

# 30. AUSTRALIAN AND INTERNATIONAL COATING STANDARDS

## INTRODUCTION

With the globalisation of commerce and industry, there is an imperative to ensure that performance benchmarks are set in all jurisdictions. International standards are increasingly called up in specifications, and Standards Australia has adopted a policy of aligning all Australian standards with International Standards Organisation (ISO) standards as they are published or revised.

The importance of consistent standards in an international trading environment is essential to ensure that suppliers are competing on an equal footing in terms of product specifications and quality. While the world is rapidly moving towards uniform standards, there are still many regional, national and internal standards that are called up in specifications. These may include standards from:

United Kingdom	- BSI
International	- ISO, EC, ETSI
United States	- ANSI, ASTM, ASME...
Germany	- DIN
New Zealand	- SANZ
Japan	- JIS
Canada	- CSA

There are now many Australian/New Zealand standards that have been released in recent times, related to coatings on steel in particular. Those related to zinc-based (galvanized) coatings on steel products are of particular interest, as most address identification issues that are important to specifiers.

Many zinc-based coatings look similar, but can vary significantly in durability performance as a result of the technology used in their application.

This chapter is aimed at listing the more important of these new standards, and highlighting the performance related issues addressed therein.

In addition, we have included a complete listing of current Australian standards associated with coatings for reference.

## CATEGORIES OF COATING STANDARDS

There are six categories into which the current coating standards fall. These are:

1. Process applied coatings
2. Manually applied coatings
3. Product related standards that define coating performance requirements
4. Environmental classification standards
5. Methods of measurement standards.
6. Generic materials standards (e.g. zinc metal, organic and inorganic coatings etc.)

While most of these standards are designed as stand-alone documents, most reference related standards and hence form a matrix of information sources that can be quite complex.

### 1. Process applied coatings.

These include galvanized coatings of all types, powder coatings, electroplated coatings and any other coating that is applied to an item in a purpose designed facility. The coating's characteristics are determined by the process and are usually maintained to tight specifications in a controlled environment.

### **2. Manually applied coatings.**

These include most types of commercial and industrial paint coatings, where the surface preparation is at the discretion of the operator, as is the application of the coating. These coatings are heavily dependent on the skill of the applicator and the ability to deal with the variables of the environmental conditions prevailing at the time of application.

### **3. Product related standards that define coating performance requirements.**

These types of standards reflect the shift to performance-based standards rather than prescriptive standards. The recently published AS/NZS 2699.3:2003 Built-in components for masonry construction – Lintels and shelf angles (durability requirements) is a good example of this new generation of standards. A minimum performance life (50 years) is nominated, and complying coatings are listed in the standard for a range of exposure classifications.

In 2008, Standards Australia released a new standard: AS 2309 – Durability of galvanized and electrogalvanized zinc coatings for the protection of steel in structural applications that defines the performance of the various types of zinc-based coatings for steel with respect to their thickness in atmospheric exposures in Australia.

### **4. Environmental classification standards.**

These standards are intended to provide environmental classifications based on a range of corrosivity factors, which can then be overlaid on coating standards to determine system performance. AS/NZS 2312:2002 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings, along with ISO standards ISO 9223, 9224, 9225, and 9226 cover the classification of environments. A new standard (AS 4312 – Corrosivity zones in Australia, has been developed by Standards Australia, that will be a single-source document for this application.

### **5. Methods of measurement standards.**

There is a large number of very specific standards related to the measurements and test procedures associated with the application and performance of applied coatings of all types. These standards range from methods of measurement of coating thickness to the determination of surface cleanliness.

### **6. Generic materials standards.**

These standards related to the quality requirements for the basic materials used in the protective coating process. Some are incorporated into the coatings standards. Examples include a standard for testing the metallic zinc content of zinc-rich paint coatings and the component requirements for two-pack epoxy paint designed for industrial applications.

The aim of all standards is to clearly define the requirements of the product or process for the purposes of specification and the assurance of the quality of the finished product. Most standards are quite product-specific, and rarely give rise to confusion in the specification process.

One exception is zinc (galvanized and electroplated) coatings, which until recently, have not been separated sufficiently to facilitate clear specification based on required performance.

For that reason, these standards will be dealt with in more detail in this summary.

### **THE ZINC-COATED (GALVANIZED) STEEL STANDARDS.**

**AS/NZS 4680:2006** – Hot dip galvanized (zinc) coatings on fabricated ferrous articles

**AS/NZS 4680** – Is specific to after-fabrication galvanizing and specifies the heaviest galvanized coatings. In most cases, the hot dip coating will always exceed the specified minimum thickness

because of the nature of the application process. Minimum coating thickness is specified on the basis of steel thickness. The coating is specified in grams/m<sup>2</sup> which is usually converted to average coating thickness in microns so non-destructive measurement of the coating can be done.

**AS/NZS 4534:2006** – Zinc and zinc/aluminium coatings on steel wire

**AS/NZS 4534** – Is specific to continuously galvanized wire. The coating is applied in a continuous process. A number of coating classes are available that vary with wire diameter. A WXX identification system is used, with W10 being the standard class against which the other classes are rated. e.g. W20 is double the coating mass of W10 and W05 is half the coating mass of W10 for the same wire diameter

**AS/NZS 4791:2006** – Hot dip galvanized (zinc) coatings on ferrous open sections applied by a continuous or specialised process.

**AS/NZS 4792:12006** – Hot dip galvanized (zinc) coatings on ferrous hollow sections applied by a continuous or specialised process.

**AS/NZS 4791** – Open sections

**AS/NZS 4792** – Hollow sections

These two standards were developed specifically for OneSteel's Duragal™ continuously galvanized hollow and open sections and Palmer Tube's and Orrcon's hollow sections manufactured from continuously galvanized (CG) strip. Some sections may be hot dip galvanized using a semi-continuous galvanizing process.

Where the hot dip galvanized coating is used, the coating class is designated by the classification HDGXXX, where the XXX numerals are the coating mass per square metre on each surface. e.g. HDG200 is 200 g/m<sup>2</sup> average.

Where CG strip is used, the coating class is designated by the classification ZBXXX/XXX. The ZB indicates 'zinc both sides' and the XXX is the coating mass per side in g/m<sup>2</sup>. e.g. ZB100/100 represents 100 g/m<sup>2</sup> coating mass average on both sides.

Where the coating is applied by an in-line process (Duragal™), the coating class is designated by the classification ILGXXX, where ILG indicates in-line galvanized and the XXX is the single-side coating mass in g/m<sup>2</sup>. e.g. ILG100 represents 100 g/m<sup>2</sup> on the outside of hollow sections and all surfaces of open sections.

**AS 1397:2001 – Steel sheet and strip – Hot dipped zinc coated and aluminium/zinc coated coated**

This standard has been virtually unchanged from previous editions and covers both galvanized (zinc), zinc/iron alloy and Zinalume™ coated steel sheet and strip. The Zinalume™ coating contains approximately 60% aluminium and 40% zinc.

The steel strength grade is designated by a GXXX classification, where the XXX represents the steel's yield strength in megapascals (MPa). e.g. G350 indicates a 350 MPa minimum yield strength.

The coating type is designated by ZXXX for galvanized (zinc) coatings, ZFXXX for zinc/iron alloy coatings and AZXXX for Zinalume™ coatings, where the XXX represents the total average coating mass on BOTH sides of the sheet. e.g. Z350 indicates a galvanized coating with a total coating mass on BOTH sides of the sheet of 350 g/m<sup>2</sup> or 175 g/m<sup>2</sup> on each side of the sheet.

**AS 4750:2003** – Electro- galvanized (zinc) coatings on ferrous hollow sections.

This standard was developed to complement the other in-line galvanizing standards, where the zinc coating is applied by a continuous electroplating process, rather than using a molten zinc bath.

There are a number of hot-dip galvanizing standards related to structural fasteners. These standards are similar with respect to coating specifications, but are differentiated by the types of fasteners.

These standards include:

**AS 1214:1983** Hot-dip galvanized coatings on threaded fasteners (ISO Metric coarse thread series)

**AS/NZS 1559:1997** Hot-dip galvanized steel bolts with associated nuts and washers for tower construction.

**AS/NZS 1252:1996** High strength steel bolts with associated nuts and washers for structural engineering.

**AS/NZS 1390:1997** Cup head bolts with ISO metric coarse pitch threads.

### **THE ENVIRONMENTAL CLASSIFICATION STANDARDS.**

The most significant document in the Standards Australia library on the classification of environments for corrosivity is **AS/NZS 2312:2002** – Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings.

The section in this standard covering classification of atmospheres is largely descriptive and makes no attempt to quantify corrosivity in given environments.

**AS/NZS 2312** references a suite of ISO standards that are intended to provide the platform for classification of corrosivity or atmospheres. These standards are:

**ISO 9223** - Corrosivity of atmospheres – Classification

**ISO 9224** – Corrosivity of atmospheres – Guiding values for corrosivity categories

**ISO 9225** – Corrosivity of atmospheres – Measurement of pollution

**ISO 9226** – Corrosivity of atmospheres – Determination of corrosion rate for standard specimens for the evaluation of corrosion.

While these standards provide the metrics to determine atmospheric corrosivity, they have been developed for Northern hemisphere conditions, and fall short in some areas that are appropriate for the Asia-Pacific region.

These shortcomings have been recognized by Standards Australia and a local standard, AS 4312 Corrosivity zones in Australia (Draft) is under development in 2004 at Standards Committee level.

Standards of this type will become increasingly important as the determination of durability of construction materials will lead to more performance based, rather than prescriptive, standards being published and also incorporated in to building codes and standard specifications.

### **FINDING THE STANDARD**

It is no longer necessary to reference a large printed catalogue of standards, or even purchase a printed standard from an authorized distributor. Standards Australia develops the standards and they are then sold through SAI Global which is a public company with exclusive distribution rights for Standards

Australia publications.

Information about individual standards is available from the SAI Global web site, and any Australian or international standard can be purchased as a hard copy or as a downloadable .pdf file from the SAI Global site.

Students can register with Standards Australia and this will allow access to any standard for downloading for reference. These files are time stamped and copyrighted and have very short use-by date after downloading, but provide students with standards access on a 24/7 basis.

The Standards Australia web address is [www.standards.com.au](http://www.standards.com.au). The SAI Global web address is [www.saiglobal.com](http://www.saiglobal.com).

#### COATING STANDARDS SURVEY

This listing contains most of the Australian Standards that cover industrial protective coatings. There are additional standards that deal with specialised coatings (gold plating, vitreous enamel, etc) that have been excluded for practical reasons from this listing.

<i>Standard</i>	<i>Title</i>
AS 1231 –2000	Aluminium and aluminium alloys – Anodic oxidation coatings
AS 4750 – 2003	Electrogalvanized (zinc) coatings on ferrous hollow and open sections
AS 1192 -2004	Electroplated coatings – nickel and chromium
AS 4397 - 1996	Electroplated coatings of zinc on steel fasteners with imperial threads
AS 1897 – 1976	Electroplated coatings on threaded components (metric coarse series)
AS 1798 – 2003	Electroplated zinc (electro galvanized) coatings on ferrous articles (batch process)
AS/NZS 2312 –2002	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings.
AS 1214-1983	Hot-dip coatings on threaded fasteners (ISO metric coarse thread series)
AS/NZS 4680 –2006	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 4791 -2006	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialised process.
AS/NZS 4792 -2006	Hot-dip galvanized (zinc) coatings on ferrous open sections, applied by a continuous or specialised process.
AS 4750 - 2003	Electrogalvanized (zinc) coatings on ferrous and open sections
AS/NZS 1559 -1997	Hot-dip galvanized steel bolts with associated nuts and washers for tower construction
AS 2483 2003	Metal finishing – Recommended sampling plans for the inspection and testing of coatings (ISO 4519:1980, Mod)
AS 1247- 2004	Metallic coatings – Rating of test specimens and manufactured articles subject to corrosion tests
AS 2331.3.11 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests – Chemical residue tests – Chemical residue tests
AS 2331.3.2 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests – Chemical residue tests – Acetic acid salt spray test (ASS test)
AS 2331.3.3 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests – Chemical residue tests – Copper accelerated acetic acid salt spray test (CASS test)

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AS 2331.3.4 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests – Thioacetamide anti-tarnish and porosity tests
AS 2331.3.5 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests – Sulfur dioxide/hydrogen sulfide porosity tests
AS 2331.3.6 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests – Electrographic porosity tests
AS 2331.3.7 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests – Corrodokote (Corr) test (ISO 4541:1978.Mod)
AS 2331.3.8 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests- Humidity test –24 hour cycle – Damp heat
AS 2331.3.9 – 2001	Methods of test for metallic and related coatings - Corrosion and related property tests – Metallic coatings – Porosity tests – Ferroxyll test
AS 2331.3. 1–2001	Methods of test for metallic and related coatings – Corrosion and related property tests – Neutral salt spay (NSS) tests
AS 2331.0 –2001	Methods of test for metallic and related coatings – Introduction and list of methods
AS 2331.1.1 –2001	Methods of test for metallic and related coatings – Local thickness tests – Micrographic examination of cross section
AS 2331.1.2 –2001	Methods of test for metallic and related coatings – Local thickness tests – Colourmetric method
AS 2331.1.3 –2001	Methods of test for metallic and related coatings – Local thickness tests – Magnetic method
AS 2331.1.4 –2001	Methods of test for metallic and related coatings – Local thickness tests – Magnetic induction and eddy current method
AS 2331.1.5 –2001	Methods of test for metallic and related coatings – Local thickness tests – Beta backscatter method
AS 2331.4.2 – 1990	Methods of test for metallic and related coatings – Physical tests – Ductility test
AS 2331.4.1 – 2001	Methods of test for metallic and related coatings – Physical tests – Qualitative adhesion tests
AS 2331.4.4 – 2001	Methods of test for metallic and related coatings – Physical tests – Assessment of intensity of shot peening.
AS 2331.2.1 –2001	Methods of test for metallic and related coatings – Test for average coating mass per unit area or for thickness. Dissolution methods – Strip and weight analytical
AS 2331.2.3 –2001	Methods of test for metallic and related coatings – Test for average coating mass per unit area or for thickness. Hydrogen evolution method for zinc coatings
AS/NZS 1580.205.3 -1997	Paints and related materials – Methods of test – Application properties – Roller coating
AS/NZS 1580.481.0 -2003	Paints and related materials – Methods of test – Coatings – Guide to assessing paint systems exposed to weathering conditions
AS/NZS 1580.481.5 -1993	Paints and related materials – Methods of test – Durability and resistance to fouling – Marine underwater paint systems
AS/NZS 1580.481.1.10 -1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of flaking and peeling
AS/NZS 1580.481.1.11-1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of chalking
AS/NZS 1580.481.1.12 -1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of colour change
AS/NZS 1580.481.1.13 -1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of fungal and algal growth
AS/NZS 1580.481.1.2 -1998	Paints and related materials – Methods of test – Exposed to weathering – Discoloration (including bronzing)

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AS/NZS 1580.481.1.3 -1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of dirt collection
AS/NZS 1580.481.1.4 -1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of dirt retention (after washing)
AS/NZS 1580.481.1.5 -1998	Paints and related materials – Methods of test – Exposed to weathering – Change in gloss
AS/NZS 1580.481.1.6- 1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of erosion
AS/NZS 1580.481.1.7 -1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of checking
AS/NZS 1580.481.1.8 -1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of cracking
AS/NZS 1580.481.1.9 -1998	Paints and related materials – Methods of test – Exposed to weathering – Degree of blistering
AS 1580.481.5 - 2004	Paints and related materials – Methods of test – Coatings – Durability and resistance to fouling – Marine underwater paint systems
AS 3894.4 - 2002	Site testing of protective coatings – Assessment of degree of cure
AS 3894.1 - 2002	Site testing of protective coatings – Continuity testing – High voltage (brush) method
AS 3894.9 - 2002	Site testing of protective coatings – Determination of adhesion
AS 3894.3 - 2002	Site testing of protective coatings – Determination of dry film thickness
AS 3894.6 - 2002	Site testing of protective coatings – Determination of residual contaminants
AS 3894.5 - 2002	Site testing of protective coatings – Determination of surface profile
AS 3894.7 - 2002	Site testing of protective coatings – Determination of surface temperature
AS 3894.11 - 2002	Site testing of protective coatings – Equipment report
AS 3894.12 - 2002	Site testing of protective coatings – Inspection report - Coating
AS 3894.13- 2002	Site testing of protective coatings – Inspection report - Daily
AS 3894.14 - 2002	Site testing of protective coatings – Inspection report – Daily painting
AS 3894.10 - 2002	Site testing of protective coatings – Inspection report – Daily surface and ambient conditions
AS 3894.0 - 2002	Site testing of protective coatings – Introduction and list of test methods
AS 3894.2 - 2002	Site testing of protective coatings – non-conductive method – Continuity testing – Wet sponge method
AS 3894.8 - 2002	Site testing of protective coatings – Visual determination of gloss
AS 1397 - 2001	Steel sheet and strip – Hot-dip zinc coated or aluminium/zinc coated
AS/NZS 4506 –2006	Thermoset powder coatings
AS/NZS 4534 -2006	Zinc and zinc/aluminium alloy coatings on steel wire
AS 4848.1 - 2006	Application specifications for coating systems – Single coat inorganic (zinc) silicate – Solvent-bourne.
AS 5056 - 2006	Powder metal (and composites) applied by mechanical means at ambient temperature.



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# 01 - SPECIFIERS MANUAL – THIRD EDITION

Industrial Galvanizers Australian Galvanizing Division (IGAG) operates nine galvanizing plants around Australia, ranging in size from large structural galvanizing facilities to specialised small plants designed to process small parts.

The Australian Galvanizing Division has galvanized in excess of 2 million tonnes of steel products in Australia since its first plant was commissioned in 1965 and is recognized for its ability to handle complex and difficult projects, as well as routine contracts.

This experience has been collated in the Specifiers Design Manual, to assist those involved in the design of steel products and projects to better understanding the galvanizing process and allow the most durable and cost-effective solutions to be delivered to these products and projects. All sections of this Third Edition have been completely updated and additional sections have been included to provide additional technical information related to the use of hot dip galvanized steel.

In addition to its Australian Galvanizing operations, Industrial Galvanizers Corporation has a network of manufacturing operations in Australia, as well as galvanizing and manufacturing businesses throughout Asia and in the USA.

The company's staff in all these locations will be pleased to assist with advice on design and performance of hot dip galvanized coatings and products. Contact details for each of these locations are located elsewhere in this manual.

This edition of the Industrial Galvanizers Specifiers Manual has been produced in both html and .pdf formats for ease of access and distribution and all documents in the Manual are in .pdf format and can be printed if paper documents are required.

The Specifiers Manual is also accessible in its entirety on the company's web site at [www.ingal.com.au](http://www.ingal.com.au).

Additional copies of the Specifiers Manual are available on CD on request.

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