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ZINGA®

ZINGAMETALL

CORROSION UNDER CONTROL

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Corrosion is a natural process with costly and far-reaching consequences for industries and society alike. When it affects operating equipment, systems can become unreliable and safety may be compromised. Beyond that, corrosion impacts public health, the environment, and global sustainability.

To safeguard the long-term integrity of assets, **ZINGAMETALL** provides proven solutions for corrosion protection—effective both as proactive prevention and reactive repair. By mitigating the harmful effects of corrosion, ZINGAMETALL helps industries operate more safely and sustainably.

ZINGAMETALL is committed to protecting the environment including the prevention of environmental pollution and improving environmental performance.



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ZINGA®

A FILM GALVANISING SYSTEM WITH CATHODIC PROTECTION



Every year corrosion is costing billions to the industry. This corrosion doesn't merely make the assets appear neglected, more importantly it causes structural instability and consequently poses a serious safety hazard. It also causes severe disruption of the production process and thus profitability. ZINGA® differentiates from other anti-corrosion methods in combining both Passive and Active protection in an easily applied film galvanising system that not only delivers active cathodic protection but also provides a passive physical shield.

EXTREME ENVIRONMENTS DEMAND
SUPERIOR PROTECTION

WHAT IS ZINGA®?

ZINGA® is a one component Film Galvanising System containing 96% zinc (dust) in its dry film. It is a metallic coating and not a paint. The purity of the zinc used, is so high that dry ZINGA® does not contain any toxic elements.



ACTIVE AND PASSIVE PROTECTION

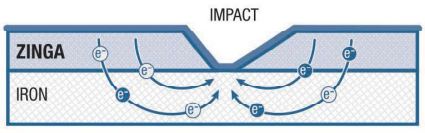
ACTIVE GALVANIC PROTECTION

The zinc in ZINGA® (anode) sacrifices itself, protecting the steel beneath in a comparable and even better way than hot-dip galvanising. Upon impact, the electron flow resulting from a potential difference between the Zinc and steel will prevent the steel from corroding.

PASSIVE BARRIER PROTECTION

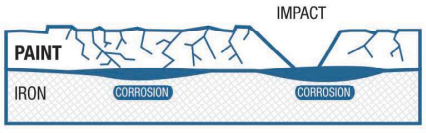
As the ZINGA® oxidises, a layer of zinc salts slowly builds up on the ZINGA® surface, closing the film and enhancing the barrier effect of the coating. Next to this, a supplementary barrier protection is provided by the binder in ZINGA®. The binder reduces the depletion of the Zinc, providing a long lasting active protection.

GALVANIC - NO CORROSION



PROTECTING LAYER	ZINC-SYSTEMS = ACTIVE SYSTEMS
REACTION DUE TO AIR AND MOISTURE	$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$ $Zn \rightarrow Zn^{2+} + 2e^-$
FORMATION OF:	ZnO

NON GALVANIC - CORROSION



PROTECTING LAYER	PAINT-SYSTEMS = PASSIVE SYSTEMS
REACTION DUE TO AIR AND MOISTURE	$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$ $Fe \rightarrow Fe^{2+} + 2e^-$
FORMATION OF:	Fe_2O_3

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ZINGA®

IN ZINC WE TRUST FOR FIGHTING RUST

HOW CAN IT BE USED?

STAND ALONE SYSTEM

ZINGA® provides comparable protection to conventional galvanising without the need for topcoats. Although ZINGA® is only available in grey (the natural colour of zinc), the significant advantage of this form of application is that the ZINGA® layer can be re-coated at any point in the future with the bare minimum of preparation and without compromising the integrity of the coating (see Re-charging of ZINGA®). ZINGA® on its own is often used, because the structure is already on site or too big for the molten zinc baths. For optimal protection, ZINGA® should be applied in two layers of 60 or 90 µm DFT each.

AS A PRIMER WITH SUITABLE TOPCOATS

Not everybody likes the colour grey and with the additional protection of a compatible topcoat the coating durability offered significantly increases. ZINGA® does not even have to start actively working until the topcoat has been compromised and with no underlying corrosion creep or rust bubbling, the topcoat itself inevitably lasts longer. In a duplex system (Active + Passive), ZINGA® should be applied in 1 layer of min. 60 to 80 µm DFT.

AS SHOP PRIMER

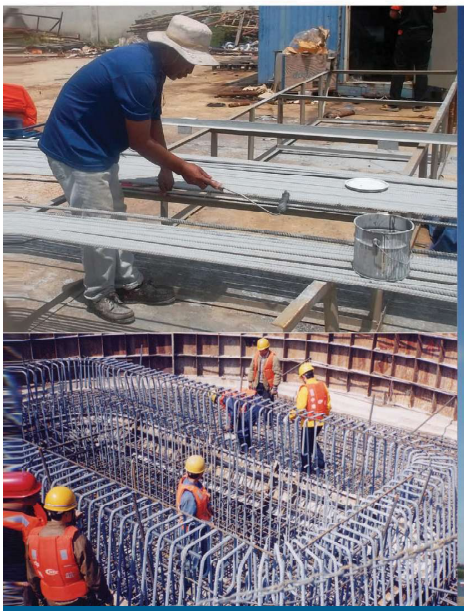
At a thickness of 30-40 µm, ZINGA® can be used as a shop primer. The big benefit is found in the fact that the steel structures do not require reblasting before coating if ZINGA® is applied as a shop primer. The steel structure can be overcoated with ZINGA® to obtain a cathodic protection or with any other paint without the need for reblasting! Zinganised steel structures can be welded and bent during assembly.

REPAIR FOR WORN OR DAMAGED HOT-DIP GALVANISING OR HOT METAL SPRAY

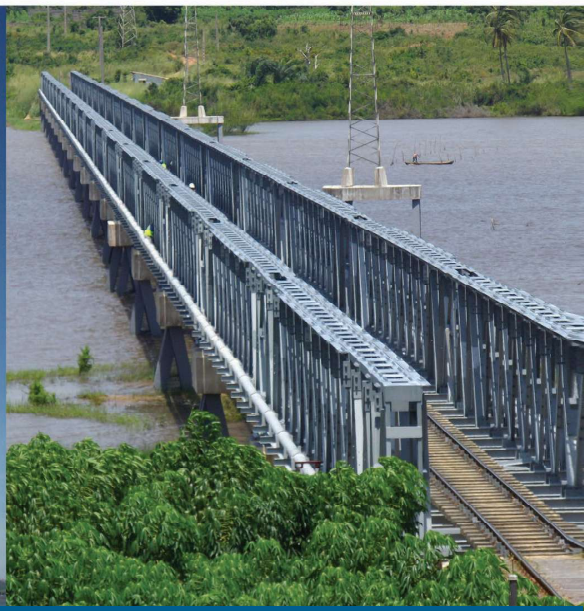
This is probably the most common use of ZINGA® as it requires the simplest surface preparation. ZINGA®'s mechanism of protection is so similar to conventional galvanising that they work in complete unison, as they are merely different forms of zinc. Rather than replacing galvanised assets, structures can simply have their protection "re-charged" by applying ZINGA® to the rough surface of the old galvanising after appropriate decontamination and removal of the salts.

ON REBARS

Widely used in countries where the available concrete can be of lower quality, Zinganising the steel re-bars before assembly and immersion in concrete ensures vastly increased protection from corrosion without reducing the pull-out strength of the bars. Recent tests in three independent laboratories showed that ZINGA® had at least twice the corrosion protection of either galvanised or epoxy coated rebars.

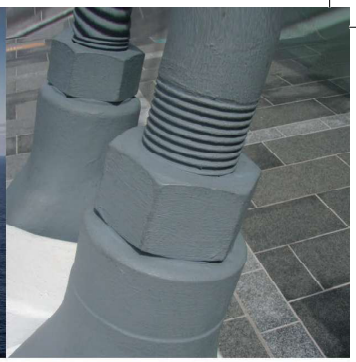






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PHYSICAL & CHEMICAL PROPERTIES

- **RELATIVE DENSITY:**
  2,67 kg/dm³ at 15°C
- **DRY EXTRACT:**
  80% in weight, 58% in volume (ASTM D2697)
  96% Zinc, purity 99,995%
- **TEMPERATURE RESISTANCE:**
  From -40°C to +150°C
- **COLOUR:**
  Grey (zinc)
- **THEORETICAL SPREAD RATE:**
  3,62 m²/kg for 60 µm DFT
- **FLASH POINT:**
  ≥40°C - 60°C
- **SHELF LIFE:**
  Unlimited



With hot-dip galvanisation, deformation of the structure is possible due to the use of high temperatures of molten Zinc. There is also potential for hydrogen embrittlement within welds.

ZINGA®	CHARACTERISTICS	HOT-DIP GALVANISATION	PAINT
✔	Active cathodic protection	✔	✖
✔	Easy application on site	✖	✔
✔	Reloadable	✔ WITH ZINGA®	✖
✔	Overcoatable	✖	✔
✔	Application under extreme circumstances (high & low temperatures and in humid environments)	-	✖ / ✔ *
✔	Unlimited shelf life	-	✖
✔	Contact with potable water = ok**	✔	✖ / ✔ *
✔	Flexible layer, adjusts itself to the metal structure (resistant to temperature variations and mechanical shocks)	✖	✖
✔	Welding on coated steel***	✖	✖
✔	The structure keeps its form during application.	✖	✔

** Requires special paints.*
*** Authorisation depends on local legislation.*
**** Please contact a Zingametall representative for more information.*

HOW TO APPLY ZINGA®?

Once thoroughly mixed, ZINGA® can be applied by using a normal paintbrush, a short-fibre roller (not for the first coat), or a conventional or airless spray-gun. When applying ZINGA® by spraying it must only be thinned with Zingasolv.

ZINGA® can be applied in a wide variety of weather conditions. The application surface temperature range is from -15 °C to +40 °C, where conditions allow with a maximum humidity of 95% so long as the steel temperature is 3 °C above the dew point. Like all coatings the substrate surface should be free from all types of contamination.

PREPARATION OF THE SURFACE

NEW METAL SURFACES:
Steam-clean or high-pressure wash-down all surfaces, followed by a grit or slurry blasting to SA 2.5 to obtain a roughness degree Rz 50 to 70.

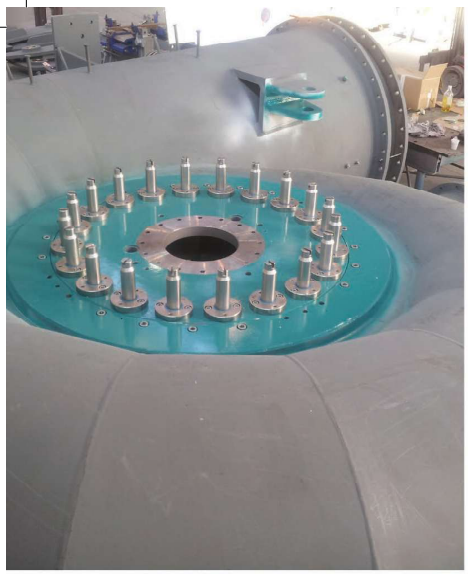
OLD, PREVIOUSLY GALVANISED, PAINTED AND/OR RUSTY SURFACES:
Steam-clean to remove all contamination from porous surfaces. Allow to dry off and blast-clean as normal.

GALVANISED AND ZINGANISED STEEL IN (FAIRLY) GOOD CONDITION:
Steam-clean the surface, followed by a light sweep blast to remove the zinc salt layer.

DRYING TIME

ZINGA® is touch dry and dust-free in about 10 minutes at 20 °C (40 µm DFT).
It can be overcoated with a new layer of ZINGA® 1 hour after touch dry.
ZINGA® can be overcoated with a compatible paint after 6 to 24 hours, depending on drying conditions. To overcoat ZINGA®, use a mist/full coat technique.



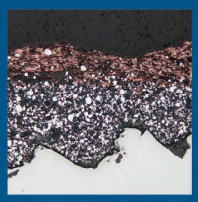






ZINGA® RELOADING

Another of ZINGA®'s unique characteristics is its ability to re-liquidise when a new coat of ZINGA® is applied onto an existing ZINGA® layer to form a single homogeneous layer. This ensures a massive cost saving in on-going maintenance, because the old ZINGA® layer does not need to be removed before re-coating with a new ZINGA® layer (a removal of contaminants is required though).



A thin film of copper dust was applied on top of a first dry coating of ZINGA®. The coating was photographed using a strong microscope (µm scale).



Seven days later, a second coating of ZINGA® was applied on top of the copper dust. The copper dust becomes fully integrated within the two coatings, proving that the homogenisation of the two ZINGA® layers has actually taken place.



The same test has been done with a zinc rich epoxy paint. The layer of copper dust remains intact between the two paint layers. The copper film is clearly visible, demonstrating that the two layers remain separate layers.

INDEPENDENT TEST RESULTS

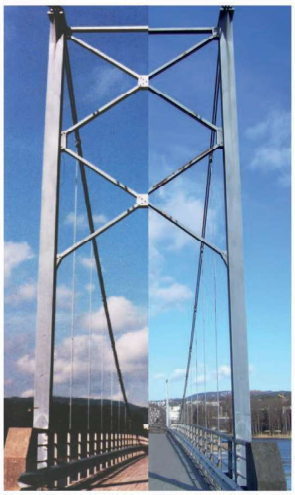
Over the last 30 years ZINGA® has undergone numerous testing at different certified laboratories all over the world. All testing was according to local and international standards. The most important include:

- ISO 12944: ZINGA® 2 x 90 µm DFT - C5 I/M High
- NORSOK M-501- syst. 1 and 7: ZINGA® 2 x 60 µm DFT - passed
- ASTM B-117 (Salt spray): ZINGA® 2 x 90 µm DFT - over 4200 hours passed

CERTIFICATIONS AND APPROVALS

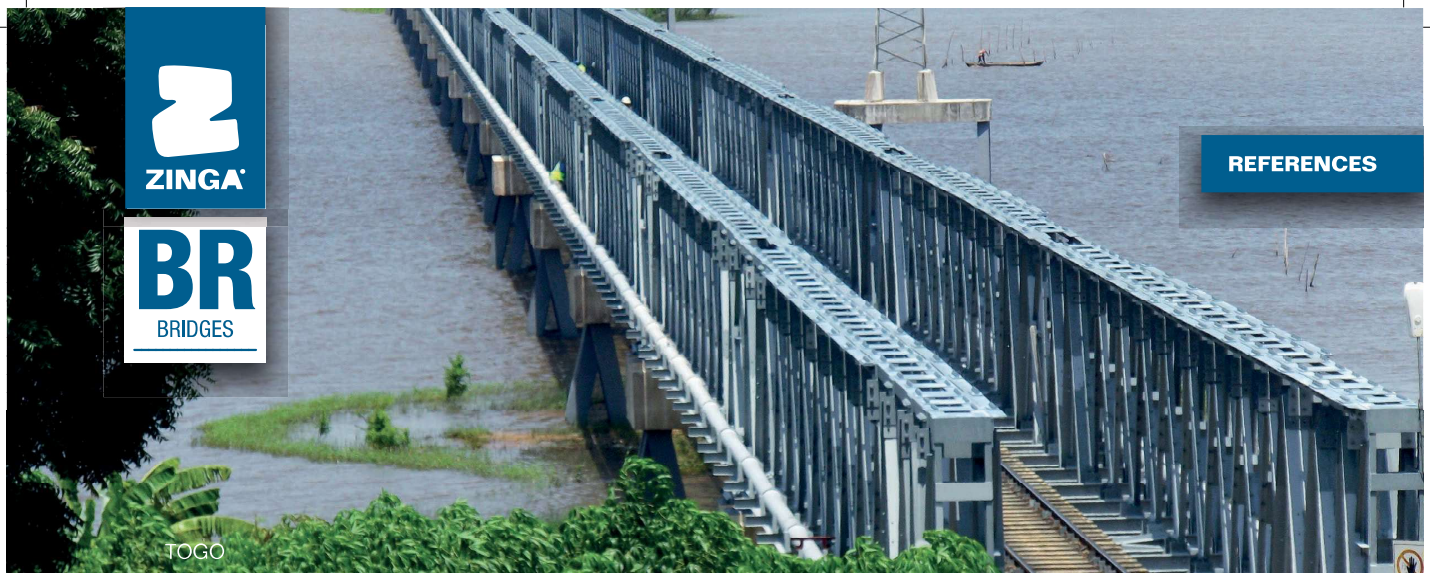
In consequence of ZINGA®'s performance (proven by testing), ZINGA® has been approved for use by governments, companies, armies. The most important include:

- Lloyd's Register (Approval for use in void spaces)
- European Technical Approval (Europe)
- Approval by APAS (Australia)
- Registration by Petrobras (Brazil)
- Approval by Ministry of Transport (Canada)
- Approval by Czech Railway (Czech Republic)
- Approval by GASCO (Egypt)
- Approval by Engineers India Limited (India)
- Approval by Statoil (Norway)
- Approval by CFE (Mexico)
- Approval by Meralco (Philippines)
- Approval by Agrement Technic (Romania)
- Approval by SWCC (Saudi Arabia)
- Approval by Land Rover (UK)
- Approval by Crown's Castle (USA)

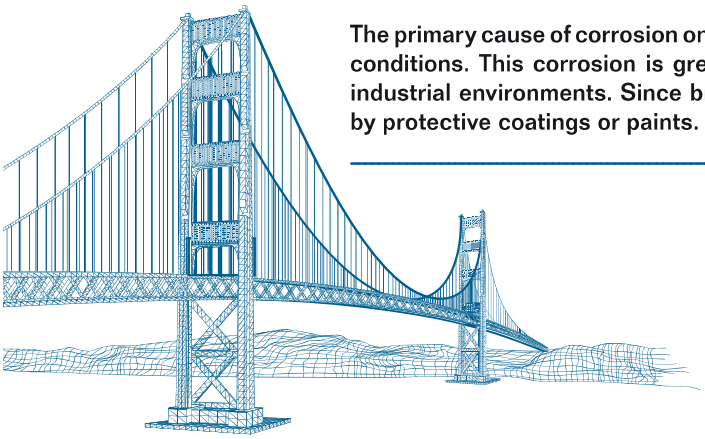


The Kalvoya bridge in Norway has been treated with ZINGA® in 1985. After 30 years, the bridge is still in good condition.

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ZINGA® ON BRIDGES



The primary cause of corrosion on steel bridges is the exposure of the steel to atmospheric conditions. This corrosion is greatly accelerated by marine (salt spray) exposures and industrial environments. Since bridges cannot be dismantled, they should be protected by protective coatings or paints.

Changes in environmental protection regulations have brought about a transformation of the approach to corrosion protection for steel bridges. Until the mid to late 1970s, virtually all steel bridges were protected from corrosion by multiple thin coats of lead- and chromate-containing alkyd paints applied directly over mill scale on the formed steel. Maintenance painting for prevention of corrosion was rare and was primarily practised on larger bridge structures.

Indirect costs to the public are estimated to be at least 10 times higher than the direct corrosion costs: construction of new bridges, failure, or maintenance of corroded bridges can increase wear and tear on automobiles, gasoline usage, and delays in transportation due to bridge closures and, above all, structurally deficient bridges cause a risk to public safety.

ZINGA offers an environmentally friendly, sustainable and effective solution for the corrosion protection of steel bridges, especially in severe marine corrosive environments.



KALVØYA BRIDGE

In 1985 ZINGA was applied by brush on the steel structures of the Kalvøya Bridge in Norway. Paint gloves were used for the carrying cables.
In February 2010, 25 years after the application, the layer thickness of ZINGA on the Kalvøya Bridge was measured. The loss in layer thickness after 25 years was approx. 30 µm.
In 2015 the bridge was entirely refurbished with ZINGA. This could be done at a significantly reduced cost, since the bridge did not have to be reblasted to the bare steel: after a minimal surface preparation, the new ZINGA reliquidised the old layer to form one new layer.

REFERENCES

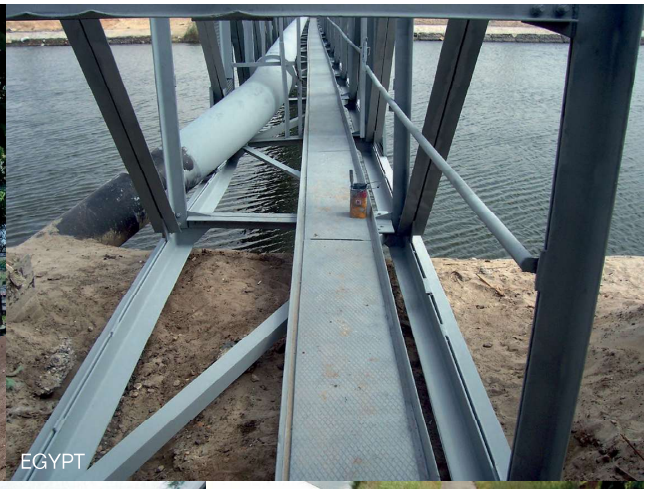
- **AUSTRALIA** - Burdekin River Bridge, Molisson Street Bridge, Bremer River Bridge
- **BELGIUM** - Melle Bridge, Keizer Bridge, Rumst Bridge
- **CHINA** - Tsing Ma Bridge, Stonecutters Bridge, Huangzhou Bay Bridge, Yan'an Freeway
- **EGYPT** - El Salaam Gas Pipeline Bridge
- **ESTONIA** - Siesniki Soft Traffic Bridge, Otiveski Bridge
- **MYANMAR** - TOTAL Traffic Bridge
- **TOGO & BENIN** - Office Togolaise des Phosphates Railway Bridge, Zou and Ouémé Railway Bridge
- **TURKEY** - Izmit Bay Suspension Bridge
- **USA** - Mississippi Biloxi Traffic Bridge

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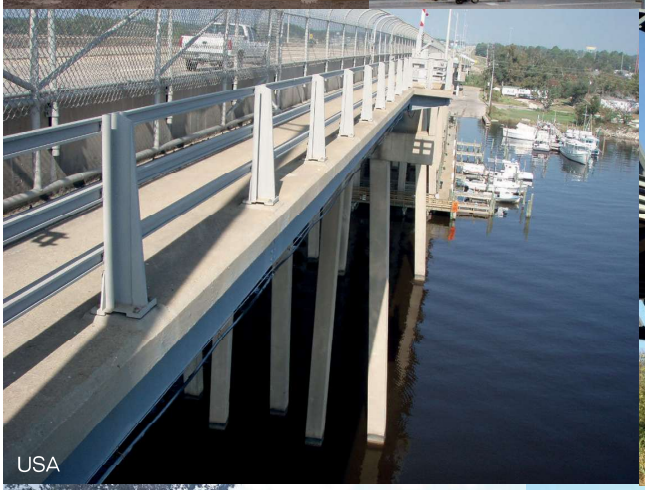

AUSTRALIA


EGYPT


TURKEY


CHINA


BELGIUM


USA


MYANMAR



ESTONIA

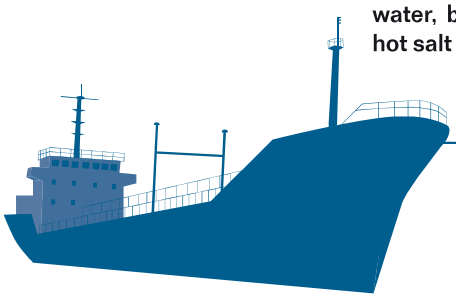

CHINA

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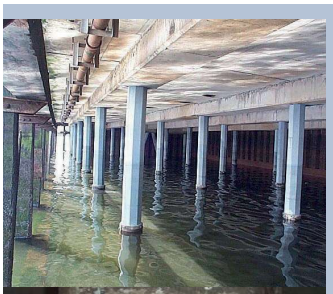
ZINGA® ON SHIPS AND MARINE STRUCTURES

Year after year the cost of marine corrosion has increased with an estimation today of 4% of the Gross National Product. Many different types of destruction can attack structures, ships and other equipment used in sea water service. The term 'aqueous corrosion' describes the majority of the most troublesome problems encountered in contact with sea water, but atmospheric corrosion of metals exposed on or near coastlines, and hot salt corrosion in engines operating at sea or taking in salt-laden air are equally problematical and like aqueous corrosion require a systematic approach to eliminate or manage them.



Sea water, by virtue of its chloride content, is a most efficient electrolyte. The omnipresence of oxygen in marine atmospheres, sea spray and splash zones at the waterline, and sometimes surprisingly at much greater depths, increases the aggressiveness of salt attack. The differential intensity of oxygen dissolved at the waterline or in a droplet of salt spray creates a cell in which attack is concentrated where the oxygen intensity is the lowest. Crevices, which allow ingress of water and chlorides, but from which oxygen is excluded, rapidly become anodic and acidic and are hidden start points of corrosion.

Zingametall offers a total galvanic protection for every simple part of marine structures, from piers to boats, ship hulls, decks, ballast and water tanks.





KILLYBEGS (IRELAND)

The Killybegs fishing pier, which supports factory buildings, is held up by 309 mild-steel hexagonal shaped legs, all approx. 600 mm in diameter. These pier legs have been in the sea for 25 years and due to the salt and the sulphate reducing bacteria present in the sea water, they were losing up to 2 mm per year of their thickness. The waters around Killybegs are particular because they have the highest rate of corrosion in Europe.

The application of ZINGA on the pier legs at Killybegs Harbour was done in the summer of 2000.

In 2003, 2006, 2009 and 2014, inspections performed by SGS concluded that ZINGA was still in very good condition.

REFERENCES

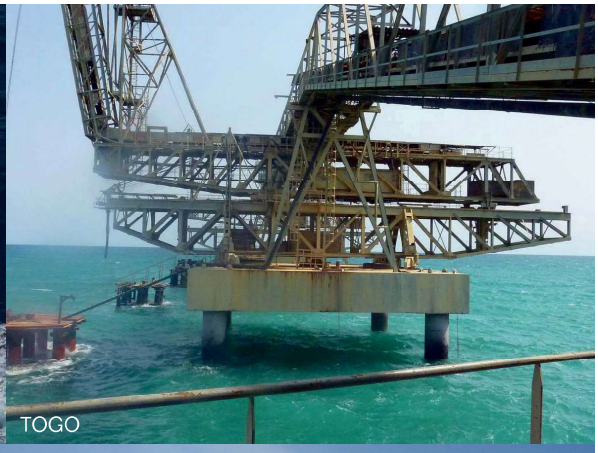
- **BELGIUM** - MV Bonne Industrial Theresia Houseboat Waltzing Mathilde, SV Mercator
- **CANADA** - Pacific Grain Elevator, USNS Zeus Cableship, BC Ferry Terminal
- **INDONESIA** - Indonesia Navy Ships
- **IRELAND** - Killybegs Fishing Pier, Bangor Harbour Piles
- **LA REUNION** - St. Paul's Jetty
- **TAHITI** - ADT Fire Fighting Plane Hangar
- **TOGO** - Office Togolais des Phosphates Charging Crane
- **UNITED KINGDOM** - NB Kingsground, MV Copious, SY Adela Potable Water Tanks

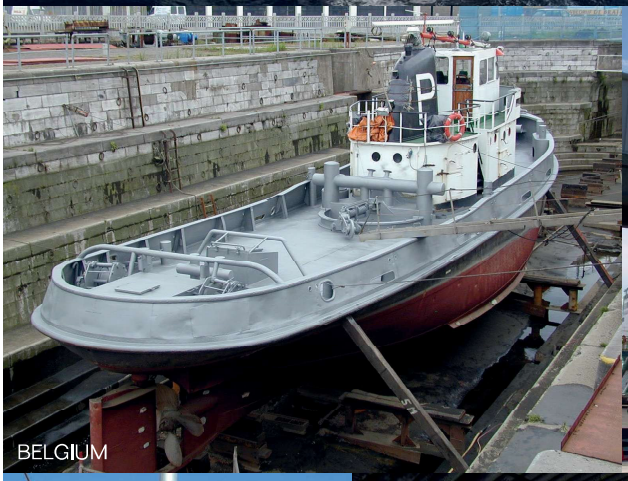
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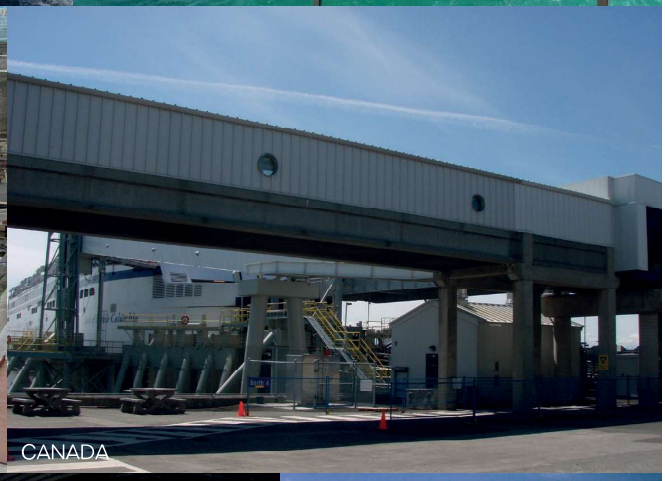
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UNITED KINGDOM

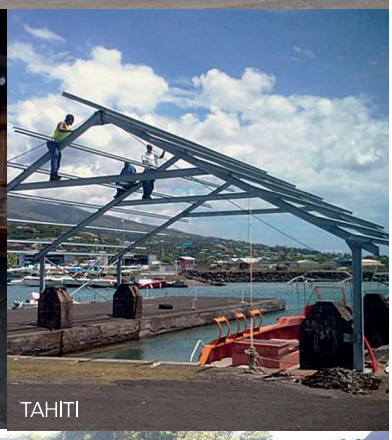

TOGO


BELGIUM


CANADA


LA REUNION


UNITED KINGDOM


TAHITI


INDONESIA



BELGIUM

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ZINGA® ON OFFSHORE STRUCTURES

Offshore structures by nature are exposed to some of the harshest environmental conditions in the world. The structural integrity and life of offshore structures is the single most important driver throughout its service life.



With corrosion posing an ever increasing risk to the depletion of structural integrity and featuring more regularly on operators' agendas, an effective corrosion prevention strategy and system for key metallic structural components is imperative throughout operation life to ensure the longevity of the offshore industry.

Extensive infrastructure is required to support the offshore production industry. There are more than 6500 offshore oil and gas installations in some 53 countries around the world.

An offshore platform has significant exposure in seawater immersion, splash zone, and salt air. Corrosion of steel in these environments can be greater than 100 mils per year. Corrosion rates are the highest in the splash zone. In addition to the marine environment, offshore platforms have areas subject to severe abrasion and highly corrosive water chemistries.

Zingametall offers a complete galvanic protection for all the different parts of offshore structures, from jackets to platforms, living areas, heli decks, pipelines, pylons and cranes, exhausts and tanks.



OMV PETROM (ROMANIA)

OMV Petrom S.A. is a Romanian oil company, the largest corporation in Romania and the largest gas and oil producer in Eastern Europe. It is a subsidiary of OMV. Between July and October 2013, ZINGA was used on the rehabilitation of an offshore oil platform. Before application with ZINGA, the platform was in very bad shape, showing corrosion attack over the entire surface.
A ZINGA duplex system with sealer and topcoat system was applied after thorough surface preparation.

REFERENCES

- **BELGIUM** - Smulders Eneco Wind Turbines
- **BRAZIL** - Polvo Drilling Platform
- **FRANCE** - Direction Départementale de l'Équipement Buoys
- **GHANA** - Triton Logging Barge Deck
- **INDONESIA** - Transocean Sedco Forex Oil Rig
- **NORWAY** - Statoil Oseberg and Njord A Platform
- **ROMANIA** - OMV Petrol Oil Platform
- **THAILAND** - Royal Thai Navy
- **UNITED KINGDOM** - Vector International, Shell Oil, Dolphin Drilling, BP, Cooper Cameron

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ROMANIA


UNITED KINGDOM


THAILAND


BRAZIL

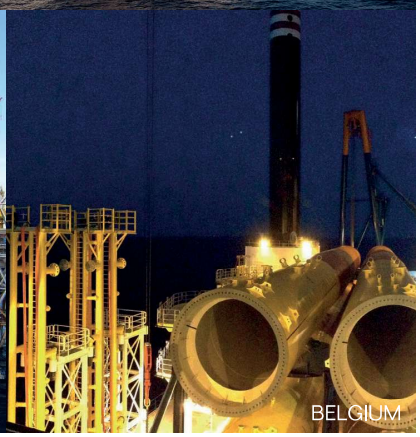

FRANCE


GHANA

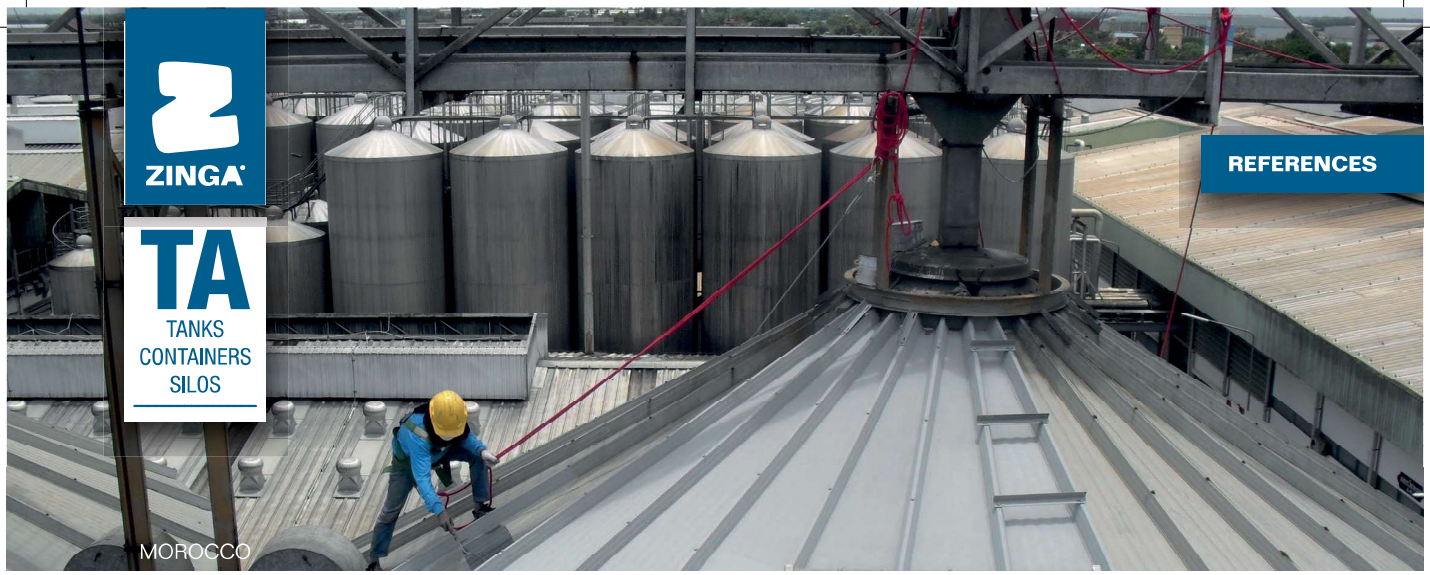

NORWAY


INDONESIA


NORWAY


BELGIUM

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ZINGA® ON TANKS, CONTAINERS & SILOS

Containers, tanks and silos are used around the world to store a wide array of materials. The containers protect the stored materials from the environment, but the containers should also be protected from the effects of the mostly harsh weather conditions they are in. Leaking storage tanks, whether above or below ground, can pollute the environment, threaten public health, and lead to billions of dollars in direct and indirect costs.



Containers are exposed to various corrosive elements such as airborne salt and industrial pollutants, rain and saltwater. Transport damage during loading onto and unloading off trucks, train beds and ships breaches the paint coating, which contributes further to corrosion. The result is shortened container life and high costs for container repair or replacement.

The main reason for storage tank failure is corrosion. Fortunately, corrosion prevention technology exists, which can protect storage tanks and keep them structurally sound for years to come.

ZINGA offers a sustainable long-lasting protection to containers, tanks and silos by creating an active, galvanic protection to the underlying steel.



SHELL (MOROCCO)

Since 2006, 4 huge storage tanks for hydrocarbon products that are property of Shell have been repaired using a system based on ZINGA.

The biggest of these storage tanks measured 16 meters in height and 20 meters in diameter and has been repaired in November 2007.

In order to provide long lasting protection in the harsh marine and chemical environment, a duplex system, using Zingalufer as a sealer, has been used. This system has been succesfully tested according to ISO 12944.

REFERENCES

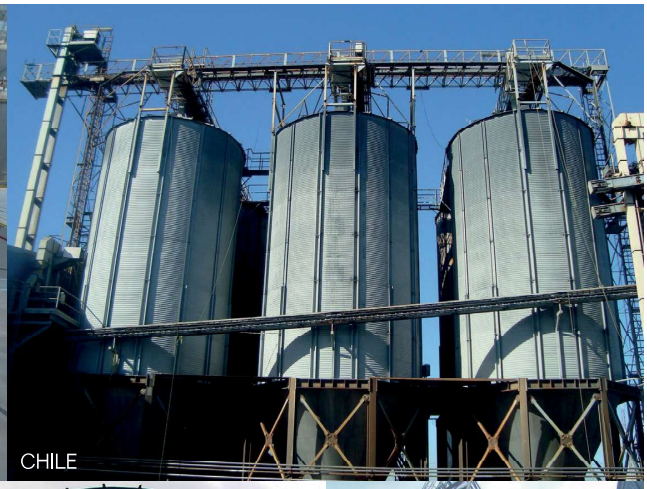
- **BELARUS** - Kobrin Oil Pumping Station Tanks
- **BELGIUM** - Coca-Cola Storage Tank, Paesen Concrete Mill Silos, Quartes Cattle Feed Silos, Snack Foods Silo
- **CHILE** - Ewos Storage Tanks
- **GHANA** - Dangote Greenview Cement Bagging Plant
- **MOROCCO** - Grain Silos Nador Cereales, Shell Storage Tanks, Hydro Tanks
- **TAIWAN** - Maersk Containers, Bomta Storage Tank
- **THAILAND** - Chang Beer Storage Tanks, Red Bull Storage Tanks
- **UNITED KINGDOM** - Exxon Mobile Oil Storage Tank, Braithwaite Potable Water Tank

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MOROCCO


CHILE


UNITED KINGDOM


BELGIUM


THAILAND


BELGIUM


GHANA


THAILAND


BELGIUM


BELARUS

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ZINGA

RI
ROAD INFRASTRUCTURE

ZINGA® ON ROAD INFRASTRUCTURE



The development of modern transport infrastructure, transport systems and vehicles belongs to the fundaments of competitiveness. The basis for choice and verification of materials and long-term surface corrosion treatments exposed to atmospheric environment is the degree of corrosivity.
For atmospheric corrosion, there are two dominant corrosion stimulators – industrial air pollution represented by SO_2 and salinity.

The proliferation of rusted road infrastructure in many northern countries identified road salt as a major cause of corrosion. Other contributors, however, include sea spray in coastal areas, dust-control chemicals (e.g. calcium chloride) in rural areas, and atmospheric pollutants from the burning of organic fuels.

These pollutants -nitrogen oxide (NO_x) and sulfur dioxide (SO_x)- convert into acids (nitric and sulfuric acid) that cause acid rain, acid dew, and acid snow (i.e. acid deposition). Acid deposition increases the acidity (i.e. lowers the pH) of the environment, which hampers the formation of natural protective films on metal surfaces. When low-pH conditions are combined with chloride ions from road salt and sea spray, the corrosivity of the highway environment is significantly increased.

ZINGA offers a sustainable protection to road gantries, sign posts and crash barriers. ZINGA as a unique system (180 µm) will offer a protection of more than 15 years in the hardest conditions (C5 I environment).

REFERENCES

- **ALGERIA** - Ets Kechabia Lamp Posts
- **AUSTRALIA** - Signage Gantries Bribie Island
- **GERMANY** - Düsseldorf Highway Crash Barriers
- **SINGAPORE** - Land Transport Authority Crash Barriers
- **THAILAND** - Don Muang Toll Way, Highway Department
- **UKRAINE** - Kiev Road Administration Traffic Lights, Ukravtodor Crash Barriers
- **UK** - British Airway Authorities Crash Barriers
- **URUGUAY** - Katoennatie Light Pole



LAND TRANSPORT AUTHORITY (SINGAPORE)

In April 1998 a test application with ZINGA was done on the guard rails on Ulu Pandan Road in Singapore.
After 12 months of monitoring and observations, the LTA (Land Transport Authority) finally accepted ZINGA.
Since then LTA has embarked on a program of rehabilitating stretches of previously hot dipped galvanized guardrails using ZINGA.
The high quality protection against corrosion, the ease of application for maintenance, the non-toxicity of the process and the reduction in road closures also provided substantial cost-saving benefits for the LTA.

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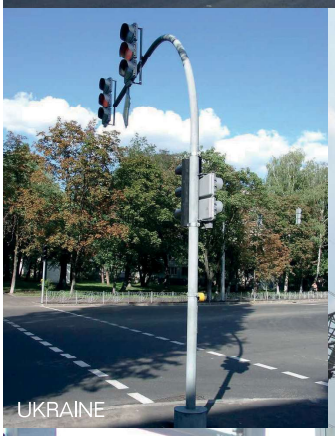
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UKRAINE


ALGERIA


AUSTRALIA


UKRAINE


THAILAND


SINGAPORE


GERMANY


URUGUAY


UKRAINE

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ZINGA® ON PYLONS

The lifetime of a transmission tower may reach 80 to 120 years, proper maintenance provided. Within this time some elements need to be changed (maybe earth wires, conductors, clamps), others need refurbishment (foundations, earthing grid).
In most cases steel towers need protection against corrosion. Hot dip galvanising is a common method for such protection. The galvanising materials do not last forever and after a certain period of time, coating of structures on site becomes necessary (maintenance coating).

ZINGA is the ideal solution when it comes to the protection of pylons or electricity poles. The vast majority of pylons are hot-dipped. This is because they consist of small elements bolted together (easy to hot-dip) and because most pylons are situated in highly corrosive areas.

Since the structures are to be in constant operation modus (a shut down means no electricity), they can not be dismantled for regalvanising. Therefore, to ensure cathodic protection, treatment with a galvanic coating is necessary.

ZINGA can recharge the galvanic protection!



TRANSPOWER (NEW ZEALAND)



Transpower New Zealand Limited is the state-owned enterprise responsible for electric power transmission in New Zealand.

The New Zealand national grid provides the means of transporting bulk electricity from where it is generated to cities, towns and some major industrial users.

Transpower owns and operates 11,806 kilometres (7,336 mi) of transmission lines.

Since 2009, ZINGA in a unique system (2 x 60 µm DFT) has been used on over 330 transmission towers of Transpower, reloading the old hot-dipped pylons.

REFERENCES

- **AUSTRALIA** - Alcoa LTD Pylons, Transend Networks Pylons, Transgrid Pylons, Powerlink Pylons, Energex Pylons
- **AZERBAIJAN** - Bakcell Communication Tower
- **CAMEROON** - Sonel Pylons
- **COSTA RICA** - ICE High Tension Pylons
- **CZECH REPUBLIC** - Krasikov Transformer Station
- **INDONESIA** - PLN High Tension Pylons
- **MALAYSIA** - Tenaga Nasional Berhad Pylons
- **NEW ZEALAND** - Transpower Pylons
- **ROMANIA** - Muntenia Pylons

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AZERBAIJAN


NEW ZEALAND



INDONESIA



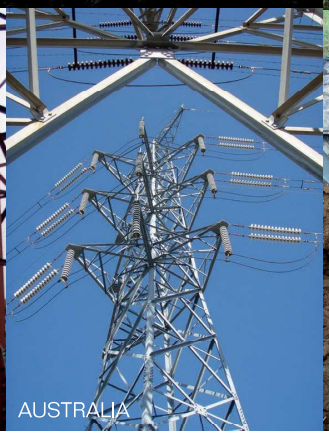
CZECH REPUBLIC


MALAYSIA


COSTA RICA


CAMEROON


ROMANIA


AUSTRALIA


COSTA RICA

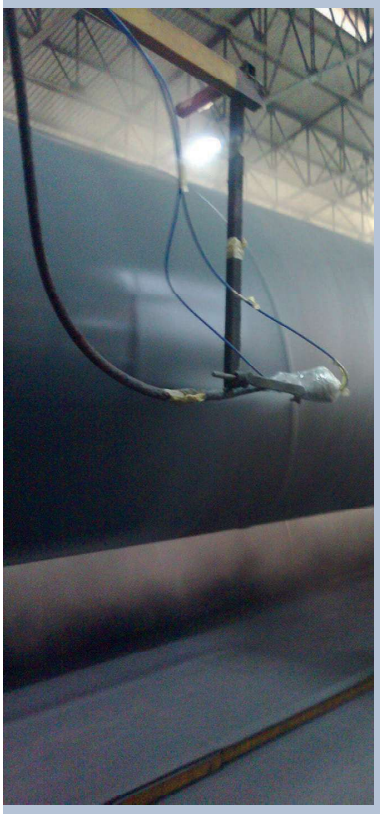

AUSTRALIA

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ZINGA® ON PIPELINES

Unprotected pipelines, whether buried in the ground, exposed to the atmosphere, or submerged in water, are susceptible to corrosion. Without proper maintenance, every pipeline system will deteriorate eventually. Corrosion will weaken the structural integrity of a pipeline and make it an unsafe vehicle for transporting potentially hazardous materials. However, technology exists to extend pipeline structural life indefinitely if applied correctly and maintained consistently.



HATBORU (TURKEY)

Hatboru is a family owned company, established in the 1970's, located in the south east of Turkey. It is the 3rd biggest spiral welded steel pipes producer in Turkey with very qualified leading people and equipped with a latest generation production line.

In November 2011 ZINGA was used on the outside of welded pipes for a potable water pipeline project in Azerbaijan.

The total project is a pipeline of 120 km, which was finished in 4 sections of 30 km each in 2012.

In total about 30 Tons of ZINGA were used.

Pipelines play an extremely important role throughout the world as a means of transportation for gases and liquids over long distances from their sources to the ultimate consumers. The general public is not aware of the number of pipelines that are continually in service as a primary means of transportation. A buried operating pipeline is rather unobtrusive and rarely makes its presence known except at valves, pumping or compressor stations, or terminals.

Effective corrosion control can extend the useful life of all pipelines. The increased risk of pipeline failure far outweighs the costs associated with installing, monitoring, and maintaining corrosion control systems. Preventing pipelines from deteriorating and failing will save money, preserve the environment, and protect public safety.

ZINGA can be used on both the outside and inside of pipelines, whether in marine or industrial environments. ZINGA has been used as a unique system and in a duplex system (paint topcoat) for signal coloured pipelines. ZINGA can also be used to prevent corrosion under insulation (CUI).

REFERENCES

- **BELGIUM** - Total Petrochemical Feluy Pipings
- **EGYPT** - Gasco Company Pipelines, El Salaam Bridge
- **GHANA** - Metronco Oil Pipelines, Akasombo Dam
- **POLAND** - INTOP Gas Pipelines
- **RUSSIA** - Mosvodokanal Water Pipelines
- **THAILAND** - Donmuang Airport Airconditioning, Suvarnabhumi Airport Water Treatment
- **TURKEY** - Hatboru Pipeline

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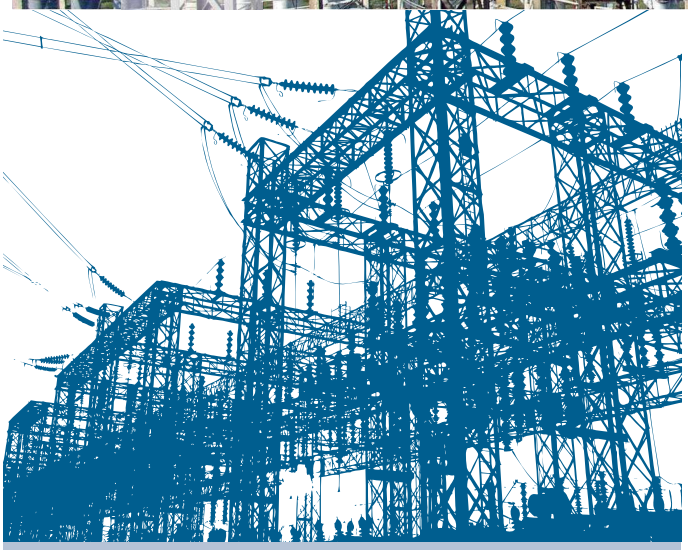


ZINGA®

PP
POWER PLANTS

REFERENCES


UKRAINE



ZINGA® ON POWER PLANTS

Major failures have occurred in power plants due to single-phase or wet-steam erosion-corrosion, resulting in injuries or loss of life as well as extensive plant downtime. Both nuclear and fossil power plants as well as petrochemical plants are susceptible to erosion-corrosion.

In power plants, corrosion processes are strongly affected by operational measured variables such as environment medium, construction, material and/or mechanical load. The substantial material strains by the operating pressure, the mass flow, the temperature of the cooling water, the special requirements of water chemistry (conductivity) represent a special hazard regarding corrosive material changes in this range.

Important influence factors which can favour corrosion processes at safety-relevant components are the operating conditions existing in Light Water Reactor plants such as water chemistry, assigned materials, mechanical and thermal loads, neutron irradiation, operational state (full power or outage) and geometrical factors. In particular in the first years of nuclear energy production, corrosion damages in the nuclear power plants led to undesired consequences.

ZINGA can be used on all structural steel parts of the power plants, as it provides durable corrosion protection to steel in industrial environments.

REFERENCES

- **AUSTRALIA** - Alcoa LTD
- **AUSTRIA** - Gugler Waterturbines
- **BELGIUM** - Tractebel Power Station
- **CZECH REPUBLIC** - Krasikov Transformer Station, Temelin Nuclear Power Plant
- **UKRAINE** - Kiev Energo Power Plant, Zuyevskaya Thermal Power Plant, Chernobyl Nuclear Power Station
- **SOUTH AFRICA** - Port Elisabeth Electricity Department



RUNCORN WTE PLANT (UNITED KINGDOM)

In 2011, the construction of a new Waste-to-Energy facility was started. This project 'Runcorn II', was finished in 2015.
The facility is located in Manchester, UK where it will offer a solution for the large amount of municipal waste by using this waste to produce up to 80 MW of electricity and 54 MW of heat.
The large steel beams at the top of the building, which are too big to be hot dip galvanised, were treated with ZINGA.
This is the first major project in the UK where a combination of hot-dip galvanised and film-galvanised steelwork has been assembled into a single structure.

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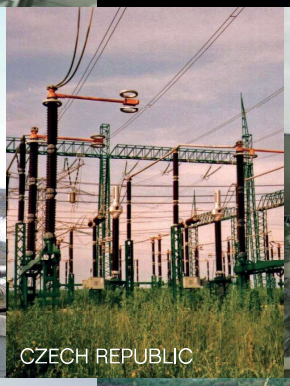
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AUSTRIA


AUSTRALIA


UKRAINE


CZECH REPUBLIC


BELGIUM


SOUTH AFRICA


UKRAINE


AUSTRIA


CZECH REPUBLIC


UNITED KINGDOM





ZINGA® ON RAILWAYS

Rail corrosion, particularly at the base of the rail, is a serious problem in railway transit systems.
Rail base corrosion compromises the integrity of the rail and could result in catastrophic failures.

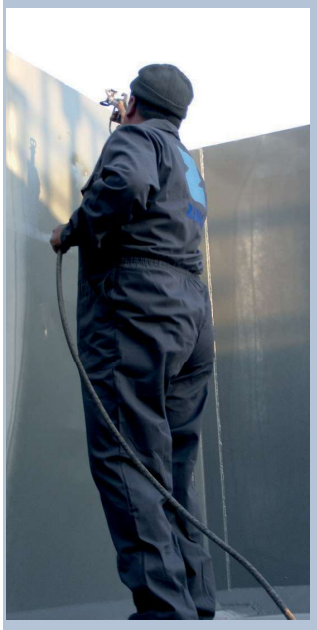
Modern railway systems are subject to use with fast trains and large loads. The primary requirement is structural integrity, which determines the suitability of steel for rail track applications. It depends on interactions between engineering parameters, material properties and the environment.

Corrosion of rails has been recognized as one of the serious causes of damage to railway track. The corrosion of rail along with cyclic loading may lead to corrosion fatigue failure of the railway track. Cases of failure of rails have come to light at load much below the safe load mainly due to deterioration of rail as a result of corrosion. Railway track comes close to different environments during its service life, like seacoast environment, various humidity of the atmosphere, different temperature of the atmosphere and tunnel area, which is acidic in nature. Strength of the rail material changes with the change in atmosphere.

A rail coated with ZINGA can withstand harsh coastal conditions or corrosive railway tunnels, expanding the lifetime of the railway tracks.

REFERENCES

- **AUSTRALIA** - Corduroy Bridge, Queensland Rail Bridges
- **BELGIUM** - Cita Railway Wagon, De Lijn Electricity Poles
- **BRAZIL** - Dorbras Railway Company
- **CAMEROON** - Camrail Wagons
- **CHINA** - Maglev Transrapid Railway, Yuehai Passage Train Terminal, Chongqing Monorail
- **FRANCE** - SNCF
- **ROMANIA** - Rompetrol
- **SAUDI-ARABIA** - Mashair Railway
- **TOGO** - SNPT Railway Bridge
- **UNITED KINGDOM** - London Underground



ROMPETROL (ROMANIA)

In November 2009, ZINGA was used to protect 70 railway freight carriages from 'Rompetrol' against corrosion.
The wagons are used for bulk transport of coal or sulphur.

On each of these 70 railway wagons 80 kg of ZINGA was consumed.
120 µm DFT in 2 coats of each 60 µm DFT were applied by airless spray gun by the contractor 'General Navorep'.

Whilst the original coating failed within 6 months after application, the ZINGA system was evaluated after 1 year and was in excellent condition.

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AUSTRALIA



CHINA

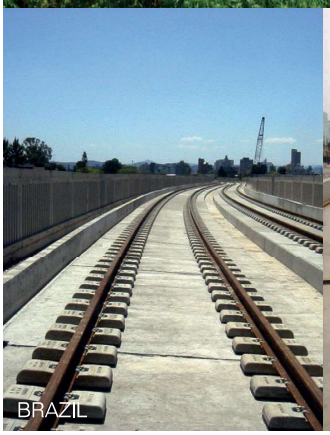


BELGIUM


CAMEROON


TOGO


ROMANIA


BRAZIL

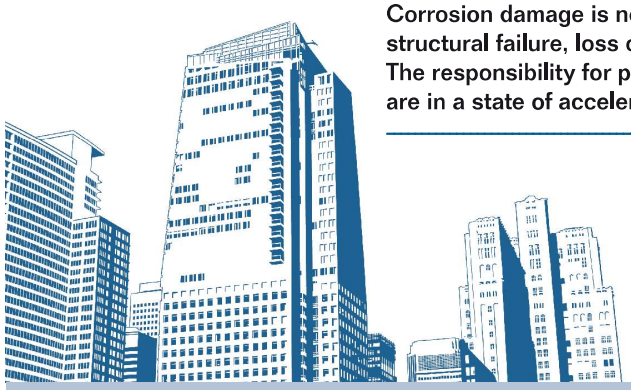

CHINA


SAUDI-ARABIA



ZINGA® ON INFRASTRUCTURE

Many infrastructure facilities are deteriorating and literally crumbling. One major cause is inattention to corrosion control as part of an overall maintenance program. Corrosion damage is not always visible to the public, but nevertheless can lead to structural failure, loss of life, loss of capital investment, and environmental damage. The responsibility for preserving and maintaining these aging facilities, some of which are in a state of accelerating decay, rests with both the private and public sectors.

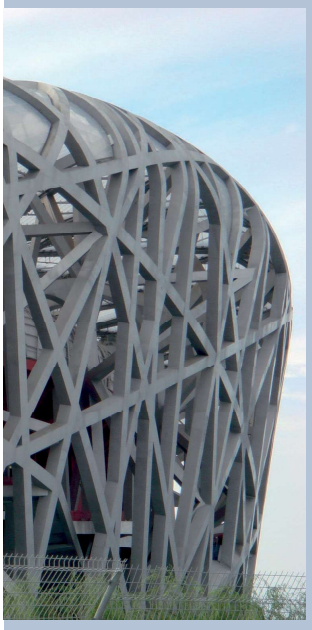


Construction and building industries are the two major and most active sectors in the world. In Europe, they represent 28.1% and 7.5% of employment in industry and in the European economy, respectively. Worldwide, construction and building industries keep on growing at a fast pace. It is estimated in China alone nearly 40 billion cubic meters of combined residential and commercial floor space will be constructed in the next decade, which is equivalent to building one New York every two years or the area of Switzerland.

Whether considering public safety or environmental protection, countries cannot afford to allow their infrastructure facilities to deteriorate. Attention to corrosion in the design, material selection, construction, operation and maintenance of infrastructure facilities will save billions of dollars in repair, maintenance and replacement costs. Controlling corrosion in the infrastructure can prevent premature failure and lengthen useful service life, both of which save money and natural resources, promote public safety, and protect the environment.

Protection of steel structures with ZINGA offers a sensible, sustainable protection.

BIRD'S NEST (CHINA)



The stadium was designed for use throughout the 2008 Summer Olympics and Paralympics. Located in the Olympic Green, the $423 million stadium is the world's largest steel structure and took five years to complete. It is an architectural wonder constructed with more than 42,000 tonnes of steel.

ZINGA was used on special critical areas (such as complex joints, gutters, and ETFE membrane mounted sections) of the Bird's Nest steel structure which could not be metallised (thermally sprayed zinc) after welding during September to December 2006.

REFERENCES

- **AUSTRALIA** - Sydney Myer Music Bowl
- **CHINA** - Bird's Nest, Beijing Theatre, Tianjin Museum, Chongqing Guotai Arts Centre, Beijing Water Park
- **GERMANY** - Düsseldorf Airport, Schalke 04 Footbal Stadium, Tropical Island Dome
- **INDIA** - Mumbai Domestic Airport, DY Patil Dubai Cricket Stadium
- **THAILAND** - Suvarnavhumi Airport
- **UNITED KINGDOM** - Eden Greenhouse Dome

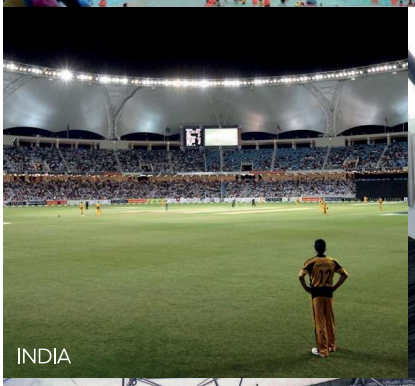
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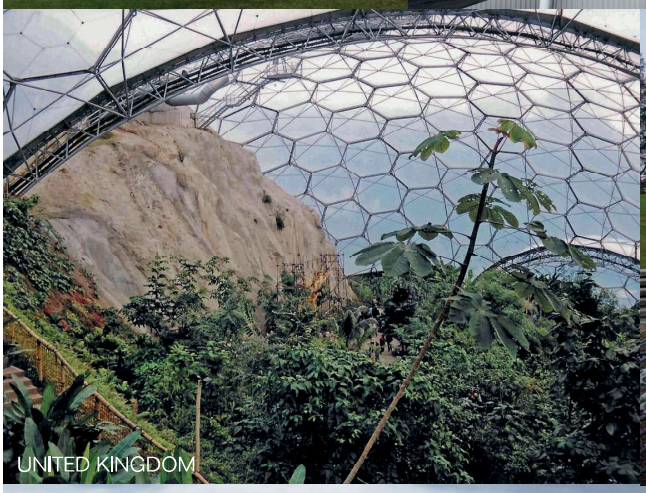

CHINA


INDIA


INDIA


GERMANY


INDIA


UNITED KINGDOM


AUSTRALIA

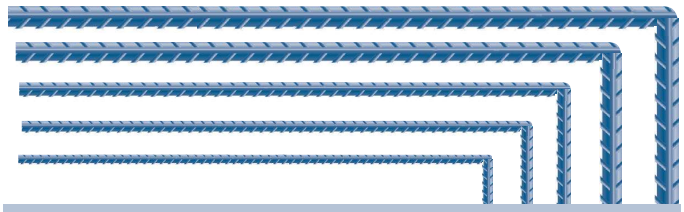

THAILAND

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ZINGA® ON REBARS

In the second half of the 20th century, the construction and building sector was characterised by a concrete craze that assumed vast proportions in all continents. At the same time the technique of reinforcing the concrete with steel bars or rebars was developed. In the beginning, people did not realise that these steel bars would cause such major problems after only a short period of time. Due to the formation of rust, the steel bars began to expand and the concrete began to crack, which led to gigantic safety problems.





HANGZHOU BAY BRIDGE (CHINA)

The Hangzhou Bay Bridge is a highway bridge with a cable-stayed portion across Hangzhou Bay and connects the harbours of Shanghai and Ningbo.

At 35.673 km (22 mi) in length, Hangzhou Bay Bridge is among the ten longest trans-oceanic bridges.

In May 2005, ZINGA was applied on the rebars used for this project.
A supplementary extension to the project (emergency platform) prescribes ZINGA on the entire construction.

The highly alkaline conditions inside concrete provide a passivating environment for the reinforcement bars. A thin layer of oxides forms on the steel surface. This oxide layer is stable in the alkali rich solution and protects the steel against further corrosion. The steel is unlikely to rust as long as the passivating conditions remain at a pH of 10.

Passivation can be destroyed due to a reduction in alkalinity. This can have various causes:
- Infiltration of atmospheric carbon dioxide (CO_2) (carbonation)
- Infiltration of sulfur dioxide (SO_2) in industrial climates
- Infiltration of aggressive chloride ions in marine environments
- Infiltration of de-icing salts sprayed on roads in winter

The rust can form up to 2 times the volume of the initial steel and can cause cracking of the concrete or even the complete destruction of it.

In comparison with all other methods of protection that have been tried out on reinforcing steel, a thin layer of ZINGA (approx. 40-60 µm) provides the best protection at a very low and cost-effective price.

REFERENCES

- **CHINA** - Hangzhou Bay Bridge, Chongqing Water Turbine Works
- **IRAN** - National Iranian Gas Company, Chabahar Port, Automatic Spraying Line
- **KENYA** - Lamu Port Rebars
- **RUSSIA** - Rublevo Water Intake Plant, Civil Construction Rebars

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ZINGA® ON PHOTOVOLTAIC PLANTS

As the world rapidly transitions to renewable energy, the lifetime performance of a solar farm depends not only on the efficiency of the photovoltaic modules but also on the durability and reliability of its supporting steel structures. While solar panels are designed to operate for 30 to 35 years, the challenge lies in ensuring that the foundations and frameworks can match this lifespan with minimal maintenance.

ZINGA®, with its exceptionally high zinc content of 96%, provides the ideal solution. Acting as an advanced system for galvanic protection, repair, and maintenance, ZINGA® guarantees long-lasting corrosion resistance even in the most demanding environments. The product is fully compatible with HDG, making it the perfect choice for touch-ups, reinforcing zinc thickness, and restoring compromised areas without the need for complete replacement.

Application is both efficient and practical. ZINGA® systems can be applied in a single day with limited surface preparation, ensuring minimal downtime during construction or maintenance phases. For projects situated in harsher conditions, such as aggressive soils or environments with elevated chemical exposure, an additional layer of **ZINGATARFREE** provides superior long-term protection, safeguarding critical assets against premature degradation.

For owners and contractors, this translates into one clear advantage: a future-proof solution that guarantees supporting steel structures last as long as the solar panels themselves. With reduced operational expenditure (OPEX), vastly extended maintenance intervals, and proven performance, ZINGA® helps maximize return on investment while ensuring sustainability targets are met.

It is no coincidence that leading companies across the globe have already placed their trust in ZINGA®. From small-scale solar installations to large photovoltaic power plants, ZINGA® has become a trusted partner in securing structural integrity and protecting renewable energy investments for generations to come.

SO
SOLAR



SOME EXAMPLES OF OUR +100 REFERENCES

- **SPAIN** - Carmona Solar Farm
- **SAUDI ARABIA-K.S.A.** - Solar Parks SAUDI ELECTRICITY Cy.
- **INDIA** - Devikot 240MW Solar park
- **VIETNAM** - BIL-2 solar power plant (250MW)
- **IRELAND** - Solar Panel Mounting Brackets (Galway)
- **PERU** – Tacna Solar Plant
- **MEXICO** - Las Lomas de Ocampo
- **FRANCE** – Parc Solaire commune de Salaunes

JORDAN

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SPAIN


FRANCE


UK


PERU




MEXICO



JORDAN – BELECTRIC GULF SOLAR PLANT

The AZEZA (Aqaba Special Economic Zone Authority) invested in a new photovoltaic plant nearby the Amman Airport. The BELECTRIC GULF company, a subsidiary of BELECTRIC Solar & Battery Gmbh (Kolitzheim, Germany) obtained the order. BELECTRIC GULF decided to protect the supporting beams of the solar panels with ZINGA, which were previously hot dip galvanised but already showing black spots and red rust.

The Jordan ZINGA Distributor, JORDAN UNITED FOR GENERAL SUPPLIES (J.U.G.S.) supplied the ZINGA. The works started in 2022 with the Main Contractor YELLOW DOOR ENERGY and the whole project was delivered in March 2023. The whole plant has a capacity of 46 MWp and consists of 395,000 photovoltaic panels (the size of 400 football pitches).

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PSA LIGHTING MASTS – SINGAPORE

PSA (Port of Singapore Authority) is one of the busiest ports in the World.
ZINGA was selected to be coated on 65 lighting masts.
Each lighting masts measures 45 meters in height and coated with a minimum DFT of 120 microns.
The first lighting masts were coated in 2002.
Being a port, the chloride content in the environment is high. There has been no or very little corrosion that has been found on the Zinganized lighting masts.



SURFACE PREPARATION

Wire brush - To remove loose rust

Wash down - To remove contaminants

APPLICATION

ZINGA - 2 Coats by roller or brush

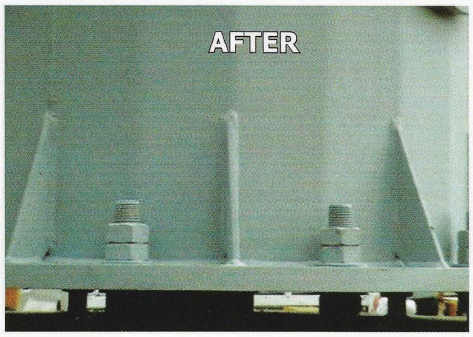
DFT - minimum 120 microns

WARRANTY 10 YEARS AGAINST CORROSION









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ISO 12944
NORSOK M-501

ISO 9001:2008

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PSA LIGHTING MASTS







2002-2013 No Corrossion

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ZINGA® - Viable Alternative to HDG

Extreme Environments Demand Superior Protection

Surface Preparation: Blasted to SSPC SP10 / ISO 8501-1 SA 2.5 with optimal surface profile of 60 µm

Standalone System: Single-pack, stand-alone system certified ISO 12944-6 C5 VH for harsh corrosive environments.

Dry Film Thickness and Reloading : ZINGA® ensures recommended DFT and can be reloaded into a homogeneous layer, saving time and reducing surface preparation.

Fast Turnaround: Second coat can be applied 30 minutes after touch-dry, reducing scaffold, labour, and downtime costs.

Blasting Versatility: Surface prepared to SSPC-SP10 / SA 2.5 using autoblast or manual blasting.

ZINGA® - Film Galvanizing Process

STEP 01: Original Condition of Steel Members on Autoblast Chamber



STEP 02: Steel members blasted to SA 2.5, prior to ZINGA® Application



STEP 03: ZINGA® Application - 2 coats for minimum 120 µm DFT



STEP 04: Final QAQC Check for 10 Years Warranty against Corrosion



Sample Cost Comparison For Structural Steel *

Parameter	HDG	ZINGA® (Viable Alternative to HDG)
Steel Weight	234 tonnes	234 tonnes
Surface Area	2,208 m²	2,208 m²
Unit Cost	450 SGD / tonne	38 SGD / m²
Total Cost	105,300 SGD	83,904 SGD
Warranty	❌None	✅ Years
Cost Difference		**ZINGA® saves ~20%**

*Note: Based on current market rates and may be subject to change

105,300 SGD HDG

83,904 SGD ZINGA®

~20% Cost Savings with ZINGA®

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ABRABLAST

Recycled Crushed Glass Abrasive



SIRIM VERIFIED

AMORPHOUS phase only
NO Crystalline Silica

ENVIRONMENTALLY
Friendlier Abrasive

Abrablast is a versatile blasting media that can be used for most blasting operations, it is safe, economical, environmentally friendlier, and effective for both dry and wet blasting.

- Independent Lab tested in Singapore with Zero Heavy Metals Detected
- Singapore Green Label Certified
- SIRIM Tested Minimum 6 Mohs Hardness
- DOE approved as non scheduled waste

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Typical composition

Chemical	Symbol	% by weight
Sodium Oxide	Na2O	14.2
Magnesium Oxide	MgO	4.02
Aluminium Oxide	Al2O3	1.25
Silicon Dioxide	SiO2	69.4
Sulphur Trioxide	SO3	0.22
Chlorine	Cl	0.06
Potassium Oxide	K2O	0.52
Calcium Oxide	CaO	9.98
Iron (III) Oxide	Fe2O3	0.18
Strontium Oxide	SrO	0.01
Zirconium Dioxide	ZrO2	0.01

Loss on Ignition on balance

Available in:



20/25 kg

JUMBO
1 Tonne

Standard mesh size of 30/60 and 20/40 or customised sized as required.

Why Us ?

- **Competitive Pricing**
- **Exceptional Quality**
- **Customer Centric Services**
- **Sustainable Practices**
- **Ethically Sourced Materials**
- **Industrial and Technical Specialist**

Production Plant

ABRABLAST SDN BHD

Lot 8742, Bt 26 Kg Jeram Batu,
Pekan Nanas 81500, Johor

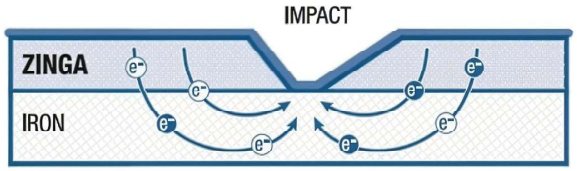
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Discover How ZINGA® Provides Continuous, Active Galvanic Protection

Why Choose ZINGA® Film Galvanizing System

GALVANIC - NO CORROSION



PROTECTING LAYER	ZINC-SYSTEMS = ACTIVE SYSTEMS
REACTION DUE TO AIR AND MOISTURE	
$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$	$Zn \rightarrow Zn^{2+} + 2e^-$
FORMATION OF:	ZnO

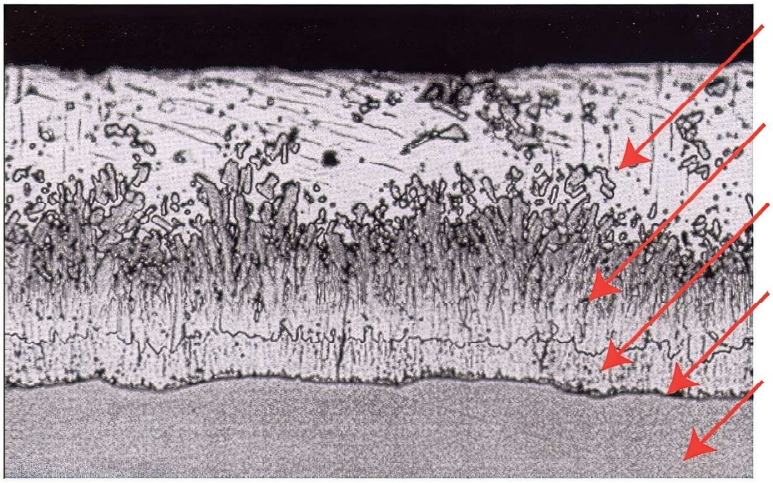
On-Site Application: ZINGA® can be applied directly on-site, no need to dismantle, transport, or send steel members to a HDG yard. Ideal for marine, infrastructure, and remote projects.

Safe for Welding and Touch-Ups: Welding on HDG can release toxic zinc fumes and damage the coating. ZINGA® is weld-safe, it can be applied around welds or reapplied after welding without affecting performance.

Reloadable and Easy to Maintain/Repair: ZINGA® coatings can be reloaded on top of existing ZINGA® and HDG layers, forming a homogenous layer

No Alloy Layers: Unlike HDG, which forms brittle zinc-iron alloy layers that can crack under stress, ZINGA® remains flexible and uniform.

How Corrosion Occurs In HDG



Eta
(100% Zn)
70 DPN Hardness

Zeta
(94% Zn 6% Fe)
179 DPN Hardness

Delta
(90% Zn 10% Fe)
244 DPN Hardness

Gamma
(75% Zn 25%Fe)
250 DPN Hardness

Base Steel
(100% Fe)
159 DPN Hardness

Once the **ETA (pure zinc) layer erodes**, corrosion advances rapidly through the following alloy layers.

Cut edges, welds, and bolt holes are especially vulnerable, they often lack full zinc coverage.

ZINGA®
Asset integrity for eternity.

Zingametall Singapore Pte. Ltd.

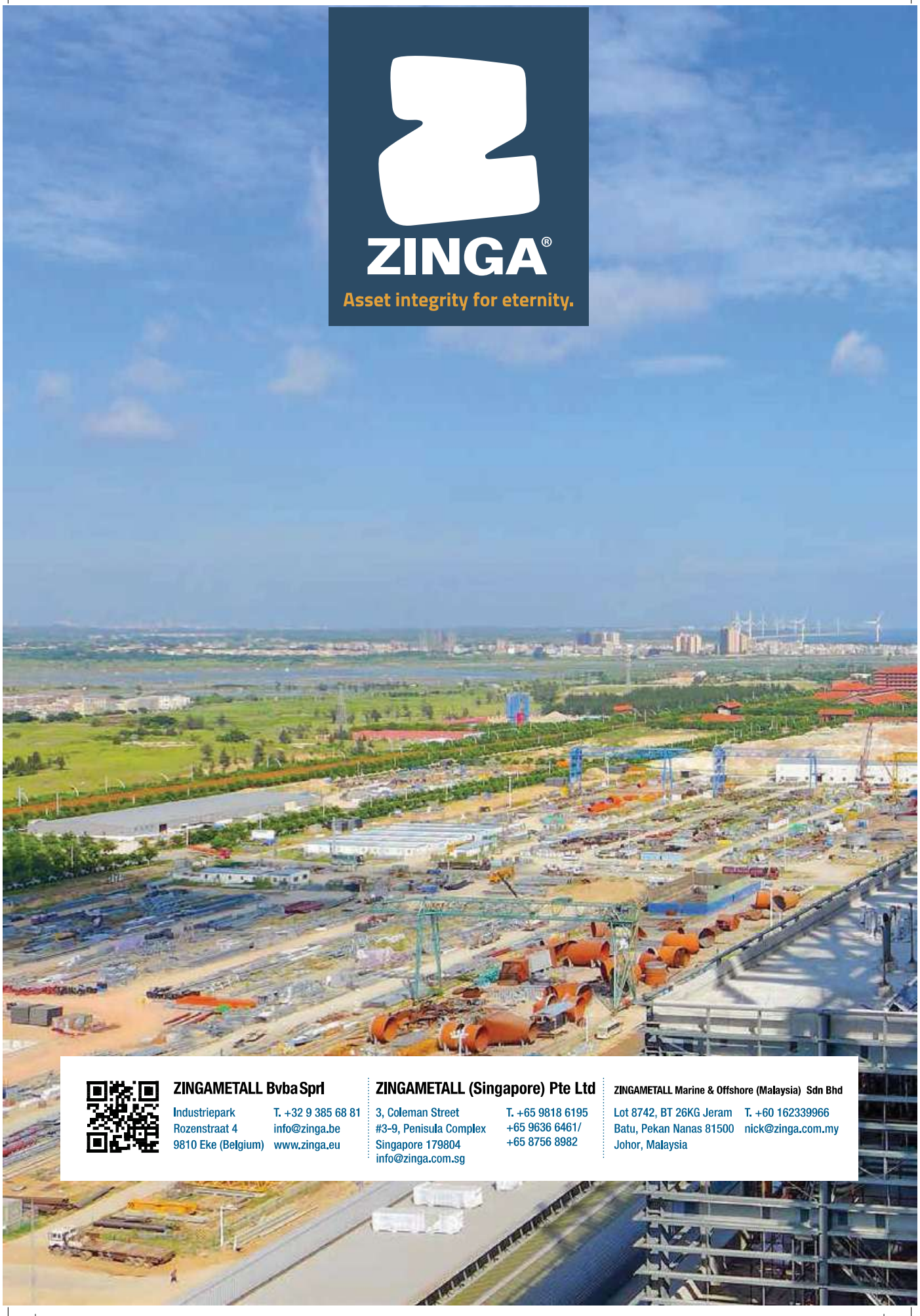
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ISO 12944
NORSOK M-501

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