



Associate of International Zinc Association

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Asia Pacific Edition

HOT DIP GALVANIZED STEEL

GALVANIZING IS ALL AROUND US

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Editorial

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Prepared by

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The Rural Residence, Mt Nebo

Recently the Australian Steel Institute invited their members to submit entries to their biennial Steel Awards. For the first time, the ASI Galvanizing Excellence awards were included in the proceedings and any entrant in the main awards with a significant galvanizing component was automatically entered.

High quality entries were received which were ripe with engineering and architectural innovation in a range of project sizes. The judging panel reviewed the shortlisted projects and came up with two winners, representing the best of the small and large entries. The stories of the winners are featured in this edition.

In addition to the ASI Galvanizing Awards, there are four case studies included from the GAA's own annual awards – the Sorel Awards. These projects represent an interesting use of HDG, from car parks to playgrounds for big and small kids, but the winner was a comparatively straight forward use of galvanizing – a warehouse for ALDI. What made this warehouse stand out was the work performed by the various members of the supply chain to develop a tailored solution that satisfied the customer's desire of being maintenance free for a long period and be warranted – something that could not be offered by the original paint specification.

GAA Life Members, **Colin Bain** and **Mike Dennett** kindly returned as Sorel award judges, between them bringing over 60 years of galvanizing industry related experience and nous to the deliberations. They commented that the nature of the ALDI project could provide a template for similar projects in the future as the Australian industry becomes more risk adverse with the issue of non-conforming building products hitting the headlines.

Also featured in this issue is the expansion of Sun Metals refinery in Townsville which will include a stand-alone 100MW solar plant to set a great example of a practical solution to a long-term power restriction; thus enabling an expansion of the plant and more jobs for Australian manufacturing. Finally, we've included an announcement on an Australian-first: the launch of the Australasian Corrosion Association Hot Dip Galvanizers Inspection Course, providing independent accreditation for inspectors of hot dip galvanized steel – locally made or not.

I hope you enjoy this edition of galvanize – our 78th edition since 1981.

Peter Golding

Chief Executive Officer

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FIRST AWARDS SHOW

GALVANIZING ENABLES GRAND DESIGNS

The two winning projects of the inaugural Galvanizing Excellence Awards, announced on 12 September, took advantage of hot dip galvanizing (HDG) to enhance the architectural merits of a striking new college building and a bushland home.

The awards were organised by the GAA as part of the national round of the Australian Steel Institute's (ASI) biennial Steel Excellence Awards for which it was the 'on' year. These were presented at the ASI's Gala Dinner function of its national Steel Convention held at the Grand Hyatt Hotel in Melbourne.

All 19 projects entered in the initial State rounds with a significant HDG element were considered and awards granted in two categories of both large and small structures.

HDG was applied to the exposed structural steel frame supporting the outer skin of the winner in the Large Structures category, Ngoolark Student Services Building at Edith Cowan University's Joondalup campus in Western Australia. The frame facilitates ample space from the building superstructure to allow design freedom for the sunscreen to be the defining element of the project.

Appreciating that the skeletal structure supporting the permeable screen enveloping the building would remain entirely visible, a design decision was made to galvanize the structural framing to ensure the longevity of both the internal and external faces of the steel members.

The design team communicated closely with Hartway Galvanizers to determine the most economical member component lengths for fabrication and erection, given the limitations of the available galvanizing baths, which also helped in keeping onsite erection safer.

The decision to use HDG rather than a paint coating also helped environmentally by reducing the emission of volatile organic compounds and was part of the reason the building achieved a 5 Star Green Star Rating by Design using the GBCA Rating Tool.

The other projects shortlisted in this category were the Skymate recreational structure in South Australia, the Sunshine Coast University Hospital car park, and the New Generation Rolling Stock Maintenance Building in Queensland, of which the first two were also shortlisted for the 2016 Sorel Awards.

The awards were organised by the GAA as part of the national round of the Australian Steel Institute's (ASI) biennial Steel Excellence Awards

HDG was provided by Brisbane's Fero Galv for The Rural Residence, winner of the Small Structures category, which is nestled within a rugged Queensland bushland setting and required "honest, robust and non-combustible materials" to suit the client brief and bushfire code requirements.

A conscious decision was made to embrace a predominantly steel structure to achieve the architect's vision of sharp angular forms "designed to create a strong contrast with the natural setting".

All the other projects shortlisted in this category were also from Queensland, being the House in Hamilton, Reflection House and The Boat House entries.

GAA Chief Executive Officer, Peter Golding said the awards came about as many of the past entrants to the ASI's design awards incorporated significant amounts of HDG.

"We noted hot dip galvanized steel was used often without specific recognition of the durability, innovation and sustainability benefits provided by this essential form of corrosion protection and how in many projects it was used for both engineering and aesthetic qualities," he said.

The awards were judged by **Arun Syam** from OneSteel and **James Staughton** of Workshop Architecture along with GAA technical staff, **Ann Sheehan** and **Will McLean**.



Top L-R: Reflection House; Skymate recreational structure; New Generation Rolling Stock Maintenance Building
Bottom L-R: The Boat House; Sunshine Coast University Hospital car park; House in Hamilton

GALVANIZING EXCELLENCE AWARDS 2016

WINNER PROFILES

Ngoolark Student Services Building

The Ngoolark Student Services Building located at Joondalup campus of Edith Cowan University (ECU) in Perth is an elegant five-storey building clad in a sleek gold coloured skin. Acting as a sunscreen, it allows subtle light and shadow to dapple through and is supported by a complex structural steel hollow section frame that defines the geometry.

A design decision was made to hot dip galvanize (HDG) the structural framing to ensure the internal faces of the steel members were protected. The design team communicated closely with the galvanizer to determine the most economical member component lengths for fabrication and erection, given the limitations of the available galvanizing baths.

The project was designed to achieve a 5 Star Green Star Rating by Design using the GBCA Rating Tool as part of an ECU directive for all its building projects. The project incorporated a highly rigorous design process to maximise environmentally sustainable performance.

As part of this sustainability assessment, ongoing maintenance minimisation and reduction in volatile organic compounds (VOCs) through the galvanizing of steel members in lieu of paint treatment was factored in and contributed to gaining steel credits.

PROJECT TEAM

Architect: JCY Architects and Urban Designers

Structural Engineer: BG&E

Head Building Contractor: PACT Construction

Steel Fabricator: CR Steel Fabrications

Steel Detailer: OneCAD Solutions

Hot Dip Galvanizer: Hartway Galvanizers

The Rural Residence

The architecture of this abode set in Mount Nebo on Queensland's D'Aguilar Range was conceived as a series of pavilions arrayed along the hillside. The sharp angular forms of the architecture were designed to create a strong contrast with the natural setting. Honest, robust and non-combustible materials were required as part of the client brief and bushfire code requirements. These requirements were not seen as a hindrance but were embraced and expressed.

A conscious decision to embrace the qualities of the steel structure has produced a building true to its form and not afraid to hide its lineage. Materials were selected to contrast with and reflect the aesthetic of the surrounding forest. Polished concrete floors, HDG steel columns, zinc roofing and glass facades are juxtaposed with natural accents of timber. Timber screens and steel detailing were used to create a connection back to the trees that surround the site.

PROJECT TEAM

Architect: ETS Architects

Structural Engineer: Northrop Engineers

Head Building Contractor: Scattini Construction

Steel Distributor/Manufacturer: Vulcan Steel

Steel Fabricator: B&L Steel

Steel Detailer: B&L Steel

Metal Building Contractor: Euroclad

Hot Dip Galvanizer: Fero Group



HDG RISK COVERAGE ECLIPSES RED OXIDE COMFORT



The ability to guarantee the performance of hot dip galvanizing (HDG) for a given period based on known properties, backed by research and testing, convinced supermarket chain ALDI to choose this treatment for its 800-tonne new distribution centre in Perth, despite a red oxide coating system being the general specification for its warehouses nationally.

Hartway Galvanizers used simple modelling based on information from the GAA and industry Standards (AS 4312, AS/NZS 2312.2, AS/NZS 4680) to offer a reliable, low-risk alternative to the original specification that found favour with the client.

The steel fabricator wanted to galvanize the structure for cost, transport and site resilience, but needed to redesign the trusses to fit the galvanizing 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. 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.

Hartway Galvanizers' Business Development Manager, **Shane Hunt** said that previous work on warranties and AS/NZS 2312.2 provided a solid knowledge base and legal framework to lower the risk of its offering.

"Use of the GAA's Life Cycle Costing Calculator (LCCC) and presentation of the reduced lead time, ability to deliver on-time to site, and erection resilience helped to convince the fabricator that hot dip galvanizing was a viable option and pushed them to recommend this up the chain," he said.

"We were able to lower the risk to the asset owner due to the amount of reliable data in the Standards and predictability of the coatings performance in terms of shorter lead times for surface preparation, more resilience in rough site conditions and heavy lifts and lower overall lifecycle costs than the original red oxide specification."

He said that also liaising with a local light pole and fence manufacturer on when poles and fences were installed and using its own site information were useful when determining the expected life of the galvanized coating.

"Contacts at AD Coote (light poles) and Fencwright (fence contractor) allowed us to determine an intuitive rate of corrosion in the location of the build," Mr Hunt said.

"Liaising with the light pole and fence manufacturer as to when their products were installed along with our site information helped to create a linear extrapolation to predict the life expectancy of the coating.

"Also, our risk profile is lower as we have more experience and knowledge in the performance of the treatment and the application error is low because the surface preparation and coating application are factory applied by the one company in the same process."



In January 2016, Hartway issued a 10-year warranty for the coating to Metro Steel 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.

"This was easily assessed using the data from AS/NZS 2312.2 and the amended warranty issued," Hunt said.

PROJECT TEAM:

Developer/Owner: ALDI Stores

Architect: Oldfield Knott

Specifier: Pritchard Francis

Project Manager: Georgiou Group

Main Contractor: Metro Steel

Hot Dip Galvanizer: Hartway Galvanizers

Other: AD Coote (light pole information)

Hartway Galvanizers used simple modelling based on information from the GAA and industry Standards to offer a reliable, low-risk alternative to the original specification



WILD PLAY OF WEIGHTY FORMS PROTECTED

SOREL
AWARD

HIGH COMMENDATION 2016

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Australian hot dip galvanizing (HDG) has helped ensure the durability of monster-sized parts of two Australian designed aerial adventure parks that incorporate 200 tonnes of steelwork offering a collection of traversing-at-height and vertical adventure challenges.

Mega Adventure and SkyPeak Adventures are state-of-the-art aerial adventure rope parks for those that like to challenge themselves. Mega Adventure in South Australia includes the aerial SkyMate structure which provides the opportunity to play tennis in the sky, row a boat mid-air or manoeuvre between obstacles such as the floating esky, BMX bike and sky-high picnic table.

SkyPeak Adventures in NSW has over 80 different challenges to explore at heights for all skill levels, including suspension bridge walks, barrel runs, rope climbs and trapeze swings with some parts of the structure reaching up to eight storeys high as well as 'SkyPeak Tree' allowing customers to experience the sheer exhilaration of scaling a magnificent River Red Gum tree.

The same design, engineering, fabrication and galvanizing team contributed to the new structures located hundreds of kilometres apart. Both superstructures and all of 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.

In particular, the large pipes used for the columns presented logistical challenges the galvanizer, Galvatech, had to overcome. Sales and Technical Manager, Darren Bagley said that the large diameter pipe columns were supplied to the fabricator with a thick black paint or lacquer coating that needed to be addressed due to the difficulty of removing such coatings in the usual caustic pre-treatment.

"The coating on the pipe needed to be removed via abrasive blasting before any fabrication to make it easier for the welder to fabricate and the hot dip galvanizing process more efficient," he said. "Additionally, the columns of over 9.3 metres needed to be double-end dipped and extra holes drilled for drainage and venting."

Hot dip galvanizing is harder than the base metal, providing the durability and high resistance to abrasion required

These parts also posed transport challenges with semi-trailers utilised to safely move the long columns to the galvanizer while Galvatech's eight-tonne tabletop trucks transported the sections of steel less than 8.6 metres long.

"The loads varied from about two to seven tonnes of steelwork which worked in well with our normal two to three-day lead times, sometimes even overnight if required," he said.

He added that resilience to abrasion was also a key requirement for the hard use expected of the two 'action packed' structures with each adventure park engineered to accommodate over 400 people at a time.

"Hot dip galvanizing is harder than the base metal which is typically 150 DPN (Diamond Pyramid Number), providing the durability and high resistance to abrasion required ranging from 6 to 25 percent producing hardness levels between 179-244 DPN."

The customers stressed their preference for use of HDG because of the consistent quality of the zinc protection and its development of a desirable natural metallic patina. The heavy-duty corrosion protection afforded by the treatment was particularly required for the Adelaide park, Mega Adventure located within 200 metres from a beachside.

As prominently located structures, each park dominates the landscape in outer Sydney and Adelaide beach and airport environs respectively.

PROJECT TEAM

Architect: Touch Cloud Global

Engineer: Partridge Engineering

Project Manager: Touch Cloud Global

Main Contractor: Touch Cloud Global

Hot Dip Galvanizer: Galvatech

Fabricator: Codmac Engineering

Steel Suppliers: OneSteel, Southern Steel, Orrcon Steel, Horan Steel

SAND-BY CASTLE'S SECOND LIFE ASSURED



A termite-infested wooden playground structure that served as a community hub for over 30 years located just 20 metres from an aggressive coastal environment was rebuilt using hot dip galvanized (HDG) steelwork providing significant benefits over the original design in aesthetics, constructability, durability, public safety and cost.

BluBuilt Constructions was engaged by the City of Salisbury to upgrade the St Kilda Adventure Playground after developing an alternate design concept at project tender for the design and construction of a new three level structural steel castle.

The biggest playground refurbishment of its type to be undertaken in Australia, the castle stands 14 metres high and is comprised of 18 tonnes of steelwork. The new structure is required to withstand the rigours of an aggressive coastal environment (C4) with an aim that the playground framework would not need maintenance due to corrosion for many years.

With a very tight project timeframe of 30 days, constructability and durability were the key drivers in the development of the final design of the structure and emphasis was placed on eliminating any onsite welding works, given the aggressive coastal environment.

Accordingly, the design was developed in collaboration with the fabricator to maximise use of prefabricated elements. With consideration to galvanizing size constraints, bolted connection details were used throughout the playground as well as using sleeved assemblies for platform and column connections.

Kingfield Galvanizing's QA Manager, **Ashley Clinnick** said that due to the coastline location, the project constraints called for the galvanized steel not to have any site welding or uncoated surfaces to meet the brief to shore up the structure from needing maintenance for many years.

"The complete sub frame as well as all staircases and handrails were hot dip galvanized and every connection was sleeved and then bolted onsite," he said.

Clinnick said as Kingfield is a Victorian-based company and the fabricator is in Adelaide, extra care had to be taken to minimise loads and load handling.

"The main challenge was the logistics in that we had a tight deadline to have works galvanized, then delivered to South Australia. The semi-trailer load of steel arrived on a Wednesday, was galvanized and then reloaded onto the truck for a return delivery on the Friday of the same week," Clinnick said.

"We were lucky enough to have close communication with the main contractor and logistics company which allowed the scheduled timeframe to be met."

And rather than disposing of all the existing timber playground material, much of the previous main structure was recycled into park furniture.

PROJECT TEAM

Developer/Owner: City of Salisbury

Architect: PT Design

Specifier: BluBuilt Constructions

Project Manager: BluBuilt Constructions

Main Contractor: Macweld Industries

Hot Dip Galvanizer: Kingfield Galvanizing

The complete sub frame as well as all staircases and handrails were hot dip galvanized and every connection was sleeved and then bolted onsite



CARPARK BEAUTY TREATMENT RESISTS BUMPS



The challenge of producing an attractive skin for a busy, multilevel Queensland hospital carpark that could stand up to heavy usage and a corrosive environment was met with a hot dip galvanized (HDG) solution providing initial cost savings and superior corrosion protection.

This carpark provides an excellent example of a functional and aesthetic façade with a robust treatment. It can take the bumps in the carpark without compromising looks or corrosion performance at a location within one kilometre of the sea and close to a salt water creek.

A total of 610 tonnes of HDG welded steel frames were used as external screens to provide structural bump rails, fall protection screens and façade treatment, with the upper three levels duplex coated to enhance looks.

General Manager of National Galvanising Industries, **Richard Londt** said that most of the frames were supplied as a standardised unit with a height of approximately three metres and width of 2.7 metres.

"The customer did not want any double dip lines on the standard frames and as a result they had to be dipped with the 2.7 metres dimension vertical as our kettle is three metres deep," he said.

"Normally we are comfortable with single dipping up to 2.6 metres as we usually allow for 100mm of freeboard, 200mm of bottom dross and 100mm of zinc over the top of the article. It is preferred to keep the item out of the bottom dross zone to minimise dross sticking to the surface of the finished product.

A total of 610 tonnes of HDG welded steel frames were used as external screens to provide structural bump rails

"To allow us to single dip the 2.7 metre deep frames, we increased our crossing frequency and planned the frame dips for just after the crossing was completed.

"The depth of the dipped frame and alternating slopes on the vertical members of the frame created a challenge in keeping member slopes steep enough to avoid runs. We employed a technique when the item was hung so that the upper sloped member could drain whilst the frame was relatively flat to avoid the dross layer and the frame was then lifted to a steep angle as soon as it was clear of dragging the bottom corner in the dross zone.

"The overall finish achieved was excellent and duplex coating the upper level frames provided the required visual outcome while achieving a very durable and tough product which will provide corrosion protection well into the future despite the occasional bump and scrape from cars."

A packing system was developed to preserve the best possible quality, with frames stacked using specially cut timber provided by the fabricator to make sure potential damage was minimised.

"Processing the frames was also coordinated using an optimum sequence to meet the onsite schedule through constant communication between ourselves and the fabricator."

PROJECT TEAM:

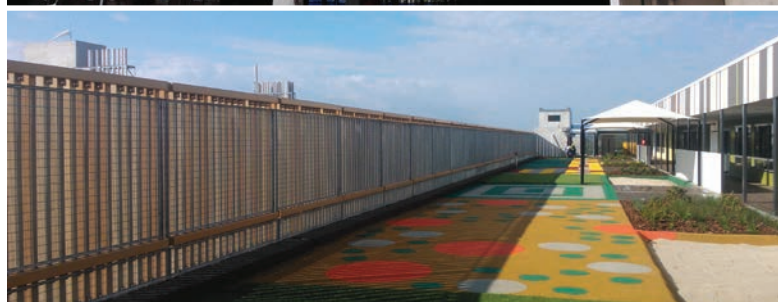
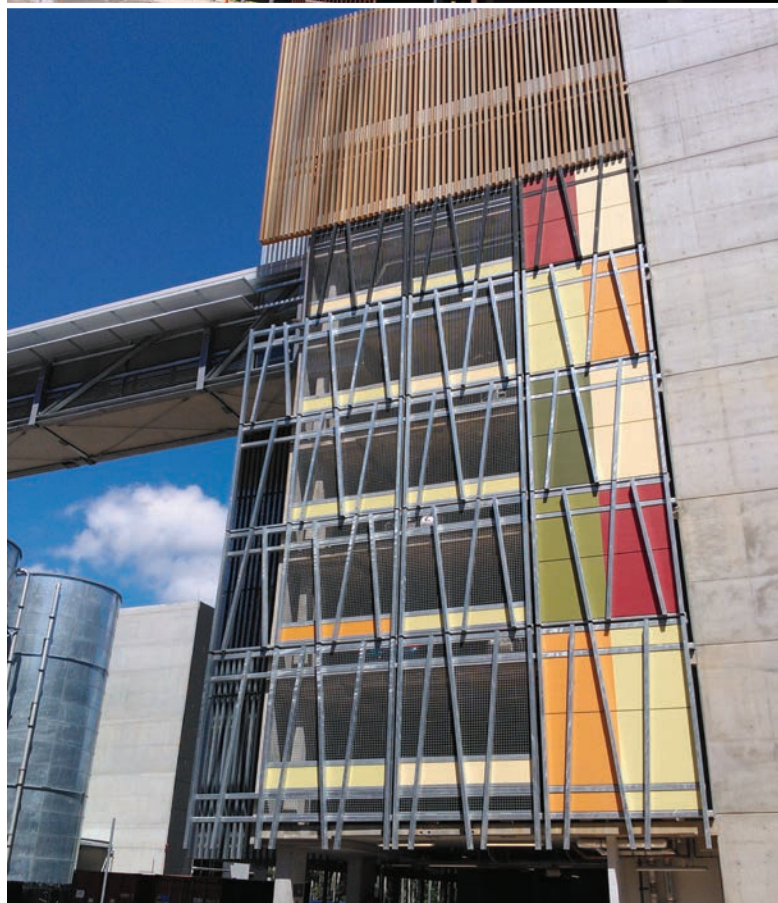
Developer/Owner: Lendlease

Architect: Sunshine Coast Architects

Fabricator: Steel Fabrications Australia

Main Contractor: Lendlease

Hot Dip Galvanizer: National Galvanising Industries



GOING BEYOND FACE VALUE WITH QUALITY CHECKS

With demand for steelwork during the recent resources boom unearthing widespread confusion between what constitutes proper inspection requirements of coatings and hot dip galvanizing, the GAA and ACA have taken ownership and control of the process with a formal, independent course to help engineering practices and steel businesses confirm the required corrosion protection is applied.

Over the past ten years the rapid development of large scale resource 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.

Australian galvanizers have recognised a need to develop an industry consensus among designers, fabricators, galvanizers and end-users for the inspection of hot dip galvanized steel

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 hot dip galvanized steel.

Any experienced galvanizer would know that coating specification writers and accredited coating inspectors can sometimes cause 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.

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 & 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 hot dip galvanizing 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 to 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.

By Peter Golding

Chief Executive Officer, Galvanizers Association of Australia

REFINERY PROSPECTS SOME GOOD 'ZINCING'



Multi-million-dollar expansion plans for a major zinc refinery in Queensland stand to benefit the galvanizing industry which, by a happy coincidence, relies on the zinc as the key chemical element in the hot dip galvanizing (HDG) process.



On 6 October, Sun Metals CEO **Yun Birm Choi** announced to business leaders attending a Committee for Economic Development of Australia meeting that his company is planning a major expansion at its zinc refinery in Townsville.

The first planned stage of this renewed investment would be the construction of a 100MW solar farm, designed to power the refinery and sell electricity back to the grid. This would require substantial structural supporting infrastructure which will need heavy duty protection from the harsh UV exposure and rugged open air conditions at the industrial site.

HDG adds three pillars of sustainability for solar farms by significantly extending product lifetimes and reduces maintenance costs for only small increases in impact during manufacturing; the HDG process uses 100 percent recyclable steel and zinc and it is competitive on cost. A 100MW solar farm typically uses 10,000 tonnes of fabricated HDG steel so this development, like all solar farms, is good for galvanizing and fabrication industries alike.

The second stage would include the expansion of Sun Metals' Townsville refinery using cutting-edge technology to provide a 25 percent increase in zinc production. This would entail the construction of heavy engineering facilities for which HDG is usually the chosen treatment for steelwork.

"While this is not by any means a certain or an easy thing, if executed it will mean that we will invest approximately \$460 million in the next five years and create about 100 extra jobs directly at the refinery on an ongoing basis," Mr Choi said.

Queensland Premier **Annastacia Palaszczuk**, who delivered a State of the State address at the meeting, praised the move.

"On behalf of the Government, I welcome the announcement that it is actively investigating additional investments and expansions of its operations," she said.

The first planned stage of this renewed investment would be the construction of a 100MW solar farm, designed to power the refinery and sell electricity back to the grid.

NEW DIGITAL APP GALVANIZE

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For iPad readers, the magazine is now available to download free from the Apple store and this version often includes extra photos and videos of the projects featured.

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We provide information, publications and assistance on all aspects of design, performance and applications of hot dip galvanizing.
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