2008 Volume 5 Issue 2

HOT DIP GALVANIZING TODAY

HOT DIP GALVANIZERS ASSOCIATION Southern Africa

35

Featuring:

Fasteners, Order timeously and Availability matrix

Energy efficient, resource sustaining hot dip galvanizing facility

Appropriate paint selection for duplex coating systems

Coating inspectors course – becoming popular!

Misconceptions on pricing hot dip galvanizing

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

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Front Cover: *A kaleidoscope of photographs showing the use of hot dip galvanizing on some new and old buildings, at a winery and some fasteners, threaded rod and holding down bolts..*

Hot Dip Galvanizing – Adding value to Steel

Executive Director's Comment

The immediate past few months at the Association has seen our team heavily involved with marketing promotional activities. These activities include presenting a number of formal technical papers at conferences and/or seminars. These technical papers have addressed the value of hot dip galvanized reinforcing steel in concrete, duplex coating systems, analysis of corrosive environments, including atmospheric, water and soil conditions and the effects on service life. Detailed analysis work has been undertaken in terms of Life Cycle Costings with some very interesting results. All these presentations and supporting calculations are available through the Association offices and interested parties are welcome to call in to obtain copies or discuss any details relating to these presentations.

Please be reminded that Association staff remains available to make formal and informal technical presentations to project owners, their engineers, consultants, mining engineers and operators and undergraduate university and technical institute's student bodies. We are able to provide presentations relating to corrosion control in general, hot dip galvanizing and duplex coating systems in detail and address issues relating to environmental controls within our industry and how zinc is employed as "Man's Friendly Metal".

It is also very pleasing to report that we have experienced a marked increase in participation at our two day Inspector's Courses. The courses conducted in February and April, so far this year, have been well attended with some excellent examination results being recorded. A new bench mark was established on the February course with a lady participant obtaining a 96% aggregate on the 3 part examination. This is particularly gratifying to us at the Association, as the particular individual concerned heads up the quality control and inspection functions at a leading steel fabricator. Hot dip galvanizing, being on the supply chain, is fully reliant on the various steel fabricators to manufacture product that is suitable for galvanizing and consequently we need knowledgeable QA inspectors, at all levels, to understand what is required to produce a quality end product. A further six Inspector's Courses are planned for the remainder of 2008 and include a course in East London and one in Cape Town. More courses can be arranged if we identify additional demand.

Bob Wilmot

Note from the Editor

I have been in Cape Town permanently now since August last year and on my travels seen a huge number of structures that have been protected by using hot dip galvanizing and where necessary a duplex coating system.

Informed consulting engineers and architects that stay near the coast generally understand the implications of underspecified coatings. It is therefore a great pity that the bulk of the structural steelwork on the coastal stadiums will not be hot dip galvanized or duplex coated but only painted!

Obviously, the huge size of some of these components have, in spite of the innovative methods used to duplex coat the two Athlone Stadium arches, placed dampeners on the roof components being hot dip galvanized.

The Duck Pond Stadium at St Georges Park, Port Elizabeth is a fitting example of what happens when an underspecified coating has been used to protect steelwork in a marine environment. The stadium had to be completely refurbished and certain components replaced after a short period of 10 to 12 years, whereas hot dip galvanized seating supports on an adjacent grandstand were in sound condition after the same period.

Both my colleague in Johannesburg and I are readily available to comment and offer advice on all aspects of both hot dip galvanizing and duplex coating systems, when required.

We repeat our offer to asset owners to request Association staff to evaluate and report on the durability of exposed and weathered hot dip galvanized or duplex coated components that are 10 years or older. The contribution may be entered in our annual awards event or as a case history and be published in the magazine. Should a reader wish to participate in this programme, kindly contact Bob or myself.

Our feature for this issue is Fasteners, with a contribution from Bob on Hydrogen Embrittlement, particularly when the fasteners are hot dip galvanized.

Under the Awards Event we publish an example of what constitutes a good entry for future submissions as entries for the 2008 event have subsequently been closed.

Under Duplex Coatings, Mike Book of Duplex Coatings discusses compatible paints that can be used over hot dip galvanized steel.

Education and Training, expands on our certificated coating inspectors course, an essential requirement in any coating inspectors portfolio. Following a lecture to a group of architectural students from Cape Town's University of Technology, we pictorially record their respective plant tours of member galvanizers.

The Coating Report discusses the Extension to the Cold Storage Facility – Maydon Wharf, Durban.

Galvanizing Failures addresses the errors of an inadequate specification by an ill informed specifier and the costly results.

Other regular articles include Misconceptions, where Miss makes the statement, "Hot dip galvanizing of high strength fasteners is not recommended, due to the propensity for fracture as a result of hydrogen embrittlement." True or false?

Walter's Corner continues the discussion on threaded articles.

Bob Andrew in his own column, Bob's Banter discusses the all-important issue of being happy at work.

Our Guest Writer, for this edition is Dr Ram K. Iyengar of Technovations International Inc. USA. In light of the discolouration and thicker than usual coating thicknesses one often sees in hot dip galvanized coatings because of the chemical composition of the steel, Ram discusses a strategy for a co-operative effort by all parties to reduce zinc consumption for galvanizing reactive steels.

Our Personality Profile has been innovatively renamed to "On the Couch" and includes an interview with architect and author Pieter Mathews.

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

Terry Smith

Energy efficient, resource sustaining hot dip galvanizing facility

This project, which was entered in the Australian Galvanizers Awards Event was sent to us by our international member, Kingfield Equipment. We publish the article as an example of efficient energy utilization, sustainablity of resources and is a fitting, well motivated entry into their awards event.

GB GALVANIZING – DESIGN AND CONSTRUCTION OF NEW GALVANIZING PLANT

Project timeframe

Over the last 2 years

Name of product/process

Design and construction of a sustainable and environmentally friendly galvanizing plant – GB Galvanizing

Type of product/process

Various process improvements in galvanizing plant to reduce environmental footprint and increase sustainability

Brief description of product/process

The process involved examining all the aspects of a galvanizing plant and then aiming to improve the efficiency, sustainability and environmental friendliness of the different steps. The incremental gains achieved at each part of the plant could then be combined to give a large improvement in the overall performance of the plant based against efficiency and "green" indicators.

Main content

Electrical power

- Lighting in the plant and yard are metal halide as opposed to mercury vapour which produce 40% more light for the same power hence having 40% less lights in the plant.

Low operating temperature of the new degreaser, considerably reduces the evaporation.

General view of the plant from the despatch yard.

- Lights are set on timers and light sensors to reduce the need for unnecessary power consumption.
- 90% of the motors in the plant are variable speed. Motors that start and stop regularly such as crane motors, compressor motors and scrubber equipment saves between 10% and 20% in power.

Conventional caustic degreasing

- Additive required to emulsify oils from surface
- 90°C results in high level of evaporation
- Sludge in caustic tank
- High gas use increases greenhouse gas emissions

New caustic degreaser

- Solvent based additive
- 27°C saves 4 000 to 5 000lt of water per day due to reduced evaporation.
- Saves $8 000 per month in natural gas cost.
- Minimises greenhouse gas emissions
- Improved air quality and air emissions in plant
- No sludge production in caustic tank reduces the need to de-sludge therefore lowers down time.
- Caustic rinse still requires de-sludging.

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Rain water off the building is stored in these tanks for subsequent use in the process.

Easy to use PLC systems, control the entire chemical process.

Rinse water

- Reduces cross contamination of low and high PH chemicals.
- Caustic rinse used to top up caustic tank reduces disposal of water tank.

Acid tanks

- Fabricated out of a polymer so as to eliminate the need for timber lining which in due course becomes a hazardous waste and needs to be treated and disposed of to land fill.
- The estimated timber saving is 58m^3 of hard wood timber to use and dispose every 4 to 6 years.

Acid rejuvenation

- GB is currently in the early stages of trialing iron exchange technology used in acid plants to see if it is a viable option.

Acid rinse water

- Reduces cross contamination of chemicals and reduces the carry over of iron in the Zinc Ammonium Chloride tank. This in turn reduces the production of ash and dross.
- Acid rinse water is used in acid tank make up.
- On site water capture and storage is used to refill rinse water tank.

Rain water capture

- The building was designed to capture 100% of rain water with suspended down pipes and a current storage capacity of 150 000lt which can be expanded if required.
- Any major process requiring water in the plant draws water from storage tanks. At this stage all acid caustic and flux tanks were made up using stored rain water.

Zinc ammonium chloride

- New nickel based flux reduces the need for the flux to be heated to 65°C saving up to $5 000 dollars in gas per month.
- Nickel reduces the reaction with high silicon steels thinning the coating thickness bringing the coating closer to the Australian standard.
- Also reducing the possibilities of thick grey coatings that can become brittle.
- No evaporation saves up to 3 000lt of water usage per day.
- Minimal evaporation also results in improved air emissions and better air quality in the workplace.
- Iron content is controlled periodically, in tank trials underway at the moment with minimal sludge make up.

Drying tank

- Spent gases from zinc bath are used to heat tank – no costs.
- Drying tank reduces zinc splashing reduces zinc consumption due to minimised oxidisation caused by zinc splash.
- Reduces oxidisation on the surface fluxed steel reducing ash make by up to 10%.
- Pre-heating reduces the thermal shock on the zinc bath increasing bath life.
- Reduces carry over of wet flux which in turn reduces dross make up.
- All these things combined can produce savings of $50 000 to $70 000 in ash and dross make and zinc usage per annum.

Zinc bath

- Being well insulated saves energy cost.

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ITS BEEN PROVEN THAT USING OUR HOT BATHS INCREASES THE DESIRABILITY OF YOUR PRODUCT.

ARMCO
GALVANIZERS

Armco Galvanizers has been in operation since 1989. Our Isando plant can accommodate heavy steel structures with our 13,2 metre kettle and our improved cranage and loading facilities. Our Dunswart plant specialises in small, difficult-to-handle items with centrifugal and jobbing work handled efficiently with three production lines. Both plants offer an in-house transport facility, a high level of expertise and quick turnaround time – guaranteed!

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A major advantage of the new plant is the reduction of emissions into the air.

- Rotational pulse firing ensures even heat distribution.
- Natural gas furnace plc controlled to optimise furnace range and capacity with continuous dross and flue gas monitoring.
- Bath covered during non production times saves 20% in gas consumption per month.
- Waste gas flue utilisation for heating drying oven.
- Variable speed motors on air blowers conserves power.

Dipping canopy

- 95% capture of fugitive emissions.
- Zinc splash recovered and reused.
- OH&S benefit.

Scrubber unit

- GB design
- Water re-used in scrubber for 4 weeks the water is currently being disposed and treated off site.
- Filter unit to be installed to cope with sludge produced.
- Very low pressure drop through the scrubber means less power consumption (1kpa).
- Variable speed motor and drive saves power.
- On demand usage runs only during the galvanizing process.
- Achieving a result 50% better than environmental SEPP limits.
- With a 70% collection efficiency.

Alternative to a scrubber (bag house)

- High pressure drop through the bags.
- 100kw more power to run must run 30kw 24/7 in order to keep filter bags dry.
- Needs compressor for reverse pulse system
- Hopper heaters to keep dust dry on bags or if the unit goes through due point dust will sludge up.
- Lime dosing 2 tonnes per month increases waste stream.
- Poor bag life 18 months
- Can be very temperamental

How or why was the product/process developed?

The aim was to develop a plant that was:

(a) environmentally friendly

(b) cost efficient

(c) reduced greenhouse gas emissions

(d) OH&S friendly

Why is it unique?

The development of the plant involved a holistic approach. All steps of the galvanizing process were examined to see where gains could be made.

What challenges were faced in its development?

(a) initial cost

(b) new technologies that required testing and refinement

(c) deployment of personnel to manage design and construction

How were these challenges overcome?

(a) in-house expertise was utilised where possible

(b) there was constant refining and testing

(c) where necessary, external expertise was brought in

A general view of the new GB Galvanizing Plant.

Improved technology

How does the process/product promote innovation?

It uses a number of new products not common to the Australian industry. Some of the developments were designed and developed in-house.

In what way does the process/product improve on the existing application?

The new process uses significantly less energy than would otherwise be required and it is more environmentally friendly than similar capacity plants.

How does the process/product promote development?

The new plant promotes the "green" performance credentials of the industry.

How does the process/product promote possible new applications?

The successful implementation of some of the elements of the new plant means that other industry members can see that these technological innovations work in Australian conditions.

Describe how teamwork existed on the project?

Suppliers and the utilisation of in-house expertise were a major part of the success of the project. Suppliers assisted with testing, advice and fine tuning of the final process.

How will the award benefit the general galvanizing industry?

The submission shows that there is a commitment on the part of the galvanizing industry to reduce their resource use, environmental footprint and emissions. These show that the galvanizing industry is sustainable and always looking to improve.

Sustainable resources

What environmental benefits does this project bring?

(a) lower resource use

(b) lower environmental emissions

(c) greater recycling

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Does this project encourage renewable resources?

There is an emphasis placed on recycling of water and capture of rainwater. This means there is less use of precious potable water in the process.

How does this project promote resource management?

The aim of reducing water evaporation means that water can be used more efficiently and lasts longer. Also, rainwater capture makes use of the roof space of the facility rather than allowing water to pass into to the storm water system. The use of energy efficient equipment requires less use of natural gas and electricity. This results in lower energy use and consequently less greenhouse gas emissions.

Promotion

In what way could this project be used in promotional publications?

The project is a model case study in displaying the environmental sustainability of hot dip galvanizing. If the process is seen as sustainable by the current and next generation of specifiers, then the use of galvanizing in the future will continue and, hopefully, expand. A major advantage of the new plant is the reduction of emissions to air to a greatly reduced level – this is a insignificant improvement on another air emission technologies.

Conclusion

Why do you believe your submission should win?

Environmental sustainability and recycling are key issues in society. The increasing demand for infrastructure concurrently with the demand for more environmentally friendly building materials means that industries need to demonstrate a commitment to sustainability. Work of this kind shows the industry in a positive light to current and future generations of specifiers.

The hot dip galvanizing industry is acknowledged at the Africa Energy Awards 2008

The Hot Dip Galvanizers Association Southern Africa (HDGASA) received the Award for the Best Environmental Rehabilitation project at the Africa Energy Awards held on 16 April 2008.

The finalists in this particular category were the Vanilla Development Foundation in Kenya and the HDGASA, who submitted an entry on behalf of the hot dip galvanizing industry.

The hot dip galvanizing industry has for more than 50 years been a major supplier to the Southern African Power Distribution Industry. It has been at the forefront of supplying the primary corrosion control requirements that are used to provide long term service life and sustainability of a wide range of steel structures used in this sector. Power transmission lines, sub-station steelwork and numerous other ancillary steel installations throughout the Southern African region, have been hot dip galvanized as the primary means of protecting steel structures that are subjected to the destructive corrosive elements present in a wide range of differing environmental conditions.

Here Derek Watts (TV personality) and Emma Sayers (GM of Terrapin) hand Bob Wilmot the Award.

Due to the fact that the entry met the criteria in this category, i.e. enhancing environmental benefits and meeting the government requirements of environmental rehabilitation, the Award was presented to Robert Wilmot, Executive Director of the HDGASA.

Robert was pleased with the award and said that “Zinc is regarded as one of man’s friendly metals as it is essential for all forms of growth, does not contaminate or harm the environment and is used in the hot dip galvanizing process. Zinc has the ability to provide long term corrosion protection of steel structures at extremely economical life cycle rates.”

Fastener availability matrix and participating fastener suppliers

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

TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
LOCKING NUTS							
Half Lock Nuts	Bearing Man	MS			M8 – M24	Yes	
	Bolt & Eng Distributors	MS				Yes	
	Hammon Fasteners	MS/HT S/S			M8 – M24		Yes
	Tel-Screw Products	MS/HT			M8 – M48	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	Yes
Hard Lock Nuts	Bearing Man					Yes	
	Bolt & Eng Distributors	Gr: 8	No Spec			Yes	
	Hammon Fasteners				M8 – M24		Yes
Castle Nuts	Bearing Man				M8 – M100	Yes	
	Bolt & Eng Distributors	Gr: 8	Various			Yes	
	Hammon Fasteners				M8 – M20	Yes	
	Tel-Screw Products	MS/Gr: 8			M6 – M100	Yes	
Steel Hex Lock Nuts	Bearing Man	MS			M8 – M100	Yes	
	Bolt & Eng Distributors	MS				Yes	
	Hammon Fasteners				M8 – M24		Yes
	Tel-Screw Products	MS/HT			M6 – M100	Yes	
	WLS Fastener Manufacturing Co. cc	MS				Yes	
Crimped Nuts	Galvfast Trading	ER8	DIN 980		M12 – M30	Yes	
	Impala Bolt & Nut	MS				Yes	
	Tel-Screw Products	MS			M8 – M48	Yes	
Flanged Crimped Nuts	Bearing Man				Made to order	Yes	
	Impala Bolt & Nut					Yes	
Locking Washers	Bolt & Eng Distributors		DIN 127			Yes	
	Hammon Fasteners				M10 – M24		Yes
	WLS Fastener Manufacturing Co. cc					Yes	
Nyloc Nuts	Most suppliers	Most smaller size Nyloc nuts are imported and are only available as electroplated					
	Galvfast Trading	MS	DIN 985		M3 – M48	Yes	
	Hammon Fasteners				M4 – M36	Yes	
	Impala Bolt & Nut		DIN 985				Yes
Cleeve Lock Nuts	Hammon Fasteners				M8 – M24	Yes	
Prevailing Torque Hex Lock Nuts	Tel-Screw Products	Gr: 8 & 10	DIN 980V			Yes	
NORMAL NUTS							
Hex OS Nuts	Bearing Man				M6 – M36		Yes
	Bolt & Eng Distributors	Gr: 8	DIN 934				Yes
	Bolt & Eng Distributors	Gr: 10	SABS 1282			Yes	
	CBC Fasteners	Gr: 8	DIN 934	ISO 4032	M6 – M30	Yes	Yes
	Galvfast Trading	MS/HT	DIN 934		M6 – M30	Yes	Yes
	Hammon Fasteners				M8 – M42		Yes
	Impala Bolt & Nut	Gr: 8	DIN 934		M8 – M30		Yes
	Tel-Screw Products	Gr: 8,10 & 12	DIN 934		M16 – M36	Yes	
	Tel-Screw Products – HS Friction Grip	Gr: 8 & 10	DIN 6915		M8 – M64	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M64		Yes
Hex Long OS Nuts	Bearing Man					Yes	
	Galvfast Trading	MS/HT			M8 – M30	Yes	
	Rawlplug South Africa	MS			M6 – M16	Yes	
	Tel-Screw Products	MS/HT	TSP		M8 – M48	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes
Shear Nuts or Anti-vandal Nuts	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	No Spec			Yes	
	Galvfast Trading	Mechanically Plated			M8 – M16	Yes	
	Hammon Fasteners				M10 – M16	Yes	
	Impala Bolt & Nut	MS					Yes
	Rawlplug South Africa	MS			M8 – M16	Yes	Yes
	Tel-Screw Products	MS/HT			M8 – M48	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M24	Yes	
Flanged Nuts	Bearing Man					Yes	
	Hammon Fasteners				M10 – M20	Yes	
	Tel-Screw Products	HT/MS			M8 – M36		
	WLS Fastener Manufacturing Co. cc	MS			M8 – M16		Yes
WASHERS							
Thru Hardened Washers	Bearing Man					Yes	
	Bolt & Eng Distributors		DIN 6916		M6 – M42		Yes
	Galvfast Trading		DIN 6916			Yes	Yes

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TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
WASHERS continued							
Thru Hardened Washers continued	Hammon Fasteners				M10 – M30		Yes
	Tel-Screw Products		DIN 6916		M10 – M64	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes
TFlat Washers	Bearing Man				M6 – M36		Yes
	Bolt & Eng Distributors						Yes
	Galvfast Trading	MS	DIN 125		M8 – M42	Yes	Yes
	Hammon Fasteners				M8 – M42		Yes
	Impala Bolt & Nut		DIN 120/125		M8 – M30		Yes
	Tel-Screw Products	MS	DIN 120/125		M8 – M76		Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M76		Yes
Square Flat Washers	Bearing Man					Yes	
	Hammon Fasteners				M8 – M24	Yes	
	Tel-Screw Products	Specially manufactured to order			M6 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M30		Yes
Square Curved Washers	Bearing Man	Manufactured to order				Yes	
	Tel-Screw Products	Specially manufactured to order			M6 – M76	Yes	Yes
Spring Washers	Bearing Man					Yes	
	Bolt & Eng Distributors		DIN 127				Yes
	Galvfast Trading		DIN 127		M3 – M48	Yes	Yes
	Hammon Fasteners				M10 – M24		Yes
	Impala Bolt & Nut		DIN 127		M8 – M30		Yes
	Tel-Screw Products		DIN 127		M8 – M64		Yes
	WLS Fastener Manufacturing Co. cc				M8 – M36		Yes
BOLTS AND SCREWS							
Hex Head Screws	Bearing Man	MS/HT	DIN 558/933	ISO 4017	M6 – M24		Yes
	CBC Fasteners	MS	DIN 933	ISO 4017	M18 – M30	Yes	Yes
	CBC Fasteners	Gr: 8.8	DIN 933	ISO 4017	M8 – M30	Yes	Yes
	Galvfast Trading	Gr: 8.8	DIN 933		M8 – M30	Yes	Yes
	Galvfast Trading	MS 4.8	DIN 588		M8 – M24	Yes	Yes
	Hammon Fasteners				M8 – M24		Yes
	Impala Bolt & Nut	MS	DIN 658		M8 – M24		Yes
	Impala Bolt & Nut	Gr: 8.8	DIN 933		M8 – M30		Yes
	Rawlplug South Africa	MS	DIN 933		M6 – M12	Yes	
	Tel-Screw Products	Gr: 8.8/MS			M5 – M39	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36		Yes
Hex Head Bolts and OS Nuts	Bearing Man	MS	DIN 601		M6 – M24		Yes
	Bolt & Eng Distributors	MS	DIN 601		M8 – M30	Yes	
	CBC Fasteners	MS	DIN 601	SABS 135	M8 – M30	Yes	Yes
	Galvfast Trading	MS Gr: 4.8	DIN 601/588		M8 – M30	Yes	Yes
	Hammon Fasteners				M8 – M30	Yes	Yes
	Impala Bolt & Nut	MS			M8 – M30	Yes	
	Tel-Screw Products	MS/HT	DIN 601	Lay – 520	M8 – M39	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes
Hex Head Bolts and OS Nuts (High tensile)	Bearing Man	HT	DIN 931		M6 – M24		Yes
	Bolt & Eng Distributors	Gr: 8.8	DIN 933		M27 – M56	Yes	
	CBC Fasteners	Gr: 8.8	DIN 931	ISO 4014	M8 – M30	Yes	Yes
	Galvfast Trading	Gr: 8.8	DIN 931		M8 – M30	Yes	Yes
	Hammon Fasteners				M8 – M30	Yes	Yes
	Impala Bolt & Nut	Gr: 8.8	DIN 931		M8 – M30		Yes
	Tel-Screw Products	Gr: 8.8/MS	DIN 931		M8 – M56	Yes	Yes
	WLS Fastener Manufacturing Co. cc	HT			M8 – M36		Yes
Large Dia Bolts & OS Nuts	Bearing Man					Yes	
	Bolt & Eng Distributors		DIN 601/934			Yes	
	Galvfast Trading	MS/HT			M30 – M36	Yes	
	Hammon Fasteners				M30 – M39	Yes	Yes
	Tel-Screw Products	Gr: MS/8.8			M36 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M39 – M76	Yes	
Cup Head Square Neck Bolts & OS Nuts	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	SABS 1143		M8 – M20	Yes	
	CBC Fasteners	MS	SABS 1143		M8 – M20	Yes	Selected
	Galvfast Trading	MS 4.8	SABS 1143		M8 – M12	Yes	Selected
	Hammon Fasteners				M10 – M16	Yes	Yes
	Impala Bolt & Nut	MS	DIN 603		M8 – M16	Yes	
	Rawlplug South Africa	MS	DIN 603		M8 – M12	Yes	
	Tel-Screw Products	MS	SABS1143 / DIN 603		M8 – M30	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M20	Yes	
C/Sunk Square Neck Bolts & OS Nuts	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	SABS 1143		M12 – M24	Yes	
	CBC Fasteners	MS	SABS 1143		M10 – M20	Yes	No
	Impala Bolt & Nut	MS	DIN 605		M10 – M16	Yes	
	Tel-Screw Products	MS/HT	SABS 1143		M8 – M30	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M10 – M20	Yes	
C/Sunk Nib Bolts & OS Nuts	Bearing Man					Yes	
	CBC Fasteners	MS	SABS 1143		M12 – M24	Yes	No
	Galvfast Trading	MS	SABS 1143		M10 – M20	Yes	Yes

TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
BOLTS AND SCREWS continued							
C/Sunk Nib Bolts & OS Nuts continued	Impala Bolt & Nut	MS	DIN 604		M10 – M20	Yes	
	Tel-Screw Products	MS	SABS 1143		M8 – M24	Yes	
	WLS Fastener Manufacturing Co. cc	MS			M12 – M24	Yes	
Friction Grip Bolts & Nuts	Bearing Man					Yes	
	Bolt & Eng Distributors	Gr:10.9S	SABS 1282		M12 – M30	Yes	
	CBC Fasteners	Gr: 8.8S/10.9S	SABS 1282	ISO 7411	M12 – M30	Yes	No
	Galvfast Trading	Gr. 8.8S/10.9S	SABS 1282		M12 – M30	Yes	
	Hammon Fasteners				M16 – M24	Yes	
	S.A. Bolt Manufacturers	Gr: 8.8/10.9S			M12 – M30	Yes	
	Tel-Screw Products	MS/HT					
	WLS Fastener Manufacturing Co. cc	HT			M12 – M30	Yes	
Hex Socket C/Sunk Head Screws	Bolt & Eng Distributors	Gr: 10.9	DIN 7991		M8 – M24	Yes	
	Galvfast Trading	Gr. 10.9	DIN 7991		M8 – M24	Yes	
	Hammon Fasteners				M10 – M24	Yes	
	S.A. Bolt Manufacturers	Gr: 10.9/12.9			M6 – M48	Yes	
	Tel-Screw Products	HT					
	WLS Fastener Manufacturing Co. cc	HT			M8 – M24	Yes	
Lockbolts	Bearing Man					Yes	
	Hammon Fasteners				M12 – M24	Yes	
	S.A. Bolt Manufacturers Pins & Collars	Gr: 6.8/8.8			M12 – M24	Yes	
Pigtails – 1 &1½ Turn	Bascol (Pty) Ltd	MS/EN8 304 316			M8 – M12	Yes	Yes
	Bolt & Eng Distributors	MS			M8 – M12	Yes	
	Hammon Fasteners	MS/EN8 304 316			M8 – M12	Yes	Yes
	Tel-Screw Products	MS/SS/HT			M6 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M24	Yes	
3m – Threaded Rod	Bascol (Pty) Ltd	MS/EN8 304 316			M4 – M72	Yes	
	Bearing Man					Yes	
	Bolt & Eng Distributors	MS			M8 – M36	Yes	
	Galvfast Trading	MS			M10 – M64	Yes	Yes
	Hammon Fasteners	MS/EN8 304 316			M4 – M72	Yes	

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TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
BOLTS AND SCREWS continued							
3m – Threaded Rod continued	Impala Bolt & Nut	MS/HT	DIN 975		M8 – M24	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes
1m – Threaded Rod	Bascol (Pty) Ltd	MS/EN8 304 316			M4 – M72	Yes	Yes
	Bearing Man					Yes	
	Bolt & Eng Distributors	DIN 975			M12 – M30	Yes	Yes
	Galvfast Trading	MS/EN8			M10 – M30	Yes	Yes
	Hammon Fasteners	MS/EN8 304 316			M4 – M72	Yes	Yes
	Impala Bolt & Nut	MS/HT	DIN 975		M8 – M24	Yes	
	Rawlplug South Africa	HT			M5 –M30	Yes	
	Tel-Screw Products	MS/HT			M8 – M36	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M36		Yes
HD Bolts (Foundation Bolts) & OS Nuts	Bascol (Pty) Ltd	MS/EN8 304 316			M4 – M72	Yes	Yes
	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	No Spec			Yes	
	Galvfast Trading	MS/HT			M12 – M36	Yes	
	Hammon Fasteners	MS/EN8 304 316			M4 – M72	Yes	Yes
	Rawlplug South Africa	MS/HT			M8 – M36	Yes	
	Tel-Screw Products	MS/HT			M8 – M72	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M72	Yes	
CONCRETE ANCHOR BOLTS							
Rawlbolts	Hammon Fasteners				M6 – M24	Yes	Yes
	Rawlplug South Africa	5.8	BBA	All International	M5 – M24	Yes	
SPT Construction Anchors	Hammon Fasteners				M6 – M24	Yes	
	Rawlplug South Africa		EU	All International	M6 – M24	Yes	
R-KEM Chemical Bolts	Hammon Fasteners				M12 – M24	Yes	
	Rawlplug South Africa	5.8/HT	BBA		M8 – M30	Yes	Yes
R-KEX Chemical Bolts	Hammon Fasteners				M12 – M24	Yes	
	Rawlplug South Africa	5.8/HT	BBA		M8 – M30	Yes	Yes
R-CAS Chemical Bolts	Hammon Fasteners				M12 – M24	Yes	
	Rawlplug South Africa	5.8/HT	BBA		M8 – M30	Yes	Yes
R-HAC Chemical Bolts	Rawlplug South Africa	5.8/HT	BBA		M8 – M30	Yes	Yes
Express Anchor Bolts	Hammon Fasteners				M8 – M20	Yes	Yes
	Rawlplug South Africa				M6 – M24	Yes	Yes
Chemical Anchors & Threaded Studs	Bascol (Pty) Ltd	MS/EN8 304 316			M4 – M72	Yes	Yes
	Galvfast Trading	MS/EN8			M8 – M30	Yes	
	Bolt & Eng Distributors	EN8	No Spec			Yes	
	Hammon Fasteners	MS/EN8 304 316			M4 – M72	Yes	Yes
	Rawlplug South Africa	MS/HT			M8 – M30	Yes	Yes
	Tel-Screw Products	MS/HT			M8 – M36	Yes	Yes
	Tel-Screw Products	MS/HT			M16 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	EN8			M8 – M30	Yes	Yes
Kalm Chemical Anchor Bolt	WLS Fastener Manufacturing Co. cc	EN8			M8 – M30	Yes	
Trugrip Anchor Bolt	WLS Fastener Manufacturing Co. cc	EN8			M10 – M30		Yes
Rawl Kemfix Chemical Anchor Studs - for use with all chemical anchoring (capsule and/or cartridge systems)	Rawlplug South Africa	Gr: 5.8	Imported	Imported	M8 – M30 Various lengths		Yes
Through Bolts / Stud Anchors / Wedge Anchors	Rawlplug South Africa	Gr: 5.8	Imported	Imported	M8 – M24 Various lengths		Yes
MISCELLANEOUS							
Self Drilling Screws	Bearing Man					Yes	
	Galvfast Trading	DIN 7504K			Various	Yes	
	Rawlplug South Africa				Various	Yes	
	WLS Fastener Manufacturing Co. cc					Yes	
Cast-In Lifting Sockets	Tel-Screw Products	EN8			M8 – M36		
	WLS Fastener Manufacturing Co. cc	EN8			M8 – M36	Yes	
SPECIAL FASTENERS							
Countersunk Machine Screws	Bearing Man					Yes	
	Bolt & Eng Distributors	MS/HT	DIN 963			Yes	
	Galvfast Trading	MS/HT			M8 – M20	Yes	Yes
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Tel-Screw Products	MS/HT	DIN 963 & 965		M6 – M36	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	
Round U-Bolts	Bascol (Pty) Ltd	MS			M8 – M36	Yes	Yes
	Bearing Man					Yes	
	Bolt & Eng Distributors	MS			M8 – M76	Yes	
	Galvfast Trading	MS/EN8			M8 – M36	Yes	Yes
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
	Tel-Screw Products	HT			M8 – M76	Yes	
Square U-Bolts	Bascol (Pty) Ltd	MS			M8 – M48	Yes	
	Bolt & Eng Distributors	MS	No Spec		M8 – M24	Yes	
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes

TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
SPECIAL FASTENERS continued							
Square U-Bolts continued	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	
TV U- Bolts	Bascol (Pty) Ltd	MS			M8 – M16	Yes	Yes
	Bearing Man						Yes
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
Hook Bolts	Bascol (Pty) Ltd	MS			M8 – M20	Yes	
	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	No Spec		M8 – M76	Yes	
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Rawlplug South Africa	MS			M5 – M12	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
Channel Bolts	Bascol (Pty) Ltd	MS			M8 – M10	Yes	
	Bolt & Eng Distributors	MS			M8 – M10	Yes	
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
J-Bolts	Bascol (Pty) Ltd	MS			M8 – M36	Yes	
	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	No Spec		M8 – M24	Yes	
	Galvfast Trading	MS			M8 – M16	Yes	Yes
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Rawlplug South Africa	MS			M5 – M12	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
Eye-Bolts	Bascol (Pty) Ltd	MS			M8 – M16	Yes	
	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	No Spec		M8 – M76	Yes	
	Galvfast Trading	MS			M8 – M16	Yes	Yes
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes

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TYPE OF FASTENER	COMPANY	STEEL GRADE	SPECIFICATION	SPECIFICATION	AVAILABLE SIZES	HOT DIP GALVANIZED TO ORDER	HOT DIP GALVANIZED EX STOCK
SPECIAL FASTENERS continued							
Eye-Bolts continued	Rawlplug South Africa	MS			M5 – M12	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M6 – M76	Yes	
Straining Eye-Bolts	Bascol (Pty) Ltd	MS			M8 – M16	Yes	
	Bearing Man					Yes	
	Galvfast Trading	MS			M8 – M16	Yes	Yes
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Tel-Screw Products	MS/HT			M6 – M76	Yes	Yes
	WLS Fastener Manufacturing Co. cc	MS			M8 – M24	Yes	
Linked Eye Nuts	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Rawlplug South Africa				M6 – M16	Yes	
Linked Eye Rods	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
Forged Eyebolts	Bearing Man					Yes	
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Rawlplug South Africa				M6 – M16	Yes	
	Tel-Screw Products	MS/HT			M8 – M30	Yes	
Welded Eyebolts	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Rawlplug South Africa	MS			M8 – M16	Yes	
Scaffold Rings	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Rawlplug South Africa	MS			M8 – M16	Yes	
Threaded Studs	Bascol (Pty) Ltd	MS/EN8			M8 – M64	Yes	
	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	No Spec		M8 – M76	Yes	
	Galvfast Trading	MS/EN8			M8 – M64	Yes	
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	Yes
	Rawlplug South Africa	MS/HT			M5 – M30	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	Yes
Tie Rods	Bascol (Pty) Ltd	MS/EN8 304 316			M4 – M72	Yes	
	Bearing Man					Yes	
	Bolt & Eng Distributors	MS	No Spec		M8 – M76	Yes	
	Galvfast Trading	MS/EN8			M8 – M64	Yes	
	Hammon Fasteners	MS/EN8 304 316			M8 – M39	Yes	
	Tel-Screw Products	MS/HT			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
Other specials	Bascol (Pty) Ltd	MS/EN8	Threading & bending to customers specification				
	Bearing Man					Yes	
	Bolt & Eng Distributors	Specials manufactured to order					
	Galvfast Trading	To order					
	Hammon Fasteners						
	Rawlplug South Africa	Special application chemical and/or mechanical anchor bolts as required					
	Tel-Screw Products	Specials manufactured to order			M8 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M76	Yes	
Domed Head or Cap Nuts	Bearing Man					Yes	
	Hammon Fasteners				M8 – M39		
	Tel-Screw Products	MS/HT	DIN 1587		M6 – M76	Yes	
	WLS Fastener Manufacturing Co. cc	MS/HT			M8 – M36	Yes	
Hex Coach Screws	Bearing Man					Yes	
	Hammon Fasteners				M6 – M12		Yes
	Rawlplug South Africa		DIN 7976		M5 – M12	Yes	
	Tel-Screw Products	MS	DIN 7976		M6 – M12	Yes	Yes

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

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

PARTICIPATING FASTENER SUPPLIERS CONTACT DETAILS

COMPANY	TELEPHONE	EMAIL	WEBSITE
Bascol	011 493 8160	michael@bascol.net	www.bascol.co.za
Bearing Man	031 576 6221/6262	sales@bearingman.co.za darrylc@bearingman.co.za	www.bearingman.co.za
Bolt & Engineering	011 824 7500	mike@bolteng.co.za	www.bolteng.co.za
CBC Fasteners	011 955 4485	tech@cbc.co.za	www.cbc.co.za
Galvfast Trading	011 391 1510	arthureh@mweb.co.za	www.galvfast.co.za
Hammon Fasteners	011 914 4055	hammonk@telkomsa.net	–
Impala Bolts & Nuts	011 824 3925	adiamond@impalasa.co.za	–
Rawlplug	011 894 7147	rmuller@infodoor.co.za	www.rawlplug.co.za
SA Bolt Manufacturers	011 814 2240	info@sabolt.co.za	www.sabolt.co.za
Tel-Screw Products (Pty) Ltd	011 898 3200	info@telscrew.co.za	www.telscrew.co.za
WLS Fasteners	011 882 1150	wlsandrew@telkomsa.net	www.kalm.de

The 'ins' and 'outs' of hydrogen embrittlement

Hydrogen embrittlement can be sometimes seen as a major cause of "high tensile" fastener failure. Current thinking is that steels with Rockwell hardness above C30 and tensile strengths >1 000MPa are vulnerable. The phenomenon is fairly wellknown although the precise mechanism has eluded extensive research. A number of proposed mechanisms have been proposed, and most have at least some merit.

Current thinking is that high tensile steels are susceptable to hydrogen embrittlement caused by latent hydrogen being trapped and populating the grain boundaries within the steel's crystal structure. In other words, hydrogen embrittlement can be described as absorption of hydrogen ions, which will later combine to form hydrogen molecules, trapped within grain boundaries promoting enhanced de-cohesion of the steel, primarily as an intergranular phenomenon.

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Tensile Strength (MPa)	Tensile Strength (000 psi)	Rockwell Hardness HR_C	Baking Cycle @190° – 220°C (minutes)
1700 – 1800	247 –261	49 – 51	22+
1600 – 1700	232 –247	47 – 49	20+
1500 – 1600	218 – 232	45 – 47	18+
1400 – 1500	203 – 218	43 – 45	16+
1300 – 1400	189 – 203	39 – 43	14+
1200 – 1300	174 – 189	36 – 39	12+
1100 – 1200	160 – 174	33 – 36	10+
1000 – 1100	145 – 160	31 – 33	8+

NB. Per ASTM B 850–94 "For steels of actual tensile strength below 1 000MPa, heat treatment (baking) after plating is not essential."

ASTM B 850-94 specification for baking cycles of high strength zinc electroplated fasteners.

Some free hydrogen ions are generated during the cleaning and pickling cycles, applicable to both the electro-plating and hot dip galvanizing processes. However, during the electro-plating process, performed at "normal" room temperatures, and by a process of electrolysis; additional free hydrogen ions are generated, adding to the potential for this embrittlement phenomena.

By contrast, in hot dip galvanizing the pickling cycle is followed by drying at temperatures ranging from 60 to 80°C and finally by immersion into molten zinc at 450°C. Such temperatures are beneficial in terms of de-embrittlement in that the ingress of hydrogen is reversed and driven off.

When electro-plating high strength fasteners (>1 000MPa), it is recommended that a process of baking is performed in order to reduce the risk of hydrogen embrittlement. A useful specification table for baking cycles is shown on the previous page. Generally, for the production electro-plater, having to remove the parts from the production line to bake followed by a separate chromating process can be seen as a laborious process.

Prevention of hydrogen embrittlement

Apart from the use of a baking cycle, not normally used when hot dip galvanizing; other precautions are employed to prevent the potential for hydrogen embrittlement. In terms of the acid pickling cycle, it is essential that a suitable inhibitor is added to the 6 to 16% hydrochloric acid and that the immersion time is limited to less than 15 minutes. In addition, no acid stripping and regalvanizing of fasteners is permitted.

When it is required to hot dip galvanize high strength fasteners, >1 000MPa, one needs to refer to SANS 10094 Annex B, which details the process to be followed in order to control and eliminate the potential for hydrogen embrittlement. Part of the requirements of the SANS 10094 specification is that the bolt manufacturer must provide the hot dip galvanizer with a certificate of manufacturing and heat treatment compliance. The hot dip galvanizer in turn must also provide a compliance certificate that the zinc coating process was completed in terms of Annex B of the said specification.

For further general information relating to hot dip galvanizing of fasteners, refer to our Information Sheet No. 7 on our Association website www.hdgasa.org.za. Alternatively contact the Association offices.

SANS 10094
HOT DIP GALVANIZING OF GRADE 10.9 FASTENERS IS ACCEPTABLE!

Annexure B (Extracted from SANS 10094 –Informative)

General

Grade 10.9 fasteners may be hot dip galvanized, provided a certificate of compliance is issued, by the galvanizer, stating that the hot dip galvanized coating has been carried out in terms of the national or international standard. The two most important factors to be considered in terms of hot dip galvanizing of class 10.9 fasteners is to restrict the pickling times to less than 15 minutes, and comply with the coating thickness requirements as given in table B.1.

TABLE B.1 – COATING REQUIREMENTS FOR CLASS 10.9 HOT DIP GALVANIZED FASTENERS

1	2	3	4
Threaded articles thickness	Local coating thickness	Mean coating thickness	Maximum coating
6mm to 20mm diameter	35mm or 250gms/m^2	45mm or 325gms/m^2	55mm or 395gms/m^2
Greater than 20mm diameter	45mm or 325gms/m^2	55mm or 395gms/m^2	65mm or 465gms/m^2

NOTE: Excessively thick hot dip galvanized coatings, i.e. immersion times for longer than 2 minutes can result in excessive growth of the hard Fe/Zn alloy layers and possible fatigue failure from crack propagation at stress raisers. Excessively thick coatings, on threads, will interfere with thread tolerances.

Threads are to be clearly defined and free of excess solidified zinc allowing for ease of nut fitting and tensioning.

B.2 Procedure for hot dip galvanizing of grade 10.9 fasteners

B.2.1 Degrease the components in 5% to 6% caustic soda solution heated to a temperature of 60°C to 70°C.

NOTE: If available, lightly wheelabrate for less than 5 minutes in order to reduce the pickling time to a minimum.

B.2.2 After a water rinse, immerse in 6% to 16% hydrochloric acid, containing an inhibitor for less than 15 minutes. Agitate by lowering and raising the components at least 3 consecutive times.

B.2.3 Immediately following acid pickling, components are rinsed in water, fluxed and immersed into molten zinc.

NOTE 1 Thick hot dip galvanized coatings are avoided by limiting the immersion times to less than 2 minutes, agitating in the molten zinc and ensuring that all subsequent components are immersed for similar periods of time and followed by efficient centrifuging.

NOTE 2 No stripping and re-galvanizing of rejected sub-quality fasteners is allowed.

Impala Bolt & Nut S.A. (Pty) Limited is a manufacturer of mild steel and hi-tensile bolts and nuts, ranging from M6 right up to M30 in diameter.

We have established ourselves over the years as a reliable and quality conscious manufacturer who strives for customer satisfaction with every order.
We specialise in hot dip galvanized bolts and nuts and have a very large stockholding of these items.

Impala Bolt also has a specialised fastener division which manufactures for the motor industry and any specials that you, the client, might have.
We are available at any time to be of assistance and offer sound advice as to what product best suits your application.

All items manufactured are also available in zinc plated / hot dipped / CAD and trivalent coating as per the motor industry standards.

Our dedicated sales team will gladly assist you with all your requirements.

IMPALA BOLT & NUT S.A. (PTY) LIMITED

Manufacturers of Industrial Fasteners

48 Nagington Road, Wadeville, Germiston
P.O. Box 14766 Wadeville 1422
Tel.: (011) 824-3925 • Fax: (011) 824-3803

In light of the fluctuating steel price and the restrictive suppliers quota affecting the availability of fasteners, early ordering is even more important...

Concerns for the hot dip galvanizing industry? None, although we use a non-member of the Association, we believe we are getting good service. Although we try to provide the galvanizer with adequate time, when we can't due to circumstances, they frequently surprise us with a short turn around time, to suit our needs. We would prefer for our galvanizer to be member as we believe this would add value to all parties concerned including our customers.

Quality? – Do you frequently get requests from customers to supply the nut and bolt in nutted up form? Not usually, most times the nuts fit the bolt without effort.

Quality? – When requested to, does the galvanizer provide quality hot dip galvanized high strength fasteners in grades 8.8 and 10.9 over night? The galvanizer works strictly according to SANS 10094 Annex B and as a rule will not galvanize high strength fasteners during the night shift. A certificate of conformance is issued to the fastener manufacturer who takes the overall responsibility for the quality.

Do customers readily order hot dip galvanized fasteners timeously so that all parties can perform according to their best ability? No, fasteners are usually left to order till the last minute and in spite of Bolt and Engineering keeping a considerable stock of hot dip galvanized fasteners in many different sizes and diameters, frequently, fasteners have to be manufactured and coated in less time than is desirable. This is generally where problems are encountered. The additional problem currently is the shortage of steel, which means that for the first time in many years we are experiencing shortages of fast moving popular sizes. Hot dip galvanized fasteners constitute about 60% of our coated fasteners, this has increased considerably over the last few years.

I understand that local fastener manufacturers have been subjected to a quota system by the steel manufacturers. What impact will this have on the industry, importers and the general price of fasteners? Mittal Steel has imposed a quota system on all its customers, this has profound effects on the production and general availability of fasteners, which in turn has a profound effect on pricing. This policy of the steel manufacturer will have a future major implication on the customer, particularly if the fasteners are left until the last minute to order. By ordering timeously, considerable savings can be made particularly as regards to the recent and future possible steel price increases.

Understandably, Bolt and Engineering are maintaining huge stocks of hot dip galvanized fasteners, when high strength fasteners are ordered what nuts are supplied with grade 10.9 and grade 8.8 fasteners and why? Grade 10 nuts are supplied with grade 10.9 bolts and grade 8 with grade 8.8 bolts. We decided many years ago to stock grade 10.9 rather than 8.8 as we believe that you can substitute 10.9 for 8.8 but you cant substitute 8.8 for 10.9.

Cadmium has long been outlawed as an environmentally unfriendly metal, do you still have customers that request coating by this metal and why? Yes we still do, we have one company in particular who export to Australia and who specify cad and wont accept anything else.

Are they aware that in spite of the atmosphere, hot dip galvanized fasteners due to their superior coating thickness will always outperform an equivalent fastener that has been cadmium coated, even in marine atmosphere. Not sure if our customers are.

What other positive or negative comments do you generally get from customers with respect to hot dip galvanized fasteners. Customers often leave the procurement of fasteners to the last minute and if they need to be hot dip galvanized this makes it more difficult as they believe these bolts are frequently available as hot dip galvanized off the shelf and then due to time restrictions they take the fasteners black or electro plated (electrogalvanized). Most customers once having used hot dip galvanized fasteners, won't use anything else.

Any further comments or ideas for the industry? Try to give your fastener supplier ample time to prepare the order so that it ready to go to site at the same time as the steel also ensure that all items are properly packaged and correctly labelled.

The above interview was conducted with Mike Giltrow of Bolt and Engineering Distributors.

"A company with a pedigree"

"Telscrew is a company that is a proud member of the Foundation for the Development of Africa, is ISO 9001 certified and has been in business for the past 39 years, in short the company has got a pedigree," says Ronnie Teleng, Managing Director.

Telscrew Products not only carries one of the largest ranges of ex-stock fasteners in the country, which includes an extensive range of hot dip galvanized fasteners, but also stocks unique specialised fasteners. In addition, Telscrew will manufacture and arrange to hot dip galvanize any product to customer specification, at short notice.

The company deals with approved South African Bureau of Standards hot dip galvanizers, to ensure appropriate quality and service. Telscrew's fasteners range from M8 to M76, including a simple stud to a complex formed and NC machined fastener or component. All hot dip galvanized fasteners and components are supplied with SANS 121 (ISO 1461) certificates.

For more details on their range of hot dip galvanized fasteners, refer to the Fastener Matrix published elsewhere in this feature.

"Focusing on hot dip galvanized fasteners"

A company that has built up a reputation over the years as a quality manufacturer and supplier of hot dip galvanized fasteners is Germiston-based Impala Bolt & Nut. This is not the easiest of product coatings to specialise in, but Impala has a good relationship with their galvanizers and is able to ensure a ready supply of HDG stock, even for urgent requirements.

Says Impala director Anthony Diamond, "Although bolts and nuts are critical to any job they always seem to get thought about last, which is why we try to keep a good stock holding to ensure that late orders or a change of requirement on site can be accommodated."

In spite of keeping considerable stocks of the various hot dip galvanized fasteners, early ordering is extremely important to circumvent irritations by the project partners and prevent unnecessary hold-ups on site.

The company is also able to advise clients on the correct type of fastener for their application, as well as assist in specifications. Impala manufactures high strength friction grip in 8.8 and 10.9 grade steel, even though the process involved in hot dip galvanizing 10.9 bolts is difficult and many manufacturers may steer away from that particular specification.

The full range of nuts, bolts and washers supplied by Impala is referenced in the accompanying Fastener Availability Matrix in this feature. Other types of coatings are also available on request.

Impala's product range is supplied countrywide and as far afield as the Middle East. Team work at Impala Bolt & Nut is the key to advising clients and meeting their needs timeously.

Can hot dip galvanizing cause stripping of nut threads?

The hot dip galvanizing process does not adversely affect the mechanical properties of high strength fastener steel or even material such as spring steel. Hardened steels <1000Mpa yield strength, will not soften and are not considered to be prone to hydrogen embrittlement.

In this instance, the initial observation that was made was that the nut threads had stripped and it was thought that hot dip galvanizing had been the cause.

As there was no grade specification on the nut, or manufacturer head marking, it was then believed that the reason for the strip was a mild steel nut on a high tensile bolt.

Further samples were obtained for the same batch and these were tested and found that they were of a grade 8 nut. Although the nuts passed, users should always take care that the grade of nut is specified.

The reason for the nut stripping is likely to be over torqueing and this lead to the failure. Alternatively it is also possible that the bolts were misaligned on installation which contributed to the threads stripping when tightening. This would explain the bolts being slightly bent.

For all hot dip galvanized fasteners it is recommended that the “turn of the nut” method of tensioning should be adopted.

"Times are a changing"

There was a time when leading construction anchor supplier Rawlplug South Africa held good stocks of hot dip galvanized anchors in their branches around the country, especially the coastal branches. This was driven by more regular end user demand, which in turn was influenced by the proper long term planning of construction projects.

However, the trend in recent years has been to order the required anchors at the last minute with typically very little warning. Rawlplug has found it more practical to carry less depth of stock at branch level, but rather to hold the bulk stock holding in their Gauteng warehouses and despatch overnight to branches.

Rawlplug MD, Rob Muller commented that in an ideal world architects and engineers would tap the expertise of the specialists like themselves at the design stage when any design features that may compromise anchor performance could be highlighted. He mentioned that they have had a number of recent cases where small design features have resulted in avoidable additional expense and delays to accommodate the loads required by the consulting engineer. Typical features which are often overlooked are slab thickness, edge distances and anchor spacings, all of which can have a dramatic influence on anchor performance. Rawlplug offer a full service to contractors and consulting engineers at all stages of construction and particularly at the design stage. They are obviously well qualified to advise on anchor selection and offer on site anchor testing to back up their recommendations as to anchor choice and their load capabilities in situ. Their service extends to training and auditing installation method and practices during the actual construction.

The Rawlplug brand has been synonymous with innovation, reliability and safety in the development and manufacture of construction anchors for the past 90 years.

Over the last few years Rawlplug has increased its stockholding of hot dip galvanized expansion and chemical anchor studs but unfortunately cost constraints often result in appropriately corrosion-protected anchors being passed over in favour of marginally lower cost inadequately protected anchors. Anchors generally, are such a small cost element of any construction project, that it is sometimes surprising that anchor quality is compromised.

Innovation remains at the heart of Rawlplug's success, including significant developments of torque controlled anchors and bonded anchor systems for safety critical applications.

Full specifications and their highly useful design guide can be accessed on their website: www.rawlplug.co.za

A performance comparison between a painted bracket and a hot dip galvanized gate.

Being happy at work

Managers don't normally talk about their employees being happy at work. They might say that they encourage employee satisfaction or job satisfaction, but one wonders whether they understand what this means. Being satisfied is important, no doubt, but does being satisfied make one happy?

Many companies have shown that it pays to have happy employees and studies have demonstrated that companies with happy employees consistently outperform their less happy competitors. Considering all the challenges that companies face today, creating a happy organisation should be a strong strategic imperative.

Being happy at work means more than just being satisfied with your job. It means far more than this; it means really enjoying what you do, feeling proud about your work, knowing that you are recognised for what you do, feeling motivated and energised most of the time and, most importantly, having fun in your work.

Happiness at work is a personal choice; nobody can force you to be happy and you can't force other people to be happy. Happiness is different for everyone; one person's happiness could be another's hell. Happiness is not eternal; you can't be happy all of the time. Happiness is not just fun and games; it goes beyond frivolity. Happiness is not about being ecstatic all the time; a quiet serious person can also be happy.

One of the most important factors that discourage happiness at work is that most companies want to maximise their employees time at work and to do as they are told. For genuine employee happiness, acknowledgement of talent, knowledge and potential is required. Allowing employees to innovate, make their own decisions, continuously improve and manage change rapidly are critical factors in today's business environment and only happy, motivated, creative and engaged employees can do this. In other words, companies need happy employees.

How does an organisation create workplaces where the employees can be happy? Since happiness is an internal state of mind, managers can never be responsible for the happiness of their employees. Each person is responsible for their own happiness at work. The role of the manager is to create a work environment where it is easy for workers to be happy. Research has shown that there are three basic aspects of workplace happiness: perks, choice and security. Perks relate to fair and reasonable compensation for what you do; choice is about creating an environment in which people who want to be happy can and security relates to safety and knowing that your work is secure and sustainable.

All of the business success factors, like innovation, productivity, customer service, focus, motivation, good working relationships etc., are developed by happy employees, not by technology or business consultants. If you believe that the only reason for being in business is to make money, you still need to look after the people who give you the platform for running your business, since if you do, you will make more money.

To have happy employees, managers don't necessarily have to motivate their employees; they have to stop demotivating them!

The Association wishes to thank Bob Andrew who is a consulting value engineer and honorary member of the Association for his article.

Correct paint selection for a duplex coating system

Beyond the need for surface preparation, the paint itself must be compatible with the hot dip galvanized coating in order to create a successful duplex system. There are numerous paint systems that have been successfully used with hot dip galvanized steel. However, some types of paint will not adhere adequately to galvanized steel, or will only do so under restricted conditions. In order to ensure a successful duplex system, it is important to find a suitable paint system with a first coat that is fully compatible with a zinc surface. The first coat serves as a "tie coat" or interface between the hot dip galvanized steel and the topcoat.

To achieve a good interface, it is important to understand the characteristics of the different paint types that can be used. Each individual formulation of paint exhibits unique characteristics that can affect its suitability for use with hot dip galvanized steel. Because of this, only individual paint manufacturers can provide specific guidance on the use of their products. It is advisable to contact paint manufacturers for specific information regarding the suitability of paint systems for use on galvanized steel.

Overleaf is a table that shows general compatibility between the specified paint system and hot dip galvanized steel.

Zinc rich paints

Zinc rich paints have long been recognised for their excellent paint adherence to both new and weathered galvanized surfaces. Zinc-rich paints have been used in the U.S. for more than 75 years and in Europe for well over a century. In a 1960's study by the American Iron and Steel Institute and the Steel Structures Painting Council, zinc-rich paint outperformed all other classes of paint. Significantly, at the nine-year inspection in 1970, there

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COMPATIBILITY OF PAINT WITH HOT DIP GALVANIZED STEEL		
TYPE	**COMPATIBILITY**	**COMMENTS**
Acrylics	Sometimes	If the pH of the paint is high, problems may occur due to ammonia reacting with zinc
Aliphatic Polyurethanes	Yes	If used as a top coat for a polyamide epoxy primer, it is considered a superior duplex system
Alkyds	No	The alkaline zinc surface causes the alkyds to saponify, causing premature peeling
Asphalts	No	Petroleum base is usually not recommended for use on galvanized steel
Bituminous	Yes	Used for parts that are to be buried in soil
Chlorinated Rubbers	Yes	High VOC content has severely limited their availability
Coal Tar Epoxies	Sometimes	Rarely used, only if parts are to be buried in soil
Epoxies	Sometimes	If paint is specifically manufactured for use with galvanized steel
Epoxy-Polyamide Cured	Yes	Has superior adherence to galvanized steel
Latex-Acrylics	Yes	Has the added benefit of being environmentally friendly
Latex Water-Based	Sometimes	Consult your paint manufacturer
Oil Based	Sometimes	Consult your paint manufacturer
Portland Cement in Oil	Yes	Has superior adherence to galvanized steel
Silicones	No	Not for use directly over galvanized steel, can be beneficial in high temperature systems with base coat
Vinyls	Yes	Usually requires profiling, high VOCs have severely limited their availability
Powder Coating	Yes	Powder coatings generally work exceptionally well over galvanized steel

Table showing compatibility of paint with hot dip galvanized steel.

was no loss of adhesion to the zinc surface.

With a high percentage of zinc in the dry film, these paints can synergistically combine with the corrosion inhibitive properties of metallic zinc. The zinc dust in paint is integrated with organic binders. These binders allow the zinc particles to remain in contact with each other so the zinc paint can provide cathodic protection.

Zinc-rich paints are an accepted method of repairing damaged galvanized coatings according to ASTM A 780. Zinc-rich paints containing at least 65 percent zinc meet the specification requirements. They are widely used for touch-up and repair of damaged galvanized coatings because of their relative ease of application.

Refer to the HDGASA for appropriate coatings for repair.

Although zinc-rich paints are useful as primers to gain surface adherence, they are also satisfactory as a finish coat when a neutral or matching gray colour is desired. These paints can be used alone, but for a more attractive finish, a topcoat is often employed. While most topcoats are easily used, some with very strong solvents may result in a lifting of the primer.

Successful topcoats include polyvinyl, acrylic latexes, polyurethanes, and polyamide cured epoxies. Specific manufacturer's recommendations should be followed for application and top coating.

Acrylics

Acrylics are single-component coatings, generally applied over a primer due to thin film build. A wash primer may be used with these paints, or they may be applied directly over the hot dip galvanized surface. If the pH of the paint is high, problems may occur due to ammonia reacting with the zinc. Acrylics provide exceptional gloss and colour, combined with an extremely durable finish.

Aliphatic Polyurethanes

This is a two-component, high performance system generally applied over a polyamide epoxy primer or a wash primer. These polyurethanes have superior weathering and chemical resistance characteristics with good adhesion, as well as an enamel-like finish. This system requires strict attention to application procedures. If top coating is necessary, a light abrading or roughening of the surface is generally required.

Alkyds

In moist areas, zinc will produce an alkaline surface causing alkyds to saponify, resulting in premature peeling and flaking of the paint system despite initial satisfactory adhesion. Due to this chemical incompatibility with zinc, alkyds are very difficult to use on galvanized surface unless the paint is specifically formulated for using over galvanized steel. Contact the paint manufacturer for more specific recommendations on using an alkyd paint system.

Asphalts

Asphalts are generally petroleum-based products that are not recommended for use on galvanized steel.

Bituminous

These types of paints are thicker than conventional paint systems. As they are coal tar products, unlike asphalts, they can be used with galvanized steel. Bituminous paints are often used over galvanized steel that will be buried in soil.

Chlorinated Rubbers

Although difficult to apply, chlorinated rubbers are fast drying and provide good protection for exterior exposures and chemical resistance to acids, alkalis and most gases. However, they chalk readily and need a high surface profile for good adherence. In addition, their high VOC content has severely limited their availability and end use.

Epoxies

In most cases, epoxy-esters and epoxy-amines are not generally recommended for use directly on galvanized steel as they are typically high stress materials and may react with the zinc in certain environments; however, epoxies do have some limited success if the paint is specifically formulated for using over galvanized steel. Contact the paint manufacturer for more specific recommendations on using an epoxy paint system.

Epoxy-Polyamide Cured

These epoxies generally have superior adherence to any type of galvanized surface. Because they are not resistant to sunlight, they are typically used as a primer or for corrosive interior applications. A galvanized steel/polyamide epoxy primer/aliphatic urethane topcoat system is considered to be a superior high performance duplex system.

Latex-Acrylics

Fast drying and water-based, latex acrylics have great adhesion, durability and weathering characteristics. This system is often top coated with itself and is suitable for new and weathered galvanized steel. These paints have the added benefit of being environmentally friendly.

Latex Water-Based

This type of latex paint is also fast drying and weathers well, but takes time to cure before it provides acceptable adhesion and abrasion resistance. Therefore, these paints are not recommended for shop application. Adhesion and abrasion resistance improve with time (two to four weeks).

Oil-Based

Oil-based paints are poorly suited for use directly over galvanized steel. These paints are easy to apply, but have unsatisfactory chemical and solvent resistance. They are not generally used over galvanized steel as the oil can react with the alkalinity of the zinc and saponify in moist or humid environments. (see alkyds)

Portland Cement in Oil

These single package paints incorporate Portland cement as part of the pigment. They have outstanding adhesion to galvanized steel, but are often top coated since they do not weather as well as other coatings and may yellow with age. Occasionally, they do become brittle with time, so formulas with special resins designed to preclude embrittlement may have better success.

Silicones

Silicone's suitability for use directly over galvanized steel is poor, and

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therefore it is not widely used. However, silicone is sometimes employed in high temperature applications where it develops a cross-link silicate that prevents oxidation of the zinc coating. Silicone-alkyd compounds typically do not perform as well as silicon-acrylic compounds.

Vinyls

Vinyls have exceptional resistance to acid and alkali environments and can be supplied as either a thin film needing top coating or as a high-build coating. As a rule, Vinyls exhibit only fair adhesion and should be assisted by the use of surface profiling such as a sweep blast or a wash primer. Vinyl acrylics have a great glossy finish with good colour retention. High VOC levels have limited their availability and use in certain areas.

Only a partial listing of available paints and paint systems has been provided. The paint manufacturer can provide more thorough information about the compatibility of specific systems with galvanized steel. Always consult the paint manufacturer prior to painting galvanized steel. Different physical and chemical characteristics of the same types of paint may have varied reactions with a galvanized surface. The paint manufacturer and the galvanizer can assist in the creation of a successful duplex system.

Editorial comment:

Whilst we thank Mike Book for this interesting article, I must point out his reference to zinc rich paint providing cathodic protection has been extensively argued, see magazines No 25, 26 and 28, with the final article from the paint manufacturers admitting that cathodic protection exists only for 80 days and then the zinc rich paint coating becomes a barrier coat! Products recommended by the HDGASA, such as "Zincfix" are no different, in spite of the coatings benefits and that is why it is imperative to keep coating repairs to a minimum.

Walter's Corner

The hot dip galvanizing of threaded articles

A chain is undoubtedly as strong as its weakest link. This statement can also be applied indirectly when dealing with corrosion protection of steel structures.

Frequently one encounters corrosion control specifications which call for effective protection of steel structures by, for example, heavy duty hot dip galvanizing whereas for the bolts and nuts which hold the structure together, a thin zinc electroplated coating is assumed to be adequate. Alternatively, fasteners manufactured from a different durable material, other than carbon steel, are specified.

Apart from the cost of special metals such as a stainless steel, dissimilar metals in direct contact; (e.g. stainless steel or copper in contact with zinc); will result in premature corrosion attack of the surrounding zinc coating in the presence of an electrolyte such as rain water. This is, of course, due to the zinc constituting the anode in relation to the more noble fastener material in what constitutes a corrosion cell. A similar situation can occur where carbon steel fasteners are coated with a more noble metal such as chromium. While chromium will resist corrosion in numerous environments, it may well have a negative impact on the surrounding metal with which it is in direct contact.

For significant protection to be provided by metal zinc in all but the most benign conditions, the coating thickness is of prime importance.

Zinc is frequently described as a "wasting protector". In other words, it is sacrificed over a period of time and while it develops its own protective surface film of protective basic zinc carbonate, the thickness of the zinc coating initially applied will determine the overall durability

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of the coating in a given environment. To illustrate – if zinc is attacked at a rate of 5µm per annum, a zinc coating which is 18µm thick will provide protection for about three years; whereas a coating which is 40µm thick will protect for more or less 8 years. It is for this reason that thinly coated zinc electroplating; (frequently described erroneously as electro-galvanizing); fails prematurely. What is initially an attractive coating is often as little as five or six micrometers in thickness compared with a correctly applied hot dip galvanized zinc coating of about 10 times greater thickness. Meanwhile the cost of applying these different coatings is somewhat similar regardless of the variation in thickness.

What then are the reasons for the less durable thin coatings to be preferred by some specifiers and end users?

Our human nature being what it is invariably encourages us to take the easier way out when it comes to reaching a solution to a problem. There is a misconception that hot dip galvanizing of threaded components is far more complex than electroplating while the undoubted benefit of superior corrosion protection is frequently ignored.

Provided that a few simple steps are taken and most importantly, an experienced and suitably approved hot dip galvanizing organisation is employed, the results will be entirely satisfactory and hassle free.

There are certain requirements all of which are covered in the relevant galvanizing specification. These include coating thickness, thread tolerances and tensioning procedures.

Coating thickness: While the coating thickness will determine coating durability, excessively thick coatings are unacceptable due to the problems that will be encountered during the assembly of nuts and bolts. For this reason, the galvanizer must not only ensure that the minimum acceptable coating thickness is provided but also that the maximum thickness actually applied does not and will not create problems during assembly.

It must be stressed that while the specification requires substantially thicker coatings than that applied by electroplating, of necessity the minimum thickness on fasteners is less than that demanded for structural steel components. For this reason, added protection of fasteners in aggressive environments can be provided by brush applying a protective coating such as a zinc rich paint or even coal tar epoxy over the galvanized fastener assembly after tensioning.

Thread tolerances: In contrast to the situation where a thin metal coating is applied, the substantially thicker hot dip galvanized coating necessitates an adjustment to thread tolerances. This is achieved by either oversizing the nut threads or undercutting the thread on the bolt. The technically preferred method is to hot dip galvanize nuts in blank form and tap the nut threads to a specified oversize limit after galvanizing.

The fact that there is no zinc coating on the female nut thread has no adverse impact on corrosion free life after tensioning of the fastener assembly. This has been confirmed by numerous accredited corrosion tests of galvanized fastener assemblies throughout the years.

The following requirements for thread tolerances for various bolt and nut diameters is an extract from the Association's "Practical Guidelines for Inspection and Repair of Coatings" – *table 5, page 7*. It must be stressed that provided the specified thread tolerances are adhered to there will be no detrimental effect on the ultimate tension properties of fastener assemblies.

Tensioning: The outer layer of a hot dip galvanized coating consists of relatively soft zinc whereas the underlying Fe/Zn alloy layers are, if anything, harder than the steel substrate. In order to avoid a smearing effect of the soft outer zinc eta layer, the use of a thread lubricant is recommended for tensioning; particularly in the case of high strength fastener assemblies. This is easily achieved by applying a lubricant such as molybdenum disulphide to nut threads prior to assembly.

It must be conceded that lubrications will influence the torque/tension relationship between nut and bolt threads which can result in overstressing. For this reason, the easy and most reliable turn of the nut tensioning procedure is recommended for high strength and friction grip assemblies which are hot dip galvanized. Information concerning the degree of nut turn after a "snug tight" position is achieved, is contained in the Association's "Steel Protection by Hot Dip Galvanizing and Duplex Coating Systems".

Finally, it is recommended that hot dip galvanized fasteners are purchased from an approved supplier and manufacturer approved by the Standards Authority. This will ensure that the requirements as discussed in this article are adhered to.

Editorial comment:

Kindly refer to the HDGASA web site to view both mentioned publications.

Student plant tours

There appears to be renewed interest in the hot dip galvanizing process from universities and technikons lately. Ninety third year architectural students from the University of Technology of Cape Town attended a lecture on hot dip galvanizing in their class. Due to the size of the class the students were broken up into three groups and toured three different galvanizers.

The photos show the happy students after the respective plant tours.

Guest Writer

Our guest writer for this edition is Dr. Ram K. Iyengar from Technovations International Inc. USA.

Strategy for a co-operative effort to reduce zinc consumption for galvanizing reactive steels

Structural steels are specified based on the requirement for a minimum yield strength and impact resistance. The grade designation in the SANS 1432:2005 standards show the minimum yield strength and impact resistance. The chemical compositions (in weight %) for the structural steels are shown below.

The demand for continuously cast silicon killed steels and high-strength steels have increased as structural materials. For steels with silicon between 0.05% and 0.12% and for level higher than 0.25%, Sandelin reported peaks in reactivity that were also a function of temperatures (Sandelin curves). These high reaction rates are unpredictable and the coating formed can lead to detrimental coating quality (Potter) Besides, these reactive steels cause high consumption of zinc because of thicker coatings, which are brittle and have a dark, lusterless appearance. Due to the variation in surface silicon concentration or different rate of cooling, the coating appearance is not uniform, with dull areas visible in a shiny coating. The higher rate of reaction also increases dross.

The Sandelin curve shows that the height of the peak is greater at 450˚C compared with 440˚C. Around 430˚C (not possible to galvanize) there is no peak but a plateau with coating thickness of about 120 microns. Between 0.12% to 0.2% Si, a normal coating is produced with coating thickness around 120 microns for temperatures up to 450˚C. Above 0.2% Si the coating thickness increases linearly. The coating thickness is around 140 microns at 0.25%. Steels with silicon level above 0.25% give an all-alloy coating, which is adherent, hard and easier to paint. Some specifications call for thick coatings up to 200 microns by the deliberate use of such steels. These coatings do not have the brittleness associated “Sandelin Peak” steels.

While galvanizing reactive steels, the hot dip galvanizers are interested in lowering the cost of galvanizing and reduce the consumption of zinc. One option that is within the control of the hot dip galvanizers is to reduce the molten zinc temperature to 440˚C for reactive steels.

The steelmaker can also become more customer-friendly and help the hot dip galvanizer by maintaining the silicon concentration in steel between 0.15% and 0.25%. This will ensure that the coating thickness remains below 140 microns while giving some flexibility to the hot dip galvanizer in temperature control. This article provides a strategy to the steelmaker for controlling the silicon concentration in steels between 0.15% and 0.25% during steelmaking.

During continuous casting of steel, a deoxidiser is added to the molten steel to reduce the amount of dissolved oxygen. When dissolved oxygen is above a certain level there is a possibility of reactions such as

$$\underline{C} + \underline{O} \longrightarrow CO\ (g)$$

Where C and O are in solution in liquid steel and CO is evolved as gaseous bubbles.

Grades	C	Mn	Si	P	S	Nb	V	NB + V	Al	Ceq
240WA & WC	0.22	1.60	0.50	0.040	0.050	0.01	0.03	0.04	0.10	0.38
240WDD	0.22	1.60	0.50	0.040	0.050	0.10	0.10	0.04	0.10	0.38
300WA & WC	0.22	1.60	0.50	0.050	0.050	0.03	0.10	0.05	0.10	0.43
300WDD	0.22	1.60	0.50	0.050	0.050	0.10	0.10	0.10	0.10	0.43
350WA & WC	0.22	1.60	0.50	0.050	0.050	0.10	0.10	0.10	0.10	0.43
350WDD	0.22	1.60	0.50	0.040	0.040	0.10	0.10	0.10	0.10	0.45
450WA, WC & WDD	0.22	1.60	0.50	0.040	0.050	0.10	0.20	0.15	0.10	0.45

Chemical compositions (in weight %) for structural steels.

The gaseous carbon monoxide (CO) can get trapped at the solidification front and cause porosities in solidified steel product. The presence of a deoxidiser in liquid steel reduces the dissolved oxygen level. Consequently the partial pressure of CO is lowered, which prevents its formation. The deoxidation reaction is given by

$\underline{xM} + y\underline{O} \longrightarrow M_xO_y$

Where M_xO_y is generally a solid or a liquid product called inclusions.

For automotive steel sheet manufacture, aluminum is used for deoxidation as well as for grain refinement. In continuous casting, liquid steel is poured through a nozzle from a holding vessel called tundish into a mold, where liquid steel solidifies as a slab. The deoxidation products using aluminum (called alumina) have a tendency to agglomerate and cause blockage of the nozzle between the tundish and the mold. Development of submerged pouring tubes, using an inert gas like argon, has largely overcome the build up of alumina. Consequently, steel sheets and plates can be produced with aluminum deoxidation. The silicon level in these steels can be maintained as required for surface and mechanical properties.

Continuous casting of structural steel blooms and billets using aluminum deoxidation has been difficult due to blockage of the metering nozzles by alumina. With heavy sections the steel manufacturer prefers to use silicon or in some cases silicon plus aluminum for the control of dissolved oxygen. These steels normally have 0.05 % to 0.10% silicon. Some steel plants have produced structural steels with silicon below 0.03% that has given reproducible galvanized coating characteristics.

The SANS standards for the structural grades show that silicon specification is 0.5% max and therefore can be anywhere from less than 0.05% to 0.5%. Also it may be noted that the maximum aluminum specification is 0.10%. Therefore the steelmaker can control the silicon level between 0.12% to 0.25% while using aluminum to control dissolved oxygen in molten steel. The two issues that discourage the steelmaker to meet the above goal are (1) the problem of nozzle blockage and (2) maintaining the mechanical properties specified in SANS standards. Let us look at the second issue first.

Carbon is the principal strengthening element in carbon and low alloy steels. In general each 0.01% increase in carbon increases yield point about 3.5MPa. To obtain higher strength other strengthening elements are added. In practice carbon content is limited to avoid reduction in ductility, notch toughness and weldability. The latter is related to carbon equivalent, which for structural steel is defined as

$C_{eq} = C + (Mn/6) + ((Cr + Mo + V)/5) + ((Ni + Cu)/15)$

Silicon increases strength, notch toughness, and hardenability. It lowers the ductility transition temperature but it also reduces weldability. A decrease in silicon by 0.1% lowers the yield strength by 10MPa. If the nominal silicon level in the structural steel is 0.35% then lowering the silicon to 0.2% will reduce the strength by 15MPa.

Manganese also increases strength, hardenability, fatigue limit, notch toughness and corrosion resistance. An increase in Mn by 0.1% raises the yield strength by about 3.3MPa. It lowers the ductility and fracture transition temperature. It hinders aging and counteracts hot shortness due to sulfur. Manganese also reduces weldability by increasing the carbon equivalent.

Nitrogen has similar effect on yield strength as carbon.

The decrease in strength due to lower silicon can be compensated by an adjusting the concentrations of C, Mn and N to obtain the mechanical properties as specified by the SANS standards, while making sure that the Ceq is below the required level for weldability.

The major issue for the steelmaker is whether they can control the steel chemistry to the following range for the structural steels, while simultaneously meeting the mechanical properties and producing a good sound solidified billet, bloom or slab.

C 0.22 Max, Mn 1.60 Max, Si 0.12 to 0.25, Al 0.10 Max

Since the control of Mn and Si depends on a sound deoxidation practice, the control of dissolved oxygen level for obtaining reproducible recovery of trim alloys, becomes critical. All steelmaking shops use secondary steelmaking process to control the final steel composition and remove the undesirable inclusions using argon /nitrogen stirring and synthetic slag cover. Using an oxygen probe, it is possible to control the oxygen level prior to and after addition of trim alloy additions. Dissolved oxygen measurement can also be used to control the dissolved aluminum level. Modern steelmaking practices therefore provide tools to the steelmaker to produce steels, which meet the above composition for structural steels while helping the hot dip galvanizer.

In an interdependent customer-focused economy, the steelmaker, the fabricator and the hot dip galvanizer should work together to bring the maximum value to the ultimate customer.

Extension to the cold storage facility – Maydon Wharf, Durban

As part of the Association's effort to educate and improve the frequent ineffective communication between end clients 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.

Brief description of project

Refurbishment and development of the additional cold storage fruit terminal facilities on Maydon Wharf Durban.

Description

Five additional cold stores covering an area of approximately 6 000m^2, handling and rail siding loading areas.

The cold store buildings were essentially steel framed with insulated walls and ceiling, with aluminium roof covering.

Structural design

The initial design was based on geometrically smaller spans and of a welded construction. The anti corrosive treatment was abrasive blast cleaning to a SA 2½ specification, followed by a 4-coat paint system, with the final coat of paint being applied at site after erection.

The construction programme was particularly fast track, based on a client requirement date for export of fruit.

An Alternative design was proposed, which was more cost effective, meet the stringent programme requirements and provided an effective anti corrosive protection. Scott Steel

General view of the cold storage fruit terminal facility.

Projects, being experienced in the design and construct concept, provided an alternative design based on 40m span trusses using an all bolted construction. The steelwork was hot dip galvanized in accordance with SANS 121 (ISO 1461) and given no further protection. This design methodology enabled the steelwork to be fabricated and hot dip galvanized in Cape Town, delivered to site in Durban, at competitive rates and erected within the stringent time constraints.

Many aspects of the structural steelwork were specifically designed to facilitate the hot dip galvanizing process and provide a finished article of quality.

The partially exposed cold rolled channel purlins were given a duplex paint system, to ensure an equal maintenance free life service with the main galvanized steelwork.

Much of the steelwork in the storage terminal was hot dip galvanized.

The Hot Dip Galvanizers Association of Southern Africa were requested to carry out an inspection after the work had been completed, to ensure that the hot dip galvanizing process had been adequately carried out and would provide a minimum of 25 years maintenance free lifespan in the specified environment. They commented that, based on the experience obtained at the Durban Bay Head Container Depot, as well as known performance data of zinc within defined environmental conditions, it was shown that main structural steelwork components, having a galvanized coating thickness in excess of 120 microns of zinc, could be expected to have a service life, in terms of its corrosion protection system, of more than 30 years. The cold-formed sections had a thinner zinc coating applied of approximately 70 microns and with the application of a duplex epoxy primer to 60 microns, the service life is extended to match that of the main structure.

Conclusion

Innovative design, together with extensive practical experience and knowledge of hot dip galvanizing, enabled the project to be completed within the client's budget and programme, and will provide him with a project that will meet environmental conditions throughout the economical life of his investment.

Another view of the cold storage fruit terminal facility.

The hot dipped galvanizing process is an economic and practical solution to many corrosive situations even within coastal environmental conditions and successful use is obtained by carefully evaluating the application based on site conditions.

Scott Steel is to be complemented on their professional approach to such projects as well as the use of hot dip galvanizing.

Bob Wilmot

On the couch with

Pieter Mathews

Architect and author (and graphic designer it seems – judging by the company's website) Pieter J Mathews obtained his BArch Degree in 1991 at the University of Pretoria, receiving the prestigious Goldfields of SA Scholarship for Architecture, the David Haddon Prize for Office Practice as well as a second place in the Portnet SA Richard's Bay Harbour Development Competition. He is married, with two boys. Hot Dip Galvanizing Today caught up with Pieter during his company's (Mathews & Associates Architects) move to their brand new high tech offices in Nieuw Mackleneuk, Pretoria. This is what he had to say:

I got into this business from a very young age I preferred to build with blocks or mud. There were only two architects in town and both were family friends; the models displayed in their office intrigued me.

True South African architecture to me is when we get less interested in copying overseas styles and gimmicks. Good design should make use of key principals such as local vernacular, texture/space/ landscape/light and colour. With these principals we can reach a point where timeless and local design becomes more important than mere style.

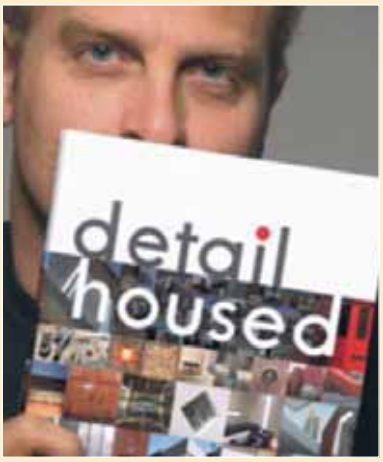
I find inspiration in books, travel, watching programs such as Grand Designs and I try to attend open lectures and the Design Indaba each year.

My company MAAA specialises in up market contemporary houses, boutique hotels and various commercial work such as offices,

dealerships and industrial buildings with flair.

The professional achievements that I am most proud of are the publication of my two books called Architexture and Detail Housed; secondly our various merit awards from the Institute of Architecture and thirdly our recently completed office in Pretoria.

How does the graphic design element fit into the grand scheme of things? We found that the creative process did not cease after the buildings had been designed and



constructed – inevitably clients need promotional and branding material, such as signage. For us graphic design is a natural extension of the creative process.

I use hot dip galvanized coatings often because of its unpretentious finish and obviously the durability and low maintenance of the hot dip galvanized coating. It fits well into our philosophy of exploiting the character of each material and the honest display thereof.

A prime example of the application of hot dip galvanizing in one of my designs is the balustrades and duct covers in House Millar in Nelspruit for which we won an Institute of Architecture Award.

I choose to live in South Africa, because when I did my practical training in London I read an excellent article on the sense of belonging. The sense of belonging in man is greater than all material wealth. We should just tackle our problems head on and not deny them such as certain politicians tend to do.

When I leave the office, I try never to take work home. I leave problems and work at work – at home I focus on my family and endeavour to start every new day afresh.

For more information on Pieter Mathews and Mathews & Associates Architects cc log onto: www.maaa.co.za

Detail Housed ISBN 0620333707 is available from all leading bookstores.

The Association wishes to thank Desere Strydom for this contribution.

Inconcise specifications reduce overall coating performance!

"Galvanizing Failures" have been introduced as a regular feature to mostly highlight inappropriate use of hot dip galvanizing and hence its failure to provide sustainable service life that the coating is known for due to vague specifications, lack of communications, design faults and the general mis-use of the word "galvanize". Other zinc coatings that are often inappropriately specified or incorrectly used when general hot dip galvanizing is preferred will also from time to time be highlighted in this feature.

The Hot Dip Galvanizers Association Southern Africa was asked to provide an opinion on the performance of certain coated steel components at a low cost housing development in the Western Cape. The coated steel components included doors, windows and roof sheeting. The specification, which was very vague, has been set out below:

Roof

Galvanized corrugated iron roofsheets on 228 x 50 SA Pine. Beam at maximum 1 100mm centre ends wrapped in plastic and built into walls and tied down with galvanized hoop iron minimum three courses. 76 x 50 SA – Pine wallplate tide down minimum 3 courses with galvanized hoop iron straps. Roof overhang – minimum 230mm at sides and 150mm at gables. Roof angle at 45° unless otherwise shown.

Windows

White epoxy coated metal clisco type OR galvanized and enamel painted.

This specification was sent to me for prior comment and initially answered as follows:

- Roof sheeting requires "Galvanized" sheeting. There are several coating classes available ranging from Z100 (about 7 microns of zinc per side – minimum 4.8) to Z600 (about

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43µm of zinc per side – minimum 34). The most commonly available is Z275 (about 20µm per side – minimum 13.5). Unfortunately with the building boom, unless you specify and prove by delivery note that you require and get a certain class of coating you may get anything, including something like a Z60 (about 4µm of zinc coating)! Mittal Steel has a branding system whereby full width sheets may be identified according to coating class. Refer to specifications SANS 4998 (Structural grades of material) and SANS 3575 (Deep draw and commercial grades of material). See also attached table and pdf copy on, "Continuously Hot Dip Galvanized Sheeting".

- Roofing ties by galvanized wire, is similar. Here, one has a choice of several coating thicknesses ranging from about 5 or 6 microns to 30 to 40µm, dependent on the specification requested. Hoop iron wire ties for cavity walls, are similar! Refer to specifications SANS 675 Fencing (under review) this specification has only one coating class of between 30 and 40µm dependent on diameter (preferred) whereas SANS 10244 (supersedes SANS 935), comprises two parts with several coating thicknesses, with only the upper class equalling the same as specified in SANS 675.
- It would appear that in spite of what was discussed, the drawing calls for the windows to be 'epoxy coated metal' this could be interpreted to be 'powder coated' or 'solution painted by a epoxy based coating'. There is nothing on the plans about 'galvanizing'. Unfortunately, if one only specifies 'galvanizing' it can easily be misconstrued as 'zinc electroplated' which because of its usually thin coating will prematurely corrode when exposed to moderate to

General photo of part of the housing development. Two abandoned houses were visited with a view of evaluating the coatings on the door and window frames and roof sheeting.

Window 1 on which an evaluation was carried out (left). Close up photo of coating damage and subsequent corrosion (right).

Photo above left, shows the overall coating thickness of the zinc electroplated and the powder coating (187µm). Photos above centre and right shows the general coating thickness of the zinc electroplating (13.l and 4.7µm respectively).

aggressive environments. There are many electroplating companies that can accommodate reasonably large components. This will, mainly due to insufficient coating thickness and consistency of the distribution of the zinc coating, result in premature failure if used in exposed environments, most particularly at the coast.

Accompanied by the architect, I subsequently visited the site and report as follows:

Conclusion and recommendation:

Roof sheeting

Although the electro-magnetic coating thickness instrument was calibrated according to thin coatings of about 25µm and many readings on the sheeting were taken, measurement by this method will provide only an indication of coating thickness. For more accurate results, a panel of sheeting must be removed and the zinc stripped off and coating measured in terms of the Chemical Stripping (Gravimetric) Test to ISO 1460.

Coating thickness (µm)				
Component	Mean	Min	Max	No. of readings
Window frame (overall coating thickness)	164	75	240	22
Window frame (metallic coating thickness)	9.2	0	23	22
Door frame (overall coating thickness)	128	96	153	18
Door frame (metallic coating thickness)	3.4	1.1	8.7	19

General coating thickness readings.

However, coating thickness readings indicated that the sheeting was a Z275 class of coating.

The roof sheeting has been secured to the roof trusses by means of electroplated screws with plastic caps. In one instance – see photo, the plastic cap has been broken off and seemingly the screw is discolouring and in time will corrode. The plastic cap offers a barrier to prevent corrosion from the atmosphere, much the same as an appropriate coating, however once the barrier is broken, premature corrosion will occur.

Roofing ties

The coating on the hoop iron wire ties in the building could not be assessed due to inaccessibility.

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Photo above left shows powder coating on window frame 2 removed by a scrapping tool in one spot and the residual coating thickness measured. Photos above centre and right shows the overall coating thickness of between 66 to 75µm. Photos below all show the zinc electroplated residual coating thickness, after the powder coating was removed (3.5, 2.2 and 5.6µm).

Window frames

The window frames have been zinc electroplated. Immersing articles in a solution (electrolyte) and connecting them to the negative lead in a low voltage DC circuit, carries out the application of a metallic coating by means of the electroplating process. Coating thickness is usually thin (usually between 3 and 15µm) depending on the shape but also on current density; temperature; bath composition and processing time.

The top coating on the windows inspected was powder paint applied by the electrostatic process and then stoved in an oven. The powder coating layer was well cured and proved to be tenacious and difficult to remove.

Door frames

The door frames were also zinc electroplated but the ones we inspected were over coated with a solution paint which was less tenacious and easier to remove than the fully cured powder paint on the window frames.

The advantage of solution painting versus powder paint is that without elaborate processing, coating film build is easier to achieve, whereas powder paint is applied and then oven stoved providing a fully cured and quite abrasion resistant surface.

Recommendation

Refurbishment of a failed coating, particularly components that cannot be removed for recoating is difficult and largely dependent on the success of preparation of the insitu component. It is also highly dependent on the application

Photo above left shows the door frame coating (which appeared to be wet solution painted – see paint run (powder paints that are stoved do not behave in this manner). Photo above middle shows the overall coating thickness (121µm) and photo above right shows the residual zinc electroplated coating thickness (6µm).

Photo above left shows that the appearance of the continuously hot dip galvanized sheeting is very normal in moist atmospheres, with the weathered coating appearing slightly white. Photo above centre shows one of the electroplated roofing screw fasteners that has started to discolour and corrode due to the removed plastic cap of the fastener mechanism and exposure to the atmosphere. Photo above right shows a typical individual residual coating thickness (23µm) taken on the sheeting. A number of coating thickness readings, although not 100% accurate, suggested that the roof sheeting is a Z275 class of coating.

standard. For this reason preparation and application controls cannot be taken too light heartedly!

As painting of the door and window frames will be difficult on site, it is recommended that one component be addressed at a time, ie. preparation and paint at least the first coating of a component prior to moving onto the next component.

Remove loose and flaking paint with a scrapper.

Remove all visible grease and oil and other contaminants using a degreaser in accordance with the manufacturer's instructions. Remove all traces of the degreaser, ideally with running water and scotchbrite pads or bristle brush.

Once the surface is dry using a 80 to 100 grit water paper abrade the entire surface ensuring that all tenacious paint that remains is fully feathered or scratched to create a key for subsequent paint adhesion.

Apply two coats of multimastic high build surface tolerant epoxy paint, to a DFT of 80 to 100µm per coat, or equal. Follow this up with one coat of aliphatic polyurethane topcoat to a DFT of about 40µm.

All paint application and intermediate drying times, etc is to be done according to the manufacturer's instructions.

Using a reputable gun grade exterior sealant, seal all wall to frame crevices and smooth to acceptable finish. (Sealing of this interface is important to avoid crevices and hence crevice corrosion or differential aeration).

It is worth noting that without a comprehensive specification for a coating system, interpretation by the would be contractor will frequently be incorrect and selected to suit cost effectiveness and ease of supply and will not necessarily be in the clients best interests.

Terry Smith

Misconceptions on pricing of hot dip galvanizing

In recent times there has been considerable debate in respect of the prevailing price of hot dip galvanizing. Determining the price to be charged for hot dip galvanizing is partly, but not solely linked to the input cost of zinc. Unlike many other industries, there is no simple factor determining the zinc input cost per ton of steel galvanized, mainly due to factors such as steel wall thickness, steel composition and a number of other processing cost factors, all of which vary.

To understand and appreciate current hot dip galvanizing price levels, one needs to go back in time to the mid to late 1990's.

The 'average' galvanizing price at the time was of the order of R1 000/ton, with the zinc input cost fairly averaging around the R5 000 – R7 000/ton level, except for the brief peak in 1997. In 2004, the average price was at a similar level, with the zinc input cost being in a similar range. Thus, in a 7 - 8 year period, there had been a total under-recovery of processing costs within the industry. This situation had largely resulted from fluctuating levels in the demand for corrosion protection of steel:-

- Infrastructural development in the SA Economy had stagnated.
- The Mining Royalties Bill had been promulgated, resulting in the mines halting new project work.
- The Rand strengthened against major international currencies after reaching horrendous levels in 2001, which had been great for exports.

In addition, more hot dip galvanizing capacity had been brought on stream throughout the country.

At this point in time the industry was struggling to survive. Although providing corrosion protection to fabricated steel products and piping, the process of hot dip galvanizing is extremely corrosive and wasting. Constant refurbishment of buildings, plant and process equipment is required. This includes building structures, roofing and cladding, process tanks, kettles and overhead cranes, which, collectively is extremely costly.

A number of waste products are generated, and there are constant costs incurred to have these removed in an environmentally friendly manner, by an approved waste management provider.

In the latter half of 2006, the international zinc price, along with most other resources, suddenly started rising, and the pace and extent of the price increase was way beyond expectation. The galvanizing industry was caught up in substantial cost increases, which had not previously been experienced. Pricing became a nightmare throughout the industry, impacting on all stakeholders, including specifiers, fabricators and customers. During this period, there was little possibility for full cost increase recovery, let alone, margin improvement, which was of critical importance to the galvanizers. To ensure survival, all that could be done was to try to recover the increased zinc input cost.

With the zinc price softening from mid 2007, and with extremely high demand levels for hot dip galvanizing, there was at last some room to recover other significant cost increases which had been incurred over many years, but not recovered through corresponding price adjustments.

It was critical that the industry as a whole return to profit, so as to be able to embark on much needed re-investment, or face Eskom like consequences.

A quick look around the industry will clearly reveal that in the past year, a considerable amount of re-investment has taken place at many galvanizing plants. If one was to canvass the industry as a whole, I am certain that the response would be that much more refurbishment still has to take place in order to ensure enduring survival and growth of the industry, for the long term benefit of all stakeholders.

While the galvanizers are well aware of the necessity to act responsibly in terms of the environment, there is increasing pressure to improve on process controls. This will include fume extraction and processing (clean air), along with water treatment plants, especially in view of water becoming a scarce resource.

As we stand right now, the zinc price remains volatile, with an upward trend again appearing possible. Added to this is the volatility in the Rand/US$ exchange rate, with the recent and sudden depreciation of the Rand against a weakening Dollar. Galvanizers also have to contend with power outages, and not just for the outage time. Once power is restored, it takes almost as long again for kettles to be re-heated to their operating temperature, before dipping can recommence. In this regard, generators are not a viable option.

Other significant cost increases on process consumables such as jigging wire, power, chemicals etc, along with fuel cost increases, skills shortages and increased maintenance costs are often overlooked as almost the entire cost focus is on the zinc input cost. The demands placed on the industry in terms of service level requirements also attracts hidden costs.

The hot dip galvanizing price in South Africa remains well below the equivalent price in many other countries, despite the same zinc input cost being incurred.

For the long term success of the industry, with ongoing re-investment a necessity, it is vitally important that a reasonable margin is earned. It is my considered opinion, after many years in the industry, that at the present time, the prevailing prices charged for hot dip galvanizing are fair and equitable.

There will always be room for debate with some people comfortable with the pricing in terms of 'value for money', while others will feel less comfortable. May the hot dip galvanizing industry remain viable and serve its valued customers for many years to come.

Geoff Colloty – Managing Director Robor Galvanizers and Vice- Chairman HDGASA.

MISCONCEPTIONS

Miss Conception puts it "straight"

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

Hot dip galvanizing of high strength fasteners is not recommended, due to the propensity for fracture as a result of hydrogen embrittlement.

True or false?

Provided that correct procedures are maintained by the hot dip galvanizer, the possibility of fracture during service of galvanized fasteners; even up to grade 12.9, is highly remote.

The same cannot be said in the case of electro deposition; (zinc electroplating), where hydrogen in nascent form can be absorbed by the steel, not only during acid cleaning but also by way of the actual electroplating mechanisms. This applies particularly to high strength steels. In contrast, the hot dip galvanizing process after acid cleaning has the opposite effect in that hydrogen which may have been absorbed during acid cleaning is normally diffused from the steel at the molten zinc temperature which for fasteners is best maintained at 440°C.

Meanwhile, an approved hot dip galvanizer of threaded articles and other small components will ensure that, as an added precaution, acid cleaning is undertaken in acid containing an inhibitor while the immersion cycle in acid is kept as short as possible.

There is another phenomenon frequently confused with hydrogen embrittlement and this is strain – age embrittlement. Strain ageing can occur in the case of hot dip galvanized fasteners under tension if surface defects in the underlying steel are excessive. This is because micro cracks in the extremely hard Fe/Zn alloy layers of the coating may propagate into the steel itself if situated over a steel surface stress raising defect.

It must be emphasised that embrittlement problems in hot dip galvanized material can be avoided if the coating is applied by a technically experienced and approved hot dip galvanizer.

For further information concerning the benefits obtained by hot dip galvanizing and the measures to be taken to avoid embrittlement, *refer to Walter's Corner – "The Hot Dip Galvanizing of Threaded Articles"* which appears in this issue.

FEATURES 2008

In order to streamline production of the magazine, while still ensuring the contents remain interesting and topical, only a few preferred features have been retained. In addition to the regular articles including: Case History; Coating Report; Galvanizing Failures; Misconceptions, etc. the magazine will from time to time highlight other interesting articles.

AUGUST/SEPTEMBER: (Advertising deadline – 10 August)
The Annual Awards Event

NOVEMBER/DECEMBER: (Advertising deadline – 19 October)
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