hydrogen evolution method for zinc coatings, given in AS 2331.3.2.

G3.2 Coating mass

Where

M = coating mass in grams per square metre

V = volume of hydrogen evolved, in millilitres

A = stripped surface area, in square millimetres

The area above applies to the measurement made using a gauge with a 10 mm hole.

G4 MASS ON MASS METHOD

The coating mass shall be determined by weighing the test piece before and after galvanizing and dividing the difference by the area of the surface before galvanizing.

Care shall be taken to ensure that the test piece and the galvanizing mass are dried to a constant mass before weighing.

G5 ULTRASONIC MEASUREMENT OF LOCAL THICKNESS

G5.1 General

The method used shall be in accordance with either AS 2331.3.1, AS 2331.3.4 or AS 1874.3.

G5.2 Calculation of coating mass

If required, the coating mass may be calculated by multiplying the thickness by 7.2.

G6 TEST REPORT

A test report shall include the following information:

(a) Name of testing authority.

(b) Report number and date of issue.

(c) Batch number and details of the material under test.

(d) Test method used.

(e) Details of test samples and test specimens.

(f) Results of the test and a statement of compliance or otherwise with the requirements of this Standard.

(g) Details of any deviations carried out.

(h) Reference to this test method, i.e. AS/NZS 4680, Appendix G.

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APPENDIX H

GENERAL INFORMATION ON FACTORS INFLUENCING CORROSION OF GALVANIZED STEEL

(Informative)

H1 SCOPE

This Appendix provides general information on factors that affect the corrosion rate of galvanized steel in the environment. More detailed information is given in the Australian/New Zealand Standard AS/NZS 2312.

H2 ATMOSPHERIC CORROSION

H2.1 GENERAL

The factors that influence external atmospheric corrosion include:

(a) Time of wetness.

(b) Atmospheric pollutants.

(c) Atmospheric hydrogen sulfide content.

(d) Atmospheric salt content.

During which the most suitable of corrosion possible. It is influenced by factors such as and can be quantified to within accuracies in terms that the relative humidity is above 80% for temperatures

include the frequency, strength and prevailing wind and the deposition rate which influence concentration in the atmosphere. Airborne salt has a major influence corrosion rates and can be neglected except when occurring near such as coastal and industrial areas with sulfur dioxide and

wetness is the period of time water which renders atmospheric metal surface, orientation and pollut the number of hours per year above 0°C.

pollutants. Since atmospheric corrosion proceeds more rapidly in the presence of pollutants, particularly sulfur dioxide, and since these pollutants are found in greater concentrations in industrial areas than in rural areas, the corrosion rate is higher in industrial areas than in rural areas. On the other hand, reduces corrosion, while less polluted areas

Rainfall also influences corrosion rates. Frequent rainfall washes away corrosion products and pollutants, thereby reducing the corrosion rate. On the other hand, rainfall can increase the corrosion rate by providing the moisture necessary for the corrosion reaction.

Temperature influences corrosion rates. Generally, corrosion rates increase with increasing temperature. However, the relative humidity is usually lower at higher temperatures and, therefore, the time of wetness is reduced.

H3 LOCAL ENVIRONMENT

EFFECTS

The effects of the general atmospheric environmental factors, such as rainfall, wind, temperature, relative humidity, and the circumstances associated with the local environment can influence and therefore should be taken into account in the evaluation of the corrosivity of the atmosphere.

Local environmental factors that should be considered include:

(a) Sheltering from the direct effects of rainfall.

(b) Presence of dust or dirt.

(c) Presence of corrosive chemicals.

(d) Presence of organic materials that may absorb moisture.

(e) Presence of dissimilar metals in contact or close proximity.

(f) Presence of crevices.

(g) Presence of surfaces that may trap moisture.

(h) Presence of surfaces that may be difficult to clean.

(i) Presence of surfaces that may be difficult to paint.

(j) Presence of surfaces that may be difficult to inspect.

(k) Presence of surfaces that may be difficult to maintain.

(l) Presence of surfaces that may be difficult to repair.

(m) Presence of surfaces that may be difficult to replace.

(n) Presence of surfaces that may be difficult to protect.

(o) Presence of surfaces that may be difficult to monitor.

(p) Presence of surfaces that may be difficult to control.

(q) Presence of surfaces that may be difficult to manage.

(r) Presence of surfaces that may be difficult to maintain.

(s) Presence of surfaces that may be difficult to repair.

(t) Presence of surfaces that may be difficult to replace.

(u) Presence of surfaces that may be difficult to protect.

(v) Presence of surfaces that may be difficult to monitor.

(w) Presence of surfaces that may be difficult to control.

(x) Presence of surfaces that may be difficult to manage.

(y) Presence of surfaces that may be difficult to maintain.

(z) Presence of surfaces that may be difficult to repair.

(aa) Presence of surfaces that may be difficult to replace.

(bb) Presence of surfaces that may be difficult to protect.

(cc) Presence of surfaces that may be difficult to monitor.

(dd) Presence of surfaces that may be difficult to control.

(ee) Presence of surfaces that may be difficult to manage.

(ff) Presence of surfaces that may be difficult to maintain.

(gg) Presence of surfaces that may be difficult to repair.

(hh) Presence of surfaces that may be difficult to replace.

(ii) Presence of surfaces that may be difficult to protect.

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(ss) Presence of surfaces that may be difficult to manage.

(tt) Presence of surfaces that may be difficult to maintain.

(uu) Presence of surfaces that may be difficult to repair.

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(ww) Presence of surfaces that may be difficult to protect.

(xx) Presence of surfaces that may be difficult to monitor.

(yy) Presence of surfaces that may be difficult to control.

(zz) Presence of surfaces that may be difficult to manage.

[redacted]

[redacted]

[redacted]

[redacted]

ANNEX L

(Informative)

Suggested Test Specimen Orientation for Chemical Analysis of Consumable Inserts

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