Asia Pacific Edition
HOT DIP GALVANIZED STEEL

galvanize 76
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CHANGES TO AS/NZS 2312 ON HOT DIP GALVANIZING

The new Part 2 of the AS/NZS 2312 Standard on hot dip galvanizing (HDG) allows designers to more accurately estimate the durability of HDG coatings whilst providing detailed specification advice for duplex coatings, the effect of the steel chemistry and illustrating good design practice.

In this issue

Editorial
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Austin Health – Walton Constructions

As such, it will serve as an essential aid for engineers, architects, specifiers and consultants for many years to come.

AS/NZS 2312, *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings*, originated in 1967 as a guide for steel designers on methods for the corrosion protection of structural steel. The previous revision (2002) incorporated much information on the common methods of corrosion protection, including paint, HDG, thermal spray, powder coating and wrapping systems.

Unfortunately the complexity of designing and specifying protective paint systems meant that much of the useful HDG information was lost in the detail of the other systems.

During the process of reviewing the old Standard it was recognised that steel designers would benefit by separating it into product-specific sections to avoid confusion. The revised Standard was released in December 2014 in two parts, covering paint systems and HDG with both using the same definitions from AS 4312 for corrosivity categories in Australia, but now clearly recognising that the design process and durability of the two products are very different.

Designers wishing to specify batch galvanizing need only use two Standards; one covering the design and durability of HDG steel (AS/NZS 2312.2) and the other dealing with the manufacturing process and tolerances (AS/NZS 4680).

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CHANGES TO AS/NZS 2312 ON HOT DIP GALVANIZING

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Improved durability selection

AS/NZS 2312.2 references the latest international corrosivity (ISO 9223/ISO 9224) and design Standards for HDG (ISO 14713). This means that the design durability (life to first maintenance) of HDG now aligns long-term performance results from Australia with world recognised Standards increasing the estimated life for HDG coatings on structural steel.

Life to first maintenance of hot dip galvanized steel complying to AS/NZS 4680

AS/NZS 4680 (manufacturing)				AS/NZS 2312.2 (durability)				
Steel thickness	Coating mass & thickness[1]		Designation	Corrosivity category[2] & Life to first maintenance (years)				
mm	g/m^2	µm		C2 Low	C3 Medium	C4 High	C5 Very high	CX Extreme
>1.5 to ≤3.0	390	55	HDG390	78->100	26-78	13-26	6-13	2-6
>3.0 to ≤6.0	500	70	HDG500	>100	33-100	16-33	8-16	3-8
>6.0	600	85	HDG600	>100	40->100	20-40	10-20	3-10
>>6.0	900	125[3]	HDG900	>100	60->100	30-60	15-30	5-15

1 For articles galvanized to AS/NZS 4680 the steel thickness defines the coating thickness produced.

2 Corrosivity categories are defined in Clause 6 of AS/NZS 2312 Part 2.

3 HDG coatings thicker than 85µm are not specified in AS/NZS 4680, however in conjunction with the galvanizer, a specification may be written for thicker coatings.

James Cook University

The durability of a batch HDG coating is now calculated from the minimum average coating thickness in AS/NZS 4680, which also means non-standard HDG thicknesses can be easily assessed for estimated life to first maintenance.

New design advice

AS/NZS 2312.2 includes design advice on how the chemistry of some steels can be used to develop thicker coatings or when more durability is required than standard.

An all new and detailed section on the design of duplex coatings (paint over HDG) is included with two performance options for durability (aesthetic and corrosion). The Standard recognises a properly specified, applied and maintained duplex system will increase the service life of the HDG article beyond that of the unpainted article. Further, the total life of that duplex coating system is significantly greater than the sum of the lives of the HDG coating and the paint coating alone (by 1.5 – 2.3 times, depending on the environment).

AS/NZS 2312.2 also identifies seven standard decorative and industrial paint systems suitable for most corrosivity environments and applications.

Appendices to the Standard also cover corrosion in different environments, including bimetallic corrosion and the interaction of HDG steel with soil, concrete, water, chemicals, and wood.

More information and free training on the use of AS/NZS 2312.2 and HDG in general is available from the GAA [**www.gaa.com.au**]

Peter Golding is Chief Executive Officer of the Galvanizers Association of Australia. He has 25 years of experience in the steel industry, has co-authored the *Australian steelwork corrosion and coatings guide* published by the Australian Steel Institute (**www.steel.org.au**) and was the Drafting Leader of the Standards Australia committee for AS/NZS 2312.2 on galvanizing.

Peter Golding
Chief Executive Officer
Galvanizers Association of Australia

HELLISH TEST ENVIRONMENT CONTAINED

The Victorian Emergency Management Training Centre in action.
Photo courtesy of Major Projects Victoria

The durability provided by hot dip galvanized (HDG) steel is proving its mettle in withstanding exposure to fire, water and chemical residue that is all in a day's work at the Metropolitan Fire Brigade's (MFB) Victorian Emergency Management Training Centre.

Located in Craigieburn, north of Melbourne, the facility provides fire fighters and all other Victorian emergency management with modern training facilities and infrastructure to train together in realistic emergency situations.

The centre has areas that simulate the situations emergency services personnel typically face which include fires at a shop front, service station or petrochemical facility through to searching collapsed buildings, carrying out road rescues and an emergency in a railway tunnel.

Within the facility is a large seven-storey prop complete with car park offering emergency training for high-angle and aerial rescue. Internally the building is fitted out with various fires and smoke spread situations that a fire fighter would encounter in a city multistorey building.

The petrochemical plant was nearly entirely constructed from HDG steel whilst 88 percent of all buildings, including all handrails, had some HDG component with 280 tonnes of steel in total.

> This job is unique in that it is believed to be the first project of this sort to use HDG steel to such an extent.

Odd shaped handrails were specified which required precision handling to ensure venting, minimise draining and distortion issues as well as enhance aesthetics.

Being involved from the design stage with the architect and fabricator, the galvanizer could ensure all members were designed with HDG in mind and the facility met MFB requirements the first time with regard to fit and finish. The good working relationship was also maintained from early in the project with the engineers, transport companies and riggers.

This job is unique in that it is believed to be the first project of this sort to use HDG steel to such an extent. The use of HDG steel also means little maintenance is required by facility managers after each training session and during the life of the product.

This project was the winner of the Australian Institute of Project Management (AIPM) 2014 Project of the Year and 2014 Construction / Engineering project over $100 million. It was also a GAA 2014 Sorel Award finalist.

PROJECT TEAM

Developer/Owner: Metropolitan Fire Brigade
Client advisor: FIDUN
Architect: Woods Bagot
Project Manager: Major Projects Victoria
Builder: Leighton Contractors
Steel Fabricator: Structural Challenge
Specialist Fire Services: HAAGEN
Engineering Services: Umow Lai
Hot Dip Galvanizer: Kingfield Galvanizing.

GLISTENING SKIN GIVES STYLE TO TROPICS

Hot dip galvanizing and weathering steel combine to provide a stunning contrast clearly visible from the nearby main road.

A university building in North Queensland proves once again that hot dip galvanized (HDG) surfaces can lift the appeal of prominent architectural features without additional treatments required.

This project joins the Lavarack Barracks, Daintree Discovery Centre and Cairns Futsal Stadium where HDG provides corrosion protection, durability and a stunning visual impact. It has already been the subject of a seven-page spread in the Architecture Australia magazine's March 2014 edition.

The Cairns Institute building is encompassed by a super-sized hot dip galvanized steel lattice skin, or 'trellis', shielding the building whilst connecting it to its tropical rainforest setting. Among other elements it comprises over 4km of HDG strapping and 10,000 structural bolts with around 58 tonnes of galvanized steel in total.

The landmark building supports James Cook University's aim to become one of the world's leading research universities in the tropics.

The landmark building supports James Cook University's aim to become one of the world's leading research universities in the tropics, facilitating research activities in social sciences, humanities and other related fields of tropical knowledge.

Inside the trellis, the tall two-storey structure is essentially three buildings; a long rectangular research and office wing and two oval 'pods', the lecture theatre, and the seminar pods, all of which are linked together by a two-storey high exhibition and display foyer.

This project is a visually stunning example of the appropriateness of HDG for a tropical environment. While the galvanizing in this project was not particularly difficult or unique, comprising mainly straight RHS and flat sections, all the galvanizing is visible, both from the outside and inside of the building.

The HDG used to treat the trellis encapsulates aesthetics and sun control. There were also more standard items galvanized such as interior stairs. All external steelwork was HDG treated which presented logistical challenges as the nearest galvanizing plant is many kilometres away.

The galvanizer's professional in-house software and communication procedures with the local contractors meant the project was seamless from a customer viewpoint. The company worked closely with the steel fabricator to achieve the exact finish required and coordinate the processing and delivery to site to meet construction time lines.

This project was awarded Commendations for Interior Architecture and Public Architecture in the 2014 Australian Institute of Architects, Queensland Chapter awards. It was also a GAA 2014 Sorel Award finalist.

Here the hot dip galvanized trellis combines with a modern skin to complete the building entrance.

PROJECT TEAM

Developer/Owner: James Cook University
Architects: Woods Bagot, RPA Architects
Urban Design: Andrew Prowse Landscape Architect
Civil and Structural Engineer: Flanagan Consulting Group
Project Manager: Hansen Yuncken
Main Contractor: Hansen Yuncken
Steel Fabrication and Detailing: CSF Steel Fabricators
Hot Dip Galvanizer: Australian Professional Galvanizing
Photography: Galvanizers Association of Australia

CRITICAL RAIL LINK REVIVED

The successful restoration of a busy rail bridge in regional NSW and the completion within a short installation window proved again how the use of hot dip galvanized (HDG) steel can help meet tight deadlines.

At 133 years old, the rail bridge over the Macquarie River at Wellington, NSW is a critical part of the State's rail network links freight and high-speed passenger services between Sydney and Dubbo. Originally opened in 1881, the bridge recently underwent major repairs with steel cross-braces and stringers all replaced and the structure renovated providing an extra 100-year design life.

The galvanizers employed their corrosion mapping model to predict the coating life which confirmed that the 180 tonnes of HDG on the structural beams (coated to at least HDG 600) gave an average life of at least 100 years with minimum maintenance.

The Wellington Rail Bridge was one of twelve similar bridges designed for John Whitton (Engineer in Charge – Rail Bridges) by Sir John Fowler, who also co-designed the Firth of Forth Bridge in Scotland and the London Underground. Increasingly, the main girders of these bridges are being replaced to reduce maintenance and carry heavier train-loads, but the characteristic latticework remains in place.

As a crucial link in the State Rail network, an extended outage was not possible so deft planning was required to streamline work onsite. Planning of this major refurbishment took 18 months as well as seven weeks of pre-work at the site so the bridge would only be out of action for 16 days to carry out the replacement of the steel deck.

As the former steelwork was coated with red-lead paint, the structure required encapsulation to ensure no paint flakes were discharged into the river below.

The galvanizers employed their corrosion mapping model to predict the coating life which confirmed the 180 tonnes of HDG on the structural beams (coated to at least HDG 600) gave an average life of at least 100 years with minimum maintenance.

The use of pre-treated HDG steel eliminated potential weather delays that would have been an issue with onsite coating options and eliminated the need for remedial touch-ups after erection. Being prepared off-site, the steel sections were delivered ready to assemble.

Teamwork was necessary to ensure all the HDG components were delivered on-time for the start of the project and were placed in the correct sequence in the lay-down area.

Communication continued throughout the project and teamwork was critical in fabricating and galvanizing a number of components that were required overnight to keep to the tight schedule such as galvanizing of additional items like shims and spacers to maintain the replacement schedule.

This project was a GAA 2014 Sorel Award finalist.

PROJECT TEAM

Asset Owner: Transport NSW
Steel Specifier: John Holland
Engineer: John Holland
Steel Fabricator: Tubular Steel Manufacturing
Principal Contractor: John Holland CRN
Hot Dip Galvanizer: Industrial Galvanizers

Installation of over 300 galvanized cross-braces required a round-the-clock effort to ensure this vital bridge link was returned to operation on schedule.

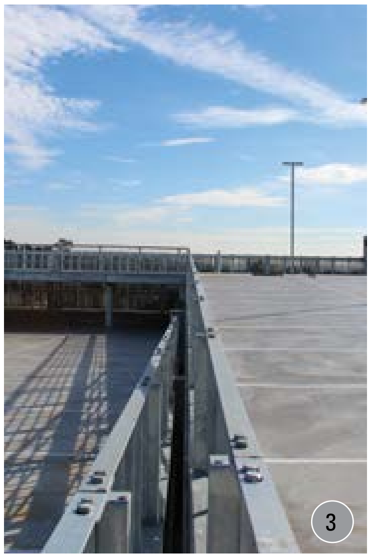
Riveted fasteners were replaced to facilitate speedy removal of the old cross-beams during the 16-day outage.

Galvanized stringers being secured to the newly-installed cross-braces.

CARING FOR GROWING HOSPITAL CAR PARK

1

2



3

4

Recent improvements of the car park of Austin Hospital in Melbourne showed that hot dip galvanizing (HDG) with steel frame construction can speed construction time, ease trades and congestion onsite, increase safety and ensure the asset will be protected against corrosion for decades to come.

The car park has been extensively expanded over the past decade at what is the largest hospital redevelopment ever undertaken in Victoria, and one of the largest in Australia.

Structural beams, cable trays, handrails and lighting towers were all galvanized in this 1800-tonne project.

Lay down area was extremely limited in the existing operating car park so each load of steel had to be tightly sequenced. Daily meetings between the steel fabricator and galvanizer ensured the delivery schedule was met minimising storage of galvanized items onsite.

They also held venting and draining education sessions ensuring steel sections were correctly prepared for galvanizing. This reduced rework, improved turnaround times as well as quality and ensured that all the steel was available for delivery in its scheduled load lot.

Galvanized steel arriving onsite could be immediately craned into position.

The steel fabricator adopted bolted angle connections to improve fabrication efficiency whilst making structural members an ideal size for galvanizing.

> This project was the International Award winner in the 2015 American Galvanizers Association – Excellence in Hot-Dip Galvanizing Awards and was a GAA 2014 Sorel Award finalist.

The need for off-site preparation and the lack of onsite storage meant any protective coating on the steel needed to be tough and resistant to handling damage as it would be craned directly into position from the back of the transport.

To enable shear studs to be welded to the hot dip galvanized beams, stop-off or masking paint in different widths was applied to specified beams to prevent the zinc coating bonding to the steel during galvanizing. The galvanizer treated over 2000 individual pieces this way.

This project was the International Award winner in the 2015 American Galvanizers Association – Excellence in Hot-Dip Galvanizing Awards and was a GAA 2014 Sorel Award finalist.

PROJECT TEAM

Asset Owner: Austin Health
Architects: Clarke Hopkins Clarke
Principal Builder: Walton Constructions/Built
Steel Specifier: Robert Bird Group
Steel Fabricator: Page Steel
Hot Dip Galvanizer: Industrial Galvanizers
Photographer: Industrial Galvanizers

1. *The extension of the Austin Hospital car park made extensive use of a galvanized structural steel frame and reinforced concrete, combined to produce a stunning and attractive addition.*
2. *The installation of angled louvres to the galvanized framework produce a colourful, patterned exterior that creates delightful reflections from the sunlight. It also provides significant ventilation and breaks up the angular lines of the car park structure.*

3-6. *Extensive use of HDG fasteners complement the overall design and allow for significantly reduced assembly time and costs.*

7. *Fully exposed galvanized steel beams support Bondek which has been used to form up the reinforced concrete slab that creates the next parking level.*

NEW DIGITAL APP GALVANIZE

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