2011 Volume 8 Issue 2

HOT DIP GALVANIZING TODAY

HOT DIP GALVANIZERS ASSOCIATION Southern Africa

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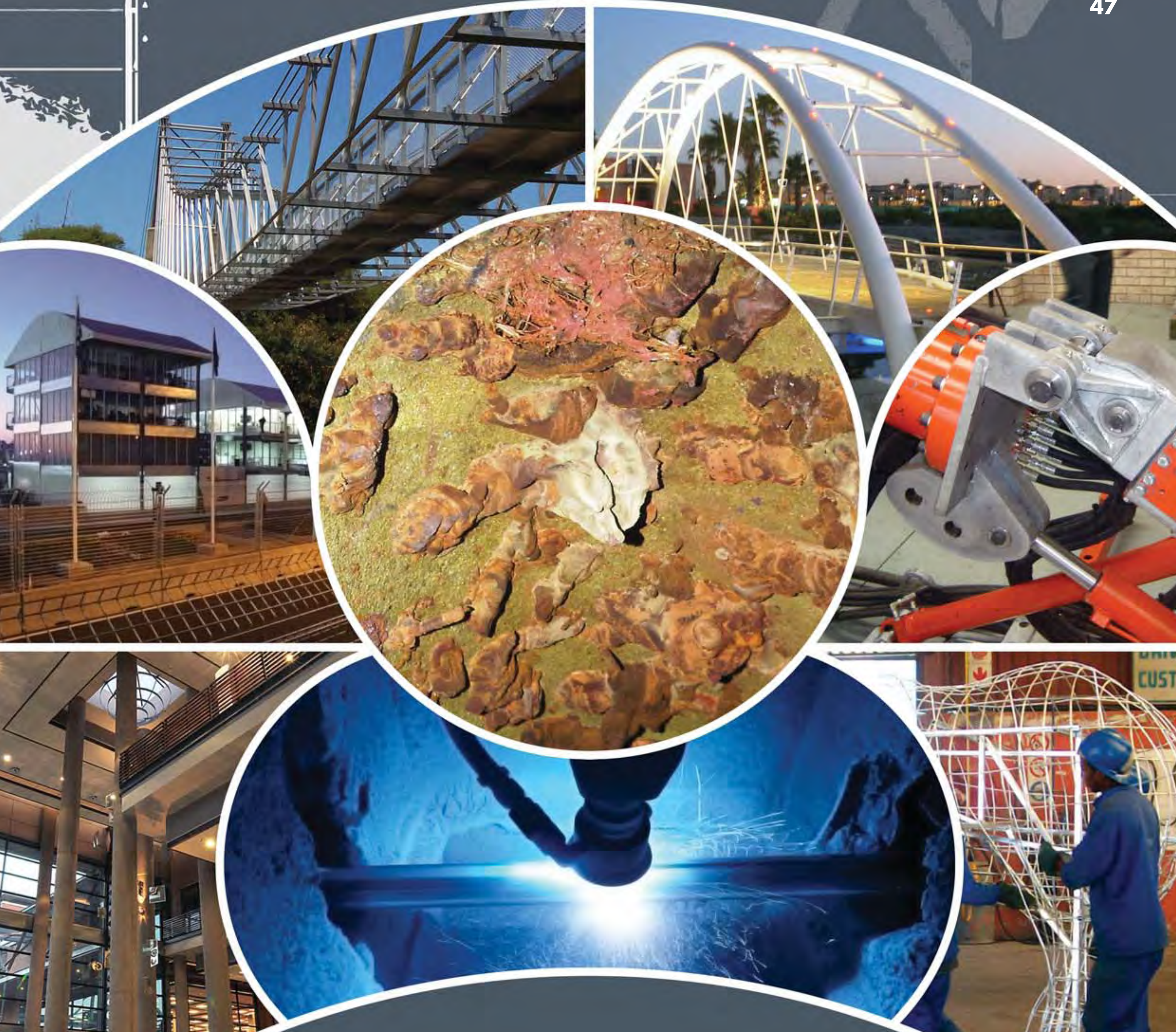

The Hot Dip Galvanizers Association is proud to announce that the

HOT DIP GALVANIZING AWARDS EVENT

will take place at Montecasino in Johannesburg in August

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HOT DIP GALVANIZING TODAY

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Front Cover: *A kaleidoscope of past Awards Entries including in the centre a tube which has been attacked by Microbial Influenced Corrosion (MIC) and more specifically Sulphate Reducing Bacteria (SRB).*

Hot Dip Galvanizing – Adding value to Steel

Executive Director's Comment

Hot dip galvanizing of fasteners under review

The local practice of the hot dip galvanizing of nuts and bolts is under review, as the industry currently aims to adhere more strictly to specifications set out by the International Organisation for Standardisation (ISO).

Current standard practise, which is to continue, when hot dip galvanizing grades 4.8 and 8.8 fasteners, is to apply South African National Standard, SANS 121 (ISO 1461: 2009) specifications and test methods .

The current applicable specification for fasteners beyond a tensile level of 1000 MPa, as with grade 10.9 friction grip fasteners, hot dip galvanizing is undertaken in terms of SANS 10094 Annex B Edition 4.1.

During 2010 South African Bureau of Standards (SABS) circulated a draft proposal that aims to adopt the EN/ISO 14399, parts 1 to 10 specification as a replacement for all high tensile fasteners exceeding a tensile limit of more than 1000MPa. This new SANS/EN 14399, part 1 to 10 is currently awaiting adoption and official implementation within the fastener industry.

SANS 14399 consists of ten parts for high-strength structural bolt and nut assemblies and are highly detailed and include greater controls and test procedures.

The effect of the proposed specifications on the hot dip galvanizing of high-tensile fasteners (greater than 1000MPa) will be the replacement of SANS 10094 with SANS/ISO 10684 entitled 'Fasteners – Hot dip galvanized coatings'.

Concerns with regards current practice, suggesting that pickling (cleaning) of fasteners, prior to galvanizing, in hydrochloric acid should be eliminated to safeguard against any possibility of hydrogen embrittlement. SANS/ISO 10684 allows for both limited acid pickling as well as mechanical cleaning. Planned local practices are aimed at the elimination of acid pickling all together and only accept mechanical cleaning. This practice will ensure the total elimination of any potential for hydrogen embrittlement.

Without waiting for the final adoption by SABS of SANS/ISO 10684 specification, moves are already in place to implement the replacement of acid pickling with that of mechanical cleaning.

Bob Wilmot

Note from the Editor

When considering specifying hot dip galvanizing an important standard to refer to is the extremely useful and updated **SANS 14713:2011**, Part 1: General principles of design and corrosion resistance and part 2: Hot dip galvanizing. Part 3: Expands on sherardizing. The standard has just been released from the SABS and is a useful standard to add to any reputable specifier's library.

The first feature for this issue includes **Tubes and Pipes**, here due to some suppliers stocking thin zinc coated tubes which may be incorrectly used for hand railings that are potentially exposed to aggressive environments, **we again emphasise the need for correct specifications!**

Should a specification state only the word "Galvanizing" or even "Hot Dip Galvanizing" without the addition of a SANS, ISO or EN standard, there are huge possibilities that when available other zinc coatings, including continuously hot dip galvanized components such as purlins or zinc electroplated, "Electrogalvanized" fasteners may be provided, when in fact general hot dip galvanizing according to SANS 121 (ISO 1461) is in fact what is preferred.

Both of these coating systems when used appropriately, ie. in non-aggressive environments, have their place.

Subsequent features include **Masts and Poles** where we include a case history on some lighting masts exposed to the marine and industrial environment of Richards Bay and **Water Storage** using the hot dip galvanized panel type water storage tank system.

We again discuss **zinc metal spraying** as an alternative to hot dip galvanizing and successful coating repair material.

In the **Duplex article**, Iain Dodds of Cape Galvanising, discusses various issues concerning the duplex coating system, including premature failures, correct preparation, coating guarantees and comparable costs of the system and asks the question on many a specifiers lips, *"Why spend the extra money on a duplex coating system?"*

We include a **Coating Report** by Riaan Louw of Robor Galvanizers when a complaint came in regarding a premature failure of hot dip galvanized piping used for water conveyance.

The **Case History** includes a utility gantry that has been exposed to marine conditions of Simonstown for 20 odd years.

Education and Training again includes our new 3-day Galvanizers Inspectors Course, which replaced the previous 2-day course. A single day more practical course for those with limited formal education and if applicable a pre-qualifier for the 3-Day course, has also been introduced.

Other regulars include **"On the couch"** where we interview **Nick Proome** the other original partner in Elphick Proome and in **"Bob's BANTER"**, Bob discusses "*Problem solving means reaching destinations, not just reading signposts*".

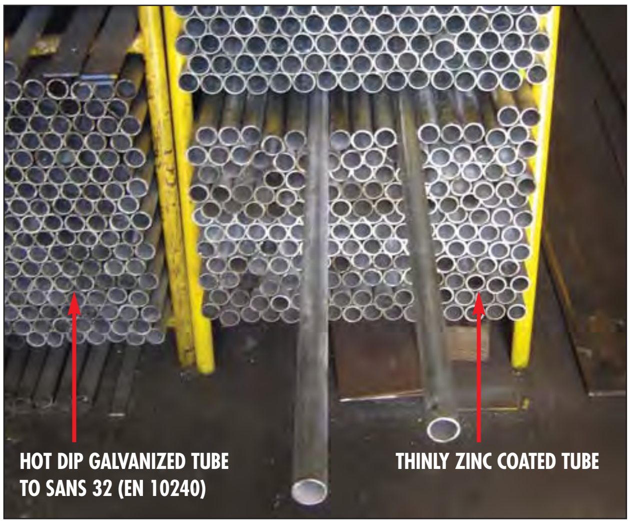
Process chemical supplier, Surtec, discusses their environmentally friendly "Quench additive" and in **Members News** Transvaal Galvanizers tells us of their existing plant and their future plans.

Should a reader wish to express an opinion or provide us with an article, or comment on our articles, kindly contact us –

Enjoy the "magazinc".

Terry Smith

Ensure that the specification is correct when requiring general hot dip galvanized products!



Hot dip galvanized tube to SANS 32 (EN 10240) and thinly zinc coated tube.

Hot dip galvanized stanchions to SANS 121 (ISO 1461).

The Hot Dip Galvanizers Association was requested to investigate some thinly zinc coated tube that was supposed to have been general or tube hot dip galvanized. Reported by Terry Smith:

Thinly zinc coated tubing

Based on the coating thickness readings taken both inside and outside of the tubes, it is apparent that the tubes in question have been manufactured from zinc electroplated sheet. The sheeting may not necessarily have been manufactured in South Africa and the specification may be different to the range manufactured locally. However, the following provides an example of this type of coating and its nominal coating thickness.

Produced by ArcelorMittal in South Africa zinc electro-galvanized steel sheet consists of a cold rolled steel substrate over coated with zinc by electrolytic deposition on a continuous line. Electro-galvanizing allows greater control in coating thickness while also permitting two different coating

continued on page 4...




Clockwise from top left shows the outer upper coating thickness (22.3µm), the outer lower coating thickness (13.9µm), the inner lower coating thickness (4.9µm) and the inner upper coating thickness (10.1µm).

Photo above shows the discoloration on both the tube ends and electrical resistance welded area on the inner weld bead. The zinc coating has the ability to protect steel both from a barrier perspective and sacrificially in preference to mild steel, however, the life of the zinc coating for both these benefits will be based on its thickness and the environment that it will be exposed to. *See typical zinc coating loss in terms of the environment in Table 2.*

thicknesses on either face of the sheet. A range of coating thicknesses is offered with the maximum coating thickness being equivalent to a Z100 (7.14µm nominal coating thickness) continuous hot dip galvanized sheet.

Bonding of the coating is purely mechanical and therefore there are no iron / zinc alloy layers.

Table 1 of zinc coatings is taken from the data sheet. While it is difficult to ascertain the exact coating designation in this instance, accurate results will only be achieved if samples of the tube are subjected to a Chemical Stripping (Gravimetric) Test to ISO 1460.

Hot dip galvanized tube

Tubes in this instance are hot dip galvanized in a semi-automatic production line. Should smoothness of the exterior face not be critical and additional coating thickness is required, the tubes can be hot dip galvanized to SANS 121 (ISO 1461).

Immediately after withdrawal from the zinc bath in the tube hot dip galvanizing

Photos above from left to right show the hot dip galvanized coating thickness to SANS 32 (EN 10240) (91.8; 93.8 and 71.0µm respectively) on the lower batch of tube in comparison.

process, excess zinc is mechanically wiped off externally by passing the tube through an appropriately sized air ring and internally by a blast of heated steam and / or mechanical mandrill passing down the centre of the tube.

In order that tube be hot dip galvanized in this manner, it must be flangeless and not greater than diameter 200mm and 9.4m or less in length.

Tube hot dip galvanizing in South Africa is done in accordance with SANS 32 (EN 10240), where generally the minimum coating thickness is 55µm.

The coating of tubes by this method comprises of a series of iron/zinc alloys outwards from the steel base, which is generally generously over coated with a layer of pure zinc.

Hot dip galvanized stanchions

Pre-cleaned components hanging from a jig are dipped into a bath of molten zinc at about 450°C.

A metallurgical or chemical reaction between the steel and zinc results in a coating comprising a series of iron/zinc alloys which are generally over coated with a layer of pure zinc.

continued on page 6…

Photos above show the hot dip galvanized coating thickness on the stanchions (59.2 and 74.6µm). This is normal as per the requirement of SANS 121 (ISO 1461).

A number of things influence the coating thickness and appearance, with the chemical composition of the steel as in silicon and phosphorus playing the major role. Steel thickness and surface roughness also have a major influence.

SANS 121:2011, requires that for steel greater than 3mm thick but equal to or less than 6mm shall have a minimum local coating thickness of 55µm but a minimum mean coating thickness of 70µm.

Coating designation	Description	Nominal coating thickness per side	Nominal coating mass per unit area per side (g/m²)	Minimum coating mass per unit area per side (g/m²)
ZE 25 / 25	Normal coating	2.5 / 2.5	18 / 18	12 / 12
ZE 50 / 50	Heavy coating	5.0 / 5.0	36 / 36	28 / 28
ZE 75 / 75		7.5 / 7.5	54 / 54	47 / 47
ZE 50 / 0	One-sided coating	5.0 / 0.0	36 / 0	28 / 0
ZE 75 / 0		7.5 / 0.0	54 / 0	47 / 0
ZE 100 / 0		10.0 / 0.0	72 / 0	65 / 0

Table 1.

Conclusion and recommendation

As hot dip galvanizing is known for its corrosion control properties and if appropriately used will provide a reasonably long service life. Coating life of any metallic zinc coating is proportional to its thickness in a given environment. It stands to reason therefore that the thicker the coating the longer the service life.

It is therefore recommended that (in this instance) the thinly zinc coated tubes be replaced with hot dip galvanized equivalents or alternatively stripped of zinc and re-galvanized to SANS 121 (ISO 1461).

Table 2 will give you an indication of the zinc coating loss for a certain environment and is based on Table 5 taken from ISO 9223, Corrosion of metals and alloys – Corrosivity of atmospheres – Classification.

In Cape Town the vicinity of the V&A Waterfront area off Table Bay falls into a C3/C4 atmosphere, whereas from Glencairn to the west of Somerset West off the False Bay coastline up to 3km from the sea is a generous C5 atmosphere.

1	2	3	4	5	6	7
				Maintenance free life of the coating		
Corrosion category	Description of environment	Corrosion rate (av. loss of steel in μm/yr.)	Corrosion rate (ave. loss of zinc in μm/yr.)	Continuously hot dip galvanized sheeting Coating class – Z275 ($\pm 20\mu$m)	Hot dip galvanized coating (85μm) Steel thickness ≥6mm	DUPLEX COATING SYSTEM Hot dip galvanizing + an appropriate paint system
C1	Interior: Dry	≤1.3	≤0.1	>50	>50 #1	Not required for corrosion protection #2
C2	Interior: Occasional condensation Exterior: Exposed rural inland	>1.3 to 25	0.1 to 0.7	>40	>50 #1	
C3	Interior: High humidity, some air pollution Exterior: Urban inland or mild coastal	>25 to 50	0.7 to 2.1	10 to 40	>40	
C4	Interior: Swimming pools, chemical plant, etc. Exterior: Industrial inland or urban coastal	>50 to 80	2.1 to 4.2	5 to 10	20 to 40	Total coating life of a duplex coating system is the combined sum of the lives of the HDG plus Paint coating system x at least 50%
C5-I / C5-M	Exterior: Industrial with high humidity or high salinity coastal	>80 to 200	4.2 to 8.4	2 to 5	10 to 20	

#1 Although mathematically incorrect (coating thickness divided by the corrosion rate), the maintenance free life indicated in column 6 has for practical purposes been curtailed to a maximum of 50 years.
General hot dip galvanizing specifications state the local (minimum) and the mean coating thicknesses. The coating thickness actually achieved, varies with the steel composition and this can range from the minimum to at least 50% greater.
As life expectancy predictions are normally based on the minimum coating thickness, they are usually conservative.

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

Table 2.

Hot dip galvanized mild steel sleeved high rise masts

Central Sports Complex, City of Umhlathuze (Richards Bay)

Photo 1.

Photo 2.

Photo 3.

Photo 4.

The Hot Dip Galvanizers Association was requested by Terry Chrystal of nDawonye Networks Consulting Engineers to inspect the hot dip galvanized coating on certain lighting masts that had been exposed to the environment in Richards Bay for varying periods of up to 16 years.

Accompanied by Sean Roberts of Bay Galvanizers and yourself, the residual hot dip galvanized coating thickness was measured in a number of places using a calibrated Elcometer 456 coating thickness instrument.

The inspection was carried out on Tuesday 12 October 2010 and apart from one or two areas that required coating repair, generally the hot dip galvanized coating was in excellent condition. Reported by Terry Smith:

Photo 1 shows the typical sleeved lighting mast, *photo* 2 the holding down bolt configuration (some with mastic coating for additional protection) and *photo* 3 some with a stainless steel nut coupled to a zinc electroplated holding down bolt.

Apart from mild discolouration on the zinc electroplated bolt, there was no dissimilar metal effects between the stainless and washer or hot dip galvanized base plate. Re-applying a

continued on page 8...

Photo 5.

Photo 6.

Photo 7.

Photo 8.

Photo 9.

Photo 10.

Photo 11.

Photo 12.

Photo 13.

Photo 14.

Photo 15.

Photo 16.

Photo 17.

Photo 18.

Photo 19.

Photo 20.

Photo 21.

mastic coating over the two metals would alleviate any future corrosion effects.

The white deposit seen on the base of the mast was the residual dye penetrant testing that had been used after 15 years of exposure to test the integrity of the welds.

Coating repairs

Some of the lighting masts had been altered and welded and required coating repair (*photo* 4).

Residual coating thickness general

Residual coating thickness was still in excess of that required by SANS 121 for the different material thicknesses. (*See photos* 5 *to* 21 *respectively* – 135µm; 167µm; 149µm; 151µm; 188µm; 149µm; 148µm; 141µm; 140µm; 129µm *- on a channel bracket; on stiffener plates -* 73.1µm; 96.3µm; 164µm *and* 137µm; 140µm; 96.9µm *and* 102µm.)

Coating inside the mast similar to the outside (as to be expected)

While no residual coating thickness inside the mast was recorded in *photos* 22 *and* 23, it was measured to be similar to the coating on the outside. No deterioration of the hot dip galvanized coating could be seen.

Residual coating thickness on mast pieces laying on the ground with heavy discolouration on one face (from Foskor):

The discolouration was removed in a number of areas and the residual coating

continued on page 10...


Photo 22.


Photo 23.


Photo 24.


Photo 25.

Photo 26.

Photo 27.

Photo 28.

Photo 29.

Photo 30.

INSPECTION OF HOT DIP GALVANIZED LIGHTING MAST SECTIONS					
Coating Thickness Instrument			Calibrated Elcometer 345		
Mast number	Position	Reading 1 (µm)	Reading 2 (µm)	Reading 3 (µm)	Reading 4 (µm)
H4 – Bottom section (standing stump) approx. 14 years old	Inside	182	214	205	219
	Gusset	180	169	182	
	Exterior	180	211	188	
	Shiny end	168	161	200	
	Inside	217	220		
H2 – Bottom section	Inside (through hatch)	203	166		
	outside	133	152	165	
	Foskor side	122	140	140	
Hockey SEOutside	276	248	432		
	Base plate	194			
Fallen pieces (from H4) – one of the tallest masts. Approx.16 years old	Above stump	160			
	Foskor facing	38	55	69	
	Inside stump end	187	178		
	Inside gen.	159	164	157	100
	Lamp arm	Failed			
	Base section	Outside	87	87	
	Centre section	Outside	97		
	Top section	Outside	65 Glossy		
		Inside	96		

Table 1.

TABLE 1. MINIMUM COATING THICKNESS ON ARTICLES THAT ARE NOT CENRIFUGED – SANS 121:1999 (ISO 1461)		
Profiles	Local coating thickness min. µm*	Mean coating thickness, min. µm*
Steel ≥ 6mm	70	85
Steel ≥ 3mm to < 6mm	55	70
Steel ≥ 1.5mm to < 3mm	45	55
Steel < 1.5mm	35	45
TABLE 2. MINIMUM COATING THICKNESS ON ARTICLES THAT ARE CENTRIFUGED TO SANS 121:1999 (ISO 1461)		
Diameter of the article	Local coating thickness min, um*	Mean coating thickness min, um*
≥ 20mm diameter	45	55
≥ 6mm to < 20mm diameter	35	45
< 6mm diameter	20	25

Table 2.

measured (*see photos 24 - 30 respectively – 63.1µm; 61.9µm; 57.6µm; 59.4µm; 54.6µm; 60.6µm and 67.8µm*).

On a previous occasion, Jerry Wolfaardt of Bay Galvanizers undertook coating thickness readings on the masts. These results are shown in *Table 1*.

SANS 121 (ISO 1461) Standard – Coating thickness

In spite of the environmental and marine conditions imposed by the local industries and location of Richards Bay wrt the coast, the hot dip galvanized coating on the lighting masts has performed extremely well over the years, in comparison to the original coating thickness requirements set out by SANS 121 (ISO 1461), *see Table 2*.

NOTE: SANS 121 (ISO 1461) *superceded* SABS 763 *in* May 2000, *which means that these lighting masts would have been hot dip galvanized to the latter standard. While the interpretation of inspection methods may vary, the required coating thicknesses in conformance with the standards are similar.*

Conclusion and recommendation

Apart from one or two areas where site welding has taken place, which should be repaired, the residual coating thickness readings that were taken indicate that the hot dip galvanized coating is in excellent condition and will provide many more years of maintenance free life.

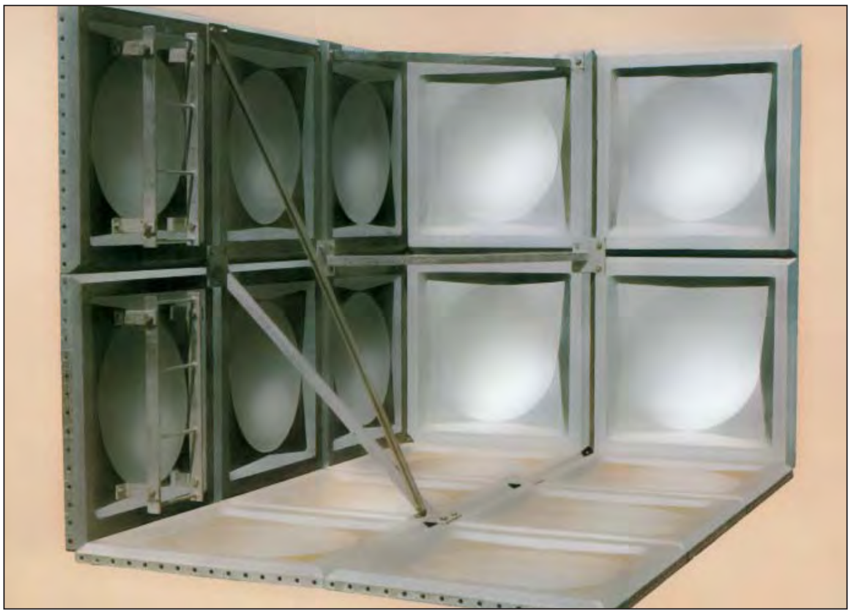
Richards Bay is known to many as being critically corrosive and in many areas where the industrial atmosphere combined with high humidity and time of wetness is combined with the prevailing winds these lighting masts do prove that hot dip galvanizing on its own can perform in spite of the known atmospheric corrosivity.

Pressed steel sectional water tanks

Stucta Technology manufactures and supplies pressed steel water tanks under the 40 year old brand, Prestank. Structa Technology's Prestanks are hygienically safe, cost effective and a reliable way to store water for commercial sectors, private sectors and even for personalised storage. The Prestank may be used for various water storage applications from temporary or permanent installations at mines, power stations, building sites, hospitals, water affairs, municipalities, rural communities and agriculture. The Structa Prestanks are fully customizable, high quality water storage solutions that are manufactured according to SANS guidelines and meet South African hot dipped galvanizing requirements.

There are many benefits to choosing Prestanks:

- It facilitates construction of an infinite range of sizes and configurations to meet the specifications and needs of the client: Handrails, walkways and lightning protection are just a few examples of the features available to our clients.
- The profile panel sections provide excellent strength properties and are structurally sound for storing water. The stand is designed strictly in accordance with SANS 10160 for wind and SANS 10162 for Structural Steel work. Tanks mounted on steel towers above ground level have an aesthetically pleasing appearance.
- Another major advantage of the sectional tank design, is that it facilitates easier handling and transportation over long distances to remote areas, regardless of the final dimensions of the assembled unit.



- Assembly on site is quickly achieved without the need for sophisticated tooling methods.
- Minimum maintenance is required because the galvanized steel panels resist weathering from the elements, while maintaining the integrity of the water within from contamination of most forms.
- Access to the water tank can be restricted by means of a lockable, ventilated access cover, providing safety and peace of mind to our clients.
- Our tank is designed according to SANS 10329:2004

Reservoirs constructed from pressed steel sections are used extensively by the mining Industry and municipal authorities. Large storage tanks to this design which are mounted on steel towers can also be seen at many of Eskom's power stations. Structa's pressed steel sectional tanks are hot dip galvanized for corrosion control in accordance with the requirements of the SANS 121 (ISO 1461) galvanizing standard. The thickness of the hot dip galvanizing coat is applied within a range of 80 to 100μm. This is more than five times the thickness of zinc on pre-galvanized corrugated steel cylindrical tanks. The purpose is to ensure extended maintenance free life in situations where water with aggressively corrosive properties is required to be stored. Prestanks have recently been installed at Welkom Hospital, The University of Swaziland and Northern Platinum Mine to name a few projects in 2010.

The Structa Group of companies consist of eight subsidiaries active in the manufacturing and supply of structural steel products for water, infrastructure (electrification and telecommunications), mining, petrochemical and industrial sectors. For more information contact *watertanks@structa.co.za* and visit *www.structa.co.za*

Seam spraying of pre-coated ERW tube

Introduction

Tube is produced on a tube forming mill by Electrical Resistance Welding of the longitudinal seam. By using pre-coated steel strip, tube with enhanced corrosion resistance can be produced. Pre-coated steel strip is available with zinc coating (galvanized), aluminium coating (aluminised) or Zn/Al Alloy Coating (various trade names apply – Galvalume, Zincalume, Aluzinc, Zalutite, Galfan).

During the welding process, the heat generated around the weld area and the subsequent tooling operation to remove the weld fin destroys the external coating around the weld area; unless reprotected this area of the tube will corrode.

The reprotection of this weld damage is achieved by applying a metal sprayed deposit with a material which affords similar corrosion resistant properties to the strip pre-coat.

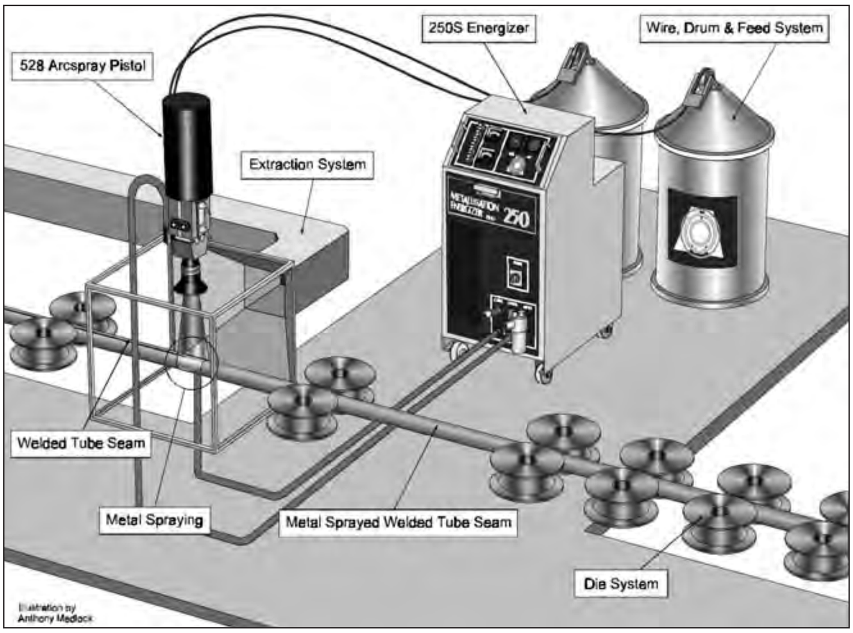
This "in-line" method of repair is the only method available which offers the flexibility of producing tube with zinc, aluminium or Zn/Al coatings.

Applications

Corrosion resistant tube produced by this method is made and used throughout the world for many diverse applications. These include:

- Domestic and garden furniture
- Car seat frames
- Horticultural tunnel type greenhouses
- Children's play area equipment
- Car ports
- Parking barriers
- Ballustrading
- Conduits
- Motor vehicle exhaust systems (aluminised) etc

The selection of coating material depends upon the application for which the tube is to be used. In general, the following guidelines apply:



Seam spraying of pre-coated ERW tube.

Pre-galvanized tube – Tube made from strip which has a continuous hot dip galvanized deposit applied during manufacture. The galvanized deposit thickness being in the range 14 to 20 microns (200 to 275 grams/m^2 both sides coated). The weld damaged area is sprayed with a zinc deposit (02E) to a thickness of approximately 0.04mm.

Temperature limitation of finished tube: up to 150°C.

Life expectancy: dependent upon pre-galvanized deposit thickness and working environment. Used in non-polluted, mild rural environments.

Pre-aluminised tube – Tube made from steel strip which has a hot dip aluminised deposit applied during manufacture. The aluminised deposit thickness being in the range 40 to 50 microns (230 to 290 grams/m^2 both sides coated). The weld damaged area is sprayed with an aluminium deposit (01E) to a thickness of approximately 0.05mm.

Temperature limitation of finished tube: up to 500°C.

Life expectancy: dependent upon pre-aluminised deposit thickness and working environment.

Used in applications which involve operation at elevated temperatures or where thermal cycling occurs. Also recommended for coastal or offshore environments.

Tube pre-coated with Zinc/Aluminium Alloys – Tube made from strip which is pre-coated during manufacture by a continuous hot dipping process.

Trade names:

Galvalume, Zincalume. Aluzinc and Zalutite have an analysis 43% Zinc / 55% Aluminium and other trace elements.

Galfan has an analysis 95% Zinc / 5% Aluminium and trace elements of mischmetal (lanthanum cerium)

The weld damaged areas can be treated with either:

- (01E) Aluminium or
- (21E) a Zinc/Aluminium Alloy in the

continued on page 16...


Zinc Metal Spraying?
Suppliers of Arc Spray and Flame Spray Equipment and Consumables
TAFA
WEARTECH (Pty) Ltd
THERMAL SPRAY DIVISION
187 Galjoen Street, Wadeville
P.O. Box 14125, Wadeville 1422
Gauteng, South Africa
Telephone: (011) 824-6010/2/3/4/5
Fax: (011) 824-6090
KZN - Telephone: (031) 466-4461
CAPE TOWN - Telephone: - (021) 447-4728
E-mail: sales@weartech.co.za
Website: www.weartech.co.za

approximate ratio 85% Zinc / 15% Aluminium

At time of preparation of this article, Zn/Al Alloys in the ratio 43% Zn / 53% Al are not available in wire form.

Equipment:

Metallisation 528E Arcspray System

Coating Materials:

- Metallisation (02E) 99.99% purity zinc wire
- Metallisation (01E) 99.5% purity aluminium wire
- Metallisation (21E) 85/15% purity Zn/Al wire

(All wires 2.0mm diameter)

Method

The weld repair system can be installed on to either new or existing tube mills. The spraying pistol must be located as close as possible to the fin removal tool and if possible within 1 metre of the welding coil. The surface to be sprayed should be clean and dry. No "carry over" of lubricating fluid can be tolerated in the spray area, because the mechanism for the adhesion of the coating relies upon the inherent heat retained in the weld seam. It is also undesirable to have excess cooling fluid contaminating the spray chamber as this can lead to a build up of dust which may restrict air flow in the extraction ducting.

The weld repair system taking place in the spray chamber.

The deposit is applied using the following equipment:

- Spray Pistol – Metallisation Electric Arcspray 528E Model fitted with CG20 Head
- Power Source – Metallisation Series 250S (Switched Unit) Rated at 250 amp duty 100% duty cycle
- Spray Controller – Electronic Controller to accurately control and meter the deposition rate of the 528E Pistol
- Wire Dispensing – Various wire dispensing options are available dependent upon materials to be used and space available in location of spray area.

Typical performance data for zinc spraying

Tube Mill Speeds – 60 to 110 metres / minute

Spray Distance – 30mm from arc point

Atomising Air Pressure – 5 BAR (approximately 80 psi)

Spray Voltage – 21 to 23 volts when spraying

Spray Current – 150 amps

NOTE: *Coating quality may be affected by mill line speed and tube size. Slight compensating adjustments may be required to the above parameters.*

Coating properties

Any metal sprayed deposit exhibits some degree of porosity (hence the need to apply slightly thicker sprayed deposits than the pre-coatings which are continuously hot dip applied). The "as sprayed" deposit has a fine satin appearance, surface finish. After spraying, the sizing roll stations of the tube mill will slightly deform the sprayed deposit to produce a flattened partially shiny appearance. The sizing operation will also reduce surface porosity.

The sprayed coating will withstand deformation and manipulation.

Advantages of METALLISATION Arcspray Systems

Combustion Flame Spraying has in the past been used for this application. Electric Arc Spraying offers slightly significant benefits over the combustion flame spray method. These include:

Economic

- Energy costs when running arc spray equipment are approximately one tenth those of flame spray systems.
- No energy is consumed by arcspray systems when wire is not being fed (unlike flamespray systems in which gases are burned even when wire is not feeding).
- Arcspray equipment generally requires less maintenance and uses fewer spare parts than flamespray systems.

Safety

- Arcspray systems do not use explosive gases.

Quality

- Pre-set parameters ensure repeatable quality of arcsprayed deposits.
- Using arcspray systems throughput rates can be varied independently of the size of wire being sprayed. Thus, spray rates can be co-ordinated with line speed to ensure even coating thicknesses are applied, independent of the mill operating speed, and spray rate adjustments for alteration in line speed, are made automatically.

Electric drive arc spray gun spraying zinc onto the welded area.

Reference technical bulletins

2.2.2 *Metallisation Wire 02E Zinc*

2.2.1 *Metallisation Wire 01E Aluminium*

2.3.14 *Metallisation Wire 21E Zinc Aluminium Alloy*

Bob's BANTER!

Problem solving means reaching destinations, not just reading signposts

A popular motivational adage is to consider a problem as a challenge. Another is to use the Chinese derivation of the word 'crisis': one half of the word represents 'danger', the other 'opportunity'. Solving problems can mean attaining goals.

This must have been good advice for those early sea creatures who, 400 million years ago left behind their watery world to venture onto land. They had major problems. The harsh sunlight and dryness damaged their sensitive skins, they were not used to the new oxygen-rich atmosphere and their weak muscles could not handle gravity. They also had too much calcium in their bodies for their new land-based metabolic processes.

New skin materials had to be formed; breathing organs had to be modified; bones, limbs and muscles had to be developed. Excess calcium had to be removed. Innovative and drastic changes were required. Saline conditions were incorporated in the animals' new bodily fluids to compensate for the dry land environment, durable skin materials were developed, oxygen breathing organs were formed and excess calcium was excreted as shells and skeletons. Lower calcium levels enabled the metabolism of nucleated cells to produce muscles. The problems had given rise to evolutionary feats of staggering proportions: those creatures who left behind their sea world created wonderful new opportunities as land animals.

While the animals may have been individually limited, collectively they were able to use the problems to change their structure and their life

processes. Their only limitation to problem solving was their collective imagination.

Why is problem solving so difficult today? Is it because we think of a problem only as a deviation from a norm or from what we expect? If there is no deviation there is no problem. Perhaps we should rather define a problem as a means of achieving a better future. This would change our focus from measuring and analysing possible deviations to imagining and creating a new vision. Many companies spend a great deal of money in gathering information and data to determine if there is a problem. It may be wiser to gather information to improve the definition of the vision. Ludwig Wittengenstein (Philosophical Investigations) stated this wisely when he said: "The problems are solved, not by giving new information, but by arranging what we have known since long".

Another difficulty we have in solving problems is that we tend to see obstacles or risks rather than opportunities. Overcoming obstacles and managing risks are vital to any business. They should, however, be viewed as part of the visioning process and not only as part of problem solving. Someone once defined obstacles as "those frightful things you see when you take your eyes off the goal"

There are many barriers to organisational improvement processes. The most prevalent is a disorientated leadership that does not appreciate or stay focused on the anticipated end result. These leaders dwell on the means rather than on the end. They also do not provide the necessary support to secure successful implementation. Equally destructive is the type of thinking that refuses to accept or to share the involvement or responsibility of others. The power of teamwork is not recognised.

Perhaps the biggest difficulty lies within ourselves: we don't like problems. People who cause problems are referred to as 'rocking the boat' or 'trouble-makers': they upset the status quo. We need to change this mindset and acknowledge those who identify and solve problems as visionaries.

Problem solving is fundamentally about change. The key to problem solving is therefore too recognise the state to which we want to change. If we don't know or care where we would like to go, we will never get there. As Louis Kronenberger said: "The trouble with our age is that it is all signposts and no destination"

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.

Simonstown utility gantry

Chatting with Harry Dilley an ex Mayor of Simonstown, experienced sailor and multiple boat owner we find the following facts about this utility gantry.

The gantry was installed in about 1991 which makes it about 20 years old. The gantry was originally installed for fishermen to offload their catch of Broadbill Swordfish which because of their general mass of in excess of 300kg was difficult to do without such a gantry. Today the gantry which is used for offloading general items from the boats is still in excellent condition.

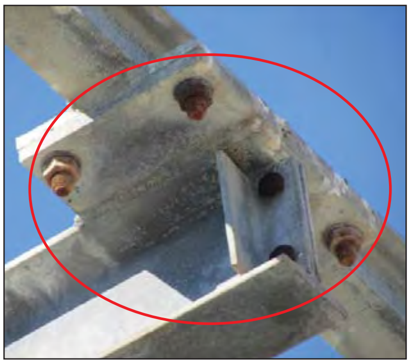
Simonstown because of its location is relatively protected from aggressive chloride carrying south easter winds, see location map and hence the hot dip galvanized coating has not generally deteriorated and will be able to protect the steel for many more years without any maintenance.

The only items that require maintenance on the gantry are the uncoated plate above the gantry and the zinc electroplated fasteners. Should this be carried out shortly, using a reputable repair material such as Zincfix or Galvpatch, the fasteners will not have to be replaced.

The exposure of hot dip galvanizing to marine conditions will inevitably

continued on page 20...

Simonstown is relatively protected by the landform from the aggressive south easterly chloride carrying winds. Gordons Bay and its surrounding area is similarly protected.



Photos above show the gantry with some uncoated carbon steel that has been added. This will in time tend to discolour the hot dip galvanizing when the former begins to rust. Photo right shows the inappropriately coated fasteners, which were most probably originally only zinc electroplated, requiring replacement or coating repair.

General photos of the gantry showing Simonstown Harbour and the yachts in the background.

Zinc chloride layer including the hot dip galvanized coating thickness of 308µm.

Zinc chloride layer including the hot dip galvanized coating thickness of 297µm.

Zinc chloride salts removed and the residual coating thickness measured - 144µm.

Zinc chloride salts removed and the residual coating thickness measured - 130µm.

Zinc chloride layer including the hot dip galvanized coating thickness of 518µm.

Zinc chloride layer including the hot dip galvanized coating thickness of 452µm.

Zinc chloride salts removed and the residual coating thickness measured - 176µm.

Zinc chloride salts removed and the residual coating thickness measured - 189µm.

Zinc chlorides salts almost non-existent due to the orientation of the web wrt the direction of the prevailing wind, coating thickness - 165µm.

result in a white zinc chloride salt formation on the surface facing the seaward side. Depending on the severity of the local conditions this white substance may only affect the structure aesthetically as in this case or may result in a more rapid demise of the hot dip galvanized coating. This atmospheric aggressiveness can locally be found east of and including Glencairn along the False Bay coast to the west of Somerset West.

General hot dip galvanized coating thickness readings taken on the gantry are shown in the table on the right.

	Overall coating thickness including zinc chloride and hot dip galvanizing (µm)	Residual hot dip galvanized coating thickness with zinc chloride salts removed (1) in (µm)	Residual hot dip galvanized coating thickness with zinc chloride salts removed (2) in (µm)
Mean	377.6	187.8	160.3
Max	645	573 – High spot	235
Min	199	141	118
No. of readings	48	71	33

General hot dip galvanized coating thickness readings taken on the gantry.

The minimum coating thickness required by SABS 763 for steel greater than 6mm thick which was relevant when this structure was hot dip galvanized, is 70µm local and a mean of 85µm. This is similar to the new standard which is SANS 121:2011 (ISO 1461:2009). See *Table 3* taken from the standard.

Zinc chlorides salts almost non-existent due to the orientation of the web wrt the direction of the prevailing wind, coating thickness - 167μm.

Zinc chlorides salts almost non-existent due to the orientation of the web wrt the direction of the prevailing wind, coating thickness - 214μm.

Zinc chlorides salts almost non-existent due to the orientation of the web wrt the direction of the prevailing wind, coating thickness - 179μm.

Zinc chlorides salts almost non-existent on round bar climbing hoops, coating thickness - 158μm.

Zinc chlorides salts almost non-existent on round bar climbing hoops, coating thickness - 157μm.

Zinc chloride layer including the hot dip galvanized coating thickness of 469μm.

Zinc chloride salts removed and the residual coating thickness measured - 152μm.

NOTE 1

Hot dip galvanizing specifications state the minimum acceptable coating thickness and not average coating thicknesses. The thickness actually achieved, varies with steel composition and this can range from the minimum up to at least 50% greater. As life expectancy predictions are normally based on the minimum coating thickness, they are usually conservative.

Variance in coating thickness

A requirement for a thicker coating (25% greater than the standard in *Table* 4 (*see page* 22), can be requested for

continued on page 22...

Zinc chloride salts removed and the residual coating thickness measured - 148µm.

Zinc chloride salts removed and the residual coating thickness measured - 125µm.

Zinc chloride salts removed.

Zinc chloride salts removed and the residual coating thickness measured - 125µm.

Zinc chloride salts removed and the residual coating thickness measured - 134µm.

Zinc chloride salts removed and the residual coating thickness measured - 150µm.

components not centrifuged, without affecting specification conformity).

NOTE 2

Where steel composition does not include moderate to high reactivity, thicker coatings are not always easily achieved.

Conclusion

Due to the relatively moderate environ-ment (most probably a C3 corrosion category in terms of ISO 9223) the hot dip galvanizing has stood the test of time and will most probably not require any maintenance for many, many years to come.

The mild steel plate should be protected against the elements and the fasteners over coated using something like Zincfix or Galvpatch which are reputable coating repair products recommended by the Association.

TABLE 3. MINIMUM COATING THICKNESS ON ARTICLES THAT ARE NOT CENRIFUGED – SANS 121:2011 (ISO 1461:2009)

Profiles	Local coating thickness min. µm*	Mean coating thickness, min. µm*
Steel >6mm	70	85
Steel >3mm to ≤6mm	55	70
Steel ≥1.5mm to ≤3mm	45	55
Steel <1.5mm	35	45

TABLE 4. MINIMUM COATING THICKNESS ON ARTICLES THAT ARE CENTRIFUGED TO SANS 121:2011 (ISO 1461:2009)

Diameter of the article	Local coating thickness min, µm*	Mean coating thickness min, µm*
≥6mm diameter	40	50
<6mm to <20mm diameter	20	25

See notes 1 and 2, including variance in coating thickness.

Painting hot dip galvanized steel

Painting hot dip galvanized steel is littered with failures over the years that have been created by a lack of preparation prior to applying the relevant paint system and failures due to very thin coats of paint applied in highly aggressive environments.

Having understood the need for carefully preparing the galvanized coating which must not be passivated prior to painting, either by sweep blasting at the right pressure and with the correct media, or by chemical cleaning which requires scrubbing the entire structure with a suitable chemical cleaning agent and then washing off and drying before paint application, we must now look to the next step.

It is then necessary to select the correct paint coatings and dry film thickness (dft) after studying the positioning of the structure the accessibility and the aggressiveness of the environment. The lifetime and maintenance period intervals are also important considerations as thin coats of paint may require annual maintenance if they are very close to the sea. This may not always be possible, so heavy-duty paint coatings should be applied at the onset.

The use of the correct applicator is also an important consideration. In this regard, a short-term guarantee jointly by the applicator and paint supplier to ensure against paint failure, and corrosion may be considered necessary. Paint adhesion failures normally occur in the first year after application. In South Africa most reliable suppliers will stand by their products including the hot dip galvanizing industry that may also have their own paint facilities.

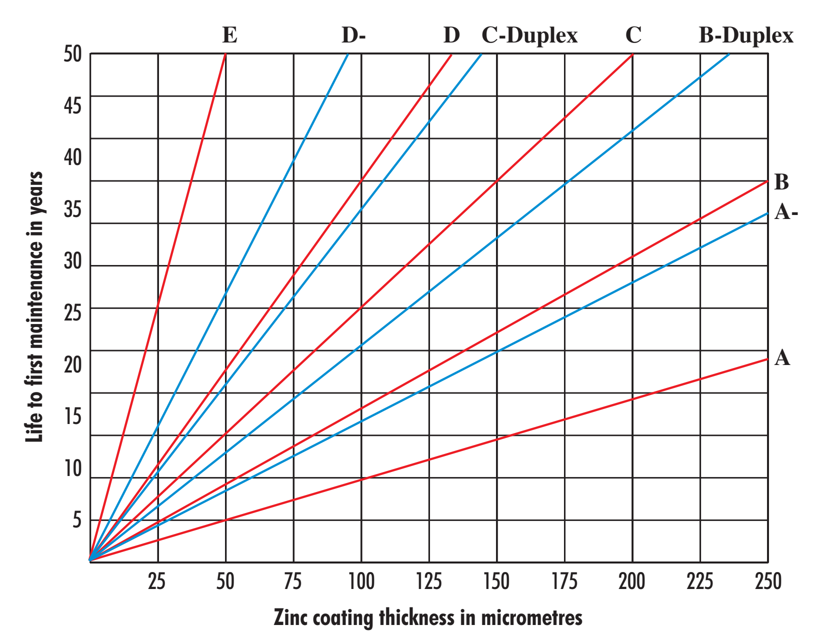
continued on page 24...

What is the cost of applying an epoxy primer and polyurethane topcoat on galvanized structural steelwork of varying thicknesses?

The table on *page* 25 details the cost of the coatings and is to be used as a guideline for specifiers and their clients. These costs can vary considerably from applicator to applicator.

Why spend the extra money for a duplex system?

Inland in South Africa atmospheric failures of hot dip galvanizing are very rare and a normal coating can easily last 50/100 years. In the coastal regions, this is very different especially where there are continuous on shore winds and the items are subjected to permanent salt spray deposits. This is accentuated if the structure does not receive full sunlight and drying. This



Category	Distance from sea Metres – (m) Kilometres (km)	Corrosion category	Approx. zinc corrosion rate/year (μm)	Conservative for structural steel but assume 100μm	Approx. zinc life to first maintenance	Approx. Duplex Coating System life
A	0 - 50 m False Bay coast	Extremely severe marine	10 to 20	100	5 to 10 years	7 to 14 years
B	50 - 500 m False Bay coast	Very severe marine	5 to 10	100	10 to 20 years	14 to 28 years
B	0 - 50 m Atlantic coast	Severe marine	5 to 10	100	10 to 20 years	14 to 28 years
C	500m - 3km False Bay coast	Severe marine	3 to 5	100	20 to 30 years	28 to 42 years
C	50m - 1km Atlantic coast	Moderate to severe marine	3 to 5	100	20 to 30 years	28 to 42 years
D	3km - 5km False Bay coast	Mild to moderate marine	2 to 4	100	25 to 50 years	35 to 70 years
E	From 2km inland Atlantic coast	Rural inland exterior	1 to 2	100	50 to 100 years	Only required for colour
E	From 5km inland False Bay coast	Rural inland exterior	1 to 2	100	50 to 100 years	Only required for colour

phenomena is called the "time of wetting" and adds considerably to the corrosion burden, as does severe onshore wind coupled with heavy wave action and a lack of rainfall to wash down the salt deposits. This means that in the Cape Peninsula that the False Bay coastline is twice as corrosive as the Atlantic Ocean coastline due to the South Easter being the prevailing wind for eight months of the year whilst on the Atlantic side the North Wester is accompanied by rainfall that has a wash down effect thereby reducing the salt deposits. Salt spray can be deposited a long way from Muizenberg with a big south east wind.

In these instances next to the sea, duplex systems are essential and are a prerequisite to achieving a reasonable corrosion free life.

Thin paint coatings require annual maintenance and heavy-duty three coat systems with a minimum of 225 microns dft are essential to achieve a reasonable lifetime to first maintenance. We attach a graph indicating the lifetime of the hot dip galvanized coating on its own, which will be more than doubled with a suitable paint coating because if the zinc coating is protected then so is the ultimate life of the structure.

continued on page 26...

	Per Ton		Per Ton		Per Ton		
Steel Profile Thickness	m² per ton of Steel	Hot Dip Galvanizing Cost	Average H.D.G Coating Thickness	2 Coat Paint System Cost	2 Coat Paint Coating DFT	Total cost Duplex System	Total coating thickness
3mm to 4mm	64	5500	100	5120	120	10620	220
5mm to 6mm	42	5000	125	3360	120	8360	245
7mm to 8mm	32	4500	150	2560	120	7060	270
9mm to 10mm	26	4250	175	2080	120	6330	295
11mm to 12mm	21	4000	200	1680	120	5680	320
13mm to 20mm	13	3750	225	1040	120	4740	345

Notes:

1) Costs will vary for different applicators but are approximate on 100-ton lots of structural steel.
2) The paint system quoted is for an epoxy primer and polyurethane top coat for atmospheric conditions close to the sea and includes preparation before painting.
3) This is a duplex system for a coastal environment but will require an extra paint coat (dft 100) depending on the proximity to the sea.
4) The heavy galvanized coating thickness is achieved by hot dipping silicon killed steels and longer immersion times in the zinc. The SANS 121 (ISO 1461) standard for general galvanizing is extremely conservative and only calls for a mean of 85 microns for steel profiles thicker than 6mm. This thinner coating is only achieved on aluminium killed steels which generally never exceed 4mm in thickness and the general galvanizer spends most of his time putting on double the zinc coating that is required due to reactive silicon killed steels. This heavy zinc coating is not a well advertised fact in the galvanizing industry.
5) m² are based on the last profile thickness mentioned.

It is the duty of the specifier to provide his client with a coating system that allows his client the security and the knowledge that his permanent installation will not fail due to the ravages of corrosion which costs the country many billions annually. Always remember hot dip galvanizing is the most reliable and effective primer coat as the coating forms a metallurgical bond with the steel in the form of a series of zinc/iron alloy layers. This coating is superior in every sense to any paint primer.

Notes: *Refer to graph on page* 25

1) *All zinc corrosion rates are approximate and are a guideline only.*
2) *In all cases, the zinc coating thickness is relative to the lifetime.*
3) *Continuously galvanized sheet and purlins should not be used externally in coastal areas.*
4) *The above are the writers views only.*

The Association wishes to thank Iain Dodds of Cape Galvanising for this contribution.

The 'unsung' but extremely necessary hot dip galvanizing standard

SANS 14713:2011 (ISO14713:2009) Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures. Parts 1, 2 and 3 have recently been released.

We discuss only Parts 1 and 2 in this article, by including the Scope, Titles of each section and occasionally important copy or part copy within such sections.

The Standard is now available from the SABS, call 012 428 7911 or visit *www.sabs.co.za* and this article is printed with the kind permission of the South African Bureau of Standards.

Part 1: General principles of design and corrosion resistance

(*For simplicity sake, the article only addresses issues relevant to hot dip galvanizing and thermal sprayed coatings*)

1. *Scope*

   This part of the standard provides guidelines and recommendations regarding the general principles of design which are appropriate for articles to be zinc coated for corrosion protection and the level of corrosion resistance provided by zinc coatings applied to iron and steel articles, exposed to a variety of environments.

2. *Normative references*
3. *Terms and definitions*
4. *Materials*
   a. Iron and steel substrates
   b. Zinc coatings
5. *Selection of zinc coating*
6. *Design requirements*
   a. General principles of design to avoid corrosion
   b. Design for application of different zinc coating processes
   c. Tubes and hollow sections
      i. *General*
      ii. *Corrosion protection of internal and external surface*
   d. Connections
      i. *Fastenings to be used with hot dip galvanized or thermal sprayed coatings*
      ii. *Welding considerations related to coatings*
      iii. *Brazing or soldiering*
   e. Duplex systems
   f. Maintenance
7. *Corrosion of different environments*
   a. Atmospheric exposure, including Table 1, which expands on corrosivity categories wrt the zinc corrosion rates. Table 2 indicates the coating life to first maintenance in a range of classes.
   b. Exposure to soils, including Table 2, which expands on the different coatings, coating thicknesses and their relevant durability's in terms of the various classes.
   c. Exposure to water
   d. Abrasion

continued on page 28...

e. Exposure to chemicals
f. Elevated temperatures
g. Contact with concrete
h. Contact with wood
i. Bimetallic contact, including Table 3 (Galvanic series of metals) and Table 4, expected corrosion between zinc and other metals

8. *Accelerated test methods applied to zinc coatings*

Part 2: Hot dip galvanizing

1. *Scope*

This part of ISO 14713 provides guidelines and recommendations regarding the general principles of design which are appropriate for articles to be hot dip galvanized for corrosion protection.

The protection afforded by the hot dip galvanized coating to the article will depend on the method of application of the coating, the design of the article and the specific environment to which the article is exposed. The hot dip galvanized article can be further protected

2. *Normative references*
3. *Terms and Definitions*
4. *Design for hot dip galvanizing*

a. General

It is essential that the design of any article required to be finished should take into account not only the function of that article and its method of manufacture but also the limitations imposed by the finish. Annex A illustrates some of the important design features, some of which are specific to hot dip galvanizing. Some internal stresses in the articles to be galvanized will be relieved during the hot dip galvanizing process and this may cause deformation or damage of the coated article. These internal stresses arise from the finishing operations at the fabrication stage, such as cold forming, welding and residual stresses inherited from the rolling mill, etc. *The purchaser should seek the advice of the galvanizer (or the HDGASA) before designing or fabricating.*

The purchaser should be aware of the two distinct types of hot dip galvanizing, that of batch or general hot dip galvanizing after fabrication and that of continuous hot dip galvanizing, where various classes of coating are produced.

b. Surface preparation

c. Procedures related to design considerations

d. Design features

Preferred design features for articles to be hot dip galvanized are shown in Annex A.

Warning – It is essential that sealed compartments be avoided or be vented, otherwise there is a serious risk of explosion that may cause serious injury (or death) to operators. This aspect of design should be given careful consideration...

e. Tolerances

5. *Design for storage and transport*

Hot dip galvanized work should be stacked securely so that the work can be handled, stored and transported safely.

Where there is a specific need to minimise the development of wet-storage staining (primarily basic zinc oxide and zinc hydroxide, formed on the surface of the galvanized coating during storage of work in humid conditions), *this should be communicated by the purchaser to the galvanizer at the time of ordering and any relevant control measures should be agreed on.* Such measures might include...

6. *Effect of article condition on quality of hot dip galvanizing*

   a. General

      i. *Material composition, including Table 1 which relates to the desired chemical composition of steel and the likely effects and coating characteristics.*

      ii. *Castings*

   b. Surface condition

   The surface of the basis metal should be clean before dipping into molten zinc. Degreasing and pickling in acid are recommended methods of cleaning the surface. Excessive pickling

continued on page 30...

should be avoided. Surface contamination that cannot be removed by pickling, eg. Carbon films (such as rolling oil residues), oil, grease, paint, welding slag, labels, glue, marking materials, fabrication oils and similar impurities, should be removed prior to pickling; this allows for more effective and efficient use of pretreatment materials. *The purchaser is responsible for removing such contamination, unless alternative arrangements have been agreed between the galvanizer and purchaser.*

c. Influence of steel surface roughness on hot dip galvanized coating thickness

d. Influence of thermal cutting processes

e. Effect of internal stresses in the basis steel

   i. General

   The hot dip galvanizing process involves dipping clean, pretreated, fabricated steel articles in the bath of molten zinc/zinc alloy at a temperature of about 450°C, and withdrawing them when the metallurgical reaction developing the coating is complete. Relief of large or imbalanced stresses in the article during the dipping process may occur. The galvanizer cannot be responsible for any associated deformation of the steelwork during galvanizing (as the specific state of stress in the article at the time of dipping is not in his control) unless the distortion has occurred through inappropriate handling (eg. Mechanical damage or incorrect suspension of the article).

   ii. Distortion cracking

   iii. Hydrogen embrittlement

   iv. Strain age embrittlement

   v. Liquid metal assisted cracking (LMAC) or liquid metal embrittlement (LME)

   vi. Large objects or thick steels

   vii. Hot dip galvanizing practice

7. *Effect of hot dip galvanizing process on the article*

   a. Dimensional tolerances on mating thread

   b. Effect of process heat

   c. After-treatments

   To retard the possible formation of wet storage stain on the surface, articles can be given a suitable surface treatment after hot dip galvanizing. If the articles are to be painted or powder coated after galvanizing, *the purchaser should inform the galvanizer before the article is galvanized.* For application of duplex systems...

ANNEX A – *Containing a number of sketches and notes on preferred designs of articles for hot dip galvanizing.*

This standard is highly recommended for any specifier or end-user who is involved in designing, detailing and fabricating articles for hot dip galvanizing.

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:
15 to 17 February; 15 to 17 March; 19 to 21 April; 17 to 19 May; 21 to 23 June; 16 to 18 August; 4 to 6 October; 22 to 24 November.

Cape Town:
8 to 10 March; 7 to 9 June; 6 to 8 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

Revision of EN ISO 14713

Courtesy of the Galvanizers Association – United Kingdom

The continual need to keep standards updated has resulted in the much needed updating of EN ISO 14713. Published in 1999, it included important information that was impractical and quite confusing for the specifier to understand.

A new approach has been developed to help users understand corrosion of steel and to select the most effective protection against it.

EN ISO 14713:1999 'Protection against corrosion of iron and steel in structures – Zinc and aluminium coatings – Guidelines' has now been revised.

It has been split into three parts:

- 14713-1 - Zinc coatings – Guidelines and recommendations for the protection against corrosion for iron and steel in structures – Part 1: General principles of design and corrosion resistance
- 14713-2 - Zinc coatings – Guidelines and recommendations for the protection against corrosion or iron and steel in structures – Part 2: Hot dip galvanizing
- 14713-3 - Zinc coatings – Guidelines and recommendations for the protection against corrosion or iron and steel in structures – Part 3: Sherardizing

System	Reference Standard	Minimum thickness (µm)	Selected corrosivity category (ISO 9223) life min/max. (years) and durability class (VL, L, M, H, VH)							
			C3		C4		C5		CX	
Hot Dip Galvanizing	ISO 1461	85	40/>100	VH	20/40	VH	10/20	H	3/10	M
		140	67/>100	VH	33/67	VH	17/33	VH	6/17	H
		200	95/>100	VH	48/95	VH	24/48	VH	8/24	H

The figures for life have been rounded to whole numbers. The allocation of the durability designation is based upon the average of the minimum and maximum of the calculated life to first maintenance, e.g. 85µm zinc coating in category C4 (corrosion rate for zinc between 2.1µm per annum and 4.2µm per annum), gives durability of 85/2.1 = 40.746 years (rounded to 40 years) and 85/4.2 = 20.238 years (rounded to 20 years). Average durability of (20 + 40)/2 = 30 years - designated "VH".

Table 1: Life to first maintenance for a hot dip galvanized coatings in a range of corrosivity categories (part of a table taken from EN ISO 14713-1:2009).

	Atmospheric Exposure			Immersed	
Metal	Urban	Industrial	Marine	Fresh Water	Sea Water
Aluminium	a	a - b	a - b	b	b - c
Brass	b	b	a - c	b -c	c - d
Bronze	b	b	b - c	b - c	c - d
Cast Iron	b	b	b - c	b - c	c - d
Copper	b	b - c	b - c	b - c	c - d
Lead	a	a - b	a - b	a - c	a - c
Stainless Steel	a - b	a - b	a - b	b	b - c

"a" The zinc coating will suffer either no additional corrosion, or at worst, only very slight additional corrosion which is usually tolerable in service.
"b" The zinc coating will suffer slight or moderate additional corrosion which may be tolerable in some circumstances.
"c" The zinc coating may suffer fairly severe additional corrosion and protective measures will usually be necessary.
"d" The zinc coating may suffer severe additional corrosion and contact should be avoided.

Table 2: Indication of additional corrosion expected due to direct contact between zinc and other metallic materials.

The three parts of the revised standard was published in 2009. The scope of the standard has been refocused and now deals solely with the use of zinc coatings for corrosion protection.

Taken together, parts 1 and 2 provide valuable information and guidance on design for galvanizing and performance of coated articles in a wide range of exposure conditions.

The standard updates the information provided on the performance of zinc coatings in atmospheric exposure, citing an extended corrosivity category, CX, relating to more aggressive environments such as unventilated spaces in sub-tropical environments and polluted tropical and sub-tropical coastal regions (*Table l*).

Where the use of duplex systems are described, reference is made to the most up to date and relevant Euronorms or international standards for the specification of these systems. The long list of corrosion resistance performance tables in the 1999 version of the standard have been condensed into one table in the update of 2009.

The life to first maintenance of any system in a chosen exposure condition has been categorised for improved clarity, providing both minimum and maximum life data (in years), together with a broader classification (short, medium, long etc)for ease of reference.

Information on the performance of a zinc coating in contact with soils and water have been extended and additional information on the performance of similar coatings on exposure to chemicals, elevated temperatures, contact with concrete and wood and bimetallic contacts (*Table* 2) have been introduced.

This data will assist specifiers to assess the likely performance of the coatings in specific applications.

The revised standard concludes with a commentary on the use of accelerated test methods to predict infield performance of zinc coatings, noting that the accelerated corrosion tests are not good predictors of in-field performance of zinc coatings.

EN ISO 14713-2 'Zinc coatings – Guidelines and recommendations for the protection against corrosion or iron and steel in structures – Part2: Hot dip galvanizing' now includes extended guidance on design for hot dip galvanizing, incorporating many of the design diagrams from the 1999 version of the standard. Further guidance on the influence of the basis steel substrate on the development of galvanized coatings is set out.

For instance, more detailed information on the effects of the surface chemistry of the iron / steel substrate on the development of the hot dip galvanized coating has been included; other sections of the revised standard deal with the effects of internal stresses in the article being sent for galvanizing and the effects of the hot dip galvanizing process on the article.

One of four galvanizing plant tours to final year Architectural Students from CPUT in Cape Town earlier this year.

EN ISO 14713 - 3 'Zinc coatings – Guidelines and recommendations for the protection against corrosion or iron and steel in structures – Part 3: Sherardizing' completes the set of documents revising the 1999 version of standard, for using galvanizing or sherardizing.

Quench additive for hot dip galvanizing – a new approach

When it comes to temporary corrosion protection of hot dip galvanized parts the use of sodium dichromate, Cr(VI), and certain other additives, have been widely used. However, more and more end-users are asking for a bright finish, free of white rust, which retains this state and appearance for as long as possible after installation. Additionally, the hazardous nature of Cr(VI) is of major concern and this is quite often associated with the customary yellow colour.

The solution to this lies with the introduction of a non-hazardous trivalent chrome solution, Cr(III), which was introduced into the SA market in 2010 by SurTec SA. During this period numerous parts have been quenched in this system with excellent results. The resultant layer is colourless, retains a bright finish for an extended time and is non-hazardous.

Method of Application

This product is added to a normal water quench bath at 3 - 4 ml/l and applied by immersion for 30 - 60 secs. It is operated at ambient temperature but requires the latent heat from the components out of the zinc kettle to facilitate the chemical reaction of this conversion coating and subsequent layer thickness. It is unnecessary to maintain the solution below 60°C – the higher the solution temperature the faster the reaction.

The bright, white rust free surface finish of non-reactive hot dip galvanized steel.

Aluminium killed steel (thinner section steel) should be dipped immediately after the hot dipped zinc application. *Silicon killed steel* (thicker structural steel) should first be dipped in a pre-quench water bath as this prevents black streaking on the surface. If a pre-quench is not available a cool down period of around 10 to 15 mins prior to immersion into this solution is recommended to achieve the same bright finish.

F A Q

Q - If it is based on trivalent chrome it must still be hazardous.

A - Not true – sodium dichromate, or CrVI exists as an *anion* (which means that it is absorbed through the skin) and in solution is well established as a cause of allergic contact dermatitis. It is considered an occupational carcinogen. Cr(III) on the other hand exists as a *cation* which is not able to penetrate the skin. Cr(III) is classified as non-hazardous according to Directive 67/548/EEC. Notably Cr(III) plays an important role as an essential micronutrient in many dietary supplements for human consumption.

Q - All chrome will soon be outlawed.

A - There are no known regulatory and legislating agencies in the USA and Europe currently planning on banning chrome in its form as chrome metal Cr (O) or trivalent compound Cr(III). Presently no non-chrome substitutes can provide all the Cr related features or at least its critical aspects especially corrosion resistance.

Q - Trivalent chrome has been tried before with poor results.

A - It is true some suppliers have offered trivalent chrome compounds with rather suspect results. They key to effective trivalent chrome compounds is the stability of Cr(III) in solution. Earlier versions had the tendency to convert back to Cr(VI) and became difficult to control with resultant incomplete or poorly formed conversion layers. SurTec International GmbH has tested this process over a period of 5 years commencing in the UK. Following numerous field trials in various other hot dip galvanized applicators the product was launched in 2009. Following extensive use of this product under South African conditions Cr(III) has at least matched and in many cases has out-performed Cr(VI) and substitutes.

Q - The price of Cr(III) is higher than Cr(VI).

A - The price per kilogram is higher than sodium dichromate but the consumption and low concentration level coupled with the benefits of this non-hazardous product makes it cost effective. The biggest effect on consumption is drag-out.

SurTec South Africa markets the product under the trade name SurTec 541 and contact details can be found in our advertisement. Additionally, we also offer cleaners, inhibitors and comprehensive service and laboratory analyses for the hot dip galvanizing industry.

Transvaal Galvanisers

Transvaal Galvanisers opened their doors in 1985, specialising in the hot dip galvanizing of transmission line towers and sub-stations. Over the past 26 years the company has grown and adjusted to the ever changing market and today encompasses four hot dip galvanizing plants.

Capacities

At three of their plants Transvaal Galvanisers operates a different system of galvanizing: spinning, dipping and drag line galvanizing. The monthly capacity for general galvanizing i.e. structural, pipes, angle iron, plates and fittings is 4 000 tons and for spin galvanizing between 800 to 1 000 tons.

New plant

Transvaal Galvanisers opened a new plant measuring 1 000m² under roof, in January 2011. It has a 330m² tank farm and a 70m² fan room. This plant specialises in the centrifugal / spin hot dip galvanizing of bolts, nuts, pipe fittings, couplings, screws, plates, shackles, tie points etc.

The plant has a fully automated loading and pickling area, operated by means of tumblers and manipulators.

The plant is SANS 121 (ISO 1461) approved and a TUV ISO listing will be in place by year end.

Bath sizes

The galvanizing baths at each plant, measured in length, breadth and depth are:

- Plant 1: L-9.5 / B-1.0 / D-1.2
- Plant 2: L-6.22 / B-1.545 / D-1.5
- Plant 3: L-8 / B-1.2 / D-1.5
- Plant 4: L-3.5 / B-0.9 / D-1.2

Customers and contracts

Among the new customers at Plant 4 are SA Bolt, Robor, Rand York Castings, Imab, EW Johnston and Babcock, adding to Transvaal Galvanisers' already long standing client base for all its plants.

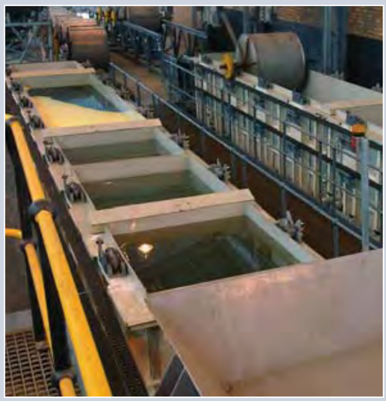
Contracts are supplied to Medupi Power Station and to Eskom for their 765kv +400kv transmission lines and substations, accounting for 70% of South Africa's demand

Environmental responsibility

In the process of improving environmental responsibility, Transvaal Galvanisers uses low fuming fluxes. A new effluent treatment plant will be up and running in the second half of 2011 and the use of bag house filters and wet scrubbers for fume extraction has been added to the plants.

Future project

A proposed 5th new plant will increase current production levels by 4000 tons. The new plant bath size will be L-14m/ B-1.8m/ H-3m thus making Transvaal Galvanisers even more versatile and able to cope with any galvanizing requirement, from the smallest items to the largest.



Microbiologically influenced corrosion of water pipes

Introduction

This report addresses a corrosion phenomenon called Microbiologically Influenced Corrosion (MIC). There can be many reasons for this type of corrosion, but what is quite certain is that the incidence of MIC seems to be on the increase.

What is MIC?

MIC is the corrosion or deterioration of a material, which is initiated and / or accelerated by the activities of micro organisms. MIC normally gets a foothold in a system during the initial start-up process when water is left stagnant in the pipes for extended periods during construction.

Investigation

An investigation was carried out on a water feed installation in an apartment building in a suburb of Johannesburg. The apartment is a multi storey building with a central water feed system to supply water at a constant pressure and temperature to all the apartments. The system was installed approximately five years ago when the apartments were constructed. Corrosion of the warm water feed was soon evident after occupation and had to be replaced in April 2011 (*photo* 1).

The corrosion of the pipes is very severe as can be seen from the photographs. In some instances the pipes are corroded right through, with pitting and general corrosion evident on all the pipes and couplings.

A very heavy rust deposit is also present in all the pipes with numerous tubercles present inside most of the pipes and couplings. P*hoto* 2 is typical of the tubercles found inside the pipes.

The tubercles are the result of microbiologically influenced corrosion (MIC). This is a mode of corrosion incorporating microbes that react and cause corrosion processes of metallic materials. In other words this type of corrosion is not only restricted to hot dip galvanized products , but under the same conditions will also cause corrosion of copper and copper alloys, stainless steel and mild steel. MIC is also known to effect non metallic materials, such as plastics and concrete.

MIC is caused by bacterial microbes which thrive under the right conditions inside pipes. The right conditions incorporate a host location, which would normally be the inside of a pipe, fitting tanks or vessels, which contain water and nutrients found in the water and a certain amount of oxygen.

MIC bacteria tend to find more favourable growth conditions in stagnant water inside a place called a biofilm.

Biofilms are a collection of micro-organisms which exists wherever surfaces have contact with water. Biofilms are typically like the plaque on your teeth, the slippery slime on river stones or the gel like film on the inside of a vase which have held flowers for a week. This can typically happen when water reticulation systems are tested during the construction period and the water left in the system while construction is completed. This can sometimes take longer than three months, which allows the bacteria to get a foothold during this period.

If the biofilm is thick enough, oxygen will be depleted at the pipe surface creating an anaerobic environment. Oxygen depletion at the surface also creates the right condition for sulphate reducing bacteria to grow. Non uniform growth or colonization (Patches of bacteria) can result in differential aeration cells. These cells then create the perfect environment for sulphite bacteria to grow. The bacterial wastes then produce tubercles and bio films which create micro-environments on metal surfaces under the tubercles.

The anaerobic bacterium reacts and digests the pipe wall material and in turn excretes acidic by-products which chemically attack the metal surface. The tubercles also act as a shelter for the bacteria and their growth from the water

Photo 1: Some of the corroded products after being removed and replaced with copper pipes.

Photo 2: Tubercles found inside the pipes.

flow in the system, enabling the bacteria to continue growing.

There are a number of different bacteria found in association with MIC related corrosion and in order to establish the exact type, tests of the water system and the corrosion products will have to be carried out. At this stage however we can assume with a fair amount of certainty that the type we are dealing with is the Sulphate-Reducing Bacteria (SRB). This type of bacteria is known to grow in low oxygen environments with sufficient organic nutrients.

The incidence of MIC is becoming more frequent than ever before, which could also indicate to a deterioration of the quality of our fresh water supply in general.

Remedial action

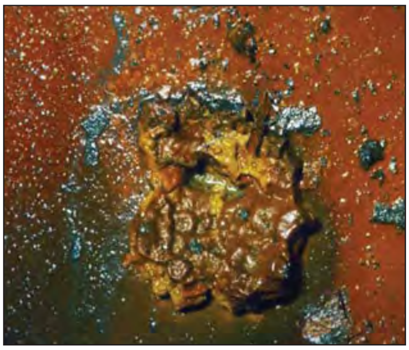
Once corrosion of a water feed system is noticed, it is too late to treat the bacteria and the only option left is the expensive route of replacing the rusted pipes. Chemical treatment processes are unfortunately very expensive and very toxic and not recommended for fresh water supply systems.

In most instances contractors opt to replace the rusted galvanized pipe with very expensive copper pipes or in some instances stainless steel pipes, without realizing that had the copper or stainless pipe been subjected to the same conditions as the galvanized pipe it would have suffered the same fate. In fact copper is actually more inclined to suffer from MIC than steel.

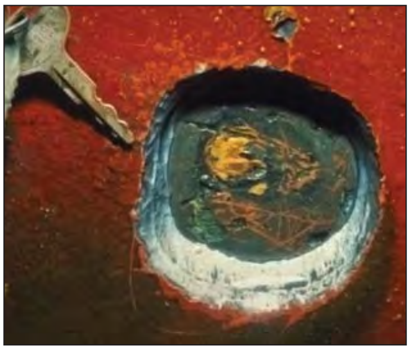
As hot dip galvanized pipe is the most preferred method to do water reticulation systems, mainly due to the strength and economics, it is also then unfortunately the first to suffer from MIC.

Tests must be carried out to determine the extend of the corrosion problem and where necessary to replace the pipes, before total failure and as stated before it is not necessary to replace the pipes with expensive copper or stainless steel pipes

According to one of the residents the water pressure has also deteriorated over time and despite the replacement



Close up of a singular SRB tubercle.



Close up of a cleaned out singular SRB tubercle.

of the rusted pipes the pressure is still not good. One can thus only assume that the corrosion products have caused the filter systems to have become blocked and it would be a good idea to clean and flush out the system to get rid of the corrosion products trapped in the pipes.

Conclusion

Although there is no doubt that the type of corrosion that we are dealing with is MIC, further studies need to be carried out to establish exactly which kind of bacteria we are dealing with. This will entail chemical analysis of the tubercles and an electron microscope investigation of the corrosion surface.

There is no doubt that there is a definite increase in MIC related corrosion types and at this stage one can only assume that the presence of certain types of micro organisms in our water supply are on the increase.

The Association wishes to thank Riaan Louw of Robor Galvanizers for this article.

Zinc: the element of human development

If zinc had a slogan it would be *the metal with might*. And also: *chemical element with a cause*.

More than half of the 12 million tons of zinc produced each year is used to protect steel from corrosion, making it last significantly longer.

Zinc also plays a vital role in strengthening the human body. It helps boost the immune system to fight off a wide-range of illness and enhances physical growth, particularly in young children. Zinc deficiency is rare in North America and is most common among children in developing countries. It weakens the immune system and leaves the body vulnerable to infectious diseases such as diarrhoea and pneumonia, which can lead to death. It can also cause slow growth in infants and children, including both physical and intellectual retardation.

Still, studies show about one-third of the world's population is zinc deficient. About half of the world's agricultural soil also lacks sufficient amounts of the micronutrient used not only to make food more nutritious, but also to increase crop production.

In China, the world's second-largest economy and home to about one-fifth of the global population, half of its arable land has been identified as being low in zinc.

The World Health Organisation calls zinc deficiency "a public-health problem," responsible for malnutrition of children in developing countries and behind hundreds of thousands of deaths worldwide.

It's a urgent issue the zinc industry, represented by the non-profit International Zinc Association , is tackling head on through partnerships with UNICEF and most recently China's Ministry of Agriculture.

The IZA's goal is to get more zinc into crop fertilisers and into the mouths of people who need it most.

While zinc producers can clearly benefit from increased use of zinc, IZA chairman Don Lindsay said it's the social agenda not a commercial angle that's driving the campaign.

Less than 1 per cent of annual zinc production today goes toward use in fertilisers and health supplements, Mr. Lindsay said.

"When you learn something can be done, you have to do it. It has nothing to do with generating new demand for zinc because it's a tiny amount," said Mr. Lindsay, whose day job is as chief executive officer of Vancouver-based Teck Resources Ltd., one of the world's largest zinc producers. Teck, which started out as a zinc company, generates about 15 per cent of its revenues today from zinc, with the bulk coming from copper and coal.

"It does benefit zinc's image worldwide. So much of it is education," added Mr. Lindsay, who is now serving his fourth year of a three-year term at the IZA.

He chose to stay on a bit longer, until this fall, to help the Organisation further some of its projects, including the Zinc Saves Kids campaign with UNICEF. The campaign not only raises awareness of zinc deficiency, but supports zinc-supplementation programs for children in poor nations around the world.

Most recently, the IZA has made a big push into China, a country with which Teck has developed a special relationship in recent years. In 2009, the nation's sovereign-wealth fund, China Investment Corp., invested $1.5-billion in Teck for a 17-per-cent stake in the diversified miner.

Mr. Lindsay capitalised on that new connection to help the IZA broker a partnership with the Chinese government to study and promote adding more zinc to fertiliser in the country. The initiative, announced this spring, will look at ways to both increase crop yields and improve nutrition of the foods produced in China.

Today, China has just 9 per cent of the world's arable land to feed 1.3 billion people, or about 22 per cent of the global population. It's also the world's largest consumer of fertiliser, accounting for 30 per cent of global supply. However, its soil has been depleted of micronutrients such as zinc, having been overpowered over the years by macronutrients such as nitrogen, phosphorus and potash.

The project with IZA "comes at the right time to correct zinc deficiency in Chinese soils," Xia Jingyan, director general of China's National Agro-Tech Extension Center), a division of the agriculture ministry, said in a recent statement.

"It will certainly accelerate zinc-fertiliser production and use in China."

According to a 2005 national nutrition study in China, about 40 per cent of the nation's children under age 6 suffer from zinc deficiency.

"What we are hoping is that, ultimately, governments [in China] will say, 'All fertilisers should contain zinc.'" Mr. Lindsay said.

Such a bold move would increase zinc demand by about one million tons annually, Mr. Lindsay estimates. Depending on overall market demand for zinc, that could result in increased production. Zinc inventories currently sit at about 800 000 tons in London Metal Exchange warehouses.

"That is basically where what we are doing is quite commercial for us, even though it has all of these wonderful social benefits," Mr. Lindsay said.

BRENDA BOUW - *The Globe and Mail* (May 20, 2011); *Canadian CTV News* (May 20, 2011)

On the Couch......

Nick Proome

By Desere Strydom

In this edition of On the Couch, we touch base with "the other half" of the largest architectural firm in KwaZulu Natal, Nick Proome of Elphick Proome Architects, having featured his partner George Elphick in Galvanizing Today in 2007.

Your education: I grew up in Northern Rhodesia (Zambia), in a little town called Choma and moved to Southern Rhodesia (Zimbabwe) to a town called Gwelo, where I completed my schooling.

How did you get into the field of architecture? When I was sixteen, a national art competition was launched called the Allied Arts Competition and the brief was to design your dream home. I came second nationally, which is kind of ironic, since I took both science and art subjects at school. In retrospect, my mother was a painter and my father a master craftsman in woodwork, so the creative element was always there. Quite frankly I found the idea of being an architect more appealing than being a lawyer or accountant. I studied architecture at UND (now UKZN) where I met my now partner George Elphick, who was a year ahead of me.

Do you have any role-models in the field of architecture? There are too many to mention, but I would like to focus my favourites on South African Architects that I feel have paved the way for a true South African Architectural style. They are Barnie Brits, Peter Rich and Joe Noero, and this is going back some time – mid 1970's. They have been successful in capturing the spirit of Africa – the look, feel and smell by means of using texture, colours and the history of Southern Africa in a more subtle way than some. I also greatly admire the work of my partner George Elphick, which I feel will go down in history as one of the best architects this country has seen.

The work of EPA regularly features the use of hot dip galvanizing, why is that? Well we have throughout the history of the practice used hot dip galvanizing. In effect it is always looking out for the client's best interest – i.e. cost saving in terms of longevity and maintenance. Quite frankly hot dip galvanized steel out-performs stainless steel in most instances. What people don't realise is that only the top grades of stainless steel are not prone to corrosion in most instances – whereas others corrode like normal steel would. Hence the superior performance and cost effectiveness of hot dip galvanized steel. What we have tended to do, is to implement duplex coating systems close to "eye and hand" leaving the rest exposed.

What are your thoughts on true South African Architecture? Unfortunately there still is a great tendency to "theme-ing", which has spilt over from residential developments into office development. Too many competent South African architects are still looking at Eurocentric solutions which might be visually attractive, but not appropriate in a South African context. We as a company endeavour to respond to any development firstly taking climate into consideration, then South African building techniques and lastly capturing textures, palettes and materials that talk of the light and shadows of Africa.

EPA have had many outstanding projects and won many awards – which project stands out for you and why? I would have to say the first project in my and George's partnership that won an Architectural Award of Merit – Action Bolt Warehouse, Springfield Park, Durban. Another for the "totality of the experience" was the Lesotho Postal Building in Maseru. This project forged relationships that have endured to this day. And currently the new Unilever dry food factory in Riverhorse Valley, which I dare say is a building of international standards.

EPA has had a long illustrious career, what makes your partnership so successful? They say opposites attract, but in my and George's case, we are very much alike. We share the same work ethic, are both relationship driven which has served us well in the industry in the sense that we have repeat clients and overall acceptance in the industry.

Please tell us a little bit about your family? I have been married to Michelle for 27 years. We are parents to Michael (26), Chantelle (24) and Roxanne (17). We are also the proud grandparents of an adorable little boy called Troy (1) who gives us much joy.

Hobbies and passions? I moved to Umdloti a few years ago, which has been an incredible joy. I do a little of the following, a lot less than I would like to: surfing, scuba diving and snorkelling. I am also heavily into wildlife and photography.

5pm Friday, Nick Proome... Contemplates the weekend. Ponders what the beach will have to offer and looks forward to spending time with his family in general.

Also see www.eparch.co.za and http://commentfromthecouch.blogspot.com

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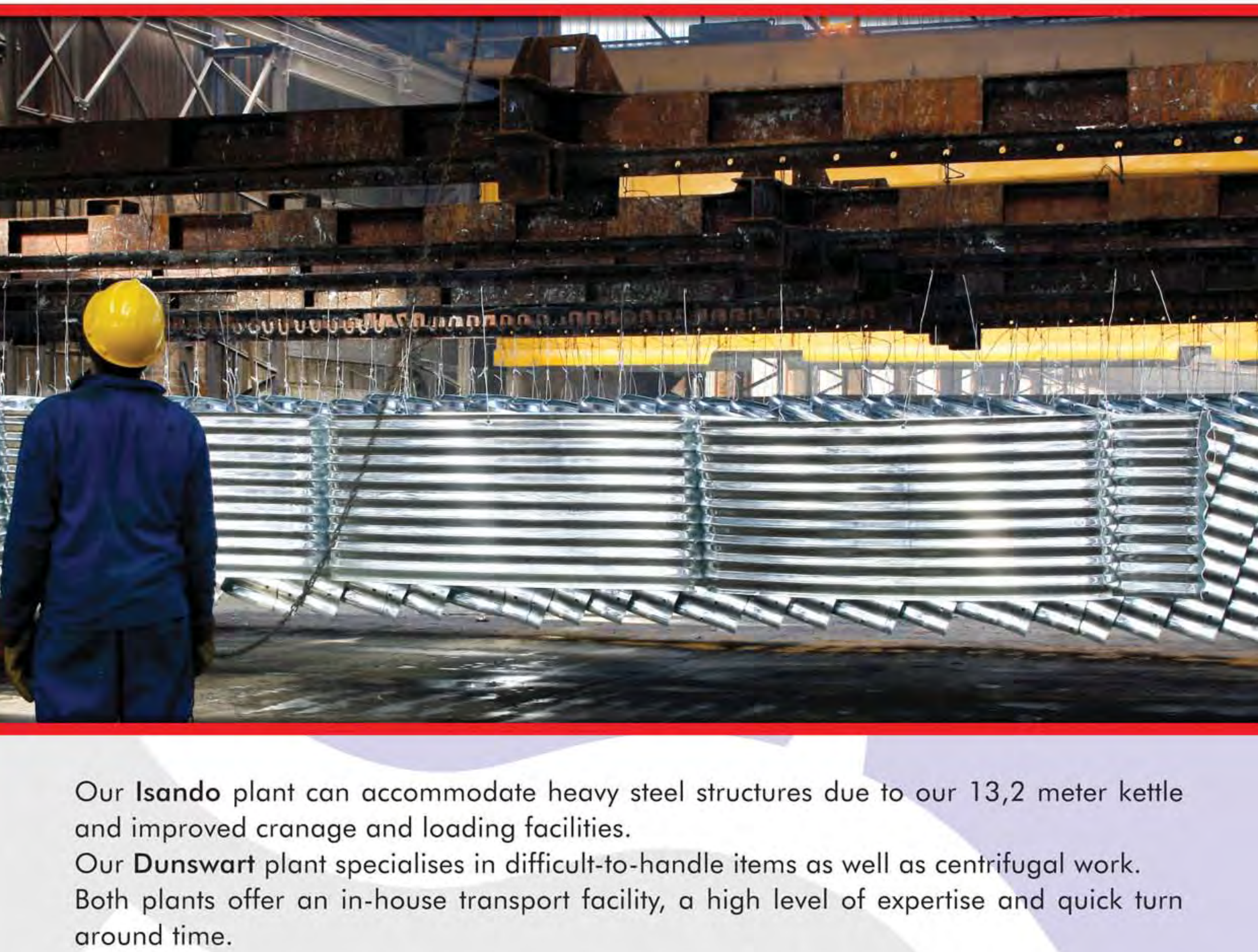

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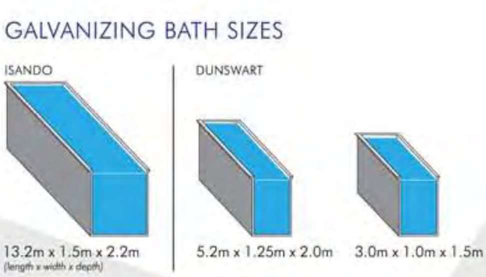
Our **Dunswart** plant specialises in difficult-to-handle items as well as centrifugal work.

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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