Going beyond face value with quality checks

By PETER GOLDING
Chief Executive, Galvanizers Association of Australia (GAA)

With demand for steelwork during the recent resources boom unearthing widespread confusion between what constitutes proper inspection requirements of coatings and hot-dip galvanizing (HDG), a formal, independent course to help engineering practices and steel businesses confirm the required corrosion protection has been developed.

Over the past ten years the rapid development of large-scale resources projects tested Australian supply chains, with many new international suppliers and customers entering the market. In many cases the international suppliers were unaware of the harsh Australian conditions, often leaving customers dissatisfied with the product's performance.

In many cases, asset designers were distant from project fabrication sites while the asset locations were often remote from everywhere, meaning that the components had to be inspected before despatch as there were no facilities to repair onsite.

Project managers looked for qualified local HDG inspectors and found there were none. However, there were plenty of qualified coating inspectors and most project managers saw HDG and paint as a coating that could be inspected in the same way.

As a result, Australian galvanizers have recognised a need to develop an industry consensus among designers, fabricators, galvanizers and end-users for the inspection of HDG steel.

Any experienced galvanizer would know that coating specification writers and accredited coating inspectors are trouble for galvanizers, as they have no formal galvanizing training. For example, both NACE and SSPC coatings courses spend about 30 minutes discussing HDG despite the courses consisting of around 60 hours of training.

Thus, paint inspectors often don't recognise the differences between paint and galvanized coatings and many specifications for coatings don't accurately describe the inspection requirements for galvanized coatings.

We have seen many reports written by inspectors which cost the galvanizers and their clients many thousands of dollars and lots of management time just because they don't understand the product they are inspecting.

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We considered all the options and alternatives, ranging from doing nothing to developing an Australian and New Zealand solution.

Formal training needed to be developed for both independent inspectors and galvanizer inspection personnel alike and they needed to be taught in the same manner with the same literature.

The course needed to be conducted at a galvanizing plant with a significant hands-on component. The course work needed to be written by highly experienced galvanizing industry personnel so that it dealt with the real issues and inspection training developed by highly experienced coating inspectors to get a real understanding of how inspection works on a day-to-day basis.

And, as our region is truly international and imported parts can be galvanized to different Standards, the inspection course needed to cover all the ISO, ASTM and Australian and New Zealand galvanizing Standards.

We decided that independent accreditation and assessment would deliver value to both the galvanizers and inspectors alike.

The outcome was the Hot-Dip Galvanizing Inspector Program jointly developed by the two local galvanizing associations (GAA and GANZ) and the Australasian Corrosion Association (ACA) which is a well-respected organisation with an extensive training arm including delivery of NACE and SSPC coating inspector programs in the region, together with some Asian locations.

The prerequisites are simple, with the need to have either a NACE coatings inspector accreditation or have worked in a galvanizing company for more than 12 months. We are also looking at offering the course to people with other appropriate technical experience.

The structure of the course ensures that inspectors understand good quality galvanizing starts with good quality fabrication so a portion of the course describes the assessment of the suitability of fabricated steel articles for the HDG process.

Another aspect deals with measurement of the coating thickness and a visual assessment of the product. It also shows the attendees how the various Standards differ and how to conduct a statistical inspection to ensure compliance to the relevant Standard.

Participants who complete the course can recognise inspectors' common duties, responsibilities and authority, use galvanized coating inspection equipment according to the manufacturers guidelines, understand and identify 33 design, fabrication and galvanizing issues, prepare an inspection plan/procedure and scrutinise and document galvanized coatings.

The ACA and GAA are keen to talk with interested engineering and fabrication companies to expand the reach of the course and aim to deliver long-term improvement in quality through education in design and best practice in fabrication for galvanizing.

Guaranteed protection draws latest Sorel praise

A hot-dip galvanizing (HDG) offer which took advantage of the Galvanizers Association of Australia's (GAA) work on warranties and industry Standards for a new ALDI distribution warehouse in suburban Perth has topped the Sorel Awards for 2016.

The award-winning aspect of this entry from Hartway Galvanizers Naval Base was the development of a warranty provision that reduced the level of risk of maintenance borne by the project owner, convincing them to depart from ALDI's standard coating specification of red oxide paint and accept HDG as the superior treatment.

Hartway used the GAA's Life Cycle Costing Calculator (LCCC) along with presentation of reduced lead and delivery times to convince the fabricator HDG was a viable option and convince them to recommend this up the chain.

GAA Life Members, **Colin Bain** and **Mike Dennett** kindly returned as award judges, between them bringing over 60 years of galvanizing industry-related experience and nous to the deliberations.

They commented that the nature of this project could provide a template for similar projects in the future as Australian industry becomes more risk adverse with the issue of non-conforming building products hitting the headlines.

Of the four entries shortlisted, two featured adventure playgrounds located in corrosive seaside environments.

HDG helped shore up the durability of monster-sized parts of the Mega Adventure and Sky Peak entry by Galvatech which incorporate 200 tonnes of steelwork offering a collection of traversing-at-height and vertical adventure challenges. The judges considered this entry on fun facilities in coastal Adelaide and western Sydney worthy of a Special Commendation on two counts; namely the high visibility of the HDG coating and the low maintenance the treatment will give the owners.

The other two entries involved treatment of the castle-shaped playground in Adelaide by Kingfield Galvanizing and National Galvanising Industries' work on shoring up the façade of a busy Queensland hospital carpark which serves both as a decorative skin and safety crash barrier.

Entries were assessed using the methodology first adopted in 2008. This involved allocating points on four important criteria:

- Market development potential for the industry (30 points max)
- Technical and engineering innovation (30 points max)
- Economic benefit for the user (20 points max)
- Environmental and social responsibility exhibited by the project (20 points max)

Using this methodology, two entries were tied after the second round of judging and on the third round a winner was decided by a small margin of five points.

The Sorel Award commemorates French civil engineer Stanislaus Sorel who filed a patent in 1837 for a method of protecting iron from rust - the parent of the HDG process. The 2017 Sorel Awards will be open for entries this coming June.

WINNER: Hartway Galvanizers (ALDI distribution warehouse, Perth)

Using simple modelling based on information from the GAA and industry Standards (AS 4312, AS/NZS 2312.2, AS/NZS 4680) Hartway was able to offer a reliable, low-risk alternative to the original specification that found favour with the client. To secure the asset owner's approval, they had to be convinced that changing from the original specification of red oxide was low risk and would produce benefits which outweighed the cost of changing the design.

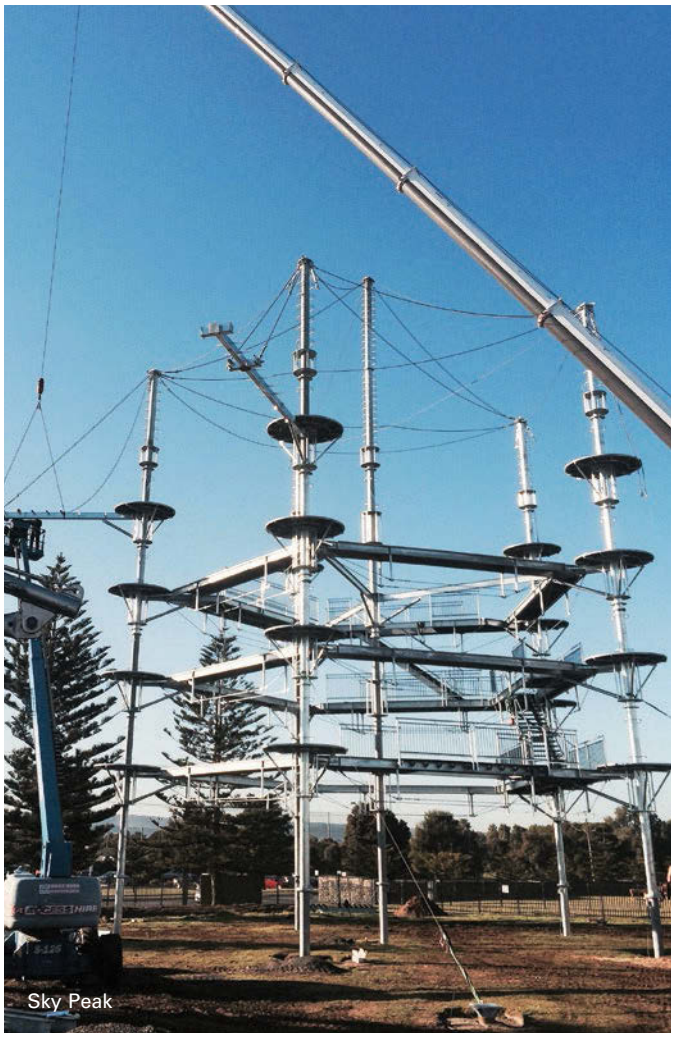
ALDI distribution warehouse

All the structural steel (bar the purlins) was to be galvanized, meaning that the trusses needed to be redesigned to fit the bath.

As they were originally 27 metres long by about two metres high in single sections, splices had to be included and bolting plates added to make them fit. Use of the GAA's LCCC and presentation of the reduced lead time, ability to deliver on-time and site and erection resilience helped convince the fabricator, Metro Steel that HDG was a viable option and convince them to recommend this up the chain. In January 2016, Hartway issued a 10-year warranty for the coating to the fabricator before dipping a single piece of steel. This convinced the asset owner that the move was low-risk and in the same month, the order came through to start the project. That March, with all the steel coated and installed, ALDI then requested a warranty for 25 years to close out their Master Deliverables Register which was easily assessed using the data from AS/NZS 2312.2 and the amended warranty was issued.

PROJECT TEAM:

Developer/Owner: ALDI Stores
Architect: Oldfield Knott
Specifier: Pritchard Francis
Project Manager: Georgiou
Main Contractor: Metro Steel
Hot Dip Galvanizer: Hartway Galvanizers
Other: AD Coote (light pole information)



Sky Peak

SPECIAL COMMENDATION: Galvatech (Mega Adventure/Sky Peak)

Mega Adventure and Sky Peak Adventures are state-of-the-art aerial adventure rope parks for those who like to challenge themselves. The same design, engineering, fabrication and galvanizing team contributed to the new structures located hundreds of kilometres apart. All of the entire superstructures and their components were galvanized, including 29 columns, 100 'cloud stations' (platform bases), 320 span anchor assemblies (with five components each), stairs, stringers, platforms, stays, bracing beams, brackets, sky gate chassis and balustrading as well as a three-metre engineered spigot for the tree foundation at the Sky Peak Adventure Park. Large pipes used for the columns presented particular logistical challenges supplied to the fabricator with a thick black paint or lacquer coating removed via abrasive blasting before any fabrication to make it easier for welding and HDG treatment. Additionally, columns of over 9.3 metres were double end dipped and extra holes drilled for drainage and venting.

PROJECT TEAM:

Architect: Touch Cloud Global
Engineer: Partridge Engineering
Project Manager: Touch Cloud Global
Main Contractor: Touch Cloud Global
Hot Dip Galvanizer: Galvatech
Steel Fabricator: Codmac Engineering
Steel Suppliers: OneSteel, Southern Steel, Orrcon Steel, Horan Steel

St Kilda Adventure Playground

Sunshine Coast University Hospital Carpark

Fero's new WA digs make it leading big dipper

The Fero Group has invested over $30 million to design and build an advanced new hot-dip galvanizing plant with the nation's largest zinc kettle to treat more bulky components and almost double productive output.

Located at the Fero Group site in the Perth suburb of Kewdale with hardstand and workshops occupying over 100,000sqm, the new facility boasts Australia's largest zinc kettle with 46m3 more capacity than the next largest.

The kettle is 15 metres long, 2.2 metres wide and 3.6 metres deep able to contain the equivalent of four F150 trucks which is over twice the volume of the next largest kettle in WA, providing more opportunity for bigger articles. It also commissioned a fully automated centrifuge plant to galvanize small articles.

The main galvanizing plant is separated into two zones – standard dips and double dips. The standard dipping area consists of seven dedicated bays for jigging/un-jigging of steel whilst its dedicated double dip area ensures minimal interference with the galvanizing process. Articles up to 21.5 metres long or 4.75 metres wide can easily access the plant's specially-designed jigging/un-jigging area made particularly for bulky, large items.

Fero has redirected traffic and aligned with the nearby road junctions to provide access for largescale items to manoeuvre through the facility easily and also installed 20 cranes into the new plant to streamline handling. A significant inclusion to the new facility is a drying oven which significantly improves the quality and consistency of the galvanizing process as well as reducing zinc wastage when articles are dipped into the 450C degree zinc kettle.

Fero Sales Manager (Construction), **Sam Griffiths** said the business' key focus was to establish an integrated Australian manufacturing facility to shore up the ability to compete against offshore markets.

"This was mainly achieved through scaling up of the facility and advanced automation," he said.

"The plant is fully automated which is a significant investment in process control of the facility to improve consistency, locating labour away from hazardous environments and reducing time for article processing."

He said a new tagging system with barcoding that travels through the entire galvanizing process attached to the articles allows for complete traceability and reduces time in expediting materials before despatching to site. The inclusion of the centrifugal spinning plant now doubles capacity to galvanize small items being only the second plant now available in Perth. The plant is also fully automated and includes innovations such as the drying oven and cooling stack for barrels which ultimately delivers a better quality product with less need for handling.

Fero also invested heavily in the reduction of its environmental footprint, building significant innovations into the process to reduce gaseous offtake, recycle energy and reduce logistics requirements of raw materials and waste through the facility overall. Equipment to manage quality and reduce cost of waste and offtake includes a fully encapsulated acid chamber with wet scrubber to clean fumes and reduce maintenance on cranes and infrastructure. Mr Griffiths said Fero sees the investment as one to improve fabricator capabilities in WA and Australia, lowering total project costs and making a more sustainable local manufacturing sector to supply future projects. Provisions are also built-in for future plant development.

"Construction is a cyclical market and whilst a current downturn is taking place in WA, the nature of the market is one we are familiar with having operated continuously since 1972 and we have planned for long-term sustainability," Griffiths said.

"For Australian manufacturing, the need to have a culture underpinned with innovation and efficiency is paramount as the market continues to grow and attract more investment from local and foreign sources."

He said the plant development effort begun in 2011 following the commissioning of Fero's galvanizing facility in Brisbane with commissioning of the new Perth plant completed this month.

Fero Group has a similar footprint in Brisbane with a second galvanizing facility which underwent a significant capacity and process improvement investment in 2010 and 2011.

"The WA and Queensland markets operate similarly, sharing a focus on industrial and mining-based services. With our internal manufacturing divisions located in both states, the galvanizing plants at each site provide efficient production of this service," he said.

"We also see vast opportunities in export and competing in new markets which are otherwise serviced by less efficient operations sourcing from other countries."

Sweeping as articles are lifted from the kettle at the Kewdale facility to remove zinc oxide by-product to ensure a smooth quality finish.

Industrial coatings for steel structures

Owners and operators of high-value assets need to understand the cost implications of ignoring the effects of corrosion that pose a threat to all infrastructure through the degradation of structures such as buildings, roads, bridges, pipelines and towers. The economic impact of corrosion represents an annual cost of many billions of dollars to the economy.

Some of the advantages of planning for corrosion control and mitigation at the design phase include extending the life of an asset - thus making it more profitable - and reducing maintenance time and costs, thereby increasing an asset's utilisation.

According to the Director of Napier Sandblasting (NSB) in New Zealand, **Craig Ross**, some construction contractors sought to save money on infrastructure projects by using substandard coatings with the result that some buildings, towers and bridges are already showing signs of fatigue and distress.

"While most of the shoddy coatings applicators have gone, many of their structures already require remediation," he said. "Luckily, changes in regulations and better enforcement of standards mean that new designs should have a much longer operational life."

Coatings consultant at Remedy Asset Protection, **Justin Rigby** added that steel structures within industrial facilities are usually located in "aggressive" environments.

"Owners of offshore platforms or dock cranes exposed to a marine environment cannot afford for corrosion to degrade their assets," he said.

Ross added that even relatively non-reactive stainless steel requires protection in certain situations.

"NSB does a lot of work in the hide tanning industry and other really severe environments, generally where acid attack or abrasion is an issue," he said.

Cathodic protection is one technology that can be used to impress a current into a structure to alter the surface reactive characteristics of a metal to minimise corrosion.

According to Rigby, it is important that a protective coating project is carefully planned.

Protective coatings projects are usually unsuccessful for relatively simple reasons. Planners often do not fully comprehend the technical complexity of many coatings projects, especially if the coating is to be applied to an existing steel structure; even more so if the site is in a remote location. Consequently, they fail to invest the time and resources to manage it effectively which results in substantial cost implications when things go wrong.

Protective coatings are not just paint. Coatings are engineered products that undergo rigorous testing and refinement to provide specific properties that will protect a structure from its service environment.

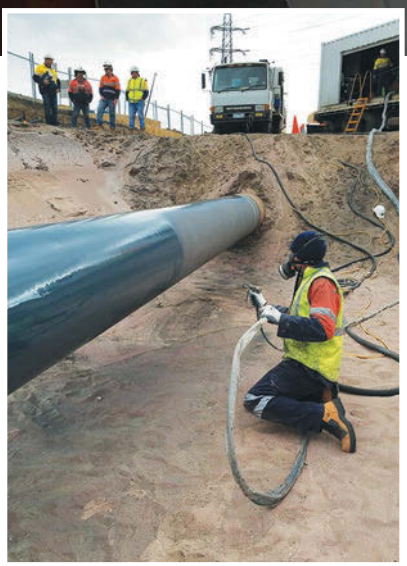
"A simplistic analogy would be to a structure that is plastic coated," Rigby said.

There is a wide selection of coating products available to the market so it is essential that the appropriate coatings system is chosen. There is no single product that meets every coating situation so during the planning of a project, a compromise may need to be made and not to be fooled by 'one size fits all' claims made by some manufacturers.

Modern technology has developed active pigments which are being incorporated into primers to provide additional protection. Active anticorrosive pigments are added to primers which can give further protection for areas with coating damage. These pigments prevent corrosion of a metal substrate by building up permanently passive conditions at the metal surface and/or by a build-up of solid compounds which fill the damaged area of the coating.

It is important to be flexible and adaptable when developing protective coating projects. While identifying areas of risk at the start of a project is an extra expense, it will help ensure a project's success.

The Australasian Corrosion Association (ACA) works with companies like Remedy and NSB, along with academia, to research all aspects of corrosion to provide an extensive knowledge base that supports best practice in corrosion management, ensuring all impacts of corrosion are responsibly managed, the environment is protected, public safety enhanced and economies improved.



"The quality of the finished project is dependent on how skilfully and effectively a coating is applied," Rigby said.

The technicians chosen to apply a coating must have apt skills. A less obvious criterion, especially for any sort of tower structure, is abseiling skills; technicians might have to be in a harness and suspended in mid-air which requires a particular mix of physical and psychological attributes.

When planning protective coatings, it is also important to take account of factors such as the geography, access to the structure and climate, all of which impact the cost of the project.

According to Rigby, there are a range of quality tests available that comply with Australian and international standards, many of which are covered in the ACA's NACE Inspector courses. A good coating specification will reference AS/NZ 2312 as a minimum and categorise the service environment according to its corrosivity and then nominate a coating system based on the desired design life of the coating.

One vital aspect of coatings projects is to have certification that the job complies with all the appropriate legislation, regulations and standards. There are two ways to achieve this; to pay for third party inspection and engage a contracting firm that has a PCCP accreditation. This ensures they have staff with the necessary skills and accredited processes, providing peace of mind to customers that quality is 'built-in' throughout project planning and execution.

The cost to coat a structure with an appropriate and effective protective material varies depending on whether it is applied in a workshop or onsite and averages between $80 and $300 per square metre.

"This is a relatively minor cost compared to the cost of not coating the steel," said Ross.

"However, cost is very much relative to what the required durability expectation is, the level of aesthetics required and how harsh the environment is."

If a structure to be protected is in a remote location, it will be necessary to select the most cost-effective means of transporting materials and personnel to the site. Additionally, remote sites may be exposed to climatic extremes which impact on applying a coating. For example, monsoonal rains in tropical regions would make it difficult to spray a coating onto any type of structure.

The health and safety analysis of a project must look at how to effectively protect a structure and address any environmental considerations. It must also consider how to properly apply the coating to minimise its effects on the surrounding areas as well as protect the technician who might be working in a harness tethered metres above the ground.

The ACA is a not-for-profit, membership association that disseminates information on corrosion and its prevention through the provision of training courses, seminars, conferences, publications and other activities. The vision of the ACA is that corrosion is managed sustainably and cost-effectively to ensure the health and safety of the community and protection of the environment. For further information, visit http://www.corrosion.com.au

Advanced pre-treatment keeps plant clean and lean

Proving that environmental sustainability and business efficiency can go hand in hand, the fully automated and sealed pre-treatment area of Kingfield Galvanizing's larger new plant in Melbourne allows staff to be re-deployed to other areas of the business and turn up the heat to achieve much greater throughput.

Commissioned in April 2015, the plant expansion more than tripled its working floor area to 7500sqm and is designed to support 30,000 tonnes of throughput a year.

It involved 490 tonnes of steel and an additional 290 tonnes was used for installation of the equipment (pre-treatment room walls, materials handling system support structures). Every piece of structural steel in the building is galvanized.

Kingfield Galvanizing Chief Executive Officer, **Steve Laussen** said the new plant introduces recycling initiatives, state-of-the-art manufacturing processes and improved workplace safety to build greater capacity with at least double the throughput of the old plant.

"It allows a more diverse product mix with a longer and deeper bath, greater quality control through clearly defined and measured pre-treatment recipes, increased yard capacity and under-cover storage and overall improved tracking of individual products," he said.

But the most significant improvement Mr Laussen said was the incorporation of a fully enclosed and automated pre-treatment area. The enclosed facility ensures all corrosive fumes from pre-treatment processes are captured and cleaned through a wet scrubber.

The HDG process is basically the same across all plants with most of the steel going through a cleaning process with a degreasing agent (sodium hydroxide), acid (hydrochloric acid) and a flux (zinc ammonium chloride) before dipping in molten zinc.

"The design of the enclosed pre-treatment area is that as doors are opened or closed for product to enter or leave, extraction fans automatically increase the drawing of fumes so that no fumes leave the room and don't risk impacting the rest of the facility," he said.

"It allows us to heat our pre-treatment chemicals to increase their efficacy and lifespan without the extra fumes creating corrosion.

"Most importantly, we achieve greater life from our chemicals, using less chemicals per tonne of steel galvanized as well as decreasing our volume of waste chemicals per tonne of steel galvanized.

"Throughout the pre-treatment process we use recycled heat from the HDG furnace, re-use acid cleaned from the air in the pre-treatment tanks and reduce waste via automated processes."

He said the key benefit to staff of the enclosed pre-treatment room is that the plant is a much more enjoyable and safer environment to work in.

"The key safety elements come from the automation whereby jig movements from the moment a jig has been prepared for pre-treatment to when it is to be dipped in the bath does not require manual handling," he said.

"The zones through which the jigs move exclude human traffic and if a staff member does have to enter these areas, the material handling system shuts down."

He said the need to build the new plant required investigation into what had taken place recently in the local markets as well as overseas. The requirement of the EPA to create a pre-treatment facility that met 'world best practise' further influenced the investigation.

They toured European facilities to inspect large capacity plants (>40,000T/year) where the product range was small as well as smaller plants that were galvanizing a broad range of products similarly to in Australia.

"The general view within Australia is that an automated plant with enclosed pre-treatment is too expensive to build and could not efficiently process the diverse product range that HDG businesses in Australia have to accommodate," he said.

"All plants utilised automation and enclosed pre-treatment to achieve operational efficiency, high product quality and with significantly reduced maintenance costs. The opportunity to meet with plant owners, production managers and general staff confirmed the benefits of the investment.

"We saw the opportunity to bring this technology to Australia and achieve the same outcomes while delivering a safer and more sustainable workplace for our galvanizing team."

Enclosed pre-treatment area with extraction fans to capture all emissions.