

# 29. AS/NZS 4680:2006

## INTRODUCTION

Australian Standard AS/NZS 4680:2006 – Hot dip galvanized (zinc) coatings on fabricated ferrous articles is the defining standard for hot dip galvanized coating specifications in Australia. It is closely aligned with the International Standard ISO 1461:1999 – Hot dip galvanized coatings on fabricated ferrous products, in keeping with the Australian Governments policy of aligning all Australian standards with appropriate international standards.

AS/NZS 4680 defines the minimum requirements for coating mass (thickness) for various steel sections, methods of test and repairs to galvanized coatings, as well as containing informative information on design for galvanizing, surface preparation for painting and metallurgical information.

Some of the key parts of the Standard have been reproduced here in condensed form. Copies of all Australian and International standards can be downloaded from the Standards Australia web site at [www.standards.com.au](http://www.standards.com.au).

## ASSOCIATED STANDARDS

The original galvanizing standard, AS 1650:1989, has been replaced by a series of standards dealing with each type of galvanized product; sheet, wire, tube and after fabrication galvanized products. This has resolved a deal of confusion as each product and process produced galvanized coatings of differing durability and metallurgical characteristics. The additional standards are:

- AS**  
1397 Steel sheet and strip—Hot-dipped zinc-coated or aluminium/zinc coated
- AS/NZS**  
**4534** Zinc and zinc/aluminium-alloy coatings on steel wire
- 4791** Hot-dip galvanized (zinc) coatings on ferrous open sections, applied by an in-line process
- 4792** Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialised process.

## COATING THICKNESS SPECIFICATION

AS/NZS 4680:2006 specifies minimum coating thickness requirements for steel of various section thicknesses. While most galvanized coatings are classified by the mass of the galvanized coating in g/m<sup>2</sup>, the practical requirements of testing and measuring galvanized coatings non-destructively require the coating thickness to be a measure of conformance.

Because of the variations inherent in the steel chemistry, surface condition and the nature of the hot dip galvanizing process, both local minimum coating thickness and average coating thickness levels are nominated in the Standard.

Small parts may be galvanized using a centrifuge process to remove excess zinc from the components. This produces a galvanized coating that contains less free zinc than those that are galvanized using standard hot-dipping procedures. The coating thickness characteristics produced by these processes are reflected in the following tables

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

Article thickness mm	Local coating thickness minimum $\mu\text{m}$	Average coating thickness minimum $\mu\text{m}$	Average coating mass minimum $\text{g}/\text{m}^2$
<1.5	35	45	320
>1.5 <3	45	55	390
>3 <6	55	70	500
>6	70	85	600

**REQUIREMENTS FOR COATING THICKNESS AND MASS  
FOR ARTICLES THAT ARE CENTRIFUGED**

Thickness of articles (all components including castings) mm	Local coating thickness minimum $\mu\text{m}$	Average coating thickness minimum $\mu\text{m}$	Average coating mass minimum $\text{g}/\text{m}^2$
<8	25	35	250
>8	40	55	390

**NOTE:** 1  $\text{g}/\text{m}^2$  coating mass = 0.14  $\mu\text{m}$  coating thickness.

### PURCHASER OBLIGATIONS

A large variety of items are delivered to the galvanizer for processing. These items vary in design, steel chemistry, surface condition and end-use requirements. There are obligations on the purchaser of the galvanizing service to provide information to the galvanizer as to the characteristics of the item to be galvanized and any specific requirements related to its application.

To ensure that the end-result is satisfactory, the purchaser needs to supply the following information to the galvanizer. These purchaser obligations are included in the Standard. Some of the more significant purchaser obligations are:

1. Reference to AS/NZS 4680 as the basis of the galvanizing specification.
2. The nature, chemical composition and mechanical properties of the product to be galvanized, and its end use
3. Whether a passivation coating is required.
4. Whether removal of surplus zinc on threads is required Requirements for independent testing, if applicable.
5. Location of significant surfaces.
6. Any special or supplementary requirement of the coating, e.g. for a special finish such as powder coating, or requirements for pretreatment or post-treatment.
7. Any special coating thickness requirements.
8. Instructions for renovation of damaged or uncoated areas

### STEEL CHEMISTRY

Most ferrous metals used for structural applications can be satisfactorily hot-dip galvanized. Where there is uncertainty about other types of ferrous metals, adequate information, or samples, should be provided by the purchaser to the galvanizer to decide whether they can be satisfactorily galvanized.

Steels containing higher than standard levels of sulfur, silicon or phosphorous can produce thick galvanized coatings that are not of uniform appearance and have lower impact resistance than galvanized coatings on standard grades of steel.

### **STRESSES IN THE BASIS METAL**

AS/NZS 4680: 1999 contains information on stresses giving rise to distortion and embrittlement of the steel arising from the hot dip galvanizing process. These issues are covered in more detail elsewhere in the INGAL Specifiers Manual.

### **EXTENT OF REPAIRABLE DAMAGED OR UNCOATED AREAS**

One of the contentious issues associated with hot dip galvanized coatings is the allowable extent of damaged or missing coating that can be repaired. This aspect is covered precisely in AS/NZS 4680.

The Standard nominates that the sum total of the damaged or uncoated areas shall not exceed 0.5% of the total surface area or 250 cm<sup>2</sup>, whichever is the lesser, and no individual damaged or uncoated area shall exceed 40 cm<sup>2</sup>. Where the design of the item or fabrication makes larger uncoated areas unavoidable, uncoated areas greater than 40 cm<sup>2</sup> shall be repaired.

### **REPAIR REQUIREMENTS**

AS/NZS 4680:1999 nominates coating repair requirements for damaged or uncoated areas. While these recommendations may produce satisfactory results, this section of the Standard does not reflect industry best practice.

This differs from AS/NZS 4680. Single pack organic zinc rich paint, containing 90% zinc by weight in the dry film, is used throughout the industry for touch-up and repair, unless specified by the client. The Galvanizers Association of Australia endorses this procedure.

Inorganic zinc rich paints are not considered suitable as touch-up coatings for galvanized products because the surface preparation requirements specific to uncoated steel will damage the galvanized coating adjacent to any area being repaired.

### **SWEEP (BRUSH) BLAST CLEANING OF GALVANIZED STEEL PRIOR TO PAINTING**

A frequent problem arises with inexperienced painting contractors painting over hot-dip galvanized coatings, where abrasive blasting is required as the surface preparation. This has been addressed in AS/NZS 4680 and the surface preparation procedure nominated in the standard should always be referenced when painting over galvanizing is specified. This process is covered in more detail elsewhere in the INGAL Specifiers Manual.

### **SUMMARY**

AS/NZS 4680:2006 should be used as the reference document when specifying hot dip galvanized coatings. This Standard is subject to periodic reviews to ensure that it remains current with industry best practice. It is also aligned with the major international galvanizing standards, particularly the ISO Standard, ISO 1461:1999.



# INGAL

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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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