

HOT DIP GALVANIZING TODAY⁷¹

The Official Publication of the Hot Dip Galvanizers Association Southern Africa

CORROSION CONTROL OF STEEL



HOT DIP GALVANIZING MEMBERS

GALVANIZER	LOCATION	TEL. NO	SPIN	NO. OF LINES	BATH SIZES (L x W x D) (m)
GAUTENG					
ArcelorMittal South Africa	Vanderbijlpark	016 889 9111		3	Sheet galvanizer
Armco Galvanizers	Isando	011 974 8511		1	13.2 x 1.5 x 2.2
Armco Galvanizers - Randfontein	Randfontein	011 693 5825		1	6.5 x 1.3 x 2.0
Galferro Galvanisers	Springs	011 817 3667		4	13.5 x 1.65 x 2.5
In-line and general					6.8 x 0.9 x 1.4 6.5 x 0.9 x 1.5 6.45 x 0.755 x 0.9
Lianru Galvanisers cc	Nigel	011 814 8658		2	7.2 x 1.3 x 1.6 4.5 x 1.3 x 1.6
Pro-Tech Galvanizers (Pty) Ltd	Nigel	011 814 4292	•	2	3.2 x 1.1 x 1.5 3.0 x 1.1 x 1.2
Silverton Engineering	Silverton	012 843 8000		1	7.0 x 1.7 x 2.0
SMT Galvanizers	Benoni South	011 421 1495	•	2	2.6 x 1.0 x 1.5 2.0 x 1.0 x 1.5
Transvaal Galvanisers	Nigel	011 814 1113		4	15.5 x 2.0 x 3.2 – 1 of 12.5 x 1.2 x 1.8 – 1 of 8.0 x 1.2 x 1.5 – 2 of
WESTERN CAPE					
Advanced Galvanising (Pty) Ltd	Bellville	021 951 6242		1	14.0 x 1.4 x 3.0
South Cape Galvanizing (Pty) Ltd	George Industria	044 884 0882		2	3.7 x 0.94 x 2.3
EASTERN CAPE					
Galvanising Techniques cc	Port Elizabeth	041 486 1432		1	12.0 x 1.3 x 2.3
Morhot (Pty) Ltd	East London	043 763 1143		1	7.0 x 2.5 x 1.5
KWAZULU/NATAL					
A&A Galvanisers	Pietermaritzburg	033 387 5783	•	1	3.8 x 0.9 x 1.8
Bay Galvanisers	Richards Bay	035 751 1942		1	5.0 x 1.2 x 2.5
Durban Galvanizing (Pty) Ltd	Briardene	031 563 7032		1	9.5 x 1.3 x 3.0
Phoenix Galvanizing (Pty) Ltd	Phoenix	031 500 1607	•	2	14.0 x 1.4 x 2.5 3.0 x 1.2 x 1.2
Pinetown Galvanizing	Pinetown	031 700 5599		1	9.0 x 1.2 x 3.0
INTERNATIONAL					
MAURITIUS					
Galvanising Co Ltd	Port Louis	+230 234 5118		1	7.0 x 0.75 x 1.68
ZIMBABWE					
Essar Tubes	Graniteside	+263772833477		1	10.0 x 1.1 x 1.0

- Sheet, wire, pipe and other in-line galvanizing members dedicate their plants to the galvanizing of their own products. The bath sizes are inside dimensions and not maximum component size. Kindly take note of the expansion of the component when dipped into molten zinc or discuss with relevant galvanizer.



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Bedfordview Office Park, Building 1, Ground Floor, 3 Riley Road, Germiston

P.O. Box 2212 Edenvale 1610 Tel: 011 456 7960 Email: hdgasa@icon.co.za Website: www.hdgasa.org.za

Executive Director: Robin Clarke Cell: 082 902 5119 Email: robin@hdgasa.org.za

Publication Liaison: Anthony Botha Cell: 082 326 6080 Email: anthony@hdgasa.org.za

Advertising and Sales: Anne van Vliet Tel: 011 462 5073 Cell: 082 775 0711 Email: anne@communiquépr.co.za
Richard van Vliet Cell: 076 299 3471 Email: rvanvliet076@gmail.com

Design and Layout: Sandra Addinall Tel: 011 868 3408 Email: cbtdesign@adcot.co.za

Reproduction and Printing: Camera Press Tel: 011 334 3815 Fax: 011 334 3912 Email: cpress@iafrica.com

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EXECUTIVE DIRECTOR'S Comment

A number of attempts, the last of which included wider engagement with all stakeholders in the mining industry appears to have resulted in a more palatable draft of the mining charter. This appears to have eased investor confidence somewhat. In tandem with this encouraging event, a report that S.A. is attracting less than 1% global exploration spend has prompted our Mineral Resources Minister to commit a R20-billion investment to a multidisciplinary mapping program to boost global investment in local exploration. If coupled to favourable commodity prices, mining projects may well appear on the horizon. It is hoped that local steel fabrication and hot dip galvanizing industries will be key participants in such an upturn. Certainly capacity is available to do so.

It is also exciting to note Anglo American's revised view and commitment to exploration in Africa. At the 2018 SA investment summit held in Johannesburg, Anglo American committed funds of approximately R71 billion to this end.

Whether at home or north of our borders, the development of new mines or the extension of life of mines has traditionally played a significant role in our economy. South African engineers, mining operators and fabricators have specialized in such work and developed world class capabilities to support the mining industry. Outside of the mines themselves there is also scope for participation in the infrastructure developments that inevitably occurs in support of both new mines or expansion of existing facilities.

Our predecessors at the Hot Dip Galvanizers Association and in particular Walter Barnett, was instrumental in establishing hot dip galvanizing as the preferred solution to combat corrosion control issues being experienced in mines. Deep level mines in particular are harsh environments with extreme rates of corrosion being experienced at depth. Amongst early projects included the Moab Khotsong Mine and Vaal Reefs Shaft 11. Follow ups in the form of coating inspections on hot dip galvanized coatings on steelworks were performed many years after commissioning. Visual assessments of the coatings as well as coating thickness readings indicated good service life performance despite the harsh environments. The Association's website, www.hdgasa.org.za is home to many case studies done on various projects in which hot dip galvanizing was used. Amongst such studies we find mining related case studies for the Douglas, Leeupan, Goodehoop and Twisdraai collieries as well as the deep level Moab Khotsong mine.

By way of reinforcement of the benefits of the hot dip galvanizing in the industry, a paper was delivered by Bob Wilmot at the 'Structures for mining and related materials conferences' hosted by the Southern African Institute of Steel Construction both in 2009 and again in 2012.

Another interest development is the Limpopo special economic zone (SEZ) in which Chinese state owned companies are set to invest. This zone, in and around the Musina/Makhado area may also provide a much needed economic stimulus for the area and the country as a whole. Primarily, the metallurgical complex is envisaged to beneficiate local ores into alloy metals. Agro- processing and possibly petro-chemical processing is also envisaged. Per the DTI'S stated objectives for the area and despite heavy foreign investments, it is hoped that South African workers, management, equipment suppliers are all provided an opportunity to participate to a meaningful degree in the construction and operation of these plants.

At the time of press the Christmas season would be upon us and many readers will have received our magazine after the December holidays. However I trust that the season was filled with good cheer and a time of relaxation with family and friends. As the new year approaches I reflect on 2018 as an interesting year in the history of our country. Checks and balances appear to have been brought into play to steady a very unstable ship. It is hoped that in 2019 the ship sails a new course into warmer and calmer waters.

Have a wonderful 2019.

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SMT Electroplaters | kevin@smtgroup.co.za
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EDITORIAL COMMENT

in this issue

Mining has and always will always be a key component of Africa's economy. The African continent is the most likely place on earth to be explored for all manner of nature's bounty.

South Africa has been synonymous with mining over the last few centuries. It would be fair to consider mining as South Africa's DNA. Every type of mine from deep level gold mining to alluvial diamond mining and opencast is represented across our country. Minerals of all types are abundant in this land of ours. The health of our economy will forever be linked to the mining sector. In this issue we focus on the tide once again starting to rise with clarification on the Mining Charter having been achieved.

- The key points of the mining charter have been broken down for the easiest consumption.
- The wide variety of mining steelwork that has been and should be hot dip galvanized is presented in this issue.
- We provide a window to view some new developments in mining that include high level material handling systems for challenging terrain and stockpile domes for better control and reduction of lost material while also managing the environmental challenge of dust pollution.
- Training and education is still a key aspect to having all stakeholders at the level of understanding as to what, how and when hot dip galvanizing is an appropriate corrosion control technology.
- We introduce you to the HDGASA Inspector's toolkit – a must have flashdrive with all the essential information at your fingertips. Fully customizable templates for checklists, reports and other QA documentation are included. The Inspector's Toolkit is available to inspectors through the HDGASA.
- Skorpion Zinc – Gamsberg mine is up and running.
- Banking the knowledge – ESKOM have a series of books that are indisputably critical in maintaining the knowledge base developed over decades and being made available to the public.
- Galvanized steel pipework is an important element in moving water over large distances while ensuring short installation time by on site trained workers.



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COATINGS & CHEMICALS

MINING CHARTER III HIGHLIGHTS

Finding a happy medium

SOURCE: DELOITTE TOUCHE TOHMATSU LIMITED

Ring-fenced elements

- Ownership and Mine Community Development; 100% compliance required at all times.

Ownership

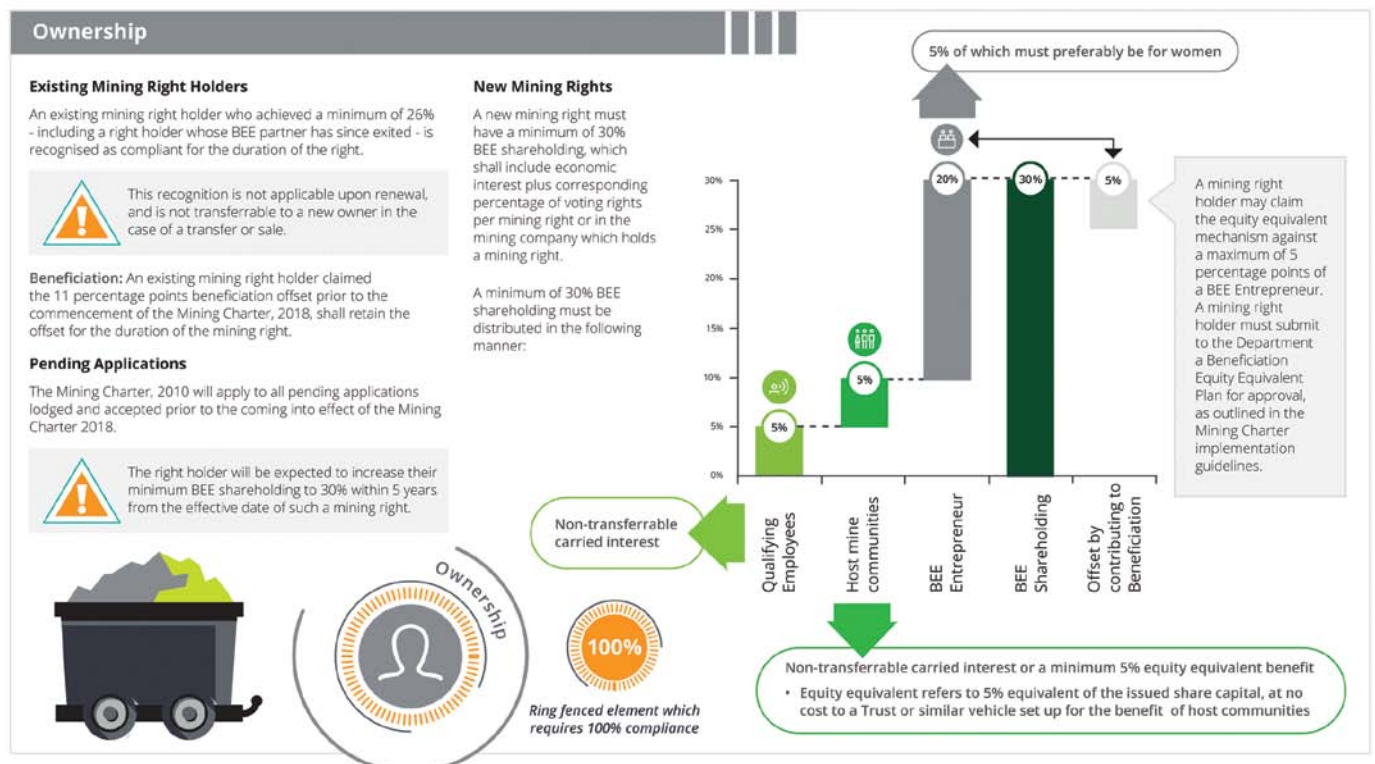
Existing mining rights:

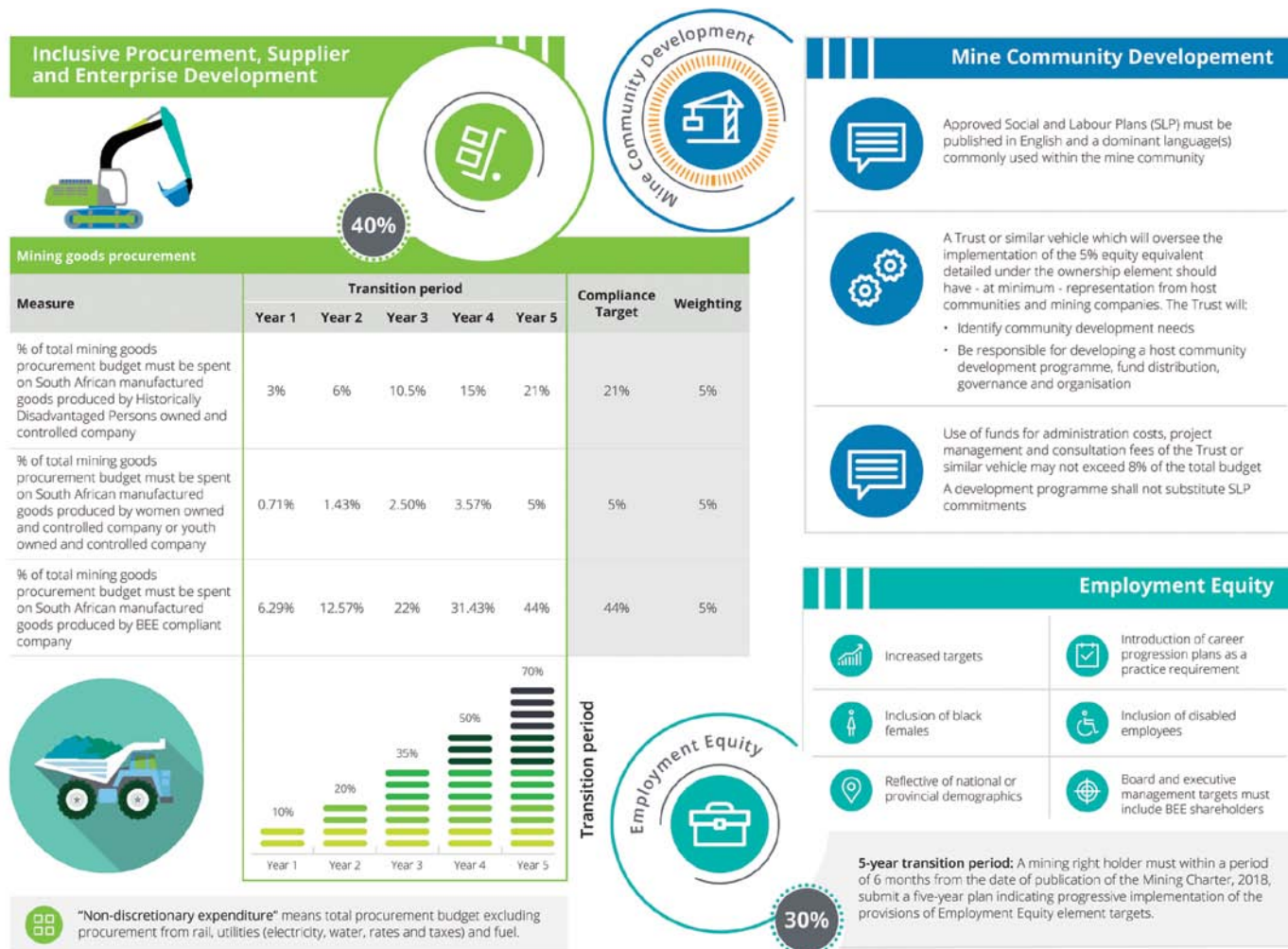
- An existing mining right holder who has achieved a minimum of 26% BEE shareholding shall be recognised as compliant for the duration of the mining right; not applicable on renewals and transfers.
- Pending applications lodged and accepted prior to the commencement of the Mining Charter, 2018, shall be processed in terms of the requirement of the Mining Charter, 2010, with a

minimum of 26% shareholding – top up to 30% within 5 years.

New mining rights – minimum 30% distributed as follows:

- 5% non-transferable carried interest to employees.
- 5% non-transferable carried interest to host communities, comprising 5% equivalent of the issued share capital of the mining right holder, at no cost to a trust or similar vehicle set up for the benefit of all host communities.
- 20% black entrepreneurs; 5% preferably to be women.
- 20% ownership shares to a BEE shall not be diluted below 51% ownership and control by BEE Entrepreneur.





- BEE shareholding may be concluded at holding company level, mining right level, on units of production, shares or assets. Where BEE shareholding is concluded at any level other than at mining right level, the Flow Through Principle will apply.
- A BEE shareholder exiting the transaction must have held the empowerment shares for a minimum period equivalent to a third of the duration of the mining right, and an unencumbered net value must have been realised.
- The Charter outlines requirements for Junior Miners – i.e a mining right holder with a single or multiple mining rights, having a combined annual turnover of less than 150 Million Rand. It sets targets for licences granted under the Precious Metal Act, 2005 and the Diamonds Act, 1986;

and threshold for precious metals jewellers and beneficiaries.

Mine community development

- Mine community: communities where mining takes place, major labour sending areas, adjacent communities within a local municipality, metropolitan municipality or district municipality.
- A mining right holder must meaningfully contribute towards Mine Community Development, in keeping with the principles of the social license to operate.
- The Trust or similar vehicle to oversee implementation of the 5% equity equivalent should have - at minimum - representation from host communities (including Community Based Organisations and Traditional Authorities where applicable) and mining companies.

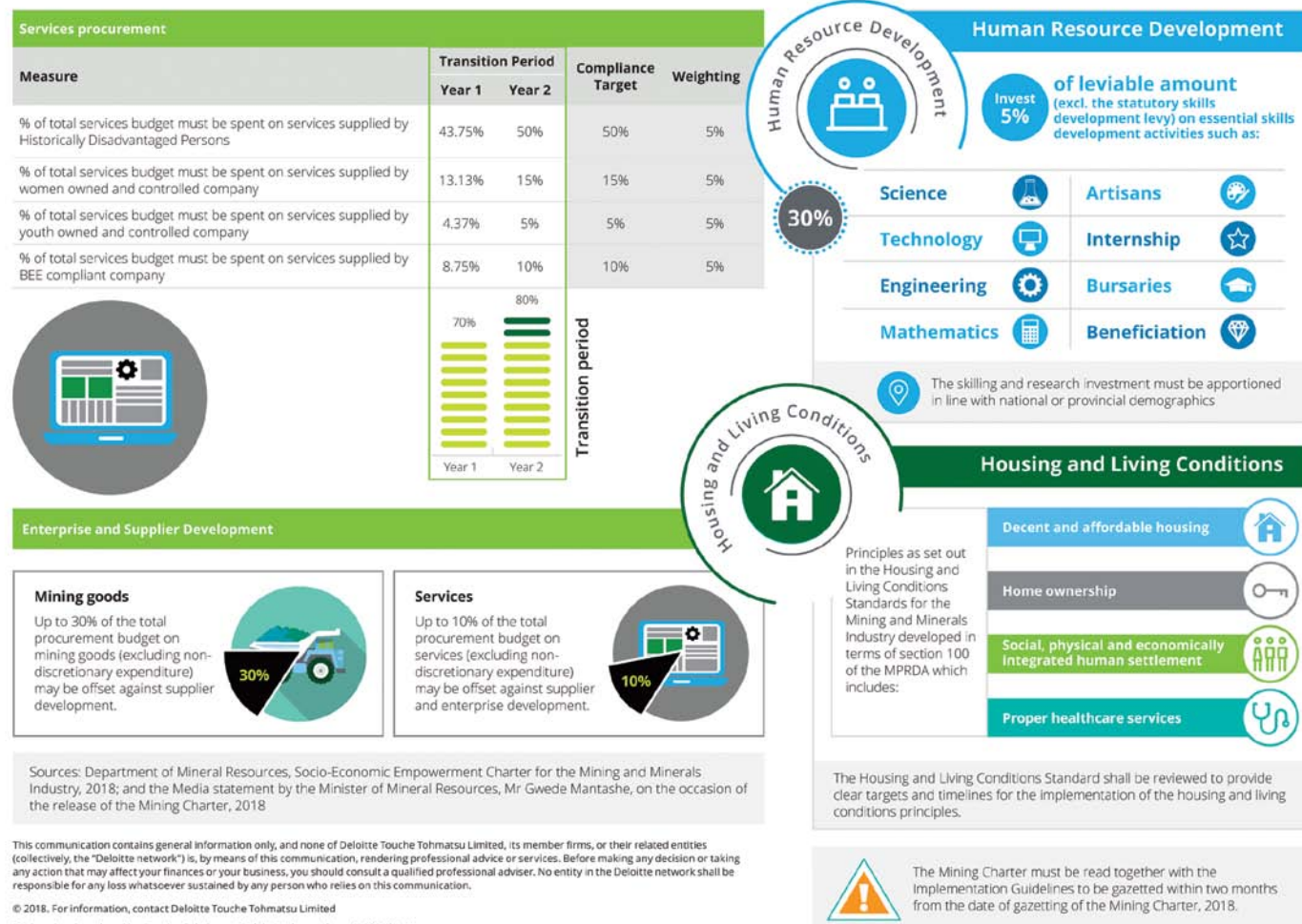
- The Trust to identify community development needs and develop a host community development programme (to be published in at least 2 local languages), fund distribution, governance and organisation.
- Administration costs, project management and consultation fees of the Trust may not exceed 8% of the total budget.
- Community development programme approved under this element shall not substitute Social and Labour Plan (SLP) commitments.
- Mining right holders operating in the same area may collaborate on identified projects to maximise the socio-economic developmental impact, in line with their approved SLPs. Approved SLPs must be published in English and a dominant language(s) commonly used within the mine community.

Employment equity

- Board level: 50% black; 20% to be women.
- Executive/Top management: 50% black; 20% to be women.
- Senior management: 60% black; 25% to be women.
- Middle management: 60% black; 25% to be women.
- Junior management: 70% black; 30% to be women.
- Employees with disabilities: 1.5%.

Inclusive procurement, supplier and enterprise development

- 70% of all mining goods to be from BEE entities.
- 80% of all services to be from BEE entities.



Scorecard



Ring fenced element
which requires
100% compliance

Ownership

Ownership

New Mining Rights

Element Description	Compliance Target (%)	Measure	Weight (%)
Minimum target for representation of Historically Disadvantaged Persons ownership.	30% BEE shareholding	A minimum of 5% non-transferable carried interest to qualifying employees from the effective date of a mining right. A minimum of 5% equity equivalent benefit defined herein or 5% carried interest to host communities from the effective date of a mining right. A minimum of 20% effective ownership in the form of shares to Historically Disadvantaged Persons, 5% of which must preferably be for woman.	Y/N
	Beneficiation Equity Equivalent mechanism in lieu of BEE shareholding	A maximum of 5 percentage points of BEE shareholding.	
Meaningful and effective participation.		Net value Voting rights attaching to an equity instrument owned by or held for a participant measured using the Flow through principle or Control principle. Economic interest representing a return on ownership of the entity similar in nature to a dividend right, measured using the Flow Through Principle.	

Existing Mining Rights

Element Description	Compliance Target (%)	Measure	Weight (%)
Minimum target for representation of Historically Disadvantaged Persons.	26%	Meaningful economic participation Full shareholder rights	Y/N

Pending Applications¹

Element Description	Compliance Target (%)	Measure	Weight (%)
Minimum target for representation of Historically Disadvantaged Persons ownership.	26%	Net value Voting rights attaching to an equity instrument owned by or held for a participant measured using the Flow through principle or Control Principle. Economic interest representing a return on ownership of the entity similar in nature to a dividend right, measured using the Flow Through Principle or Control Principle.	Y/N

¹All pending applications will be required to top-up from 26% to 30% HDP ownership within the 5 year transitional period provided in terms of Clause 2.1.2.

DTI levels	DMR scorecard	Ring Fenced Element + percentage weighting
Level 1	Ring fenced Element + 100%	Compliant
Level 2	Ring fenced Element + 80 - 100%	
Level 3	Ring fenced Element + 70 - 80%	
Level 4	Ring fenced Element + 60 - 70%	
Level 5	Ring fenced Element + 50 - 60%	
Level 6	Ring fenced Element + 40 - 50%	Non-compliant
Level 7	Ring fenced Element + 30 - 40%	
Level 8	Ring fenced Element + 20 - 30%	
Non-compliant	Ring fenced Element + <20%	
Non-compliant	Ring fenced Element not met + weighted element score	



Mine Community Development

Element Description	Compliance Target (%)	Measure	Weight (%)
Meaningful contribution towards Mine Community Development with biasness towards mine communities both in terms of impact, in keeping with the principles of the social license to operate.	100% compliant with approved SLP commitments	Publish the SLP in 2 languages (Dominant one in the community and English) Implement all approved commitments in the SLP	Y/N

- 100% of mineral samples to be analysed by SA-based firms.
- 30% of all procurement budget on mining goods may be offset against supplier development.
- Goods must be procured in line with a standardised product identification coding system being developed by the dti.
- 10% of all procurement budget on services may be offset against supplier and enterprise development.
- 70% of all R&D budget to be on South African based entities.

Beneficiation

A maximum offsetting of 5% against BEE Entrepreneur;

- Existing mining right holder who has claimed the 11% points beneficiation offset prior to the commencement of

Employment Equity			
Element Description	Compliance Target (%)	Measure*	Weight (%)
Board	Historically Disadvantaged Persons	50%	2%
	Of which must be women	20%	2%
Executive Management	Historically Disadvantaged Persons	50%	4%
	Of which must be women	20%	3%
Senior Management	Historically Disadvantaged Persons	60%	3%
	Of which must be women	25%	3%
Middle Management	Historically Disadvantaged Persons	60%	2%
	Of which must be women	25%	2%
Junior Management	Historically Disadvantaged Persons	70%	2%
	Of which must be women	30%	2%
Employees with disabilities	Employees with disabilities as a percentage of all employees	1.5%	2%
Core and critical skills	Historically Disadvantaged Persons	60%	3%

*Proportionally represented in terms of provincial or national demographics



Human Resource Development			
Element Description	Compliance Target (%)	Measure	Weight (%)
HRD expenditure as percentage of total annual leviable amount (excl. mandatory skills development levy)	5% leviable amount	Invest 5% of the leviable amount as defined in the HRD element in proportion to applicable demographics (employees and non-employees).	30%

Housing and Living Conditions			
Element Description	Compliance Target (%)	Measure	Weight (%)
Improvement in the standard of housing and living conditions of mine employees.	100% compliant with Housing and Living Conditions Standard commitments.	Implement all Housing and Living Conditions commitments in the Standard.	Y/N



Inclusive Procurement, Supplier and Enterprise Development ²			
Element Description	Compliance Target (%)	Measure	Weight (%)
Total procurement budget spend on goods and services	Procure 70% locally manufactured mining goods with a 60% local content	21% of total mining goods procurement budget must be spent on South African manufactured goods produced by Historically Disadvantaged Persons owned and controlled company	5%
		5% of total mining goods procurement budget must be spent on South African manufactured goods produced by women owned and controlled company or youth owned and controlled company; and	5%
		44% of total mining goods procurement budget must be spent on South African manufactured goods produced by BEE compliant company	5%
		80% Services	5%
Research and Development	50% of total services budget must be spent on services supplied by Historically Disadvantaged Persons	15% of total services budget must be spent on services supplied by women owned and controlled companies	5%
		5% of total services budget must be spent on services supplied by the youth owned and controlled companies.	5%
		10% of total services budget must be spent on services supplied by a BEE compliant company	5%
		Sample Analysis	2.5%
Sample Analysis	Utilise South African based facilities or companies for the analysis of 100% of all mineral samples across the mining value chain.		2.5%

² See transitional arrangements for progressive targets to be met during the transitional period.



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Sources: Department of Mineral Resources, Socio-Economic Empowerment Charter for the Mining and Minerals Industry, 2018; and the Media statement by the Minister of Mineral Resources, Mr Gwede Mantashe, on the occasion of the release of the Mining Charter, 2018

Mining Charter 2018, to retain the offset for the duration of the right.

- The Department must approve Beneficiation Equity Equivalent Plan as outlined in the Mining Charter implementation guidelines.
- A mining right holder must submit an annual progress report to the department in line with the approved beneficiation equity equivalent plan.

Housing and living conditions

Principles as set out in the Housing and Living Conditions Standards for the Mining and Minerals Industry developed in terms of section 100 of the MPRDA which includes:

- Decent and affordable housing;
- Provision for home ownership;

- Provision for social, physical and economically integrated human settlements; and
- Secure tenure for mine employees in housing institutions;
- Proper healthcare services;
- Balanced nutrition.

Human Resource Development

5% investment of the Leverage Amount on essential skills development such as science, technology, engineering, mathematics, artisans, internship, apprentices, bursaries, literacy, and numeracy skills for employees and non-employees, research and development of solutions in exploration, mining, processing, technology, beneficiation, environmental conservation and rehabilitation.

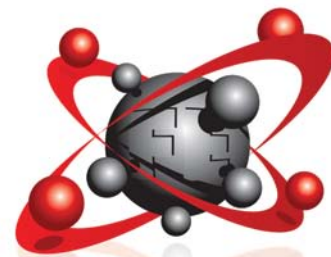


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HOT DIP GALVANIZING'S proven mining applications

AS THE MINING CHARTER IS BEING PUT TO BED, THE OPPORTUNITY FOR REALIZING OUR COUNTRY'S SUPERIOR ACCESS TO MINABLE RESOURCES BECOMES ONCE-AGAIN THE DOOR TO ECONOMIC REVIVAL. THE MINING INVESTMENT FRATERNITY AND THE ORGANIZATIONS BEHIND THE MINES WILL AGAIN PROVIDE A SOLID SOURCE OF ECONOMIC WELLBEING. PART OF THAT IS THE DESIGNING AND ERECTION OF NEW AND REFURBISHING OF SOME MOTHBALLED MINING OPERATIONS. MATERIALS HANDLING WILL AGAIN BE REQUIRED AS WELL AS ALL ASPECTS OF STRUCTURAL STEEL APPLICATIONS.

Hot dip galvanizing has been successfully used to protect small components as well as large structures in the Mining Industry in South Africa over several decades and accommodating extension of the life of mines beyond the original planned service life.

Hot dip galvanizing is a diffusion process and occurs when a suitably cleaned iron or steel article is immersed in molten zinc at $\approx 450^{\circ}\text{C}$. This is preceded by a cleaning phase which includes degreasing, pickling in acid and then applying suitable fluxing. Abrasive cleaning is generally not necessary, other than to remove weld slag or tenacious mill scale etc.

Through immersion, all surfaces are brought into contact with the molten zinc and resulting in the formation of a comparatively uniform, metallurgically bonded zinc and zinc-iron coating including internal surfaces, edges and corners. The general galvanizing process or batch type hot dip galvanizing, of products other than sheet and wire, provides a dense coat which is capable of providing both abrasion resistance and corrosion control to iron or steel.

The hot dip galvanized coating structure differs somewhat to the 'thinner' or wiped coatings applied to sheet and wire technologies. Zinc can be applied to steel and other metals by a variety of processes. These methods include electro-deposition, thermal spraying, mechanical plating, zinc rich pastes & paints and hot dip galvanizing.

The formation of zinc-iron alloys i.e. metallurgical bonds between zinc and steel, are entirely absent in all other pure zinc coating technologies, used for corrosion control. The durability of a zinc coating is, in broad terms, roughly proportional to its thickness, regardless of the method of application. Hot dip galvanizing employs zinc's strengths as both a barrier and a sacrificial material.

Applications of hot dip galvanizing for corrosion control include:

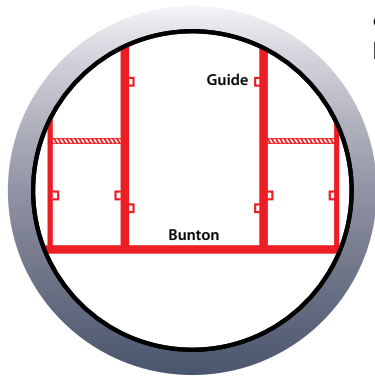
Structural steel applications

All structural steel is suitable for hot dip galvanizing. However the steel chemistry of a given batch will be the predominant determining factor of the thickness of the hot dip galvanized coating developed



with the silicon and phosphorus content playing the major roles.

The preferred silicon equivalent* level is between 0.15% and 0.25%, and in this range, coatings are developed without such coatings becoming undesirably brittle. Not only do these thicker coatings provide longer corrosion free life but the abrasion resistant properties of the zinc-iron alloys, which make up the greater proportion of these coating, are of considerable benefit in the case of buntions and shaft guides.



While steel suppliers are well informed in this regard, orders for shaft guide and bunton steel should state "material to be suitable for hot dip galvanizing, Si content 0.1% – 0.25%". This is not necessary in the case of normal structural steel such as angles etc.

* Silicon Equivalent $SiE = Si \% + (2.5 \times P \%)$
where Si = Silicon & P = Phosphorus

Buntions

Streamlined buntions can be hot dip galvanized without distortion. An advantage is that internal surfaces are also hot dip galvanized. If buntions are not open-ended, drainage and ventilation holes must be provided on end plates to ensure satisfactory coating of internal surfaces and to prevent explosions during hot dip galvanizing. The hard zinc-iron alloys that constitute about 80% of the final hot dip galvanized coating are far more resistant to abrasion, which is experienced on the upper bunton surfaces, than that of uncoated steel or painted surfaces.

Shaft guides

Both top hat and square tube guides are suitable for hot dip galvanizing. The

Metsep

The waste-acid regeneration specialists

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Contact: Rob Watchorn
Tel: 011 626 2425 Fax: 011 626 2430



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The company has followed the guidelines laid down by the Government for broadbased black economic empowerment.

IPM is flexible, competitive and direct. Our steel products are used with confidence by most metro authorities in South Africa and beyond.

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- Tubing from leading black empowered suppliers to SANS 657/1/2/004.
- Designing of poles to SANS 10225-1991/1.
- Hot dip galvanizing to SANS 121 (ISO 1461).



Industrial Poles and Masts

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galvanizers who specialise in coating guides have installed equipment for checking tolerances and straightening should this be necessary. The main corrosion problem with guides is in crevices at bolted mating surfaces and the provision of a hot dip galvanized coating on mating surfaces reduces corrosion substantially.

Corrosion on riding surfaces is normally not severe, due to the wiping effect, but, the abrasion resistant zinc-iron alloys in the coating usually remain present, even on riding surfaces, for several years after installation. Guides are usually hot dip galvanized prior to cropping, drilling and matching but straps are hot dip galvanized after drilling. The drilling, cropping and matching may be performed by a specialist galvanizer, in-house, alternatively, the galvanizer is a sub-contractor to the fabricator in which case the galvanizer


is only responsible, to the fabricator, for galvanizing and supply to the specified degree of straightness. Orders must specify that all cropped ends and uncoated bolt holes shall be coated by zinc thermal spraying in accordance with SANS 121: 2011 (ISO 1461: 2009).

Station steel structures

Screens, grid flooring and structural steel components, used in stations, are hot dip galvanized without difficulty. These structures are often test erected either at the galvanizer's or fabricator's works or even at the mine site to ensure correct fabrication has been carried out and to avoid the need for costly and time consuming modifications during installation underground.

Hydro-power piping

Organic coatings are generally unsuitable for protecting this equipment and either



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hot dip galvanizing or a material such as 3CR12 should be considered. When hot dip galvanizing is selected, the galvanizer must be instructed to remove excess zinc and protuberances from gasket grooves either by re-matching or melting out excess zinc. Another method is to mask grooves with a silicon based material which will prevent the formation of a coating in the grooves during galvanizing. The masking material is then removed after galvanizing.

Air columns

Galvanizing can be an effective method of protection for both internal and external surfaces of air-columns. Added external protection at deeper, more corrosive mine shaft levels, can be provided by duplex coating with an appropriate paint system.

Pump columns

The degree of corrosion control of a hot dip galvanized coating, applied to internal surfaces of high pressure pump columns, will depend on the level of corrosivity of the water being pumped, the amount of abrasive suspended solids present and the flow rate which, if higher than 0.5m/s, will reduce the service life of the coating.

External surfaces can be provided with additional protection by duplex painting at levels in a shaft where corrosion is severe but internal duplex coating is not recommended since it is difficult to determine whether paint coatings applied onto internal pipe surfaces possesses the required adhesion properties and dislodged paint films can result in damage to mechanical equipment in the pipeline system.

Flanged piping

When flanged piping systems are used under high pressure conditions, the galvanizer shall be required to ensure that the 'gramophone grooves on the flange faces, are clearly visible after the galvanized coating has been applied. Certain high pressure gaskets, however, do not require grooves to be present on flange faces. Hot dip galvanized high strength fasteners, with suitably lubricated threads, should be used to connect flanges.

Flangeless piping

Hot dip galvanizing has an advantage over organic coatings, in the case of flangeless piping, in that, provided the weld metal is deposited in a continuous, flowing and uninterrupted run, damage to the zinc coating, on internal surfaces, will be insignificant. If a second pass is required after the route run, the deposited metal must first be allowed to cool down in order to avoid excessive temperature build-up which could result in localised melting of zinc on internal surfaces. Both shielded wire and stick welding is suitable.

Ventilation ducting

This product was conventionally fabricated from 'thinly' coated pre-galvanized sheet to which ungalvanized flanges



and attachments were welded. Ducting, which is fully galvanized with a heavy duty coating after fabrication, is now available and this should be specified. Ducting up to 1.5m diameter can be galvanized after fabrication.

Buried pipelines

The durability of external surfaces of buried pipes will depend on the corrosivity level of the soil. If soil conditions are corrosive and foreign non-corrosive back-fill is not available, the application of a low cost bitumen or tar coating, to galvanized external pipe surfaces not only prevents rapid thinning of the zinc coating but also reduces the propensity for localised bacterial corrosion. However, a comprehensive evaluation of soil analysis etc, should always be carried out before using buried pipes.

Chute bodies

Hot dip galvanized structures are frequently used in conjunction with

removable liners, in severely abrasive applications, and the ability of this coating to withstand fairly rough handling in service and when maintenance takes place, is an advantage. Contact between hot dip galvanized surfaces and uncoated steel may have the tendency to diminish the coating life at contact surfaces in moist conditions due to cathodic protection by the coating of the uncoated steel. This may be avoided, in some applications, by providing an insulating paint film prior to attaching the lining.

Headgears

Hot dip galvanizing of structural steel for sub-vertical headgears is a practical solution to the corrosion of these structures. Even for surface headgears there is a case for employing hot dip galvanizing. Hot dip galvanizing will provide indefinite maintenance free corrosion life for such surface structures at more or less the same initial cost of painting with a dependable paint system.



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The plate girders on which these structures are mounted can distort during galvanizing unless they are designed with subsequent galvanizing in view (ISO 14713 parts 1 and 2). An alternative to galvanizing, for plate girders, is zinc thermal spraying or the application of an inorganic zinc-rich paint primer after abrasive blast cleaning and followed by a compatible paint top coat.

Gold plants

Structural steel, for the construction of gold plants, is effectively protected by hot dip galvanizing but, as zinc forms an amalgam with gold zinc coated steel should not be permitted where recoverable gold dust is present.



Refrigeration plants

Refrigeration and ice plants are effectively protected by hot dip galvanizing and no additional paint protection is necessary. The coating is not affected by sub-zero temperatures and it can be expected to provide maintenance free life when used in this application.

Cooling towers and storage tanks

Under most conditions hot dip galvanizing after fabrication provides adequate protection. Where corrosive water is used, added protection by means of a duplex system is recommended by using a product such as epoxy tar. In the case of storage tanks which will contain portable water specially formulated bituminous paints, which are "taint" free are available for internal lining.

Concrete rebar

Hot dip galvanizing of steel embedded in concrete does not adversely affect bond strength in any way and hot dip galvanized coating is being increasingly used to prevent concrete spalling caused by corroding reinforcing steel. Anchor bolts and other connecting devices, which are cast into concrete, should be fully galvanized, not just the protruding portion.

Conveyor steel

Hot dip galvanizing of conveyor steel structure, including idler bases, is recommended and usually more cost effective than painting. This applies to both surface and underground conditions. It is, however, not practical to galvanize idlers.



Brackets, clamps and sundry fittings

Small components, including castings, forgings and hot and cold pressings are suitable for hot dip galvanizing. These products are galvanized by specialists who utilise a centrifuging process which removes excess zinc deposits. Provided that accepted engineering standards are applied in the manufacture of cold worked components, such as pipe brackets and cold headed bolts etc. the possibility of subsequent fatigue failure, during service, can be discounted. Maximum coating thickness standards for components falling into this category are provided in SANS 121: 2011 (ISO 1461: 2009) and this should always be specified in order to avoid receiving thinly zinc electroplated components by misconception.

Heat exchangers

These are often partially hot dip galvanized with a coating applied on the outside only. This is achieved by attaching a snorkel tube to the heat exchange

header and then (because it will float) forcing it under the surface of the molten zinc.

Hot dip galvanizing is an effective method of protecting heat exchangers which would be difficult to coat uniformly by spraying or brushing with a paint system. Units are frequently removed after several years in service and regalvanized before being returned to service.

In all the aforementioned applications the corrosion control of iron and steel is achieved by firstly enveloping the articles in a tough imperviable barrier of the Zinc-Carbonate film, or zinc patina, and in parallel cathodically protected by the sacrificial anodic layer of the zinc and zinc-iron alloys. As we grow and re-establish the strength of the sector let us ensure the best practices in corrosion control to deliver the lowest Total Cost Of Ownership (TCO) of mines for the initial planned lifespan and potential extensions beyond.

RENOVATION OF HOT DIP GALVANIZED STEEL

GALVPATCH® Zinc Rich Epoxy Paste

Paragraph 6.3 of SANS 121:2011 and ISO 1461: 2009(E) states that the total uncoated areas for renovation by the galvanizer may not exceed 0.5% of the total surface area of the component. Furthermore, each uncoated area for renovation shall not exceed 10cm². Unless it is agreed between the galvanizer and the purchaser, items with larger uncoated areas should be re-galvanized.

The standard recognises three repair medium:

1. Zinc thermal spraying
2. Suitable Zinc paste products
3. Suitable Zinc rich paint where the zinc dust pigment conforms to ISO 3549

The above repair medium should achieve a minimum coating thickness of 100µm on the renovated areas, unless the purchaser advises otherwise.

Under the guidance of the Hot Dip Galvanizes Association Southern Africa Galvpatch® was developed to comply with SANS 121:2011 and ISO 1461:2009(E) standards for renovation of hot dip galvanized coatings. The development started in early 2007, by mid-2007

pilot tests were being done. After undergoing and passing the ASTM B117 corrosion test, test samples were given to selected consumers for further testing and feedback. In mid-2008 Galvpatch® was registered and successfully launched. Ten years later Galvpatch® is a recognized repair medium for hot dip galvanized coatings by a number of state owned enterprises as well as privately owned entities. Galvpatch® is often the choice product for site renovation as it is easy to apply and can achieve 100µm in a single application.

Galvpatch® is a two part, solvent free organic epoxy paste, containing 100 % solids of which >80% is micronized zinc by mass. The 100g squish pack allows for convenient application and storage of the product. No specialised equipment is needed to apply Galvpatch® and easy to follow instructions with illustrations are printed on each squish pack. Each squish pack has a batch number for full traceability. To comply with Quality Assurance standards, Material Safety Data Sheets (MSDS), Technical Data Sheets (TDS), and Batch Certificates are available for data packs.



1

1 Concentrator at Ngezi –
Image courtesy of Zimplats Mine.

Expansion projects at Ngezi continued focusing on the upgrading of the dust abatement system in 2018. Zimplats appointed FL Schmidt as the supplier to Ngezi Platinum Mine of a Stockpile Dome some 110 metres in diameter. The dome is reportedly the largest currently employed in Zimbabwe. Hogarth Engineering Ltd was appointed as mechanical contractor for the project.

The structural steel fabrication was contracted to Viva Engineering with hot dip galvanizing undertaken by Monoweld Galvanizers.

The project is targeted to reach the completion of the 1st phase of erection by the end of February 2019 with the first loads being transported having left Viva Engineering on the 22 November 2018.

Updates will appear in future issues of Galvanizing Today.

NGEZI PLATINUM MINE [ZIMBABWE PLATINUM MINES (PRIVATE) LIMITED]

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Contacts:

Viva Engineering: Leon Pretorius, +27 (0)11 392 3926 / +27 (0) 82 658 1406 Email: leonp@vivaeng.co.za

FL Schmidt: Martin Kruger +27 (0) 82 855 0205

Hogarth Engineering (Zimbabwe): Graham Bryce, +263 77 215 3502 / +263 77 220 3408 Email: grahambryce66@gmail.com

SOLVING MATERIAL TRANSFER CHALLENGES for mines in challenging terrain

THE USE OF HOT DIP GALVANIZED TOWERS TO SUPPORT AERIAL MATERIAL HANDLING SOLUTIONS

A leading platinum mining group is directing the mining sector into the future. They are delivering on time, on budget projects using innovative materials handling technology never before seen in South Africa.

To achieve this, an EPCM contractor with a +30 year track record in support of the mining industry was appointed. This contractor is well known for their collaborative approach and extensive experience in project delivery.

Together a solution was sought for the material transfer challenges of the mine. Solutions considered ranged from slurry pumping to ground level overland conveyors and several variants of aerial material handling technologies. Visits to Europe to investigate best practice were undertaken by a joint project team.

An aerial materials handling system was eventually selected as the best solution for the mine's material transfer needs. The system comprises a series of hot dip galvanized steel towers, strategically positioned between the mine and the processing plant.

Described as unique in the Southern African context it is also purported to be the longest of its kind in the world. The system traverses around five kilometres of mountainous terrain with elevations differing by almost 500 metres. Raw material will be transported across a series of twelve hot dip galvanized steel towers, the tallest of which is almost 60m in height. The longest span between two towers measures just shy of 900m.

The systems' small footprint is many times more cost effective than the alternative conventional systems evaluated, for the same tonnage requirements and easily overcomes the challenging mountainous topography of the mine. The hot dip galvanized steel tower installations were completed two weeks prior to schedule due to excellent civils and the hot dip galvanized structural modular tower sections being used.

Life Cycle Costing and the low maintenance, estimated long-service-life of the hot dip galvanized systems bear out the understanding that innovation and keen awareness of environmental aspects will drive responsible mining towards a profitable future in South Africa.



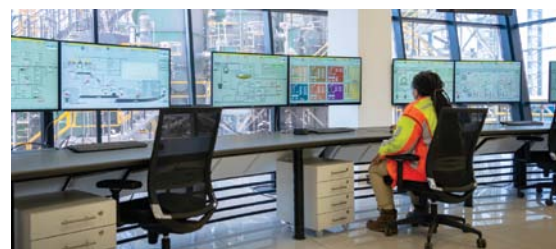


GAMSBERG Project

Vedanta Zinc International (VZI) is the custodian of the Southern African zinc assets of Vedanta Resources, a globally diversified natural resources major with interests in zinc, lead, silver, copper, iron ore, aluminium, power, and oil and gas. A major focus on VZI's growth front is the Gamsberg project – a new zinc mine and its' associated infrastructure, phase 1 of which is ready to be launched, after being in development for the last three years.

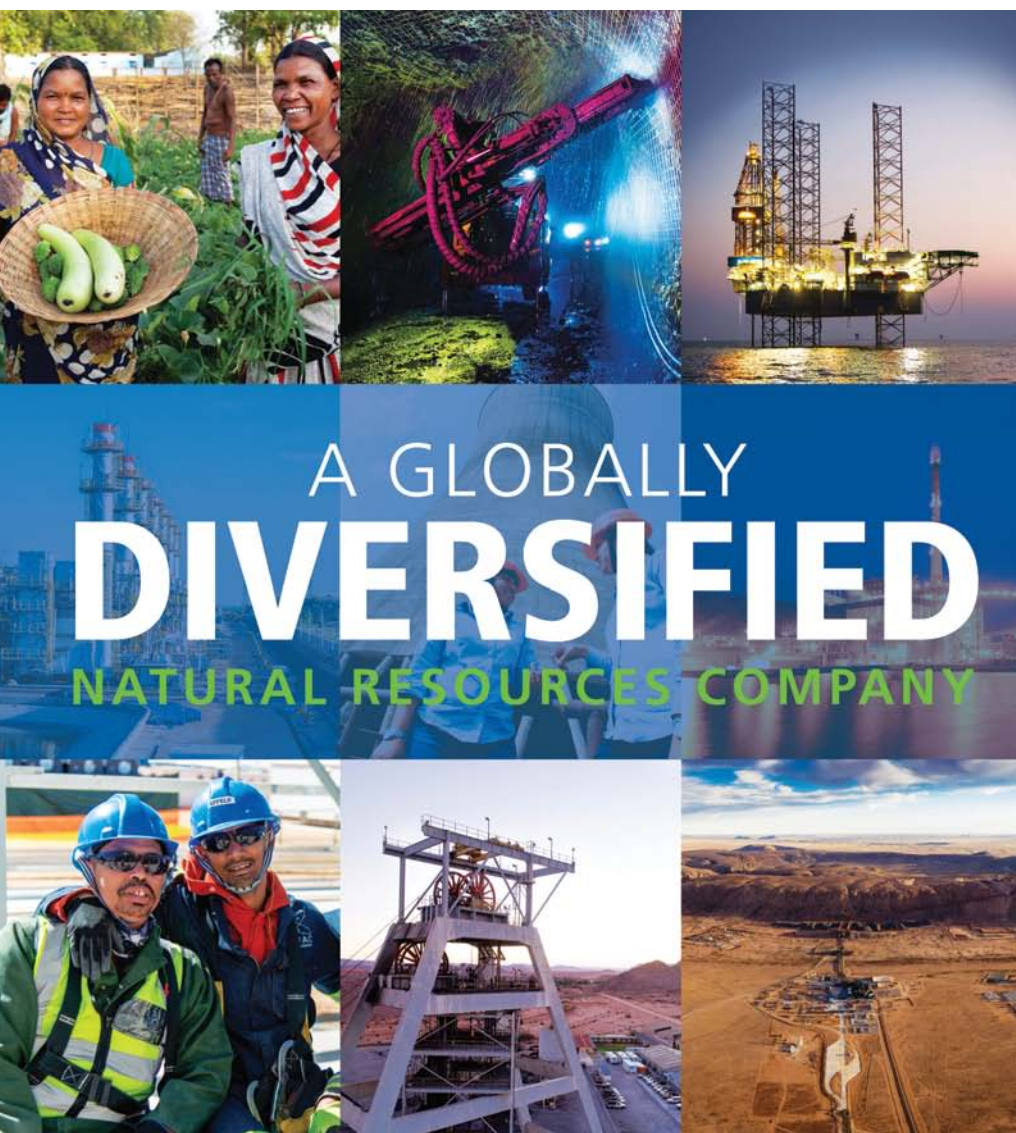
VZI's Gamsberg Project is part of the Black Mountain Mining complex, located near Aggeneys in the Khâi-Ma district of the Northern Cape. Gamsberg is one of the largest zinc deposits in the world (although discovered more than 40 years ago) and was held undeveloped by its various owners before Vedanta acquired it from Anglo American in 2011. It has a reserve and resource of more than 214Mt and an estimated life of mine (LoM) of 30+ years. Gamsberg's development forms part of Vedanta's long-term





commitment to the development of the Northern Cape. Phase 1 of this investment, worth US\$400 million, is now complete.

In Phase 1 – which has a LoM of 13 years – four-million tonnes a year of ore will be produced from Gamsberg’s open pit and 250,000t/y of concentrate from its concentrator plant. Phase 2 – an investment of a further US\$350 to US\$400 million – would see ore mined increase to 8mtpa and production of zinc-in-concentrate to 450,000 tonnes and in a modular fashion ultimately, to 600,000tpa. When Gamsberg is fully developed with its future phases of growth, it will be one of the world’s top 5 zinc mines. The project’s current reserve and resource is 214Mt with a grade of between 6% and 6.5% zinc. Gamsberg has the potential to trigger a new wave of industrial and economic development in the Northern Cape.



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WHITE-RUST MATTERS

and dealing with wet storage staining

THE FINISH AND APPEARANCE OF A HOT DIP GALVANIZED COATING IS DYNAMIC, A 'LIVING' SURFACE THAT VISIBLY CHANGES UNTIL THE HOT DIP GALVANIZED SURFACE ATTAINS A STABLE ZINC PATINA OR ZINC CARBONATE FILM WHICH IS A DENSE INSOLUBLE FILM DULL-GREY IN COLOUR.

Wet storage staining or white-rust occurs when galvanized materials are closely nested or tightly stacked with moisture entrapped between them and there is inadequate airflow across the zinc surfaces. Examples of this may be found when galvanized materials have been exposed to rain, condensation or high humidity atmospheric conditions and have remained wet for an extended period of time. Once the hot dip galvanized components are separated and dried-out, the formation of white-rust ceases.

White-rust is a post-galvanizing phenomenon. Prevention thereof lies in the manner materials are packed and stored prior to installation and use. The presence of white rust is not a reflection on the galvanized coating's performance. By ensuring that the causes of white-rust are recognised and the risks of its occurrence minimized it is avoidable and easily managed by all parties involved in the supply chain.

Dealing with this condition is twofold firstly removal of the residues and secondly determining the impact on the overall corrosion control ability of the remaining coating. The white or light-grey powdery residues from wet storage staining / white rust can be removed by using a stiff bristle non-metallic brush, some clean water and drying the material completely. Once removed, a 'shadow' or



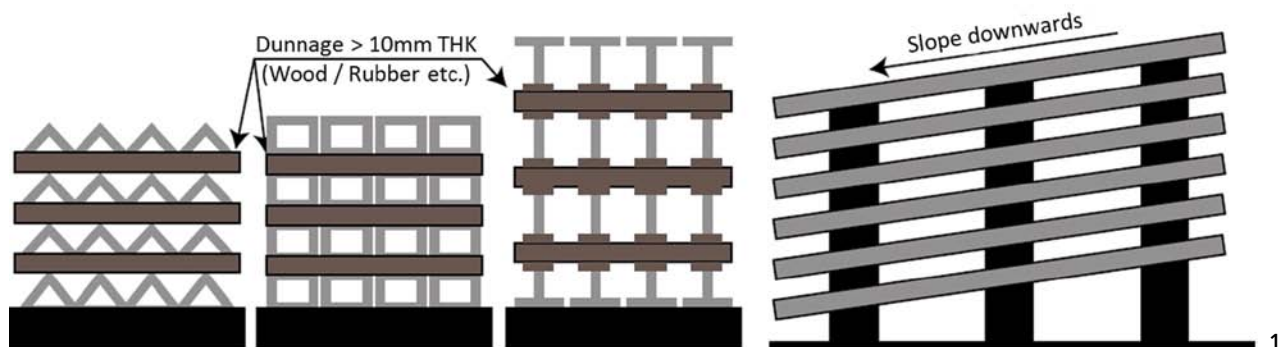
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Phoenix Galvanizing has been in operation since 1996 and is a 100% Black Owned company. Together with our 23 years of experience in general and structural galvanizing at the highest quality, we are proud to hold quality standards such as SABS SANS 121 and ISO 9001:2015. We are also members of the HDGASA and SAMFA and have updated Air Emissions Licenses with Ethekwini Municipality. Our zinc bath size is 14m length x 2.5m height x 1.4m width. We have a capacity of 2500 tonnes per month. Phoenix Galvanizing Centrifuge specialises in spinning of threaded and overhead power line items and has a capacity of 250 tonnes per month. We operate a local transport fleet servicing most of KZN and operate a special projects division for large structural projects.

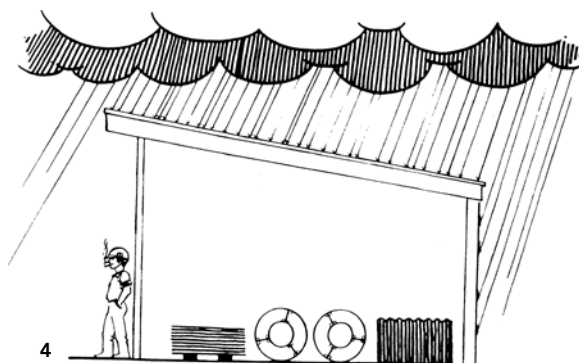
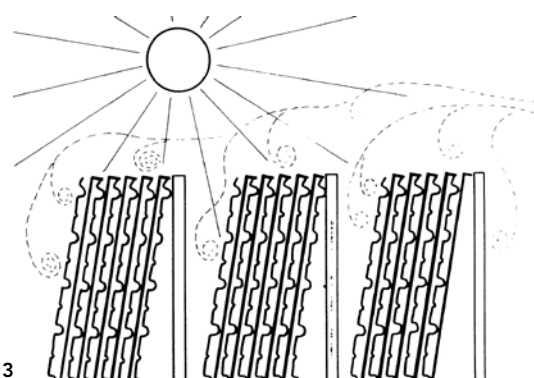
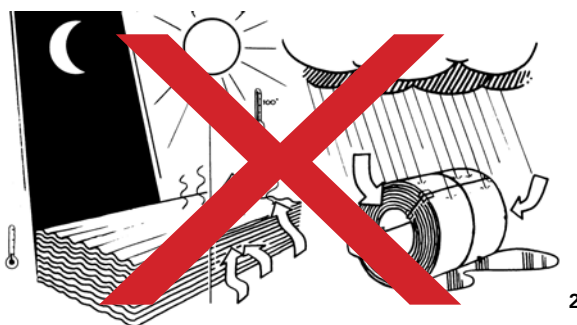
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BY ENSURING THAT THE CAUSES OF WHITE-RUST ARE RECOGNISED AND THE RISKS OF ITS OCCURRENCE MINIMIZED IT IS AVOIDABLE AND EASILY MANAGED BY ALL PARTIES INVOLVED IN THE SUPPLY CHAIN.



1 Examples of proper storage layouts.

2 Incorrect storage of hot dip galvanized materials.

3 Store so as to maintain ventilation between hot dip galvanized articles.

4 Wherever possible store under cover and prevent ingress of moisture.

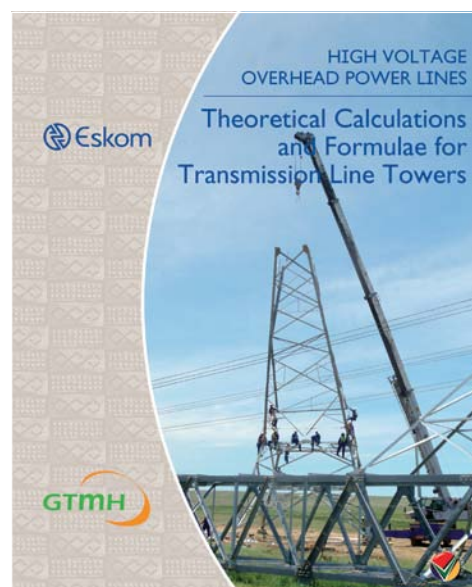
dark area where the wet storage stain had been will appear on the article. This is due to the reaction with CO_2 that has occurred and is of no consequence.

To assess the condition of the coating, the thickness of the remaining hot dip galvanized coating across the affected zone should be measured. The measured coating-thickness should be equal to or greater than the minimum coating-thickness stated in the relevant standard. Should the coating-thickness conform to the standard, then there is no reason

to reject the material. Guidance from the various product standards should be referred to in cases where an aesthetic requirement had been specified.

The HDGASA recommend that hot dip galvanized materials be stored in a well ventilated environment, free from moisture entrapped between articles and under cover. These simple measures will significantly reduce the risk of developing wet storage staining or white rust and can easily be maintained at every stage of the supply chain.

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industry, locally and abroad. Currently, 12 volumes (comprised of 13 books) are available for purchase. Two additional series, filling further gaps, are the Leadership and Management Series and the Professional Development Series.

Some volumes of interest in the Eskom Power Series includes:

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Volume 2: Fundamentals and Practice of Overhead Line Maintenance

Volume 6: High Voltage Overhead Power Lines (Part 2): Theoretical Calculations and Formulae for Transmission Line Towers

For further information or to view summaries of the full list in the Power Series collection, please contact Sanjeev Bisnath on +27 11 629 5702 or bisnats@eskom.co.za or follow the link below: http://www.eskom.co.za/AboutElectricity/EskomPowerSeries/Pages/Eskom_Power_Series.aspx

INSPECTOR'S TOOLKIT® FLASHDRIVE:

Guideline for Inspection of Hot Dip Galvanized Materials



THE GUIDELINE WAS COMPILED TO ASSIST USERS IN SUCCESSFULLY APPLYING THE REQUIREMENTS FOR TESTING AND INSPECTION, AS WELL AS IN THE INTERPRETATION OF THE TEST RESULTS OF HOT DIP GALVANIZED MATERIALS.

Several useful templates including a report layout and certificate of compliance are included on the flash drive as well as a visual reference guide to numerous surface conditions, their origins and their effects on corrosion control is included. Although it is difficult to cover every condition, the guide covers those conditions frequently observed in the field.

The guide also considers design and fabrication requirements (ISO 14713) as well as hot dip galvanizing practice. The standard to which reference is made in the text is predominantly SANS 121:2011(ISO1461:2009) unless otherwise stated.



1.0 INSPECTOR
TOOLKIT
INSPECTION
GUIDELINE Rev 0



Report on
evaluation of hot
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material and str...



T01 Pre
Galvanizing
Report



T02 Non
Conformance
Report



T03 Inspection
Checklist



T04 Certificate of
Conformance



T05 Report on
evaluation of hot
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ANNEXURE B – SURFACE CONDITIONS



1 APPEARANCE OF SODIUM DICHROMATE (Passivation Staining)

What is this?

A small amount of Sodium Dichromate is generally added to the quench water bath for passivation.

Cause

Although the recommended quantity of Sodium Dichromate is about 0.15% to 0.3%, occasionally when topping up, more is added. This often results in a dark yellow to brown colour on the galvanized surface. The darker colour will provide enhanced initial corrosion protection.

Effect / Remedy / Responsibility

This can be accepted since there is no adverse effect on corrosion control. The galvanizer should maintain the concentration of Sodium Dichromate at about 0.15% to 0.3%.

The Guideline covers:

- Introduction to the Guideline
- Service Life – Time to First Maintenance
- Acceptance Inspection
- Visual Inspection
- Aesthetic Effects
- Wet Storage Staining (White Rust)
- Renovation
- Inspection Sample Selection for Coating Thickness Evaluation
- Coating Thickness
- Zinc-Iron Alloys
- Pure Zinc
- Factors outside the Control of the Galvanizer
- Steel Chemical Composition
- Reactive Steels
- Preferred Steel Chemistry
- Surface Condition Prior to the Hot Dip Galvanizing Coating
- Design, Form and Stress
- Reference Areas
- Acceptance Criteria Hot Dip Galvanized Thickness
- Threaded Articles
- In Case of Dispute
- Adhesion of the Hot Dip Galvanized Coating
- Further Information on Renovation of Hot Dip Galvanized Coating
- Zinc Metal Thermal Sprayed Coating Procedure
- Zinc Rich Epoxy or Zinc Rich Paint
- Site Repairs to Hot Dip Galvanized Material
- Certificate of Compliance
- Design and Fabrication Considerations
- Drainage and Venting Holes
- Venting – Critical

- Filling and Drainage
- Clearances and Tolerances
- Defects i.r.o. Fabrication
- Annexure A: HDGASA Information Sheet 7 – Hot Dip Galvanizing of Nuts and Bolts
- Annexure B: Surface Conditions 18
- Annexure C: Formulae for Surface Area
- HDGASA Training Courses
- HDGASA Endorsed Products
- HDGASA Location Map

Tables:

- TABLE 1 – Control Sample Size Related to Lot Size
- TABLE 2 – Required Number of Reference Areas for Testing
- TABLE 3 – Minimum Coating Thickness on Samples not centrifuged
- TABLE 4 – Minimum Coating Thickness on Centrifuged Articles
- TABLE 5 – Oversize Tapping Allowance for Hot Dip Galvanized Nuts

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ADVANCED COURSE ON HOT DIP GALVANIZING

A customised course on Hot Dip Galvanizing (HDG) was presented to a delegation from PROMAC on the 16th and 17th of October 2018. The two day course focussed on zinc and how it protects, the corrosive environments (ISO 9223 / ISO 12944), the HDG process, Duplex Systems, HDG rebar and inspection, standards, methodology and certification of HDG articles.

The customized format allowed for maximum interaction with the delegates and ensured a high level of knowledge transfer. A plant tour ended the course with the delegates shown the workings and procedures of a modern HDG Plant.

REFRESHER OPERATOR TRAINING

A series of tailored interactive courses for refresher training of personnel at ARMCO (Isando and Randfontein) were presented to operators over two successive Fridays by HDGASA Executive Director Robin Clarke. "The level of interaction and keen participation by the guys is very positive" said Robin. The courses leveraged the experience of several of the senior employees and encouraged responsibility of all operators for the production of high quality hot dip galvanizing.

THE CORROSION INSTITUTE OF SOUTHERN AFRICA COURSE SCHEDULE 2019



Introduction to Corrosion Engineering Course (5 days)

8th – 12th April 2019	The CORë, Midrand
2nd – 6th September 2019	The CORë, Midrand
7th – 11th October 2019	CPT, venue to be confirmed

Corrosion Management (2days)

11th – 12th March 2019	The CORë, Midrand
5th – 6th August 2019	The CORë, Midrand

Not Just Rust (Half day)

27th February 2019	The CORë, Midrand
17th April 2019	The CORë, Midrand
26th June 2019	The CORë, Midrand
28th August 2019	The CORë, Midrand
30th October 2019	The CORë, Midrand

NACE CIP 1 – Coating Inspector Program Level 1 (6 days)

21st – 26th January 2019	The CORë, Midrand
18th – 23rd February 2019	KZN, Westville Country Club
25th – 30th March 2019	The CORë, Midrand
6th – 11th May 2019	The CORë, Midrand
3rd – 8th June 2019	CPT, venue to be confirmed
8th – 13th July 2019	The CORë, Midrand
16th – 21st September 2019	The CORë, Midrand
4th – 9th November 2019	The CORë, Midrand

CITWI – Corrosion in the Water Industry (4 days)

20th – 23rd May 2019	The CORë, Midrand
18th – 21st November 2019	The CORë, Midrand

NACE CIP 2 – Coating Inspector Program Level 2 (6 days)

27th May – 1st June 2019	The CORë, Midrand
25th – 30th November 2019	The CORë, Midrand

NACE CIP 3 – Peer Review

On request – minimum 15 students Garden Court, Sandton

NACE CP 1 – Cathodic Protection Tester (5 days)

4th – 8th March 2019	The CORë, Midrand
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NACE CP 2 – Cathodic Protection Technician (5 days)

24th – 28th June 2019	The CORë, Midrand
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NACE OCAT – Offshore Corrosion Assessment Training (5 days)

19th – 23rd August 2019	CPT, venue to be confirmed
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NACE – Corrosion Control in the Refining Industry (5 days)

21st – 25th October 2019	The CORë, Midrand
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NACE – Marine Technology (4 days)

22nd – 25th July 2019	The CORë, Midrand
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NACE – Corrosion & Protection of Concrete Structures and Buildings (2 days)

27th – 28th May 2019	The CORë, Midrand
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Any of the above courses can be presented at your premises, dependant on numbers. Courses with no dates can be requested through Linda. Please contact Linda on +27 10 224 0761 or courses@corisa.org.za for further information

“Knowledge is the only instrument of production that is not subject to diminishing returns” John Maurice Clark

Level I: Introduction to Hot Dip Galvanizing

The HDGASA one day INTRODUCTION TO HOT DIP GALVANIZING course is designed to provide an initial understanding of the concepts relating to hot dip galvanized coatings applied for corrosion control of steel components. The course comprises six modules. In order for the course to be viable we require six or more candidates to attend. Arrangements can also be made for this course to be held at a venue of your choosing for more than six candidates. In addition to the course, a special visit to a hot dip galvanizing plant may be arranged on a separate date, should six or more candidates be interested and able to attend.

Level II: Certified Galvanizing Inspectors

The HDGASA advanced Level II course provides the necessary skills to assess the quality and conformance of Hot Dip Galvanized coatings and Duplex Systems to the applicable specification. Delegates are introduced to other metallic type coating specifications and their application for corrosion control design.

The course provides an in-depth interpretation of the specifications and accepted best practice procedures for determining coating thickness, visual inspection of surface finishes as well as the evaluation of these coatings for corrosion control of steel components. The course includes a visit to a hot dip galvanizing plant where delegates will have an opportunity to assess finished product against the relevant quality standards on a real time first hand basis.

Three Continuous Professional Development (CPD) points are awarded to delegates attending the entire course. Bookings are limited to a maximum of 10 people, with applications treated on a first-come-first-serve basis. In order for the course to be viable we require 6 or more candidates to attend. Arrangements can also be made for the course to be held at a venue of your choice for more than 6 candidates.

ENROL IN A COURSE TODAY!
CALL Lara at 011 456 7960
EMAIL: hdgasa@icon.co.za

INCLUDES ELECTRONIC 'HDGASA INSPECTOR TOOLKIT'

HOT DIP
GALVANIZERS
ASSOCIATION
SOUTHERN AFRICA



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Honorary Life Membership

Bob Wilmot



Early in his employment career Bob was tasked with investigating the process and feasibility of building a hot dip galvanizing plant, for the then American owned Armco Corporation. Bob recalls his first thoughts were "what is hot dip galvanizing?" His research and investigation took several years to complete. Bob's initial proposal to his board was rejected, mainly due to the political unrest in South Africa at the time and shareholder nervousness.

Later when Armco became part of the Murray and Robert's group, Bob wasted no time re-submitting an application to build a hot dip galvanizing plant. He had kept his feasibility study up to date over the years, believing the project would bring increased revenue and production. The board quickly approved his application. With a smile Bob recalls asking the board, "Are you giving me permission to build a hot dip galvanizing plant?"

The project was scheduled to take two years. Bob together with Walter Barnett worked on the development and the plant was commissioned in 15 months. Bob describes the plant as, 'A magnificent investment, a success.'

Thereafter, Bob started working at Macsteel Tube and Pipe. His primary focus was to optimise production of the existing facilities. Hearing talk of them wanting to build a hot dip galvanizing plant, he approached the MD, insisting that if a plant was going to be built, he was the man for the job. Bob's proposal was approved and he became the project manager for this investment. The project was constructed and commissioned in 14 months and represented the latest in European technology. Technically up to date and fully automated, the plant was

built for large production of automated galvanizing of tube and pipe.

Bob joined The Hot Dip Galvanizers Association when a position opened for a technical consultant. His interest and passion for hot dip galvanizing, his technical knowledge and experience in production, building of plants as well as marketing of the technology made him an excellent candidate. After 6 months at the Association, Bob was given the position of Executive Director. Bob describes his time at the Association as very rewarding, offering tremendous job satisfaction. Relationships with international associations led to a constant source of current information relating to the industry. Bob particularly loved working out in the field doing technical investigations.

When asked about the greatest challenges he experienced he simply said, "relationships and expectations of people posed the greatest challenges but if you work at this you will find lifelong friends."

The Association would like to thank Bob for his years of mentorship and guidance to members and staff. Bob's willingness to share his technical knowledge, advice and support has continued even beyond his retirement in 2015.

AVAILABLE FROM THE ASSOCIATION

METAL-PRO GALV-FRIENDLY MARKERS

Designed for use in the hot dip galvanizing process, this **marking pen** stays on during fabrication but is removed completely in the galvanizing process.

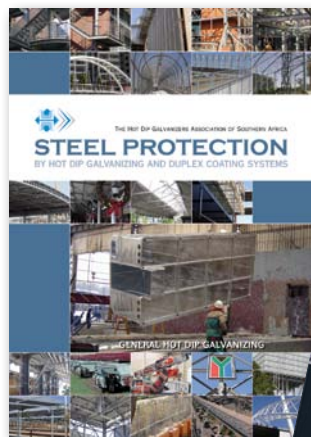
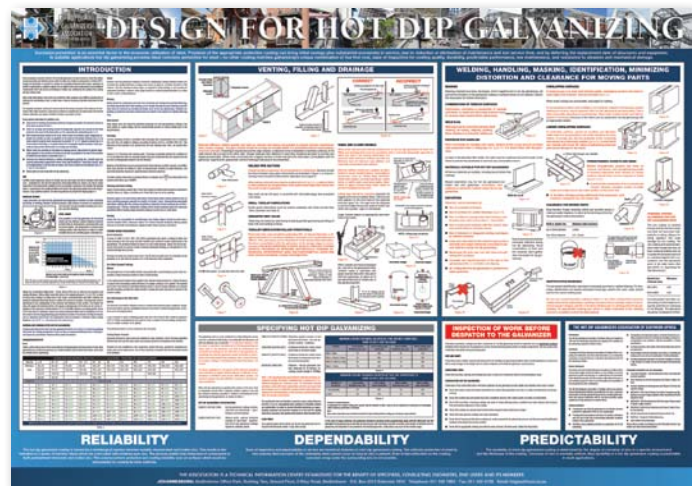
PRO FEATURES

- ◆ Permanent marks during fabrication
- ◆ Ergonomic non-slip rubber PRO GRIP®
- ◆ Marks on wet and oily surfaces
- ◆ Durable clip cap
- ◆ Fast drying
- ◆ Weather resistant marks
- ◆ Crisp lines or bold lines
- ◆ Suitable for all metal surfaces



DESIGN FOR HOT DIP GALVANIZING WALL CHART

The **wallchart** is an invaluable reference chart for fabricators and specifiers. Key information is readily available to allow for best engineering practice for galvanizing.



TECHNICAL GUIDES

The HDGASA **Steel Protection Guide** and **Facts about Hot Dip Galvanizing** are available in high-gloss printed material for reference and guidance.

HOT DIP
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ASSOCIATION
SOUTHERN AFRICA



CALL **NOW** FOR PRICES

CONTACT LARA TEIXEIRA +27 11 456 7960 OR EMAIL hdgasa@icon.co.za

HOT DIP GALVANIZING... THE **BEST PROTECTION!**

GALVANIZING BATH SIZES

ISANDO



13m x 1.45m x 2m
(length x width x depth)

RANDFONTEIN



6m x 1.45m x 1.8m
(length x width x depth)

CONSISTENTLY DELIVERING SUPERIOR QUALITY GALVANIZED PRODUCTS TO ALL OUR CUSTOMERS

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

Armco Galvanizers Randfontein is our second facility based in the Randfontein area. Randfontein has an average output of plus minus 800 tons per month and is geared up to handle light to medium structural steel up and till 6m in length.

The company has it's own SANS 121 2000 ISO 1461 accredited Hot Dip Galvanizing plants. And is listed under the SABS ISO 9001 scheme.

Isando | Tel. +27 11 974 8511

Randfontein | Tel. +27 11 693 5825

Web. www.armco.co.za

