2011 Volume 8 Issue 4

HOT DIP GALVANIZING TODAY

HOT DIP GALVANIZERS ASSOCIATION Southern Africa

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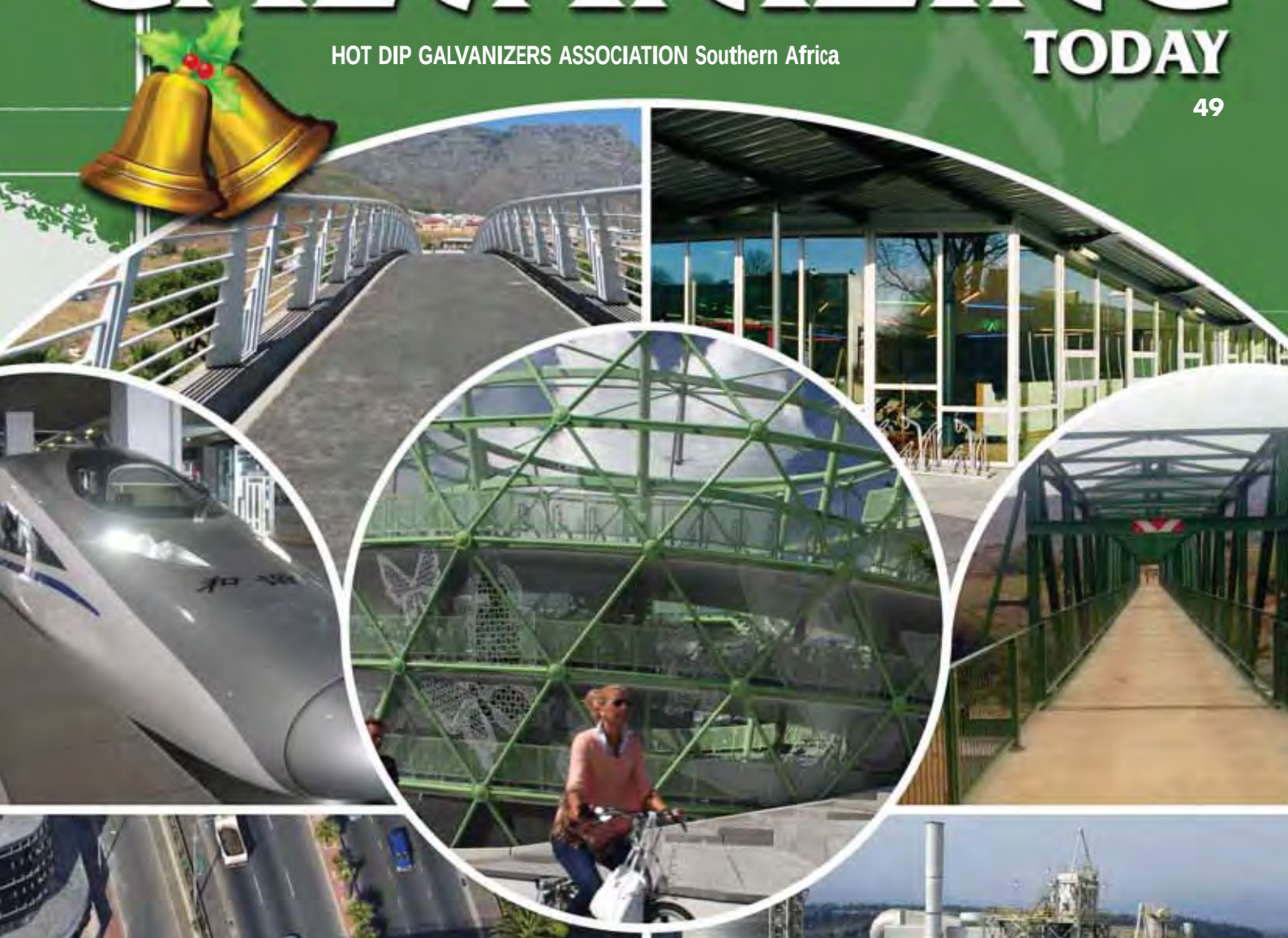

Featuring:

- The World of Galvanizing Around Us
- Bridges
- Feedback on our Awards Evening
- Duplex Coating Systems
- Other regulars: On The Couch, Bob's BANTER and Education and Training.

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

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Front Cover: *A kaleidoscope of photos including some local pedestrian bridges, a novel bicycle garage and community school from the Netherlands, Japan's bullet trains and a cement production plant from Chile.*

Hot Dip Galvanizing – Adding value to Steel

Executive Director's Comment

As an industry, we have been aware of the difficulties at Zincor, with maintenance problems of aging equipment, shortfall on production and the need to supplement supplies by way of imports. Zincor's closure was not unexpected, but recent electricity increases could well have been the last straw that precipitated the event. The announcement that Zincor would cease operations at year end, introduced the need to embark upon a programme of establishing new zinc supply chains. As from January 2012 all zinc will be imported into South Africa and as such shall be subject to cash flow restrictions and the need for some long term inventory planning.

From all accounts, our members have reacted very well to the changed situation and have made the necessary arrangements to ensure the continuity of supply. We can confidently ensure the users of hot dip galvanized steel that there will be no disruption in zinc supply.

Association staff were again actively engaged in formal technical presentations, numerous site visits, as well as reporting on issues of coating quality and corrosion control and applying appropriate use of hot dip galvanizing and duplex coatings.

Education and training continued as a major objective with our 3 day Inspectors Courses receiving priority. A review of results are gratifying and an indication of a need within the corrosion field.

The three day course results for 2011 year to date are as follows: 9 courses held, including 2 in Cape Town, with 57 attendees, 27 achieved >75%, a further 29 over 50%. Average pass rate was 72%.

Our new one day course *"The Introduction to Hot Dip Galvanizing"* has also been well attended, with the following summary of results: 10 courses held, including 2 for Eskom East London, with 98 attendees, 52 achieved >70%, a further 28 over 50% with an average pass rate of 65%.

To all our supporters, readers of our journal, consulting engineers, fabricators, project developers and Association members, we wish you well for the coming festive season and a successful 2012.

Bob Wilmot

Note from the Editor

SANS 121 (ISO 1461) includes Annex A, which addresses the essential information to be provided by the purchaser to the hot dip galvanizer, while the Annex is situated at the back of the Standard does not reduce its importance when specifying hot dip galvanizing. Most general galvanizers accept steel for hot dip galvanizing as long as the component has been reasonably designed and fabricated taking into account some simple design rules but they cannot be aware of the potential reactivity of the steel in its black form with respect to molten zinc before galvanizing!

The galvanizer takes responsibility for hot dip galvanizing the steel but the selection of the steel is the responsibility of the specifier, fabricator and steel supplier, particularly when the latter has been informed that the steel is to be hot dip galvanized!

One hugely important point set out in Annex A which in my opinion requires attention is for the purchaser/specifier/user to provide the galvanizer with an accurate steel chemical composition certificate. Generally certificates are only available with Graded and not Commercial Grade Steels. This will highlight possible problem steels. Irrespective of the certificate, should the galvanizer find the steel to be problematic, he should cease dipping and inform the customer accordingly.

The two chemical constituents in steel that affect coating thickness and aesthetical appearance are Silicon and Phosphorous with, out of specification silicon, phosphorous and combinations of the two elements also influencing the successful metallurgical bonding of the coating. Ideal steels require a Silicon content of 0.02 to 0.04% (Aluminium Killed Steel) and 0.15 to 0.25% (Silicon Killed Steel) with a maximum Phosphorous content of less than 0.02%.

In a subsequent edition of the magazine we will be reporting an incident of hot dip galvanized structural steel where the silicon was in the ideal range but the phosphorous was as high as 0.042%! This resulted in coating cracking and significant subsequent delamination of the coating!

The main feature for this edition is the "World of hot dip galvanizing around us" where we have contributions from China, Holland, Japan and Chile. While the projects from Chile are significant, some technical content may be skewed due to the lack of accurate translation, we apologize for this.

The other feature is on "Bridges" in SA where hot dip galvanizing and/or duplex coating systems have been used for corrosion protection.

Regulars include Duplex Coating Systems, Education and Training, Bob's BANTER and On the couch where we interview Prof. Denis Twigg, first Executive Director of the HDGASA.

On behalf of Sandra Addinall, Anne van Vliet and myself, we thank our advertisers and contributors for their support and wish you and all our readers a safe, healthy and happy festive season and a prosperous 2012!

Enjoy the "magazinc".

Terry Smith

2011 HOT DIP GALVANIZING AWARDS EVENING

After a two year hiatus, the Hot Dip Galvanizers Association of Southern Africa hosted the eleventh Hot Dip Galvanizing Awards Evening on Friday 26 August in The Ballroom of Montecasino, Johannesburg.

Thank you once again to this year's sponsors - Armco Galvanizers, Bulldog Projects, Chem Systems Metal Chemicals, Exxaro – Zincor Ltd, Macsteel Tube & Pipe, Metsep (Pty) Ltd, Robor Galvanizers and the SA Institute of Steel Construction.

In spite of the tough economical conditions, the Association was pleased to have a good turnout.

Al Prodgers who was the MC in 2009 was requested to undertake this role again. Unfortunately due to the fact that Al's wife was expecting their first child and he was unable to attend and Melt Sieberhagen gallantly stepped in and saved the day!

Melt is an accomplished scriptwriter, editor and director, as well as a regular face on television and in film. He certainly did not let us down!

The evening was enjoyed by all of those who attended.

Due to a small camera problem the photos recording the presentation of the Awards Certificates were not great and hence the reduced photo size.

The use of hot dip galvanizing in China's high speed rail system

Hot dip galvanizing is widely used in high-speed rail (HSR) construction in China, which has the world's longest high-speed rail network with about 6 920km of routes in service as of July 2010.

China's high speed rail lines consist of upgraded conventional rail lines, newly-built high-speed passenger designated lines, and the world's first high-speed commercial magnetic levitation (maglev) line. With generous funding from the government's economic stimulus program, 17 000 kilometres of high-speed lines are now under construction. The entire HSR network will reach 13 000 kilometres by 2012 and 16 000 kilometres by 2020.

All steel structures are required to have maintenance-free durability and longevity, thus the choice of anticorrosive coating is critical to the high speed railways' service life. Hot dip galvanizing is the coating of choice as it is economic, durable and gives an aesthetic finish.

A large amount of equipment involved in the high speed rail construction is exposed to corrosive outdoor elements. China's railway system experiences big differences in temperature between south and north, as well as high precipitation in the north western and high humidity in the south part all the year around, and heavy marine salts in the coastal line areas and interior salt lake areas. Without proper anti-corrosive treatment the steel will rust quickly, and once rusted it will be difficult to recover and will need replacement, resulting in high economic losses.

The advantages of hot dip galvanizing for steel structures are numerous. Steel which is completely unprotected may have a service life of as little as two years before its structural integrity is compromised. Even in the worst outdoor atmospheres the standard galvanized coating on fabricated products will last ten years without any maintenance.

The world produces more than 11 million tons of zinc annually, 50% of which is used for preventing steel from corrosion. In China, the annual loss from steel corrosion amounts to about 5 billion yuan (R6.35 billion). Hot dip galvanizing provides greater savings and its protective performance is an advantage to other industries such as communications, traffic and electrics.

Use of steel columns for overhead contact system

Electrified railway provides power through the electric power pylon and overhead contact system along railway lines. This system is composed of contacting suspensions, supporting devices, positioning devices, prop and base. Steel columns are widely used, especially in large stations. The vertical structural column (welded by angle steel) has the advantages of light weight, large capacity, impact resistance, convenient transportation and installation. Anti-corrosive treatments by hot dip galvanizing can improve its durability properties and effectively extend its life cycle.

Hot dip galvanizing is especially suited for the atmospherically polluted areas and moist weather areas on electrified railways They are mainly used for places with many track spans, high

columns and large capacity head-span wire systems. Because of the bad weather that the system has to cope with, electrified railway columns should be well protected against corrosion.

Standard

Standard TB/T2921.1-4-2008 for China's electrified railway regulates the corrosion protection of hot dip galvanizing for various overhead contact system steel columns. Hot dip galvanizing of steel tubes should be conducted after the quality test and should meet regulations of standard GB/T13912 and GB/T2694-2003.

Track accessories

Fasteners

The flexibility of ballast-less tracks depends on the fastener system. Hot dip galvanizing for fasteners can separate humidity and air, and protects against moisture and rust. Hot dip galvanizing also can effectively prevent the spalling of zinc coating caused by crash and knock. In accordance with regulations on the operation and inspection of China's Ministry of Railways, the grade of hot dip galvanizing of spare parts shall meet regulations of TB/T2075.

The rapid development of China's electric power and transportation will greatly promote the development of hot dip galvanizing for fasteners.

Bolt

The high-speed railway bolt is a standard component specially used for construction and maintenance of high-speed railways; just like fasteners, bolts are also indispensable components. Hot dip galvanizing the bolts eliminates the need for maintenance and increases the service life of the components.

Steel structure in high speed railway stations

New Guangzhou Railway Station is built at the crossing of four main lines and is one of three starting stations for the Wuhan-Guangzhou Passenger Dedicated Line. Total steel consumption of this station reaches 79 000 tons, which is about 1.7 times the steel used to construct the Chinese National Stadium (Bird's Nest). Corrosion protection of the steel structure in the station is of great significance.

The main structure of the New Guangzhou Railway Station is the joint form of station and bridge; the subsurface layer is cast-in-place reinforced concrete; layers above 12m are big span pre-stressed concrete and steel truss beam-column; layers above 21m and roofing adopted a wide span spatial steel structure system. The outline steel structure of the station building and canopy is similar, with several large Lingnan banana leaves rising up layer by layer. Steel structures that have been hot dip galvanized include the roof canopy without post steel truss, the pre-stressed cable-arch structure, the primary station building arch steel roof and central day-lighting band, and the pre-stressed cable-arch and cable-shell combined arch roof structure system at the entrance hall. Steel structure components are circular tubes, fusiform tubes, oval tubes and square tubes. Statistics show that total zinc consumption was about 3 950 tons.

Retrospect and prospect

According to incomplete statistics in April 2010, steel consumption of China's built railway track (statistics for fasteners, bolts, traction bracket and accessories) was 1 621 010 tons, and estimated zinc consumption was approximately 81 050 tons. Hot dip galvanizing will continue to be an important industry in the construction of high-speed railway traction networks as well as new sites along the railway line.

The Association wishes to thank and acknowledge Prof Gary Kong – Consultant – General Galvanizing, IZA China for this article.

Use of galvanized rebar in Chile

Coal-fired Thermal Power Station, Colbún SA, Coronel Port

Implementation of galvanized rebar in the pit drive cooling sea water (sea water pump pit)

General

Constructor
Construction and Assembly COM S.A

Tons
565

Within the project 'Santa Maria de Coronel coal-fired power station' currently being developed by the company Colbún SA with a total investment of U.S. $1 000 million and a projected lifespan of 30 years.

This mega project involves the installation and operation in two stages of a pair of steam turbines of 350 megawatts (MW) of power each, with 700MW to be delivered to the Central Interconnected System (CIS) of Chile, electricity supplies from Tal tal to Chiloé.

The energy is significant when one considers that in the central region the Ralco Hydroelectric Plant contributes 640MW of power to the CIS. The latter project includes the construction of a high voltage transmission line of approximately 32 kilometers long, which will be connected with Hualpén substation.

The first stage will operate the second half of 2010 and the second unit in 2013.

Direct Protection vs Indirect protection			
Settlement	**Bare steel rods**	**Settlement**	**Galvanized steel products**
Concrete Type	HB40 (90) 20/12	Concrete Type	HB40 (90) 20/12
Ratio W / C	**0.40**	**Ratio W / C**	**0.55**
Dosage Strength Cement	406 kg/m^3	Dosage Strength Cement	350 kg/m^3
Concrete Cover	**7.5cm**	**Concrete Cover**	**5cm**
Quantity	3 450m^3	Quantity	3795m^3
Steel 36mm	595 815kg	Steel 36mm	543 000kg

Costs with black rebar				
Product	**Quantity**	**Unit**	**Unit price CLP $**	**Cost CLP $**
Concrete	3.795	m^3	72.482	275.069.190
Pump service	3.795	m^3	7.345	27.874.275
36mm Steel rebar	595.815	kg	450	268.116.750
			Total CLP $	**571.060.215**
			Total US$	**952.609**

Costs with galvanized rebar				
Product	**Quantity**	**Unit**	**Unit price CLP $**	**Cost CLP $**
Concrete	3.450	m^3	59.723	206.044.350
Pump service	3.450	m^3	7.345	25.340.250
36 mm Steel rebar	543.000	kg	450	244.350.000
Galvanizing service	543.000	kg	180	97.740.000
			Total CLP $	**573.474.600**
1 US$=599,47 CLP$, March 2009			**Total US$**	**956.636**

The two units use pulverised coal to a boiler for steam generation, accompanied by a system for controlling emissions.

The application

The sea water is used as a cooling system of the boilers of the new plant, including the collection, treatment, drive to the plant and return to the sea. The water flow is of order of 48 000m^3/h.

Initially reinforced concrete structure that will contain this large volume of seawater, was specified to an indirect protection system which is based on a design by the strength of concrete and greater concrete cover over the reinforcement steel, this was seen to be necessary to ensure that the concrete remained more alkaline, ensuring greater passivity of the steel reinforcement and also delaying the onslaught of chlorides into the concrete mass.

The alternative

Due to this unit is critical for the functioning of the entire central and even more so considering the life of the structure and the inability to perform corrective and preventive repair product of the conditions of use and particular operating conditions in highly aggressive, in direct contact with sea water and areas of varying heights of water was key to protecting the reinforcing steel with a system of direct protection to protect the steel through the process of hot dip galvanizing.

The results

Resulting from use of this solution is able to use coating thickness very close to the standard specified by the ACI 318S05, points 4.4 and 7.7 according to the diameter of the bar used without the need to incur in over thickness reducing volume of concrete used and therefore the amount of reinforcing steel.

Conclusion

With all of the above it is concluded that under no circumstances incur excessive expenditure increased by using galvanized bars as a protection system.

Overview of the construction of the Colbún's thermoelectric plant in Coronel showing the coal loading dock, sea water lines and the construction zone of the plant.

The Association wishes to thank and acknowledge the following people for this article:

David Vela – Executive Director, Latin America Zinc Association (LATIZA)

Ricardo Suplicy Goes – General Manager, Non-ferrous Metals Association, Brazil (ICZ)

Eng. Luis Gallegos – General Manager of BBosch Galvanizing, Chile & Brazil

Juan Antonio Osses M – Commercial Manager, B Bosch Galvanizing

Christian Sánchez Villa – Technical Marketing Manager B Bosch Galvanizing

Use of duplex systems in Chile

Cement grinding Mill, Melon S.A. Ventanas, Chile

General

Melon Cement Project located in the commune of Puchuncavi, sector Ventanas coastline in central Chile.

Environmental characteristics

The exposure conditions are unique in combining the effects of marine and industrial environment, given the influence of the activity in the area, which highlights the presence of a smelting and refining of copper concentrates and thermoelectric power generation plants. This combination of high concentration of sulphur dioxide in a marine environment in the upper range of C5 environments according to ISO 12944-2.

The requirements imposed by the client for the corrosion protection coating require time for its first maintenance work over 15 years.

Project

The project consists of the corrosion protection of 800 tons of structural steel, grills and railings, equivalent to 30 000m^2.

The specified duplex protection system was:

- Hot dip galvanizing conforms to ASTM A123
- Abrasive brush off cleaning, SSPC SP7
- Epoxy primer, 50µm DTF
- Aliphatic polyuretane, 60µm DTF

After assembly of the structure is carried out an inspection to determine possible alterations and damage to the coating to ensure durability of the protection system.

Life cycle costing analysis

The analysis of life cycle cost is carried out with the methodology published by NACE international in the paper number 08279 to compare different alternatives for corrosion protection considering the maintenance of the protection system through the years of service. The results are delivered in a current cost curve versus time graph, *figure 5*.

Location of both the thermal power station and cement grinding mill with respect to the coastline.

	Traditional epoxy system	Duplex System
Surface preparation	SSPC SP10	As described above
Paint system	2 coats amine aliphatic epoxy, 100 µm DTF each	As described above
Service life in years, nomaintenance	9	28*
Cost, US$/m² over service life	36.69	23.91
**Service life in years (no maintenance) of a duplex system calculated from 1.5*(HDG+Paint). HDG time: 10 years / Paint time: 9 years*		

Comparison between the two coating systems.

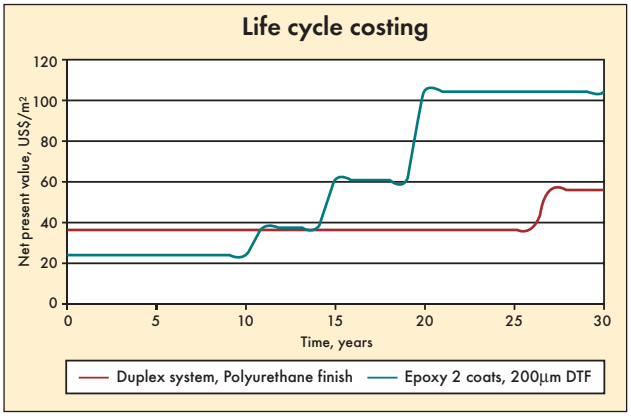


Figure 5. Life cycle costing graph.

The table summarises the coating conditions.

Conclusion

With all of the above it is concluded that under these circumstances should consider the variables involving industrials activities in the vicinity of the facility to classify environments and determine the appropriate corrosion protection that delivers the expected service life for the project and result in economical behaviour through time.

The selection of protection system should consider their behaviour through the service life taking into account the costs of operation maintenance, safety issues and stopping processes.

The Association wishes to thank and acknowledge the following people for this article:

David Vela – Executive Director, Latin America Zinc Association (LATIZA)

Ricardo Suplicy Goes – General Manager, Non-ferrous Metals Association, Brazil (ICZ)

Eng. Luis Gallegos – General Manager of BBosch Galvanizing, Chile & Brazil

Juan Antonio Osses M – Commercial Manager, B Bosch Galvanizing

Christian Sánchez Villa – Technical Marketing Manager B Bosch Galvanizing

De Waterlelie Community School – safety and durability on a higher plane

The first thing which is reflected in the pond of the park in the Prinsenhof area of Leidschendam is the railing on the first floor of a school building.

This railing is not just attractive but also offers solid protection for children playing outside 'De Waterlelie' Community School.

The new Community School designed by Gerrit-Jan van Rijswijk of VVKH Architects in Leiden is a versatile complex accommodating a great number of functions. The new building houses two primary schools, a day nursery with after school care, a community centre for the Turkish Cultural Centre Leidschendam, a health centre, a boxing school and a sports hall. The sports hall and boxing school including activity area and changing rooms are situated in the basement of the complex. The Community School occupies a total area of 4 568m^2. The complex is equipped with a sophisticated climate control system.

As a result of good insulation and ventilation with heat recovery the school is 25% more energy efficient than existing regulations. The design has also been tested with regard to a number of durable building aspects, such as use of materials, water, health, energy, etc. The building scored extremely high in this study (final mark 8.4 out of 10).

The roof of the school which also serves as a playground is accessible via a bridge. A robust system of galvanized steel railings has been installed around the playground to create a safe play area for the children. Galvanizing as a surface treatment ensures that the steel elements in question are well protected against corrosion and therefore have a high degree of durability. Furthermore the coating requires little maintenance and is able to cope with the daily wear that the railings system will endure from the enthusiastic activities of the children.

Project details:

Architect/photo's:
G.J.M. van Rijswijk (VVKH), Leiden

Designer:
IMD, Rotterdam

Installations:
Valstar Simonis, RijswijkBouw: Stout, Hardinxveld-Giessendam

Landscaping:
Kuiper Compagnons, Rotterdam

Client:
Leidschendam-Voorburg Council

The Association wishes to thank and acknowledge the Architect G.J.M. van Rijswijk (VVKH) from Leiden and Gerard Reimerink, Technical Director of "Zinc Info Benelux" (Galvanizers Association of Belgium, Luxemburg and the Netherlands) for the photos and written article respectively but also UKGA for the translation from Dutch to English.

Solana Solar Power Plant in the USA

The Spanish Group Abengoa Solar has won a contract to install the world´s largest solar power plant. One of the most important matters to mention is that all the necessary steel for the support of the cells is going to be hot dip galvanized in one of the plants in Queretaro, México of this important group.

COMEMSA is going to be responsible for the hot dip galvanizing of the steel parts with the most modern and efficient technology in the fabrication of the pieces and the hot dip galvanizing process.

The name of the solar power plant is SOLANA and will be built in the state of Arizona, USA.

The capacity of the thermal plant will be 250 MW. The plant will be we located 100 kilometres southwest of Phoenix, USA and will produce sufficient energy to cover the consumption needs of 70 000 homes while avoiding the emission of 475 000 tons of CO_2 per year, compared with a natural gas plant.

Moreover, it will generate significant economic and environmental benefits for Arizona State, helping to achieve the objectives of national energy independence.

Important to mention is that the Abengoa Group is one of the leaders in the installation of plants which protect the environmental avoiding the emission of huge quantities of CO_2.

Solana is the first power plant in the US that is capable of storing the energy it produces, six hours of thermal energy storage utilising molten salts that will be allow electricity to be produced during overcast periods and after sunset. The plant will produce energy at night to satisfy the demand for electricity that exists in the area in summertime.

Abengoa Solana estimates the Solana project will generate from 1 600 to 1 700 jobs during construction, and 85% permanent jobs.

The Association wishes to thank and acknowledge Ing. Edmundo Gomez Ortiz of Votorantim Metals – Business Development and Technical Support Manager for this article.

Bicycle Apple Garage – Netherlands

Bicycle garages are unfortunately not a familiar part of our urban landscape. However, in the Netherlands great importance is attached to the provision of parking for bicycles. So much so that quite extraordinary designs are being conceived not only to make this provision into an interesting experience but also to make it intergrate into the transport landscape of the towns and cities of the Netherlands.

A special bicycle garage has been constructed in the newly developed area around Alphen aan den Rijn. The new structure takes the striking shape of a gigantic apple complete with stalk and leaf. It has imaginatively been given the name of 'Bicycle Apple'.

The Bicycle Apple sits next to the railway station of Rijn Couwelijn. The planned development of the surrounding area will ensure the bicycle garage is put to good use.

The unusual design concept for the garage takes the shape of an apple with its core removed. A continuous spiral ramp runs around the internal skin of the structure that provides the parking spaces for bicycles, 1 000 in total.

An added feature of the design is a butterfly patterned mesh that adds a decorative skin to the apple.

The whole structure including the ramps, stair and parking racks have been constructed from hot dip galvanized steel to provide long term protection. The outer steel layer is powder coated apple green to give the required aesthetics.

The design and build of this project did not follow a normal workflow. A mock up of the structure was designed for testing purposes before the detailed design was produced. Close collaboration between the architects (Architectenbureau Kuiper Compagnons International B.V.), steel construction company (Jos van den Bersselaar Constructie B.V.) and the client (gemeente Alphen ann de Rijn) resulted in the successful completion of the project.

The apple shape of the construction is not completely bulb-shaped which has consequences for the structural stability and the dimensional characteristics. It was therefore decided to carry out a full test assembly off-site for testing of its structural integrity.

Maybe sometime in the future we will also have an apple or orange bicycle car park of our own to boast about.

The Association wishes to thank and acknowledge the Architect - Architectenbureau Kuiper Compagnons International BV; Steel Construction Company - Jos van den Bersselaar Constructie BV and Client - Gemeente Alphen ann de Rijn and Gerard Reimerink, Technical Director of "Zinc Info Benelux" (Galvanizers Association of Belgium, Luxemburg and the Netherlands) for the photos and written article respectively but also UKGA for the translation from Dutch to English.

Asia Pacific General Galvanizing Association (APGGA)

Follow up study of a hot dip galvanized steel bridge

The Shin-nukui river bridge was built in 1964 and is one of the oldest galvanized steel bridges in Japan. The Japan Galvanizers Association investigated the present state of this bridge in 2006. The objective of the investigation was to confirm the durability of galvanized coating of 42 years after the construction. Because this bridge was a rare case of galvanized bridges in Japan, some investigations other than that of JGA had been carried out before. This summary is based on the survey done in 2006, partly citing the data from those surveys done before.

Name of the bridge:	Shin Nukui River Bridge
Location:	Fujioka city, Gunma Prefecture (Middle Japan) 36 16' 40" N 139 5' 49" E
Environment:	Far from the Pacific Ocean and the Sea of Japan. Natural environment is mild.
Completion of the bridge:	December 1964
Date of survey:	March 2006
Method of survey:	Visual observation and galvanized coating thickness measurement with electromagnetic film thickness meter.

Visual observation

Surfaces of main girder of the outer sides of the bridge showed dull gray colour with no rust. Surfaces of main girders of the inner sides of the bridge looked smooth and partly kept the gloss of metallic zinc. Some of the lattices had gone dark gray due to dust and dirt, but no rust was found on the surfaces

Date of survey	January 1972		May 1975		February 1987		March 2006	
Object	µm	g / m²	µm	g / m²	µm	g / m²	µm	g / m²
Flange	–	–	187.5	1,337	180.0	1,283	166.3	1,186
Web	157.3	1,122	158.0	1,127	150.0	1,070	137.1	977.5

Coating loss over 34 years.

Measurement of galvanized coating thickness

Getting ten measurements within an area of 100cm² and averaging them determined the zinc coating thickness of the measuring area. To estimate the annual tendency of the zinc coating thickness, data obtained by this survey was compared with the data from a former report*.

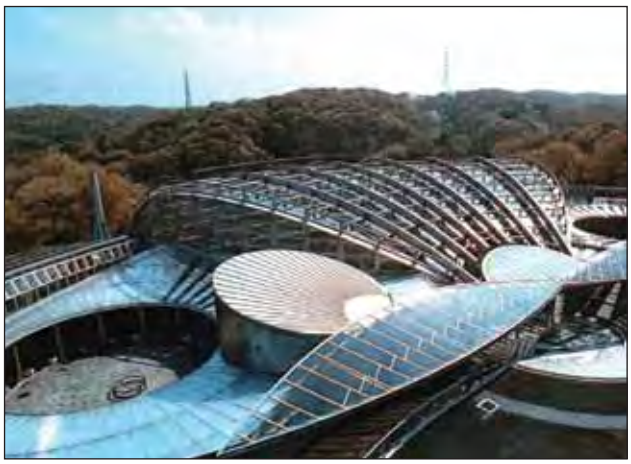
From these results we can estimate the annual corrosion rate of the galvanizing. Adopting the data of 1987 and 2006, the corrosion rate can be calculated as 5.08g/m²/year for flange areas and as 4.85g/m²/year for web areas. From this we can estimate the service life of the galvanized steel as 210 years for the flange areas and 181 years for web areas without maintenance. * *K.Nishikawa et al, Kyouryou to kiso, 88-1*

Tama Animal Gardens Insects Ecological Park

Insects Ecological Park in Tama (Tokyo) Animal Gardens imitates the shape of a butterfly. It consists of a right-wing, main hot-house (body) and a left-wing. In the right and left-wing, common insects such as grasshoppers, mantes and fireflies are kept. Butterflies and beetles can be found in the main hot-house.

You can enjoy both live and model versions of the insects, as well as play with experimental equipment and images.

The Shin-nukui river bridge.



Tama Animal Gardens Insects Ecological Park.

Galvanizing serves to protect the delicate animals by being free from maintenance such as polishing and repainting.

This architecture won the Architectural Institute of Japan Prize and the Japan Association of Artists Craftsman & Architects Prize.

Built: 1987/12 *Area:* 2 486^2

Solar panel shelter and louver of local government office building (Okinawa Pref)

This local government office building of Itoman city, Okinawa was rebuilt in 2002. It is equipped with solar panels which can generate 195kW of power. The panels are set on the roof and shelters of the building to utilise the solar power and to weaken the sunshine. They are expected to provide up to 20% of the total electric power expenditure of the office building.

Galvanized steel beams support the panels and are exposed to the rainwater, sun and sea breeze of the subtropical zone.

Umeda Sky-Building

The 40 stories-high Umeda Sky-Building stands near the Osaka Station of West Japan Railway Co. It consists of two towers, which meet each other at the 39th story. The rooftop is used as an observation platform.

The steel structures and frames used for the see-through elevator from the third story, the escalators from the 36th story and the connection bridge at the 22nd story are hot dip galvanized.

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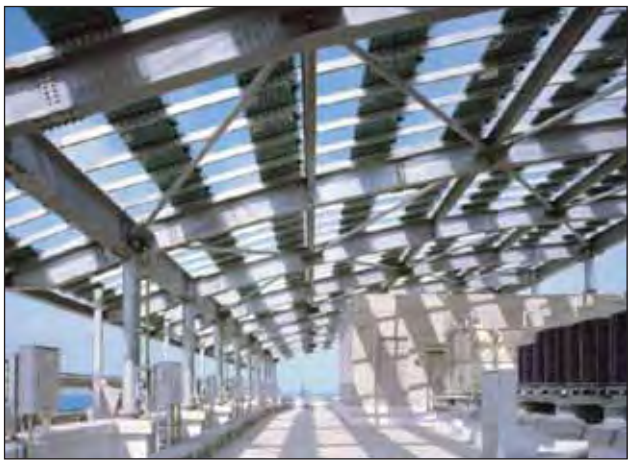
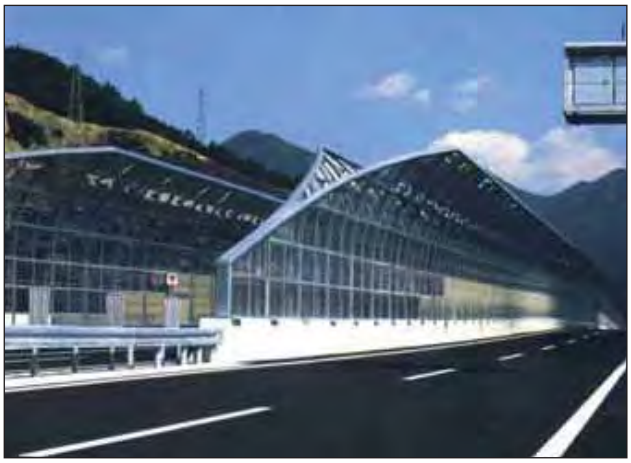


Solar panel shelter and louver of local government office building (above left and right).

Umeda Sky-Building.



Soundproof walls for Hiroshima-Iwakuni Highway.

About 100 tons of steel was used for the connection bridge at the 22nd story alone.

Soundproof walls for Hiroshima-Iwakuni Highway

Cities on the coast of Seto Inland Sea is one of the industrial development centres in Japan.

About 20 years ago, the Hiroshima-Iwakuni Highway was constructed as a bypass to relieve the traffic congestion on the existing roads.

Soundproof walls are set up if necessary where the traffic noise seemed to affect the amenity of the circumference. Galvanized steel was used for the support of the soundproof wall, guardrails, sign poles etc.

Railway station

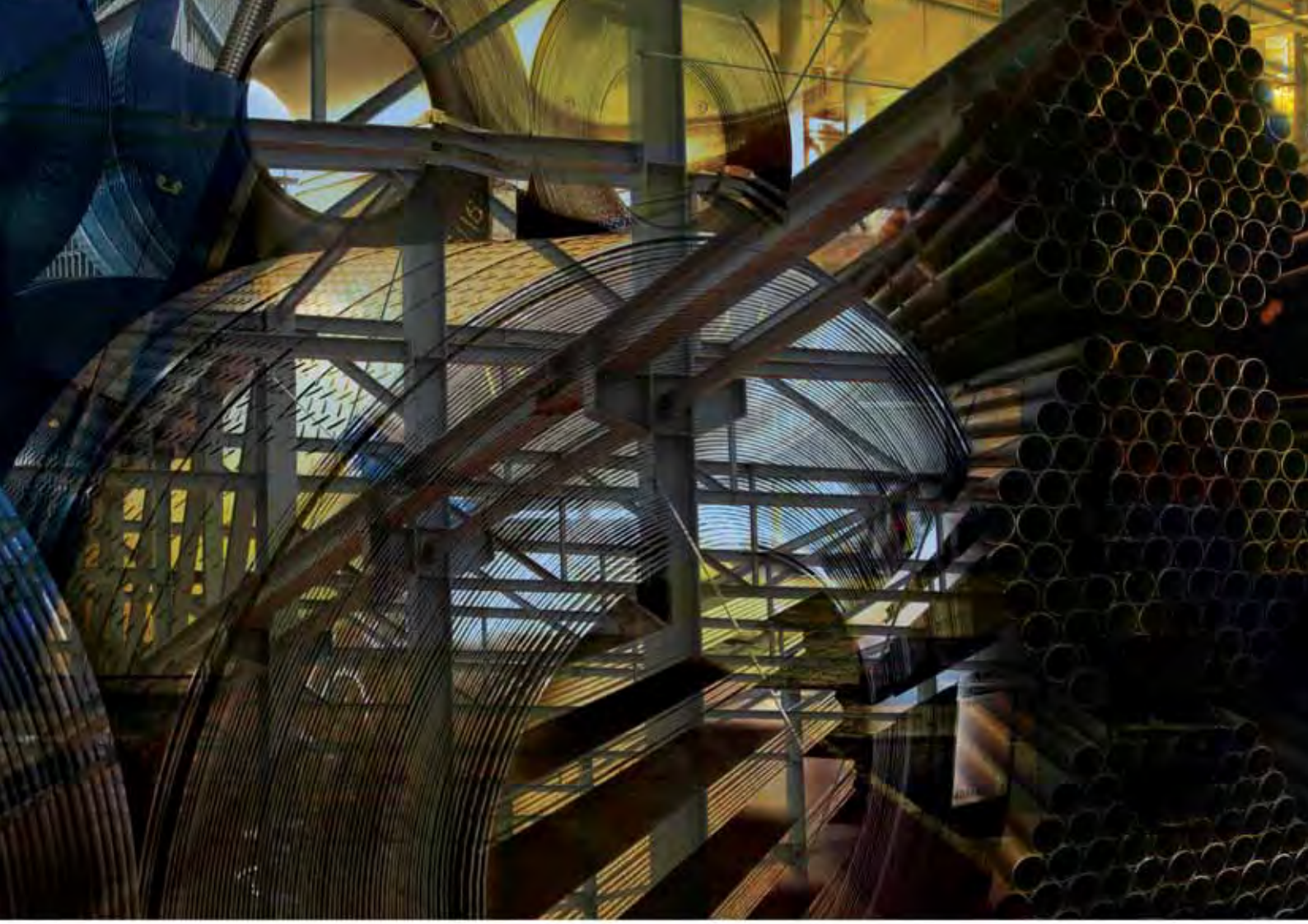
The main use of hot dip galvanized steel in the railway system for a long time has been overhead wiring poles. But in recent decades, at every opportunity of modernisation and rebuilding, the station buildings, such as platform houses, are being substituted by galvanized steel structures.

The photo with the train at the platform shows a station of privately owned railway in Yokohama city. It was built in 1948 as a wooden station and renewed in 2000 as a steel-built station. All the steel for the station was hot dip galvanized to minimise the maintenance cost as trains run every six minutes during the busiest hours.

The other two photos show a local railway station owned by local governments and private companies along the

continued on page 18...

Station of a privately owned railway in Yokohama city.



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railway. This station has no station staff. Steel beams and columns of the station house and staircase are galvanized to protect the steel from the sea breeze coming from the Pacific Ocean that lies 50m south from the station.

Harmonising with environment

The hot dip galvanizing not only gives the corrosion resistance to steel but also is useful for adding beauty to the environment. One of the techniques is organic colour coating onto the galvanized steel but there is another useful option – chemical treatment. The phosphate treatment is carried out by treating galvanized steel with the solution that contains phosphoric acid as a principal ingredient. It adds translucent gray, dark gray or other colours onto the zinc film. The translucent colour of phosphate film not only protects zinc surface from corrosion but also gives an elegant atmosphere

A local railway station owned by local governments and private companies along the railway.

Pedestrian's Deck 2.

Information center outside wall.

Steel fence.

Pedestrian's shelter.

to the surrounding environment. As it is well known that phosphate treatment is used as a primary treatment for organic paint, you can apply organic paint over this phosphate film after years of usage without any trouble, if necessary.

Middle and right bottom photos are examples of permanganate treated galvanized steel structures. The permanganate treatment surface looks gray. The colour of the permanganate treated power transmission tower harmonises with surrounding greens of the mountain in comparison with the non-treated galvanized tower.

The Association wishes to thank and acknowledge Japan Galvanizers Association (www.aen-mekki.or.jp) and the Asia Pacific General Galvanizing Association (APGGA) for kindly contributing the above articles.

Power transmission tower (galvanized only).

Power transmission tower (galvanized and chemical treatment).

Hand rail (galvanized and chemical treatment).

Pedestrian bridges

Bisi Pedestrian Bridge
(Umzimkulu KwaZulu Natal)

Situated in an area that is not easily accessible by ordinary vehicles, the bridge was designed and constructed as a safe, durable and maintenance free crossing for the local rural population. Estimated maintenance free service life in excess of 80 years.

Makanise Bridge
(known as Pongola Bridge)

This project takes advantage of the corrosion control properties of hot dip galvanizing within an inland rural society classified, in terms of ISO 9223, as a C2 environment with an estimated maintenance free service life in excess of 80 years.

Century City
(Cape Town)

Hot dip galvanized and painted - Duplex System. Corrosion control was designed to combat a severe marine environment and provide an estimated service life in excess of 30 years.

Bisi Pedestrian Bridge.

Makanise Bridge.

Century City Bridge.

Graceland Bridge.

Transnet Pedestrian Bridges.

Vaalbank Pedestrian Bridge.

Zwelitsha Pedestrian Bridge.

Graceland Bridge
(Keat's Drift area of KwaZulu Natal)

A rural community in the Keat's Drift area found themselves cut off from amenities when their wooden access bridge across the Mooi River was destroyed by floodwaters. The local rural community were forced on a 10km detour to reach trading stores on the southern bank of the river. The KZN Department of Transport's Rural Road Transport Forum Initiative together with the affected community identified the desperate need and a new 90 meter span Hybrid Suspension and Truss Bridge was constructed.

Transnet Pedestrian Bridges
(Richards Bay)

Approximately 300m from the sea and 80m from a fertiliser bagging facility representing a severe corrosive environment with a design imperative to protect these structure with a reliable, maintenance free protection system hot dip galvanizing plus a top paint system (Duplex system) was chosen for its proven corrosion control characteristics with an estimated service life in excess of 25 years.

Vaalbank Pedestrian Bridge
(D*annhauser KwaZulu Natal)*

A 54 meter span by 3 meter wide truss type structure was used to obviate the need to locate piers within the loose sandy riverbed. The construction of the structure shortened the route during the rainy season that school children and other villagers had to travel to essential services. Hot dip galvanizing was chosen by the engineers for corrosion control of the bridge because of *"it's build and forget"* characteristics particularly when located in remote inland areas.

Zwelitsha Pedestrian Bridge
(over the Buffalo River)

The Zwelitsha Pedestrian Bridge crosses the Buffalo River in a rural area of the Eastern Cape. Commissioned by the Buffalo City Municipality in response to tragic drowning incidents, the bridge provides a safe river crossing to some 500 pedestrians per day, linking the rural communities with essential services, including schools and clinics. Corrosion design specifications were for a Duplex system to combat a marine environment and ensure a maintenance free service life in excess of 40 years.

The opening of Intombe Bridge

Amongst the dignitaries were, MEC, Mayor, Inkosi, NDOT officials, HOD, Senior Government officials and so forth. The opening has attracted a big coverage from all walks of life including the media.

The Intombe Bridge was built as a pedestrian foot bridge which allows emergency vehicle to go through. However 16-seater taxis, sedan and Bakkies with maximum load of 4 tons are also allowed to go through. The health care service providers were unable to cross the river to both sides using the mobile clinic due lack of proper access. People struggled to transport the coffins to bury the dead due to lack of proper access. When the Intombe River is flooded, all the village community comes to the standstill as there is no means of reaching the community from both sides of the river

Background

The Intombe 1 bridge is situated adjacent to the small village of Luneburg that is located on the Mpumalanga/ KwaZulu-Natal border and is just a few kilometres to the North of the town of Paulpietersburg. It is situated on the Ntombe River, a tributary of the Pongola River and near an Anglo Zulu war battle site. The main business activities take place in the Piet Retief town which is approximately 50km from the project site.

History of the area

In the 1860s German immigrants were released from their obligations to local missionary societies and forced to eke out a living for themselves. This they did by establishing a timber industry. The village was named Luneburg after a town in their home country. This whole area is jam-packed with stories from the Zulu and the Boer Wars, with plenty of tales of bravery.

Luneburg is essentially a farming community and its centre offers little by way of attraction other than the two incredibly beautiful churches, which form the nucleus of the community, the town's butcher and the farm cash store. Today Luneburg is the site of the oldest German school in northern KwaZulu-Natal. The village is surrounded by rolling hills, starlit skies, rivers that wind their way through the valley, and by the cry of the fish eagle.

Surely there are areas where service delivery is brought to the most needy communities, I give our government a thumb up!

The Association wishes to thank Messrs Gilbert Mukhudwane and Rob Forbes of Shuma Africa Projects (Pty) Ltd, for this article.

Celebrating the opening of the bridge.

Intombe Pedestrian Bridge

Throughout history bridges of all descriptions have played a pivotal role in the development of local communities and ultimately to advancement of civilisation. The story of the Intombe Pedestrian Bridge is certainly no different in its role of many similar bridges that have contributed to improving the lives of local inhabitants. Situated on the Ntombe River, a tributary of the Pongola River and near an Anglo Zulu war battle site; if this bridge had existed in 1879, a minor part of South African local history would have been different.

An early rudimentary wooden log bridge over the Ntombe river that served the local community, but ignored any form of safety or construction standards. It was exposed to the elements and incapable of withstanding regular summer flash flooding.

More recent events in the area have included two previous attempts to construct rudimentary river crossings, but due to frequent summer flash flooding of the Ntombe River, these bridges have either been severely damaged or completely washed away.

In July 2010 the Mpumalanga Department of Public Works, Roads and Transport, as part of their Integrated Rural Mobility and Access Project (IRMA), initiated a preliminary design report to address service delivery and to improve the lives of local rural inhabitants. A 140 metre pedestrian foot and single vehicle access bridge was designed by Shuma Africa Projects (Pty) Ltd and constructed by YESIVE Construction cc in association with KELETSO CIVILS cc at a project cost of R6.9 million.

The preliminary design assessment included the topographical, surveys, geotechnical investigation, flood calculations and determination of flood line. The potential environmental impacts associated with the construction of the structures formed part of the consultants brief.

An important consideration of the project was that of the environmental impact of the installation in an area that is reported to be ecologically extremely sensitive. To address this aspect of the installation was required to comply with the Environmental

continued on page 24...

Impact Assessment Regulations of 2006 published in Government Notice R385 to R387 on 21 April 2006, in terms of Chapter 5 of the National Environmental Management Act, 1998.

This project shows that through well planned and innovative design, an attractive rural steel bridge could be developed at an affordable cost. Due to the remoteness of the bridge site and the high costs associated with possible future maintenance, effective corrosion protection was a factor that played an integral consideration during the design process.

An all steel bridge founded on reinforced concrete pears producing a series of 4 x 42 metre long spans with a 4 metre wide pedestrian walkway. Essentially a pedestrian bridge, but capable of allowing for access of emergency vehicles to the inhabitants situated over a wide rural area.

Hot dip galvanizing was selected to provide a maintenance free service life estimated to exceed 80 years. The galvanized structure was painted in order to lessen the impact and blend the structure into the surrounding terrain. This project is evidence of the fact that when the galvanizing process is given high priority from the inception of a project, there are simple and creative ways to ensure that all steel components are effectively hot dip galvanized.

The end result of this project is a satisfied client and a grateful local community. Without paying a premium, the client has a visually striking and durable bridge that reflects positively on the local municipality and community. The community has a structure that allows safe passage to essential services for themselves and their children. Although a relatively small project, it represents a positive and rewarding return on the investment and a major contribution to service delivery.

Bob Wilmot.

Servicing the needs of rural communities

When consulting engineers Vela VKE were given a brief by the KwaZulu Natal Department of Transport to supply two pedestrian bridges over rivers subjected to flash floods, the time span for design and implementation were very tight. These bridges were desperately needed as the flooding rivers cut rural communities off from access to schools and clinics.

Both bridges were designed using simply supported hot dip galvanized steel truss decks, supported on reinforced concrete piers and abutments.

The design was based, as far as possible, on a robust, maintenance-free approach.

Assembly of the pre-hot dip galvanized steelwork on site, in pieces which were about 5.7m in length and weighing about 680kg, proved to be manageable.

This project was not only completed on time, but it was also below budget. The design certainly proved itself and will be useful for similar projects in the future.

The Association wishes to thank Vela VKE KZN - Contact: Peter Squires, for this article.

The real protection is hidden!

While hot dip galvanizing is frequently used for protection of steelwork on its own and is easily seen to be doing this, there are many instances where the coating is hidden and performs the essential back-up of corrosion control to various forms of over coatings and covers.

An example of this is when duplex coating systems are applied and while the performance of the two systems are working synergistically to provide the corrosion control solution, the hot dip galvanizing is out of sight.

Similarly, when reinforcement for concrete is hot dip galvanized it too is providing the essential back up but hidden!

The petrol service station steelwork is also an example of this, that when cladded in corporate colours, we know that the hot dip galvanizing will provide the backup required for sustainability!

Restoring Cape Town's long standing pedestrian bridges

Tonnes of steel:	73 tonnes
Project inception date:	30 March 2009
Project final completion date:	29 October 2010
Final project value:	Consulting & Contracting: MR21.25 (incl. Contingencies & VAT)

Description of project

Eastern Boulevard (Mandela Boulevard) and De Waal Drive are major thoroughfares into the heart of the City of Cape Town, and are the primary routes used by international and local visitors approaching Cape Town from the airport. All seven footbridge structures have been subject to theft of sections of their aluminium balustrades during the preceding 15 years, presenting a serious hazard to public safety due to openings in the balustrade. In addition strain on already stretched resources caused by the frequently repeated need for immediate response to install temporary safety measures which were never aesthetically pleasing.

The client's objective was replace the existing handrail system with an aesthetically pleasing design as an upgrade to the immediate precinct . The existing footbridge structures are elegant structures, presenting appropriate flowing form against the backdrop of Table Mountain. The replacement balustrades were required to enhance the form of the footbridges, the precinct and the impression of Soccer World Cup-destined motorists.

Although many design configurations and construction materials were considered, structural steel protected with duplex coating, comprising hot dip galvanized steel overcoated with a comprehensive paint system finished with a polyurethane-based top coat, was selected as the material of choice for the following reasons:

- The service life of the handrail system of 50 years is anticipated

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- Enhanced aesthetic appearance
- Allowed careful choice of final top coat colour to assist with elegant appearance of the handrail.

The balustrade design utilised a rotated, splayed and inclined wedge-type frame that housed six horizontal rods in an inward-tapered profile, completed with a robust, continuous handrail. The wedge frames were connected to the concrete coping of the footbridge using a recessed bolted connection, that was filled and coated to ensure a smooth, clean appearance. The unique wedge frame creates unusual shadow lines and the appearance varies with the differing daily sun position. The careful, deliberate use of a shadow line below the baseplate assisted in accommodating the construction tolerance in achieving the continuous flowing-appearance handrail system.

Interesting information

Footbridges provide a vital link within the community which was originally separated during the construction of Eastern Boulevard freeway. The footbridges were originally constructed with aluminium handrails cast into reinforced concrete copings, but the majority of the handrails have been vandalised over the preceding years, and replaced with temporary handrails, which in turn have also been vandalised in some cases.

Structural steel, enhanced with a duplex corrosion protection system (hot dip galvanizing overcoated with an appropriate paint system, was selected as the material of choice for the new handrail system.

This unique replacement handrail system was developed to improve the appearance of and to bring about aesthetic improvement to the general precinct. The aesthetic and safety improvements also function as a point of pride for the community.

The Association wishes to thank Messrs Stephen Roux Principal Professional Officer, City of Cape Town,Transport, Roads & Stormwater Directorate, Roads & Stormwater Department, Structures Section, and Abé Newmark (Pr. Eng.), Technical Director, Western Cape Transportation Division, BKS (Pty) Ltd, for this contribution.

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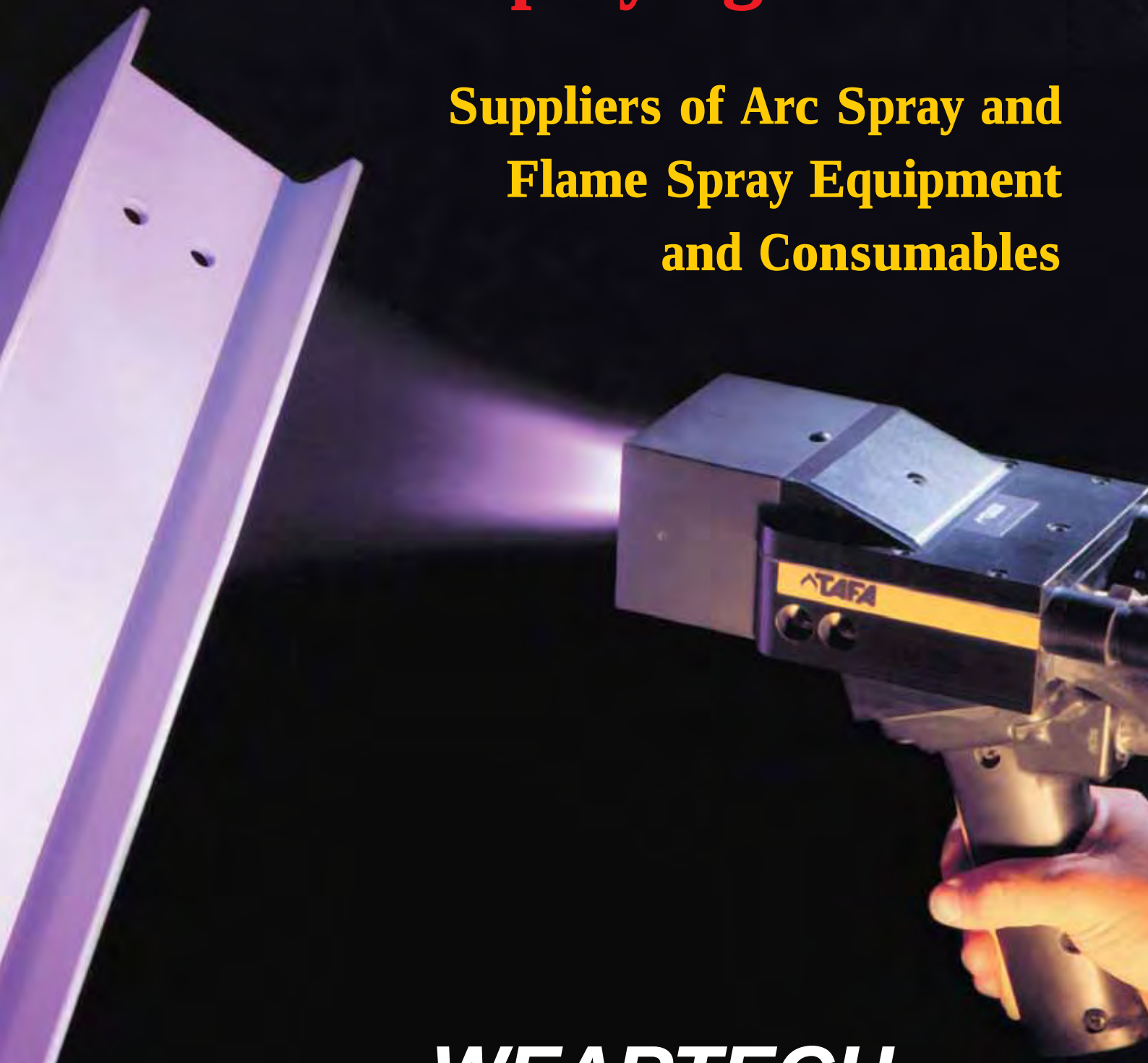

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ADVERTORIAL

Duram duplex coating surface preparation: detergent wash and water rinse.

Lack of adhesion due to ineffective surface preparation.

Prime coat: acrylic primer with anti-corrosion pigment.

Duram's water based duplex systems

Duram Paints (Pty) Ltd recently acquired Optima Coatings (Pty) Ltd with its full range of imported water based industrial coatings and its duplex coating systems. This very simple but sound approach to duplex coating systems ensures that all the benefits of water based technology is passed throughout the value chain. The Duram water based duplex coating systems are heavy duty, high build, single component, anti-corrosion coatings for various industrial applications. They are easy to use by both the 'man on the street' and the steel fabricator or galvanizer. The duplex coating process involves non-toxic water based materials with minimum impact on the environment, a low carbon footprint and very few safety precautions to worry about.

Surface preparation

When using the Duram duplex coating system, the surface to be coated does not need to be sweep blasted or acid etched before painting. These procedures can be expensive, require skill, are time consuming, and can be toxic to the environment and possibly dangerous to humans. They can also potentially damage the zinc coated surfaces especially in the case of sheet metal, where the continuous hot dip galvanized coating can be thinner than 20 microns. Another challenge is that it is not always possible to sweep blast small parts and fasteners.

The only surface preparation that the Duram duplex coating system requires is a proprietary alkali detergent wash (Duram OptiDegreaser). This is followed by a clean water rinse with potable water to achieve a water-break-free surface. The benefit of this being: no danger to workers and zero damage to the environment.

Priming

The potential risk of lack of adhesion caused by ineffective surface preparation is one of the most frequent causes of failure in duplex coatings.

Corroding fasteners will damage the integrity of a structure.

Bolts primed by dipping.

Duplex coating systems have failed near the coast due to inadequate substrate preparation or an inappropriate paint system.

Duram products being applied directly using airless spray or brush application from the can without mixing or thinning and without runs or sags.

Surface preparation and painting can also be done equally well on site.

Handling damage is minimal and easily repaired.

The finished product (other than the bolts).

Duram's duplex coating system has solved this problem by using an acrylic adhesion primer, which has exceptional adhesion properties when applied to a zinc coating. This primer does not contain acid for etching and has been used successfully since 2003 on numerous industrial projects.

Duram's primer can be sprayed, brushed, rolled or even dipped, in order to prime even the smallest parts and fasteners.

Fasteners

To maintain the integrity of a duplex system it is important that hot dip galvanized fasteners be used and treated the same way as the rest of the steelwork to follow through with the overall duplex coating system.

Duram recommends that all fasteners be prepared and primed before assembly, and that they receive an additional stripe coat after assembly, to ensure that nuts and bolts are thoroughly protected.

Anti-corrosion coating

The backbone of a successful duplex system is the anti-corrosion properties of the paint and, in aggressive conditions, the DFT of the paint system. This effectively protects the zinc from attack from the elements in wet, acid or alkali environments. In non-aggressive, dry conditions the anti-corrosion coating can be replaced by a decorative finish. Examples exist where duplex coating systems have failed near the coast, due to inadequate substrate preparation or an inappropriate paint system. This is often due to solvent paint systems being applied too thinly and for this reason will inadequately protect sharp edges or seal crevices.

The Duram duplex coating system provides a high build coating that can be applied at a wet film thickness of between 200 and 400 microns, without sagging. The film thickness can vary and is usually specified according to the exposure conditions. The paint forms a relatively soft rubber-like film that remains flexible, with excellent adhesion, and under film corrosion creep resistance.

Handling and maintenance

Initially the Duram duplex coating is soft and tacky and needs to be handled with care until it has cured fully. This usually takes approximately 3 weeks. It is important that painted surfaces do not touch each other during this period or the films will weld together.

Subsequent damage during transport and erection is usually very superficial and can easily be repaired by cleaning and recoating on site. The same applies for maintenance painting after ten years of exposure. The existing coating does not need to be removed and the fresh paint will weld with the aged surface.

With Duram's duplex coating system the finished product looks neat and tidy. It is recommended that any hold down bolts and the joint between the steel and concrete foundation are also coated by the same anti-corrosion coating because of its flexibility and gap sealing capabilities. This is much more durable than the soft sealants that are usually prescribed, therefore reducing the time before maintenance is required.

What are the costs involved?

- **Surface Preparation:** Duram's duplex coating system offers huge savings in skilled labour, materials and time.
- **Application:** There is no wastage due to pot life constraints and over coating delays.
- **Maintenance:** So far none of the projects where our systems have been used at the coast have required maintenance over the past 5 years, fulfilling the synergistic properties of a successful duplex coating system and considerably extending the lifespan of the project.

Duram
Smart Paint

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Coega Harbour rail yard

The Coega rail yard is a good example of a duplex coating system using a water based paint. The project commenced in January 2009. The hot dip galvanized overhead track masts were painted by the fabricator and erected on site. The type of environment where these masts were erected was 3km away from a major salt farm (Cerebos) and approximately 5km from the sea (Coega Harbour). The rail yard is also situated in a valley that channels a lot of wind, carrying high levels of chlorides from the prevailing wind and salt sea spray.

A general view of the duplex coated masts.

Handling during erection did not cause undue damage to the freshly applied paint coating; however care had to be taken to correctly tighten the cable holding clamps in order to prevent slipping due to the slow curing and rubber-like nature of the film.

The joints between the biscuit foundation and the mast were sealed with the same anti-corrosion coating which adheres to concrete and effectively seals the gap that often appears at these joints.
Even the markings on these masts were done with the same coating system because the paint is compatible and easy to apply by stencilling without runs.

Stencilled markings.

Foundation joints sealed.

Some close up views of the finished duplex coating system.

Light masts being painted on site.

The hot dip galvanized monopole light masts at this site were also over coated with the water based paint system, and very few site based problems became apparent.

The large light mast structures had to be assembled and painted on site for logistic reasons and the water based coating system ensured that the assembly joints between the different sections were properly sealed.

The project clearly illustrates the versatility and user friendliness of the appropriate water based paint coating system.

PROPOSED FEATURES FOR 2012

February / March (No 50):

- Fasteners and availability matrix
- Continuous sheet and wire galvanizing

May / June (No 51):

- Tubes, pipes and scaffolding
- Masts and poles
- Water storage
- Heat exchangers and cooling fans

August / September (No 52):

- Annual Hot Dip Galvanizing Awards
- Cable ladders and trays.
- Artistic / Architectural hot dip galvanizing

November / December (No 53):

- The world of hot dip galvanizing around us
- Greening of the hot dip galvanizing industry

NOTE: FEATURES MAY BE SUBJECT TO CHANGE

Companies can realise their potential by using their employees' inbred talents

Charles Darwin's evolution theory is based on three tenets: all organisms tend to produce more offspring than can possibly survive; there are significant variations in the offspring and these variations are passed down to successive generations.

Since many offspring must die, on average, the survivors will be those individuals who have variations best suited to the changing local conditions. Because of heredity, the offspring of the survivors will resemble their successful parents.

Based on his theory, Darwin recognised two forms of 'struggle' for perpetuating any species: the 'struggle for existence' and the 'survival of the fittest'. The organism has to compete against other organisms for limited food resources and must be resistant to the rigors of the physical environment.

Some species have another type of 'struggle'. They want to advance and not just exist. They may not know, or care, where or how they will end up. They just want to realise their inherent potential that they inherited from their forefathers.

The period a species survives for is not a true measure of its rate or extent of development. Many species have been around for a long time and do not appear to have advanced. One wouldn't exactly call bacteria advanced although they have been here since life began. Insects appear to be quite happy with their lot; they have changed very little over hundreds of thousands of years. Obviously some species want to advance, others do not.

It may come as something of a surprise to learn that most evolutionists believe that birds are probably the most developed species, after man and perhaps some other primates. Like humans, birds are relative newcomers, believed to have

evolved out of the reptile and dinosaur family. It is thought that gliding (perhaps falling) down from trees was their first taste of free flight and they liked it!

Humans and birds must then have a desire to advance. Nobody knows why and nobody knows whereto. But what talents do they have in common that has allowed them to do so? Biologists believe that innovation (the ability to invent new behaviour); communication and social propagation (to transfer skills among the species) and mobility (moving around in flocks) are the talents which birds have in common with humans. These talents are the vehicles for them to realise their potential.

Innovation allows new skills to be developed, communication allows for the skills to be learned by others and mobility allows for the skills to be exploited in new territories. These talents may help us to survive, but they also provide humans and birds with the ability to advance intellectually.

Apart from flocking, birds demonstrate mobility by rotating their leaders during trans-continental flights. All get a turn to be the leader. While a flight path may have been decided upon, each bird gets a turn to steer the flock toward its destination. Do we need birds to teach us how important this may be for developing people as well?

Progressive businesses also want to realise their potential. This is their vision. For them this may be more important than competing with other companies for a slice of the market for a particular product. They realise they need to use these human and bird-like talents to advance. They obtain them from their staff. Employees are free to be innovative and to transmit their novel ideas by social interaction. The talent of mobility is exercised by continually moving people into new and different roles so that new skills can be learned and taught. They encourage a community of work rather than isolated and insulated departments.

Companies that allow people to use their instinctive talents of innovation, social interaction and mobility acknowledge the importance of intellectual capital. These people may be their employees, their customers or their suppliers. They realise that intellectual capital is not contained in libraries, archives or boardrooms but is stored within their employees and communities, their internal shareholders. People are indeed their greatest asset and provide them with their greatest competitive edge.

A company's corporate mission should be to realise its potential. Its values should be to achieve this through the intellectual development of its people.

The Association wishes to thank Bob Andrew who is a consulting value engineer and honourary member of the Association for his article. He can be contacted on anneve@iafrica.com or boband@mweb.co.za.

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Specialising in dipping, spinning and drag line galvanizing, **Transvaal Galvanisers** accounts for 70% of South Africa's demand for transmission line tower and substation galvanizing.

Transvaal Galvanizers' partnership with IMAB Engineering ensures that

"We strive for excellence, meet our commitments and grow with our client base"

1430/05/11 CBT Tel: (011) 868-3408

Transvaal Galvanisers (Pty) Ltd

3 Third Avenue, Vorsterskroon P.O. Box 983, Nigel 1490 Tel: 011 814 1113/4 / 011 814 4710/2 Fax: 011 814 1645

3 CPD POINTS

3-day Galvanizers Inspectors Course

Hot dip galvanizing is one of the most widely used methods of protecting steel from corrosion. During fabrication and after hot dip galvanizing the coating is inspected for compliance with the relevant specifications.

Following up on comments received from the many participants attending our regular two day inspector courses over the last nine years, we decided to expand and update our 2-Day course into a more comprehensive 3-Day course.

Included are revisions of the course material and the introduction of more practical activities in the form of a full morning at a hot dip galvanizing plant followed by an afternoon of Duplex coatings. The galvanizing plant visit examines materials prior to galvanizing and hands on inspections of finished product. The afternoon is a visit to a paint applicators yard and Duplex coatings systems. Included are demonstrations on chemical cleaning and/or sweep blasting, examination of resulting profiles and followed by the application of paint onto galvanizing. The course will provide delegates with sufficient knowledge to advise on fabrication for successful hot dip galvanizing and also test, inspect and interpret test results after hot dip galvanizing.

COURSE DURATION AND CONTENTS

Day 1	**(08h00 to 16h00)**
Lecture 1	Introduction to the Environment, Steel & Corrosion
Lecture 2	Understanding Zinc Coatings (How does Zn protect)
	ISO 9223 & 12944
Lecture 3	Designs, Fabrication and Inspection before hot dip galvanizing SANS (ISO) 14713:1999
Lecture 4	General Hot Dip Galvanizing Processes
	SANS 121 (ISO 1461:2009) Batch type galvanizing
	SANS 32 (EN 10240: 1997) Automatic T & P
	SANS 10094:2007 HDG of Friction Grip Fasteners
Day 2	**(07h00 to 16h00)**
	Hot Dip Galvanizing Plant Visit and Inspection
Lecture 5	Duplex Coatings and HDG Reinforcement in Concrete
	Duplex Coatings Plant Visit and Applications
Day 3	**(08h00 to Completion of Exam)**
Lecture 6	Inspections after Hot Dip Galvanizing
Lecture 7	Quality Assurances in Coating Applications
	Application of specifications
	Control documentation for a QA System
	Examination on Course Effectiveness

Course schedule may be altered and interesting activities added for the benefit of delegates.

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 HDGSA Galvanizing Inspector. Registration will be confirmed on an annual basis. Successful galvanizing inspectors will become Affiliate Galvanizing Inspector Members of the HDGASA for the year.

VENUE AND NUMBER OF DELEGATES

The courses are usually run in Johannesburg from the Hot Dip Galvanizers Association in St Andrews, Bedfordview and also from a suitable venue in Cape Town. Bookings are limited to 10 people per course on a first come first serve basis.

DATE AND TIME

Courses commence at 08h00 sharp and end at 16h30 (or as otherwise instructed). Lunch and refreshments will be provided. Comprehensive course notes can be collected from our offices two weeks before the course (this is highly recommended).

Johannesburg:
21 to 23 February; 13 to 15 March; 8 to 10 May; 26 to 28 June; 14 to 16 August; 9 to 11 October; 27 to 29 November.

Cape Town:
6 to 8 March; 5 to 7 June; 18 to 20 September.

Special courses can be arranged for a minimum of 6 delegates at appropriate venues in South Africa.

COURSE COST AND PAYMENT TERMS

R4 200.00 per person exclusive of VAT. Should you have two or more delegates from the same company, course costs will be R4 000.00 per person exclusive of VAT. Please note that payment is due on the first day of training. Cheques are to be made out to "Hot Dip Galvanizers Association SA". Members qualify for a discount.

CONTINUOUS PROFESSIONAL DEVELOPMENT (CPD)

By attending the Association's 3 day course Galvanizing Inspectors Course, you will obtain 3 points (accredited by ECSA).

SHOULD YOU BE INTERESTED, KINDLY CONTACT SASKIA SALVATORI OR MARJORIE MONTGOMERIE AT THE ASSOCIATION

On the Couch.....

Professor Denis Twigg

Honorary Life Member of the HDGASA

By Desere Strydom

When were you employed by the Association and in what capacity? I was appointed in 1983 as the first Executive Director and remained in this position until 1990.

What position did you hold prior to this appointment and why did you decide on this career move? I was the Head of Metallurgy at the South African Bureau of Standards, Pretoria, and became closely acquainted with the South African galvanizing sector and personnel as a consequence of having responsibility for the galvanizing certification mark schemes and the revision of the national and ISO specifications.

At that time what were some of the challenges facing you in this newly established position? Whilst the Association had been in existence for several years it was only being developed on a part-time basis and it now became a requirement to convert this activity into a full-time one. The prime movers at that time were three general galvanizers namely Rietfontein General Galvanizers (the late Walter Barnett),

continued on page 36...

Monoweld Galvanizers (Ken Henderson) and Industrial Galvanizers (the late Piet Meyer).

The initial emphasis was inevitably on promoting general galvanizing and the thinner galvanized coatings on sheet. The Associations initial income was mainly through the general sector.

Subsequently over next seven years of my term of office it became appreciated that all galvanizing and other uses of zinc should be promoted and to do this it was necessary to convince companies in these other areas to join the Association and that benefits would ensue from a combined effort and increased income from the total industry.

What is your opinion of the Association as of today? The Association has an outstanding staff led by Bob Wilmot. Also from first hand experience the quality of the Association and its technical knowledge is well known and appreciated overseas. The aims of the Association are clearly being met.

Do you have any comments on the Associations 'Hot Dip Galvanizing Today' magazine? I am delighted with this outstanding magazine that I find far more interesting and useful than the combined European Journal. Under the leadership of Terry Smith it is providing up-to-date technical information of value to local members and their clients. The change to allow advertising to help in the costs of this high quality magazine was perhaps the most positive move since I was involved in its production. In my opinion more technical articles covering the developments in steel manufacture and the improved resulting properties would enhance the magazine and galvanizing.

What has happened to your career since leaving the Association? I initially returned to an academic career at the Port Elizabeth Technikon, now known as the Nelson Mandela Metropolitan University (NMMU). I was subsequently made a Professor – a title I am allowed to use in retirement as it is based on my total career in Metallurgy and Corrosion Technology in South Africa and the United Kingdom.

Currently I am a Consultant in Metallurgy and Corrosion Technology to the Automotive Technology Station of the NMMU.

In England I am a course organiser and presenter for the National Metals Technology Centre (NAMTEC). My knowledge of steel and galvanizing is in demand particularly for seminars.

Do you have any advice for the Association? With regard to Structural Steel the general galvanizing sector will have to become more aware of steel developments that could affect the galvanizing characteristics such as zinc pick-up and the possibility of liquid metal embrittlement in the higher strength grades.

Modern structural steels are produced in plates and sections up to several inches thick and generally with yield strengths up to about 500MPa. However structural steels also include low alloy grades which are quenched and tempered up to about 700MPa. There is inadequate knowledge of the galvanizing characteristics of some of these steels e.g. there are reports from the UK Galvanizers Association of a periodic zinc liquid embrittlement issue.

It has been excellent to note that the Association recognises that galvanizing has its limitations and is never promoted where it cannot be successfully applied. This is the successful way to promote galvanizing using technical facts as the back-up proof.

Also by combining with the paint sector to promote duplexing has been a success story. Let the work continue as this combined system has considerably enhanced the use of galvanizing.

Any other comments? Finally once again let us remember Misconceptions and Walter's Corner, etc. published by the late Walter Barnett in the Associations magazine. So much experience and know-how that we have to thank him for!

HOT DIP GALVANIZING MEMBERS

GALVANIZER	LOCATION	TEL. NO	SPIN	NO. OF LINES	BATH SIZES (L x W x D) (m)
GAUTENG					
ArcelorMittal South Africa	Vanderbijlpark	016 889-9111		3	Sheet galvanizer
Armco Galvanizers	Isando	011 974-8511		1	13.2m x 1.5m x 2.2m
Armco Galvanizers – Dunswart	Dunswart	011 914-3512	●	3	5.2m x 1.2m x 2.0m 3.0m x 1.0m x 1.5m 2.0m x 1.0m x 1.5m
Armco Galvanizers – Randfontein	Randfontein	011 693-5825		1	6.5m x 1.3m x 2.0m
Babcock Ntuthuko Powerlines (Pty) Ltd	Nigel	011 739-8200		1	12.0m x 1.4m x 1.8m
DB Thermal SA (Pty) Ltd	Nigel	011 814-6460		In-line	16.0m x 1.0m x 1.0m
Galvadip (Pty) Ltd	Waltloo	012 803-5168		2	7.2m x 1.7m x 2.2m 7.0m x 1.5m x 2.5m
Galvaglow	Factoria	011 955-5200		1	4.0m x 1.5m x 2.5m
Galvspin Galvanizers cc	Boksburg North	011 918-6177	●	2	2.0m x 1.2m x 1.5m 1.5m x 1.0m x 1.5m
GEA Air Cooled Systems	Germiston	011 861-1571		In-line	11.5m x 1.0m x 1.0m
Lianru Galvanisers cc	Nigel	011 814-8658		2	7.2m x 1.3m x 1.6m 4.5m x 1.3m x 1.6m
Macsteel Tube & Pipe	Boksburg	011 897-2194		In-line	13.5m x 1.6m x 2.4m
Pro-Tech Galvanizers (Pty) Ltd	Nigel	011 814-4292	●	2	3.2m x 1.1m x 1.5m 3.0m x 1.1m x 1.2m
Robor Galvanizers (Pty) Ltd	Germiston	011 876-2900		3 Tube	14.0m x 1.35m x 2.5m 10.0m x 2.0m x 4.0m Dia 42mm to 114mm max tube length 6.7m
Robor Tube	Elandsfontein	011 971-1600		1	Tube & pipe galvanizer
Supergalv	Alrode	011 908-3411		1	6.0m x 1.2m x 1.8m
Transvaal Galvanisers In-line & general	Nigel	011 814-1113		3	9.0m x 1.0m x 1.0m 8.0m x 1.2m x 1.5m 6.0m x 1.3m x 1.3m
NORTH WEST					
Andrag Agrico	Lichtenburg	018 632-7260		#	In-line galvanizer
FREE STATE					
Harrismith Galvanizing & Steel Profile (NB: Big line is not in operation)	Harrismith	058 623-2765		2	4.5m x 1.3m x 2.5m (12.0m x 1.2m x 2.5m)
WESTERN CAPE					
Advanced Galvanising (Pty) Ltd	Bellville	021 951-6242		1	8.0m x 1.5m x 3.0m
Cape Galvanising (Pty) Ltd	Parowvalley	021 931-7224		1	14.0m x 1.6m x 2.6m
Galvatech (Pty) Ltd	Bellville	021 951-1211		1	7.5m x 1.5m x 2.6m
Helderberg Galvanizing	Strand	021 845-4500		1	5.5m x 0.8m x 2.4m
Pro-Galv cc	Stikland	021 945-1803		1	7.2m x 1.3m x 2.6m
South Cape Galvanizing (Pty) Ltd (NB: Big line is not in operation)	George Industria	044 884-0882		2	3.7m x 0.94m x 2.3m (5.5m x 1.0m x 2.6m)
EASTERN CAPE					
Galvanising Techniques cc	Port Elizabeth	041 486-1432		1	12.0m x 1.3m x 2.3m
Galvaspin (Pty) Ltd	Port Elizabeth	041 451-1947	●	1	3.0m x 1.2m x 1.8m
Morhot (Pty) Ltd	East London	043 763-1143		1	6.0m x 1.2m x 2.5m
KWAZULU/NATAL					
A&A Galvanisers	Pietermaritzburg	033 387-5783	●	1	3.3m x 0.9m x 1.9m
Bay Galvanisers	Richards Bay	035 751-1942		1	5.0m x 1.2m x 2.5m
Phoenix Galvanizing (Pty) Ltd	Phoenix	031 500-1607	●	2	14.0m x 1.4m x 2.5m 3.0m x 1.2m x 1.2m
Pinetown Galvanizing	Pinetown	031 700-5599		1	9.0m x 1.2m x 3.0m
Voigt & Willecke (Pty) Ltd	Durban	031 902-2248		1	14.0m x 1.3m x 2.5m
MPUMALANGA					
HDGCS (Associate Galvanizer)	Steelpoort	013 230-3205		1	7.0m x 0.9m x 2.4m
MOZAMBIQUE					
F&F Services (International Galvanizer)	Mozambique	+258 823021260		1	4.0m x 0.8m x 1.5m

 # Sheet, wire, pipe and other in-line galvanizing members dedicate their plants to the galvanizing of their own products.

Note:

- *Where more than one galvanizing line is available, the number of lines and the significant bath dimensions are listed, ie. widest, longest and deepest.*
- *For specific contact names (e.g. sales or production personnel) and mobile telephone numbers, contact company receptionist.*
- *The bath sizes are inside dimensions and not maximum component size (length, width and depth). Kindly take note of the expansion of the component when dipped into molten zinc, or discuss with relevant galvanizer.*

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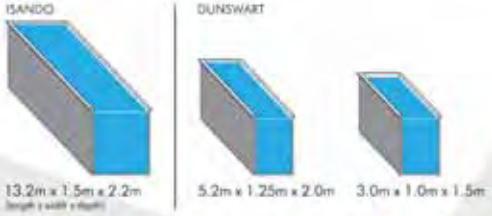
Our **Isando** plant can accommodate heavy steel structures due to our 13,2 meter kettle and improved cranage and loading facilities.
Our **Dunswart** plant specialises in difficult-to-handle items as well as centrifugal work.
Both plants offer an in-house transport facility, a high level of expertise and quick turn around time.

The company has it's own SANS 121 2000 ISO 1461 accredited Hot Dip Galvanizing plants. And is listed under the SABS ISO 9001 scheme.

"ARMCO IS OUR NAME, GALVANIZING IS OUR GAME"

GALVANIZING BATH SIZES



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