2007 Volume 4 Issue 3

HOT DIP GALVANIZING TODAY

HOT DIP GALVANIZERS ASSOCIATION Southern Africa

32

Featuring:

The 2007 Eskom Hot Dip Galvanizing Awards – winners and entries

Masts, poles and sign gantries

Duplex system in a mild atmosphere

Coating Report: Sweep blasting is great for achieving paint adhesion but follow the rules...

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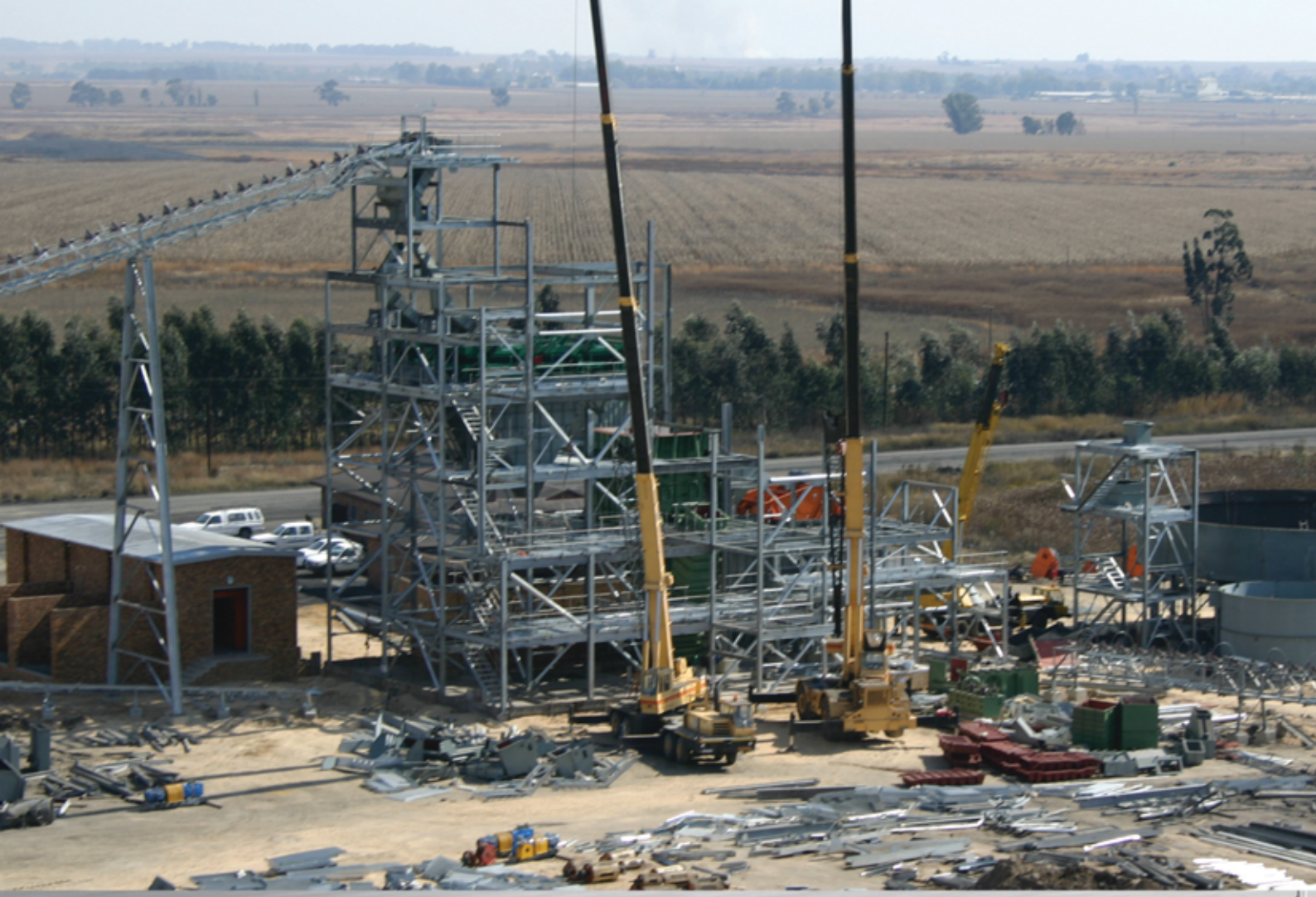

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The Association is a technical information centre established for the benefit of specifiers, consultants, end users and its members

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Front Cover: *A kaleidoscope of photographs including some of the awards entries.*

Hot Dip Galvanizing – Adding value to Steel

Executive Director's Comment

It was approximately 4 years ago that we were directed by our Association Executive to compile a hot dip galvanizing skills development programme. This programme was to include an "outcomes" training material together with a formal accredited SAQA National Certificate. During this four year period we participated in a MERSETA organised workshop that was tasked with the responsibility of compiling a family of unit standards that would include competence levels 2 and 3. All this work was completed during 2007 and the said qualifications were published on the SAQA web site for public comment. Public comments on both qualifications, under the title of "Metal Processing" were requested to be submitted by the end of July 2007. We now await the formal acceptance and approval of these two National Certificates as a formal qualification for people working within the hot dip galvanizing industry.

Once these qualifications are approved, we plan to invite suitably qualified service provider's to offer training courses that meet the requirements of the various unit standards that constitute such qualifications. The Association will provide the necessary hot dip galvanizing training material to the selected service providers and will ensure that "best practice" for our industry will be followed and implemented.

Bob Wilmot

Note from the Editor

While just having produced magazine No 31, No 32 the Awards issue is being finalised for initial distribution on the night of the Awards Event. It's amazing how time flies, particularly they say, as one gets older. I for one at this moment of my life don't believe in allowing age to interfere with my physical goals and running plans. I believe you are as old as you allow yourself to be!

I am excited to announce that I will be setting up an office in Cape Town, starting 6 August. While the bulk of my technical marketing activities will still take place when I regularly visit Gauteng, and visits to KZN and the Eastern Cape will continue, we hope to offer the Cape Town members and specifiers the same facilities currently enjoyed in Gauteng.

In addition the Association will soon be looking out for a third technical marketing person to assist in the promotion of the coating, hereby further enhancing the proactive activities of the organisation and the industry throughout the country.

Features for this issue include the 20 entries for the Annual Eskom Awards Event, and this year we have category winners in Vintage, Export, Industrial & Mining, Architectural, Duplex and a special commendation in R&D/Innovation, with the overall winner not being a category winner.

We also look at Masts and Poles in the various materials, i.e. hot dip galvanized steel, concrete, timber and GRP. Highway sign gantries are also discussed particularly the current method of corrosion protection.

Under Duplex Coatings, Mike Book addressess the topic of duplex coatings in mild to moderately aggressive environments.

Education and Training, expands on our certificated coating inspectors course, an essential requirement in any coating inspectors portfolio. We also highlight the introduction of the HDGASA's coating inspectors' validity card. The holder of this card assures the client that coating inspection will be carried out in terms of SANS 121 (ISO 1461) but also ensures that acceptance or rejection is practical in terms of the coatings benefits.

The Coating Report highlights that when one is required to prepare hot dip galvanizing for paint using the sweep blasting technique, one must follow the rules set out in the Association's Code of Practice for surface preparation.

Other regular articles include Misconceptions, where sweep blasting is discussed and Miss asks the question, should sweep blasting be avoided as this preparation method invariably results in delamination of the zinc coating from the underlying steel surface? Walter's Corner discusses, Corrosion Control of Threaded Articles.

Our Guest Writer's article is entitled "Don't be worried by pessimism; it can provide the key to a better future!"

Our Personality Profile is architect George Elphick of Elphick Proome Architects. EPA makes extensive use of steel in their buildings and naturally hot dip galvanizing comes with the territory. This former rock band member also says music has always played a pivotal role in his life.

Some of the members update us with their company news, in Members News.

Should a reader wish to express an opinion, provide us with an article or require the technical input from a staff member, kindly contact us – enjoy the magazinc.

Terry Smith

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2007 Eskom Hot Dip Galvanizing Awards

Overall Winner

Acrylic Art street lights for Nasrec Road (2010 World Cup)

Description

The design and manufacture of architectural street light poles and luminaries, erected in Nasrec Road at SAFA House (opposite FNB Stadium) for the 2010 World Cup Soccer.

Location

Nasrec Road, Johannesburg

Tonnes of steel

30 tonnes

Project partners

Developer / Owner:
Johannesburg Development Agency

Architect:
Majet Architects

Consulting engineer:
Arcus Gibb Consulting Engineers

Project manager:
P.D. Naidoo & Associates

Main contractor:
Stefanutti & Bressan

Manufacturer:
Acrylic Art – Lighting & Pole Manufacturers

Sub-contractor:
G-Ko Tech

Hot dip galvanizer:
Armco Galvanizers

Project inception date

October 2006

Information

- SAFA House for the 2010 FIFA World Cup was built opposite the FNB Stadium and the only access to this is using Nasrec Road. It was vital to upgrade the surroundings in Nasrec Road in order for it to be more pedestrian-friendly in time for the World Cup and beyond.
- This involved paved walkways with plants, trees and architectural street light furniture.

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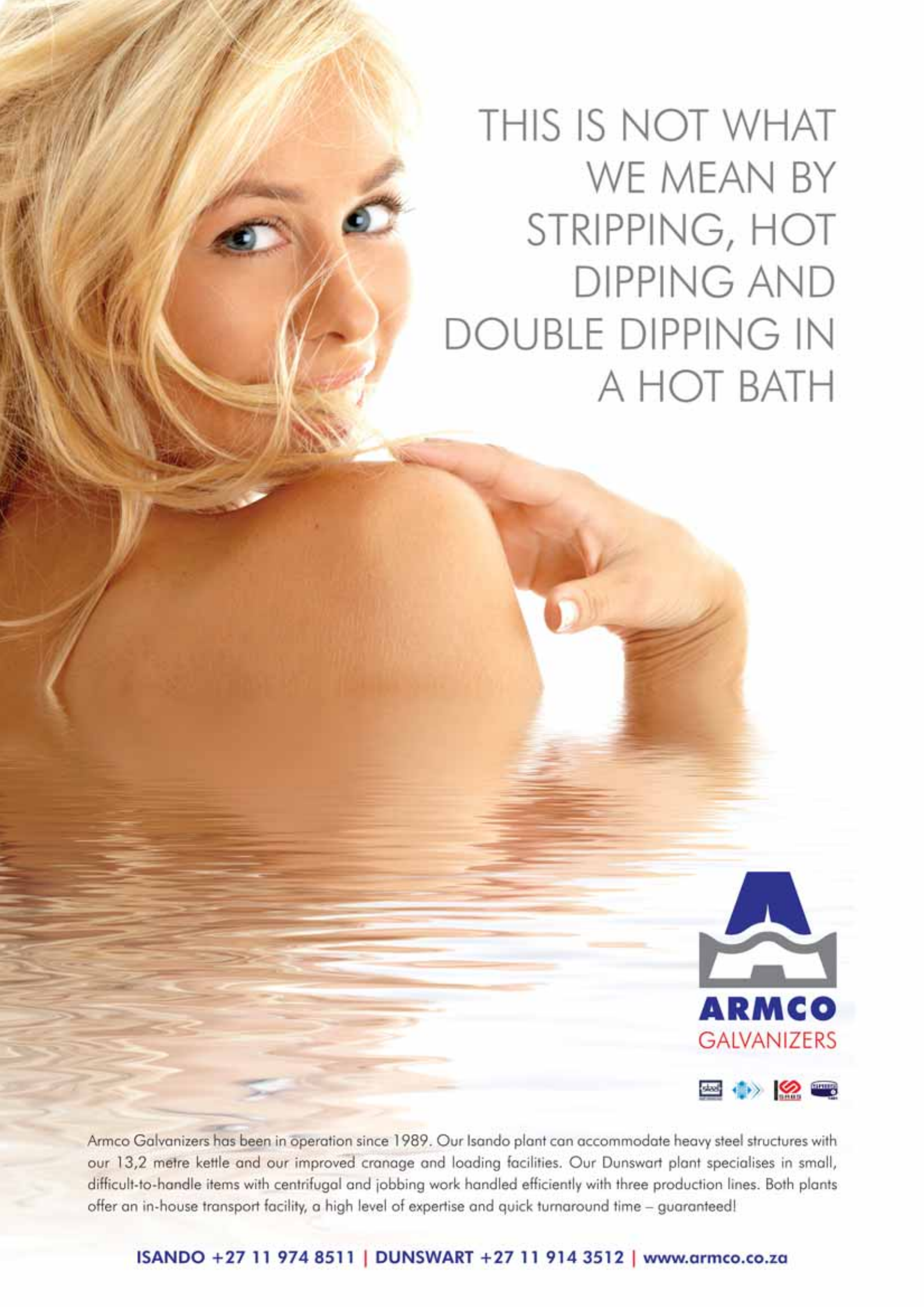
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DOUBLE DIPPING IN
A HOT BATH
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- The client, JDA, was looking for the "wow" effect for the street lights.
- The consulting engineer approached Acrylic Art with an architectural sketch, which required the design of a totally new concept in street lighting. Time was of major importance and Acrylic Art had to design, manufacture and erect a completely new design of a light pole within one week.
- The first concept designed by Acrylic Art was not accepted by the client, who although impressed with the time in which the streetlight had been manufactured, felt it lacked the "wow" effect.
- Further meetings were held between the project manager, architect, consulting engineer and manufacturer in order to submit another design.
- The curved section of the street light had to be manufactured as no facility was available countrywide to curve this section to the required radius. Only after the third attempt, and with great difficulty, did Acrylic Art succeed in manufacturing the bend.
- The design was extremely complex in order to achieve uniformity between the main pole, bend and luminaire. The HDGASA was contacted for input regarding the possibility of distortion during the hot dip galvanizing process.
- The entire structure was hot dip galvanized and powder coated, both for corrosion protection and aesthetical appeal.
- This is a new design in all aspects, the first of its kind in South Africa and has led to the development of a totally new concept in the street light industry. The project has led to the development of other similar applications in other areas, such as Midrand.
- The project was exceptionally well managed by PD Naidoo & Associates (the project manager), with the work being well co-ordinated between all team players. With the complexity of the product, the rate of manufacturing was approximately three units per week.
- The consulting engineer originally looked into importing the product but found that the cost to import only the luminaire was four times higher than the cost of the entire unit made locally!

Vintage Category Winner

FPT Citrus pre-cooling facility

Description

Hot dip galvanized racking in a cold storage facility

Location

Durban Docks T-Jetty

Project partners

Current client:
Fresh Produce Terminals

Designer / Project manager:
Peet Potgieter

Contractor:
Elma Works (Pty) Ltd

Hot dip galvanizer:
Phoenix Galvanizing

Project completion date

1997

Project value

R5 million in 1997

Information

- Development of the Durban Citrus Cold Store started in 1985 / 1986, with the pre-cooling facilities in the Port of Durban now being operated by Fresh Produce Terminals (FPT).
- The FPT services include cooling fruit in preparation for shipping, cold storage at the quayside, tracking pallets and loading fruit onto vessels for shipping.
- Transport of fruit within the cold storage facility is by packed cartons placed on wooden pallets and transferred using forklifts. This complex was originally designed without racking to support palletised fruit packed cartons.
- Due to a change in pallet size, racking was installed in 1997 in

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order to support the top tier of pallets.

- The racking was manufactured to fine tolerances and all fixing holes were drilled and gussets welded on prior to hot dip galvanizing. No re-drilling, flame cutting, welding or sawing was allowed after galvanizing.
- The racking was assembled using hot dip galvanized bolts, nuts and washers.
- Hot dip galvanizing is the only corrosion protection method that will withstand the varying levels of cold room humidity and temperatures. Furthermore, it is able to withstand the working environment in which the racking is bumped by forklift or abraded by wooden pallets.
- The cold rooms are situated on the wharf, approximately 20m from the loading docks. When not in use, the rooms are left open for ventilation; therefore the racking is exposed to the corrosive conditions of a marine environment.
- A site inspection of the 10 year old facility confirmed the excellent performance of the hot dip galvanized steel racking system. Various coating thickness readings were taken, with the minimum showing 135 micrometers.

Export Category Winner

QMM mineral sands

Description

Manufacture, supply and erection of prefabricated buildings in Madagascar.

Location

Madagascar

Tonnes of steel

780 tonnes

Project partners

Developer / Owner:
QMM – Rio Tinto

Partner:
Universal Sodexho Afrique

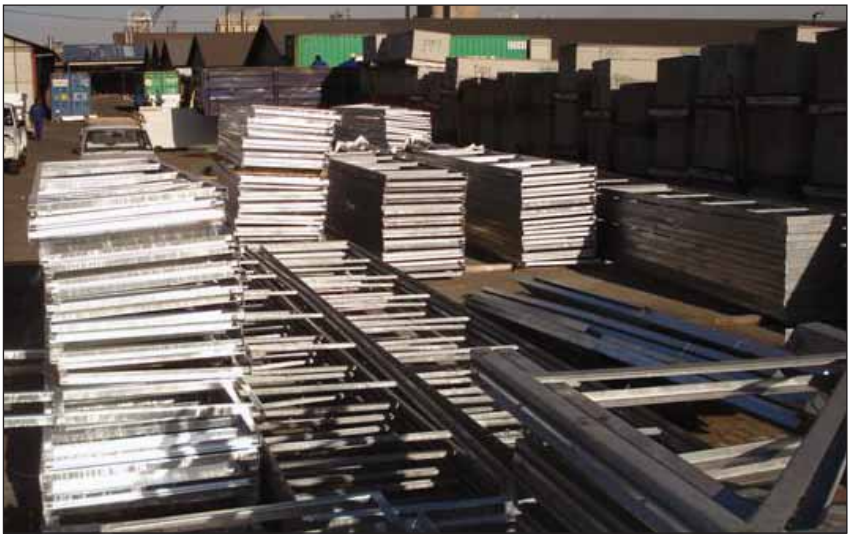
Specifier:
Hatch Limited

Project manager:
Fabricated Steel Manufacturing Co. (FSM)

Hot dip galvanizer:
Robor Galvanizers

Project inception date

November 2006



Information

- The QMM Project is a mineral sands project based near Fort Dauphin on the south eastern coast of Madagascar.
- Madagascar is a cyclone prone area and all FSM's buildings are certified to withstand wind speeds in excess of 150km per hour.
- For phase one of the project, Fabricated Steel supplied a mine village consisting of accommodation, kitchen, recreation, laundry and medical facilities.
- The second phase consisted of the supply of 200 three bed houses of 82m^2 each for accommodation on site. These houses are intended to be permanent buildings which are designed to outlast the mine development. As a result, the client specified that all the steel components be hot dip galvanized.
- A major project requirement involved an integrated logistics planning and co-ordination of the supply arrangements.
- As a result of the remote site location and availability of construction materials and equipment, the designer decided on the use of pre-fabricated and hot dip galvanized steel.
- The construction of the houses will result in an economical benefit to the client in that they will provide living quarters to miners and personnel while establishing the mine and will also outlast the initial mining development.

Mining and Industrial Category Winner

Sishen Iron Ore Expansion Project

Description

The hot dip galvanizing of conveyors and structural steel for the Sishen Iron Ore Expansion Project.

Location

Sishen, Northern Cape

Project partners

Client:
Kumba Resources

Contractor:
Roymec (Pty) Ltd

Fabricator:
Tubular Technical Construction

Hot dip galvanizers:
Armco Galvanizers, Babcock Nthuthuko Powerlines (Pty) Ltd, Phoenix Galvanizing (Pty) Ltd & Robor Galvanizers

Project inception date

March 2007

Information

- Following numerous meetings and technical discussions with Kumba's design and project engineers, the HDGASA and various other players, hot dip galvanizing was accepted and specified as the preferred corrosion protection system for the Sishen Iron Ore Expansion Project.
- The co-operation between the client and the HDGASA included the development of a detailed hot dip galvanizing and duplex specification for the "wet" areas.
- In addition to the development of specifications, it was stipulated that the galvanizers must be members of the Association and be subject to audit by Kumba personnel.
- This expansion project was aimed at tripling the output of iron ore from the mine with 80% of production being destined for export via the 861km rail link to the iron ore terminal located at Saldanha Bay.
- Hot dip galvanizing was specified by Kumba as the only corrosion control system capable of providing a maintenance free service life well in excess of 40 years.
- Furthermore, hot dip galvanizing was used in preference to the painted steelwork of the original plant, where maintenance was found to be problematical.
- Success of this project was believed to be partly due to the galvanizer's ability to handle the requirements of quality, capacity and meet the delivery schedules.

Architectural Category Winner

Tied arch pedestrian bridge – Century City

Description

The first tied arch pedestrian bridge constructed in the Western Cape, which is coated with a duplex system.

Location

Knightsbridge Island Complex, Century City, Cape Town

Tonnes of steel

31.5 tonnes

Project partners

Developer / Owner:
Century City Property Developers

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Architect:
Boogertman & Partners (Pretoria)

Specifier:
HHO Africa

Main contractor:
Peak Projects

Specialist subcontractors:
DLE Engineering

Hot dip galvanizers:
Cape Galvanising (Pty) Ltd &
Galvatech (Pty) Ltd

Project inception date

January 2006

Project value

R3.5 million

Information

- A 30m span tubular structural steel tied arch footbridge was constructed to span the canal between the prestigious Knightsbridge apartment complex and the Canal Walk area.
- The prestigious Knightsbridge development in Century City, Cape Town required numerous canal crossings to provide access to the Knightsbridge Island. At this particular location it was decided to incorporate three existing piers (a result of previous unfinished development in the area) into the new structure.
- The use of hot dip galvanized steel allowed the designers to achieve the desired elegance and impact required for this structure. Simply put, no other material could have brought about this result with such style.
- A 105 micron thickness was specified in conjunction with a duplex painting specification, in order to ensure durability and produce the high quality finish required for such a prestigious project.
- The fabrication of the main arch members required much teamwork and interaction from a number of parties across the country. The end result saw some sections fabricated and curved in Gauteng, with the rest being sourced locally.
- This bridge formed part of a case study by final year civil engineering students at the University of Cape Town, thereby promoting the transfer of knowledge of the duplex coating system to future engineers.

R&D / Innovation Category –

Special Commendation

D'lites

Description

Mild steel lamps, which have been laser profiled in distinctly South African designs and hot dip galvanized.

Project partners

Developer / Owner:
MSB Design

Laser Cutting:
Laser Profiling & Saw Specialist

Hot Dip Galvanizer:
Phoenix Galvanizing Centrifuge (Pty) Ltd

Information

- The inspiration for D'lites was born out of tubular industrial laser profiled components. The distinct beauty of these components got the team thinking that the principle could work commercially, if modified to have both function and form.
- Mild steel was a natural choice for the designs. The metal provides a sturdy medium from a weight and stability point of view. It is also fire resistant, a major consideration when dealing with domestic lighting.
- The team believes that stainless steel has its place in the interior design market. Hot dip galvanized steel on its own as a medium in interior design, is a genre which has not been explored to its full potential.
- The product was designed to be hot dip galvanized from inception, due to the designer's fascination with the process.
- The corrosion protection properties of hot dip galvanizing and cathodic protection of zinc would make the product a lasting investment. Similar household metal goods are generally powder coated or chrome-plated, which is problematic from a corrosion point of view, especially in coastal areas.
- The weathering of the hot dip galvanized coating will be explained to consumers by way of a label, this will expand the general public's knowledge of the hot dip galvanizing process.

Duplex Coatings Category Winner

Standard Bank Regional Head Quarters

Description

New Regional Head Office Complex for Standard Bank

Location

Kingsmead Office Park, Durban, Kwazulu Natal

Tonnes of steel

212 tonnes

Project partners

Client:
Standard Bank

Architect:
Elphick Proome Architects

Programming consultant:
Key Projects

Contractor:
G. Liviero & Son Building (Pty) Ltd

Structural & civil engineers:
WSP

Quantity surveyor:
FWJK Quantity Surveyors

Steel fabricators:
Churchyard & Umpleby, Belrex & Classique Steelworx

Hot dip galvanizers:
Phoenix Galvanizing (Pty) Ltd and Voigt & Willecke Galvanizers

Project inception date

September 2005

Information

- In September 2005 construction started on the new R266 million Standard Bank Regional Head Office complex at Kingsmead Office Park in Durban. This move consolidated the banking giant's scattered corporate facilities around the city and affirmed the banks commitment to the rejuvenation of the Durban CBD.
- The building consisted of three elements: sandstone, glass and steel. Sandstone is used on blade-walls on the east and west sides of the building and addresses climate and noise issues. The north and south sides of the building are expansive glass walls.
- Specialised beams and spider-like fasteners facilitate the floor to ceiling glazing. Probably the most striking feature of the building is the large steel canopies, in the form of a number of 'trees'.
- In total, eight pairs of canopies (trees), each unique in height, design and treatment, grace the inside and outside of the building.
- Hot dip galvanized steel grating panels provide security and natural light in the basement parkade. Internal steel bridges improve vertical circulation and provide a sense of connection to the rest of the building.
- The project team faced a number of design challenges on this project. The basement parkade's foundations are situated just 30mm above sea level and therefore had water table issues. An extensive storm water culvert had to run the length of the building. The biggest challenge however, was the timeframe in which the project needed to be completed, 18 months, which proved impossible.
- Although visually effective, the design and fabrication of the steelwork provided some challenges.
- The consulting engineer was informed of the local galvanizing bath sizes and where possible eliminated the need for double end dipping of the components by introducing more bolted joints. Shortening the lengths of the sections also reduced the transport costs.
- Specifications called for the steel to be hot dip galvanized and prepared for painting in accordance with HDGASA 01-1990 – Code of Practice for Surface Preparation and Application of Organic Coatings.

Phoenix Galvanizing (Pty) Ltd

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PG Bison – Ugie

Mining & Industrial Category

Description

The use of pre-fabricated and hot dip galvanized steel as the preferred material of construction for a chipboard manufacturing company.

Location

Ugie, Eastern Cape

Tonnes of steel

4 500 tonnes for the main building and 500 tonnes of ancillary steelwork

Project Partners

Client:
Steinhoff Timber Industries (STI), PG Bison (Holding Company)

Principle agent:
Andrew Forbes and Associates

Structural engineers:
Andrew Forbes and Associates

Civil engineers:
CBM Africa cc

Architect:
Osmond Lange Architects

Quantity surveyors:
HRN Quantity Surveyors

Electrical engineers:
Clinkscales Maughan-Brown

Mechanical engineers:
Carifro

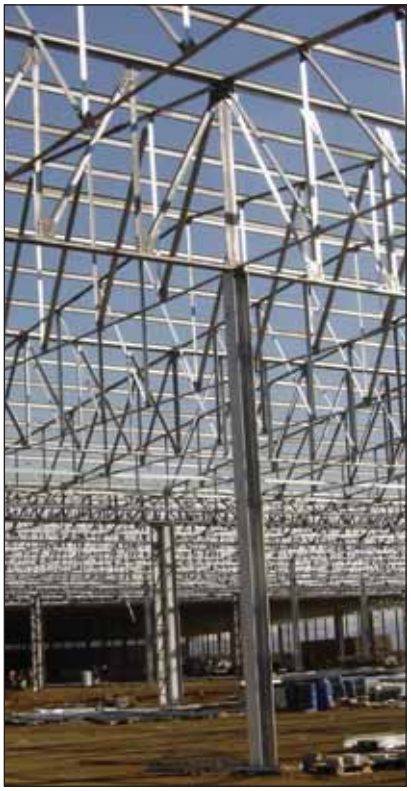
Time and cost management:
Arup

Joint venture contractors:
Grinaker/LTA, Concor and Trencon

Hot dip galvanizers:
Armco Galvanizers, Voigt & Willecke Galvanizers and Phoenix Galvanizers (Pty) Ltd

Project inception date

December 2007



Saldanha Steel Factory

Mining & Industrial Category

Description

The hot dip galvanizing of a new fabrication facility being developed at Saldanha Bay as part of South Africa's development in the oil and gas industry.

Location

Saldanha Bay

Tonnes of Steel

Approximately 1 000 tonnes

Project partners

Employer:
FerroMarine Africa (Pty) Ltd

Developer:
Atlantis Marine Projects (Pty) Ltd and MAN Ferrostaal AG

Project management:
Support Development Management (Pty) Ltd

Structural steelwork:
Scott Steel Projects (Pty) Ltd

Hot dip galvanizer:
Cape Galvanising (Pty) Ltd

Majuba Ash Starter Slew Conveyor System

Mining & Industrial Category

Description

Hot dip galvanized Ash Starter System used for additional ash handling to the dump site.

Tonnes of steel

600 tonnes

Project partners

Client:
Eskom

Contractor:
Krupp Materials Handling, a division of ThyssenKrupp Engineering (Pty) Ltd

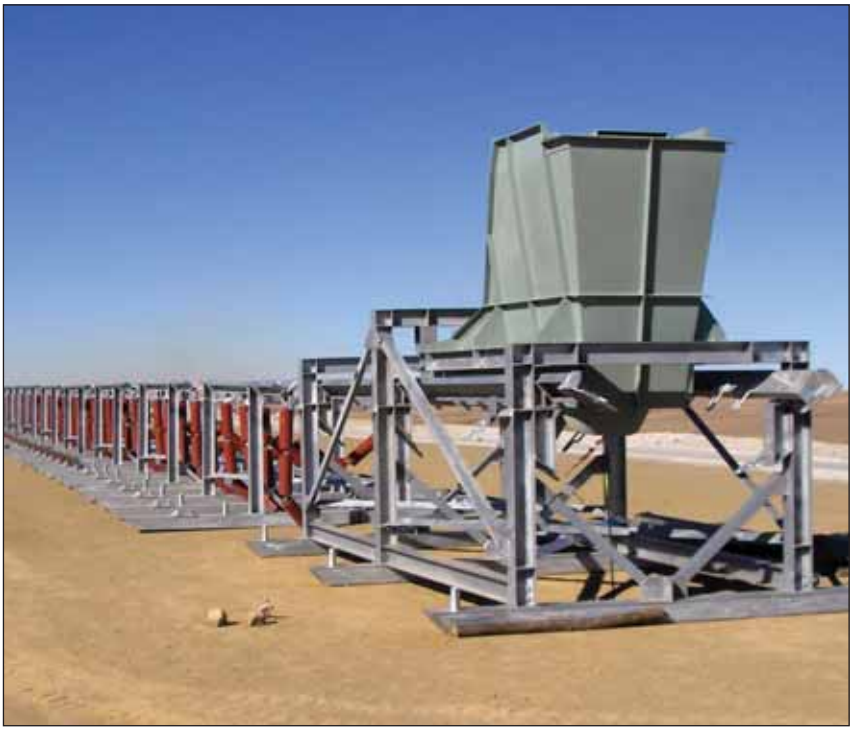
Hot dip galvanizer:
Armco Galvanizers

Project inception date

April 2007

Project value

R84 million



MOMA Sands Project

Export Category

Description

The design, offsite fabrication and hot dip galvanizing of steel for dune mining, built on the coast of the Northern Province of Nampula in Mozambique. The dune sands contain large deposits of titanium minerals.

Location

Nampula Province, Mozambique

Tonnes of steel

1 141 tonnes

Project partners

Developer / Owner:
Kenmare Resources

Project engineers:
Multiplex Bateman Joint Venture

Project co-ordinator:
Kentz Engineers & Constructors

Fabricator:
Cosira International

Hot dip galvanizers:
Robor Galvanizers and Armco Galvanizers

Project inception date

January 2006

Mufulira Smelter Upgrade

Export Category

Description

Manufacture and supply of duplex coated Powerspan® cable ladders and associated accessories.

Location

Kitwe, Zambia

Project partners

Developer / Owner:
Mopani Copper Mines Plc

Designer:
SNC Lavalin – Marples Joint Venture

Project manager:
Neil Adendorff / D.W. Hallam

Main contractor:
EPC

Manufacturer, powder coater and supplier:
O-line Support Systems (Pty) Ltd

Hot dip galvanizer:
Armco Galvanizers

Project inception date

September 2005

Flour Mill, Ghana

Export Category

Description

The hot dip galvanizing of steel at the Ghana Flour Mill at the Port of Takoradi.

Location

Port of Takoradi in Ghana

Project partners

Owner / Client:
Serge Bakalian

Engineer:
Van Gysen Consulting Engineers

Project manager:
Thierry Loupac

Manufacturer / Designer:
Anchor Steel

Hot dip galvanizers:
Cape Galvanising (Pty) Ltd and Galvatech (Pty) Ltd

Pedestrian bridges in KwaZulu Natal

Innovation / R & D Category

Description

Three hot dip galvanized bridges erected in the rural parts of Kwazulu Natal

Location

Kwazulu Natal

Project partners

Client:
Provincial Department of Transport

Consulting engineer:
Eyetu Consulting Engineers

Contractor:
Steelcon

Civil engineer:
Siyavusa Specialist Contractor & Erbacon

Hot dip galvanizer:
Bay Galvanizers

Brett Murray Artist

Innovation / R & D Category

Description

The application of a duplex coating system to artistic metal designs, created by Brett Murray

Location

Cape Town

Tonnes of steel

5 tonnes

Project partners

Client:
UCT School of Medicine

Contractor:
Brett Murray

Hot dip galvanizer & paint contractor:
Cape Galvanising (Pty) Ltd

Design, installation & commissioning of an electrically heated W.Pilling Kettle

Innovation / R & D Category

Description

The modern design methodology, manufacturing, installation and commissioning of an unusually deep, electrically heated kettle for Robor Galvanizers.

Location

Robor Galvanizers, Germiston

Project partners

Client:
Robor Galvanizers

Project manager:
South African Galvanizing Services (Pty) Ltd

Gracelands Bridge

Architectural Category

Description

The design and erection of a hot dip galvanized pedestrian bridge in Kwazulu Natal.

Location

Gracelands Farm, Kwazulu Natal

Tonnes of steel

40 tonnes

Project partners

Developer / Owner:
Gracelands Community / KZN D.O.T. Rural Road Transport Forum

Specifier / Designer:
Emzansi Consulting

Project manager:
Emzansi Consulting

Main contractor:
Somerset Oaks Trading / Cousins Steel International (Pty) Ltd

Erector:
Big Red Rigging

Hot dip galvanizer:
Phoenix Galvanizing (Pty) Ltd

Project value

R1.8 million

Vineyard Hotel & Spa

Architectural Category

Description

A four star Hotel, Spa and Conference Centre which was duplex coated.

Location

Newlands, Cape Town

Project partners

Owner / Developer:
Petousis Family

Architect:
Revel Fox & Partners

General contractor:
Vineyard Hotel

Steel sub-contractor:
Raven Steel

Engineer:
Kantey & Templar

Project manager:
Revel Fox & Partners

Hot dip galvanizer:
Cape Galvanising (Pty) Ltd

Saldanha Overland Conveyor

Duplex Coatings Category

Description

The provision of a duplex coating system to roof canopies that protect iron ore from the natural elements to help reduce the dust pollution of the environment at the Bluewaterbay Harbour, Saldanha.

Location

Bluewaterbay, Saldanha

Tonnes of steel

178 tonnes

Project partners

Developer / Owner:
Transnet Projects

Architect:
Transnet Projects

Project manager:
Transnet Projects

Main contractor
Heunis Engineering

Hot dip galvanizer & paint contractor:
Galvatech (Pty) Ltd

Project inception date

April 2007

Royal Cape Golf Course Tees

Duplex Coatings Category

Description

The hot dip galvanizing and powder coating of tee signs, used for advertising, at the Royal Cape Golf Course.

Location

Cape Town

Project partners

Client:
Royal Cape Golf Club

Project manager:
Rob Cheetham

Contractor:
Sign-A-Rama

Hot dip galvanizer:
Cape Galvanising (Pty) Ltd

Materials / coatings used in the utility pole market – summary of a 2006 survey

The following summary of the different materials used, was taken from a report produced in 2006 of the Utility Pole Market.

Lighting poles

The market estimate for steel lighting poles in 2006 was about 4 000 tpa. However, it was expected that substantial growth in this market (mainly infrastructural (township) development and replacement – accidents, corrosion, etc.) was likely to occur.

Photo 1: Without the correct treatment timber light poles can rot at the base.

Competitor materials are wood, concrete and fibreglass. Over 70% of the steel poles are of standard length. Market control is via the tender system with 90% of the municipalities specifying steel. Most steel poles are hot dip galvanized and then solution painted or powder-coated for use in aggressive conditions. Current specification control is either local municipality or SABS 0225.

For the total market it is estimated that steel represents 64%, concrete 18%, fibreglass 18%. Further information is available from the Institute of Lighting Engineers. Discussions with specifiers/users and fabricators indicated that the following material issues were important.

Wood

- Municipalities only really use wood if they have a lot of it currently in stock.
- Wood has to be treated and bitumen is applied at the base, to prevent rot. *See photo 1.*
- Problem with cable access (need to cut a groove or strap a conduit).
- Need to cut a housing.
- Life considered good.
- Good structural reliability (often reused).
- Slightly cheaper than steel.
- Easy to transport, but heavier than steel.
- Problems are with attachments (outreach arms, etc), which tend to be made of hot dip galvanized steel.

Photo 2: Outreach arms are usually hot dip galvanized steel. Care should be taken that fasteners also be hot dip galvanized for long term corrosion control.

Photo 3: GRP light post with stainless steel sleeve.

Photo 4: GRP light post where outer fibres have been exposed in the premature breakdown of the pole.

Photo 5: Outreach arms on concrete poles are usually hot dip galvanized steel. Ensure all fasteners are hot dip galvanized and not zinc electroplated for long maintenance free life.

Photo 6: Cables are attached to the outside faces of the concrete pole, limiting its aesthetical appeal.

Photo 7: Concrete poles often need outside junction boxes to accommodate incoming cables.

Photo 8: Differential aeration may be prevented by an additional steel sleeve situated above and below the ground level.

Photo 9: Concrete poles can fail with side impact loads.

Photo 10: Make use of hot dip galvanized holding down bolts for long term maintenance free life.

Fasteners used should also be hot dip galvanized and not zinc electroplated. *See photo 2.*

Fibreglass

- Initially had problems.
- Have a niche (where no maintenance needed). *See photos 3 and 4.*
- Problems when cutting grass (exposure of fibres at base). *See photo 3 of stainless sleeve.*
- Fire problem.
- Still get a lot of cracking, some from cutting grass. *See photo 4.*
- Access doors need substantial reinforcement.
- Easily vandalised.
- Designed for actual loading only (additional attachments later, and use of ladders is a problem).
- Only real advantage is low weight.
- Above a certain height need to hinge (complicated and prone to failure) – therefore tend to limit height to 6m.

Concrete

- Used to be used
- Johannesburg municipality has not bought for 15 years.
- In Cape Town they are cheaper up to 9m. Outreach arms are hot dip galvanized steel. *See photo 5.*
- Inferior to steel.
- Used in low cost housing areas where multiple use important (high V, low V, lighting).
- Limited lengths and suppliers.
- Still used in Alberton, Port Elizabeth, Durban and areas where soil considered too corrosive.
- Heavy (break if dropped).
- Limited to size of cables that can be used (often need outside junction box – *see photo 7*).
- Generally use hot dip galvanized steel outreaches so what is the point in using concrete. Fasteners should also be hot dip galvanized and not zinc electroplated.
- Earthing problems (lightening can split the poles).
- Safety issues (car impact). *See photo 9.*
- Acid rain.
- Long lead times.
- Size of access hole fixed by moulds available.
- Often due to shape cables must be fixed using a metal strap outside the pole. *See photo 6.*

Steel

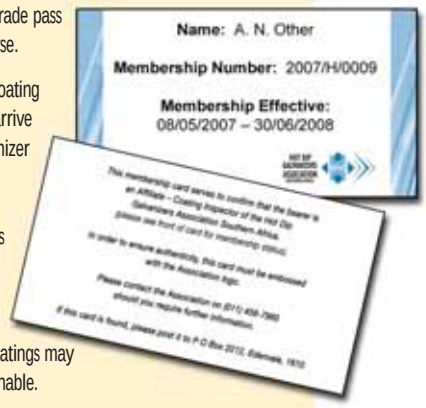
- Flexible lengths and standard sizes.
- Greater than 12m look at telescoped structure (Intermediate Height Mast).
- Competitive pricing (enough manufacturers).
- Can be hot dip galvanized.
- "Dog" sleeves used by Johannesburg (steel cylinder 4 - 6mm) to prevent differential aeration (necking corrosion). *See photo 8.*
- Can be transported in bundles.
- Easier to fabricate attachments.
- Can be tailor designed for strength and height.
- Vandal resistant.
- Not much scrap utility (not stolen in Africa, cf. Al).
- Safety (car impact) although not considered in Cape Town.
- Can be easily coloured.
- Soils not considered an issue in Cape Town (South Easter an issue).
- Access hole and door adequate.
- Easy to earth.
- Cables can be lead through the inside of the pole, where aesthetics is important.
- Use hot dip galvanized holding down bolts – *photo 10.*

Coating inspectors' validity card

The object of the Association's Coating Inspectors Course is to ensure that when coating inspectors arrive at a galvanizer, they understand the principals of the hot dip galvanized coating so that when coatings are failed or accepted they are for valid reasons.

By ensuring that the coating inspector has an intimate knowledge and understanding of a metallic coating such as hot dip galvanizing and knows what is acceptable or must be rejected, costly delays in the project may be avoided.

To this end the Association has introduced a Coating Inspectors Validity Card which will be handed out to all coating inspectors that have achieved a higher grade pass in the course.



Should a coating inspector arrive at a galvanizer without credentials such as this card, it is suggested that rejected coatings may be questionable.

If interested in attending this certified coating inspectors course, kindly contact the Association for further details.

How to choose the correct material or coating for utility poles – a layman's comments

What material should I use? To answer that we need to ask ourselves a few basic "foundation" questions.

What is the intended application?

A mast or tower, a utility pole or a fence pole? Temporary or permanent (and then just how "permanent" and how much maintenance will be done or how accessible is the pole after installation?)

For example if the poles are to support the perimeter fence of a lion enclosure adjacent to the sea, the material or coating will be selected with a different set of priorities than if it was a tennis court pole supporting the wire mesh surrounding the court in Gauteng. Although the unlikelihood of future maintenance must also be taken into account, it may also be nice to have a coating last the lifetime of the tennis court?

The pros and cons of the materials

Cost is a relative thing. What is the fence protecting? A million rand rhino or a compost heap? What is the risk involved if the structure fails? As this all varies greatly the following pointers may be useful.

Concrete

- Prestressed items need proper transport as they are prone to impact damage.
- Cast on site requires proper supervision (e.g. correct mixing ratios and not too much water to wash away the binder!) (Ready-mixed is preferred but not always possible!).
- Sufficient coverage of reinforcement steel is important.
- Should raw concrete be unacceptable for aesthetical reasons, and the component is required to be painted, due precaution in surface preparation and suitable paint selection, is mandatory.
- Later modifications / additions can be problematic.
- Grafitti may be a risk.
- Not prone to theft as the material is not easily "re-used".
- Extremely UV resistant.

Steel

- Black steel is easily transported provided that packaging precautions to prevent arrival damage and deformation, are taken into consideration.
- Structural integrity will decrease in time due to corrosion.
- Painting on site requires its own skill set, and to be effective requires additional inspection procedures.
- Fabrication shop applied coatings are preferable as it is done under more controlled environments.
- Hot dip galvanized steel because of its abrasion resistance properties can also be easily transported without excessive coating damage.
- The coating may require additional protection by a suitable paint, especially when enhanced corrosion protection or a colour for aesthetical appeal, is required.
- In the long term, exposure of the iron/zinc alloy layers may lead to surface discolouration, which may be unacceptable from an aesthetic perspective.
- Paint coatings may be applied provided that correct substrate preparation and selection of the application material is implemented.
- Hot dip galvanizing is the only effective way to coat the inside of long, hollow sections.
- Electro plating does not provide long-term corrosion protection in outdoor applications and accentuates corrosion particularly on the insides (where the coating has not taken place) of long hollow sections.
- In all steel structures, if the corrosivity of the location is known, cost effective corrosion control measures can be implemented into the design and coating maintenance minimised.

Wood

Different levels of preservation are prescribed for different exposure risks. The protection required for a roof truss would be ineffective if it is exposed to rain or soil contact. Insight into the suitable Hazard Classifications can be found on the SAWPA website (sawpa.org.za). The level of protection is also reduced if the preservative treated timber is cut after treatment. Wood can corrode – as it can be degraded by the environment it is exposed to. With incorrect preservation and fabrication, fungal and insect attack are the most common. If timeous action is taken, there are effective maintenance procedures which will ensure a long problem free life.

GRP and other composites

Composites can be designed with special "features" such as minimal electrical conductance or radar invisibility. Being primarily polymer based, they are affected to a greater or lesser degree by UV. In short, these are high-tech materials which are custom designed for specific applications. They require inputs from materials experts experienced in their craft / discipline.

There is no one ultimate material, or for that matter combination of materials! Each one has its niche, and some even overlap!

With hot dip galvanizing you get at least a guaranteed minimum protection, the alternative materials/coatings need trained and properly equipped inspector's to ensure that you get what you asked for!

Industrial Poles and Masts (Pty) Ltd

Largest steel street light pole manufacturer in South Africa

The Johannesburg-based Industrial Poles & Masts (Pty) Ltd is the largest steel street light pole manufacturer in South Africa and holds the contracts for most of the country's major metropolitan municipalities for the supply of street light – and traffic signal poles and masts.

All poles specified by all the metropolitan municipalities dealing with Industrial Poles & Masts (Pty) Ltd, are required to be hot dip galvanized.

The company also manufactures transmission – lighting conductor -, flag -, rugby and camera poles, parking area and decorative poles, mid-hinge masts, pole brackets and accessories.

The company has been accredited with ISO 9001:2000. All our products are manufactured according to the client's needs, specifications and requirements. IPM ensure the highest standards of quality, from the design according to international criteria, the acquisition of raw material, to the delivery of the final product.

All our products are cold swaged to certify maximum strength. The spigot is swaged on single and double outreaches and not welded in.

Access and cable entry openings are cut out with plasma arc at a low temperature to guarantee a smooth cut that will not damage cables and to retain pole strength.

The single and double outreach bending processes are carried out after hot dip galvanizing to provide a smoother surface and thus easier cabling.

Should you need a quote or a burst of inspiration to transform your ideas in to stunning reality, please give IPM a call today on 2711-864-7665/6 or 2711-864-1439 or Adrian on his cell at 0827703143 or email us on adrian@ipmsa.co.za or betsie@ipmsa.co.za

Sign gantry coatings – but what about the maintenance!

Sign gantries are erected on our highways throughout the country. For whatsoever reasons, paint has always been preferred for corrosion protection. The painted gantries are usually painted grey in colour.

Painted structures generally offer a shorter service life (about 8 to 12 years dependent on material choice, preparation of the substrate and application of the paint coating), compared to a hot dip galvanized coatings, particularly in rural environments (30 to 50 years dependent on coating thickness which is determined mainly by the chemical composition, material thickness and surface roughness.) Maintenance of a painted gantry can sometimes be accommodated when general maintenance is required on the highway and occupation is necessary. However, the two aspects of maintenance cannot always be co-ordinated. Also maintenance painting will seldom resemble the quality of the original coating, further reducing the future service free life, resulting in a shorter maintenance cycle.

There are, however, some exceptions to the rule and these are:

The first sign gantry to be hot dip galvanized was erected on the Heidelberg Road, just before it joins the M2 east and west. This gantry was mainly constructed as a buffer for trucks packed illegally higher than the road restrictions of 5.1m. Trucks packed too high are caught by this gantry which has been designed to take a 25 ton horizontal load. Once the truck hits the gantry, the driver is alerted and then with his damaged truck, can find an alternative route. The gantry also fulfils an informative function.

This gantry was hot dip galvanized in excess of about 20 years ago and has had very little coating loss. See photos and coating thickness readings in the table below. With the current corrosion rate of about 1 to 2µm per year, the remaining coating is likely to outlast the design life of the highway.

This buffer sign gantry was constructed some 20 years ago and the hot dip galvanized coating is very much intact. Coating thickness readings (see table below) prove that the coating is likely to provide a further 20 to 30 years of maintenance free coating life.

Coating thickness readings (µm) – Taken at ground level			
Mean	Max	Min	No. of readings
347	428	274	35

When considering the initial choice of coating, besides understanding the environment in which the product or project is likely to be exposed to, (ISO 9223 Corrosion of Metals and Alloys – Corrosivity of atmospheres – Classification and the Association's Information Sheet No. 8 – Corrosion of Zinc – Corrosivity of Atmospheres). See our web site. These may be used to assess the corrosivity of the environment.

In corrosion categories C1 to C3 (90% of the country), zinc corrodes at a maximum of 2µm per annum. Even though most structural steel when hot dip galvanized will result in a coating of at least 20 to 50% more than the minimum required, which is 70µm minimum with a mean of 85µm by the specification SANS 121 (ISO 1461).

Painted only sign gantries often require extensive maintenance within a short period of less than 10 years after installation. When site repainting does take place in appropriate site conditions and inadequate substrate preparation due to difficult application conditions extensively shorten the required maintenance cycle.

Future accessibility to all parts of the component for future maintenance is also an extremely important consideration, when specifying.

Holding down bolts and nuts should also be hot dip galvanized to provide a

similar maintenance free life. Corrosion protection at all site welded areas should be comprehensively reinstated by using a reputable repair material such as “Zincfix” or equivalent.

When required, coating maintenance of the current sign gantries has to be extremely expensive, no matter how one looks at it!

With the daily traffic volumes experienced in many of the big cities, particularly Johannesburg and the corresponding costs both direct and indirect, hot dip galvanizing of the sign gantry structures makes absolute cost effective sense.

Surely, when designing highways at today’s costs and particularly when it is a build operate and transfer type of project, maintenance must be a major factor for consideration, making hot dip galvanizing an extremely attractive option.

Repainting of insitu sign gantries for a successul maintenance free coating is dangerous and extremely difficult to achieve.

After years of exposure the performance of the painted bracketry that was added to the original buffer sign gantry can be visually compared to the hot dip galvanized coating.

Coating thickness readings prove that the coating will provide a further 20 to 30 years of maintenance free life.

Guest Writer

Bob Andrew, our guest writer, is a consulting value engineer and Honourary Life Member of this Association.

Don't be worried by pessimism; it can provide the key to a better future

Have you ever wondered why the writings of the German philosopher Arthur Schopenhauer (1788-1860) are not more popular in South Africa? He is known as the 'prince' of pessimism, which we now seem to be developing into an art form.

Schopenhauer believed that the world was made up of misfortune and affliction. The only consolation was that there was always someone worse off than you. We may not always be aware of them, but pain and suffering are around us all of the time. We may obtain short-term relief, but mankind's fate is bleak and there is nothing we can about this.

Misfortune, pain and boredom do, however, have their uses. According to Schopenhauer, they can act as driving forces and 'prevent us from going mad'. If we existed in a state of total happiness and serenity we would have no will to change anything; we would vegetate, albeit in a happy frame of mind.

In Schopenhauer's view, the essence of our humanity is our unconscious will and not reality, which in any case according to him, is an illusion. Our behaviour and our circumstances are determined by our will and not by external forces. There is nobody to blame: we and the causes of our problems are part of a single system. We construct our world according to our will. Without hardship, there would just be acceptance and no construction.

Thomas Hardy, a firm follower of Schopenhauer's philosophy, believed that pessimism is playing the sure game. You cannot lose at it; you may gain. It is the only view of life in which you can never be disappointed. If you survive in the worst possible circumstances, when better arise, as they may, life will become child's play.

Pessimists are people who have no hope for themselves or for others. As Oscar Wilde said: if given the choice of two evils, a pessimist chooses both.

Let's face it: these attitudes typify much of what is happening in South Africa today. It may explain why we have become a nation of 'negaholics'.

We have all been through a great deal of trauma before and during the transformation of our country. Many underprivileged people remain underprivileged. Political, social and cultural changes have made us fearful and anxious. The restructuring of businesses and the advent of 'jobless growth', largely as a result of globalisation and increased competition, have changed our perception of such things as employee loyalty and job security. Crime and corruption have not helped us to alter our negative attitudes.

So, what do we do? Do we wallow in our pessimism, believing like Thomas Hardy that if we survive this, anything else will be a doddle?

Paradoxically, Schopenhauer may hold the key: we must use our pessimism to get us out of this state of mind. We must construct a better world by using our will. We must not accept our perceptions of the reality around us.

Firstly, unlike pessimists, we must become agitating and caring individuals. We must not breed indifference to others, we must not be consoled by other peoples' misery. Our survival and success are interconnected and interdependent to those of others. We must have the necessary will to alleviate the suffering of others. We must have the will to work for the survival of our country.

Our communications media must take the trouble to thrust positive views upon the unconvinced, even if these are unpopular in some quarters or received with cynicism. Positive communication is an antidote for pessimism. Focusing on problems without looking for solutions is demolition not construction.

The corporate world, a strong generator of negativity in recent times, needs to become a champion of optimism. Decisions that can affect all the stakeholders of a company, including shareholders, employees, unions and communities, need to be interactively discussed: pessimism often arises when affected people are kept uninformed. Companies that want to re-engineer themselves must be honest and communicate frankly the real reasons for wanting change. So often employees feel they are responsible for a company's shortcomings and this leads to doubts in confidence and fear of losing their jobs. Positive feedback is a means of reducing fear and anxiety. A company's vision must include the positive contributions that all employees can make.

Human beings are wonderful at imagining negatives and miserable at imagining positives. That will not change. What must change is the environment around us. A more positive one will put us in a position of being better able to give the future the benefit of the doubt.

Duplex system in a mild to moderately aggressive environment

Duplex coating systems are nowadays being applied to an increasingly large variety of projects worldwide.

Asset owners, designers and consultants are now becoming more and more aware that Duplex Coating Systems have been shown to have a high reliability (R) factor when compared with paint systems in low, mild and aggressive environments.

Jan van Eijnsbergen (deceased) a world-renowned authority on corrosion first mooted the "Reliability factor" in his book, "Duplex Systems". Jan quoted the following, "An important factor which is not always sufficiently observed is the reliability of coating systems, i.e. the chance that all characteristics of a given coating system are realised in practice.

The reliability factor "*R*" of any coating system can be formulated as the quotient of 100 and the total sum of failures (ΣF):

Coating System	Reliability Factor (*R*)
Hot Dip Galvanizing only	1.0 – 1.2
Zinc Rich Primer on an abrasively blasted substrate to S.A. 2½	1.4 – 0.6
Classical paint system (3 coats) on wire brushed steel surface	0.2 – 0.3
Duplex System (Hot Dip Galvanizing plus and topcoat)	2.0 – 2.4

Reliability factor table.

$$R = \frac{100}{\Sigma F}$$

The factor *F* represents the sum of all possible failures or deviations of a coating or coating system and can be calculated in general terms from the following parameters: form (volume of object); pretreatment of metal surface; choice and composition of coating(s); application techniques;

continued on page 32...

* Select an ISO 12944 compliant system — EN ISO 12944-5:1998

Table A9: Paint systems corrosivity categories C2 to C5-I and C5-M
Substrate: Hot dip galvanized steel

The paint systems given in the following table are only examples. Other paint systems having the same performance are possible.
If these examples are used, it shall be ensured that the paint systems chosen comply with the indicated durability when execution of the paint work takes place as specified. See also 5.7.

Paint System No	Priming coat(s)			Top coat(s) including intermediate coat(s)			Paint system		Expected durability[2)6)] (see 5.5 and ISO 12944-1)														
	Binder[5)]	Number of coats	NDFT [3)µm]	Binder[5)]	Number of coats	NDFT [3)µm]	Number of coats	Total NDFT [3)µm]	C2			C3			C4			C5-I			C5-M		
									L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
S9.01	PVC	–	–	PVC	1	80	1	80															
S9.02		1	40		1	80	2	120															
S9.03		1	80		1	80	2	160															
S9.04		1	80		2	160	3	240															
S9.05	AY	–	–	AY	1	80	1	80															
S9.06		1	40		1	80	2	120															
S9.07		1	80		1	80	2	160															
S9.08		1	80		2	160	3	240															
S9.09	EP or PUR	–	–	EP or PUR[6)]	1	80	1	80															
S9.10		1	40		1	80	2	120															
S9.11		1	80		1	80	2	160															
S9.12		1	80		2	160	3	240															
S9.13		1	80		2-3	240	3-4	320															

Binders for priming coat(s)	Paints (liquid)			Binders for top coat(s)	Paints (liquid)		
	No of components		Water borne possible		No. of components		Water borne possible
	1-pack	2-pack			1-pack	2-pack	
PVC = Polyvinyl chloride	x			PVC = Polyvinyl chloride	x		
AY = Acrylic	x		x	AY = Acrylic	x		x
EP = Epoxy		x	x	EP = Epoxy		x	x
PUR = Polyurethane		x		PUR = Polyurethane	x	x	

FOR FURTHER INFORMATION CONTACT THE ASSOCIATION

Table A.9

climatic factors during application of coating and possible combinations of these parameters before, during and after application.

Duplex systems have been shown to have relatively high *R* values when compared with paint systems (applied on blasted or hand brushed steel surfaces) and with hot dip galvanizing." *See reliability factor table on page 31.*

The use of Duplex Systems is manifold, both for extending the durable life of hot dip galvanized items, and for improved aesthetics in all types of corrosion environments (refer ISO 12944 atmosphere corrosivity categories and typical environments table, also ISO 9223).

Big Ben in London with one of its 100-year-old galvanized and later painted tiles in the foreground.

If at the end of a long period of protection, maintenance painting has to take place, the absence of rust permits maintenance painting without having to rely on dusty abrasive blasting and cleaning procedures (only a weathered zinc alloy remains).

The history of Duplex Systems is difficult to trace in detail, however it is evident that it was used approximately 113 years ago on cast iron roof tiles on London's Big Ben clock. These tiles were Hot Dip Galvanized and later painted and are still in sound condition today *(see left). See also other photos in this article.*

The five basic functions of duplex systems

1) By covering the reactive Zinc surface exposed to aggressive climates such as industrial marine, urban or combinations thereof, the speed of corrosion of the Zinc is drastically reduced because of oxidation attack by the moisture, and attack by a combination of Sulphur and chloride compounds, nitrogen oxides and ammonia are prevented by the organic paint system. (The paint coating supports the hot dip galvanized coating and prevents premature oxidation, on the other hand hot dip galvanized coatings (alloyed to the steel surface) will prevent the formation of rust on the steel).
2) Improvement of the aesthetic appearance of the Hot Dip Galvanizing (eg balconies, staircases, railings, fences, lamps poles, buildings etc).
3) Objects are often required to have contrasting colours in order to enhance visibility for traffic safety roads signs, towers near airports, microwave towers, beacons, light houses, cranes, busses, rolling stock, scaffolding, garden furniture etc).
4) In contrast to (3) it may be necessary to camouflage objects eg. transmission towers, light poles and military installations to make the appearance less obvious and blend in with the environment
5) Duplex Systems can be used to assist when objects require a very long duration of protection because:
   a) Surfaces are inaccessible for coating maintenance. (ie mine shaft structures)
   b) Interruption of plant process is not convenient. (Down time costs)
   c) Contamination of goods and products are inadmissible.

The principal advantages of duplex coatings

Avoidance of under creep rust, thus preventing premature destruction of paint – coating through voluminous rust.

1. Sealing of pores and small damaged areas are sealed by formation of insoluble zinc salts.

Australian Plaza, near the Pacific beach, with purlins and glazing frames protected by a duplex system based on polyurethane.

Hot dip galvanized profiles for transmission towers, spray-painted with an epoxy iron oxide/zinc phosphate paint. Note bare bolt holes kept free of paint in order to ensure full conductivity after erection of towers. For this purpose PVC or rubber caps are used, which are removed after painting.

The polyurethane paint on the hot dip galvanized steps of this staircase has worn off almost completely. However, repainting is made easy and reliable because of the 12-year-old hot dip galvanized steel, itself yielding excellent abrasion resistance.

2. Steel surface is sealed off by the system of zinc – and zinc/iron alloy layers, preventing rust formation at the zinc/paint interface.
3. Provided permanent good adhesion has been realised, the paint film will slowly weather away until the largely intact zinc surface has been exposed.
4. After corrosion of the pure zinc layer the alloy layers offer excellent further protection.
5. When the paint film has weathered away, only surface cleaning is required before a new coating is applied.
6. Excellent edge protection, because of adequate covering of corners, edges, etc. by the zinc and iron/zinc alloy layers.
7. Avoidance of metallic corrosion when steel parts protected by duplex systems, are assembled with parts made of copper, stainless steel, aluminium alloys or parts coated by nobler metals.
8. Because of the synergistic effect optimal and mutual corrosion protection is obtained.
9. Transport and erection damage is minimised on construction sites.

Table A.9 (opposite left), taken from EN ISO 12944, represents some of the generic paint systems that can be successfully used over hot dip galvanized steel for corrosion categories C2 to C5I (industrial) and C5M (marine), in accordance with the expected durability from low (L) to high (H).

The Association wishes to thank Mike Book of Duplex Coatings cc for this article.

Walter's Corner

Corrosion control of threaded articles

The statement that a chain is as strong as its weakest link can be appropriately applied in the case of many corrosion control standards which are in common use. To illustrate, a bolted steel structure is provided with a hot dip galvanized zinc coating with a minimum thickness of 85µm of zinc. The specification calls for "galvanized" bolts so the supplier takes the easy way out and orders so called "electro-galvanized" bolts off the shelf. These zinc electroplated bolts and nuts are in all probability coated with a zinc film of about 6µm compared with a hot dip galvanized structural fastener assembly where coating thickness would be some ten times greater.

Assuming the atmospheric corrosion rate of zinc in the environment where the structure is to be erected is moderately high at 3µm per year, the life of the coating on the structural steel before 5% surface rusting would be about 30 years whereas that of the coating on the fasteners would be approximately two to three years.

This example is by no means hypothetical. In fact one comes across it in practice quite frequently.

Extensive research and experimental work has been undertaken in the past with a view to ensuring that a thicker more durable hot dip galvanized coating can be satisfactorily applied to bolts, nuts and other fastening devices without in anyway reducing the mechanical properties required from bolted connections.

Contrary to the view sometimes expressed, the hot dip galvanizing process, if correctly applied, will not cause hydrogen embrittlement of high strength fasteners, neither does the increase in tolerance between bolt and nut thread, which is required to accommodate the thicker zinc coating, adversely reduce the tensioning properties of the bolt and nut assemblies. This is provided that the over sizing of nut or undercutting of bolt threads is undertaken in accordance with the approved standard.

Hot dip galvanizing of threaded components is somewhat specialised requiring not only specialised equipment but also the necessary experience and expertise on the part of galvanizing personnel.

The majority of threaded articles are subjected to a centrifuging operation when withdrawn from the molten zinc. This is to remove excess zinc from threaded surfaces.

Centrifuging is perhaps the main difference between general galvanizing and the more specialised coating of bolts and nuts. If it is not performed by experienced personnel using efficient centrifuging equipment, the results obtained can be unsatisfactory to say the least, with clogged threads which render correct assembly of bolts and nuts to be difficult or even impossible.

In the case of lengthy components such as stay rods or threaded round bar, items are passed through an air ring or the threads are wire brushed after withdrawal from the molten zinc and prior to the coating solidifying.

Tensioning of hot dip galvanized assemblies is best achieved by lubricating threads prior to assembly. This is to avoid gauling of the relatively thick zinc coating prior to the required tension being achieved. The easiest and most reliable method of precision tensioning (e.g. with high strength assemblies) is the turn of the nut method. This is achieved by first tensioning either by hand or with a torque wrench which is set to the snug tight position, then followed by a final half or three quarter turn of the nut whichever is specified. The results of the turn of the nut tensioning method are both accurate and consistent.

The initial cost of hot dip galvanizing bolts, nuts and washers is for obvious reasons more than that for zinc electroplating. On the other hand, if one considers the cost effective life of hot dip galvanizing in most environments, it is substantially lower in cost than the normal electroplated zinc coating.

Unfortunately many suppliers will always take the easy way out by securing the cheapest product readily available off the shelf rather than the most suitable one which perhaps requires more effort to secure. In order to avoid ambiguity it is also important for specifiers to state what is required in precise terminology.

One of the best examples of the successful use of hot dip galvanized fasteners is the Eskom electrical transmission tower. Many thousands of these structures are spread-eagled throughout the countryside all assembled and held together with hot dip galvanized bolts, nuts and washers. This is one of the reasons why Eskom's budgeted maintenance free life span of 50 years for these structures is invariably achieved and frequently surpassed.

For more detailed information concerning corrosion control of fastener assemblies, Association personnel will be very pleased to discuss with you your specific problems or requirements.

Sweep blasting to prepare hot dip galvanizing for paint is a great way of achieving paint adhesion but follow the rules...

As part of the Association's effort to educate and improve the frequent ineffective communication between the end client and the galvanizer, often via a number of contracting parties, the specifiers finish expectations and the manufacturers and galvanizer's commitment to the quality of the final product, etc. we include for your reading, this coating report by the Association.

For obvious reasons names of all parties have been withheld but the article might prove invaluable to others in order to avoid similar situations in future.

Report

The Hot Dip Galvanizers Association was requested to comment on the compliance of the hot dip galvanized coating in accordance with SANS 121 after the components were sweep blasted prior to painting. The coating inspection was carried out at the paint company and then again at the galvanizers. I report as follows:

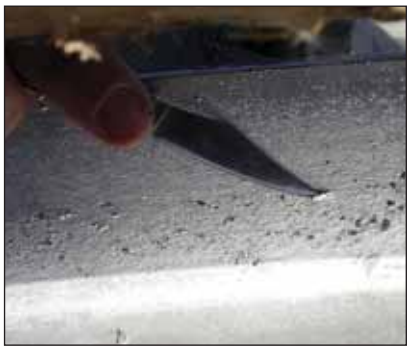
The specification required that the frames be hot dip galvanized to SANS 121 and then sweep blasted in preparation for a subsequent paint system. HDGASA has a Code of Practice for Surface Preparation and Application of Organic Coatings – HDGASA 1990-01.

Conveyor frames after sweep blasting at the paint company.

Conveyor frames as hot dip galvanized at the galvanizers.

This code of practice strictly addresses the parameters of correct sweep blasting, including: that equipment and air supply be free of oil and moisture;

continued on page 36...



Steel surface defects that occur as a result of steel particles being picked up during the rolling process. When the components are prepared by abrasive blasting prior to painting, inclusions such as these are generally removed. The surface defects will not have a detrimental effect on the corrosion resistance of the hot dip galvanized coating.

Sweep blasting at the correct blast pressure will normally remove a maximum of about 10 to 20 µm of the coating, judging by the residual coating thickness measured adjacent to the coating damage after sweep blasting, coating removal has been exceeded and in many areas, the coating has been damaged leaving a thin iron/zinc alloy layer of 24 to 35µm.

nozzle pressure be not greater than 300kPa[#1]; nozzle angle to the surface being cleaned – 30º- 60º; sweeping distance 450 - 600mm; abrasive– ultrafine non-metallic grit – not less than 0.2mm and not greater than 0.8mm; grit should not be recycled[#2]; the blasted zinc surface must be free from all contaminants including oil and dust.

#1 *Nozzle blast pressure of below 300kPa is of extreme importance, especially when thick hot dip galvanized coatings are encountered. A thick hot dip galvanized coating is normally due to the reactivity of the steel when immersed in molten zinc and is caused mainly by the element silicon in the steel. The resultant thicker coating is normally devoid of the soft outer zinc (eta) layer and made up largely of iron/zinc alloys, which can be susceptible to mechanical damage, particularly on edges of the steel, noticeably seen after the components have been inappropriately handled during loading and transport. Conversely, the soft zinc or eta layer when correctly sweep blasted is easily fluffed up to provide a surface profile for subsequent painting. The soft zinc layer is also more forgiving when sweep blasting is done at excessive blast pressures.*

In order to ensure that correct sweep blasting is carried out, a needle valve indicating blast pressure, can be inserted through the blasting hose within easy visual distance of the operator.

#2 *Although the recycling of micro-grit is not recommended in the Code of Practice, an article appeared in Hot Dip Galvanizing Today No. 27, which discusses the successful recycling of the grit when sweep blasting.*

Coating thickness (µm)

Coating thickness readings taken at the galvanizer measured far in excess of that required by SANS 121, which requires that for steel thickness equal to and greater than 6mm the local coating thickness be a minimum of 70µm with a mean of at least 85µm. SANS 121 does not have a upper limit in prescribing the coating thickness. *See 4 photos top left.*

Other comments

The photos on the opposite page show the surface profile of the steel as a result of acceptable roll wear as commented by the steel producer *(top)* and the consequent appearance of the coating after hot dip galvanizing

(middle). As can be seen the surface profile on the uncoated steel has resulted in striations in the hot dip galvanized coating. The coating is very much intact and above the coating thickness requirements of the specification.

Conclusion and recommendations:

The coating of many of the hot dip galvanized components has, due to excessive sweep blasting been damaged.

It is recommended that they be identified and sent back to the galvanizer for stripping and re-galvanizing.

Terry Smith

The surface profile of the black steel has resulted in striations in the hot dip galvanized coating – see photo below.

General view of the damaged hot dip galvanized coating on the web of the structural section.

MISCONCEPTIONS

Miss Conception puts it "straight"

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

Sweep blasting of hot dip galvanized surfaces prior to painting should be avoided as this invariably results in delamination of the zinc coating from the underlying steel surface. Sweep blasting also removes a portion of the valuable zinc coating.

True or false?

Duplex corrosion control is the term used to describe the undoubted synergistic benefits obtained from the application of an organic coating onto a hot dip galvanized surface thus combining the protective properties of both coating systems.

For a duplex coating to be successful not only must the outer organic or paint film be suitable for the specific application or environment, but long term adhesion between the outer coating and the underlying metal zinc coating is essential. For this to be achieved, the zinc surface is required to be clean and free from chemically contaminating substances.

Mechanical cleaning by extremely light abrasive blasting of galvanized surfaces has proved to provide the best and most consistent results. Not only does this sweep blasting process provide a thoroughly clean surface, but it also provides a slightly roughened matt surface finish which also enhances coating adhesion.

Provided that the correct blast medium and nozzle pressures are used, shattering or excess removal of the zinc coating will not occur. Where failures have been experienced, the cause has been excessive blasting pressures and / or the use of incorrect blasting material. Incredible as it may seem, there have been instances where hot dip galvanized surfaces required to be sweep blasted have in fact been subjected to the equivalent of the SA 2½ standard as specified for the preparation of steel surfaces. Plainly, this will shatter and remove the hot dip galvanized coating.

The quantity of zinc coating removed by sweep blasting is not significant. To illustrate, in the case of a hot dip galvanized coating of about 60µm in thickness, zinc removed is unlikely to exceed 4 to 6 µm. In fact, if one were to measure the coating thickness both prior to and subsequent to blasting, it will appear to have increased in thickness, due to the surface roughening effect of the blasting process.

For obvious reasons, sweep blasting cannot be applied to extremely thin coatings such as those produced by zinc electroplating or continuously hot dip galvanized sheeting.

Detailed information concerning recommended blasting material and blasting pressures can be provided by the Association. Enquiries from readers for further information will be most welcome.

Mentex Expanded Metal goes 'green' with LVG Plants

The versatility of expanded metal has been underscored by a novel application of the material at LVG Plants of Johannesburg. Director Geert van Geest has used Mentex Expanded Metal, together with steel tubing and lip channels, to manufacture custom-designed tables for pot plants for use in their greenhouse.

Established in 1986, LVG Plants is a six-hectare operation, and supplies pot plants to both the local and international markets, including Europe and Dubai. "To date we have purchased two batches of expanded metal from local manufacturer Andrew Mentis. It is a very good, high-quality material. This is probably an unusual application of the product, but it is perfectly suited to our specific needs," Van Geest says.

Elaine van Rooyen, marketing manager at Andrew Mentis, says this application of expanded metal at LVG Plants demonstrates the versatility of the product. The diamond-shaped openings facilitate the fixing of the permanent irrigation system to the tables, and also allows for the free passage of air and light, as well as the run-off of excess water during irrigation.

"Mentex Expanded Metal is often used in unusual applications, and it is ideally suited to the operational requirement at LVG Plants where the potted plants stand directly on the expanded metal," van Rooyen says.

Expanded metal is manufactured in a process whereby a solid sheet of metal is slit and expanded into a network of diamond-shaped mesh. This diamond truss pattern adds to the overall structural integrity of the sheet. The free passage of air, light and water is also facilitated. This, according to Van Geest, it what makes the product particularly suited for these pot-plant tables.

Expanded metal from Andrew Mentis is usually manufactured from high-quality local mild steel, but can be produced from any ductile metal to meet individual application requirements. The product is generally supplied in its raw state, but lends itself easily to any normal finishing procedures such as painting, stove enamelling, plating and hot dip galvanizing.

A view of the pot-plant stands manufactured from expanded metal supplied by Andrew Mentis.

Available in a comprehensive range of sizes, mass and thickness, Flatex and Mentex general-purpose expanded metal can be fabricated in any form by the customer. The expanded metal can be bent, shaped to radii, angled or notched, while maintaining its inherent rigidity. It is also available in various mesh sizes, from mini-meshes with small openings, to larger meshes with 150 mm x 300 mm openings. Heavy walkway meshes are also available in a variety of opening sizes.

Typical applications for expanded metal include screens, grates, shelving, racks, protection guards, internal partitioning, burglar proofing, fencing, reinforcement, walkways, platforms and stairs, beds, garden furniture, filters, dividers, scaffolding, truck bodies, tunnel and shaft linings and grain silos, to name but a few.

Genuine white rust

According to the definition, white rust is defined as a white powder formed on galvanized steel. It is occasionally found in large volumes every 25 years provided certain moist conditions prevail.

The Association would like to thank Altus Feenstra of Robor Galvanizers for this snippet.

Cathodic protection

Cathodic protection is an electrochemical technique for preventing corrosion of a metal exposed to an electrolyte. The process involves the application of DC electrical current to the metal surface from an external source. By forcing the metal surface to accept current from the environment, the underground/submerged metal becomes a cathode and protection occurs. The external source can use outside AC power through a rectifier and groundbed or by attaching sacrificial metals such as magnesium or aluminium to the structure to be protected. It is used extensively in preventing corrosion to underground and submerged steel structures; such as pipelines, production well casings, and tanks.

Pipelines sharing a right of way with power lines may be subject to electrical interference because of inductive and conductive effects. Magnetic induction (coupling) acts along the entire length of a pipeline which is approximately parallel to the power line and can cause significant pipeline potentials even at relatively large separation distances. Conductive interference due to currents in the soil is of particular concern where the pipeline is close to transmission line structures that may inject large currents into the soil during power line fault conditions. Such structures include transmission line tower or pole foundations, transmission line earths and substation grounding systems. The effects of power system interference on pipelines are due to the voltage difference between the pipeline metal and the soil.

In terms of safety for personnel and the public, a potential life threatening hazard may arise when someone comes into contact with an exposed part of the pipeline, for example at a Cathodic Protection (CP) test point (TP). This may occur, when the soil is at a significantly different potential to that of the pipeline. Power line and pipeline interference can also damage the pipeline and its coating system. Excessive coating stress voltages can degrade and/or puncture the coating. In very extreme cases, under severe soil potential rises, the pipeline wall, may become damaged.

Power line and pipeline interference can damage the pipeline and its coating. Excessive coating stress voltages (the difference between the pipe steel potential and the local soil potential) can degrade or puncture the coating. In the case of an extreme soil potential rise, the pipeline wall itself can be damaged or punctured.

Gerald Haynes of CTC, a professional member of the Association is an authority on cathodic protection.

FEATURES 2007

NOVEMBER/DECEMBER

Mining and quarries; gratings; overland conveyors; fasteners; architectural hot dip galvanizing.

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Personality Profile

George Elphick, to date...

George Elphick was born in Harrismith, Freestate and moved to Durban as a child. This Glenwood Old Boy enrolled at UKZN, for his B Arch. After his third year, he left the country to work in the UK. This stint was followed by a working holiday in Europe and the USA. He explains: "At Varsity you learn about the history of Architecture – literature of great examples of Architecture of which nothing is accessible! The most accessible example for a South African student at the time was probably the Nguni hut! I am therefore a firm believer that architects should travel. They should see the buildings they learn about."

George returned to South Africa to complete his studies at UKZN, where in his final year, this whiz kid, was awarded two scholarships; The Emma Smith Art Scholarship and the Geoffrey le Sueur Scholarship. George spent the second half of 1983 in France, Japan and the USA doing his dissertation on "Transformations in Modernism", which was a fulfillment of his obligation to both scholarships. Spending time in Japan in particular, made a great impression on the young George in terms of how societies function and interact in confined livings spaces, which is synonymous with the East. He also developed a fixation and great admiration for traditional Japanese architecture.

George returned to South Africa to complete his compulsory two years in National Service, the second year of which was spent doing Architecture! He smiles at the recall:" I designed a chapel in Lohatla, which was an Army war-game camp. It was actually quite fun!" George married Karin (a qualified pharmacist who now runs a natural healing centre from their home) and the couple moved back to the East Coast, where George worked for two years at JMA, working his way up to Associate.

He left the company to fly solo and in 1987 was joined by Nick Proome, an old varsity friend. The union saw the birth of the multi-award winning practice Elphick Proome Architects (EPA). Every success story has humble beginnings and this was no exception - initial office space was a bedroom in a house which housed another firm and for some time, five people "elbowed" their way around each other in the confined space. George reminisces:" Those were the days when there were no faxes, quotes were typed on a typewriter and it took ten days to receive the minutes of meetings by mail."

Stuck for space in the early 90's the company moved into offices in Ridge Rd. Early commissions included industrial buildings and housing complexes. With an ever expanding practice and a growing staff compliment of 25, the company moved into their own building in Mayville. Project highlights during this phase include the Lesotho Postal Office Building in Maseru. During this time the company also scooped Architectural Awards of Merit from the S.A.I.A. for Industrial work done in Springfield Park (Action Bolt Head Quarters) and for George's Westville Residence. The residential award was a highlight for the company because it was the first time a residential project in KZN had been awarded this honour. The practice was not the only burgeoning thing in George's life - the early 1990's saw the award winning home fill with three beautiful Elphick children (2 girls and a boy).

Towards the end of the millennium, commissions of apartment blocks and office buildings forced the growing practice, now employing 40 people, to Umhlanga Ridge. At this point, in George's own words, "the practice exploded". Highlights at the time include; The Absa Regional Head Office, Swaziland International Trade Fair Building, a hotel in the Seychelles, projects in Luanda as well as countless developments in Umhlanga Ridge, Westway Office Park and the Kwamakutha Library.

In 2006 the practice, bulging at the seams with 60 employees and four directors moved into their own building in Westville. The company "had arrived", establishing itself as one of the leading national architectural firms. High profile commissions continue to pour in, amongst them several developments on the renowned Point Waterfront, including the highest skyscraper built in Durban in 15 years! The company was also responsible for the new Standard Bank Regional Head Office opposite Kingsmead Cricket Oval and a Signature Development on the Vaal.

One of the trademarks of an EPA building is the extensive use of steel. Naturally Hot Dip Galvanizing comes with the territory. At EPA, steel is not concealed, but rather revealed for its natural beauty and protected appropriately to the environment.

George is "not big on role-models", but concedes that he has great admiration on a residential scale for the work of Alberto Karrach (South America), Paktau Architects (Canada), Rick Joy (USA) and Glen Murcutt (Australia) – needless to say, virtually

all of them make extensive use of steel. On a larger scale influences include Denton Corker Marshall (Australia) and Richard Rogers (UK).

When prompted about faux Tuscan, Cape Cod and Floridian styled developments we see springing up all over the countryside, George has the following to say; "Buildings need to represent the values of society. The problem with 'styles' is that it tries to 'box' buildings into categories so that non-architects can understand how they fit into their realm of understanding environment. Architecture needs to be innovative, responsive and should serve the people that inhabit its spaces. It should reflect the societal values of the era and respond to the climatic situation and context. It should not mimic buildings from "somewhere else", but rather "make sense" for where it is." George is particularly excited about brave publications that showcase truly South African design and architecture and singles out Visi Magazine as his favourite.

About living in South Africa, here and now, George has the following to say; "I am excited about living in this country and amazed at the radical transformation of the South African society in little over a decade. South Africans are spoilt. We take benefits such as the great climate and ample space for granted. It is things one only realises when one has spent time and lived in places such as Japan and Europe."

George is passionate about the environment and feels strongly about our responsibility towards the planet. He believes that humans need to respect energy and the earth infinitely more than they have - in all aspects of living; the heating and cooling of buildings, the clothes they wear and the vehicles they drive. He predicts that Climate Change will affect and challenge South African Architects more in future. "There needs to respectful use of energy and a move back to basic principles such as natural ventilation."

Besides running a successful practice and raising a family, George enjoys music. This former Rock band member says music has played a pivotal role in his life and continues to inspire him, which is evident from the majestic sound system in his Westville studio. The family Elphick list travelling as one of their favourite activities. This usually involves mom and kids going off shopping whilst George admires and explores architecture and building techniques of yesteryear. On the cards this year is exploring Africa, in particular Tanzania and Zanzibar and spending time in the Bush. Wishing them well on their travels!

The Association wishes to thank Desere Strydom for this profile.

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