HOT DIP

GALVANIZING TODAY

2013 Volume 10 Issue 2

HOT DIP GALVANIZERS ASSOCIATION Southern Africa

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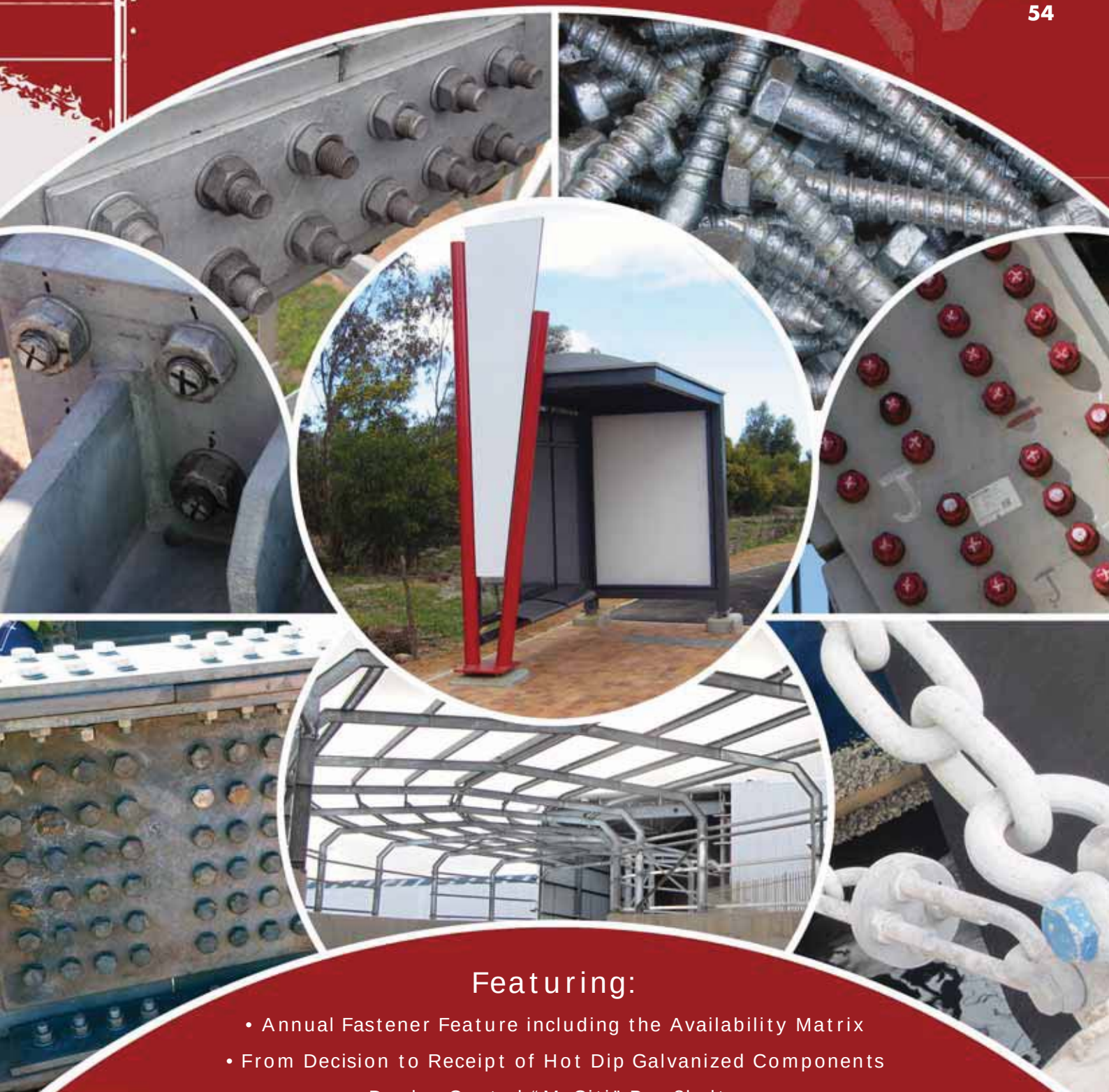

Featuring:

- Annual Fastener Feature including the Availability Matrix
- From Decision to Receipt of Hot Dip Galvanized Components
- Duplex Coated "MyCiti" Bus Shelters
- "Why would anyone want to paint a fence?"

Regulars: Education and Training including "Corrosion Economics Course"; Misconceptions; Bob's BANTER and On The Couch

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

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Front Cover: *A kaliedoscope of photos showing a duplexed "MyCiti" bus shelter in Cape Town, a unique hot dip galvanized structure in the IDZ in East London, some hot dip galvanized coach screws and anchor studs and various configurations of bolts on number of exciting projects in SA.*

Hot Dip Galvanizing – Adding value to Steel

Executive Director's Comment

Man's friendly metal

It has been suggested that zinc, similar to lead, is a "heavy" metal and therefore detrimental to human health. A visit to the internet will project a totally different story regarding zinc.

To quote; *"It's involved in the production of at least 300 enzymes and lends a hand in hundreds of body processes, from producing DNA to repairing cells.*

Zinc became a household word as an ingredient in cold lozenges during the 1990s or those sun screens from the 1980s, but physicians and nutritionists have always known it's a mineral that's necessary for good health.

Zinc earns its stripes by promoting immune function to fight illness, supporting healthy cell growth and development, and ensuring a proper sense of taste and smell. But since our bodies don't produce zinc, a daily intake is recommended to ensure healthy levels of this critical mineral [source:NIH]."

The role of zinc in galvanizing is that of corrosion control of carbon steel.

Zinc reacts with its environment "so called weathering" and forming a zinc carbonate surface patina, a matt grey surface finish. It does not shine! We refer to the zinc carbonate patina as a "barrier protection" or what we call our 1st line of defence.

Our 2nd line of defence, against corrosion of carbon steel, is "cathodic or sacrificial protection". This 2nd line of defence is only operative when four essentials are present. Carbon steel (1), zinc (2) must be in electrical contact (3) and both metals must be simultaneously exposed to the environment (4).

A small scratch or chip on a hot dip galvanized surface is not a major concern in that zinc (anode), being electro negative to carbon steel (cathode) with sacrifice itself to protect the exposed carbon steel. More importantly "under corrosion creep" is impossible.

From the above we can appreciate why zinc is referred to as "man's friendly metal".

Bob Wilmot

Note from the Editor

Soon after starting at the Hot Dip Galvanizers Association Southern Africa in 1996, Walter Barnett my early mentor and colleague, entrusted me to take control of the quarterly journal, which was then an 8 pager, fully sponsored by the Association's coffers.

The journal was initially called "HDG" and by the time I arrived it had been altered to "Galvanizing Today". For a number of strategic reasons this name was changed to "Hot Dip Galvanizing Today" in June 2002.

Despite the drain on HDGASA financial resources, Walter was not easily in favour of advertising. Only when we produced our Journal No. 19 where we combined it with the initial "Directory for Specifiers and Buyers" in 2004 did he conceded to the prospect of advertising.

However, seeing the positive effect the advertising had on our financial resources, Walter reluctantly agreed to future advertising in the journal.

While Sandra Addinall was onboard as the designer from the time I started, Anne van Vliet only joined us as Sub-Editor and to perform the vital task of selling advertising space from Journal No. 19.

Advertising in our next publication (Journal No. 20) comprised 2 x A4 and 3 x quarter sized adverts in its 32 pages.

The team has worked amazingly well over the last 9 years and taken the magazine from strength to strength. It now runs at a consistent 44 pages, graciously supported by an array of invaluable contributors, members and advertisers.

Anne has tirelessly influenced, cajoled and persuaded members and advertisers to the point that this edition of the magazine has been kindly supported by 9 x A4; 4 x half A4 and 9 x quarter A4 adverts.

Well done to both Anne and Sandra!

Just before finalising this magazine, I learnt of the untimely death of Andrew Dippenaar. Andrew was a good friend and colleague from the industry and will always be remembered for his original, rather clever adverts that he placed in this magazine. May your soul RIP Andrew.

The main feature for this edition is the Fastener Feature, incorporating the annual fastener availability matrix, where we welcome some changes and updates including the addition of the Lindapter and Hollobolt range of fixings and fasteners. We have two articles by Rob Pietersma of CBC, "Hot dip galvanizers hit by imports" as well as "Developments in construction bolting".

Included is a paper "From decision to receipt", giving motivations to improve communication and therefore quality of received hot dip galvanizing.

Bob Wilmot raises the question in an article, "Why would anyone want to paint a palisade fence?"

Under Duplex Coatings we include the Cape Town IRT "MyCiti" Bus Shelters and an article on one successful method of preparing hot dip galvanizing for painting – sweep blasting.

Regulars include Education and Training where besides the regular Association's courses, we introduce a significantly vital single day course on the Economics of Corrosion Protection, presented by Bob Andrew.

Also under this banner is the innovative new ultra/scan probe from the Elcometer 456.

Other regulars include Bob's BANTER, Misconceptions and On the couch where we chat to Nina Saunders, Vice President of SAIA.

Enjoy the "magazinc".

Terry Smith

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Developments in construction bolting

and, is all the torque worth the effort?

The use of construction bolt assemblies in terms of the new standard EN14399 has been underway for the best part of two years now. It has been a steep learning curve to say the least. This article has been written in order to share some of our experiences, to provide insights into technical jargon and to dispel some myths.

Myth: South African manufacturers are not geared up

Whilst it is true that manufacturers have been exposed to some nasty quality problems, these served as learning experiences and recent history has shown that there are at least two manufacturers who have stepped up to the challenge and who are able to produce the full requirements of the standard, including all testing and a subsequent zero failure rate is testimony to the achievement. When choosing the construction bolt route, clearly the first call is a supplier capability study with an audit of the quality system.

Up until the recent power station builds, very few construction bolts were being installed, hence there was a general lack of awareness and capability. This was on many fronts not just bolting. Medupi changed this and it has been clearly established that design engineers, manufacturers and construction companies had a long way to go to catch up with international developments and best practice standards. These include manufacturing, hot dip galvanizing, erection and welding (as we have seen in the press recently) and this list is probably incomplete.

Grade 10.9 vs grade 8.8

A question often asked is, why use a grade 10.9 bolt when there is an increased inherent risk of hydrogen embrittlement (HE) on hot dip galvanized product or other longer term risks such as hydrogen induced stress corrosion cracking (HiSCC)? Would a grade 8.8 bolt not be more advisable? In practice this is what some designers may suggest. However there are benefits to using a grade 10.9 bolt. Whilst the ultimate tensile strength of a 10.9 bolt is 25% greater than an 8.8 bolt, the clamping force is 41% greater, the yield strength being the defining difference. What benefit does this have? Firstly there is the potential to use fewer bolts which means fewer holes, less installation and therefore less cost. This is particularly the case in areas where installation conditions are challenging, for example, a mine lift shaft or structures with extreme height. Grade 10.9 is not much more expensive than grade 8.8 so this should not be the deciding factor. Secondly there is a far greater clamp load and in a fatigue application (vibratory movements or cyclical loading), the higher clamp load will avoid the cyclical loading risk. The risks of HE can be controlled by the manufacturer avoiding acid contact and controlling excessive hardness levels. Further risks associated with undue stressing of grade 10.9 HDG bolts will be avoided if good installation practice is adopted. What about the argument that grade 8.8 bolts have greater ductility and are friendlier to installation abuse (though not an excuse to engage in bad installation practices!)? This is perhaps a strong argument if the bolt has been tightened beyond the yield point, but this is generally not the case and the benefits of a higher clamp load over the grade 8.8 will apply. The greater elongation property of the 8.8 will result in earlier fatigue failure from stress relaxation.

EN14399-3 (grade 8.8 and 10.9) vs. EN14399-4 (grade 10.9 only)

Why a universal standard is not adopted is a puzzle. Clearly there were principles that were not negotiable which have led to two possibilities. The historical position has largely been maintained in that the EN14399-4 nut (previously DIN 6915), has a lower height. The intended reason is that the nut threads should fail first (not guaranteed) in the event of over tightening, purposefully avoiding a sudden bolt fracture, with installer safety being compromised. Usual construction practice is that one would like to see the bolt fail in the event of over tightening because one would know it had occurred, whereas with thread failure, this may not present immediately and a future calamity may be lurking when the right conditions prevail.

Torque vs. clamp (tension)

The talk is always about torque, whereas the objective is clamp, a spring type condition holding surfaces together. Torque (or the torsional rotation effort) is merely the means to getting to the correct clamping force. This whole process would be simple were it not for the introduction of friction. When tightening a bolt and nut assembly, 50% of the effort is as a result of friction between the nut and washer face, 40% is in the thread contact and a mere 10% of the effort is creating the clamping force. This friction can vary. In a rusted bolt and nut (B&N), the coefficient of friction is as much as 0.35. In a un-lubricated hot dipped galvanised B&N it starts at 0.19 and increases up to 0.27 as additional torquing takes place. With molybdenum disulphide lubrication (MoS_2), the coefficient of friction is 0.10 to 0.16. So, by way of example, in the case of torquing a M20 bolt at 464 Nm with a coefficient of friction of 0.14, clamping force of 127kN is achieved; when the coefficient is 0.10, less torque of 363Nm will achieve an increased clamp load of 134kN.

This leads us to the next important point, the lubrication of nuts.

Pre lubricated nuts (with molybdenum disulphide)

There may be a misconception, since there has been so much talk and use of pre-lubricated nuts that this is a new standard requirement. Whilst we recommend pre lubricated nuts for the reason there is a tested coefficient of friction that can be relied upon, this is by no means a general requirement. EN14399 specifically makes reference to surface finish as processed, meaning lightly oiled, or as agreed between purchaser and manufacturer. Nevertheless, appropriate lubrication is required during installation, particularly with hot dip galvanized bolts. In the case of no lubrication, galling will take place and in laboratory testing, we have established the potential of failure due to torsional tension.

In the case of the turn of nut method of fastening in the B&N assembly with lubrication, where potentially 25% to 35% additional clamp can be obtained than required by the standard without lubrication, the likelihood of thread failure is almost 100%. All the torque value will be absorbed by the galling effect of the soft galvanized layer and if the bolt has not started to fail due to torsion tension, the correct clamp will not have been achieved and a loose bolt left in place, with future potential failure consequences.

We really do recommend pre lubricated nuts that have been baked to a dry condition. The advantages; it avoids the wrong lubricant choice, incorrect lubricant application is avoided, the risk of attracting grit on nuts during installation due to sticky lubricant is reduced and, of paramount importance, certification of the coefficient of friction is supplied, together with recommended torque values.

Installation equipment

Many bolters rely on the torque wrenches having been recently calibrated. One of the over looked checks that needs to be undertaken is the wrench verification. This should take place on the day the wrench will be used by testing at least 3 bolts of the diameter to be installed with that wrench on that day. The verification takes place using a static torque meter. The reason for this verification is that calibration can change if, for example, the wrench was dropped. We have observed that many installers do not do verify their equipment, nor do they have the required equipment to undertake the verification.

Need it be said that hammer drill type impact wrenches are an absolute no! Their calibration cannot be verified.

continued on page 6...

	DIN 18800-7:2008			EN 1090-2:2008			SANS 10094:2005		Bolt Capability	
Bolts Size	Min. clamp	Recommended clamp	Angle method 120° result clamp	Min. clamp	Recommended clamp	Angle 90° from 75% torque, result clamp	Rec. clamp	Angle 180° from snug, result clamp	Ultimate Tensile strength Note 1	Max. bolt force Note 2
M20X120	160kN	172kN	160kN	172kN	189kN	220kN	178kN	217kN	274kN	241kN
M24X120	220kN	247kN	257kN	247kN	272kN	335kN	257kN	350kN	399kN	367kN
M30X135	350kN	393kN	495kN	393kN	432kN	560kN	408kN	575kN	636kN	603kN

Note 1: The ultimate tensile strength was obtained from a minimum of two samples tested from the same batch, not the bolt itself.

Note 2: The maximum bolt force is of the bolt under test itself and is lower in strength than the ultimate tensile strength because of additional torsion tension in the threads reducing the yield point of the bolt.

Table 1.

Laboratory testing of bolts clamp/tension

One of the requirements of EN14399 is the need to perform a suitability test to ensure that the fastener assembly will perform to certain minimum requirements. In this process the angle of rotation is measured from a pre determined pre load through to the maximum bolt force obtained before the force starts reducing again and, where necessary, to failure. It has been most interesting to compare some of the results of the different angle options, or nut rotations, included in different standards and this raises some questions. *(See table 1)*

- Generally in terms of the angle method recommended by DIN 18800-7, in the three samples tested, the clamp load achieved was at or above recommended. In the case of M24 and M30, while the clamp loads were above recommended clamp, this was not more than 82% of the maximum bolt force achieved (M30).
- In terms of EN 1090-2:2008 the angle method prescribes 75% of the torquing by wrench first and only a final 90° turn. The clamp achieved is above recommended in all case and consistently ±92% of the maximum bolt force in each case.
- In respect of the 180° angle method, again the clamp force is above recommended and in the case of M20, 9O% of the maximum bolt force, M24, 95% of the maximum bolt force and M30, 95% of the maximum bolt force. The start snug point used in the case of the M20 was according to recommended DIN18800-7 table, ~ 11% of clamp; whereas when the full force of a spanner on a tension/torque meter was used to determine snug tight under this condition, there was a difference of 40°. This would have had increased the clamp load by ~18kN, resulting in 235kN clamp, 97.5% of maximum bolt force. This illustrates one of the disadvantages of the angle method, namely 'snug' rather subjective.

In terms of ISO 898 bolt testing requirements, the proof load test is 80% of ultimate strength, whereas in the result above, clamp loads of up to 90% of the ultimate tensile strengths are being obtained (M30). More importantly, clamping levels of 95% to 98% of the maximum force of the bolt are being obtained. These high levels of clamp beg the questions; is all the effort for this stretch of the bolt capability necessary and does it leave any reserve should a shock event occur? Does any risk arise from the fact that the bolt has moved out of an elastic property to a plastic condition? Further, because of the elevated stress in the bolt, does this not create a fertile condition for HiSCC to arise? Nevertheless, the angle method is still widely and internationally applied and it is acknowledged that use of this method will result in the bolt moving into the plastic zone beyond the yield point of the bolt.

Fat tail outcomes and conclusion

Recently an economist referred to "a fat tail outcome", a phrase I have not come across. The reference was to our

OBITUARY

Len Avellini

On 7 April 2013, Len Avellini, Durban Structural Steel Industry legend lost the battle after a long illness bravely borne.

He will be sorely missed in the steel fraternity for his generous spirit and sense of humour.

Association staff wish to convey their condolences to Len's wife and children.

weakening Rand and the consequences thereof, still to be witnessed. When Googled, I found the meaning: "The relatively high probability of a relatively extreme outcome".

My experience in the field is that there is poor communication between original design engineers through all the manufacturers of components including B&N manufacturers to the installer tightening the final bolt. This can result in mistakes. Medupi Power station is testimony to this and it is no wonder the delays being experienced. Some of infield mistakes these we have observed will not result in fat tail outcome, include, a request for Nylock nuts for EN 14399 construction bolts, failing this, Clevelock nuts. We advised accordingly and implemented training. Another example is, torquing M20 grade 10.9 bolts to M24 levels. Fortunately in this case the installers had no lubrication with the result that the increased coefficient of friction was absorbed in the torquing and the resultant clamp was 205Kn, and whilst 19% above recommended, was 16% below the yield point of the bolts. Luckily threads were not damaged either. Fortunately, many mistakes are covered by the tendency to "over design/deliver", not only in bolt manufacture but also in structure design. As a result problems get caught in a normal distribution curve of applied margin of safety and no fat tail outcome emerges.

The greatest "fat tail outcome" has been where design engineers have not been involved in the pre qualification of manufacturers and audit of their quality systems, nor have they ensured that complete certification based on comprehensive testing is in place. Thereafter, they have not been on site verifying compliance to their original specification, a responsibility prescribed in regulations of the Occupation Health and Safety Act. On the contrary, where all this has been undertaken timeously and diligently, we have seen trouble free, home runs. Where this was deficient, particularly in the early stage of manufacturer pre qualification, fat tail outcomes have often prevailed.

Design engineers and primary contractors must be tasked with the "cradle to grave" responsibility in order to avoid a high probability of a negative extreme outcome. Both local and international players need to learn from these experiences (where some significant school fees have been paid), to benefit from bolting future major projects together.

Prepared By: R J Pietersma, CBC Fasteners (Pty) Ltd, April 2013.

Hot dip galvanizers hit by imports

The importation of fasteners has escalated over the last two decades on an exponential level. Whereas in 1994 total imports of bolts (including set screws) and nuts was a mere 1 400 tons, by 1998 this had escalated to 9 400 tons and in 2012 this was 30 800 tons of which 95% was from Asian low cost producers. The increase in imports from Asian countries of some 14 000 tons over the last twenty years can be closely correlated to the decline in steel despatches from steel producers. It is not true that only the fastener manufacturers have been affected. Hot dip galvanizers and electro platers have all seen their volumes drop as a result of the influx of imports.

Whilst some rationalisation of the fastener industry took place with the merger of National Bolts and CBC Fastener in 2000, there have nevertheless been further victims along the way. This includes fastener manufacturers disinvesting (Nedscroef) and also partial closures. In speaking to galvanizers, they have also been affected and had to engage in retrenchments, closures of lines and increased mechanisation. In the context of South Africa's high unemployment, the need to protect our market is paramount, particularly where unfair trade practices are involved.

The road of protecting our South African market commenced in the late 90's. Initially the success was in getting a dumping duty on nuts and bolts against China. However importers were innovative in circumventing the duty on bolts by excluding set screws (fully threaded bolts). It was only from 2011 that separate tariff headings were established for bolts and set screws as well as including stainless steel fasteners under new tariff headings. All this gave greater visibility as what exactly was taking place and as a result a dumping duty of 73% was obtained on set screws against China from November 2012. Unfortunately four Chinese exporters were excluded from this duty on the basis of negative dumping being demonstrated up to 21%. This is difficult to believe because the disparity between a positive duty of 73% to a negative dumping duty of 21% is just too great to be plausible on a virtual commodity priced product. This same anomaly seems to have also taken place in the threaded rod industry where in spite of injury being proven, negative dumping was established negating protection sorely required.

In the meantime switching of imports from China to other Asian countries already commenced on bolts and nuts in the 2002 and this trend has been observed now on set screws. Circumvention has also been highlighted by imports being re directed through other countries. The most blatant of this is the importation of 73 tons of set screws through Singapore at an average of R7 032/ton immediately after the set screw dumping duty was imposed. Singapore does not have manufacturing facilities for fasteners, had not exported any fasteners to South Africa in the preceding 15 months and further, at R7 032/ton, this is barely the price of steel so this is also a case of gross under invoicing.

Where to from now? Job preservation in manufacturing South Africa is a high priority. The retention of a viable fastener manufacturing industry is essential together with the associated downstream value add activities. Hot dip galvanizers and electro platers are collectively in support of South African fastening manufacturers in making another concerted push to defend the industry. Watch this space.

Rob Pietersma-Chairman, The South African Fastener Manufacturers Association.

Fastener availability matrix and participating fastener suppliers

From experience it has been shown that on many occasions at building sites, alternatives to hot dip galvanized such as zinc electroplated fasteners are mistakingly used. In order to provide a similar service life to that of the hot dip galvanized structure, it is important to specify and use hot dip galvanized fasteners to SANS121:2011 (ISO1461:2009) or ISO 10684 as applicable. To this end we provide the following "Fastener Availability Matrix", indicating the feasibility and availability of a range of hot dip galvanized fasteners, etc. Should a particular fastener that you require not be listed, kindly contact one of the participating fastener suppliers at the end of this matrix or the Association.

TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
LOCKING NUTS							
Hard Lock Nuts	Impala Bolt & Nut	MS/HT			M8 – M30	Yes	Yes
	Mr. Bolt & Nut	Gr: 4.8/Gr: 8			M8 – M48	Yes	
	SA Bolt Manufacturers	Gr: 4.8/Gr: 8			M8 – M64	Yes	
	Tel-Screw Products	MS/HT			M8 – M48	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	Yes
Castle Nuts	Mr. Bolt & Nut	Gr: 8			M8 – M30	Yes	
	Tel-Screw Products	MS/Gr: 8			M8 – M100	Yes	
Steel Hex Lock Nuts	Mr. Bolt & Nut	MS/Gr: 8			M8 – M100	Yes	
	SA Bolt Manufacturers	MS			M8 – M64	Yes	
	Tel-Screw Products	MS/HT			M8 – M100	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M8 – M48	Yes	
Crimped Nuts	Impala Bolt & Nut	MS			M8 – M48	Yes	
	Mr. Bolt & Nut	MS			M8 – M48	Yes	
	Tel-Screw Products	MS			M8 – M48	Yes	
Locking Washers	Mr. Bolt & Nut	MS			M8 – M52	Yes	
	Tel-Screw Products	MS			M8 – M52	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M8 – M52	Yes	
Nyloc Nuts Most smaller size nyloc nuts are only available in electroplated form. Refer to Cleeve Lock Nuts below.	CBC Fasteners	Gr: 8			M6 – M48		
	Impala Bolt & Nut	Gr: 8			M6 – M48		
	Mr. Bolt & Nut	Gr: 8			M6 – M48		
	Tel-Screw Products	Gr: 8			M6 – M48		
Cleeve Lock Nuts	Mr. Bolt & Nut	Gr: 8			M8 – M30	Yes	Yes
	Tel-Screw Products	Gr: 8			M8 – M30	Yes	
Prevailing Torque Hex Lock Nuts	Tel-Screw Products	Gr: 8 & 10	DIN 980V		M8 – M30	Yes	
NORMAL NUTS							
Hex OS Nuts	CBC Fasteners	Gr: 8	DIN 934	ISO 4032	M8 – M30	Yes	Yes
	Impala Bolt & Nut	Gr: 8	DIN 934		M8 – M30	Yes	Yes
	Mr. Bolt & Nut	MS Gr: 8 Gr:10			M8 – M30	Yes	
	SA Bolt Manufacturers	MS/Gr: 8 & 10	DIN 934	ISO 4032	M8 – M64	Yes	Yes
	Tel-Screw Products	Gr: 8; 10 & 12	DIN 934	ISO 4032	M8 – M64	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M64	Yes	Yes
Hex Long OS Nuts	Mr. Bolt & Nut	MS/HT			M8 – M16	Yes	
	Tel-Screw Products	MS/HT	TSP		M8 – M48	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36	Yes	Yes
Shear Nuts or Anti-vandal Nuts	Impala Bolt & Nut	MS			M8 – M16		Yes
	Mr. Bolt & Nut	MS			M8 – M20	Yes	
	SA Bolt Manufacturers	MS/HT			M12 – M24	Yes	Yes
	Tel-Screw Products	MS/HT			M8 – M48	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M24	Yes	
Flanged Nuts	Mr. Bolt & Nut	MS			M8 – M10	Yes	Yes
	SA Bolt Manufacturers	MS HT			M8 – M36	Yes	Yes
	Tel-Screw Products	MS/HT			M8 – M36	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M8 – M16		Yes
WASHERS							
Thru Hardened Washers	CBC Fasteners	Gr: 8			M6 – M48	Yes	
	Impala Bolt & Nut	MS	DIN 6916		M10 – M30	Yes	
	Mr. Bolt & Nut	G:10			M6 – M48	Yes	Yes
	SA Bolt Manufacturers	Gr: 8			M8 – M64	Yes	
	Tel-Screw Products	MS	DIN 6916		M10 – M64	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes

continued on page 10...

TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
WASHERS (continued)							
Flat Washers	Impala Bolt & Nut	MS	DIN 120/125		M8 – M30		Yes
	Mr. Bolt & Nut	MS			M6 – M64	Yes	Yes
	SA Bolt Manufacturers	MS	DIN 120/125		M8 – M64	Yes	
	Tel-Screw Products	MS	DIN 120/125		M8 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M76		Yes
Square Flat Washers	Mr. Bolt & Nut	MS Taper			M10 – M24	Yes	Yes
	SA Bolt Manufacturers	MS			M8 – M30	Yes	
	Tel-Screw Products	Specially manufactured to order			M6 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M30		Yes
Square Curved Washers	Mr. Bolt & Nut				M8 – M76	Yes	Yes
	SA Bolt Manufacturers	Specially manufactured to order			M16 – M30	Yes	
	Tel-Screw Products	Specially manufactured to order			M6 – M76	Yes	Yes
Spring Washers	Impala Bolt & Nut		DIN 127		M8 – M30		Yes
	Mr. Bolt & Nut				M8 – M36	Yes	Yes
	SA Bolt Manufacturers		DIN 127		M8 – M48	Yes	
	Tel-Screw Products		DIN 127		M8 – M64	Yes	
	WLS Fastener Manufacturing Co. cc				M8 – M36		Yes
BOLTS AND SCREWS							
Hex Head Screws	CBC Fasteners	MS	DIN 558	ISO 4018	M18 – M30	Yes	Yes
	CBC Fasteners	Gr: 8.8 & 10.9	DIN 933	ISO 4017	M8 – M30	Yes	Yes
	Impala Bolt & Nut	MS	DIN 658		M8 – M24		Yes
	Impala Bolt & Nut	Gr: 8.8	DIN 933		M8 – M30		Yes
	Mr. Bolt & Nut	MS/Gr: 8 & 10			M8 – M64	Yes	
	SA Bolt Manufacturers	MS/Gr 8.8; 10.9; 12.9	DIN 933		M48 – M72	Yes	Yes
	Tel-Screw Products	MS/Gr: 8.8			M8 – M39	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	Yes
Hex Head Bolts and OS Nuts	CBC Fasteners	MS	DIN 601	SABS 135	M8 – M30	Yes	Yes
	Impala Bolt & Nut	MS	DIN 931		M8 – M30	Yes	Yes
	Mr. Bolt & Nut	MS			M8 – M36	Yes	
	SA Bolt Manufacturers	MS	DIN 601		M10 – M64	Yes	Yes
	Tel-Screw Products	MS/HT	DIN 601		M8 – M39	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes
Hex Head Bolts and OS Nuts (High tensile)	CBC Fasteners	Gr: 8.8 & 10.9	DIN 931	ISO 4014	M8 – M30	Yes	Yes
	Impala Bolt & Nut	Gr: 8.8 & 10.9	DIN 931		M8 – M30	Yes	Yes
	Mr. Bolt & Nut	Gr 8.8 & 10.9			M8 – M52	Yes	
	SA Bolt Manufacturers	Gr 8.8; 10.9; 12.9	DIN 931		M10 – M64	Yes	Yes
	Tel-Screw Products	Gr 8.8; 10.9; 12.9	DIN 931	ISO 4014	M10 – M64	Yes	Yes
	WLS Fastener Manufacturing Co. cc	HT			M8 – M36		Yes
Large Dia Bolts and OS Nuts	CBC Fasteners	Gr: 8			M30 – M76	Yes	
	Mr. Bolt & Nut	MS/Gr 8.8			M27 – M64	Yes	
	SA Bolt Manufacturers	Gr: 8.8 & 10.9			M27 – M64	Yes	
	Tel-Screw Products	MS/Gr: 8.8			M36 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS HT			M39 – M76	Yes	
Cup Head Square Neck Bolts and OS Nuts	CBC Fasteners	MS	SABS 1143		M8 – M20	Yes	Selected
	Impala Bolt & Nut	MS	DIN 603		M8 – M16	Yes	Certain sizes
	Mr. Bolt & Nut	MS			M8 – M30	Yes	
	SA Bolt Manufacturers	MS	DIN 603		M8 – M24	Yes	
	Tel-Screw Products	MS	DIN 603	SABS 1143	M8 – M20	Yes	Selected
	Tel-Screw Products	Gr: 8.8	DIN 603	SABS 1143	M8 – M30	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M20	Yes	
C/Sunk Square Neck Bolts and OS Nuts	CBC Fasteners	MS	SABS 1143		M10 – M20	Yes	
	Impala Bolt & Nut	MS	DIN 605		M10 – M16	Yes	
	Mr. Bolt & Nut	MS			M8 – M24	Yes	
	SA Bolt Manufacturers	MS	DIN 605		M8 – M33	Yes	
	Tel-Screw Products	MS/HT	SABS 1143		M8 – M30	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M10 – M20	Yes	
C/Sunk Nib Bolts and OS Nuts	CBC Fasteners	MS	SABS 1143		M12 – M24	Yes	
	Impala Bolt & Nut	MS	DIN 604		M10 – M20	Yes	
	Mr. Bolt & Nut	MS			M12 – M30	Yes	
	SA Bolt Manufacturers	MS	DIN 604		M12 – M36	Yes	
	Tel-Screw Products	MS	SABS 1143		M8 – M24	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M12 – M24	Yes	

continued on page 12...

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TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
BOLTS AND SCREWS (continued)							
Friction Grip Bolts and Nuts	CBC Fasteners	Gr: 8.8S & 10.9		EN 14399	M16 – M30	Yes	
	CBC Fasteners	Gr: 8.8S & 10.9S	SABS 1282	ISO 7411	M12 – M30	Yes	
	Impala Bolt & Nut	Gr: 8.8S & 10.9S			M12 – M30		Yes
	Mr. Bolt & Nut	Gr: 10.9			M12 – M30	Yes	
	SA Bolt Manufacturers	Gr: 8.8 & 10.9S			M12 – M30	Yes	
	Tel-Screw Products	Gr: 8.8 & 10.9S	SABS 1282	ISO 7411	M8 – M48	Yes	
Hex Socket C/Sunk Head Screws	Mr. Bolt & Nut	Gr: 10.9 & 12.9			M12 – M24	Yes	
	SA Bolt Manufacturers	Gr: 10.9 & 12.9			M8 – M48	Yes	
	Tel-Screw Products	Gr: 10.9 & 12.9			M8 – M48	Yes	
	WLS Fastener Manufacturing Co. cc	HT			M8 – M24	Yes	
Lockbolts	Impala Bolt & Nut Pins & Collars ½" - ⅞"	8.8 Pins/6.8 collars			½" – ⅞" (imperial)	Yes	
	Mr. Bolt & Nut	8.8 Pins/6.8 collars			½" – ⅞" (imperial)	Yes	
	SA Bolt Manufacturers	8.8 Pins/6.8 collars			½" – ⅞" (imperial)		
Pigtails – 1 & 1½ Turn	Mr. Bolt & Nut	MS			M8 – M12	Yes	
	Tel-Screw Products	MS			M8 – M72	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M24	Yes	
3m – Threaded Rod	Impala Bolt & Nut	MS/HT	DIN 975		M8 – M24	Yes	
	Mr. Bolt & Nut	MS/Gr: 8.8			M10 – M30	Yes	
	SA Bolt Manufacturers	MS/HT	DIN 975		M8 – M36	Yes	
	Tel-Screw Products	MS/HT	DIN 975		M10 – M72	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes
1m – Threaded Rod	CBC Fasteners	MS	DIN 975				
	Impala Bolt & Nut	MS/HT	DIN 975		M8 – M24	Yes	Selected
	Mr. Bolt & Nut	MS/HT			M8 – M52	Yes	
	SA Bolt Manufacturers	MS/HT	DIN 975		M8 – M36	Yes	
	Tel-Screw Products	MS/HT	DIN 975		M8 – M72	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes
HD Bolts (Foundation Bolts) and OS Nuts	Impala Bolt & Nut	MS/350WA			M8 – M72	Yes	
	Mr. Bolt & Nut	MS/EN8			M8 – M72	Yes	
	SA Bolt Manufacturers	MS/HT			M12 – M72	Yes	Selected sizes
	Tel-Screw Products	MS/HT			M8 – M72	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M72	Yes	
CONCRETE ANCHOR BOLTS							
Rawlbolts	Mr. Bolt & Nut				M8 – M24	Yes	
Chemical Anchors with Studs	Mr. Bolt & Nut	MS/EN8			M8 – M64	Yes	
	SA Bolt Manufacturers	EN8			M8 – M30	Yes	
	Tel-Screw Products	MS/HT			M8 – M36	Yes	Yes
	WLS Fastener Manufacturing Co. cc	EN8			M8 – M30	Yes	Yes
Concrete Anchor Bolts	Mr. Bolt & Nut	MS		BBA	M8 – M24	Yes	
	Tel-Screw Products	MS			M8 – M36	Yes	
Concrete Expansion Bolts	Tel-Screw Products	MS/HT			M8 – M30	Yes	
MISCELLANEOUS							
Type 17 Self Drilling Screws	Mr. Bolt & Nut				#8 – # 14	Yes	
Gutter or Veranda Bolts	Mr. Bolt & Nut	MS			M8 x 22 – 75mm		Yes
	Tel-Screw Products	MS			M8 – 12 – 100mm	Yes	
Self Drilling Screws	Mr.Bolt & Nut	MS			Various	Yes	
SDS can be successfully hot dip galvanized but due to a slight thread softening, a smaller diameter pilot hole must first be drilled	WLS Fastener Manufacturing Co. cc					Yes	
Cast-In Lifting Sockets	Tel-Screw Products	MS/HT		BBA	M8 – M24	Yes	
SPECIAL FASTENERS							
Countersunk Machine Screws	Mr. Bolt & Nut	MS/HT				Yes	
	Tel-Screw Products	MS/HT	DIN 963 & 965		M8 – M36	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	
Round U-Bolts	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	SA Bolt Manufacturers	MS/HT			M8 – M72	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes

continued on page 14...

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TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
SPECIAL FASTENERS (continued)							
Square U-Bolts	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	SA Bolt Manufacturers	MS/HT			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	
TV U- Bolts	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
Hook Bolts	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	SA Bolt Manufacturers	MS/HT			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
Channel Bolts	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
J-Bolts	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	SA Bolt Manufacturers	MS/HT			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
Eye-Bolts	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	SA Bolt Manufacturers	MS			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M76	Yes	
Straining Eye-Bolts	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M24	Yes	
Linked Eye-Bolts	Mr. Bolt & Nut	MS/HT			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
Linked Eye Nuts	Mr. Bolt & Nut	MS/HT			M8 – M76	Yes	
Linked Eye Rods	Mr. Bolt & Nut	MS/HT			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
Forged Eye-Bolts	Mr. Bolt & Nut	MS/HT			M8 – M30	Yes	
	SA Bolt Manufacturers	MS/HT			M8 – M30	Yes	
	Tel-Screw Products	MS/HT			M8 – M30	Yes	
Welded Eye-Bolts	Mr. Bolt & Nut	MS			M8 – M16	Yes	
	Tel-Screw Products	MS			M8 – M36	Yes	
Scaffold Rings	Mr. Bolt & Nut	MS			M8 – M16	Yes	
	Tel-Screw Products	MS			M8 – M16	Yes	
Threaded Studs	Mr. Bolt & Nut	MS EN8 B7			M8 – M76	Yes	
	SA Bolt Manufacturers	MS/HT			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	Yes
Tie Rods	Mr. Bolt & Nut	MS			M8 – M76	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
Other specials	Impala Bolt & Nut	All specials relating to fasteners			M8 – M72	Yes	
	Mr. Bolt & Nut	Any special manufactured to specification				Yes	
	SA Bolt Manufacturers	Any special manufactured fasteners				Yes	
	Tel-Screw Products	Specials manufactured to order			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
Domed Head or Cap Nuts	Mr. Bolt & Nut	MS			M8 – M20	Yes	
	Tel-Screw Products	MS/HT	DIN 1587		M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	
Hex Coach Screws	Mr. Bolt & Nut	MS/HT			M8 – M20	Yes	
	SA Bolt Manufacturers	MS			M8 – M20	Yes	
	Tel-Screw Products	MS	DIN 7976		M8 – M12	Yes	Yes
Lindapter Clamps							
A	Lindapter Strutfast	Malleable Iron			M8 – M24	Yes	Yes: M12, M16 & M20
B	Lindapter Strutfast	Malleable Iron			M8 – M24	Yes	Yes: M12, M16 & M20
AF	Lindapter Strutfast	SG Iron			M12 – M24	Yes	Yes: M12, M16 & M20
CF	Lindapter Strutfast	SG Iron			M12 – M20	Yes	Yes: M12, M16 & M20
LR	Lindapter Strutfast	Malleable Iron			M10 – M24	Yes	
D2	Lindapter Strutfast	Malleable Iron			M10 – M24	Yes	
BR	Lindapter Strutfast	Malleable Iron			M12 – M24	Yes	

TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
Lindapter Clamps (continued)							
RC	Lindapter Strutfast	Forged Steel			M12 – M24	Yes	
HD	Lindapter Strutfast	Malleable Iron			M20 – M24	Yes	
Hollo-Bolts							
HB Standard Hollow-Bolt	Lindapter Strutfast	Steel			M8 – M20	Yes	Yes: M8 – M12
Floor Fixings							
FF Floorfast	Lindapter Strutfast	Malleable Iron			M8 – M12	Yes	Yes: M12
GF Gratefast	Lindapter	Malleable Iron			M8 – M12	Yes	Yes: M10

OS – Over Sized / MS – Mild Steel / HT – High Tensile

THE ABOVE FASTENER AVAILABILITY MATRIX IS NOT NECESSARILY COMPREHENSIVE AND TOTALLY REPRESENTATIVE OF THE FASTENER SUPPLY INDUSTRY BUT INCLUDES PARTICIPATING MANUFACTURERS AND STOCKISTS.

THE ASSOCIATION ASSUMES THAT ALL PARTICIPATING COMPANIES IN THE MATRIX, DO IN FACT STOCK OR ORDER HOT DIP GALVANIZED FASTENERS WHEN REQUESTED TO DO SO. THE ASSOCIATION THEREFORE, EXCLUDES ITSELF FROM THE RESPONSIBILITY OF ENSURING THAT ALL FASTENERS OFFERED WILL IN FACT BE HOT DIP GALVANIZED, BY THESE COMPANIES.

SHOULD ANYONE USING THIS MATRIX FIND INACCURACIES OR ERRORS OR HAVE ADDITIONAL SUGGESTIONS, KINDLY CONTACT THE EDITOR.

PARTICIPATING FASTENER SUPPLIERS CONTACT DETAILS			
COMPANY	**TELEPHONE**	**EMAIL**	**WEBSITE**
CBC Fasteners	011 767 0000	tech@cbc.co.za	www.cbc.co.za
Impala Bolt & Nut	011 824 3925	adiamond@impalasa.co.za	www.impalabolt.co.za
Lindapter	+44 (0) 1274 521444	enquiries@lindapter.com	www.lindapter.com
Mr. Bolt & Nut	021 511 9805	mark@mrboltandnut.co.za	–
SA Bolt Manufacturers	011 814 2240	info@sabolt.co.za	www.sabolt.co.za
Strutfast	011 473 1212	sales@strutfast.co.za	www.strutfast.co.za
Tel-Screw Products (Pty) Ltd	011 898 3200	info@telscrew.co.za	www.telscrew.co.za
WLS Fasteners	011 882 1150	wlsandrew@telkomsa.net	www.kalm.de

Corrosion protection of a giant cross that protects Van Staden Bridge

A member of the Hot Dip Galvanizers Association of Southern Africa, Galvanising Techniques has been part of a visionary project taking place in the Eastern Cape.

In the 41 years since it was opened in November 1971, 87 people have jumped to their deaths from the concrete arch bridge over the Van Staden River near Port Elizabeth.

At the end of last year a man was given a vision to create something that would help to protect and turn away the distraught people that come to this bridge to end their lives. That man was Robbie Hift and the vision he had was to build a giant cross on the mountainside facing the infamous bridge.

Very quickly Hift's vision was caught by many others, including the farmer who owns the land where the cross is to be erected. An architectural technologist and a structural engineer offered their services for free and designed a scale diagram for the steel cross. Land was cleared and a 3m steel pedestal *(see photo)* capable of supporting the 14m high cross was embedded in a deep concrete foundation. This foundation is strong enough to provide support for the cross to withstand winds of up to 200km an hour.

Dave Truter, the owner of Trekliners in Port Elizabeth caught the vision, and he promised, "When the steel cross is built, we will clad it with white plastic to make it visible from 800 meters across the Van Stadens Valley".

Brian Van Niekerk, the managing director of Rhino Plastics in Port Elizabeth promised to illuminate the entire structure with the most up to date technology, using solar lighting. But Robbie Hift's biggest challenge was to find the R100 000 he needed to purchase the steel and the money needed to construct it and protect it against corrosion.

Taking courage from the enthusiastic support of so many, Robbie then approached the first steel company. To his astonishment, the marketing manager immediately offered to contribute some of the steel required and suggested he contact other steel suppliers in the Eastern Cape to share the load. They caught the vision and his steel supply was secured!

Next, Jan Gunn the owner of G Force Engineering in Jeffreys' Bay offered to build the cross and then Ian Parker from Metalman in Port Elizabeth bent over backwards to help. Ian committed to hot dip galvanize the components saying, "You give us all the sections of the steel cross and we will hot dip galvanize them free of charge. That cross will never rust!"

The giant cross' final protection comes from Smhart Security, a large security firm in the Eastern Cape. The owner, Carl Trahms offered to organise palisade fencing and provide life-long security against vandals. It seems that all remains to be said is that "It's the steel that makes the vision real!" Follow the progress as the story unfolds at www.ecmirror.co.za.

Lion's Den, disused old zoo, Groote Schuur Estate, Cape Town

A hot dip galvanized case history

On the slopes of Table Mountain, just above the land presently occupied by the University of Cape Town and opposite the tarred access road, a cage like structure was built in 1897 to house lions. In 1930 this structure was demolished and replaced by a new lion enclosure which was known as Groote Schuur Zoo *(photo 1)*. It has been vacant since 1975.

The zoo was built by Cecil Rhodes, a British imperialist and expansionist who had two countries named after him, and who lived in the late 19th century. The zoo was his private menagerie project. His idea for the menagerie was that it should contain animals from all over the British Empire.'

Rhodes was very specific about the fact that the zoo should be open to the public, but to a very particular public: a middle class [white] settlers public. It was to be a place where people would come to promenade on Sunday. He had the animals brought in and he was gifted a lot of them from all over the Empire.' It is believed that Rhodes had a fondness for the lion as 'King of Beasts', symbolising the dreams and aspirations of the British Empire.

When they closed the zoo in the 1980s people started living in the cages. In

continued on page 18...

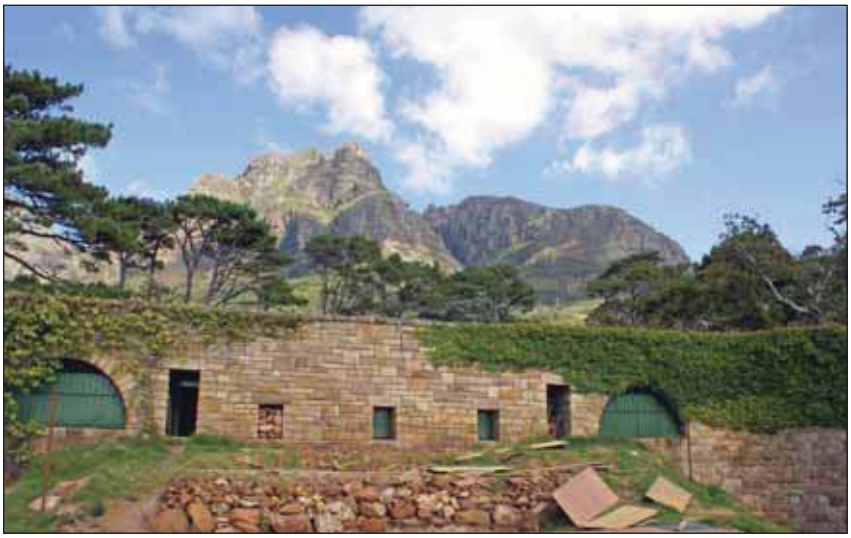


Photo 1.

Photo 2.

Photo 3.

Photo 4.

Photo 5.

Photo 6.

Photo 7.

Photo 8.

Photo 9.


Photo 10.

Photo 11.

the middle of last year a group of students moved in and they used it as an informal exhibition space.'

When and why the hot dip galvanized balustrade and handrailing was installed is anyone's guess. As the lion's enclosure was revamped a little after 1930 and the Zoo was vacated in 1975, it's logical to conclude that it was installed possibly somewhere between these two dates. This would mean the galvanizing is over 50 years old.

Looking at the condition of the hot dip galvanized coating it clearly shows it is still very much intact despite being exposed to an environment which is classified as possibly a C3 in accordance with ISO 9223/ ISO 14713 part 1! *(Photos 2 - 9).*

There were several pipe stands made up using hot dip galvanized screwed and socketed tubing on the site and here the hot dip galvanizing was also in excellent condition *(photos 10 - 12).*

Photo 12.

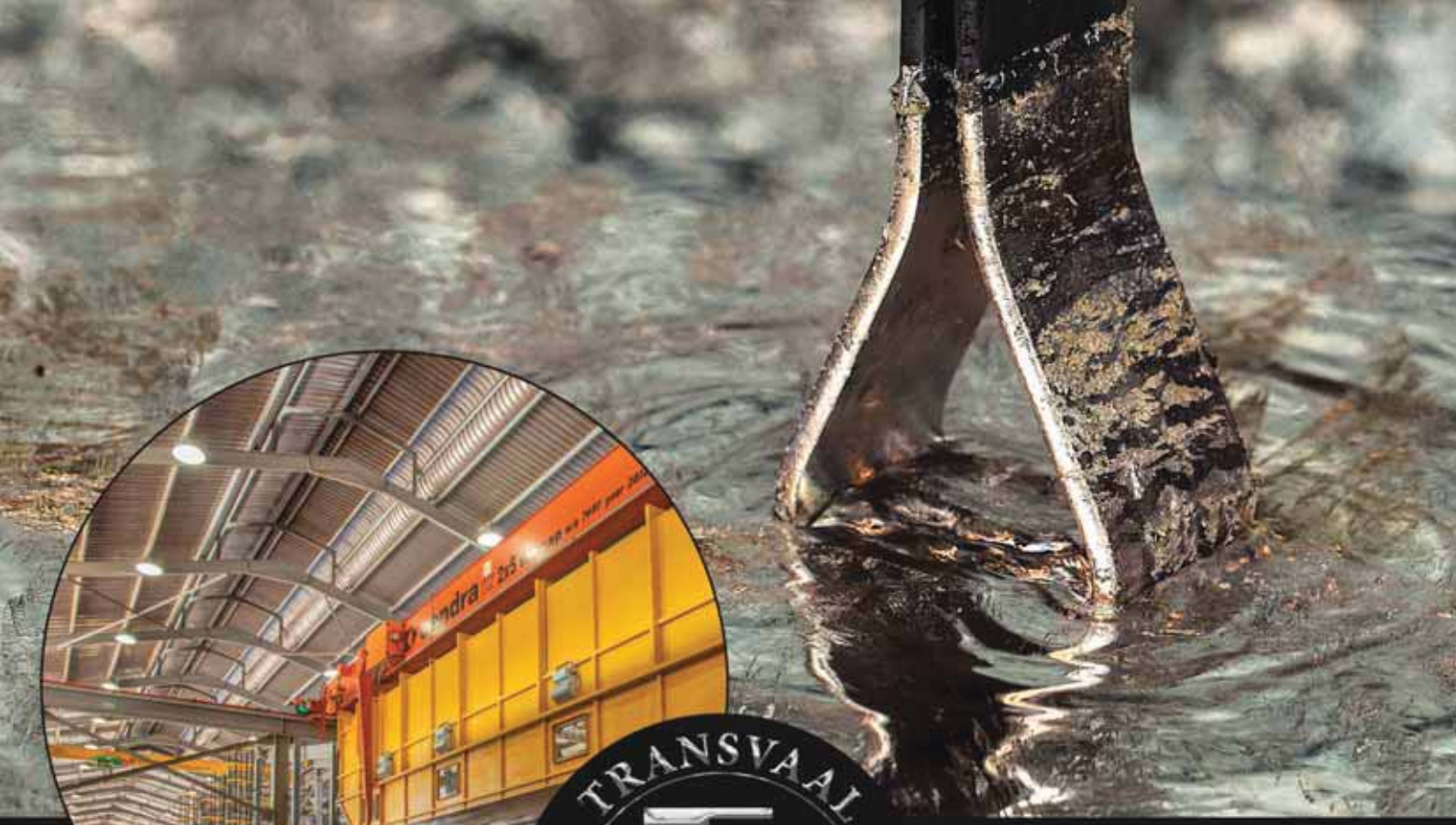
What we can do is imagine where the animals used to be. This looks like a funny shaped concrete swimming pool; there used to be water in here and crocodiles *(photo 13).*

Come and look very carefully — on the ground, all around — and tell me if you can see something that looks like an animal. You see his eye, his teeth, and his paws and there's his curly tail and his ferocious claws. These are pictures of lions *(photo 14).*


Photo 13.


Photo 14.

Zoo article taken from www.partizanpublik.nl/54/cape-towns-forgotten-zoo with thanks to Andrea Brennen, Christian Ernsten. Also to Nick Shepherd, Ronald and Richard.



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MISCONCEPTIONS

Miss Conception puts it "straight"

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

When ordering steel that requires to be galvanized after fabrication, all that is required, is to specify a quality steel grade (e.g. 300WA) and no problems will be encountered by the galvanizer in achieving the required coating standard.

True or false?

The main purpose for purchasing steel to an approved standard is to ensure that the mechanical properties of the steel after fabrication are suitable for the intended use of a product. In order to achieve this, the level of certain elements within the steel are required to be within specified limits.

In general, the elements added to steel intentionally will not have a significant influence on the quality of the galvanized coating achieved by an approved hot dip galvanizer. An exception to this can be the presence of elements such as silicon, phosphorus and to a lesser degree, manganese and carbon.

With the exception of silicon, the presence of the other elements will not significantly affect the coating quality provided that the steel is produced to an acceptable quality standard.

Silicon is added to molten structural steel as a deoxidizing agent during manufacture and in most cases for no other reason. Silicon killed steel generally includes all hot rolled sections and plate upwards of 4.5mm thick. An alternative deoxidizing agent is aluminium which is used in flat steel equal to and less than 4.5mm thick. The terms used are silicon killed or aluminium killed steels.

The presence of aluminium has no affect on the coating growth during immersion in molten zinc, whereas, depending on the silicon level, silicon can have a very significant influence on the properties of the galvanized coating ultimately achieved, which results, at certain levels, in the undesirable formation of excessively thick and brittle iron / zinc alloys in the coating.

The situation is somewhat complex in that it is not a case where the higher the silicon content, the more reactive is the iron with molten zinc. To illustrate, at a silicon level of 0.08%, thicker coatings will result at a given zinc temperature, standard zinc melt and normal immersion time cycle than, for example, at 0.15% Si content, whereas at 0.35%, coating growth is similar to that at 0.08%. This was first observed by Sandelin, the Swedish research scientist after whom the well known Sandelin curve is named.

This problem is exacerbated by the fact that the structural steels may contain silicon at levels anything from a trace up to about 0.35% and still be acceptable as far as the steel specifications are concerned.

The influence of phosphorous can be extremely severe at high levels. In contrast to silicon, the higher the phosphorous content, the greater the reactivity of the iron with molten zinc i.e. there is no Sandelin effect.

What then is the solution? If a hot dip galvanizer is aware that he is required to galvanize a reactive steel, he can reduce the molten zinc temperature slightly, add a small quantity of

aluminium and ensure the shortest possible immersion time cycle in the zinc. It should however, be borne in mind that shortening the immersion time in closed tubular sections is directly related to vent and fill/drainage hole size. These measures certainly assist in the provision of an acceptable coating but they can only be implemented if the galvanizer is aware of the steel analysis.

Strictly speaking, SANS 121 (ISO 1461) – Annex A, requires that the purchaser supply certain relevant information to the galvanizer at the time of contract. This information includes disclosing the chemical composition of the steel.

In the case of large orders, the fabricator should provide the steel suppliers with a required limit in the steel content of both silicon and phosphorus. The other elements i.e. manganese and carbon are rarely at undesirable levels. For details regarding the levels of elements to render steel to be ideally suited for galvanizing, contact the Association or alternatively a member hot dip galvanizer.

From decision to receipt

From decision (by the end-user/specifier to use hot dip galvanizing as the preferred corrosion control coating) to receipt of the finished components, on-site and the overall experience.

This paper was presented by Terry Smith at a local Johannesburg seminar several years ago and was never published. Its contents are still extremely relevant to the situation in our industry today.

Although the Association has many strategic objectives and activities, the three activities that are applicable to this paper are:

- **General promotion of hot dip galvanizing and duplex systems, where applicable.**
- **Getting involved in the design stages of major development projects on behalf of end-users.**
- **Assisting members and end-users with quality assurance, particularly with coating miss-perceptions.**

Introduction

What are the process steps to be followed by specifier's and galvanizers when selecting hot dip galvanizing as a means of corrosion control for a new major project:

Based on recommendations from other end-users / specifiers or past successful project experience, the decision to specify hot dip galvanizing for structural and other steel components for new projects, can be a rewarding one for a number of reasons.

One of the major benefits of hot dip galvanizing is the long-term maintenance free service life that is available to the client, saving enormous sums of money, normally spent on coating maintenance over the prescribed life of the project.

Hot dip galvanized coatings perform very well in most atmospheres and imperfections in the coating, such as lumps, runs; minor protuberances, excessive dross, etc. will not necessary reduce the coating's corrosion control performance. However, in order to avoid these aesthetically unacceptable imperfections, there are a number of steps that must be taken by the specifier and the galvanizer to ensure a greater degree of quality control and all round client satisfaction at the completion of the project.

Three examples of projects that have had above average success from a project management perspective:

- Bofakeng Rasimoni Platinium Mine – Bob Andrew – Anglo Platinium
- MTN Head Office – Phase 2 – Tomme Katranas – Aurecon
- New National Library – Jeremie Malan of Jeremie Malan Architects

Decision by end-user or specifier based on:

- Acceptance from past project experience.
- Referral by colleague or other authorities.
- Proper value analysis of environmental conditions.
- Proper value analysis of service life requirements.
- Discussion with HDGASA and / or Galvanizer.
- **CORROSION CONTROL SHOULD NOT BE AN AFTERTHOUGHT!**

Next step

continued on page 22...

		Appropriate (A)	Less appropriate (B)
1	**Check environment**	Look at web site; discuss with HDGASA; Assess thickness & appearance of residual hot dip galvanizing on components on site adjacent to the new project and evaluate its performance in terms of coating life.	Assume that hot dip galvanizing will perform in most applications, including all marine conditions, concentrated SO2 environments, acidic waters (immersed), in acidic soils (buried).
2	**Provide correct specifications**	HDGASA Specification: HDGASA 2006-03. SANS 121 (ISO 1461) – General Hdg. (Architectural/Duplex or Industrial finish?) SANS 32 (EN 10240) – Tube Hdg. SANS 3575/4998 – Sheet, specify class of coating. SANS 675 / 935 – Wire, specify class of coating.	All items to be "Galvanized" or SABS 763 or SANS 763. "Electro-galvanized" "Cold Galvanized" "Pre-galvanized"
3	**Compile Project Specification (PS) and Quality Plan (QP)**	SANS 121 – Annex A. • Specify steel composition. • Identify significant surfaces. • A sample or other means of showing the required finish. • Any special pre-treatments. • Any special coating thickness. • Any after treatments. • Inspection requirements. • Whether a certificate of conformance is required. Note this is only applicable if the steel has been correctly fabricated to the requirements of SANS 14713 Part 2. • Required method of repair if necessary. • Specify selected site repair material and maximum size of repair allowable. • If architectural /duplex – specify packaging if necessary.	None
4	**Negotiate Galvanizing Price for Project**	• Ensure galvanizer is member of HDGASA. • Ensure that galvanizer is aware of requirements in both 2 & 3. • Discuss max sizes of components that can be processed.	Get price from one or two galvanizers who are friends or are conveniently situated. Accept lowest price.
5	**Secure order for contract**	• Inform selected galvanizer. • Galvanizer to advise on fabrication requirements in terms of SANS 14713 and also assist with a pre-galvanizing inspection before delivering the steel to the galvanizing plant. • If necessary involve HDGASA. • Discuss roll out of project and delivery programme. Size of project. • Re-visit project specification requirements.	Start fabricating after quickly glancing at Association Web Site, or without reference to the requirements in terms of hot dip galvanizing.
6	**Send components**	Programme receipt and return of hot dip galvanized material to ensure project roll-out and optimum use of transport facility. Incoming pre-galvanizing inspection, if not already completed at stage 5.	Delays experienced by the fabricator and not keeping the galvanizer informed. Non-conformance on receipt by the galvanizer, due to insufficient drainage, vent or filling holes; also weld slag and weld porosity; etc. Components held in quarantine. Expect delays in project.

		Appropriate (A)	Less appropriate (B)
7	**Galvanizer experiences delays due to technical problems**	Inform customer promptly, renegotiate delivery programme.	No prompt communication by galvanizer. When customer phones on due date he is informed of the delay.
8	**Coating inspection and certification**	If requested under 3, Galvanizer informs customer when final coating inspection has been carried out and issues a certificate of conformance.	No plant inspection is arranged, galvanizer arranges transport and delivery. Certification often requested some time after delivery of components to the site and sometimes payment is withheld until a certificate is incorrectly issued.
9	**Components loaded on tranporter**	Particularly for distant deliveries: • Ensure packaging is complete – see Project Specification. • Ensure components have adequate and efficient dunage material so as not to rub against one another, particularly at flange / pipe interfaces. • Ensure the components are securely strapped down using soft ropes.	
10	**Arrival of finished components and offloading on site**	• Dedicated space prepared. • Sufficient space available for easy offloading. • Correct stacking on dunage – not on damp soil. • Components angled to the plane of the ground when stacking to ensure reduced rainwater retention and therefore reduce the incidence of white rust in moist atmospheres.	• Very little site space. • Components have to be stacked on top of one another. • Potential for coating damage - huge. • Coating inspection is conducted resulting in non-conformance of coating. • Galvanizers QA personnel is requested to inspect coatings on site. • Galvanizers QA personnel invites Association staff to assist.
11	**Acceptance / dispute between galvanizer, fabricator and end-user**	• Clearance certificate received from galvanizer. • Project on schedule. • No payment delays. • **SERVICE AND DELIVERY BY GALVANIZER AND FABRICATOR APPLAUDED!**	• Dispute regarding coating damage and defects. • Late delivery. • Project completion delayed (penalities). • Payment withheld. • **THE HOT DIP GALVANIZING INDUSTRY RECEIVES A BAD REPUTATION!**
12	**SUMMARY**	• **Understand environment – Discuss with HDGASA or similar organisations.** • **Quote correct specifications, compile project specification / quality plan, use architectural checklist.** • **Discuss with galvanizer when negotiating price and again when order is secured.** • **Programme receipt and return of material.** • **Communicate progress in both directions.** • **Conduct coating inspection at fabricator or at plant / Coating inspector should be qualified – HDGASA course/ Certificate of conformance is to be issued.** • **Packaging (Architectural/Duplex)** • **Correct dunage when transporting.** • **Appropriate site stacking.**	

Natural networking can achieve a sustainable business organisation

Published in the Sunday Independent:

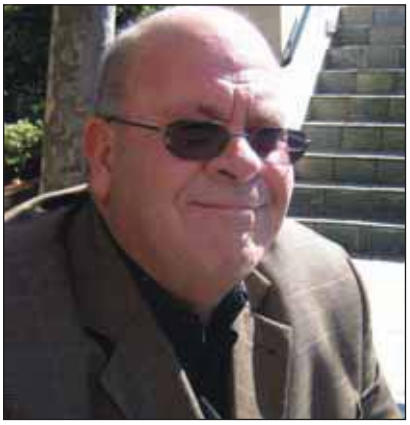
A 'system' is defined by its structure, its pattern of organisation and the process that it is involved in. For example, a motor car is characterised by a body, wheels and engine (structure); by its particular design (organisation) and by the way it generates power to serve as a means of transport (process).

In the 1970s, two Chilean biologists, Humberto Maturana and Francisco Varela, defined a 'living system' as one where the pattern of organisation is a very special type of network. According to their theory, which is called 'autopoiesis' ('self-making'), each component of the system must participate in the production or transformation of other components. In this way the network continually makes itself. The network is produced by its components and in turn produces those components. Autopoiesis is now being referred to as the 'pattern of life' and is providing the basis for the new emerging theory of the process of life.

A living system can be both open and closed: it is structurally open (matter can be added or removed) but organisationally closed (the system maintains a stable and autonomous form). A characteristic of a living system is thus the paradoxical coexistence of change and stability.

The autopoietic pattern of organisation assumes that the network knows what it is doing; i.e. it has knowledge and learning capabilities. Being autonomous and self-organising, the network must collect and process all its own information from the environment.

A living system is characterised by continual flow of material through it and continual change. In many metabolic systems in nature thousands of chemical reactions occur each second. Living systems maintain themselves in a state far from equilibrium. The only living system that



is at a state of equilibrium is a dead one!

Fritjof Capra (The Web of Life) has used the modern theory of the process of life to develop a unified understanding of the complexity and diversity of nature. Although perhaps not as rigid, the new theory can also be applied to business management. It is becoming increasingly evident that human beings have a lot to learn from nature. The inclusion of biologists as company directors may not be too distant!

As in living systems, businesses must continually generate configurations that are constantly new. Change, as in re-engineering, should not be a special event in a company's history but an ongoing integral process. Change and stability are not mutually exclusive.

Divisions, departments and sections in an organisation should be interconnected and interdependent. There is no 'silo' mentality in a living system. The essential properties of the company, i.e. its competitiveness and value, should arise from the relationships between its parts, not from any of the individual parts. A company should be viewed as an organised complex structure where the whole is greater than the sum of its parts. The relationships form the network, which in living systems is the process of life. In businesses, the network may be the process of success.

Feedback is an essential part of a network. In living systems, feedback is firmly embedded in the organisational pattern and is part of the self-regulatory mechanism. Similarly in business, internal feedback should be an integral part of the management process.

The process of life is identified with the process of knowing. So too for business. Knowing is broader than thinking, as knowledge implies action and results. The main source of information is from interacting with the environment. The system/company can couple with the environment to facilitate the transfer of information but must maintain autonomy. The environment may trigger changes but does not specify or direct them. If businesses follow living systems they will realise that their destiny is in their hands, not those of competitors or market forces.

Companies should not strive for equilibrium. Having a stable product or technology in a seemingly stable market, a complacent workforce and rigid processes means that the company may be close to extinction. Stretched targets and objectives, challenges on employees and constantly improving technology will move the company away from a state of equilibrium. As with living systems, companies will thrive and prosper in these conditions.

There are many differences between biological and human systems. We can learn little from living systems about the human personality, but we can learn a great deal about organisation and sustainability.

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

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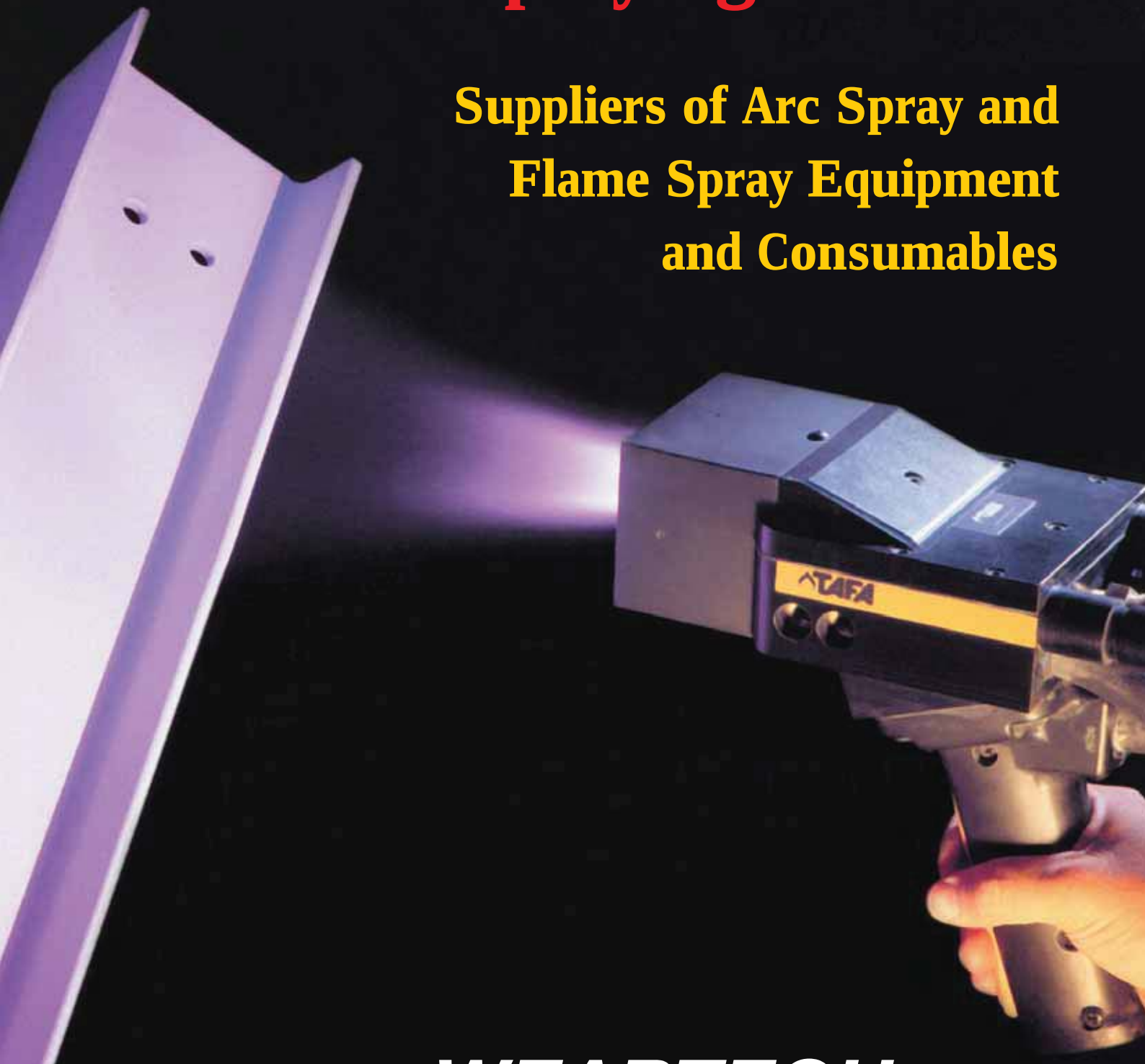

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Cape Town's MyCiti bus shelters

One of "MyCiti's" cantilever bus shelters.

Improvement of the public transport system is part of the ongoing upgrades to the Cape Town Metropolitan area. The first phase of the Integrated Rapid Transport (IRT) System has been an ongoing process since 2007. This project is aimed at improving the transport system in Cape Town by reducing congestion and the costs incurred with daily transport.

In the first phase of the new IRT MyCiti bus services, a small engineering firm in Cape Town, Arand Engineering has been responsible for the construction and installation of bus shelters. They were part of the winning tender for the Atlantis, Mamre and Melkbosstrand areas in late 2011. The client was the City of Cape Town and the main contractor Exeo Khokela Civil Engineering Construction.

Putting the final touches to a few of the completed bus shelters.

The motivation for establishing the Atlantis – Blaauwberg corridor is the fact that there is extreme congestion in that area and with new developments the congestion will only worsen. Additionally, there are no railway lines in the vicinity and there is almost no suitable public transport along this route. The MyCiti bus service is the sole provider of reliable transport in that area.

The IRT initiative aims to integrate all of the transport modes, making access easy to railway stations, conventional bus routes and bicycle paths and integrating minibus taxi routes and park-and-ride facilities.

Design

The design and construction of the bus shelters was an intricate process, combining many different aspects and variables along with different models of bus shelters and bus stops.

Three types of shelter were manufactured by Arand Engineering. Full Shelters provide seating and protection against rain, while the Reduced Totem Bus Stop is more like an old style bus stop. Its description is "a pole with a flag on top", with the 'flag' being a sign to indicate that it is in fact a bus stop. This design is used in areas where a full shelter is not necessary. Thirdly, the Cantilever Bus Shelter which looks very similar to the Full Shelter.

Before any manufacturing could take place a prototype was built and inspected by Exeo and the City of Cape Town. The total project consisted of 61 Type 1 Full Shelters, 11 Type 2 Cantilever Shelters and 65 Type 4 Reduced Totem Bus Stops.

Along with the architect's drawings, strict guidelines for materials and finishing were issued. All shelters and bus stops were to be hot dip galvanized and then spray painted with marine paint to a thickness of 280 microns. Hot dip galvanized, high tensile nuts and bolts, along with bolt certification certificates were required.

Hot dip galvanizing

It is a common misconception that hot dip galvanized surfaces cannot be painted. If the surface is cleaned and prepared properly it is possible to paint a hot dip galvanized surface successfully. Galvatech was the company chosen to hot dip galvanize the engineered components of the bus shelters. Galvatech's yard was also used to store the disassembled shelters due to space constraints at Arand Engineering's workshop.

Painting

It was agreed by Galvatech and Arand Engineering that after galvanizing the unfettled/uncleaned components would be delivered to Arand Engineering for further processing. Arand was then to clean surface imperfections, such as moderate to

"A pole with a flag on top" or totem pole assembly for this type of bus stop at the fabricators plant.

Two of the completed full bus shelters, ready for delivery to site.

heavy surface roughness, sharp spikes and lumps, using a P60 flexible sanding pad on a grinder. This process gave the galvanizing a relatively smooth finish.

After sanding the assemblies they were then cleaned with Galv-O-Clean and a Scotch Brite pad. This gives the surface a clean finish for the paint to adhere to. The Galv-O-Clean is then washed off with water and the assemblies are left to dry.

The paint supplier for the project was Decro Paints. Three coats of paint were applied to the shelters over the course of three days. This was necessitated by the many items to be sprayed and the time required for the paint to cure. The assemblies were sprayed on one side and then turned over for the other side to be sprayed. This is a delicate

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Two different bus shelter types at the fabricators plant, prior to hot dip galvanizing.

process and special care needs to be taken not to damage the paint in any way. If the paint is damaged the area must be sanded and re-sprayed.

The base coat was an epoxy galvanizing primer called Epoxy Adprime 1 Base. The paint is supplied with a catalyst to initiate the hardening process and ensure that it dries correctly. A galvanizing primer is essential as it bonds to the galvanized steel unlike other paints. In addition, it prevents the paint from peeling and it also prevents water from penetrating the paint and accumulating underneath, forming bubbles.

The next coat was an intermediate coat called Umeguard SX Base. This paint is also supplied with a catalyst to initiate the hardening process and ensure the paint dries correctly. The intermediate coat is an epoxy resin coating. The colour chosen for this coat was a light grey although it was originally going to be a red-brown. The darker colour was found to be problematic when the sun shone on the final coat, as the intermediate colour would show through. This was obviously unacceptable, therefore the decision to change the intermediate coat to the light grey was made.

The totem pole type of bus stop installed at one of the sites.

The final coat consisted of two different colours, one colour for the totem pole assemblies and the other colour for the rest of the bus shelter. The first items to be sprayed were the totem pole assemblies. These were sprayed with a paint called Uny Marine Base, supplied with a catalyst to initiate the hardening process and ensure the paint dried correctly. This is a polyurethane finishing coat with long lasting gloss retention. It is highly durable and is resistant to chemical damage.

After the totem pole assemblies were painted, the rest of the assemblies were also sprayed with Uny Marine Base in a dark grey colour. The final coat for the shelters, excluding the totem pole assemblies, gave a stone-chip effect finish. This top coating is beneficial in more than one way. It hides any slight imperfections in the paint that would normally be visible if a smooth finish was used and it gives a slightly thicker paint finish. Exeo was impressed with the look and asked for all the shelters to be sprayed with this finish.

The paint was required to be a final thickness of between 280 and 350 microns and was checked with a digital paint thickness tester. If it was found to be too thin, another coat was applied. The average thickness of the paint on the shelters throughout the project was about 320 microns.

Once the spray painting was finished, the shelters were left to stand for 48 hours in order for the paint to cure and harden properly

Assembly

As specified by the architects, all nuts and bolts used had to be high-tensile and hot dip galvanized. Two different sized nuts and bolts were used for the assembly of the shelters, M12 and M16.

Galvazinc was used to repair the hot dip galvanized coating prior to painting.

Full shelter installation

The anchor bolt cages were also manufactured by Arand Engineering. M20 ready bar was cut to length and a cage was made to hold them in place. Two different types of cages were made. The first type had four bolts in a square formation, the other had only two anchor bolts.

There was one cage with four anchor bolts and two cages with two anchor

A cantilever type bus shelter outside Arand Engineering ready for delivery.


Lifting one of the finished bus shelters to its final position on site.

bolts for each bus shelter. The anchor bolt cages were then sent for hot dip galvanizing. After the hot dip galvanizing process the anchor bolt cages were delivered to Exeo. They prepared the sites and made sure that all the anchor bolt assemblies were in the correct position, using a jig supplied to them by Arand Engineering. The jig was made to be placed over the anchor bolts and the cement slab was then cast by Exeo.

The next step was to prepare the sites for the installation of the shelters. The bus shelters were checked with a spirit level to make sure they were completely level. The roof was especially critical and needed to be accurately level. If the levels were slightly out, the levelling nuts were adjusted.

Next, washers and nuts were put onto the anchor bolts and the shelter was tightened into position. The anchor bolts were cut to the proper length of 3mm above the top of the nut. All the nuts were then welded to the bolts

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Photo showing the cast in hot dip galvanized anchor bolts and over sized nuts ready to accommodate a bus shelter.

with the use of an arc welder. The roof was then lifted by hand onto the shelter making sure it sat square and it was then attached to the shelter using self drilling aluminium screws.

The final step in the installation process was the painting. All the cut bolts and welds were touched up with a coat of Galvazinc. They were then painted the same colour as the shelter, red on the Totem Pole base plate and grey on the Side Box Assembly base plates. The underside of the aluminium screws used to affix the roof to the shelter also received a coat of paint.

Problems encountered and solved

The entire construction phase took 10 months. Initial problems with the painting process were rectified.

The anchor bolts posed most of the problems with the project. Often the cement would get onto the threads during the concrete pouring process because the bolts had not been properly protected. Each dirty bolt needed to be cleaned with a wire brush, slowing down the construction process.

Conclusion

Cape Town's MyCiti bus shelter project was a well run, well co-ordinated project utilising the hot dip galvanizing process to extend the life of the structures. All the participants in the this project were very happy with the outcome.

OBITUARY

Andrew Dippenaar

2 March 1966 – 27 April 2013

Andrew was born on the 2nd of March 1966 and grew up in Kimberley. Both Andrew's parents, Frank and Alet Dippenaar were dedicated teachers and active sportspeople, which had a huge impact on Andrew's future. He was extremely good at sport, especially in rugby, cricket and tennis and achieved provincial colours for those sports during his school career. His younger brother Boeta also followed in Andrew's footsteps as a great sportsman and later played cricket for the Proteas.

After school, Andrew did his national service. He completed his officer's course at the Infantry School at Oudtshoorn and joined the elite 101 Battalion for active duty on the border and served with distinction. He was wounded in action and also received special commendation for his services during active duty.

He studied Building Sciences at the Port Elizabeth Technicon and after completing his military service, he worked in the building and construction industry for many years. He became involved in the hot dip galvanizing industry in 2000 and remained there ever since until his untimely death on 27 April 2013.

During his time in the galvanizing industry Andrew was involved with several galvanizing companies. This included a stint at a galvanizing company in Australia where he was responsible for the erection of a galvanizing plant, giving him the opportunity to combine his skills.

Fortunately for Andrew's family and friends he did not remain in Australia for too long and returned to South Africa. He vowed never to leave South Africa again and as he put it: "I am an African in heart and soul."

Andrew was a very likeable person with an incredibly naughty sense of humour; his face could speak a million words and one could always see the naughty devils in his eyes. He had a very good relationship with all his workers and he knew how to muster loyalty and always had a joke to share when he walked through the workplace. On many occasions he would sit down with his fellow workers to share pap and vleis out of a communal bowl.

In the last year Andrew was the general manager of Supergalv where he was extremely happy.

His hobbies and sports later in his life included fly fishing, for which he also got provincial colours and making knives. His knives were extremely popular amongst friends and family and it is doubtful that he ever sold a knife as it gave him much pleasure to give them away. Such was Andrew's generous character.

Andrew had a passion for woodcraft and restoration. After purchasing a house in Benoni, which is 80 years old, he and his wife Carol set about restoring it to its former glory. Lifting the laminated flooring, he found Oregon pine floors that were sanded and treated. He sourced old farm doors that were lovingly restored and hung proudly from the old wooden door frames of the house. There was still so much to do, and he was proud of what he had achieved.

Andrew will be sorely missed by everyone, especially his wife Carol and his son Frank.

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Preparing a hot dip galvanized surface for painting

Painting over a hot dip galvanized surface known commonly as a "Duplex System" was introduced into the world by a knighted engineer Jan van Eijnsbergen in the early fifties.

Jan found that when an appropriate paint system of reasonable thickness was applied over a hot dip galvanized surface one achieved a synergistic performance from the sum of the two individual coating systems. His further developments assured that increased factors of a minimum of 1,5 to 2,3 times the sum of the individual coating lives, in varying conditions, would be achieved.

Due to some duplex failures, where the paint peels off prematurely, some people feel that the concept of the system does not work.

Paint, like any mechanically applied coating has to be applied to a suitably prepared surface and while this is essential for painting onto carbon steel, it also equally applies to painting over hot dip galvanized steel.

In most applications when steel is hot dip galvanized, the process following hot dip galvanizing is a quench bath containing a passivation. This reduces the component temperature and passivates the freshly galvanized component, providing temporary protection against the incidence of white rust.

In most instances when a duplex coating is required, the passivation is omitted, particularly if the galvanizer is aware of this requirement.

Should this not happen, the passivation must be comprehensively removed prior to painting. A simple test indicating the presence of the passivation can be done. See ASTM B201-80.

Preparation of the hot dip galvanized substrate can include a chemical washing procedure, a high pressure water blast or a sweep blast.

Sweep blasting which is done at less than 300kPa using a micro-grit at the correct angle and distance from the surface, removes surface imperfections and zinc ash and will also comprehensively remove all passivation from accessible surfaces. This means that in the case of tubular components the inside of the tube (where it is unlikely to be painted), will still be passivated and therefore protected against the formation of possible white rust.

Galvatech (Pty) Ltd a member of the Association swears by sweep blasting for duplexing. As Christof Krugmann, current Production Manager, says, "Paint coatings are only as good as the surface preparation prior to painting. If you do not go this route it is almost like plastering a wall without "chipping" it before hand. Correct sweep blasting provides an excellent key for subsequent painting."

Krugmann also says, "Utilizing sweep blasting as a surface preparation might be a little more costly to start off with, but at the end of the day ensures no unforeseen expenses. Even site work like "touch up's" are minimized by proper adhesion of the paint on galvanized structures.

Paint is not nearly as prone to chipping, not even when bolts are tightened when structures are put together on site. This observation was made by one of our clients who used to "chemically clean" galvanized steel, instead of sweep blasting before applying paint."

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 and after fabrication and after hot dip galvanizing the coating is inspected for compliance with the relevant specifications.

The course commences at the selected venue where course material is presented and reviewed, the lecturer encourages discussions between delegates and himself. Each lecture is preceded by a number of pertinent questions on the previous lecture.

Once the delegates have a reasonable knowledge of the coating, including its inspection criteria, the venue moves to a selected galvanizer where a batch of incoming components are discussed en-group and then in teams, preselected hot dip galvanized components are inspected and reports are required to be completed.

If available at the galvanizer or other venue, preparation by sweep blasting and/or chemical treatment is demonstrated and duplex coatings are discussed.

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 10684:2004 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
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. Courses in other areas are possible, contact HDGASA.

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:
26 to 28 February; 12 to 14 March; 14 to 16 May; 9 to 11 July; 13 to 15 August; 8 to 10 October; 26 to 28 November.

Cape Town:
5 to 7 March; 4 to 6 June; 10 to 12 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

The new wall chart:

Design for Hot Dip Galvanizing

Corrosion prevention is an essential factor in the economic utilisation of steel. Provision of the appropriate protective coating can bring initial savings plus substantial economies in service, due to reduction or elimination of maintenance and lost service time, and by not deferring the replacement date of structures and equipment.

In suitable applications hot dip galvanizing provides ideal corrosion protection for steel – no other coating matches galvanizing's unique combination of low cost, ease of inspection, for coating quality, durability, predictable performance, low or no maintenance, and resistance to abrasion and mechanical damage.

When designing a structure which is to be hot dip galvanized, it must be borne in mind that articles are immersed into and withdrawn from a bath of molten zinc heated to a temperature of 450°C.

Design and fabrication is required to conform to acceptable standards which apply, regardless of whether a galvanized or a painted coating is to be applied. In the case of hot dip galvanizing, some additional requirements which aid access and drainage of molten zinc, will improve the quality of the coating and also reduce costs.

With certain fabrications, holes which are present for other purposes may fulfil the requirements of venting of air and draining of zinc; in other cases it may be necessary to provide extra holes for this purpose.

For complete protection, molten zinc must be able to flow freely to all parts of the surfaces of a fabrication. With hollow sections or where there are internal compartments, the galvanizing of the internal surfaces eliminates any danger of hidden corrosion occurring in service.

In addition to using the correct specifications in terms of coating requirements, the steel chemistry should be of a quality suitable for hot dip galvanizing.

The new Wall Chart has been updated with new specifications and a number of valuable refinements.

To obtain a copy of this valuable publication, contact either our Johannesburg or Cape Town offices.

2013 Hot Dip Galvanizing Awards

The 2013 Hot Dip Galvanizing Awards Evening will be held in the Ballroom at Montecasino on FRIDAY THE 23rd AUGUST

The objective of the Hot Dip Galvanizing Awards is to recognise and promote the development, application and use of hot dip galvanizing and related technology as a corrosion protection system.

Thank you to Armco Galvanizers, Bulldog Projects, Giardina, Macsteel Tube & Pipe, Robor Galvanizers and the SA Institute of Steel Construction for sponsoring this valuable event. We do still have two sponsorship packages available, please contact us urgently to avoid disappointment.

Submissions will be available on our website at the end of June 2013, along with details on the evening.

Kindly visit our website for updated information on the event or contact us on (011) 456-7960 or hdgasa@icon.co.za

New coating thickness gauge with enhanced features

Ever since the development of the coating thickness gauge in the mid-1940's, dry film thickness measurement has relied upon individual measurements being compared to a coating's specification.

With the introduction of digital coating thickness gauges, in addition to coating thickness measurements becoming easier, more accurate and repeatable than ever before, the task has become much more simplified.

Modern gauges have significant processing power built in, allowing users to automatically compare thickness values to a coating's specification, display trend graphs and store the reading together with the date and time the reading was taken, into memory.

The gauge can even transfer data wirelessly to a mobile cell phone, recording the GPS coordinates of precisely where the measurement was taken. Measurement speeds have also increased significantly, almost doubling, from approximately 40 readings per minute back in the 1980's, to in excess of 70 readings per minute.

The Elcometer 456 Ultra/Scan Probe.

At first glance, you may ask why this is important, especially if only a small number of readings need to be taken at any one location. The measurement speed is used by manufacturers to indicate how quickly an accurate reading can be taken and therefore how soon any subsequent reading can be made.

Imagine if you will, two inspectors measuring the dry film thickness of a pipeline. Inspector 1 is on one side of the pipe and Inspector 2 is on the opposite side. Both are tasked to take 3 spot measurements every 5 meters. If Inspector 1 is using a gauge with a measurement rate of 70 readings per minute, and Inspector 2, a gauge with 40 readings per minute, then it will not be too long before Inspector 1 is significantly further ahead of Inspector 2.

Other than the time it takes to move to the next measurement location, the limiting factor for increasing the measurement speed – thereby reducing the time taken to undertake a coating thickness inspection – is the time required to lift the probe off and replace it back on to the coated substrate.

If the inspector can simply set up the gauge to automatically take a pre-determined number of readings, without the need to lift the probe off the surface, then the measurement time can be increased even further.

Additionally, if the probe could be dragged across the coated surface, without damaging the probe or the coating then the need for prescribing the number of readings to be taken over a defined area can be brought into question.

All of this is possible with the new Elcometer 456 with Ultra/Scan probes. When connected to the latest Elcometer 456 coating thickness gauge, it has a reading rate (in scan mode) in excess of 140 readings per minute - further enhancing the speed and accuracy of field based dry film coating thickness measurement on Ferrous (F) and non-Ferrous (NF) substrates.

It can be used in either Scan or Auto Repeat modes. The Scan feature allows the inspector to simply walk along the pipe - with the probe in contact with the coating - and upon removing the probe from the pipe, immediately assess the high, low and average coating thickness values on the gauge screen.

In Auto Repeat Mode, as the probe slides across the surface, more than 2 readings are taken every second, with each individual reading stored in the memory of the gauge.

The Elcometer 456 Digital Coating Thickness Gauge.

Corrosion economics:

The effect of corrosion and corrosion protection costs on business profitability and sustainability

Course overview

This course attempts to explain why considerations regarding corrosion damage and corrosion protection should be integrated into all other business management considerations related to such areas as; organisational development, operational management, health, safety and environmental issues, financial and administrative management, business strategic management, customer and stakeholder relationship management and human resource development and management. The way in which corrosion arises and the various corrosion protection methodologies that can be applied, are normally highly complex in nature, with many interdependencies and diverse relationships between the elements of the corrosion process, the wide range of factors that influence the mechanical and civil design of the particular operations, the selection of appropriate materials of construction and the design, specification and application of appropriate corrosion protection systems. Because of this high degree of complexity, a Systems Thinking approach is generally required to postulate how corrosion mechanisms can arise, how they will influence design parameters and how corrosion threats and risks effects can best identified, mitigated and managed, and, importantly, how all the implications of corrosion failures can be effectively evaluated.

While unattended corrosion damage can have grave short and long-term financial implications for a the profitability and sustainability of a business, the costs of well thought out and well implemented corrosion protection strategies can become an important investment source and produce tangible short and long-term benefits related to improved

profitability and operational sustainability, safe and injury-free operations, effective environmental protection, satisfied customers and stakeholders and sound human capital development. To achieve this, however, implies that corrosion and corrosion protection risks should never be considered in isolation, but should be viewed in conjunction with all other risks that are judged to be important for the successful continuation of an operating or production process. In all cases, the evaluation and mitigation of corrosion risks should be related to the business objectives of the particular operating, production and safety systems. The objective of this course is to present a broad overview of a Systems Thinking approach for designing effective corrosion protection strategies for industrial plant and equipment with a view to minimising life cycle corrosion costs and improving business viability and profitability.

Who would this course appeal to?

This course should appeal to the following:

- Financial Managers and Accountants, who have to approve corrosion protection budgets in terms of the Business's financial and operational strategic objectives
- Project Managers and Resident Engineers, who have to ensure that corrosion and corrosion protection are effectively considered in their

particular areas and that the risks of corrosion are identified and competently mitigated by means of the implementation of properly planned and scheduled cost-effective corrosion protection strategies

- Project and Operational Cost Controllers and Cost Accountants, who are responsible for ensuring that corrosion protection budgets are competently managed and controlled
- Sales and Marketing Personnel of Corrosion Protection Systems, who need to understand that their offered corrosion protection systems might have a better chance of being accepted by users if they are shown how their systems can be successfully and cost-effectively integrated into their operational and management systems and that they will have a high probability of reducing operational and maintenance costs

Biography

Presenter: Bob Andrew

Bob Andrew holds a BSc (Eng) in Chemical Engineering from the University of the Witwatersrand and an MSc in Corrosion Science from the University of Manchester. He is a retired Professional Engineer and a former Fellow of the SA Institute of Mining and Metallurgy and former member of the National Association of Corrosion Engineers (NACE) in the USA.

He is currently an Honory Life Member of the Corrosion Institute of Southern Africa (CorrISA) and Honory Life Member of the Hot-Dip Galvanizers Association of Southern Africa (HDGASA). Bob has over 40 years experience in corrosion science and engineering, having worked at the CSIR, JCI Ltd, Anglo and Platinum and in private consultancy.

In 1997, NACE published a book written by Bob on corrosion protection design and practice in the mining and metallurgical industries. After retiring from Anglo Platinum in 2000, Bob formed a company to provide consulting services in corrosion engineering, value management and knowledge management. In collaboration with a partner, he also provides training courses on project and construction management and assists companies in incorporating the recently developed King III Code on corporate governance into organisational and business strategies.

Should you be interested in attending this valuable course, kindly contact Bob Andrew on anneve@iafrica.com or boband@mweb.co.za or the HDGASA.

Introductory Galvanizers Inspection Course

This one day course has been designed to be more simple and more practical than the 3-day galvanizers inspectors course discussed elsewhere in this magazine.

Topics to be covered and discussed are:

- Brief description about corrosion
- How zinc protects
- The hot dip galvanizing process
- Inspection before and after hot dip galvanizing
- Multiple choice question test for course effectiveness.

Should you require some background information on hot dip galvanizing and its acceptance and have a limited formal education, this course is for you!

Contact our offices for more details.

Winners – SA Galvanizing Services.

Second place – Surface Treatment.

This year the Association hosted their annual Golf Day at the Germiston Golf Club. Whilst times are tough, we found that the day itself was well attended and we could still rely on our members for support in terms of sponsorships. Thank you to Armco Galvanizers, Bulldog Projects, Lianru Galvanisers, Robor Galvanizers and Transvaal Galvanisers for your support. The weather held out, with the threatening rain staying away. A big thank you to the Germiston Golf Club, nothing was too big or too small!

Third place – Robor Galvanizers.

The winners of this year's golf day, with a score of 62 were the team from SA Galvanizing Services consisting of Stephen van Zyl, Andrew Dippenaar, Johan de Villiers and Johan du Plessis. Well done!

Ironically, the winners of the Transvaal Galvanisers Pink Lady competition was the team from Transvaal Galvanisers – well done to Francesco Indiveri, Dale Kent, Jonathan Grassini and Clive Gillman!

Fourth place – O-Line Support Systems.

Unfortunately the Golf Club marked the Longest Drive incorrectly, so the winners of the Nearest the Pin on the 3rd hole was Eddie Collins and Nearest the Pin for two, on the 14th was Sean Diggeden. Thank you to Robor Galvanizers for sponsoring these two prizes and for providing a much needed watering hole on the 14th.

Pink Lady – Transvaal Galavanizers.

With a score of 61, the team from Surface Treatment Technologies received second prize. Well done to Natalie Webster, Jo-Anne Jaggs, Tyrel Hendrickz and Cynthia Dicks.

The team consisting of Nico Schoeman, Braam Beukes, Sean Diggeden and Danie O'Connell, hosted by Robor Galvanizers came in third place with a score of 60.

In fourth place was Richard de Sousa, Kevin Murphy, Steve Carter and Steve Endley with a score of 59. Well done to the team from O-line Support Systems!

Perhaps proving the theory that if you really want to get better at golf one should go back and take it up at a much earlier age, the team from Metsep certainly took the cake and received the Longest Day with a score of 23. Looks to me like they really needed Kennie there to help them!

To all the winners – well done! To all the players, thank you for attending the day, we hope you all enjoyed yourselves. Enjoy browsing through the photos. Should there be a photograph you would like, please contact the Association on hdgasa@icon.co.za

2013 Hot Dip Galvanizers Association GOLF DAY

Why would anyone want to paint a fence?

We often see teams of painters working on newly erected fencing or alternatively conducting maintenance of degraded painted materials. Generally, this tends to be the case for inland areas while asset owners along the coast opt for hot dip galvanizing for corrosion control.

Why is this?

Making general enquires we are told, by "coastal people", using hot dip galvanized fencing, it lasts! "Inland people" say that they opt for painted fencing because it is more economical when compared with the hot dip galvanized alternative.

A simple costing analysis would appear to challenge the apparent "inland" position.

In order to be realistic, one needs to define the use of a proper paint specification in that a wire brush preparation and a couple of coats of paint will simply fail within a very short time. While it is certainly cheap it does not provide any form of service life and would require significant future maintenance.

We would regard a proper painted fence specification consist of shot blasting to Sa 2½, inorganic zinc primer and a polyurethane top coat, having a combined coating thickness of approximately 120µm.

PROPOSED FEATURES FOR 2013

August (No. 55):
Awards Event • Cable ladders and trays • Artistic/Architectural hot dip galvanizing

November (No. 56):
Tubes, pipes and scaffolding • Masts and poles • Water storage • Heat

NOTE: FEATURES MAY BE SUBJECT TO CHANGE

Hand painting a fence is time consuming and costly.

A painted fence showing signs of premature corrosion at the interfaces.

A no maintenance hot dip galvanized palisade fence will work in the majority of the environments in SA.

A costing comparison of this paint specification to that of the hot dip galvanized fence, comprising a metallurgically bonded zinc and/or zinc iron alloy layered protective coating of 60 to 70µm, we could expect the following estimates.

Assumed fence dimensions with costs

Assuming a fence comprising 25 tons of steel with a surface area of 40m² per ton, we would have a total surface area of 1 000m² to be painted. Using estimates, from our paint friends of the suggested paint specification, cost per square metre, would be approximately R150 per m². The initial cost to paint 1 000m² would be R150 000.

The current estimated hot dip galvanizing price is in the order of R5/m² (R5 000/ton), giving an initial cost of R125 000. R6/m² would equate to that of the paint alternative.

This however does not provide any life cycle costs.

Assuming a required service life of the sample fence is to be 30 years.

Service life estimates

In order for the painted fence to conform to this requirement, a minimum of two maintenance periods would be needed. Initial period of 10 years followed by maintenance in years 10 and 20.

Using hot dip galvanized fence in an equivalent environment the service life is maintenance free.

Cost of maintenance

Employing a team of 4 painters at a cost of R150/day working at a rate of 20m²/day our 1 000m² fence would involve a current (no escalation) cost of R30 000 per maintenance period. The increase to our painting contract increases by a conservative current cost of R60 000 in order to meet the 30 year service life specified.

30 years costs (no escalation)

Painted fence cost R150 000 "initial" plus R60 000 "2 x maintenance periods" to a total of R210 000 or R210/m².

The maintenance free service life fence is R150 000 or R150/m²

Bob Wilmot

On the Couch.....

Nina Saunders

By Desere Strydom

On the Couch caught up with the former President of KZNIA, Vice President of SAIA, Hot Dip Galvanizing enthusiast and busy working mother of two, **Nina Saunders.**

Please tell us a little about your background? I grew up in East Griqualand and my step-father's business saw us taking numerous trips into the Transkei. I still think this is one of the most riveting landscape in the country. I have an extended family – my father having had two wives, although not simultaneously –we all get on well.

How did you get into this industry? My Science teacher at school prompted me to seriously consider architecture as a profession given the combination of creativity with mathematical/ scientific rigour. Her brother, Professor Walter Peters, ended up being my History of Architecture lecturer at UKZN.

Was there any particular role model/s that inspired you to follow this career path? I was lucky enough to work in the practice of Rodney Harber during my practical year and for 5 years after graduation. Rodney's approach to architecture and his range of engagements from practicing architect, to academic, writer and teaching traveller were very inspiring. His involvement in community architecture and long car trips through the Transkei to Port St. Johns, Umtata, Kokstad and Elliot were so memorable. I can boast knowing a lot about dry pit latrines...

Ora Joubert's flare and indominable passion were so invigorating for the young student I was when I met her but equally so was a really formidable group of peers in the class graduating in 1994. They still inspire me.

Please tell us briefly about your career, leading up to the position you hold currently? An involvement in social and civic architecture and urbanism has been the thread through my career twinned with a passion for promoting the profession. I joined the Durban City Architects in 2003 in the Strategic Architectural Projects Branch which allowed avenues for both interest. The City Architects were pivotal in supporting the bid for the UIA 2014 Durban Congress. My involvement in the Congress really exposed me to the 'other' take on promoting architecture through working with crazy talented creatives. This passion led to my being elected as the President of KZNIA for 2010 - 2012 term.

You are also very involved with SAIA and UIA 2014? In 2008 in Turin, Italy, SAIA won the bid to host the 'olympics of architecture' in Durban in August 2014. The International Union of Architects has a membership of 1.3million architects globally and holds the largest architectural congress tri-annually. The theme for the Durban event is 'architecture otherwhere' and principally looks to uncover best modes of practice which have emerged in areas of great human, social and economic challenge to evolve an architecture which is far more relevant to the majority of global citizens. There needs to be a perception shift in only viewing architecture as the purview of the elite. There is a growing undercurrent in the global architecturally fraternity that the time for this change has come and I believe the Durban event will be seminal.

I am currently the VP of the SAIA and the institution is similarly going through strategic changes to evolve a far more relevant organization. The institute is set on a transformation agenda which aims to grow a far more representative profession and equally to increase knowledge of the profession. Sindile Ngonyama, the current President of SAIA, is a remarkable role-model and exemplifies the kind of leadership that will grow SAIA into an institution not only benefitting its members but also the broadening society which architects serve.

Designing in a coastal city, must be challenging, considering the elements, in particular corrosion. How do you deal with this challenge? Would like to see Awards for Architecture given to buildings that have stood the test the time. And this has to do with selecting the correct materials for particular environments, and also understanding the operational demands on buildings – how they are used, when maintenance regimes are in place. Particularly like buildings which reflect the materials they are constructed off – using off shutter concrete facebrick and of course Hot Dip Galvanized steel.

Please tell us about your family? Married with 2 girl children. There are no how-to guides for the family roles– but after 10 years in the field, with hands-on experience, it's become enriching! I would not have the career-scope which I have if it were not for an incredibly supportive family, in particular my husband and mother.

Complete the sentence... 5pm Friday, Nina Saunders... Usually at the KwaZulu Natal Society for Art's Café – meeting up with my husband George and the kids enjoying the emerging Arts Precinct with the revamp Bulwer Park in the background.

Also see: http://www.uia2014durban.org

Article by Des Ray for HDG Today 2013©

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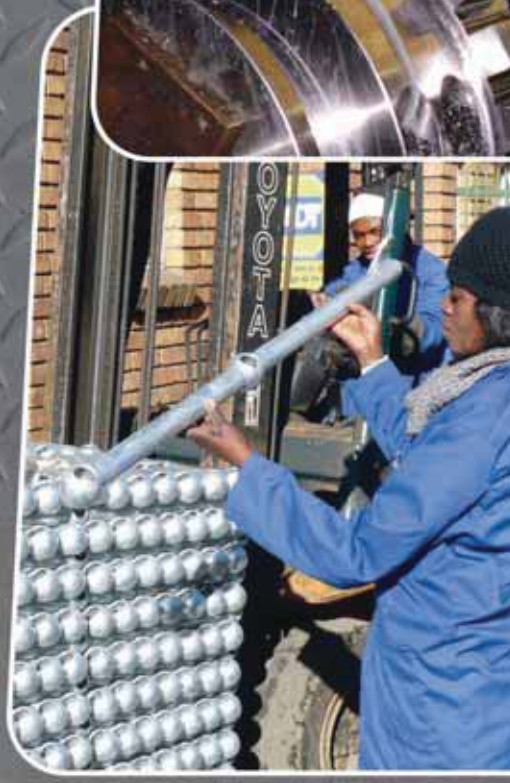
SMT GALVANIZERS

SMT Galvanizers are specialists in the hot dip galvanizing of all types of fasteners including the treating of embrittlement on site. We do offer a wide variety of services to our clients by creating a comprehensive supply chain for all their galvanizing needs. Our expert services are procured by hand railing, flooring, construction, fabrication, civil and general engineering industries for open dipping.

All work is done according to SABS-ISO 1461SANS 121 Specifications. SMT Group is SABS and SATAS accredited and BEE compliant.

SMT Group offers the following services,

- **Hot dip galvanizing** - spinning and dipping;
- **Electroplating** - Barrel work (Yellow and trivalent blue passivating);
- **Electroplating** - Jigging up to 3.5meters;
- **De-embritteling** on site;
- **Fabrication** workshop with certified welding operators;
- **High Tech engineering workshop** - cnc milling, turning and dynamic balancing;
- **Design and building** of machines to customer requirements;
- **Supply** of electrical spares at the best prices.



SABS ISO 1461 SANS 121 | SATAS | SEESA BEE COMPLIANT

SMT GALVANIZERS
SPINNING & DIPPING

SMT Galvanizers (Spinning & Dipping) | **jan@smtgroup.co.za**
SMT Electroplaters | **kevin@smtgroup.co.za**
SMT Steel (Engineering) | **bernadette@smtgroup.co.za**

Consistently delivering superior quality galvanized products to all our customers

Armco Galvanizers Isando has been operating since 1989. Geared up to accommodate heavy structural steel up and till 13m in length.
Isando has an average output of plus minus 2000 tons per month. With an improved lay down area and increased loading capacity by addition of a tower crane we strive to give "A" class service to all our customers big or small.

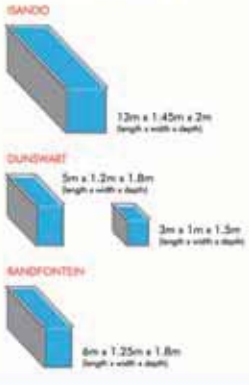
Armco Galvanizers Dunswart is a Second facility based in the Boksburg area. Dunswart has an average output of plus minus 900 tons per month. This branch specializes in small structural components and is geared up to accommodate items up and till 5m length.

Armco Galvanizers Randfontein is a third facility based in the Randfontein area. Randfontein has an average output of plus minus 800 tons per month and is geared up to handle light to medium structural steel up and till 6.2 m in length.

Isando +27 11 974 8511 | **Dunswart** +27 11 914 3512 | **Randfontein** +27 11 693 5825 | **www.armco.co.za**

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.

GALVANIZING BATH SIZE



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