2007 Volume 4 Issue 1

HOT DIP GALVANIZING TODAY

HOT DIP GALVANIZERS ASSOCIATION Southern Africa

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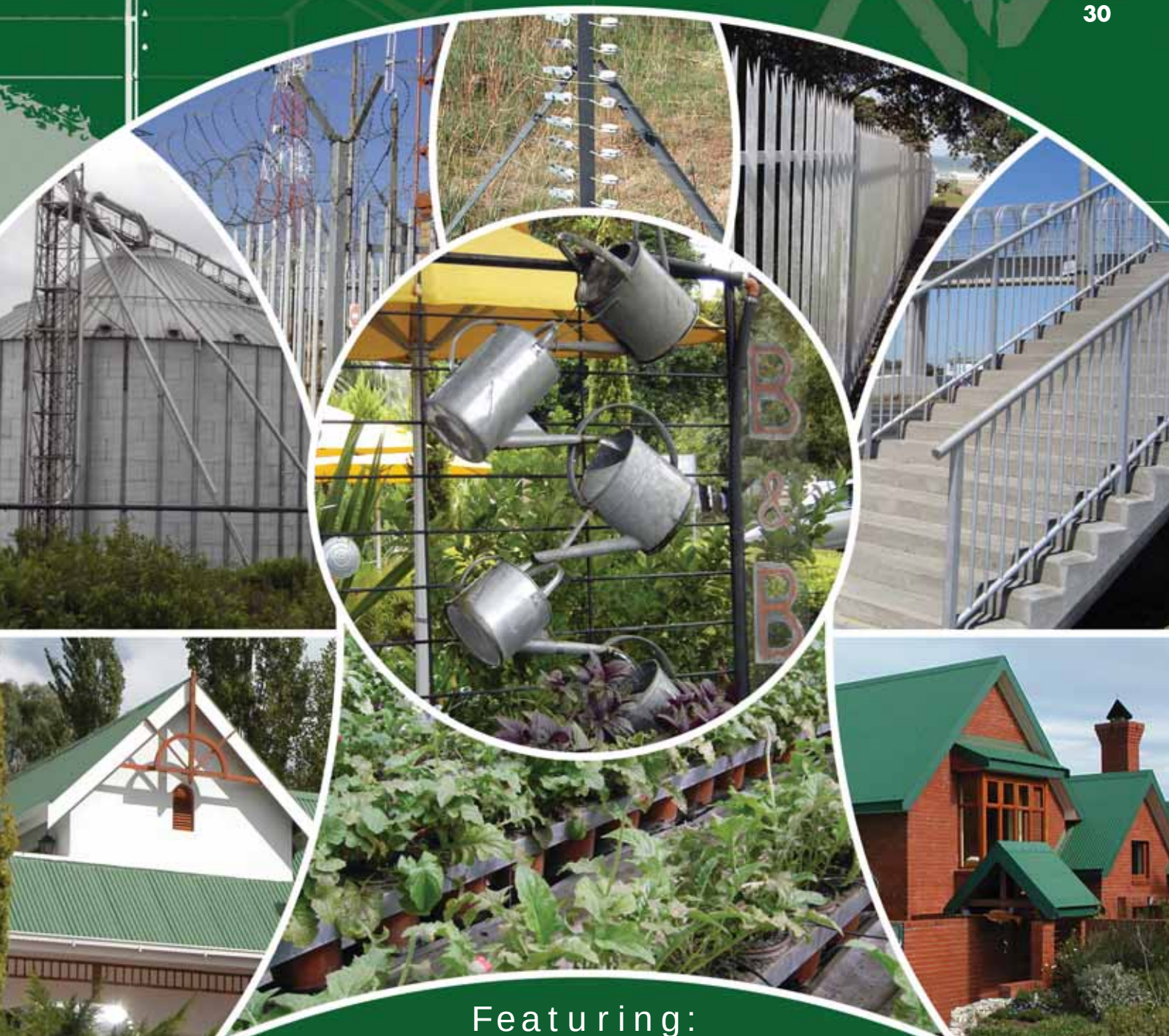


Featuring:

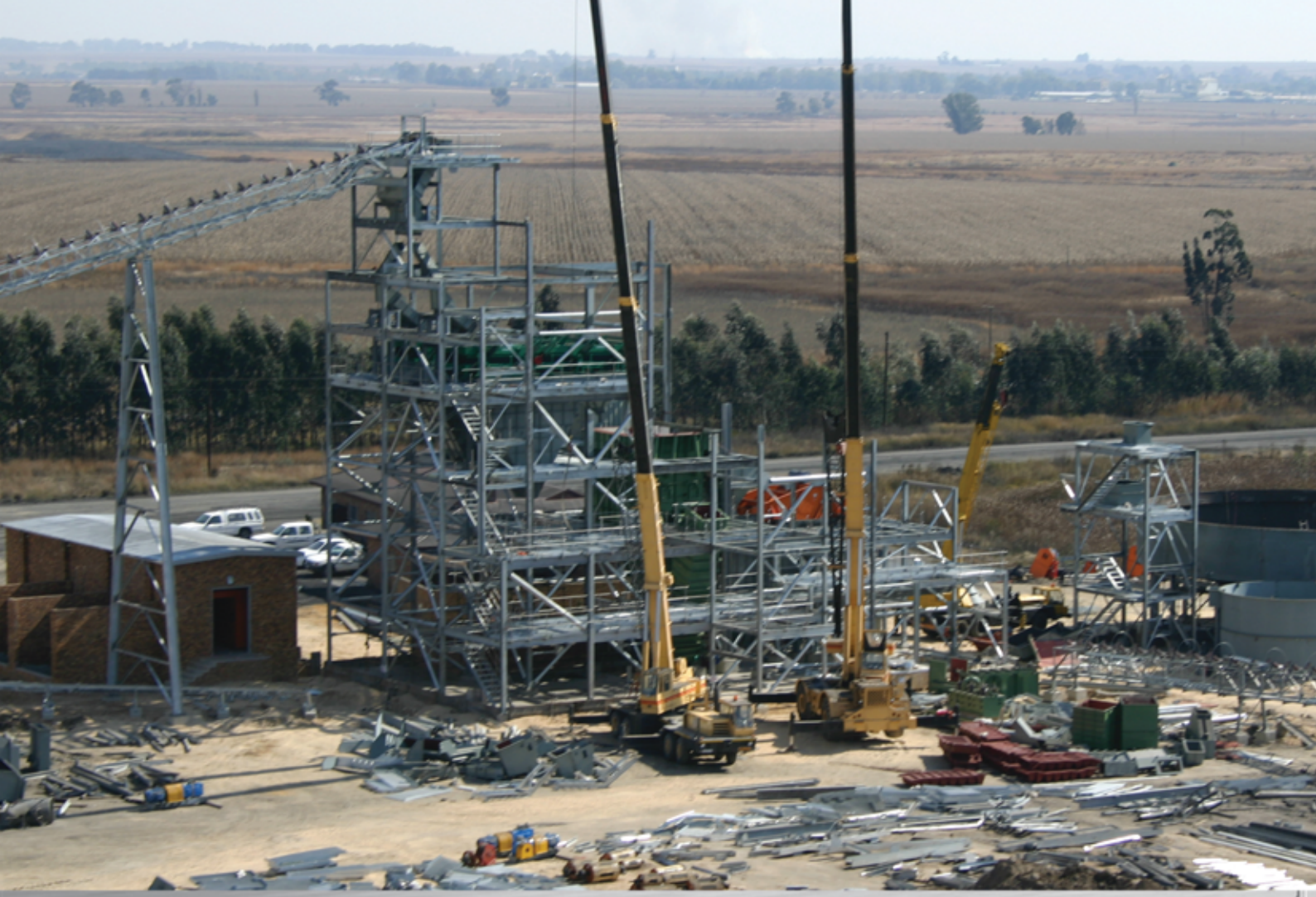
Life cycle costing analysis on industrial coatings

Durability of continuous galvanized sheeting for light steel framed structures

Introduction to SASFA

Case study – Evaluating logistics wrt the use of hot dip galvanizing

Coating reports



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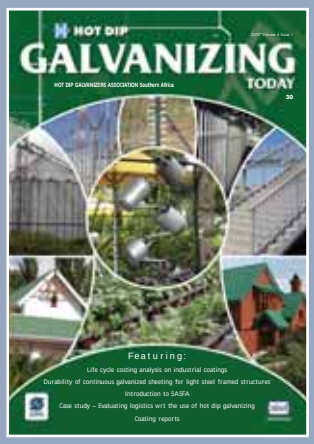

The Association is a technical information centre established for the benefit of specifiers, consultants, end users and its members

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Front Cover: *Kaleidoscope of products used in safety and security and continuous hot dip galvanized sheet and wire.*

Hot Dip Galvanizing – Adding value to Steel

Executive Director's Comment

At the start of a new year, it is well to reflect on the state of the industry and the roll of the Association. Our primary goal is one of dedication to the improvement of service and quality to the wider industry, and as a technical and marketing support organization to our membership.

As result of the substantial increase in the basic price of zinc, and the fact that over the past 6 to 8 months, we have witnessed a significant demand for hot dip galvanizing, market place perception or rumors have it that hot dip galvanizing has become too expensive and secondly that the industry, as a whole, does not have sufficient capacity to meet current demand.

Perception can be misleading and the two issues highlighted above are no exception. As published in past issues of Hot Dip Galvanizing Today, the zinc price is related to the London Metal Exchange (LME) price in US$. With reference to published data available on the web, the US$ price has come off a high of over $4 500 per ton and is now trading under $3 400 per ton. Irrespective of this change, no time over the past year can it be said that hot dip galvanizing was uneconomical when comparing corrosion performance based criteria. Rand for Rand and corresponding environmental conditions, hot dip galvanizing remains economically competitive with other forms of corrosion control coatings.

Turning to the issue of capacity constraints. It is true that there is now far less free capacity available than in previous years. However, substantial capacity remains available within the total industry. What is required, more so than in the past, is that planning and liaison between project managers, consultants, steel fabricators and galvanizers must take place in order to allocate production capacity to the various projects. Such forward planning will assist our industry to achieve turn around times and meet project requirements.

Bob Wilmot

Note from the Editor

Due to increased activities in the mining and industrial sectors over the last six months, an unusually higher demand for hot dip galvanized steel particularly in Gauteng has been experienced. Substantially increased demand is however, not the only thing that can influence delivery of quality coatings by the industry.

Every day due to work pressures and failed deadlines the galvanizers are requested that in favour of a more acceptable delivery time, they forgo fettling and cleaning before delivery. If acceptable by the galvanizer, then cleaning is carried out by the contractors at their yard or worse at the site. Although many contractors have been doing this successfully for some time, those making use of relatively untrained personnel to mechanically clean hot dip galvanized coating imperfections, etc. can very easily result in inappropriate over cleaning of the coating, leading to unacceptable quality and premature surface discolouration.

The end user can obviate this practice by insisting on a SABS certificate of conformance, whereby the galvanizer is forced to complete all cleaning in terms of his quality control procedure in the promised time, prior to delivery.

Without adequate control, the practice of over cleaning by uninformed personnel can have major long-term repercussions for this industry.

Features for this issue include:

Continuous Hot Dip Galvanizing of Sheeting, including articles by the Advanced Roofing Technology Foundation (ARTF); the establishment of the South African Light Steel Frame Building Association (SAFSA) and its objectives, a sheeting producer and a contractors comments; an article on the family of Zinc, Zinc/Aluminium and Duplex Coated Coiled Sheeting; a comment on SANS 1273, Fasteners for roof and wall coverings in the form of sheeting; as well as a coating report dealing with the implications of wet storage stain on sheeting during lengthy storage.

Continuous Hot Dip Galvanizing of Wire and Safety and Security, includes land rehabilitation at Van Ryssen Dam; the safety and security of an electrified fence and new galvanized wire specifications; and Andrew Mentis plays it safe at Marion Island.

Under Duplex Coatings, we look at life cycle costing analysis, an essential prerequisite for any specifier; Education and Training expands on our certificated coating inspectors course which, from an engineering perspective, is now CPD approved and an essential requirement in any coating inspectors portfolio.

Following previous discussions on the superior long-term sacrificial protection properties provided by Hot Dip Galvanizing, the hot debate on "Zinc Rich Paint" versus "Hot Dip Galvanizing" seems to have abated?

Duplex Coating Report, stresses the need for surface cleaning of the hot dip galvanizing prior to the application of paint, seen at a shopping centre in the Western Cape.

Other regular articles include "Misconceptions", where Miss Conception sets the record straight on market-place misconceptions; "Walter's Corner" addresses the state of the hot dip galvanizing industry; Our Guest Writer, Bob Andrew dons his philosophical hat with his article on "Quantum Theory".

Our Personality Profile, is Busi Mpontshame our first female "hot dipper".

Finally, "Case History No 13" includes the Moma Sands Project – with an emphasis on the logistics of the project and advantages of using hot dip galvanizing.

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

Terry Smith

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Southern African Light Steel Frame Building Association (SASFA)

A new division of the SAISC

In order to assist with the development of the light steel frame building industry, an association has been formed as a division of the Institute of Steel Construction. Known as the Southern African Light Steel Frame Building Association (SASFA), its founder members are the major material suppliers to this new industry : Mittal Steel, Group Five / Everite (Fibre Cement Board), BPB Gypsum and Lafarge Gypsum (Plaster Board), and Owens Corning and Brits Nonwoven (Insulation).

The mission of SASFA is to develop and grow the Southern African and export markets for light steel frame building.

Its vision is to make the following come true:

- Light steel frame building is established as a high quality, energy efficient, cost effective and preferred method of building in South Africa, for low rise residential and non-residential buildings. The goal is to capture 10% of the market for new low rise buildings by 2011.
- Light steel frames constitute a significant export industry.

A Steering Committee has been formed to guide the development of the Association and the industry, with representatives from the major material suppliers, manufacturers of light steel frame building systems, distributors of material and equipment and the Institute. An action programme has been drawn up to prioritise the many tasks identified for establishment of this industry on a sound footing.

A number of other important milestones have already been, or are being achieved:

- An interim draft Code of Practice has been compiled for light steel frame building, based on the approved timber frame code (SANS 10082), and it was accepted in principle by the NHBRC (National Home Builders' Registration Council).
- A Technical Committee has been formed, with its first priority the drafting of a comprehensive SANS Standard for Light Steel Frame Building. A lot of ground has been covered, and the draft document is taking shape. It covers foundation requirements, structural aspects, and interior and exterior cladding and insulation of light steel frame buildings. The SASFA draft is expected to be completed by early April 2007.
- The Training Committee is responsible for the identification of education and training requirements, the establishment of courses and the arrangement of seminars.
- A logo has been designed, and the SASFA website (www.sasfa.co.za) established. Judging by the rapidly growing site visits statistics, it is proving to be a valuable source of information. The names and contact detail of SASFA members have recently been added.
- A well attended and very successful cocktail function was held during October at the Country Club of Johannesburg, where suppliers to this industry had the opportunity to exhibit some of their literature. Scheduled to end at 19:30, such was the enthusiasm of some of the attendees that discussions (and later on some singing) went on until 23:00!
- A session of the Steel 50 Conference, arranged by the Institute, was dedicated to light steel frame building. Some excellent papers were presented by two overseas and a local speaker, and SASFA had its first exhibition stand. Feedback from delegates indicated that this was one of the best rated sessions of the Conference!
- The first General Meeting of SASFA was held on 21 February, and the Steering Committee for 2007 elected. It was very well attended by interested parties from all sectors of industry.

- Papers have also been presented at the International Housing Conference, arranged by the SA Housing Foundation and held in Cape Town during October.
- In order to ensure quality, preparation work is under way to establish an accreditation scheme of members. Audits will be held to establish conformance of members against an agreed set of criteria, ranging from quality assurance certification (ISO), qualification and experience of technical staff, condition of equipment and software, to training programmes for employees.
- A Quality Checklist has been drafted, to assist builders and building inspectors to ensure that building work is carried out according to specification.
- Contact has been established with the financing industry, to facilitate acceptance of light steel frame buildings.
- Widespread media coverage is being achieved – articles on light steel frame building have appeared in Steel Construction, Walls and Roofs, Engineering News, Gauteng Business, and SA Builder, to name but a few of the more prominent publications.

Invitations have been sent out to the wider industry to become members of SASFA, via membership of the Institute. A range of membership categories are available:

- Profilers and manufacturers of light steel frame building systems.
- Major material suppliers (steel, fibre cement, plasterboard and insulation).
- Other material, component and equipment suppliers.
- Professional members (architects, engineers, quantity surveyors & draughtspersons).
- Merchants, service centres and distributors.
- Building industry members.
- Associate members, and
- individuals.

Further detail, and membership application forms and applicable fees can be obtained from www.sasfa.co.za. Alternatively, enquiries may be directed to info@sasfa.co.za.

Introduction to ARTF and Roof Technology Services (RTS)

Walter Barnett is the founder and an honorary lifetime member of the Hot Dip Galvanizers Association of Southern Africa. He has had a long and illustrious career in the corrosion control field, having acquired a number of honorary titles and awards for his achievements.

Mr Barnett has twice served as President of the Corrosion Institute, and was Executive Director of the Hot Dip Galvanizers' Association of Southern Africa (HDGASA). He is a gold and silver medal award winner of the Corrosion Institute, and was appointed as their Vice Chairman in 2003. He is still very active as a senior advanced technical consultant in the fields of corrosion protection, coatings and galvanizing.

Mr Barnett is currently listed as a senior ARTF advisory panel member (independent) and has written the following introduction for ARTF and RTS:

The Advanced Roof Technology foundation Of Southern Africa (ARTF) has established over the years a commendable reputation as Southern Africa's leading and benchmark setting non-profit organization in the field of roofing care and remedial maintenance.

The ARTF advisory panel includes associates who have all established nationwide reputations for extensive technical knowledge, experience and professional competence, which has been acquired over many years of service in the public sector, prior to their retirement.

The panel includes Ron Cromarty CSIR research scientist, Gordon Munro retired S.A.B.S. Paints and Sealants Manager and Martin S Smit retired C.S.I.R. Boutek Chief Research Officer. Leading this team of experts is Rick Norwood, ARTF founder member and senior remedial roofing technologist. It is most unlikely that a team of consultants with a higher level of ethical standards, overall public spirited helpfulness and extensive technical experience could be found than that available from this group of veteran ARTF members.

Mr. Rick Norwood is also managing member of Roof Technology Services (RTS), which is a specialist-roofing consultancy. Rick has worked extensively over the years to streamline the vast technical database of ARTF into a simple and concise user-friendly system that can be used and effectively implemented by interested executives, engineers, and maintenance managers.

The outcome of this work is reflected in the ARTF Global Roof Asset Protection Plan (AGRAPP) manual which offers a safe, secure, reliable and workable method which, if correctly applied will assist owners to escape the “vicious cycle” of roof problems (including leaks) which lead to exorbitant long-term maintenance and replacement costs, the majority of which are corrosion related.

Overall costs which can be attributed to corrosion amount to several billion Rand annually in South Africa alone. Corrosion damage to roofing contributes significantly to this costly situation.

Here at last, we have a proven method whereby owners and tenants can stem the tide of costly corrosion related degradation and damage to roofs and structures.

Durability of galvanized sheet in light steel frame buildings

Background

The advent of light steel frame building in South Africa is one of the most exciting developments in recent times in the steel and building industries. While this method of building has been used in the US, Europe and Australia for decades, it has only recently been introduced to South Africa. It offers quality, cost and energy efficiency, as well as speed of erection for low-rise residential and non-residential buildings.

Light steel frame building consists of structural wall frames and roof trusses, manufactured from cold-formed thin gauge galvanized steel sections. High strength galvanized sheet in thicknesses of 0.58mm to 1.2mm, with a Z275 zinc coating designation, is normally used.

Exterior cladding can consist of a single skin brick wall or fibre cement board, fixed to the wall frames. Services – electricity and plumbing – are installed in the wall cavity created by the light steel frames, as is the insulation material. Gypsum board, fixed to the light steel frame, is typically used for internal wall cladding and ceilings.

Design and manufacturing

The key to the success and rapid growth of light steel frame building worldwide lies in the seamless interface between the computer based design and the computer controlled manufacturing facilities. Sophisticated software design programmes have been developed to carry out the structural design of each element required for a building, and to electronically convey the dimensional specifications to the roll-forming facility.

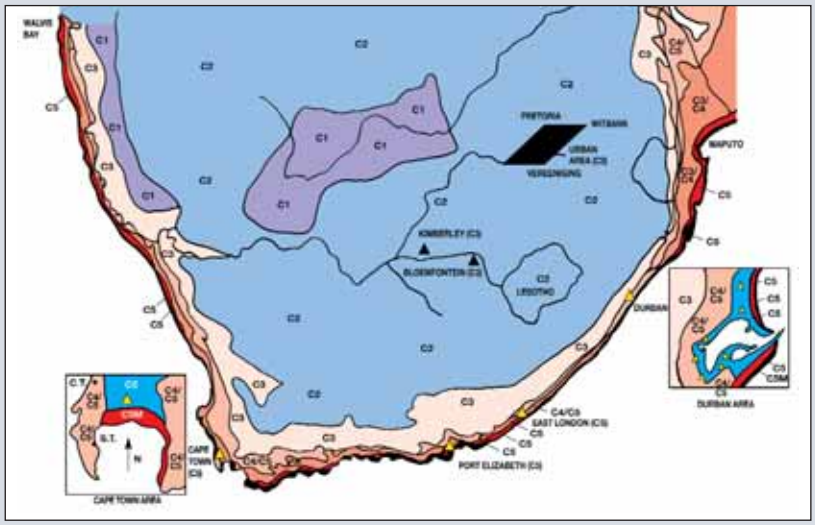

Figure 1:The map uses ISO 9223:1992 Corrosion of metals and alloys – Corrosivity of atmospheres – Classifications. A C1 classification indicates a low rate of corrosion, and C5M the highest corrosion rate.

Durability of the galvanized steel structure

Clearly the durability of the galvanized steel sheet used to manufacture the light steel frame sections is of utmost importance, as the wall frames cannot be accessed readily for inspection and maintenance. The steel frame has to last for the design life of the building, to prevent expensive maintenance. Good building practice, as required by the draft SANS Standard for Light Steel Frame Building, is required to ensure that the frame members are not subject to moisture, which could cause corrosion.

Extensive long term tests have been carried out in South Africa by various organisations such as the CSIR, Eskom and others on the functional life span of galvanized sheet in exposed applications (such as roof cladding) and in a wide range of climate zones. The corrosion performance of galvanized steel is proportional to its coating thickness and the corrosivity of the environment to which it is exposed, and is largely linear in nature. The results are well documented, and the functional life span up to first maintenance can be summarized in *Table 1* and *figure 1*.

However, the map does not apply to galvanized sheet *inside* the building envelope, largely protected from the external atmosphere - as in the case of light steel wall frames and roof trusses. An indication of the durability of galvanized sheet in such a protected environment can be obtained from the performance history of 'gang nail plates' (manufactured from galvanized sheet) which have been used to join timber truss members for more than 50 years in all the Southern African climate zones. Out of the tens of millions of nail plates used, not a single failure of timber trusses due to the corrosion of the nail plates have been documented by the country's major truss manufacturer.

To obtain scientific data, IZA (International Zinc Association), ILZRO (International Zinc Lead Research Organization) and the US Steel Framing Alliance, conducted a five year exposure test programme in North America and Europe. Galvanized steel samples were placed in wall cavities, the space between ceiling and roof as well as basements of four light steel framed buildings in aggressive marine (as close as 400m from the sea) and industrial environments. Samples were removed after one, three and five years, for evaluation of zinc loss due to corrosion.

After 5 years they determined the loss of the zinc coating due to atmospheric corrosion to be "negligible", and based on the results, calculated that the functional life of the galvanized steel elements will be in excess of 500 years!

Based on *Table 2*, Mittal Steel SA felt confident to issue a 50-year atmospheric corrosion warrantee on their galvanized sheet used inside the building envelope, subject to sound application practices and certain conditions. The warrantee applies to all structures erected 500m or more from the sea, and not in close proximity of sources of aggressive industrial pollution. It should however be noted that the *exposed* parts of the structure – such as trusses and purlins under the eaves – may need additional protection against corrosion in marine or industrially polluted atmospheres. A number of different suitable paint systems are available from reputable paint suppliers.

Visit www.sasfa.co.za for more information on light steel frame building.

J Barnard, SASFA, February 2007.

Editorial note:

While extrapolation of 5 year test data to predict a functional life in excess of 500 years may be a bit ambitious, it would appear that a Z275 zinc coating will protect the steel against corrosion for far longer that the normal design lives of buildings, provided sound and correct construction practices are adhered to.

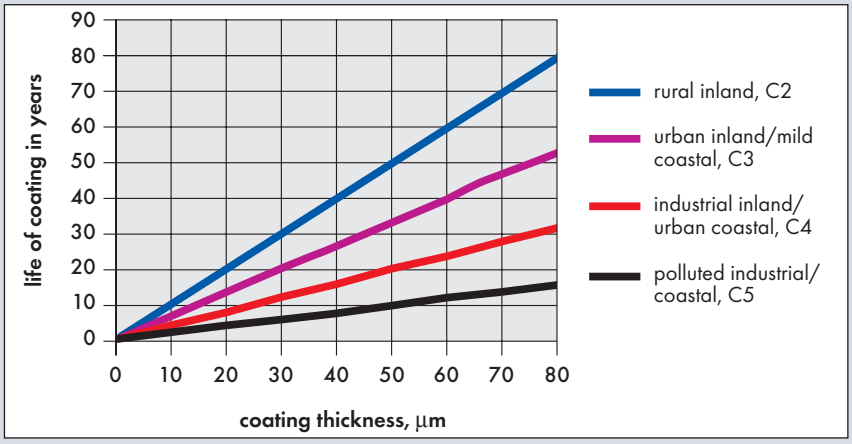

Table 1: Relationship between coating thickness and expected functional life of the zinc coating.

AVERAGE LIFE SPAN IN YEARS BASED ON:			
Samples	**Average 5-year mass loss data* (Actual coating thickness)**	**Maximum single 5-year mass loss data (Actual coating thickness)**	**Maximum single 5-year mass loss data (Nominal coating thickness)**
Galvanized 1 **	1072	1055	839
Galvanized 2 **	682	628	541
Zincalume / Galvalume	555	475	507
Average	**765**	**746**	**652**

* Samples with no corrosion (zero corrosion rate) were not used in calculating the averages.

** Galvanized 1 : Z275 coating, Galvanized 2 : Z200 coating

Table 2.

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The family of zinc, zinc-aluminium and duplex coated coiled sheeting

Definitions

Coil Coated Sheeting: Thin gauge steel sheeting produced in coil form, which is subsequently de-coiled, passed through a continuous metal coating processing line and then re-coiled.

Duplex Coil Coated Sheeting: Coil coated sheeting which is provided with an organic paint coating over an initially applied metal coating.

Although hot dip galvanized profiled roof sheeting has performed very well for many years both in Southern Africa and abroad, other protective coating systems have been developed which can in many applications provide enhanced cost effective corrosion control.

Before selecting the most effective coating system for a structure, it is essential to assess the degree of corrosion attack likely to be encountered in service. This will be influenced to a large extent by environmental conditions which are broadly described as Coastal Marine (very aggressive corrosion), Industrial (aggressive corrosion) and Rural (benign to moderately corrosive).

A further factor to consider is the extent to which corrosion inducing chemicals are produced or stored within a building and/ or the presence of corrosive fumes produced as a result of various manufacturing activities for which the building is used.

The metal coating systems available for the protection of steel sheeting fall into three main categories:

1. *Zinc-aluminium alloy coated steel sheeting*

When it was recognized that aluminium in zinc increased its corrosion resistance, the steel industry developed a coating alloy consisting of 55% aluminium, 1.5% silicon and the rest zinc. This product was first produced by Bethlehem Steel Company and marketed under the name Galvalume and subsequently Zincalume (by Lysaghts). The same product is now produced by other manufacturers under names such as Alugalva, Aluzinc, Algafort and Zalutite. The coating is applied on non-oxidising continuous anneal hot dip coating lines to a wide range of strength levels.

a) Corrosion Resistance:

Relying on long term atmospheric exposure tests (accelerated laboratory tests are unreliable), it has been established that thickness for thickness, the Galvalume type coating provides a corrosion resistant coating between two to four times that of pure zinc but with less cathodic protection and with the inherent problem of aluminium in contact with alkalis such as cement. Aluminium and zinc are described as amphoteric metals in that they react aggressively at both low and high pH levels. This is in contrast to steel where the corrosion rate decreases as the pH increases. Aluminium is tolerant down to pH levels of 3.6 while above pH 8.6 it corrodes. The

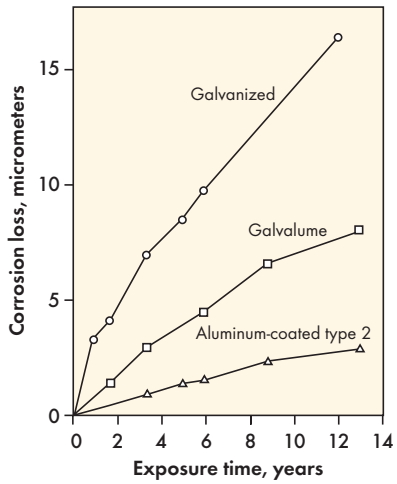


Figure 2: Corrosion performance of galvanized, aluminium coated and Galvalume sheet in a severe marine atmosphere.

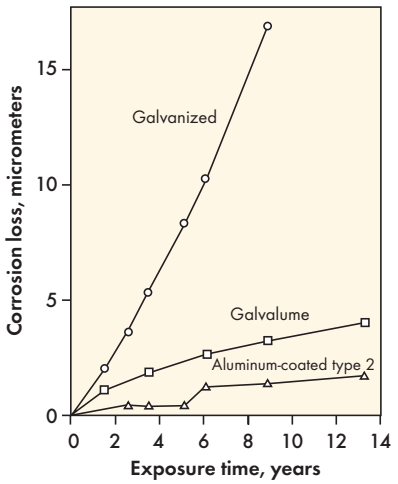


Figure 3: Corrosion performance of galvanized, aluminium coated and Galvalume sheet in an industrial atmosphere.

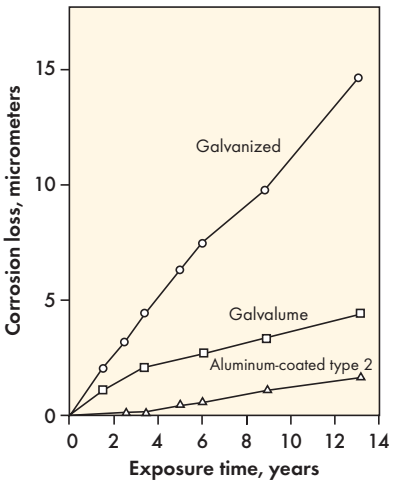


Figure 4: Corrosion performance of galvanized, aluminium coated and Galvalume sheet in rural atmosphere.

equivalent range for zinc is from about pH 5.5 up to pH 12.5.

The 55% Al –Zn alloy provides good performance under paint, good ductility and reasonable edge protection although hot dip galvanized sheet has been shown to have still better edge protection, particularly on sheets more than about 1.5mm thick. Likewise, the galvanized zinc coating has better ductility properties.

Figures 2, 3 and *4* provide the results of long term atmospheric exposure tests on hot dip galvanizing, Galvalume (55% aluminium) and hot dip aluminium coated sheets. The latter aluminium coating is more expensive and it is not available commercially in RSA.

The excellent performance of Galvalume in the industrial atmosphere (SO_2 pollution) is clear indication of the ability of aluminium to withstand corrosion attack down to relatively low pH levels.

When extrapolating these exposure test results with a view to reliably predicting a maintenance free service life, it is important to take into consideration the original as applied coating thickness prior to exposure. Specifications for coated steel sheet define the required coating by mass expressed as the sum of the coating on both sides of the sheet in gms/m2. This can lead to confusion, particularly if a less dense aluminium containing coating is being evaluated against a normal zinc coating. As a reliable indication, the mean coating thickness per side of the 55% aluminium coated sheet is 14µm compared with 19µm per side of Z275 galvanized material (137.5 gms / m2 = 19µm).

b) Zincalume Resin Coated Steel®

Unlike other types of steel roof sheeting, this can be easily prepared and coated during or immediately after installation. Corrosion "duplex theory" states that the combined life of a zinc containing coating plus a matched organic coating applied early in the life cycle of the sheeting, will be considerably longer than the sum of the lives of the two products when used separately.

Therefore the best protection and hence, life of this type of roof sheeting will be assured by applying a suitable coating early in the life of the roof. The type of organic coating selected will vary depending on the corrosive substances present in the atmosphere (e.g. marine or chloride attack and industrial SO2 acid attack).

c) Galfan

Galfan is a 5% aluminium, ± 95% Zinc coating with a small amount of mischmetal. In this particular application, mischmetal (a special mix of various "rare earth metals") is required to promote effective bonding between the steel substrate and the metal coating. It has become a standard product in many countries for the wire industry and it is being processed in ever increasing quantities by the steel coil coating industry. Galfan is also successfully used to coat steel tubing.

This coating is more ductile than the 55% aluminium alloy which is one of the reasons why it has been developed for protecting wire. Cathodic protection provided by Galfan is more or less the same as that for galvanizing, while general resistance to corrosion is said to be up to twice that obtained from pure zinc. Galfan performs extremely well in coastal marine atmospheres but understandably the 55% aluminium alloy is superior in industrial environments.

Tests undertaken in Belgium indicate that the performance of Galfan in buried conditions is considerably better than that obtained from the 55% aluminium coating. The Galfan coating is generally thicker due to the presence of Zn/Fe alloys in the coating structure.

Meanwhile, the availability of Galfan in SA as a protective coating for steel sheet is distinctly limited at present.

2) Continuously hot dip galvanized sheeting

The coating applied by this process consists almost entirely of pure zinc with a trace of aluminium (about 0.02%) added to the zinc melt. The coating is ductile and provides excellent cathodic protection at uncoated edges and surfaces where coating damage has occurred.

Hot dip galvanized roof sheeting is available in a range of coating classifications, the most available of which are three zinc coating grades.

Z275 (137.5 gms/m^2 per side) mean coating thickness = 19µm

Z450 (225 gms/m^2 per side) mean coating thickness = 32µm

Z600 (300 gms/m^2 per side) mean coating thickness = 43µm

These are distinguished by the mass of zinc present per square metre of sheet surface.

Since the life of a zinc coating is more or less proportional to its thickness in a given environment, it follows that the Z600 zinc coating will provide more than twice the maintenance free life available from the Z275 coating. The long term atmospheric exposure tests depicted in *figures 2, 3* and *4* demonstrate clearly that the 14µm thick 55% aluminium containing coating is attacked at a considerably lower rate than the pure zinc coating, but the substantially thicker zinc film of about 43µm on Z600 galvanized sheeting more than compensates for this.

The most commonly used galvanized roof sheet coating is Z275 which provides extended corrosion control in moderately corrosive environments. When this coating is used in corrosive coastal marine or heavily polluted industrial applications, duplex protection by means of an organic paint coating is recommended. Painting should take place sooner rather than later in order to avoid an accumulation of

zinc corrosion products on the zinc surface which may be difficult to remove prior to painting. For optimum corrosion free life as well as for aesthetically pleasing architectural purposes, duplex coating is also recommended in environments where moderately corrosive conditions pertain.

3) Duplex coil coated sheeting

Factory applied (usually silicon/ polyester/urethane) coloured coatings can extend the life and improve the appearance of profiled sheeting considerably.

This type of product has been manufactured in South Africa for many years by Mittal Steel (Chromadek) and HH Robertson (Colomet). Improved versions are currently being offered in technical publications and periodicals.

Coil coated sheeting is an excellent choice for vertical cladding of a building and other high visibility areas. If correctly installed, it will provide excellent durability both inland and in coastal marine environments, other than in the aggressively corrosive zone which, depending on land contours and prevailing wind direction, is more or less within 1 kilometre of the surf line.

BHP Steel Australia supplies a coil-coated version of Zincalume Resin Coated Steel Sheet ® called "Colorbond". This is an excellent product, but unfortunately it is not readily available in Southern Africa.

Where significant weathering of the topcoat has occurred, the coil coated sheeting should be recoated by a coating specialist well experienced with this type of material. 8 to 12 years after installation is the usual recommended recoating interval.

Each protective coating system has its strengths and weaknesses. An ARTF approved consultant is available to provide technical assistance at the design stage for new projects. In the case of existing structures where maintenance is required, recommendations can be provided by ARTF concerning the most cost effective methods of refurbishment or repair.

Authors: Walter Barnett (Founder, HDGASA) and Rick Norwood (Founder, ARTF).

Grateful acknowledgements to Ron E. Cromarty (Chief Science Officer, Boutek CSIR, retired) and Martin S. Smit (Chief research officer (recently retired), Division of Construction and Building Technology, CSIR,) for valuable assistance.

Acknowledgement to Frank Porter's Zinc Handbook for the corrosion performance graphs.

Durability of hot dip galvanized sheeting exposed to general atmospheric conditions

There is no doubt that in order to optimise the service life of the sheeting on a building in any environment, a factory painted galvanized steel sheeting system such as "Chromadek" or equivalent is preferred. Alternatively, the zinc coating on the sheeting could be over coated with a suitable paint system preferably shortly after the building is erected. The latter alternative requires a comprehensive coating and application specification and the services of a skilled applicator to successfully apply the paint.

Duplex coating technology suggests that the combined life of the zinc coating and the paint coating can be multiplied by a factor of between 1.5 and 2.7, depending on the conditions at hand.

However, an elaborate duplex coating system is only necessary if the service life required by the sheeting is indeterminable and the additional costs are considered negligible.

If on the other hand, the required service life is determinable such that the overall life of the sheeting is required to be say 15 to 20 years in a C1 to C3 environment, making use of a Z275 class of coating, would be appropriate. Z275 has a nominal coating thickness of about 20µm.

Similarly, if a 35 to 40 year service life in a C1 to C3 environment (*see map on page 7*) is required, a Z600 class of coating would be appropriate. Z600 has a nominal coating thickness of 43µm.

Making use of inappropriately coated roof fixing screws or a possible future variance in the local micro-climatic conditions over the prescribed life of the sheeted project, can negatively influence the corrosion rate and hence shorten the overall service life of the sheeting.

MITTAL

SHAPING THE FUTURE OF STEEL

Hot dip galvanized sheet for the light steel frame building industry

Due to the rapidly growing demand for galvanized sheet, Mittal Steel SA has recently commissioned a new state-of-the-art 100 000t/year hot dip galvanizing line to supplement its production capacity. This equates to approximately 26 million m^2/year of 0.5mm thick sheet. The introduction of the new line increases Mittal SA's galvanizing capacity by 20% to 600 000t/year and has been designed to produce galvanized sheet mainly for the roofing market with a steel thickness varying between 0.30 - 0.50mm, width between 762 - 1 050mm and Zinc coatings between 90 and 160g/m^2. (Although the requirement for light steel frame building industry is 275g/m^2, it is anticipated that the new line will alleviate the current shortage of roof sheeting)

The increased tonnage from the new line will also relieve the pressure on Mittal's other two galvanizing lines at Vanderbijlpark and enable these lines to produce material for other applications.

Apart from complying to the SANS Standard for galvanized sheet, Mittal SA also has the SABS Mark on its product, which serves to certify its quality.

The following branding Mittal Steel mark, appears at regular centres alongside the edge of all sheeting produced by the company, the branding highlighted below is for a 925mm wide, 0,5mm thick, with a Z275 class of coating.

Mittal Steel CID : P77148 W: 925 T: 0.50 C: Z275

Galvanized steel sheet has a wide range of applications, including roofing and cladding, security fencing, hot water geysers, expanded metal manufacture, electrical switch boxes and ventilation ducting.

Cold formed sections for Light Steel Frame Building (LSFB) systems has recently been added to the long list of end-uses of galvanized sheet in South Africa. These sections are produced on specialised profiling lines to narrow dimensional tolerances. During profiling the sections are swaged to facilitate connections, holes are punched for fasteners and the sections are cut to exact length required for each individual application. The profiling lines also have the facility to mark each section uniquely, to ensure it is used in the correct position.

These sections are factory assembled into wall panels, roof trusses or open web joists. The assemblies are subsequently despatched to site for rapid erection.

Light Steel Frame Building has been in use elsewhere in the world for the past 30 years. Recent developments in design software, which is linked to the profiling equipment, has created huge new interest in this building method. In order to develop this market in South Africa, Mittal Steel was instrumental in establishing the Southern African Light Steel Frame Building Association (SASFA, a division of the SA Institute of Steel Construction). Other founder members include Everite, BPB Gypsum, Lafarge Gypsum, Owens Corning and Brits Nonwoven.

For more information on Light Steel Frame Building or SASFA visit www.sasfa.co.za

SASFA's mission is to develop the light steel frame building industry in Southern Africa. The aim is to capture 10% of the low rise building market within 5 years. This implies that some 2 million m^2 (floor area) of buildings will annually be constructed using LSFB systems. When this goal is reached, a sustainable new market for galvanized sheet of some 30 000t/yr (1 850 tons of zinc/yr) will have been established. There are already 12 of these profiling lines in South Africa, with sufficient capacity to provide light steel frames for 850 000m^2 of building per year.

Mittal Steel South Africa

Colin Thomas Tel: +27 (83) 304 0559

Peter van Wyk Tel: +27 (83) 304 0430

Website: www.mittalsteelsa.com

Major new player in lightweight steel frame building industry

With lightweight steel frame construction on the increase world-wide, SA will be following suit with the establishment of another major player – Vela Steel Building Systems (Vela SBS).

"The construction industry is continually evolving. Technology is the driving force and traditional building methods are no longer the only answer. Lightweight steel framing is the next step in the evolution of construction methodologies," says Brent Harris, managing director of Vela SBS.

Harris says that the technology of lightweight steel frame building has the potential to make a palpable difference to the delivery of houses in South Africa. "Construction times are significantly reduced and the vastly improved thermal insulation of the structure insures not only a better quality end product but also one that offers better value for the money invested," he says.

"It's a double-whammy. The investment value increases right at the beginning of the process because of the speed of erection and in the long-term, the improved energy efficiency and reduced need for maintenance render the benefits of lightweight steel construction incomparable to traditional building methods."

Lightweight steel frame building consists of structural wall frames and roof trusses manufactured from cold-formed thin gauge galvanized steel sections.

Unlike other building processes, the wall panels and roof trusses are erected first, allowing the roof tiling or sheeting to be undertaken before the wall cladding begins, thereby giving the builders a roof to work under. This significantly accelerates the building process.

The roof trusses are lightweight and can be assembled on site, thereby negating transport costs. Added benefits are that the steel is not affected by moisture, will not warp or rot and is not affected by termites, eliminating a number of factors to be considered when using a more conventional building materials. Vela SBS will be selling these trusses as a stand-alone item into the general market.

Newly constructed light steel frame single story building clad with brickwork.

Exterior cladding can consist of a single skin brick wall or fibre cement board which is fixed to the wall frames. Services like electricity and plumbing are installed in the wall cavity created by the frames.

There are a number of different options for cladding the internal walls. The option commonly used throughout the rest of the world is to pack high density insulation into the wall cavity and clad them with gypsum board, then rhinolite and paint which offers an attractive finish for internal walls and ceilings. Another option is to shutter the walls and fill the cavity with lightweight concrete, and

then plaster to achieve a similar effect to conventionally plastered brick walls.

There are several advantages to Vela's light steel frame building compared with conventional building in terms of quality, cost, durability and speed. These include:

- Frames are assembled under controlled factory conditions.
- In the case of poor foundation conditions, steel framed buildings can accommodate significant movement without cracking.
- The steel frame dictates a high degree of accuracy of building dimensions, with the result that everything fits as planned.
- Walls are straight and true. Poor workmanship is no longer an option or excuse.
- Time saving can be as much as 30% when compared with conventional building.
- Structures are lightweight. A steel framed wall, clad with fibre-cement or plaster board, offers a mass saving of 90% compared with a double-skin brick wall.
- An estimated extra 4% floor space is obtained due to reduced thickness of external walls when clad with fibre-cement board.
- Services are installed in the wall cavities without the necessity for chasing the walls.

"All these advantages combine to reduce wastage, lower logistical costs and reduce time of construction. So while the materials themselves may not be less expensive than brick and mortar, there are savings to be made in the construction process, energy savings because of improved insulation and the quality of the entire structure ends up significantly better than a conventional one," says Harris.

Harris says his company has benchmarked the best production practice from around the world and that the market here can expect the highest possible quality from the outset. Vela SBS has NHBRC approval and complies with the Draft Code of Practice for Lightweight Steel Framed Building Systems, developed by the Southern Africa Light Steel Frame Building Association (SASFA). Each structure is signed off by a structural engineer.

Double story light steel frame building during construction.

"Our machinery is state of the art and our people have been trained to a competency that is on a par with anywhere we have been. We look forward to revolutionizing the construction industry in this country," Harris concluded.

The fasteners required for light weight steel framed buildings

When compared to the corrosion protection or class of coating specified for roof, wall and lightweight frame buildings, ensure that the fasteners used are similarly protected!

To compliment the fixing of roof and wall cladding materials, while taking into account the expected life of the structure and the environmental conditions on hand, the specified coating on the fastener is extremely important.

South African Bureau of Standards is finalising a specification SANS 1273 – Fasteners for roof and wall coverings in the form of sheeting. This specification covers the material / coating, dimensional and mechanical strength requirements for a number of fasteners and washers that are used in the building industry for the fixing of roof and wall coverings in the form of sheeting.

The specification will relate the expected performance of the coating / material to the various corrosion categories in terms of ISO 9223, so that the specifier can select the fastener coating/material to suit the specified life of the sheeting / structure taking cognizance of the corrosion conditions at hand.

We look forward to the publication and use of this specification by specifiers, involved in the selection of roof, side and end cladding fixing fasteners that can provide similar corrosion protection to the coating type and thickness of the specified sheeting.

Editor's comment:

We would recommend that the specification also includes the fasteners used in lightweight steel frame buildings.

Obituaries

HARRY RUPNARAIN

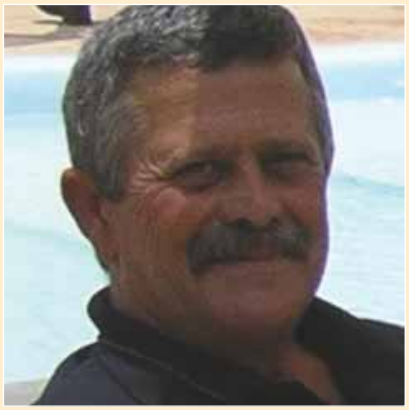
1922 – 2006

Beloved friend and greatly respected businessman, Harry Rupnarain (1922-2006) sadly passed away on 28 December 2006 at his home in La Lucia, Durban.

Having established numerous esteemed and successful businesses including New Age & Excel Stationery and most recently, Harrismith Galvanising and Steel Profiles, Mr Rupnarain was constantly held in high regard amongst his peers. His business etiquette was always gracious, sincere and honourable. He was a pillar of the religious community, but first and foremost Mr Rupnarain was a dedicated family man. A loving father, a doting grandfather and an adoring great-grandfather, he is survived by a family that will miss him immensely.

ERIC KING REMEMBERED

30/12/1949 – 23/01/2007



Eric Basil King was born on 30 December 1949. This Durbanite started his career at Fergusson Paints, working as Production Supervisor, Laboratory QC and Technical Representative. Eric was also employed by Dekro Paints as Technical Representative, providing technical service to the Marine Division. His Duplex Coating expertise, lead him to secure the position of Contracts Manager for Millburg Painting Contractors where he supervised and managed contracts. In 1991 Eric joined Voigt & Willecke Galvanizing as Sales Representative - he was promoted to Production Manager in 1996. Eric started his own Sand-Blasting & Duplex Coating business in 2006.

Eric will be remembered for his keen sense of humour and ready smile. His expertise & contribution to both the Hot Dip Galvanizing and Duplex Coating Industries will be deeply missed. He is survived by his wife Jeanie, daughter Jessica & his parents.

Babcock Ntuthuko Powerlines

52 Years of Manufacturing and
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Transmission Lines
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Facsimilie: +27 (0)11 739 8201
Email: dave.brereton@babcock.co.za

www.babcock.co.za

SABS ISO 9001:2000
Galvanising Mark-SABS 1461

Andrew Mentis plays it safe at Marion Island

More than 1 000m^2 of Mentis Positive Non-Slip Grating, developed by Andrew Mentis to give exceptional non-slip characteristics, was used on the R200-million Marion Island weather station. This award winning project clinched a trophy in the 2006 Eskom Hot Dip Galvanizing Awards evening.

With treacherous underfoot conditions due to the sub-Antarctic climate, the Mentis grating was used to provide a safe and viable alternative route for pedestrians as well as forklifts. The hazardous underfoot conditions made it virtually impossible for personnel and delivery staff to traverse the distance between the harbour and the station buildings and its surroundings without practically sinking up to their hips in the muddy terrain. It is for this reason that the weather station and walkways were constructed on essentially thousands of piles rammed into the muddy ground.

Andrew Mentis, a leading local manufacturer of grating and expanded-metal products, supplied its Positive Non-Slip Grating upon the recommendation of fabricator Petrel Engineering. Michael Franzen, managing director of Petrel Engineering, says the fabricator has an extensive track record in Antarctic research stations, including the SANAE base, and has subsequently established a successful and long-lasting relationship with Andrew Mentis.

"In addition to being able to offer the ideal grating product for such an arduous environment, where the safety of personnel is paramount, Andrew Mentis also offers the best service, delivery times and costing," Franzen says. "This makes for an ideal holistic solution for such specialised projects as the Marion Island weather station."

Mentis Positive Non-Slip Hot Dip Galvanized Grating was used on all the walkway areas between the harbour and the station.

Andrew Mentis Positive Non-Slip Hot Dip Galvanized Grating is the solution for the Weather Base Station on Marion Island.

One of the few weather stations in the southern Indian Ocean, Marion Island plays a critical role in providing information about weather systems over oceans surrounding South Africa.

A cold, wet and windy climate, together with boggy terrain and mainly mosses and ferns for vegetation, makes for a hazardous terrain that necessitated the protection of both personnel and equipment.

Ted Jarvis, managing director of Andrew Mentis, explains that the

exceptional non-slip characteristics of Mentis Positive Non-Slip Grating were realised by means of the positive raised sections forming multi-directional obstructions on the top of each bearer bar. The major advantage of this product is that the non-slip features do not compromise its load-bearing capacity, as is the case with serrated grating.

"The positive profile also means that this grating is self-cleaning, eliminating the dirt build-up commonly associated with serrated grating. The Mentis Positive Non-Slip Grating uses a pressure locking system to secure the bearer and transverse bars, rendering it extremely solid and safe for all applications.

In addition, the non-slip features work equally well in all directions, in all finishes, and on both leather- and rubber-soled footwear. "This makes for a highly flexible product adaptable to a range of arduous applications, of which the Marion Island weather station is a sterling example," Jarvis says.

Due to the remote location of the project site, combined with the logistical difficulties of obtaining suitable construction materials and equipment, designer and structural engineer Endecon Structural (Centurion) opted for pre-fabricated 3CR12 and hot dip galvanized steel for the actual weather station itself. The location also required special attention to corrosion protection, for which hot dip galvanizing is an ideal solution. "Our expanded-metal products are also an ideal solution to secure premises against intruders, or to ensure the security of plant and the safety of personnel," Jarvis comments.

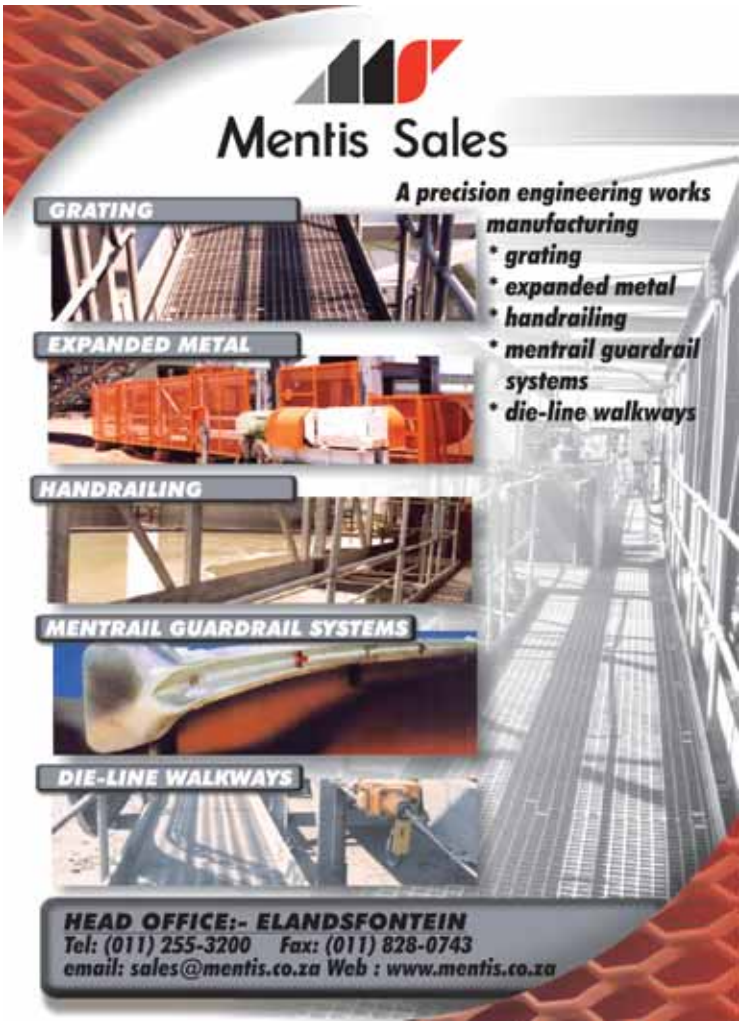
Apart from its expanded-metal products, Andrew Mentis is also well-known in the mining and road-building sectors for its Mentrail guardrail for both roads and highways. Another novel application is its use as a barrier inside warehouses to protect walls and machinery from materials-handling equipment such as forklifts. The 2.6-mm-thick Mentrail guardrail, supplied in standard lengths, is available in either uncoated or hot dip galvanized, and with a 'buried' end for the beginning and an end wing for the termination of each section.

Established in 1950, Andrew Mentis's products are used extensively in a gamut of industries, from power generation and mining to the petrochemical, motor, construction, food and beverage, pulp and paper and steel sectors. It has its head office in Johannesburg, with a national network of sales offices.

More about Andrew Mentis (Pty) Ltd

Andrew Mentis (Pty) Ltd is a leading manufacturer of grating, expanded metal, Mentrail (guard-rails for roads), DieLine Walkways, industrial handrail systems, steel floor tiles and Mendrill (automatic drilling and boring machines). Established in 1950, the company's products are used in industries as diverse as power generation, mining, petrochemical, motor, construction, food, paper and steel.

The company operates from its head office in Johannesburg, with a nationwide network of offices.



Van Ryssen Dam, Phalaborwa

Problem

In order to comply with the National Water Act (Act 36 of 1998), Foskor Mine wanted to collect and contain polluted surface run-off from its tailing dams in the Van Ryssen Dam for re-use in the mines processing plant.

The Water Management Project incorporating this recycling will result in reduced raw water requirements, currently sourced from this water scare area at a barrage in the Olifants River.

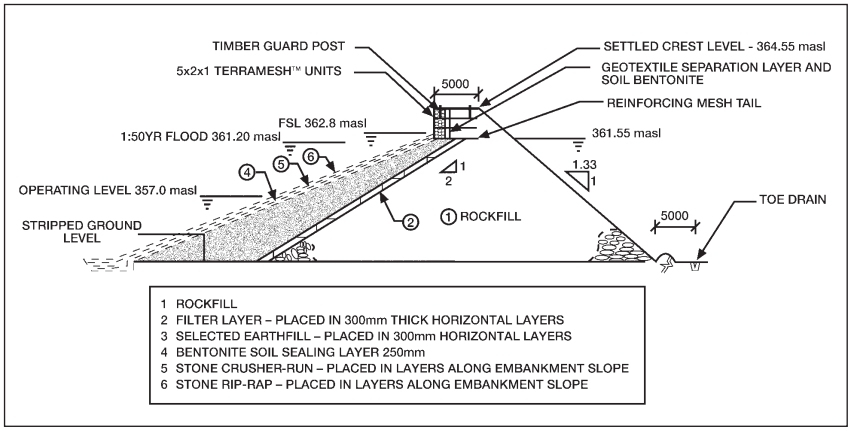
The dam was sealed with an impermeable Bentonite layer and designed to cater for the 1:50 year flood providing further benefits to the environment by preventing contamination of the downstream water resource.

Starting Terramesh™ installation.

Packing the front face.

Starting the continuous hot dip galvanized wire Terramesh™ installation.

Packing the front face.



Typical section through a dam wall.

Solution

As with all earth embankments, the higher the structure, the more fill material is required. The initial design solution comprised a 22m high rockfill dam with an upstream earthfill facing only.

However, through a simple adjustment involving reducing the height of the rockfill structure to 19m and making up the last 2.4m in height with a vertical Terramesh™ wall manufactured from continuous hot dip galvanized wire to SANS 675, on the upstream side, the amount of required rock was significantly reduced. Lack of suitable dam-building material e.g. clay, meant that recycling of the waste rock dumps to create a rockfill dam was the most obvious solution.

Benefits

The greatest benefit lay in the reduced earth fill quantities and project costs as tabled below:

	Original	Saving	% Saving
Earthfill (m^3)	290 000	100 000	30
Cost (R million)	32	8	25

Maccaferri/African Gabions' MacStars 2000™ software program was used to design the structure. The program performs a series of stability checks of the reinforced structure and provides a detailed calculation report, cross sections and safety factors for the final design.

Seismic loading together with the RMF flood had to be accounted for during the design of the wall.

Focus on security

You're enjoying a quiet evening at home with your family and the unthinkable happens. Something you have read about so many times but hoped and prayed would never happen to you. The unmistakable sounds of an intruder, already inside the house.

Your mind freezes for an instant. Once you start to think again, you madly run through all the options – do I try to get to my firearm, or the nearest panic button or do we try to escape into the garden and hope that there are not more of them outside waiting to come in?

These are some vital questions, so where do we start? How about the old adage of prevention being better than a cure?

Having been in the security industry for over twenty years, Provicom have in this time explored, tried and tested many options. They have now developed a system of perimeter protection which they feel to be the most practical, reliable and aesthetically pleasing within affordable parameters.

The Rolls Royce® of all security systems in Provicom's Divisional Manager, Geoff Brandt's opinion is Perimeter Power Protection. This is the point where one controls all potential intruders, keeping them out with a solid barrier that cannot be climbed over or burrowed under. The barrier will also provide one with a warning as the intruder attempts to gain access to one's property and will act as a deterrent to keep most perpetrators from any further attempts. A warning at this stage will also take away the element of surprise and forewarn one. Perimeter protection means that one is in full control of one's space at all times.

Here is how our Perimeter Power Protection Plan works.

Provicom's Perimeter Power Protection Plan

Outer Barrier

Steel palisade fencing designed to each unique application.

- Designed to unique aesthetical tastes.
- Designed to outsmart even the smartest vandal.
- Designed to last using the best possible materials for the application.

- HOT DIP GALVANIZED for durability (including the smallest fastener, used to connect the erected pallisade fence).
- Access to be controlled remotely at this boundary.

Inner Barrier

Electrified security fence designed to each unique application

- This is the beginning of the intelligent defense line
- This is visually the strongest and safest deterrent.
- This also acts as the first early warning.
- This is aesthetically designed in conjunction with the palisade fence.
- It signifies a no go area.
- Where spatially available wide anti-burrow systems are installed. This is done at a fraction of the cost of concrete or steel plinths.
- This helps enforce access control measures.
- HOT DIP GALVANIZED for durability (including the self drilling screws required to fix the electrical wiring system).
- Zoning, narrows target area giving you the element of surprise.

Visual Barrier

The interfacing of cameras with intelligent electric fence systems.

- Visual identification.
- 99% accurate intruder alarm, using the leading partner in access control systems.
- Can identify perpetrator even if you are not present.
- Acts as your eyes, and ears when you are not available.
- Camera mountings specially manufactured.
- HOT DIP GALVANIZED for durability (including the self drilling screws required to fix the visual barrier equipment).

Wire galvanizing specifications revised!

Hot dip galvanized fencing wire is produced from mild, high tensile or very high tensile steel wire, on a continuous coating line which includes annealing, acid cleaning, fluxing, galvanizing, wiping to remove excess zinc and recoiling of the finished wire. The process is similar in arrangement to the Sendzimir process used for continuous galvanized sheeting. Between 20 and 40 individual wires are hot dip galvanized simultaneously by passing through a molten zinc bath held at 450 degrees celcius.

Coating thickness is generally related to the diameter of the wire being processed, as is recognised in the hot dip galvanized wire standards. Life of a hot dip galvanized coating is relative to the coating thickness and therefore the thicker the coating the longer it will last in a given environment.

The two specifications that to date have covered wire galvanizing in South Africa are SANS 675 and SANS 935. The former specification was amended in 1993 to include only one class of coating for fencing products i.e. a heavy zinc coating and after a discussion at the SABS that in principle, international specifications be considered for adoption or inclusion wherever feasible, is currently under review with the intention of being revised to include aspects covered by EN 10223. SANS 675 is also referenced in the gabion specification SANS 1580. SANS 935 which included three classes of coating, has been withdrawn and replaced by SANS 10244 parts 1 and 2.

FEATURES 2007

MAY / JUNE

Architectural, agricultural and the world of hot dip galvanizing around us, also incorporating stadiums; staircases; furniture; wine industry; conveyance piping; heat exchangers; rebar.

AUGUST / SEPTEMBER

The Annual Awards Event; masts and poles; traffic signs and sign gantries; scaffolding.

NOVEMBER / DECEMBER

Mining and quarries; gratings; overland conveyors; fasteners.

MISCONCEPTIONS

Miss Conception puts it "straight"

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

A hot dip galvanized coating can be successfully used at temperatures up to 419°C, which is the melting point of zinc.

True or false?

Hot dip galvanizing is formed by way of a metallurgical reaction between molten zinc, at 450ºC, and steel "iron". Reaction between zinc and steel can occur at zinc temperatures well below the melting point of zinc, i.e. when both the steel and the zinc are in the solid state.

The best example of this is the well-known sherardizing process, which was developed by a Mr. Sherard of the United Kingdom many decades ago. In this process, steel articles are deposited into a barrel containing a mixture of zinc dust and sand and then tumbled in a rotating barrel at a temperature of about 380°C (well below the zinc melting point of about 419°C). In this way a coating consistency of iron / zinc alloy is formed by diffusion despite the fact that both metals are in the solid state.

In the case of hot dip galvanizing, the coating is made up of a relatively pure outer zinc layer which overcoats a series of iron / zinc alloy layers similar in some respects to the alloy achieved by the sherardizing process.

If a hot dip galvanized coating is heated up to a temperature at which diffusion between zinc and iron takes place (about 250°C) a portion of the zinc layer of the coating combines with iron to form further iron / zinc alloy. Because both metals are in the solid state a void is thus formed between the remaining outer zinc and the underlying alloys. This leads to a phenomenon described as heat peeling, where the remaining outer zinc layer of the coating separates from the underlying Fe / Zn layers and flakes off.

Heat peeling does not remove the entire coating since the alloy structure of the coating remains intact. The overall coating thickness is, however, significantly reduced.

For long-term service life, a hot dip galvanized coating should not be exposed to temperatures in excess of 200°C for any length of time. Occasional temperature hikes of up to 350°C can however be tolerated.

The cunning use of a specially profiled guard rail section to house a camera to record speeding motorists may in the future be on the cards?

A life cycle costing analysis comparing painted steel, hot dip galvanizing and duplex coating systems

The economics of hot dip galvanizing, including duplex coatings (hot dip galvanizing + a suitable series of top paint coatings over galvanizing) versus a good specification paint coating system for corrosion control of carbon steel, is the subject of much debate.

The economics of any corrosion control (protection) system cannot and should not be based on initial costs, but rather on the life cycle costs of the protective coating. Life cycle costings can become extremely complicated being dependent on numerous variables that the analysist wishes to include in the calculation.

Classification	Description	Corrosion rate of Steel (µm / yr)	Corrosion rate of Zinc (µm / yr)
C1	Interior: Dry benign environment.	≤1.3	≤0.1
C2	Interior: Occasional condensation. Exterior: Urban inland or mild	>1.3 to 25	0.1 to 0.5
C3	Interior: High humidity, some air pollution. Exterior: Urban inland or mild coastal	>25 to 50	0.5 to 2
C4	Interior: Swimming pools, chemical plants, etc. Exterior: Industrial inland or urban coastal.	>50 to 80	2 to 4
C5	Exterior: Industrial with high humidity or high salinity coastal.	>80 to 200	4 to 8

Table 3: Atmospheric corrosive environments classified in terms of ISO 9223, similar to ISO 12944, see table 4 for paint.

The first five photos show the early failure of a multi-coat paint coating system used to protect the steel components of a well known PE sports stadium where little regard was taken of the life cycle cost of the coating system and costly refurbishment of the coating was required after a short period of twelve years. Photo below right shows the frames of the seats on the same stadium that were originally hot dip galvanized and at the time these photos were taken, still had a coating thickeness of in excess of 60µm. (60µm of hot dip galvanized coating on these seat frames represents almost what was originally required in terms of the specification at the time the stadium was built).

The following life cycle costing analysis has been simplified by limiting such variables to identifiable, accepted and published variables. Corrosion control systems and life cycle performance is a function of the environment in which the specific corrosion control system is required to serve. For purposes of this specific life cycle costing analysis the following criteria has been used.

Environmental and corrosion rates

Table 3 (ISO 9223) defines the corrosion rates of steel and zinc. From this data one can estimate the approximate length of time to perforate a given thickness of steel, and more specifically the service life of a given thickness of a hot dip galvanized (zinc) coating.

Classification	Corrosivity	Exterior	Interior
C1	Very low		Inside heated building with natural atmospheres, offices, shops, schools, hotels.
C2	Low	Atmospheres with low pollution and dry climate. Mostly rural areas.	Unheated buildings where condensation may occur. Depots, sports halls.
C3	Medium	Urban and industrial atmospheres, moderate sulphur dioxide pollution. Moderate coastal climate.	Production rooms with high humidity and some air pollution. Food processing plants, laundries, breweries, dairies.
C4	High	Industry and coastal areas.	Chemical processing plants, swimming pools, boat yards over sea water.
C5 - I	Very high Industry	Industry with high humidity and aggressive atmospheres.	
C5 - M	Very high Marine	Marine coastal, offshore, high salinity.	

Table 4: ISO 12944 – Classification of environments.

Hot dip galvanized as per SANS121 (ISO1461)	6mm	8mm	Min. Coating Thickness (µm)	Mean Coating Thickness (µm)
Surface area (both sides)	42 m^2/ton	32m^2/ton		
Price per square metre	R66-67 per m^2	R87-50 per m^2	75	85

Table 5: Approximate pricing of hot dip galvanizing.

HDG + 3 coat top paint	Description	Price / m^2 6mm	Price / m^2 8mm	Min. Coating Thickness (µm)	Mean Coating Thickness (µm)
Primer	HDG to SANS121 (ISO 1461)	R66-67 per m^2	R87-50 per m^2	75	85
Preparation for paint	Sweep blast with non-metallic grit < 3 bar pressure	R20-00	R20-00		
Initial Coat	High build epoxy	R30-00	R30-00	75	110
Finishing Top Coat	Polyurethane colour	R27-00	R27-00	40	50
Totals	**Duplex Pricing**	**R143-67**	**R164-50**	**190**	**245**

Table 6: Approximate Pricing of a Duplex Coating System.

Three-Coat Paint System (All gauges)	Description	Price / m^2 Coating	Minimum (DFT) Coating Thickness (µm)	Mean (DFT) Thickness (µm)
Preparation	Abrasive blast to Sa2$^1/_2$	Included in the primer price		
Primer	Inorganic zinc rich with min. 81% zinc content	R70-00/m^2	50	75
Intermediate Coat	High build epoxy	R30/m^2	75	110
Finishing Top Coat	Polyurethane colour	R27-00/m^2	40	50
Totals		**R127-00/m^2**	**175**	**235**

Table 7: Approximate pricing of a three-coat paint system.

Coating System	C2	C3	C4
Hot Dip Galvanizing (85µm)	170+	42 to 170	21 to 42
Duplex Coating	Not required for corrosion control	Not required for corrosion control	46 to 78
3 x Paint system	12 to 15	10 to 12	10

Table 8: Life cycle of the three systems (years to 5% rust or life to 1st maintenance).

		Net Rate per year of life to 1st maintenance		
Coating System	Prices / m^2	C2	C3	C4
Hot Dip Galvanizing (85µm)	R87-50	R87-50/170yrs R0-52	R87-50/42yrs R2-08	R87-50/21yrs R4-17
Duplex Coating	R164-50	Not required	Not required	R164-50/46yrs R3-58
3 x Paint system	R127-00	R127-00/12yrs R10-58	R127-00/10yrs R12-70	R127-00/10 R12-70

Table 9: Life cycle costs, based on life to 1st maintenance.

Scope of the costing analysis

The example will compare the life cycle costs of hot dip galvanizing, duplex coatings (hot dip galvanizing plus a suitable top paint system) and a three-coat paint system in a C4 environment as defined in ISO 9223 and ISO 12944.

Costings and specifications as at September 2006

Hot dip galvanizing costs, based on the current zinc price of R25 000 per ton, will approximate to a selling price between R2 700 per ton to R3 100 per ton, depending on steel thickness. In order to simplify the calculation, R2 800 per ton of medium to heavy gauge steel has been used. (6 and 8mm thick steel plate). Converting this price per ton to a price per square metre of surface we have the following as shown in *tables 5, 6 and 7*.

Kindly note that the prices quoted do not in any way represent the actual prices given by member galvanizers, but are estimates used for the purposes of costing analysis. The higher, and more conservative, price for hot dip galvanizing has been used in the calculations. Estimated costs of the paint system, were obtained from a reputable painting contractor.

Service life or life cycle costs of the three defined systems

From ISO 9223 (*table 3*), three environments have been selected, ie. C2, C3 and C4 for purposes of the life cycle costing analysis. These three environments are described in *tables 3 & 4*. We will use 8mm steel for the pricing of hot dip galvanizing.

Should one wish to now estimate the figures for a C5 environment, we would have the following approximations:

C5 – Exterior: Industrial with high humidity or high salinity coastal

Hot dip galvanizing on its own would last between 10 to 21 years, with a

net cost per year to 1st maintenance of between R4-17 to R8-75, i.e. R87-50/(10 to 21yrs).

Duplex would extend the life cycle to between 30 to 46 years with a corresponding life cycle cost of R3-58 to R5-48 per year, i.e. R164-50/(30 to 46yrs).

A three-coat paint system is estimated to last 10 years, with a corresponding life cycle cost of R12-70 per year, i.e. R127-00/10yrs.

The above figures are conservative and do not account for future values or the cost of 1st maintenance, such as escalation and plant downtime costs (i.e. lost production during shutdowns), scaffolding, cleaning and recoating a structure as built.

Conclusion

A thee-coat paint system is 255% more expensive than the Duplex System – System in a C4 Environment calculated as follows:

$$\frac{\text{(Paint System R12-70) – (Duplex System R3.58) x 100\%}}{\text{Duplex System R 3.58}}$$

Paint System = 255% more expensive than Duplex system

As a footnote, a quality Duplex System should include input of the Asset owner, Hot Dip Galvanizers Association, Paint Manufacturer and the Applicator at the design stage of the project.

Conclusion

Project engineers, property owners and developers should seriously consider life cycle costs and not base values and project decisions on the initial costs only. Balanced design to meet environmental conditions is essential in the determination of the corrosion control system that is selected for a given project.

Bob Wilmot

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

Duplex coated verandah columns at Parklands Shopping Centre – Cape Town

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

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

Some protuberances and general coating roughness, normally acceptable when only hot dip galvanizing is required, should be removed prior to painting – see HDGASA 03-2006.

Photos above show unacceptable coating roughness and a zinc run at the weld area, which should ideally have been removed prior to painting.

Report

The Hot Dip Galvanizers Association was asked to comment on the duplex coated tubular columns supporting the verandah section at Parklands Shopping Centre – Cape Town. Following a brief inspection of the coatings, we report as follows:

In most instances the primary reason for using hot dip galvanizing is to protect steel for corrosion protection. For this reason two things are important with a hot dip galvanized

The general impression of the duplex coating looks impressive and provided the paint type and subsequent DFT of the paint coating is suitable, will provide an extended service free life in this environment.

coating and they are coating thickness and coating continuity.

Additional corrosion protection can be achieved by over coating a hot dip galvanized coating with an appropriate paint system, called a duplex system. Here besides coating thickness and continuity a further element must be taken into account and that is the relevant smoothness of the hot dip galvanized coated surface for aesthetical appearance of the component.

For this reason it is often felt that in preparing for subsequent painting over hot dip galvanizing, adequate surface preparation is mandatory for overall coating success.

Surface preparation can be achieved by making use of a chemical cleaner with variable results or by sweep blasting the hot dip galvanized surface by using a micro-blast material and the correct blast pressure.

Correctly done the latter surface treatment not only cleans the surface of contaminants but fluffs up the soft zinc layer providing a surface key and removing small surface imperfections such as those seen at Parklands Shopping Centre. See photos left.

Although the majority of the components seemed to be acceptable, it would be appropriate that a specification be issued at the time of contract to address these issues before the paint coating is applied.

The Association has a specification – HDGASA 03-2006, which was primarily developed to address issues such as Quality control; Coating repairs; Quality surveillance; Handling and storage; Site repairs and Duplex coatings.

Following the above results we have subsequently incorporated clauses to address the removal of protuberances, zinc lumps and runs, etc by the galvanizer for subsequent duplex coatings.

Terry Smith

NOW WITH CPD POINTS

Coating Inspectors Course

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

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

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

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

COURSE CONTENT

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

COURSE DURATION

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

DATE AND TIME

Courses commence at 08h00 sharp and end at 16h30, on the following dates in 2007: March 6 & 7; May 8 & 9; July 10 & 11; September 4 & 5 and November 6 & 7.

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

COURSE COST AND PAYMENT TERMS

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

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

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

Wet storage stain and subsequent red rust to the hot dip galvanized sheeting on a slag crushing plant

As part of the Association's effort to educate and impove communication between all, we include for your reading, this coating report by the Association.

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

The Hot Dip Galvanizers Association was asked to comment on the wet storage stain and subsequent red rusted areas to the roof, side and end sheeting of a slag crushing plant. We report as follows:

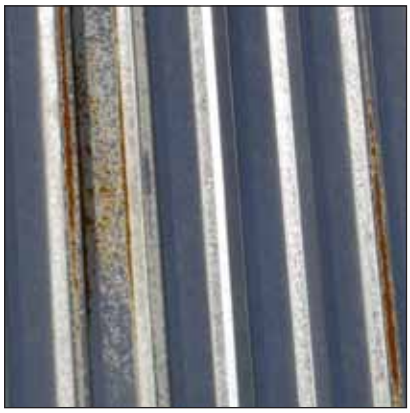
Report

Wet storage stain (white rust)

Wet storage stain is the name given to the white bulky deposit, which may form on the surface of closely stacked freshly galvanized articles, which become damp (from exposure to rain or condensate) under poorly ventilated conditions during storage or in transit.

General view of the end sheeting.

General view.



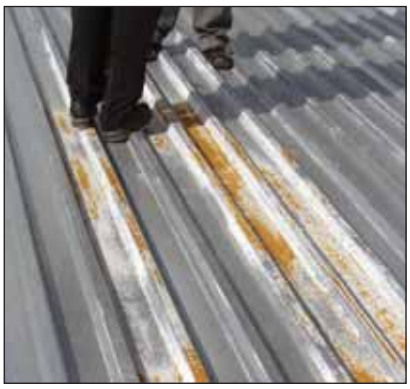
Close up of the side sheeting.

Although in extreme cases the protective value of the coating may be impaired, attack is often superficial despite the relative bulkiness of the corrosion product. Where surface staining is light and smooth without growth of the zinc oxide layer as judged by lightly rubbing fingertips across the surface, the staining will gradually disappear and blend in with the surrounding zinc surface as a result of normal weathering in service. When the affected area will not be fully exposed in service or when it will be subjected to a humid environment, wet storage staining must be removed, even if it is superficial. This is essential for the basic zinc carbonate film to form. The formation of this zinc carbonate film is necessary to ensure long-term service life. In general terms light deposits can be removed by cleaning with a stiff bristle (not wire) brush or scotch brite pads and industrial vim. Heavier deposits can be removed by brushing with a 5% solution of sodium or potassium dichromate with the addition of 0.1% by volume of concentrated sulphuric acid.

Alternatively, a 10% solution of acetic acid can be used. These solutions are applied with a stiff brush and left for about 30 seconds before thoroughly rinsing and drying. Wet storage stain is not necessary a cause for rejection, provided that the specified minimum coating thickness is present.

Unless present prior to shipment from the sheeting manufacturer or stockist, the development of wet storage stain is not necessarily the responsibility of these two parties.

The customer must exercise proper caution during transportation and



General view of the roof sheeting showing deposits of wet storage stain and subsequent red rust.

Deposits of wet storage stain have been removed from the sheeting.

Coating thickness readings have been taken and are still above the requirements for a Z275 class of coating.

subsequent storage to protect against wet storage staining.

Coating thickness

Generally local specifications call for the use of continuously galvanized sheeting according to SANS 3575 / 4998 coating grade Z275. This specification requires a coating mass of 275g/m^2 as a triple spot test but 235g/m^2 on a single spot test. The specification also states that not less than 40% of the single spot test will be found on either surface. This equates to a nominal zinc coating thickness of about 20µm with a minimum coating thickness of 13.5µm.

The equivalent thickness is calculated from the following formula:

$$\text{Thickness in microns (µm)} = \frac{\text{Mass per unit area, g/m}^2}{2 \times 7}$$

(2 includes both sides and 7 is the approximate specific gravity of zinc).

Red discoloration has been removed.

Coating thickness is just below the minimum prescribed in SANS 3575, which for Z275 is 13.5µm.

While the coating thickness readings taken on site by means of a calibrated electro-magnetic thickness gauge were generally slightly higher than that required in the specification, it is worthwhile to bear in mind that readings done in this manner may only be used as an approximation. Should accuracy proving coating thickness for any reason be required, samples will be necessary for stripping purposes.

Location of coating thickness readings	Mean	Min	Max	No of readings
General	23	59	37	43
White rust removed	32	21	43	31
Red rust area 1	26	8.5	55 #	27
Red rust area 2	33	10.1	69 #	31

 # – While every effort was taken during the coating inspection to remove all contaminants prior to measuring the residual coating thickness, sometimes contaminants remain, resulting in the impression that the coating is thicker than specified.

Coating thickness readings (µm).

Conclusion and recommendations

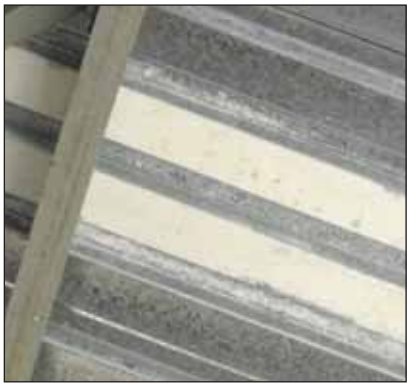
Safe Storage

To prevent unnecessary damage to hot dip galvanized or colour-coated sheets, proper measures should be taken to prevent contamination by moisture while the material is still bundled or nested in stacks.

If not required for immediate use, coils or packs of sheets must be stacked on site under properly designed cover, clear off the ground and protected from wind driven rain. Plastic tarpaulins, which completely envelop packs of sheets or coils should not be used, as a sudden drop in ambient temperature may cause condensation of water vapour, which can easily be drawn in between nested sheeting by capillary action.

Ideally, deliveries of hot dip galvanized and colour-coated steel sheet to the building site should be scheduled for a storage period of not longer than two weeks prior to installation. Inspect the storage site regularly to ensure that moisture does not penetrate the stock.

However, although the procedure of safe packaging of sheeting during transport and site storage is well known within the galvanizing industry and others, it would be appropriate if the sheeting supplier made this known to customers such as this customer at the time of delivery, so that effective prevention methods of wet storage stain could have been put in place.



Thoroughly clean all heavily white rusted areas on the undersides of the sheeting of the building prior to any subsequent coating repair.

Coating repair:

1. Rub red rusted and heavy white rusted areas (including any areas underside the sheeting on the inside of the building see photo right) with steel wire wool to remove all corrosion products.
2. Remove all dust and debris.
3. Clean compromised areas and if required the entire sheeted surface with a water soluble degreaser and scotch brite pads.
4. Thoroughly remove all residual chemicals with running water, obtain a “water break free surface”.
5. Apply one coat of “Zincfix” (see attached) to 100µm DFT to all compromised areas and overlap the surrounding unaffected coating by at least 20mm. Wait to dry.
6. If required, apply one or two coats of water based acrylic paint to a DFT per coat of 40µm or equal.

Terry Smith

Walter's Corner

The hot dip galvanizing industry is alive and well

During the past few months, there has been an unprecedented increase in the demand for hot dip galvanizing as a means of corrosion control. This has resulted in temporary delays and inconvenience for end users as the industry strives to adjust to the increase in demand, which is confidently expected to continue indefinitely.

The predictable and reliable properties of a hot dip galvanized coating for corrosion control have contributed towards this significant increase in popularity over the years of a coating process which was first introduced more than a century and a half ago.

The following statistics show convincingly the substantial increase in demand for hot dip galvanized steel during recent years. It should be noted that these statistics (*table 10*) exclude hot dip galvanized wire and continuously galvanized sheet.

Hot dip galvanizing is indeed a process that can be described as old yet ever new.

The rapid and in some instances unanticipated increase in quantities of steel requiring hot dip galvanizing has resulted in undesirably protracted delivery schedules which can impact adversely on completion programmes for some projects. The galvanizing industry has been made acutely aware of this negative situation with the result that many galvanizers throughout the country are presently installing additional facilities in order to increase productive capacity. Dimensionally, the bath sizes in South Africa are equal to the best worldwide with lengths ranging up to 14m in length, 2m in width and even 4m deep in some cases.

The durability of hot dip galvanizing and duplex systems in a vast diversity of applications is substantiated by reliable case studies compiled over many years. It is as a result of the evidence provided in these track records that more and more specifiers are turning to hot dip galvanizing for general corrosion control in a vast variety of applications which include atmospheric exposure, immersed and buried conditions as well as applications where architecturally a structure is required to provide an aesthetically pleasing appearance.

During 2006, the International producer prices for numerous commodities increased significantly. This not only related to products such as oil but also to various metals ranging from gold, platinum to commodities such as steel. Needless to say, zinc metal has not escaped this trend. Zinc price statistics, together with the overall effect on the prices for hot dip galvanizing, are illustrated by *table 11* using approximate figures from the period in question.

Meanwhile, other protective systems such as organic coatings have escalated in cost to a similar and even greater extent in line with the substantial rise of the producer price of oil.

The question arises; is hot dip galvanizing still economically justifiable to provide corrosion protection. The answer to this is of course that, with escalating material, labour and replacement costs, the value of equipment requiring protection is also escalating. When planning a capital project, the important factors to consider are:

The required life of equipment and structures, the degree of corrosion to be expected and accessibility for maintenance and replacement without sacrificing essential production time. Over protection is perhaps as undesirable as under-protection, but the usual tendency is to under-provide for protection and conservation of what is invariably expensive equipment to replace. One frequently hears the statement "We cannot afford the high cost necessary to provide corrosion protection in this case". The appropriate response to this statement is frequently "can you afford not to?"

Due to a number of reasons, the anticipated lifespan of a mine is not always easy to predict. This may lead to a conservative prediction where a less comprehensive coating system is specified to protect the shaft related steelwork. At the end of this period it is frequently decided, for a number of reasons, to extend the production life of the mine by a further period, entailing expensive maintenance and replacement costs not to mention lost production time and safety factors.

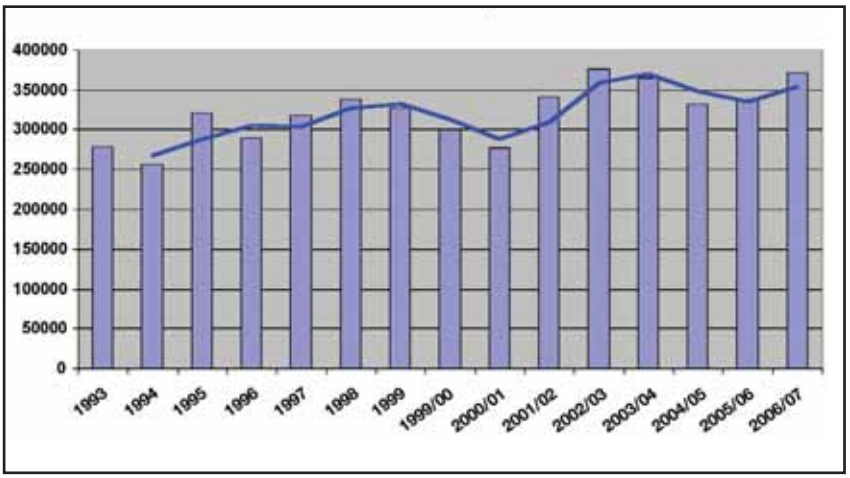


Table 10: Annual tons galvanized by members.

	2 years ago	1 year ago	Current
Zinc Prices (US$)	$1000/ton	$1800/ton	$3800/ton
% Increase	+380%	+211%	
HDG Prices (R/Ton)	R1600/Ton	R2100/Ton	R3200/Ton
% Increase	200%	152.4%	

Table 11: Illustration of approximate increases in zinc and hot dip galvanizing over a two-year period.

The conclusion

The cost of corrosion control measures has increased significantly in recent months due to a large extent to increased producer prices of both zinc (galvanizing) and oil (painting). But then again, so has the price of labour and raw materials such as steel, including stainless steel products.

As far as zinc is concerned, demand has exceeded supply for some time which has led to increased prices. According to economists this situation has peaked out and a leveling out of prices is being predicted. This is supported by the expected increase in supply anticipated as a result of an increase in mining activity by various zinc producers.

HOT DIP GALVANIZERS ASSOCIATION SOUTHERN AFRICA

"Don't just Coat it, Hot Dip Galvanize It!"

2007 CALL FOR ENTRIES
HOT DIP GALVANIZING AWARDS

HOT DIP GALVANIZERS ASSOCIATION SOUTHERN AFRICA

OBJECTIVE

To recognise and promote the development, application and use of hot dip galvanizing and related technology for corrosion protection purposes.

CATEGORIES

- Vintage
- Duplex Coating Systems
- Mining and Industrial
- Architectural
- Research & Development and Innovation
- Export

Vintage:

Long-term, maintenance free corrosion protection of hot dip galvanized and/or duplex coating applications that are 10 years or older.

Duplex Coating Systems:

Hot dip galvanizing plus an appropriate paint system, suited to the environment, aimed at longevity and/or aesthetics.

Research and Development and Innovation:

This category recognises research & development and innovative work carried out by galvanizers, universities, technikons, professional institutions and end users. For example

- Where a significant contribution has been made to expand the knowledge of the hot dip galvanizing process.
- Where the characteristics of the zinc coating or the application of the coating has been considerably improved.
- Where innovative design or novel process or procedure has been facilitated to improve the coating.
- Where in a specific application, the concept of hot dip galvanizing or a duplex system has made a newly developed product or project unique

MATERIAL TO BE SUBMITTED

NB: Technical information is extremely important. Motivation, numbers and facts will assist with the adjudication.

The professional standard of the submissions form an integral part of the judging criteria.

Submissions shall include a minimum of 5 full colour photographs. If digital photographs are to be supplied, please ensure that they are taken at 300 dpi for reproduction purposes.

Kindly ensure that electronic copies of the digital photographs are supplied on CD with entry.

The motivation shall include:

- Name of product / project
- Description of product / project
- Application
- Location
- All project partners (spelling accuracy is important)
- Quantity of steel hot dip galvanized or duplex coated
- Inception / commissioning date
- Value
- Future potential, etc.

Kindly contact the Association for further details at (011) 456-7960 or hdgasa@icon.co.za

CONDITIONS OF ENTRY

Submission to be completed according to template (available on website or on request)
Submissions that have not covered the prompts in this template, may not be considered by the Judging panel.

The judging panel will, at its discretion, change the category of the entry where it deems such a change would benefit the applicant and where it maximises the value of the award to the industry in general.

Only new submissions will be accepted, other than previous projects now qualifying for the Vintage category.

At the discretion of the judges the overall winner will not necessarily be a winner of one of the individual categories.

The product or project must be complete before being submitted.

All entries must be submitted to the Hot Dip Galvanizers Association, Unit U4 (Upper level), Quality House, St Christopher Rd, St Andrews, Bedfordview, Johannesburg, on or before 15 June 2007

The Judges decision is final and no correspondence will be entered into.

By submission of an entry, the nominator assumes responsibility for the accuracy of all information, and provides the HDGASA with assurance that permission has been obtained from the developer / owner.

CLOSING DATE FOR SUBMISSIONS IS 15 JUNE 2007

HOT DIP GALVANIZERS ASSOCIATION
SOUTHERN AFRICA

"Don't just Coat it, Hot Dip Galvanize It!"

2007 CALL FOR ENTRIES
HOT DIP GALVANIZING AWARDS

ENTRY FORM 2007

I hereby submit the following project thereby accepting the conditions of entry as detailed in this document.

Project Name:

Your Name:

Company:

Postal Address:

Tel Number:

Fax Number:

Email:

Signature:

Date:

The Winner of the 2006
WGS Barnett Trophy:
South African Weather Base
on Marion Island

PROJECT TEAM

Developer / Owner
Contact Name:
Tel Number:

Architect
Contact Name:
Tel Number:

Specifier
Contact Name:
Tel Number:

Project Manager
Contact Name:
Tel Number:

Main Contractor
Contact Name:
Tel Number:

Other
Contact Name:
Tel Number:

Hot Dip Galvanizer
Contact Name:
Tel Number:

HOT DIP GALVANIZERS ASSOCIATION
SOUTHERN AFRICA

"Don't just coat it,
hot dip galvanize it!"

2007 CALL FOR ENTRIES
HOT DIP GALVANIZING AWARDS

HOT DIP GALVANIZERS ASSOCIATION
SOUTHERN AFRICA

Zincor to undertake the rebuild of the number 4 roaster

Owen Tennant, Marketing Manager, Zincor

During 2007 Zincor plan to undertake the rebuild of the number 4 roaster at the plant. The number 3 roaster was rebuilt during 2006.

This major capital program is in line with the strategy of Zincor to continue to make capital investment to ensure the continued sustainability of the operation is South Africa.

The rebuild will take place over three months from June to August 2007. During this time there will be a decrease in zinc production. Zincor plan to import zinc during this period to support the domestic requirements of zinc.

Zincor are currently importing in January / February to ensure that zinc stocks are at the required critical levels.

It is likely that the zinc price will remain high during 2007 with plenty of volatility expected. Besides the high zinc price Zincor expects that the demand for zinc will be high, despite the slow start to the year.

Zincor wishes all participants in the corrosion protection industry a very good 2007.

Robor acquisition finalised

Robor, a R1.7-billion a year supplier of world-class steel tube and pipe and related value-added products, has been purchased from the Barloworld Group at a cost of R480-million by a management-lead consortium. The deal became unconditional on 1 December 2006, heralding the start of one of very few companies in the industry genuinely owned by management and staff.

With 60 senior staff holding a 44% stake in the company, Robor management is confident that the move will unlock the company's significant human capital, facilitate superior service from owner-managers and provide the opportunity to capitalise on the significant infrastructural growth expected in market segments where it currently operates.

These market segments include building and construction, energy, water, mining, automotive and rail and logistics. The company is well funded by its partners to cope with any growth required to meet increasing market demands.

"We have consolidated the many product brands into the Robor brand and will take a more entrepreneurial approach that will include enhanced cross-selling, specific market penetration and other initiatives," says Robor CEO, Michael Coward. "The new Robor brand is based on a promise to deliver to our stakeholders on our core values of trust, integrity and responsibility through the partnership created between management and our dedicated staff. We are now in charge of our own destiny, and we intend to leave no stone unturned in delivering our true potential."

BEE Partner Yard Capital makes up 18% of the shareholding, with another 10% held by Robor's Black Management and Staff Trust and Rand Merchant Bank owning the remaining 28%. Leslie Maasdorp, Chairman of Yard Capital states, "Yard Capital is proud to be the lead empowerment partner to Robor and this investment marks our entry into the manufacturing sector, adding to our portfolio of investments in property, IT and the services sectors. We are pleased to be associated with the Management buy-out of Robor and have full confidence in the management team."

Yard Capital intends playing an active role in the development of Robor in strategic, operational and transformational roles to ensure Robor truly takes its place in the South African market.

The company manufactures hot rolled steel tube and pipe, cold rolled tube, stainless tube and pipe and, open sections, while offering value adding services through pipe systems and hot dip galvanizing. Its' products are grouped under three primary divisions. Under the conveyance cluster, Robor groups its Galvanizing facility, Steel Services and Pipe Systems. The structural cluster is focused on Tube and Open Sections, while the precision cluster incorporates Stainless and Precision Tube.

"Robor's Galvanizing Business, a long standing member of the HDGASA (Hot Dip Galvanizers Association of Southern Africa), is South Africa's largest jobbing galvanizing facility, capable of processing 7 000t/month, with 3 galvanizing lines on a single site," says Gordon Gilmer, chairman of the conveyance cluster. "Our Steel Services business manufactures non-standard sizes of tubular steel, adds value and trades imported items. Pipe Systems' core business is the supply of 'value-added' steel pipe and complete piping systems, which comprises steel pipe (with or without various protective coatings and linings) as well as fittings, flanges and couplings."

Ben de Klerk, Chairman of the structural cluster says: "Tube is the largest division in Robor; it is the largest supplier of longitudinally welded steel tube in Southern Africa. Utilising the latest production and paint coating technology, the division produces a comprehensive range of tube and conveyance pipe."

As the original manufacturer of cold formed steel sections in South Africa, Robor's Open Sections business has been specialising in the production of both standard and special cold formed steel profiles since 1957. In addition to its value adding services, which now include punching, painting and galvanizing, it also carries the best range of standard stock products to allow for the shortest delivery lead times.

Stuart Neethling, MD of the precision cluster, comments: "Precision Tube has been manufacturing longitudinally welded steel tube from both cold and hot rolled steel since 1946. Extensive facilities are available to cut, bend, swage, reduce, cold draw and perform many other functions on the tube products offered according to the specific customer requirements. I am particularly proud of our new Stainless facility at the Elandsfontein site, which has four dedicated mills, laser cutting and other facilities. Stainless is now poised to grow significantly in various selected domestic markets."

Personality Profile

Busisiwe Christina Mpontshame

Due to the nature of the Industry, the Hot Dip Galvanizing Fraternity has always been traditionally male orientated. The few females employed in the Industry, seldom venture out of Administrative Offices. We therefore have the pleasure to present the remarkable story of the only known Female Hot Dipper in the country…

Fate stepped in when a young woman from Kwamashu (a vast sprawling township to the North of Durban) walked down Aberdare Drive in Phoenix Industrial Park to collect money from her boyfriend to fix her rusty old sewing machine. Sewing & hawking children's clothing on the side of the road had been her only means of income. As she approached the gates of Phoenix Galvanizing, the security guard on duty asked whether she would be interested in a job. Phoenix Galvanizing at the time was looking to employ females that fitted a certain criteria to work on the factory floor as part of the company's Employment Equity Plan. As fate would have it Busisiwe Christina Mpontshame fitted the criteria & walked through the gates of Phoenix Galvanizing, not knowing that seizing the opportunity would change her life for the better.

Busi, as she is affectionately known on the Phoenix Galvanizing factory floor, started her career at the company in January 2003 as a "Jigger". It was clear from the minute she set foot on the premises that this lady planned to go places. Her jigging career lasted all of three months, when she was moved into the Weighing Department at her own request. She explains:" When I was outside the plant, I didn't really know what happened inside. I figured the only way to get to know the business and the process was to move around to different departments. I also knew

that nobody would know that, unless I opened my mouth, which I did!" Once Busi "entered" the plant, she found herself fascinated with the process and in particular the actual Hot Dipping Process. She enthuses: "The minute I came inside the plant, I knew I wanted to be a Dipper. It was my dream. I used to think, one day I will be a Hot Dipper."

She expressed her interest in becoming a Hot Dipper to Phoenix Galvanizing Operations Manager, Dilesh Ramkisson. Dilesh admits that he was quite taken aback by what he thought was an odd request - coming from a girl. He nonetheless decided to give her a chance and asked the Hot Dipping Team to help Busi along. She started training as a Crane Operator and slowly but surely inched her way closer to the Galvanizing Bath. Busi also immersed herself voluntarily in some of the many training programmes Phoenix Galvanizing offers to their staff as part of the company's Skills Development Programme. She realized the importance of experiential training and seized every opportunity by volunteering to work weekends and gaining as much experience as she could. Of course there were cynics who didn't think that a girl would be able to cut it, but her tenacity silenced even her fiercest critics. She enthuses that most of her colleagues & especially Phoenix Galvanizing Management are extremely supportive of her. Just her excitement at the recall of her first solo dip, "a jig filled with fencing pales", illustrates the passion this lady has for her job.

A lot of responsibility weighs on the shoulders of a Hot Dipper, all of which Busi is extremely aware of. "Mistakes can have devastating effects and cost lives." This career is also no walk in the park, as temperatures around the Galvanizing Bath soar, making work very uncomfortable and tiring, especially during the hot and humid Durban summers and kitted with the compulsory Personal Protective Equipment. Busi is meticulous when it comes to quality and is a consummate professional when it comes to checking technicalities, such as zinc temperature, before dipping goods. She takes all of the pros and cons of her job in her stride.

When Busi is not "dipping away" at Phoenix Galvanizing, she is the devoted mother of Sfundo, aged 12, who lives with her family in Jozini. Busi explains her vision for the future: "My goal in life is to take care of my family and my son. Life was hard when I was young. I want to break that cycle. Being a woman doesn't limit you in life. What matters is how hard you are prepared to work." Busi was promoted to Phoenix Galvanizing's first female Shift Supervisor at the beginning of 2007. She was also voted as Phoenix Galvanizing's "Newsmaker of the Year 2006" following her story being published in the Phoenix Galvanizing Annual 2006 (the company's annual magazine that gets circulated to suppliers and clients). So there you have it – Busi Magic - a true inspiration to all of us!

Bread is now fortified with zinc!

South African millers have been fortifying flour and maize meal with a blend of vitamins and minerals, including zinc, following new legislation that came into effect in October 2003 to improve nutrition in the country. Millers are now required to fortify white and brown bread flour and maize meal with vitamin A, thiamine, riboflavin, niacin, pyridoxine, folic acid, iron and zinc.

"Food fortification is essential to address some of the major challenges posed by poverty and malnutrition to the growth of our nation," Health Minister Manto Tshabalala-Msimang told the national press. The South African government has received a grant worth US$2.8 million from the WHO-led Global Alliance for Improved Nutrition (GAIN) to support a food fortification program. The funding will be used to support the implementation of the program, helping millers to comply with the new requirements. Most millers already began fortifying their bread and maize soon after the announcement of the new regulations in April 2004. South Africa is one of four countries to receive funding under the first wave of GAIN grants.

China, Morocco and Vietnam will also receive support to improve the nutritional value of their food supplies.

HI-TECH ELEMENTS

DESIGNERS AND MANUFACTURERS OF ELECTRICAL HEATING ELEMENTS AND SYSTEMS

With the established infrastructure, we are able to source all heating and control products from within our group, ensuring quality and quick and efficient service to our clients at all times.

Hi-Tech Elements, established in 1992 by Andre Goosen and technical director Shaun Bester, has grown to become South Africa's leading supplier of heating, insulation and control for entire galvanizing plants.

The company has the expertise to design, manufacture, install and commission not only electrical heating elements but all equipment relating to the heating industry that would be required in a plant.

One of the company's many successful projects was the design, manufacture and commissioning in 2005 of a very large, complete galvanizing plant in Harrismith, KZN.

The expertise within Hi-Tech Elements means that we can consult and advise from the civil and structural layout of the new factory all the way to the crane size and fitment.

Also forming part of the Hi-Tech Group is the chemical heating and control of the preparation tanks as well as the entire temperature measurement and control of the zinc tank.

Having acquired both Howford Manufacturing (the HotRod® range of chemical immersion heaters) as well as Eastern Control in the last 5 years, we have also fitted our own tube filling plant, making us unique in the industry.

Technically we are able to assist in all sectors of heating and control for most industries. We specialise in designing and manufacturing to client's specific needs.

HI-TECH ELEMENTS

The Hi-Tech Group is a member of the Hot Dip Galvanizing Association of SA. We are also an ISO 9001:2000 certified management group, as well as having the CE mark worldwide on all our HotRod® range of products.

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Guest Writer

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

Like light, people and companies can be different things

One of the strangest ideas of quantum physics is the 'wave-particle duality' of light. Photons, which make up light, exist as particles and waves at the same time. They are both particles and waves.

The characteristics of waves and particles are necessary for a full description of what light is. As observers, however, we cannot measure this duality, we cannot see what light is really like. If we treat photons as particles, we can determine their exact position but not their energy. If we treat them like waves, we can determine their energy but not their position. They are indeterminate and become only what we measure them to be.

In the quantum world, both descriptions of light are equally valid and complementary. Neither description is complete in itself. There are circumstances where it is more appropriate to talk of light as particles and circumstances where it is better to think of waves. This schizophrenic personality of light is called 'complementarity'.

The 'both/and' character of light is far removed from our mechanistic and deterministic world, which has an 'either/or' nature about it. In our world, we think of objects as definite things, which we can accurately measure. While the environment might change them, they do not change internally-they do not become something else; they remain what we see them as.

Quantum theory means uncertainty. We can never be sure what we are measuring since the act of measurement affects the thing being measured. The more accurate the measurement, the more the item is affected. The measurement defines the thing being measured. The measurer influences the measurement.

New Age philosophers, like Danah Zohar and Ian Marshall (The Quantum Society) have begun to realise that people may also possess complementarity. They can have more than one characteristic: they can be both one thing and another at the same time; it depends on what we measure them as. We cannot, however, measure them completely; we cannot fully describe them. Whatever we describe people as there will always be some indeterminacy about the person-something we can never describe. The way we measure people will define the characteristic we are measuring.

In quantum theory terms, there is no point in judging people by measuring their intrinsic properties, such as IQ, dexterity, literary comprehension, etc. These measurements will always be incomplete. People should rather be measured by their behaviour in given circumstances. When they are judged on their behaviour alone, the quantum uncertainty of their personality disappears for that set of conditions we place them in.

Quantum theory also suggests that two people can have different views of the same matter and yet be equally right. It is therefore illogical to judge people on their views. The people doing the judging will influence the views.

Alfred Korzybski, as long ago as 1933, (Science and Sanity) recognised that viewing people in quantum theory terms required a new language, which he called 'English-Prime' or 'E-Prime'. In E-Prime, the word 'is' is removed. Instead of saying: "John is lazy", in E-Prime we would say: "John appears to be lazy in the office today". "John is a racist" would become "John has some racist ideas which I find offensive" and so forth. One can never be sure exactly what a person is really like and our language should reflect this.

Quantum theory can destroy the myth that a company has to be one thing or another. Many companies brutalise themselves by sticking to the seemingly rational policy that they can't be two things at the same time. Stability or progress, conservative fiscal policies or entrepeneurship, home-grown managers or imported skills is the dilemma that many companies face. In the quantum world, companies do not have to wrestle with these paradoxes; they do not have to worry about being 'either/or', they think along 'both/and' lines. They seek opportunities in both directions.

The classical ideal of a secure deterministic world, waiting out there to be analysed and exploited, does not fit into quantum theory. Instead, we must regard ourselves as inalienable participants in an indeterminate world.

Case Study
No. 13/2007

Moma Sands Project, Mozambique

The Application

The extensive use of hot dip galvanizing for structural steel components on an extremely remote site where logistics, materials handling, transport and co-ordinated planning had a profound influence on the project timing and completion date.

Environmental Conditions

The corrosive conditions encountered at this remote location can be classified as a C4 or a C5 environment in terms of ISO 9223. In terms of this classification and considering the hot humid environment, in a marine location, a C4 or "Exterior industrial inland or urban coastal" conditions are considered applicable. Zinc corrosion rates for this environmental classification is estimated in the range of 2 to 4 micron (µm) per year. Considering the actual site conditions, the expected corrosion rate of zinc would be approximately 2 to 3µm per year. Assuming these environmental conditions the estimated "Service life" of the hot dip galvanized structural steel would be in excess of 30 years before 1st maintenance.

One of three such structures, where refined products will be stored prior to conveyance, via an overland conveyor, to a specially constructed loading pier, for loading onto sea-barges for transhipment to ships anchored offshore

The Site

The site is located on the Mozambique coast approximately 30 minutes flying time north of Beira. The project involved the design, off site fabrication of steel and hot dip galvanizing, followed by the logistics of loading, ocean transportation of the entire project facilities, trans-shipping, via a sea barge to the beach, haulage inland over a distance of 3 to 4 kms to the various sites comprising the project. The project required integrated logistics planning and co-ordination of all supply arrangements. No infrastructure or formal facilities existed prior to the commencement of the project.

Our Findings

The use of hot dip galvanized steel, in the given corrosive environment, will provide an expected maintenance free service life in excess of 30 years. This estimate is conservatively based on the mean zinc coating thickness of 85µm and a corrosion rate of between 2 and 3 µm per year. The actual coating thickness measured during our site visit was generally found to be well in excess of 100µm and more often than not in excess of 120µm. Alternative corrosion control coatings can not match the

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performance of hot dip galvanizing when one considers the rough handling involved in loading, transportation and offloading at such an isolated site. Design requirements of durability and longevity were achieved by way of the metallurgically bonded hot dip galvanized zinc coating, both from the standpoint of a “barrier protection” as well as “cathodic protection”. Handling damage, repair of which was achieved by the application of a suitable zinc rich epoxy, does not compromise corrosion control, due to cathodic protection characteristic of galvanized steel. The same repair procedure was applied to the isolated occasions where site modifications were found to be necessary.

The sea pier and conveyor termination from where refined product will load onto sea-barges for trans-shipment to ships anchored off shore.

Conclusion

The primary features and benefits achieved on this project were:

1. Cost and economic effectiveness of hot dip galvanizing, given the site location and availability of local materials and equipment.

2. The effective use of hot dip galvanizing in a C4 environment, i.e. marine conditions and designing the corrosion control system to suit the given environment and service life requirements.

3. Versatility of steel and the proven and effective methods used to combat corrosive elements within the given environment.

The benefits and economics of hot dip galvanizing on large projects, situated in remote locations that involve special logistical arrangements, extreme and changeable weather conditions are again reaffirmed by this case study.

General view of part of the "dry plant" under construction, which will ultimately be used in the refining of titanium products.

The starting point of the 4km overland hot dip galvanized conveyor that ends at the sea pier from where refined products will be loaded onto sea-barges.

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COMPANY	LOCATION	CONTACT	TELEPHONE	E-MAIL	MAIN CLASS OF WORK
CORPORATE MEMBER – CORPORATIONS WHICH HAVE INTERESTS IN THE ASSOCIATION					
Zinc Corporation	Springs	Owen Tennant	011 812 9500	info@zincor.co.za	Producers of refined zinc metal for the galvanizing industry
INTERNATIONAL MEMBER – A GALVANIZER OR RELATED COMPANY BEYOND THE BORDERS OF SOUTH AFRICA					
Kingfield Equipment (Pty) Ltd	Victoria, Australia	Geoff Lisle	+613 9876 9190	geoff@kingfieldequipment.com.au	Suppliers and designers of hot dip galvanizing equipment and furnaces.
Gimeco Srl	Trezzano Rosa, Italy	Ermes Moroni	+39 02 909 60751	gimecoita@tin.it	Engineering and manufacturing of hot dip galvanizing lines
ASSOCIATE SUPPORT MEMBER – SUPPORT COMPANIES THAT PURCHASE AND SELL TO THE INDUSTRY					
Chemplus	Roodepoort	Charles Starck	011 760 6000	chemplus@mweb.co.za	Manufacture of speciality process and finishing chemicals to the hot dip galvanizing Industry
Highveld Steel and Vanadium Corp Ltd	Bedfordview	Stuart Gray	011 454 1583	stuartg@hiveld.co.za	Supplier of hot rolled structural sections, plate and coil.
Metsep (Pty) Ltd	Denver	Robert Watchorn	011 626 2425	robert@metsep.co.za	Supplying pickling plants with inhibited hydrochloric acid and removing and regenerating the spent pickle liquor in an environmentally friendly manner
MR Zinc Oxide (Pty) Ltd	Dalpark	Mike Robertson	011 915 1828	Mr.zinc@mweb.co.za	Manufacturer of zinc base alloys, marine anodes, zinc oxides – Traders of zinc ingots and purchaser of all types of zinc residues/scrap.
CSO – A division of ChemserveSystems (Pty) Ltd	Bedfordview	Lynnette Vanvreden	011 457 2400	Ryszard.orlik@chemsystems.co.za	Manufacture of speciality metal finishing chemicals to the hot dip galvanizing, electroplating, anodising, wire drawing and powder coating industries.
Surface Treatment Technologies	Jupiter	Donavan Jones	011 626 1292	sttchem@mweb.co.za	Manufacture, supply and servicing of speciality metal treatment chemical products and coatings to the hot dip galvanizing, powder coating, wire drawing, anodising and paint market.
ASSOCIATE GALVANIZING MEMBER – A DEVELOPING GALVANIZER WHO HAS BEEN IN BUSINESS FOR LESS THAN A YEAR					
Pinetown Galvanizing	Pinetown	Shainil Doorjan	082 353 0891		Galvanizer
AFFILIATE COMPANY MEMBER – COMPANIES THAT SELL HOT DIP GALVANIZED ARTICLES					
Advanced Roof Technology Foundation – ARTF	Illovo	Tanya Wolverson	011 605 2510	Info_artf@mweb.co.za	Advisory and practicing association of advanced level consultants, engineers, inspectors and paint applicators, in the roofing field.
Andrew Mentis	Elandsfontein	Ted Jarvis	011 255 3200	tjarvis@mentis.co.za	Manufacturer of steel products including expanded metal, steel floor grating, Mentrail guard rail and industrial handrailing systems.
CWI	Vanderbijlpark	Craig Viljoen	016 980 3111	craigvil@cwi-wire.co.za	Manufacture of galvanized wire and wire products.
Duplex Coatings cc	Wadeville	Mike Book	011 827 4221	mike@bulldogprojects.co.za	Specialists in the painting of hot dip galvanized substrates.
Eskom Energy Services	Durban	Gail Perry	031 792 8600	energyservices@eskom.co.za	Performance contracts with industrial customers to keep energy costs low and process efficient.
Fairmile Fencing SA (Pty) Ltd	Brakpan	Jaco Viljoen	011 743 2080	Stefan@fairmilefence.co.za	Palisade fencing, razor wire, section rolling and reinforcing steel
Galvfast Trading	Birch Acres	Arthur Harwood	011 391 3115	arthureh@mweb.co.za	Specialist supplier of hot dip galvanized and industrial fasteners to the construction industry.
Hi-Tech Elements (Pty) Ltd	Boksburg	Andre Goosen	011 894 3937	andre@hi-techelements.co.za	Design and manufacture of heating elements, systems and control for the hot dip galvanizing industry.
Jostech Fire Services cc	Birch Acres	Daryl Johnston	011 976 5097	jostech@mweb.co.za	Design, manufacture and installation of ceramic fibre insulation linings.
O-line Support Systems	Selby	Graeme Smart	011 378 3700	o-line@o-line.co.za	Electrical and mechanical support systems and powder coating.
Rand York Castings	Umhlanga Rocks	Lance Corbett	031 561 1023	sales@randyork.com	Fabrication of special steel profiles for civil and mining sectors.
Robor Pipe Systems	Isando	Jim Begbie	011 974 3351	jimb@robor.co.za	Supply of value added steel pipe and complete piping systems with various protective coatings.
SA Galvanizing Services (Pty) Ltd	Pretoria	Johan du Plessis	012 996 0458 011 422 2832	sagalv@eject.co.za	New hot dip galvanizing plant design, installation and project management technology experts.
Strutfast (Pty) Ltd	Denver	Pieter Uys	011 622 9969	sales@strutfast.co.za	Suppliers of electrical cable support systems.
T & E	Chamdor	Jack Siebert	011 762 1084	trucking@trucking.co.za	High and low pressure piping, stainless steel, steelwork and platework.
Weartech (Pty) Ltd	Wadeville	Simon Wintle	011 824 6010	simon@weartech.co.za	Suppliers of zinc thermal spray equipment, spare parts and wire.
Zinchem	Benoni	Adrian Marini	011 746 5000	sergiom@zinchem.co.za	Converters of primary and secondary zinc to superior quality chemicals and metals in accordance with the highest international standards.
AFFILIATE PROFESSIONAL MEMBER – SPECIFIERS WHO HAVE AN INTEREST IN THE ASSOCIATION					
Corrosion and Technology Consultants	Bedfordview	Gerald Haynes	011 456 7960	gjhaynes@icon.co.za	Reputable independent Corrosion and AC Mitigation Consulting Engineers and Project Managers.
AFFILIATE COATING INSPECTOR MEMBER – APPROVED COATING INSPECTORS					
Bertus Fourie	Cleveland	-	076-051-1682	bfourie@roshcon.co.za	
Tekkies Kruger	Newcastle	-	083-273-4684	tekkies.kruger@eskom.co.za	
Keith Moodie	Polokwane	-	015-291-2020	pbg@evn.co.za	
Jan Stander	Vorna Valley	-	011-800-4683	jan.stander@eskom.co.za	

HOT DIP GALVANIZING MEMBERS

GALVANIZER	LOCATION	TEL. NO	SPIN	NO. OF LINES	BATH SIZES (L x W x D) (m)
GAUTENG					
Armco Galvanizers	Isando	011 974-8511		1	13.2 m x 1.5m x 2.0m
Armco Galvanizers – Dunswart	Dunswart	011 914-3512	●	3	5.2m x 1.2m x 2.0m 3.0m x 1.0m x 1.5m 2.0m x 1.0m x 1.5m
Babcock Nthuthuko Powerlines (Pty) Ltd	Nigel	011 739-8200		1	12.0m x 1.4m x 1.8m
Cape Gate (Pty) Ltd	Vanderbijlpark	016 980-2270		#	Wire galvanizer
DB Thermal SA (Pty) Ltd	Nigel	011 814-6460		#	In-line galvanizer
Galvadip (Pty) Ltd	Waltloo	012 803-5168		1	7.2m x 1.5m x 1.8m
Galvrite Galvanising (Pty) Ltd	Randfontein	011 693-5825		1	6.5m x 1.3m x 2.0m
GEA Air Cooled Systems	Germiston	011 861-1571		#	In-line galvanizer
Lianru Galvanisers cc	Nigel	011 814-8658		2	7.2m x 1.3m x 1.6m 1.95m x 0.83m x 1.2m
Macsteel Tube & Pipe	Boksburg	011 897-2194		#	13.5m x 1.6m x 2.4m
Mittal Steel SA	Vereeniging	016 889-8816		#	Sheet galvanizer
Pro-Tech Galvanizers (Pty) Ltd	Nigel	011-814-4292	●	2	3.0m x 1.1m x 1.2m 3.2m x 1.1m x 1.5m
Robor Galvanizers	Germiston	011 876-2900		2 Tube	14m x 1.35m x 2.5m 10.0m x 2.0m x 4.0m Dia 42mm to 114mm max tube length 6.7m
Robor Tube	Elandsfontein	011 971-1600		#	Pipe plant
Supergalv	Alrode	011-908-3411		1	6.0m x 1.2m x 1.8m
MPUMALANGA					
Chevron Engineering (Pty) Ltd	Barberton	013 712-3131		1	Dia 0.7 x 1.2d
NORTH WEST					
Andrag Agrico	Lichtenburg	018 632-7260		#	In-line galvanizer
WESTERN CAPE					
Advanced Galvanising Corp.	Bellville	021 951-6242		1	8.0m x 1.5m x 3.0m
Cape Galvanising (Pty) Ltd	Parowvalley	021 931-7224		1	14.0m x 1.6m x 2.6m
Galvatech (Pty) Ltd	Bellville	021 951-1211		1	7.5m x 1.5m x 2.6m
Helderberg Galvanizing	Strand	021 845-4500		1	5.5m x 0.8m x 2.4m
ProGalv cc	Stikland	021 945-1803/4		1	7.2m x 1.3m x 2.6m
South Cape Galvanizing (Pty) Ltd	George Industria	044 884-0882		1	5.5m x 1.0m x 2.6m
EASTERN CAPE					
Butterworth Metal Industries	Butterworth	047 401-3600		1	1.2m x 0.6m x 0.8m
Galvanising Techniques cc	Port Elizabeth	041 486-1432		1	12.0m x 1.3m x 2.3m
Galvaspin (Pty) Ltd	Port Elizabeth	041 451-1947	●	1	3.0m x 1.2m x 1.8m
Morhot (Pty) Ltd	East London	043 763-1143		1	6.0m x 1.2m x 2.5m
KWAZULU/NATAL					
A&A Galvanisers	Pietermaritzburg	033 387-5783	●	1	3.3m x 0.95m x 1.9m
Bay Galvanisers	Richards Bay	035 751-1942		1	5.0m x 1.2m x 2.5m
Phoenix Galvanizing (Pty) Ltd	Phoenix	031 500-1607	●	3	14.0m x 1.4m x 2.5m 7.0m x 1.2m x 3m 3.0m x 1.2m x 1.2m
Voigt & Willecke (Pty) Ltd	Durban	031 902-2248		1	9.0m x 1.2m x 2.5m

The bath dimensions provided in this schedule are actual dimensions. Please check with your galvanizer the actual component size that can be accomodated, either in a single dip or by double end dipping.

 # Sheet, Wire, Tube and In-line galvanizing members dedicate their plants to the galvanizing of their own products.

For specific contact names (eg. sales or production personnel) and mobile telephone numbers, kindly contact the company receptionist.