2008 Volume 5 Issue 3

HOT DIP GALVANIZING TODAY

HOT DIP GALVANIZERS ASSOCIATION Southern Africa

36

Featuring:

The 2008 Hot Dip Galvanizing Awards – winners and entries

What if the Eiffel Tower had been hot dip galvanized and painted?

Misconceptions, On the Couch, Guest Writer, Bob's Banter and Walter's Corner

Case History: The Bloukrantz Bridge bungi jumping access walkway

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The Association is a technical information centre established for the benefit of specifiers, consultants, end users and its members

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Front Cover: *A kaleidoscope of photographs showing the overall awards event winner (centre) surrounded by the various category winners*

Hot Dip Galvanizing – Adding value to Steel

Executive Director's Comment

Judging by the comments from numerous individuals, the year is flying. It is hard to believe that we are more than half way through 2008 and about to welcome VIP guests, members and their guests to our annual awards evening.

Following a review and directive from our executive, we requested our awards judging panel to review project submissions on the basis of the difficulty and uniqueness of the hot dip galvanizing process and not necessarily on the size, structural design or architectural qualities of potential award winners. The criteria of "why galvanize", "how galvanizing has been employed in combating corrosion", or "what makes it unique", were seen as being important within a hot dip galvanizing awards process. As a result of this directive, it is gratifying to record that we received submissions from a broad base of organisations and end users of hot dip galvanized steel as a material of construction. As a hot dip galvanizing industry, our primary goal is corrosion protection and longevity of carbon steel structures of all descriptions. We are extremely grateful to all, who found time in a busy year, to forward submissions for consideration by our judges and to be part of our annual flagship awards evening. I believe that all the submissions are winners and an excellent representation of how hot dip galvanizing can be applied in a variety of situations. Well done to all and thank you.

I am reminded of what my grandson picked up at school and recited to my wife when she was playing a game by way of entertaining the young lad. As a form of encouragement, he was being allowed to win; when he declared that "winning was not the most important thing, but rather the fact that one takes part in the game". I believe that this idea is applicable to all our awards submissions and that all these projects are promoting the use of hot dip galvanizing as a means to protection of valuable assets. Too often hot dip galvanizing is seen as just another coating, but in fact should rather be viewed in terms of a suitable material of construction to suit specific corrosive environments.

Bob Wilmot

Note from the Editor

When specifying the use of hot dip galvanizing as a base coat for subsequent painting to obtain an aesthetically pleasing appearance, while cost effectively protecting the steel, don't only specify the conformance to SANS 121 (ISO 1461).

The reason for this is that small lumps, surface dross and zinc runs which are acceptable in terms of the standard, may be present in the hot dip galvanized coating. If these surface impairments are not mechanically addressed prior to painting, they may be emphasised when a glossy paint coating is used.

It is therefore strongly recommended that if reasonable smoothness within the constraints of general hot dip galvanizing is required, that this be specified in writing to the selected galvanizer, who are generally experienced enough not to over clean the hot dip galvanized surface prior to finalising the galvanizing contract.

Should this responsibility be passed onto the paint contractor, who is not the galvanizer, reference to the clause on *'Cleaning of the hot dip galvanized substrate prior to painting'* in the Association's Hot Dip Galvanizing and Duplex Coating Corrosion Protection Specification, HDGASA-03:2006, should be made.

This early communication with the galvanizer or paint contractor will make a huge difference to the final smoothness of the coating and hence it will be more aligned with the expectations of the specifier.

We repeat our offer to asset owners to request Association staff to evaluate and report on the durability of exposed and weathered hot dip galvanized or duplex coated components that are 10 years or older. The contribution may be entered in our annual awards event or as a case history and be published in the magazine.

Should a reader wish to participate in this programme, kindly contact Bob or myself.

Our feature for this issue includes all the entries, the winning categories and the overall winner of the Hot Dip Galvanizing Awards event.

Under Duplex Coatings, we publish an interesting article on *'What if the Eiffel Tower had been hot dip galvanized and painted?'*

Education and Training, expands on our certificated coating inspectors course, an essential requirement in any coating inspectors portfolio.

The Case History includes an evaluation of the 10 year old hot dip galvanized access walkway fixed to the underside of the Bloukrantz River Bridge, known to be the highest bungi jump in South Africa.

Other regular articles include Misconceptions, where Miss makes the statement, *'To specify the required DFT of a hot dip galvanized coating is essential?' True or false?*

Walter in Walter's Corner discusses a misconception in terms of how simple the hot dip galvanizing process is and something on heat peeling.

Bob Andrew in his own column, Bob's Banter discusses *'Acceptance of change'*.

Our Guest Writer, for this edition is Spencer Erling, Education Director of the SAISC. Spencer passes some constructive comments about his and other steelwork contractors views on the hot dip galvanizing industry.

Our Personality Profile has been innovatively renamed to 'On the Couch' and includes an interview with Mike and Marlene Oldfield, the driving force behind Cousins Steel International.

Inspecting a hot dip galvanized coating, includes taking coating thickness readings with a calibrated instrument. We include the first of a series of articles that cover, "What is important when taking coating thickness readings – selecting the probe".

Should a reader wish to express an opinion or provide us with an article, kindly contact me - enjoy the "magazinc".

Terry Smith

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Adjudication of the 2008 Hot Dip Galvanizing Awards

In being part of the judging process for the 2008 HDGASA awards, I was reminded of a saying: "Good is good, but better is better". In the past, many of the entries were good, but this year they were better, quite considerably so, and as a result, the whole process and outcome are better. Better entries also make the judging process more interesting and more challenging for the judges. There was a wide variety of entries, from virtually every sector of industry and it was pleasing to see quite a few entries related to environmental protection and community/social development.

In judging hot dip galvanized steel applications it is necessary to focus on the role that galvanizing has on the performance and success of the item that was galvanized. Generally, the role of galvanizing is to increase the service life and reduce maintenance costs. If this was the only criterion, all entries, indeed all hot dip galvanized articles, would be eligible to receive an award. The criteria used for the awards needs to go a lot further than just corrosion protection. Novelty, i.e. where hot dip galvanizing has never been used before for a specific application, applications where hot dip galvanized steel has been selected as, or demonstrated to be, the most appropriate material compared to other materials of construction, applications where a great deal of research and development has been undertaken to reach the point where galvanizing can be competently used and applications where duplex coatings can provide superior aesthetically-pleasing corrosion protection, all receive close scrutiny by the judges. Applications, however, where in addition to the above benefits, the use of hot dip galvanized steel improves the functionality of equipment, allows equipment to have added functions and benefits or valuable benefits for a specific type of user, receive the closest attention. In several nominations, these latter criteria were highly appropriate and this must be viewed as a very positive trend for the market development of hot dip galvanized steel.

Those of us who understand the appropriateness of hot dip galvanized steel as a material of construction, and not just as another form of corrosion protective coating, must be very excited at the potential that galvanized steel has. In the changing world we live in today, the world where creativity and innovation are key factors for business success, viewing hot dip galvanized steel as a unique material of construction with unique benefits that, with a sense of creativity and a spirit of innovation, will undoubtedly provide a host of new applications to be exploited. The purpose of the awards is not only to celebrate achievements in this regard but to raise the awareness and passion of just what can be achieved. In honour of the 90th year of Nelson Mandela, perhaps we should heed his view that: "one does not become a freedom fighter in the hope of winning awards" but rather to work as hard as you can and be "deeply moved" when we are rewarded. I trust that the various recipients of the awards this year will be equally moved. For companies that do not receive any awards, the work goes on but, with the potential offered by hot dip galvanized steel, the goals should be exciting, challenging and, when achieved, highly rewarding.

2008 Hot Dip Galvanizing Awards

Description

A compact and manoeuvrable drilling machine rig which is hot dip galvanized for corrosion protection.

Project partners:

Client (Current trials)
Rasimone Platinum Mines

Developer/Owner
Maxem Engineering

Conceptual design
Mark van Schaik (MD of Maxem Hldgs)

Mechanical design
Greg Thomas

Project manager
Clint Dias

Other participants
Dirk Byleveld

Manufacturer
Maxem Engineering

Hot dip galvanizer
Galvadip (Pty) Ltd

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Project inception date

2006

Commissioning of trials

February 2008

Project value

R2 million

Information

- In the early years of mining, rock drilling was a tedious, manual and labour intensive operation. From these beginnings, the industry has moved to the implementation of mechanical equipment.
- Years of experience and usage of such equipment has highlighted both the advantages as well as the shortcomings. It was from this background experience that the project team developed the prototype of the Raise Tech W50 Drilling Machine.
- The inherent concept in the design of "In the Hole Hammer Inside" (ITH) is the production of the smallest machine possible to achieve access within restricted mining areas for narrow vein mining. In addition, the equipment has a smaller hydraulic power pack, thereby using less energy and uses normal mine circulating water without the need for compressed air.
- The concept of the machine started with a simple scaled "wire" model positioned on a wooden platform that was representative of a mine haulage way, stope and ore seam.
- The design technology is aimed at the reduction of labour, minimisation of the waste material and the extraction efficiency of valuable ore from the mining stopes. All these factors contribute to the reduction in mining costs.
- The equipment is designed to be portable, easily positioned within the haul ways with its various axles of the drilling head thus achieving access to the stopes.
- The design of the drilling rig incorporated the hot dip galvanizing process in order to accommodate venting and drainage. Stringent controls were required to prevent distortion. Galvastop was used on machined surfaces. As a result of the close liaison between Maxem Engineering and Galvadip, numerous controls and procedures were implemented to overcome these potential problem areas.
- Maxem Engineering was very complimentary regarding the support and service received from Galvadip.
- In response to the question as to why it was decided to hot dip galvanize the machine, the project team responded as follows: "Paint has proved too expensive over the years of working within the harsh mining environment. Furthermore, subsequent maintenance and refurbishment of equipment is far more difficult." The team went on to say that "it is important to be able to present an aesthetically pleasing and professionally engineered product to the client."
- The use of hot dip galvanized machine components has effectively been employed as a superior coating system within severe corrosive mining environments and in terms of the rough handling conditions encountered through the machines working life.

Mining and Industrial Category Winner

Mafube Colliery, Anglo Coal

Description

The hot dip galvanizing of all structural steel for the materials handling facility for the New Anglo Colliery.

Project partners

Client and specifiers
Hot dip galvanizing specification as per Anglo Coal (joint venture between Anglo Coal and Eyesizwe Coal)

Project Manager
Roymec (Pty) Ltd

Design to installation (turnkey project)
Roymec (Pty) Ltd

Hot dip galvanizer
Armco Galvanizers

Tonnes of steel

3 000 tonnes of hot dip galvanized steel with expected further extensions and upgrades.

Project Value

± R450 million

Commencement date

November 2006

Commissioning date

April 2008

Information

- Roymec has professionally and successfully used hot dip galvanized steel as an ideal material for construction suitable for the arduous conditions encountered in bulk materials handling requirements.
- This particular project was one of Roymec's latest 'Greenfield' developments consisting of a series of coal transport conveyors, stackers, silos and loaders for a new Anglo Colliery.
- The project specification used was required to comply with that of the Anglo Coal division, which has recognised the durability and long-term maintenance free service performance offered by hot dip galvanized steel in the hard coal mining environment.
- Conveyors forming part of the project comprise 8, 6 and 3 kilometre operational units that are integrated and form the backbone of the bulk coal handling equipment.
- The professional and sustained relationship between Roymec and Armco Galvanizers is based on quality of product and service delivery. This relationship has involved extensive knowledge transfer between the role players resulting in the additional benefit of the end users credibility of the system.
- Dissemination of the performance statistics of colliery installation, such as illustrated by this project, should have a direct influence on the future decision making process of the discerning end user and his investor.
- This project is an excellent example that encompasses all the characteristics of hot dip galvanized steel, including longevity, cost effective economics, effective corrosion control and a life cycle performance without an equal and at the same time having a minimal impact on the environment.

Architectural Category Winner

Private stabling facility

Description

A private hot dip galvanized stabling facility in Alverstone, Kwazulu Natal.

Project partners

Main contractor
Rodcon Gates

Hot Dip Galvanizer
Phoenix Galvanizing (Pty) Ltd

Project inception date

March 2008

Information

- The owner of the stabling facility is a mechanical engineer and played a large role in the choice of finishes. He explains "as an engineer I have a keen understanding of materials, in particular metals and corrosion. I wasn't prepared to take any chances and having previously lived on a large property, I know the maintenance requirements are extensive. The design was done to minimise the maintenance and maximise durability, everything is strong and durable with low maintenance or is easily replaceable".
- This hot dip galvanizing enthusiast's passion for the coating is evident from the moment one enters his property. The intercom system, in front of a hot dip galvanized sliding gate, is mounted on a hot dip galvanized goose-neck. The property is surrounded by an electric fence, mounted on hot dip galvanized uprights.
- The attention to detail becomes more apparent when one enters the stable area. Arched double, custom-made, hot dip galvanized steel frame doors, clad with tongue and groove wooden panelling invite one into the facility.
- Hot dip galvanized angle iron edge steps, ensuring that the hooves of the horses don't damage the concrete stair tread profiles.
- The floor of the stable building is angled towards a central hot dip galvanized grating covered gutter. This ensures effective drainage and trapping of debris.
- Ten stables have been built using tubular hot dip galvanized steel. The framework is panelled with timber so that they are fully collapsible in the event of repairs. An extra hot dip galvanized screen was used between the stables to prevent the animals from biting one another.
- Rodcon Gates created round bar hot dip galvanized holders for the feeding and water buckets that bolt onto concrete shelves, preventing them from falling off the shelf.
- Rider's valuables can be locked away in secure steel boxes that are bolted into the concrete shelving. Bridles, stirrups, horse blankets and saddles are stored on custom made brackets.
- At the back of the building is a hot dip galvanized fenced area where the horses are shoed, washed and receive veterinary attention. The main arena, as well as every paddock, is gated with a tubular hot dip galvanized gate.
- The owner used to have a painted plough, which is used to grade the ground of the main arena. In keeping with the whole look and maintenance free philosophy, the owner requested that this be sand-blasted and hot dip galvanized!

Hot

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Duplex Coating Systems Category Winner

Dust Mitigation Project, Saldanha

Description

Fabrication and installation of dustcover frames for iron ore conveyor lines.

Location

Saldanha Bay Ore Harbour, Western Cape

Project partners

Client
Transnet Projects

Project manager / Fabricator
Heunes Engineering

Hot dip galvanizer and paint contractor
Galvatech (Pty) Ltd

Tonnes of steel

180 tonnes

Project value

R9 million

Project inception date

February 2007

Information

- This project forms part of a dust mitigation project to reduce the dust pollution of the environment in Saldanha.

- The duplex coated steel frames have been clad with sheeting and installed over most of the conveyor lines at Saldanha Bay Ore Harbour.
- This project led to improved innovations for Galvatech as the galvanizer, as they were required to be resourceful in finding ways to deliver hot dip galvanized, fettled, sweep blasted, primed and top coated components in considerable volumes.
- These innovative strategies included how to apply the primer and topcoat in the specified quantities using limited floor space. All painting was done inside their paint workshop. Frames had to be stacked upright, painted on the front side, laid down on tracks, painted on the other side and then placed in an upright position again on the opposite side of the building, while keeping coating damage and the need for subsequent coating repair to a minimum.
- The use of a duplex coating proved to be a major benefit in the tight deadlines as the hot dip galvanizing was not adversely influenced by the weather patterns and drying requirements of multiple paint only systems.
- The canopy frames were delivered and collected by Galvatech on a daily basis. Inspections to ensure that welding slag was removed and that adequate vent holes were drilled enabled the galvanizer to deliver a quality galvanized product quickly.
- Special care was taken to ensure the prevention of black spots and air pockets in corners as there was no time to strip and re-galvanize the components. Once galvanized, items were thoroughly fettled, thereby ensuring that the coating was not compromised by over cleaning. The resultant hot dip galvanized substrate was therefore properly prepared to receive the paint coating system, ensuring a quality finish.
- A duplex coating system was selected over hot dip galvanizing for a sustainable service-free performance in marine environments such as those encountered in Saldanha Bay Ore Handling Harbour.

Infrastructural Development Category Winner

Steel frame school buildings, Transkei

Description

Hot dip galvanizing of steel foundation frames for school buildings, Transkei.

Project partners

Developer / Owner
E-Kwikbuild

Main contractor
CJ Steelworks (Kwazulu Natal) and RS Steelworks (Cape Town)

Hot dip galvanizer
Phoenix Galvanizing

Project inception date

January 2008

Total tonnes

245 tonnes

Project value

R17 million

Information

- Education MEC for the Eastern Cape, Johnny Makgato has committed himself to eradicating all mud school structures in the province by the end of 2009. Currently there are 396 mud schools in the Eastern Cape. Makgato stated that the allocated budget from the Education Department (DOE) was not enough. The department would mobilise the private sector to adopt these schools.
- Eskom stepped in to replace 14 mud structured schools in the Ntabankulu area. The project was called 'The Emergency Schools Project' and the 14 schools that benefited from the project were identified by Eskom.

- The 'Ntabankulu Emergency Schools' project engaged many companies throughout South Africa, through E-Kwikbuild, the main contractor and hot dip galvanizers from the east and west coast.
- E-Kwikbuild has been producing prefabricated buildings for the DOE for a number of years and has erected structures in the Western Cape, Northern Cape and Kwazulu Natal.
- Buildings are constructed from a composite panel (52mm thick) consisting of laminated cellulose fibre cement boards with an expandable polystyrene inner board. This top structure is mounted on a hot dip galvanized metal frame, with wooden floor boards.
- The South African Bureau of Standards has tested the panels and structures for rain penetration as well for its structural strength and integrity and has duly approved the system for construction anywhere in Southern Africa.
- The company took the decision to hot dip galvanize all their structures four to five years ago, based on the fact that all buildings are relocate-able. Having the structures painted only would lead to substantial mechanical damage of the paint in the event of relocation.
- The company transfers skills and creates employment in the communities in which they erect the infrastructure under the guidance of their specialist project managers.
- The project was launched in November 2007 and completed in June 2008. In total, 98 classrooms have been built.
- The company is currently involved in infrastructure development for the DOE in Mpumalanga and is also dealing with enquiries from Mozambique, Angola, Limpopo and Gauteng. The promotion and ongoing application of hot dip galvanizing in this particular field is unlimited!

Vintage Category Winner

Floating jetties – Cape Town V & A Waterfront and Simonstown Harbour

Description

Duplex coating system for floating jetties in sea water.

Project partners

Client, developer and owner
V & A Waterfront and various municipalities and developers

Main Contractor
Jarr Marine and Petrel Engineers

Hot dip galvanizer
Cape Galvanising (Pty) Ltd

Inception date

Numerous floating jetties were installed during the early 1980s with failures incurring when using only hot dip galvanizing or a paint system. Successfully converted to a Duplex system in 1994, which remains operational and performing its designed function.

Information

- Following the early failure of a paint system to a clients specification,

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subsequent discussions and testing by Cape galvanising, the company decided unilaterally to promote their tried and tested duplex coating system for the corrosion protection of all subsequent small craft floating jetties. This has proved successful since 1994.

- What started out, as a failed system has become a good example of research and development. With research, the early Duplex system was introduced as the solution to a severe marine environment.
- This duplex coating system has been applied to the floating jetties of most small and unprotected harbours. Jetties on the west and east coast in marinas and harbours have also used the same corrosion protection system.
- The exception for this rule is the V & A Waterfront, whose moorings are fully protected from wave action. In the Waterfront the jetties are also considerably larger and above the water level and therefore less likely to be permanently damp. The time of wetting is a major factor in the life of a hot dip galvanized coating, specifically in a salt water environment.
- Most of the Gordon's Bay harbour jetties were successfully rehabilitated by abrasive-blasting the heavily rusted frames followed by re-galvanizing and subsequent painting to restore the Duplex Coating system.

Mining and Industrial Category: Special Commendation

Plant improvement project, Galvrite Galvanizing

Description

Upgrade of a hot dip galvanizing plant.

Project partners

Client
Galvrite Galvanising (Pty) Ltd

Inception date

June 2007 (acquisition date) to present

Value

From an initial 120 tonnes per month (at the time of acquisition) to the current output of 680 tonnes per month. This represents a growth rate of approximately 5.7 times over a one year cycle.

Information

- The hot dip galvanizing plant in Randfontein has been through a series of owners, resulting in a steady decline in productivity, a serious reduction in quality standards and levels of service delivery.
- Before June 2007 (the date of the acquisition by Alliance Group), the number of quality complaints averaged five to seven per week. This has been turned around and shown a steady improvement, currently the complaints have fallen to zero.
- The last complaint was in March 2008, which when investigated, was found to be a matter of client education with the need for minor site repairs.
- With the change of ownership, the company has introduced numerous management control systems, including a QA system, improved transport facilities, additional pre-treatment and replacement tanks, upgrading of buildings and

surrounding yard area and the introduction of various training courses aimed at improving product knowledge, productivity and safety standards.

- Through this marketing and sales effort, the company has re-established itself with a group of about 20 customers, with a regular order book of approximately 20 tonnes per month per customer.
- Following the current owner's positive experience, they are now planning to expand the operation further and a number of initiatives are to be implemented.
- Improved service levels have been used to gain the confidence of the market. This strategy has only been possible by ensuring a consistent standard of quality and the achievement of meeting delivery promises.
- The owners have involved the Hot Dip Galvanizers Association SA as a professional and technical knowledge source aimed at a programme of continuous improvement. Staff training, at all levels, is being undertaken, with senior management participating in the Association training courses and as such, setting the example.
- During the past year, management has demonstrated their commitment by providing resources, involvement of all stakeholders and the introduction of management controls that have been missing in the past number of years.

Innovation Category: Special Commendation

Andries Botha Sculpture

Description

Hot dip galvanizing of commissioned sculpture.

Project partners

Developer / Owner
Andries Botha

Hot dip galvanizer
Phoenix Galvanizing (Pty) Ltd

Project inception date

April 2008

Information

- Andries Botha, a Durban based artist, was trained as a sculptor at the Institute of Fine Arts where he has taught since 1978. Apart from his career as a teacher, he also works as an artist and has exhibited all over the world.
- This artist began making elephant sculptures 3 years ago as part of an international sculpture project – Beaufort Triennale 2006, where a family of 9 life size elephants were created.
- Each comprises a metal skeleton, to which a "skin" (made from pieces of wood) is attached using bolts. The Beaufort exhibition elephants were on display on a beach in Belgium for 6 months.
- The 'Phoenix' elephant is a private commission for an individual from Amsterdam as a memorial to his wife, who had an intense fascination with elephants and had seen Andries' elephants on exhibition.
- The sculpture will be based at his country home in Brabant, outside of Amsterdam. Andries Botha recommended that the elephant be hot dip galvanized because the area is situated close to the coast and it was important to Andries to supply a durable product to his client.
- This elephant is different to the other elephants in that it has a 'heart', which is a hollowed out piece of wood inside the chest cavity of the animal, into which tributes and letters will be placed.
- The process of the creation of the elephant is painstakingly handmade. The shape of the animal is drawn on the ground and then round bar profiles are bent by hand and welded to the shape, before the volumes are created.
- The 'Phoenix' elephant only just fitted into their hot dip galvanizing tank. However, it did not fit into the acid tank and the hydrochloric acid was splashed onto the creature manually for the duration of the pre-treatment. The elephant, however, was dipped in the hot dip galvanizing kettle in a single immersion and close quality supervision yielded an excellent product that was literally loaded from the scale onto the client's vehicle.
- The Cape Town 2010 coordinators are currently in negotiation with Andries Botha with regard to the commissioning of a herd of elephants which will be installed in the forecourt of the Green Point Stadium. The artist has already stated that he will definitely be hot dip galvanizing the herd!

ARCHITECTURAL CATEGORY

Penzance Primary School Aftercare Centre

Description

State of the art architectural aftercare and homework centre for Penzance Primary School

Location

Glenwood, Durban

Project partners

Developer / Owner	Penzance Primary School
Architect	Louis H Van Loon & Associates
Project manager and main contractor	MCM Construction
Hot dip galvanizer	Phoenix Galvanizing (Pty) Ltd

Project inception date

March 2008

Project value

R9 million

Information

- In order to utilise every available inch of the site, without encroaching on municipal regulations, the ground floor was split over two levels, with two mezzanine levels above.
- All the steelwork for the roof was hot dip galvanized, including a sophisticated expansion joint mechanism set in the concrete roof-gutter beams. When asked why Van Loon opted to have the entire roof structure hot dip galvanized, which was eventually hidden by ceilings panels, he replied "isn't that even more reason to hot dip galvanize. One can certainly not afford problems, especially when the area is mostly out of sight!"
- All interior balustrades have been hot dip galvanized and painted. Exterior steelwork was also hot dip galvanized.

ARCHITECTURAL CATEGORY

New NSRI Station 19 Base Richards Bay

Description

The use of hot dip galvanized steel in the new base development for NSRI Station 19.

Location

Port of Richards Bay, Bayside Area, Kwazulu Natal

Project partners

Developer / Owner	National Sea Rescue Institute (NSRI)
Project manager	nDawonye networks
Architect	Theunissen Jankowitz
Consulting structural engineer	nDawonye networks
Main contractor	Dicks Construction
Hot dip galvanizer	Bay Galvanizers

Project completion date

Late 2005

Project value

R11 million

Information

- In September 2005, the Council of the City of uMhlathuze granted a long-term lease to the NSRI to develop a new rescue station.
- The new base development included a slipway, combined boathouse / workshop / control centre / training centre and the associated vehicular access and parking areas.
- Early agreement was reached between all specifiers to make a feature of the exposed hot dip galvanized structural steelwork and cellular beams.
- The 3.5 tonne boat launching cradle was also hot dip galvanized.

ARCHITECTURAL CATEGORY

Kroondal K5 Capital Infrastructure Expansion

Description

Hot Dip Galvanizing of platinum ore conveyor steelwork.

Project partners

Client and specifier	Aquarius Platinum
Project manager	Steel Services
Design to installation	DRA
Hot dip galvanizer	Armco Galvanizers

Inclined shaft commencement date

2004 and conveyors in 2006

Commissioning date

December 2007

Tonnes of steel

500 tonnes of hot dip galvanized platinum ore conveyor steel

Project value

± R12 million

Information

- The project consists of 3 primary conveyor systems that handle ore from the transfer station. It also includes an emergency by-pass stockpile and reclaim conveyor and the rail silo feed conveyor.
- DRA has specified hot dip galvanized steel on many ore handling projects as it has maintained its workability and credibility due to extensive and successful usage.
- Hot dip galvanized steel has been shown to serve the interests of the various stakeholders, designers and operational personnel on projects of this type.
- Hot dip galvanized steel, is a natural application where rough site handling is encountered.

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MINING AND INDUSTRIAL CATEGORY

Donkerhoek Roof Project

Description

Light weight steel trusses

Project partners

Developer / Owner	Mega Group
Architect	Framelite South Africa (Pty) Ltd
Specifier	Megamaster
Project manager	Johan Venter
Main contractor	Steel Frame Projects
Hot dip galvanizer	Arcelor Mittal South Africa

Inception date

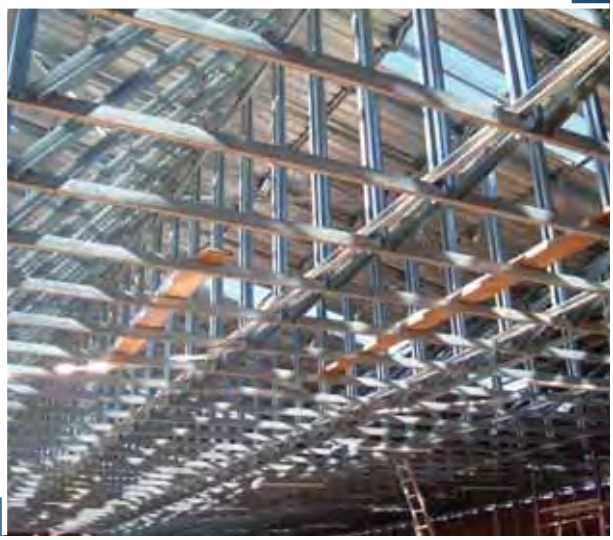
2008

Contract value

± 12 tonnes of 1mm thick continuously hot dip galvanized steel formed into sections

Information

- Of significant importance in this entry is that light weight steel frames have been used to provide an unsupported clear span of 30m, of prime importance for warehouses.
- Continuously hot dip galvanized steel is well suited to internal building applications where environmental conditions are generally less corrosive.
- Continuously hot dip galvanized material, having a pure zinc coating of approximately 20µm (Z275), remains ductile and is well suited to roll forming into sections without compromising the corrosion protection properties of zinc.
- In conserving our limited natural resources, steel, protected by zinc is fully recyclable and therefore viewed as a renewable resource.
- With the advent of light weight steel framed buildings into South Africa, this form of construction has opened up a new market for continuously hot dip galvanized steel.



VINTAGE CATEGORY

Virgin Active Swimming Pool Roof Structure Constantia, Cape Town

Description

A combined submission highlighting the benefits of using hot dip galvanizing and/or duplex coating for roof structures over swimming pools was entered – the Virgin Active swimming pool in Constantia (duplex coating – 20 years old); Camps Bay School swimming pool (hot dip galvanizing – 7 years old) and a new duplex coated structure at Sweet Valley School.

Only Virgin Active was acceptable in the vintage category.

Project Partners (Virgin Active)

Developer	Southern Peninsula Municipality
Steelwork contractor	Union Structural
Main contractor	Bruce Dundas
Specifier	Health & Racquet Club (now owned by Virgin Active)
Hot dip galvanizer	Cape Galvanising (Pty) Ltd

Information

- 1986 was the opening of the first Health & Racquet Club in South Africa in Constantia, Cape Town. Virgin Active are now owners of these gyms having some 70 swimming pools. Duplex coating systems are the preferred corrosion protection system for the steel framed roofs.
- The internal atmosphere has improved over the years with the use of a ventilation system which removes the moist and humid air.
- The Virgin Active Club in Constantia, when recently inspected was completely corrosion free. The steelwork has been up for 22 years.

VINTAGE CATEGORY

18m Mid-hinged Lighting Masts

Description

Hot dip galvanized mid-hinged utility lighting masts used in various locations in and around Randburg and Roodepoort.

Project partners

Client	Randburg and Roodepoort Town Councils
Consulting engineers	J.N. Duncan
Project manager	Late Pieter Meyer of IPM
Manufacturer	Industrial Poles & Masts (Pty) Ltd (IPM)
Hot dip galvanizer	Robor Galvanizers

Commissioning date

1990

Project value

R1 million

Information

- The late Piet Meyer, to improve service life, implemented a company policy at IPM, that all poles and masts be hot dip galvanized. Where enhanced corrosion control and aesthetics are required, duplex powder coating systems are applied. The two coatings are considered integral to IPM's product range.
- Having been exposed to the atmosphere the masts clearly exploit the service life aspect of hot dip galvanizing. Anticipated future life is in excess of 20 years.
- This project illustrates that when one is able to apply life cycle costing to a project, no other corrosion protection system can deliver the sustainable benefits inherent in hot dip galvanizing and/or duplex coating systems.

INFRASTRUCTURAL DEVELOPMENT CATEGORY

Decorative Iconic Masts

Description

Hot dip galvanized decorative iconic lighting masts

Location

Eastern Johannesburg CBD

Project partners

Client	Johannesburg Development Agency
Conceptual design	ASM Architects
Consulting engineers	Stewart Scott International
Project manager	Archway Projects/Jaco Meyer of IPM
Manufacturer	Industrial Poles & Masts (Pty) Ltd (IPM)
Hot dip galvanizer	Robor Galvanizers

Commissioning date

July 2007

Project value

R3.4 million

Information

- This project illustrates architectural changes in terms of lighting structures. The current trend is towards an ethnic theme or a more unusual and interesting utility system.
- In discussions with the manufacturer, it was emphasised that without exception, that due to corrosion control and longevity, all their products are hot dip galvanized or duplex coated.
- On this project, hot dip galvanizing was used specifically for corrosion control, but also for the 'raw' aesthetics of the galvanized finish, which was seen as being complimentary to the ethnic African theme of the project.
- The client was delighted with the final product and that it had achieved the overall theme of a 'WOW' effect that was envisaged for the project.
- The project has been specifically designed to meet the requirements of the Soccer World Cup.

INFRASTRUCTURAL DEVELOPMENT CATEGORY

The Sails on Timeball

Description

The largest of all developments in the Durban Point Waterfront Precinct

Location

Durban Point Waterfront, Kwazulu Natal

Project partners

Developer	PWR Properties
Engineer	ARUP
Contractors	Impact Engineering and New World Design Engineering
Hot dip galvanizer	Phoenix Galvanizing (Pty) Ltd
Tonnes of steel	43 tonnes
Project value	R2 million

Information

- According to the Engineer, due to the fact that the building is within 500m of the ocean at the Durban Point, duplex coating of the steel was a sensible and economic choice versus the alternative stainless steel solution for the steel elements.
- The cantilever canopies which feature throughout the building presented a problem, in terms of sizing. Through careful planning and consideration of the galvanizer's bath size, this issue was overcome.
- The large canopy frames were double dipped. Spiral hot dip galvanized staircases lead penthouse owners upstairs to roof level and their own private pool areas. These staircases were fabricated according to the Galvanizers kettle size.
- Stainless steel handrails and a duplex coated bridge were isolated from one another by an isolation membrane.
- The architect has employed both the corrosion control benefits as well as the aesthetic appeal aspects of a duplex coating into the design and presentation of the building.

INFRASTRUCTURAL DEVELOPMENT CATEGORY

Botank Reservoirs

Description

A demountable, hot dip galvanized steel tank, suitable for the storage of potable water, effluent or leachate, ranging in size from 150kl to 400kl.

Project partners

Design to installation (turnkey project)	Botank Construction (Pty) Ltd
Manufacturer	Moco Steel
Hot dip galvanizer	Lianru Galvanisers

Project value to date

± R30 million

Commissioning dates

From 1997 to present

Information

A Botank includes the structure (with or without a roof) and the ancillary piping.

- Construction takes place on a compacted earth base, which is normally prepared by the client. No concrete floor is required when sound founding material exists.
- As an example, a 2.9Ml Botank can be commissioned for around 50% less than a same volume concrete structure and within 8 weeks after instruction to proceed.
- The Botank requires a two-man training team that will use unskilled local labour, who within a few hours will be able to assemble the purpose-made hot dip galvanized tank sections.
- Made of radiused, heavy-gauge, hot dip galvanized steel, the Botank is guaranteed to be structurally and functionally sound as it is designed by a registered professional engineer.
- Hot dip galvanizing has been used for reasons of longevity, but also for the environmental nature of the system, i.e. no contamination of the environment.

DUPLEX COATING SYSTEMS CATEGORY

Duplex Lighting Masts

Description

This is a submission covering a number of decorative duplex coated poles installed in numerous locations in and around the Johannesburg Metropol.

Location

Eastern Johannesburg CBD and Rand Show Road

Project partners

Client	Johannesburg Development Agency and Beka
Conceptual design	ASM Architects and Beka
Consulting engineers	Mark Louw & Associates and SSI
Project manager	Archway Projects/Jaco Meyer of IPM
Manufacturer	Industrial Poles & Masts (Pty) Ltd (IPM)
Hot dip galvanizer	Robor Galvanizers
Commissioning date	July 2007
Project value	R3.4 million

Information

- A duplex powder coating was specified for both corrosion control and aesthetics in which uniform colour was the required surface finish.
- The geometrical setup of the poles was critical to the success of both the manufacture and installation. IPM had to ensure that all outreach brackets were aligned correctly.
- IPM had to produce a full-scale prototype for acceptance by the client.
- The manufacturer was enthusiastic about the quality and service received from Robor Galvanizers.
- The project has been specifically designed in order to meet the requirements of the Soccer World Cup.
- This project shows how hot dip galvanized steel can be employed using the benefits of strength, corrosion control, aesthetics and simultaneously remain economically cost competitive against alternatives.

DUPLEX COATING SYSTEMS CATEGORY

Athlone Soccer Stadium

Description
The only fully hot dip galvanized and duplex coated stadium built in South Africa.

Location
Athlone, Cape Town

Project partners

Developer / Owner	City of Cape Town
Main contractor	Scott Steel
Hot dip galvanizer	Cape Galvanising (Pty) Ltd

Tonnes of steel
1 000 tonnes

Project inception date
2001

Project value
R2 million

Information

- All the steel at Athlone Soccer Stadium was hot dip galvanized or duplex coated. This includes turnstiles, hand railings, structural steel roof supports and the elegant duplex coated roof arches to which the stadium roof is attached.
- The two existing roof arches measure 194m in length and 6.1m by 5.5m in cross section at the centre of the arch. The first completed arch had a mass of 65 tonnes and the second being slightly heavier at 75 tonnes.
- To date over a 1 000 tonnes of hot dip galvanizing has been used in the project and when the final phase is built, it will incorporate two slightly smaller arches.
- The specifiers required a 15 year warranty against corrosion. This was agreed to by Cape Galvanising as they played an integral role in the coating application.
- A duplex system (specified by the galvanizer) was used on the entire original arch.

Acceptance of change depends on the way we think about it

Why does change often fail?

Robbins and Finley (*Why Change Doesn't Work)* believe change fails because the idea is wrong, or the idea is right but the timing is wrong. It may also be that people aren't convinced that the change is worthwhile; they may not have been sufficiently prepared. Change may be for the wrong reason. Sometimes, the leaders may get too carried away or perhaps not carried away enough: in either case they lack credibility. Often, it's just bad luck that a change process fails.

Whether we accept it or not, change is inevitable. The present forms of plants and animals we see around us have adapted from prior forms. For thousands of years, animals and humans have had to change because their environment is changing. The rate of change depends on how fast the environment is changing. The political, social and business worlds are no different.

Change does not fail; people fail to accept change. The message is: facilitating people's acceptance of change is as important as developing the mechanism or content of the change process.

Influence and persuasion both concern deliberate change. Influence seeks any change; persuasion seeks attitude change through communication. Psychologists agree that the best way to effect change is to change attitudes since these govern behaviour. It may sound simple, but attitudes can be changed by proper influence and by effective and credible communication. Perhaps the reason that people resist change is that they are not properly influenced or persuaded.

One of the main factors in influencing a person is to understand they way in which the person thinks.

People generally think in two ways: 'systematically' or 'heuristically'. The

systematic thinker thinks carefully and analytically. By contrast, the heuristic thinker skims across the surface. Some people are predominantly systematic thinkers, some are predominantly heuristic thinkers and most are somewhere in between. A person's mode of thought can alter and will largely depend on their situation and mood at the time.

To be positively influenced, systematic thinkers need logical arguments, sound reasoning and reliable evidence-arguments must be supported by facts. Facts and data, or sound arguments do not influence heuristic thinkers. They work on 'cues' or 'triggers' in the form of attractive images, friendliness and respect of their self esteem. Visual impact is important to them. They readily recognise expertise and are influenced more by the person or setting than by argument.

Both modes of thinking can lead to the same degree of influence, provided effective 'arguments' and 'cues' have been used. Good communicators use techniques that simultaneously appeal to both.

Change, however, tends to be more enduring in systematic thinkers. Once influenced, systematic thinkers will show more commitment to change than heuristic thinkers. To them sound arguments tend to produce more persistent change than 'frivolous' cues do to heuristic thinkers.

The challenge then to change agents is how to get systematic thinking in the people they are trying to change.

Robert Cialdini (*Influence: The Psychology of Persuasion*) describes two proven ways: relevance and comprehension.

If people believe the change is important to them they will think systematically about it and thus be more inclined to accept it. If they see little or no relevance, they will think heuristically and will tend not to be duly influenced. If the change process is too complex or abstruse, systematic thinkers may switch to their heuristic mode. The ability to understand the change process is critical for acceptance.

In our ever-changing environment, it is becoming increasingly important that people are helped to accept change. Failure to do so may not necessarily retard the process but will result in frustration, apathy and abdication. The exciting challenges that reside in change will not be recognised.

Managers have a duty to ensure that change processes are simple and understood by all levels of employees. Convoluted business motives and complex schemes will not be understood.

The ability of employees to think for themselves must be appreciated. Walter Lippmann was wrong when he said: "We all think alike, no one thinks very much".

The Association wishes to thank Bob Andrew who is a consulting value engineer and honourary member of the Association for his article.

What if the Eiffel Tower had been hot dip galvanized and painted?

The Eiffel Tower is built of cast iron, a material that will last virtually forever if it is painted regularly. Since it was built (for the International Exhibition of Paris in 1889), the tower has been painted once every seven years.

Maintenance on the tower includes applying 50 metric tonnes of three graded tones of paint every 7 years to protect the 200 000 m^2 of iron lattice work from rust. The darkest paint is used at the bottom and the lightest shade at the top. Each repainting, by 25 painters working for 15 months, requires 1 500 brushes, 5 000 sanding discs and 1 500 sets of work clothes. On occasion, the colour of the paint is changed. The tower is currently painted to a shade of brown.

The application of an anticorrosion treatment lasts one year, so that the tower can stay open and continue to greet visitors. This legendary structure comprises 220 000 m^2 of surfaces that have to be maintained and repainted (7 300 tonnes of structural metal, and 10 000 metal parts held together by 2 500 000 rivets). Some of these surfaces are very difficult to reach. The budget for the job totalled 20 million francs.

The 17th time the Eiffel Tower was to be repainted, there were three new requirements:

- The monument had to be cleaned completely, with better preparation of the corroded areas before they were painted.
- The work had to be inspected
- Greater safety precautions had to be taken on the site.

The 25 painters who work on the Eiffel Tower still use the traditional methods from the time when Gustave Eiffel designed it. The paint must be applied only manually with brushes. Rollers and paint guns are not allowed.

continued on page 28...

Special paint systems used

The paints applied to the Eiffel Tower are formulated for this specific purpose. For this 17th paint job, a paint using new, lead-free pigments was developed, tested on 200m^2 of surface, and subjected to reactivity tests by the SNTE (Societe nationale de la Tour Eiffel). To emphasise the shape of the tower as seen from the ground, it was painted in three shades of brown specified by the SNTE's architect – the lightest shade at the top, and the darkest at the bottom.

Preparation of corroded areas and complete cleaning of the tower

All corroded areas were stripped, sanded and ground, then received two coats of an oleoglycerophthalic primer containing lead silicate-chromate pigment, which affords excellent resistance to corrosion while maintaining flexibility for the paints applied on top of it. (The areas that were determined not to be corroded were cleaned with high-pressure steam.)

The general finishing coat was applied with an oleoglycerophthalic paint containing basic lead silicate-chromate pigment. The colours were Eiffel Tower Brown numbers 1, 2, and 3 (one for each level of the tower). This paint has the following properties: high aesthetic appearance, perfect compatibility with the existing older paints, excellent corrosion resistance, and complete suitability for the Eiffel Tower.

In total, 60 tonnes of paint (including 10 tonnes of primer) were applied in the course of this job. It was estimated that about 15 tonnes of paint had eroded since the last time the tower was painted.

Galvanizing the Eiffel Tower?

Amazed at the cost and complexity of the work involved in repainting the tower, where the painters must use hooks, safety nets and cannot begin painting each day until the morning dew has evaporated, a Dutch corrosion expert made a hypothetical calculation of cost savings had the Eiffel Tower been hot dip galvanized. He made a cost analysis comparing the application of a paint system with a so-called duplex system, whereby the steel is first hot dip galvanized and then painted. With a duplex system, any damage to the paint coating does not lead to corrosion as the steel continues to be protected by the zinc which underlies the paint.

If only the Eiffel Tower had been hot dip galvanized? (Photo courtesy of Pilling Galvanizing Kettles – Germany.

Had the steel used to build the Eiffel Tower been hot dip galvanized before painting, only seven large-scale maintenance operations would have been required, compared to the 17 that have taken place since 1889. The first large-scale maintenance of a duplex system normally takes place after about 25 years (surface preparation and application of a primer and top coats). After this, small-scale maintenance (top coat) and large-scale maintenance take place alternately, after five or seven years respectively.

What does all this mean in terms of cost? Based on today's wage and price levels, and allowing for a favourable purchase price of the large quantity of paint needed, galvanizing before painting – the duplex system – would have saved at least US$10 million in maintenance costs! Using modern day prices to calculate construction and erection costs, these savings amount to over 50% of the construction cost.

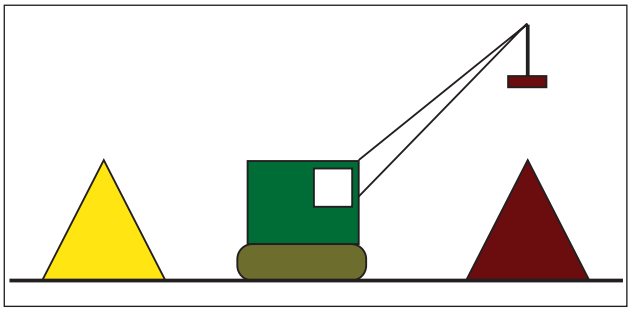
Measuring coatings on metal substrates (Part 1)

Coatings on metal

The thickness of a coating on metal directly affects the protection of the item when it is subjected to wear or attack by corrosion. Generally, the more coating there is on it, the longer it lasts. But, if this layer is too thick, parts may not fit together or the coating may break up, so the thickness of the coating must be measured.

Metal substrates

Metals are put in two basic groups, based on how the recycling business sorts scrap metal. The magnetic metal pieces are attracted to a big magnet on a crane. Magnetic metals and alloys include iron, steel, ferritic and duplex stainless, and nickel and cobalt alloys. These are called 'ferrous metals'.



The remainder of the pile will be non-magnetic metals and non-metal pieces. Separating these is easy because all metals have a certain look, which is different to plastic and wood. These metals have various colours from light grey, to yellow, to brown, to dark grey. Non-magnetic metals and alloys include aluminium, brass, copper, lead, titanium as well as austenitic stainless steel, monel and inconel. These are called'non-ferrous metals'.

Be careful using the term 'non ferrous' because there are many alloys that contain iron, nickel and cobalt that do not attract a magnet. Strangely, some modern alloys that look metallic are neither magnetic nor conductive.

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Probes Elcometer 456 and Elcometer 211

Dry film thickness gauges that use a magnet, the Elcometer 101, 211 for example, can measure on ferrous metals but not other metals. Electronic gauges, such as the Elcometer 456F, use an F-type probe specifically for these metals. The Elcometer 456N can also measure on the non-magnetic metals, by using an N-type probe. If you need to measure both ferrous (F) and non-ferrous (NF) metals an Elcometer 456 FNF gauge automatically switches between the two modes. It is worth mentioning conductivity. All metals conduct electricity though some not so well, such as lead. Only one non-metal conducts (just about): carbon.

Which probe?

Before choosing which probe to use, it is necessary to consider both the substrate and the coating.

Magnetic metal substrates require the F-type probe, which uses the electromagnetic induction technique. Their coatings cannot be magnetic, but that leaves many different materials, such as paint and zinc that can be measured. The thickness limit of metal coatings is those thicker than about 1mm (40 thou or mils). Above this point, the signal from the probe becomes absorbed in the coating and is no longer influenced by the substrate.

Non-magnetic metal substrates require the N-type probe, which uses the eddycurrent technique. Their coatings cannot be other metals but carbon is allowed. There is no problem measuring lacquer or plastic coatings on non-magnetic metals.

This article is one part of six, kindly supplied by BAMR, suppliers of coating thickness instruments.

NOW WITH CPD POINTS

Coating Inspectors Course

Hot dip galvanizing is one of the most widely used methods of protecting steel from corrosion. As a final step in the process, the hot dip galvanized coating is inspected for compliance with the appropriate specifications.

This Coating Inspectors Course has been designed to provide delegates with sufficient knowledge to test, inspect and interpret test results.

Following the course and successful result in a three-part exam, the delegate will be issued with a certificate, and if required, registered as an approved HDGASA inspector. Registration will be confirmed on an annual basis. Successful inspectors will become Individual members of the Association for the year.

The course will be run from the Hot Dip Galvanizer's Association Offices in St. Andrews, Bedfordview. Bookings are limited (maximum 20 people) and will be treated on a first-come-first-serve basis.

COURSE CONTENT

- Introduction to corrosion
- Inspection before hot dip galvanizing
- Quality assurance in coating applications.
- Understanding zinc coatings
- Inspection after hot dip galvanizing

COURSE DURATION

This is a 2-Day Course comprising lectures on the first day, a Plant Tour in the morning of the second day, and the qualifying examination in the afternoon.

DATE AND TIME

Courses commence at 08h00 sharp and end at 16h30, on the following dates in 2008: April 8 & 9; June 10 & 11; August 5 & 6; October 7 & 8 and Nov 25 & 26.

Lunch and refreshments will be provided. Comprehensive course notes can be collected from our offices two weeks before the course.

COURSE COST AND PAYMENT TERMS

R2 394.00 per person inclusive of VAT. Should you have 2 or more delegates from the same company, course costs will be R2 166.00 per person inclusive of VAT. Please note that payment is due on the first day of training. Cheques to be made payable to "Hot Dip Galvanizers Association SA". Members qualify for a discount.

SHOULD YOU BE INTERESTED, KINDLY CONTACT SASKIA SALVATORI AT THE ASSOCIATION.

NOTE: All professional Engineers, Technologists, Technicians and Certificated Engineers are required to achieve a certain number of points for Continuous Professional Development (CPD). By attending the Association's two day Coating Inspection Course, you will obtain 2 points (accredited by ECSA).

Walter's Corner

While it is true to say that the formation of a hot dip galvanized coating by molten zinc on suitably prepared steel is governed by the laws of the Creator, this does not suggest that the galvanizing process is relatively simple and not fraught with numerous pitfalls if undertaken by untrained and inexperienced personnel.

Many years ago, I was informed by an individual who, incidentally possessed a university science degree, to say that he would be installing a small hot dip galvanizing plant for coating small components. He claimed that he did not require any technical assistance as he was qualified to undertake the project on his own since it was not that complicated. A few weeks later I received a telephone call from the same gentleman which went something like this – Galvanizer: "Walter, I am having a slight problem in achieving a satisfactory galvanized coating on all the material that I have to galvanize. There is also a large quantity of zinc ash (oxide) forming on the molten zinc surface." Having asked most of the logical questions, I then asked "What is the zinc temperature?" To which he replied "the normal galvanizing temperature". Walter – "and what is that?" Galvanizer – "550°C!"

Unfortunately I could not restrain a muffled giggle, when I told him to lower the temperature by 100°c and immediately bail or pump the molten zinc out of the bath since even the special galvanizing bath steel would have probably just about perforated after a mere ten days at this temperature. Fortunately we were able to limit the damage in this case to the need to replace the steel bath which should have provided a service life of six to eight years under normal circumstances. Having severely bumped his head once, this gentleman learnt his lesson and the plant continues to function successfully many years later.

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There was a time when the hot dip galvanizing process was described somewhat disparagingly as a back yard operation. Today this is far from the truth. With the advance in technology, research and training, a successful galvanizing organisation is required to operate at a sophisticated and well managed level in order to compete with other systems of corrosion control which are available in this modern age.

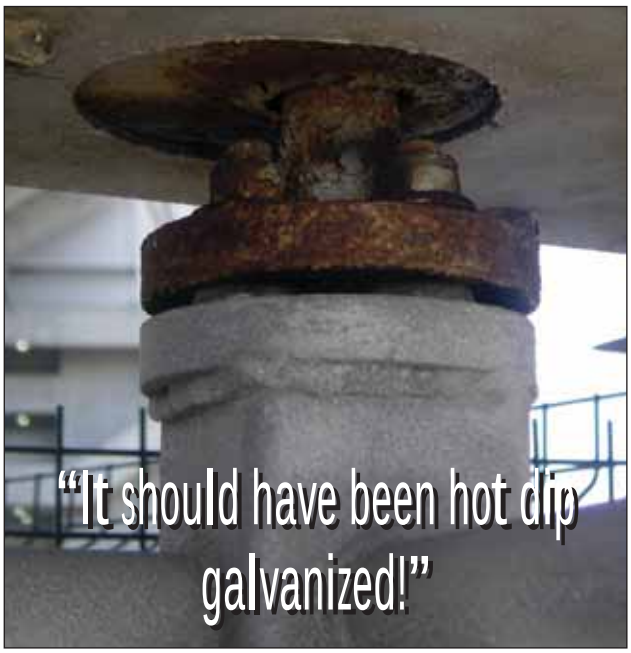
A well run operation will provide for regular testing and control of all the chemicals necessary for successful galvanizing, including the temperature and purity of solutions. In southern Africa we are fortunate to have programmes for training both production and quality control personnel. These courses which are provided by technically qualified personnel employed by Hot Dip Galvanizers Association Southern Africa are acknowledged Internationally as setting and achieving high standards in both the production process and ultimate coating quality.

It is partly for this reason that the demand for hot dip galvanizing in southern Africa continues to increase. This is evident in the quantity and diversification of steel components presently being hot dip galvanized. Several of the larger companies claim that they are being flooded with steelwork for processing through their plants at unprecedented levels.

Quite often the hot dip galvanizer receives the blame for a problem which in fact has not resulted from poor workmanship. A recent instance involved piping which was galvanized and subsequently powder coated prior to export to Europe. It was observed that the galvanized layer was delaminating within itself after painting, i.e. the outer 'eta' zinc layer was separating from the underlying iron / zinc alloy layers thus resulting in a peeling effect despite good adhesion between the outer paint coating and the eta layer. When informed that the galvanized coating applied was excellent and that the problem arose from subsequent overheating during painting, it was easy to detect the expression of disbelief in the manufacturers face. This extremely interesting phenomenon described as heat peeling can be avoided. We will discuss it in more detail in a future edition of this publication.

LIST OF CONTENTS ON BACK ISSUE COPIES OF HOT DIP GALVANIZING TODAY

We have had numerous requests for a summary list of contents on back issue copies of Hot Dip Galvanizing Today, for referencing purposes a list now exists, starting from issue number 8 published in October 1995. The list is available from our offices in Johannesburg or from our web site, www.hdgasa.org.za.



In spite of most of the components at Athlone Stadium being hot dip galvanized and/or duplex coated, this article on the turnstyle was only originally electroplated.

The Association would like to acknowledge the advertisers and thank them for their support

MISCONCEPTIONS

Miss Conception puts it "straight"

"Miss Conception" rectifies incorrect impressions concerning hot dip galvanizing.

To specifically specify the required dry film thickness (DFT) of a hot dip galvanized coating is essential if long-term corrosion control is required in applications where corrosion is severe. True or false?

As with most corrosion control coatings, the thickness of the applied galvanized coating will determine the protective life of the coating in a specific environment. Zinc is aptly described as a 'wasting form of protection' which is sacrificed gradually over a period of time in order to protect the underlying steel substrate by barrier protection as well as cathodic protection where the underlying steel may be exposed due to coating damage. It therefore goes without saying that the overall coating thickness as well as its metallurgical structure will determine overall protective life obtained in specific applications. It is for this reason that all national and international hot dip galvanizing specifications call for minimum achievable coating thicknesses for various thicknesses of steel.

In the case of continuously hot dip galvanized sheet (Senzimir process) as well as zinc electroplating (electrogalvanizing), maximum achievable coating thickness is in most instances substantially thinner than that achieved by the general hot dip galvanizing process and hence shorter protective lives can be anticipated before there is evidence of corrosion of the underlying steel.

The coating provided by the general hot dip galvanizing process is formed mainly by metallurgical reaction between molten zinc and suitably cleaned and fluxed material. The wonderful laws of God's creations ensure that the coating obtained complies with most of the requirements necessary for its durability.

Of course the galvanizer must comply with the strict and clearly defined processing procedures in order to secure what is required.

International hot dip galvanizing specifications have been developed and improved over time by technical experts and metallurgists to the extent that they can be relied upon to provide the best achievable coating quality and durability that is possible. SANS 121 (ISO 1461) provides for the best possible quality of hot dip galvanizing. Minimum acceptable coating thicknesses are also given; hence it is not necessary to repeat this elsewhere in other documents.

Terminology used for painting is erroneously used at times to describe what is required in the case of a hot dip galvanized coating. To illustrate, the term 'double dipping' is considered by some to indicate that the product is immersed in the molten zinc two times in order to achieve a thicker galvanized coating whereas in fact the correct term is 'double end dipping' which is necessary to entirely coat a structure which is too large to be totally immersed in a single dip. It does not refer to coating thickness. For long term durability, specifications provide for what is normally stated as a 'heavy duty coating'.

Products such as continuously hot dip galvanized sheet and galvanized wire are covered in separate quality specifications from that which relates to general hot dip galvanizing.

Another erroneous phrase often used, believe it or not, also by some otherwise competent specifiers is 'DFT' or dry film thickness when calling for hot dip galvanizing. One shudders to consider what would happen to the inspector's fingers not to mention damage to the instrument were he to attempt to measure the thickness of a molten or even a hot galvanized coating! In any case taking coating thickness readings on a hot galvanized substrate would result in coating thickness inaccuracies!

In hot dip galvanizing therefore, we refer to coating thickness and not dry film thickness DFT.

On the couch with

Mike Oldfield

What are the odds of a husband and wife (with 2 small kids at home), working for two different companies, getting retrenched on the same day? It happened to Mike and Marlene Oldfield, the driving force behind Cousins Steel International. Sitting in their stylishly decorated new office located in Durban's Morningside, it is evident that set-backs, such as a double retrenchment, do not get this team down – it inspires even greater achievement.

Mike Oldfield, a DHS old boy completed his BSc Civil Engineering at UKZN. Mike served his apprenticeship at the Durban City Council and then briefly went into construction. The double retrenchment gave rise to a Consulting Practice, MJ Oldfield & Associates, which the couple started from home in 1977. The company thrived for 22 years! Mike was then head hunted by a prominent Steel Construction company in Durban, where he spent two years. The connections he had built up during this period (particularly in the export market) and before, under the auspices of his consulting firm, prompted him to fly solo as Cousin Steel International (a JV with Cousins Steel cc in PMB). The company is pretty much a family affair. Son, Adam joined the team after a degree in Engineering and daughter Simone, a CA, assists with the financial side of the business. The company also employs eight other employees.

My company specialises in the provision of a single cost centre for clients. A "one stop service"

supplying design, engineering, fabrication and erection of steel frame buildings. The advantage to clients is that buildings can go up very quickly. The company's record is getting an order and handing the site over exactly a month later!

How important is aesthetics to an engineer? Very important! I am a firm believer that an industrial building can be both functional and aesthetically pleasing.

The professional achievement I am most proud of is... (Mike chuckles at this one saying that his company is not into the "bright lights"!) A highlight though is a 46m clear span building over a gymnasium in Tulear, Madagascar, in a cyclone belt.

Hot dip galvanizing to Mike means, protecting an asset for a lifetime. It is unfortunate though that the coating can not be used on its own in some environments, such as fertiliser stores, where one has to rely on duplex systems.

I use the coating often because, its simpler! If I can talk a client into using hot dip galvanizing on a project, I will.

A prime example of the application of hot dip galvanizing in one of Cousin Steel International's projects is, again the Gym in Tulear. (Which, he adds has since withstood an actual cyclone and emerged unscathed!)

I choose to live in South Africa, because, this is my home. I love this country and see it as the gateway into Africa. Any development into the continent will happen from here.

I find inspiration in, making things work. Here I refer particularly to dealing with a client's budget constraints and his requirements. I find tremendous satisfaction in making a building a reality, when there are financial constraints, whether it means re-engineering certain aspects to make it more cost-effective or sourcing alternative materials.

When I leave the office, I am the grandfather of a gorgeous little girl! I keep fit by rowing (as in "Oxford-style" rowing), scuba diving, golf and gym. I also enjoy reading steel construction magazines and engineering journals, so in a sense one can say that I leave work to work some more!

For more information on Cousins Steel International, visit www.cousinssteel.co.za

The Association wishes to thank Desere Strydom for this contribution.

Case History
No. 15/2008

Evaluation of the hot dip galvanized coating on the access walkway for bungi jumping on the Bloukrantz Bridge along the N2, Eastern Cape

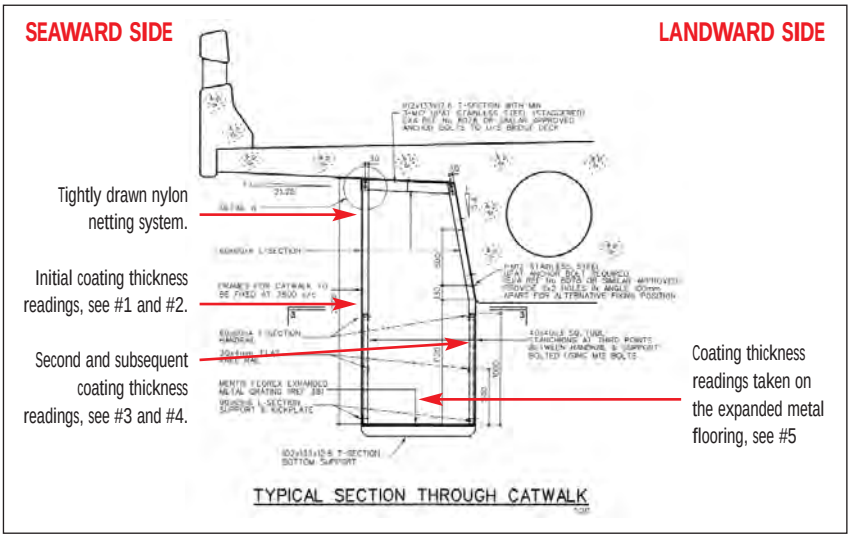
The application

The hot dip galvanized walkway is about 200m long (running from East to West) fixed to the underside on the seaward side of the concrete bridge. The steel walkway is approximately one kilometre from the sea and is about 10 years old. All the components other than some of the fasteners, some tubular hand railings and the steel wire rope supporting the nylon netting on the sides of the walkway, have been hot dip galvanized by the general process.

In my initial assessment of the performance of the coating at hand after examining some photos, taken by a Consulting Engineer in Cape Town, the hot dip galvanized coating in certain areas on the mesh floor was being attacked by chlorides. The remainder of the walkway structure did not seem to be in the same state but this could only be proved by removing the tenacious zinc chloride layer and taking residual coating thickness readings and comparing to known coating thicknesses of similarly aged components that are not quite exposed to the same conditions.

In order to evaluate the integrity of the hot dip galvanized coating, it was suggested that several coating thickness readings be taken on steel sections on the east and west side and also on fasteners and expanded mesh that looked suspect. Although coating thickness readings were taken on a variety of the steel sections, because the 40 x 40 x 3mm thick tubular stanchions looked most suspect and comprised the thinnest steel and therefore likely to have the thinnest original hot dip galvanized coating thickness due to the chemical composition of such steels, most of the recorded readings and photos were taken on these members.

Left – A general view of the bridge from the landward side (the bungi jumping ropes can be seen in the centre of the bridge) and right - a view of the access walkway looking from the east end, fixed to the underside the bridge on the seaward side.



Cross sectional sketch of the walkway indicating where coating thickness readings were taken.

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Photo 3.

Photo 4.

Photo 5.

The cross sectional sketch of the walkway on the previous page indicates where coating thickness readings were taken.

As the walkway was covered on the seaward side with a tightly drawn nylon netting system and other than one lot of readings, see #1 it was difficult to take all the coating thickness readings in this area. However, it was established that at several parts of the walkway the hot dip galvanized coating on the outside of the walkway was no worse than the areas that coating thickness readings were taken.

It was therefore decided to take readings on components that were on the inside of the walkway still facing the seaward side that looked as though they were showing signs of rusting.

Environmental conditions

The bridge is situated about 300m above sea level and about a kilometre from the sea. Damp sea air is driven by the prevailing wind through the gorge adjacent to the bridge and settles on the surfaces of the hot dip galvanized steel components.

A hot dip galvanized coating will generally provide a service life of between 8 and 70 years depending on the coating thickness and local conditions at hand. Hot dip galvanizing when new has a shiny silver appearance and this when exposed to the elements; carbon dioxide and moisture will change into

1	2	3	4	5	6	7
				MAINTENANCE FREE LIFE OF THE COATING		
Corrosion category	Description of environment	Corrosion rate (av. loss of steel in µm / yr.)	Corrosion rate (ave. loss of zinc in µm / yr.)	Continuously hot dip galvanized sheeting Coating class – Z275 (±20µm)	Hot dip galvanized coating (85µm) Steel thickness ≥ 6mm	DUPLEX COATING SYSTEM Hot dip galvanizing + an appropriate paint system
C1	Interior: dry	≤1.3	≤0.1	>50	>50 #A	Not required for corrosion protection #B
C2	Interior: occasional condensation Exterior: exposed rural inland	>1.3 to 25	0.1 to 0.7	>40	>50 #A	Not required for corrosion protection #B
C3	Interior: high humidity, some air pollution Exterior: urban inland or mild coastal	>25 to 50	0.7 to 2.1	10 to 40	>40	Not required for corrosion protection #B
C4	Interior: swimming pools, chemical plant, etc. Exterior: industrial inland or urban coastal	>50 to 80	2.1 to 4.2	5 to 10	20 to 40	Coating life in columns 5 & 6, plus the paint life multiplied by a factor of at least 50%
C5-I or C5-M	Exterior: industrial with high humidity or high salinity coastal	>80 to 200	4.2 to 8.4	2 to 5	10 to 20	Coating life in columns 5 & 6, plus the paint life multiplied by a factor of at least 50%

#A - Although mathematically incorrect (coating thickness divided by the corrosion rate), the maintenance free life indicated in column 6 has for practical purposes been curtailed to a maximum of 50 years.

#B - A duplex coating system may also be specified in order to provide a colour for aesthetic reasons.

Atmospheric corrosivity categories and examples of typical environments, taken from ISO 9223, Table 1.

Location of reading	Mean	Min	Max	No of readings
Taken on the zinc chloride layer on the outside of the hand railing. (60 x 60 x 4mm L)	281	250	336	12
Taken on the coating where the zinc chloride was removed – #1.	169	161	178	9
Taken on the coating including the zinc chloride layer on the inside of the hand railing – #2.	170	158	181	12
Taken on the coating where the zinc chloride was removed – #2.	147	144	150	13

Table 2: Coating thickness readings #1 and #2 (µm).

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Photo 6.

Photo 7.

Photo 8.

Photo 9.

Photo 10.

Photo 11.

Pictorial view of the hot dip galvanized bolts on the inside of the walkway, the two on the left are facing the seaward side, with the one on the right having been over coated with paint.

a matt grey colour (zinc carbonate film – stable layer).

Prevailing off shore winds containing moisture and chlorides from the sea can ultimately convert or partly convert this stable film into a zinc chloride layer (often seen only on the exposed side of a hot dip galvanized component near the sea).

The zinc chloride layer on top of the hot dip galvanized coating will when measured with an electromagnetic thickness gauge, indicate a thicker coating when compared to the surface on the opposite face. Chlorides are therefore attacking the metallic coating and when the metal coating has eventually been depleted, only a zinc chloride film will remain, providing very little corrosion protection, this layer can easily be removed and will tend to flake off resulting in discoloration and surface rust.

Whilst hot dip galvanizing is an excellent barrier, which by its nature corrodes slowly over its service life, acceleration of the corrosion rate can be affected by the conditions at hand. The atmosphere at hand is most probably an aggressive C4 or normal C5M environment. *See table 1.*

In spite of the atmospheric conditions the hot dip galvanized coating has provided a reasonable maintenance free life over the last 10 years of exposure.

The assessment

Photo 3 indicates a typical coating thickness reading (166µm) taken on the east end on the seaward side of the walkway hand railing (where the nylon netting was pulled away) on an area that was scrapped clean of the zinc chloride salt layer (see further readings #1 - table 2), p*hoto 4* - the coating thickness including the zinc chloride layer (163µm) and *photo 5* where the zinc chloride layer was removed (154µm) – on the inside of the hand railing – #2 table 2.

Photo 6 shows the appearance of the coating on the first 40 x 40 x 3mm thick tubular stanchion (east end), *photo 7* – the coating thickness

Photo 15.

Photo 16.

Photo 17.

including the zinc chloride layer (214µm) #3 table 3 and *photo 8* – the coating thickness reading where the coating was cleaned (92µm) #3 table 3.

Photo 9 shows the appearance of the coating on the stanchion on the west end, *photo 10* – the coating thickness including the zinc chloride layer (291µm) #4 table 3 and *photo 11* – the coating thickness reading where the coating was cleaned (77µm) #4 table 3.

Expanded metal flooring

Photo 15 shows the expanded metal flooring where due to discoloration of the hot dip galvanized coating, the expanded metal was painted. The photo shows the delaminating of the paint coating. *Photos 16* and *17* show the residual hot dip galvanized coating thickness (14.7 and 16.3µm respectively). See #5 table 3.

Originally over cleaned and damaged hot dip galvanized coating.

Photos 18 - 23 show where the coating was originally over cleaned and not repaired or damaged and repaired inappropriately, which has subsequently failed. *Photo 19* shows a damaged area with the zinc rich paint repair coating that has now failed and *photo 20* shows the residual coating thickness (15.6µm) at the damaged area. In *photo 22* the adjacent coating alongside the damaged area was measured to be 162µm thick and in *photo 23* residual coating thickness was measured at the damaged area (18.7µm).

Photo 24 shows under creep film and a zinc rich paint coating failure. The zinc rich paint was most probably originally applied over a damaged hot dip galvanized coating. Unfortunately, the position of this damaged and repaired coating was out of reach so that the paint coating could not be scraped off and the surrounding hot dip galvanizing, assessed. It is felt, however, that when the paint is removed an uncoated area will be revealed surrounded by a metallic zinc coating and this should be repaired in accordance with the coating repair procedure. Corrosion at this point will be localised and concentrated at the

Photo 18.

Photo 19.

Photo 20.

Photo 21.

Photo 22.

Photo 23.

Photo 24.

Photo 25.

Photo 26.

area of damage. Corrosion creep with hot dip galvanized coatings is impossible.

Abrasion resistance of a hot dip galvanized coating

The vastrap stair treads have been in place for 10 years and first impressions indicated that the coating had been worn off at the edge of the stair tread. Taking coating thickness readings proved to the contrary that a residual coating existed (*see photos 25 and 26* (49µm)). Walking on the vastrap plate stair treads, the hot dip galvanized coating on the edges seemed to have been worn off by the passing traffic. A residual coating thickness, however, in excess of 40µm, was found in most instances.

Conclusion and recommendations:

- The only successful method of removing the tenacious zinc chloride film that is adherent to many of the seaward face components, is to mechanically sweep blast the surface and due to the degree of difficulty in achieving consistent substrate cleanliness and the inevitable environmental restrictions of doing this, this cleaning technique will not be acceptable.
- The residual coating has been assessed for its integrity and other than several local areas, which require an appropriate coating repair; the hot dip galvanized coating is performing adequately and at the indicated corrosion rate, the coating is expected to last at least another 10 years.
- Areas that require coating repair using an approved coating repair material in accordance with the attached procedure are: All fasteners; all areas that were previously damaged and originally repaired by means of a zinc rich paint and all local areas that have subsequently been damaged and are showing discoloration or rust.
- The expanded metal flooring can also be repaired but due to the constant abrasion provided by the feet of passing traffic, may be better off being replaced using newly hot dip galvanized panel/s.
- All subsequent welding of the newly hot dip galvanized expanded metal flooring must be repaired in accordance with the Association coating repair procedure.
- The areas that were identified and where the coating was evaluated and thickness measured, should be suitability marked and identified for subsequent evaluation in two years time, say March 2010. Following this future coating evaluation and assessment, a more accurate assumption can be made as to the coatings durability and future maintenance free life.
- Should it be indicated that the hot dip galvanized coating in years to come has failed (defined as when the red rusted surface is greater than 5% of the total surface area), the individual walkway sections can be removed, abrasive blasted and regalvanized at the cost of only the hot dip galvanizing.

Location of reading	Mean	Min	Max	No of readings
Taken including the zinc chloride layer on the inside of the walkway on the seaward face of the tubular stanchion. East end – #3.	214	72	329	19
Taken where the zinc chloride was removed on the inside of the walkway on the seaward face of the tubular stanchion. East end – #3.	79	70	92	11
Taken including the coating including the zinc chloride layer on the inside of the walkway on the seaward face of the tubular stanchion. West end – #4.	229	165	342	11
Taken where the zinc chloride was removed on the inside of the walkway on the seaward face of the tubular stanchion. West end – #4.	90	70	104	14
Typical hot dip galvanized bolt, scrapped clean of zinc chloride salts	85	72	99	7
Expanded metal flooring where the zinc chloride and failed paint coating was removed. West end – #5.	22	15.9	30	9

Table 3: Coating thickness readings #3, #4 and other areas (µm).

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Guest Writer

Our guest writer for this edition is Spencer Erling, Education Director – SAISC

I am truly delighted to have the ongoing opportunity as a guest writer to the Hot Dip Galvanizing Today journal to spell out some ideas and comments about the product, on how the steel fabricating industry perceives the product and service they get from hot dip galvanizers.

Many of the remarks will come from my own experiences as a steelwork fabricator but the other remarks have been gleaned from conversations with fabricators and thus they in no way represent the general opinions of the greater industry....

The most common remark is that galvanizing is still a very cost effective way to provide corrosion protection in the correct applications.

But having made the decision to go with galvanizing then the fun starts... such as not necessarily having the great product galvanizing should be, or the frustration associated with what is perceived as 'poor service' from the galvanizers. But each of the fabricators who complained about the product and or service when probed actually agreed that they must also accept some of the responsibility for the product failure and sometimes even the service failure.

It is clear that the process of hot dip galvanizing is in its nature the combined efforts of the players from both sides of the 'fence' that in fact have to co-operate like a team to be successful

So why is it that so few steel fabricators and their chosen 'friendly galvanizer' do not communicate with each other until the proverbial is in the fan...?

Why is it that the fabricators forget about the few golden rules that they should follow to assist the team to achieve the quality of product they both so fervently desire but somehow,

often, just do not make any effort to achieve.

I mean, after all, is it so hard for the fabricator to get the half dozen or so technical issues, listed below, right for a good quality product:

- Choose the correct chemical composition for the steel where architectural finishes are required.
- Continuously weld the steel before galvanizing.
- Remove all the weld spatter, slag and or paint and other 'not desirables'.
- Round up all the sharp edges.
- Put in suitable drain holes in web stiffeners or hollow (sealed) members. Do not leave it to the galvanizer and then scream and shout about the rough holes they cut.
- Do not use wax crayons or the like to mark the steel.

And then is it so hard for both parties to do the communicating bit (probably the most important grease to make sure the wheels turn smoothly)

- Discuss those special awkward jobs early on with the galvanizer... those double dip large items, the awkward shaped items, how to keep those welded components straight and so on.
- Ask the galvanizer to come around and have a look at the steel in the fabricators yard for quality of preparation before it is delivered to the galvanizers yard.
- Give the galvanizer fair warning you are going to deliver steel for galvanizing and to discuss a sensible program with him.
- Be reasonable in your time demands... do not leave every galvanizing job to the very last minute and then blame the galvanizer for being late.

And likewise I believe it is just as easy for the galvanizer to:

- make sure what you receive at the galvanizer is what was supposed to be received and also returned after galvanizing.
- make sure that what you return to the fabricator is straight, presentable and something to be proud of (and if you cannot straighten it discuss the issue with the fabricator do not just send the damaged item back and leave it to the fabricator to sort out).
- Inspect the material at the fabricators yard before he delivers.
- Communicate with the fabricator regularly about the progress of his job after all he should be your friend 'not the enemy'.

And if we can all just pull together then we are left to fend off those really 'funny things' that can and do happen despite every effort by all the parties to prevent them from happening.

It seems that Mr Sod also has a residence at galvanizers, is alive and well and having his fun just to frustrate us all and keep us challenged.

But all said and done I am sure that if we can only operate as a team, do the few important things we need to and go that extra mile to communicate properly achieving the excellent product we want can be quite simple to achieve.

Photos above show views of pipes in uncoated, hot dip galvanized, painted & stripe coated and then the final coating for the Potsdam Sewer Bridge project.

Duplex coating systems

A duplex coating (hot dip galvanizing and an appropriate paint system) is a superior coating system used where hot dip galvanizing on its own is insufficient to provide the service life that the coating generally is known for, or when a colour, for aesthetics is required.

Galvatech, situated in Bellville, Cape Town is fast becoming known as a reputable applicator of duplex coating systems. This reputation has come about as a result of:

- Assisting clients in the design and fabrication of the components, ensuring a quality hot dip galvanized coating.
- Assisting clients with a suitable and workable duplex coating specification, including advice on the paint system, loading and unloading and appropriate coating repair, if necessary.
- Regular communication with the client or project team during application of the coatings.
- Assisting clients with the compilation of a practical QA plan.

Galvatech (Pty) Ltd. specializes in the application of duplex coating systems and provides services which include abrasive grit blasting, acid pickling, zinc metal spraying, hot dip galvanizing and industrial spray painting. We are involved with many projects in the Western Cape, South Africa and abroad.

For more information visit us at www.galvatech.co.za.

FEATURES 2008

In order to streamline production of the magazine, while still ensuring the contents remain interesting and topical, only a few preferred features have been retained. In addition to the regular articles including: Case History; Coating Report; Galvanizing Failures; Misconceptions, etc. the magazine will from time to time highlight other interesting articles.

NOVEMBER/DECEMBER:
(Advertising deadline – 16 October)
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