ZINC
International Zinc Association

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galvanize
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Asia Pacific Edition

GALVANIZING – SUSTAINABILITY AND THE ENVIRONMENT

Special Feature
EPA Victoria/GAA Partnership

CAROUSEL PAVILION
GEELONG WATER FRONT

Carousel Pavilion

Photo courtesy of City of Greater Geelong

Steampacket Place, Quay

Site: Designed to protect and showcase a restored and operating 19th century steam carousel, complete with steam engine and band organ, the steel and glass Carousel Pavilion plays a cornerstone role in the revitalised Geelong Waterfront.

Design: The steel frame of the building comprises six umbrella forms of 12 x 12 metres in a 3 x 2 array. The steel structure is exposed and utilises a range of hollow sections. The cross-linked main arms of the umbrellas are fabricated box sections sculpted to reflect roof loads with minimal use of material. The diagonal arrangement of the mainframes and the combined arching effect develops an inherently stiff structure which eliminates the need for diagonal bracing in roof or walls.

The structure was refined using a 3D software package for analysis, steel design and generation of bills of quantities to compare the cost effectiveness of design permutations. Close attention to connection detailing was important as the structure was prefabricated and fully bolted, contributing to aesthetics, integrity of protection and cost control.

Environment: Sited on the sea wall and exposed to very high wind loading, designers carried out a detailed analysis using Australian Wind Code recommendations for strength limit state conditions. Window mullions are structural and stiffened with a horizontal truss which forms the lower roof edge of the Pavilion.

Sea spray and chloride deposition on the structure were judged to require special attention for steel protection. On careful assessment of the area, top grade after-fabrication galvanizing to AS/NZS4680 (ISO 1461) was used on all structural steel.

Expanded metal cladding on the cantilevered perimeter of the roof had a cost benefit and provided the desired shading with minimum wind resistance.

The Pavilion is a classic example of how steel can cost effectively form the basis of a visually striking building.

Project details

Client:	City of Greater Geelong
Architect:	McGlashan Everist Pty Ltd
Consulting Engineer:	Meinhardt (Vic) Pty Ltd
Fabricator:	North Steel Pty Ltd
Builder:	Wycombe Constructions Pty Ltd

EPA Victoria
GAA Partnership

Galvanizers Demonstrate Environmental Responsibility

Over the past two years the Galvanizers Association of Australia (GAA) has worked in partnership with EPA Victoria to facilitate improved environmental performance of the galvanizing industry. This move follows the global trend exhibited by the mining industry to adopt a quadruple bottom line for assessing corporate performance – shareholder return, social & environmental performance, and governance.

Galvanizers Association of Australia and EPA Victoria have developed an electronic environmental management system (EMS) that specifically addresses environmental issues facing the galvanizing industry. The EMS is designed to enable galvanizers to control all environmental aspects of their operations and to improve performance by developing and implementing cleaner production initiatives.

Being electronic based the EMS allows operators to monitor and track progress of multiple plants at the one time. Top level management can use the electronic EMS to extract accurate, up-to-date information from any location where Internet access is available, allowing efficient, well informed decision making. The electronic EMS has advantages over paper based management systems, which tend to be cumbersome and require high maintenance to remain effective.

In 2001 five Victorian galvanizing plants successfully implemented the EMS. The five plants have reported benefits including:

- improved consistency (product quality)
- achieved and maintained legislative compliance
- continual demonstration of corporate due diligence
- reduced generation of industrial wastes
- mitigated impact on local air quality
- mitigated impact on local surface water quality
- reduced consumption of raw materials
- reduced consumption of utilities
- improved production efficiency; and
- reduced costs

Implementation and maintenance of the EMS will allow galvanizing plants to stay at the forefront of technology and to continually improve their environmental performance.

Architects and builders now have the assurance that the galvanizing products they use have been manufactured in an environmentally and socially responsible manner that meets international standards and protocols.

The EMS framework can be implemented at any galvanizing plant anywhere in the world and is provided free of charge to members of the GAA. For detailed information on the product and/or the partnership please contact:

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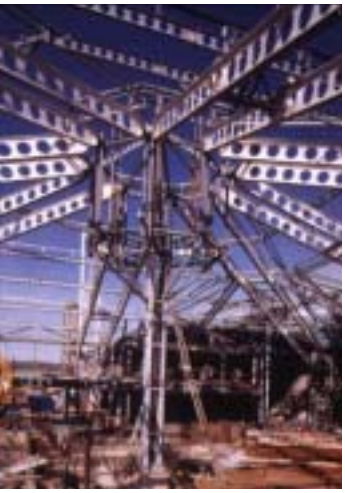
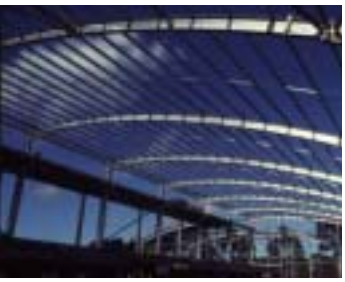
Sustainable Development
every industry's responsibility


Maroondah Dam


Essendon Aquatic Centre


Haileybury Swimming Pool


Power Transmission Towers

Sustainable Development, Sustainability – terms that are often heard but often not fully appreciated.

The philosophy is quite simple and is concerned with ensuring a better quality of life for everyone – now and, importantly, for generations to come.

The concept is common sense based on substantial criteria and principles. It sets out to meet four objectives:

- Social progress which recognises the needs of everyone
- Maintenance of high and stable levels of economic growth and employment
- Efficient protection of the environment
- Prudent use of natural resources

Enlightened governments of the world have espoused the concept of sustainable development and important initiatives to reduce carbon dioxide emissions to help halt global warming for instance, are well known and documented.

Progress in the development and use of products to enhance our standard of living has brought with it new and potentially damaging pressures on our environment and vulnerable ecological systems. It is at this level that industry globally has a crucial role to play in sustainable development, taking steps to minimise its impact on the environment. Responsible industries are those that will survive and prosper in the future. Those which can fundamentally claim to be sustainable have a distinct advantage.

Sustainable use of natural resources

Zinc is the primary raw material in hot dip galvanizing, a process which is simple, clean and cost effective. It is efficient in its use of pre-treatment chemicals and in its use of energy, with all residues of zinc from the dipping process being fully recycled. Furthermore, modern process improvements ensure that even the relatively harmless particulate emissions from the galvanizing process are contained within the plant and filtered.

Whilst zinc ore itself is plentiful, a natural resource mined in Europe, Africa, Australia, Asia Pacific and the Americas, it can be recycled indefinitely without any loss of its chemical or physical properties. At present 30% of zinc used throughout the world is from recycled sources and this figure is rising with increased environmental awareness and improvements in recycling technology.

Galvanized products can be easily recycled as the presence of the zinc coating on steel does not affect its recyclability. Galvanized steel is recycled with other steel scrap in the steel production process; it volatilises early in the process and is collected for reprocessing.

Longevity of galvanized structures

A clear measure of an industry's sustainability must be the longevity of its products. Galvanized steel products offer unsurpassed protection against corrosion. They are maintenance free and eliminate the need for solvent containing paints which release VOCs (volatile organic compounds) during application. Zero solvent = zero VOC, a definite benefit in terms of human health.
(Source: GalvAction 21, Galvanizers Association UK)

Maroondah Dam Victoria

All steel used in a recent upgrade of the dam was hot dip galvanized, including railings and auxiliary steelwork for the spillway to ensure long maintenance-free life, without introducing organic coating materials into the precincts of this important source of drinking water.

Essendon Aquatic Centre Victoria

Apart from providing corrosion protection in a swimming pool environment, the natural colour of the hot dip galvanized coating was used as the architectural finish. An added benefit of using hot dip galvanizing was that no on-site repair of the coating was required after erection.

Haileybury Swimming Pool Victoria

This leading independent school installed a swimming pool complex to FINA standards which included facilities for digital times recording. The pool is designed to 51 metres in length to accommodate the optimum level of use by including a floating cross bulkhead of fibreglass, capable of multipurpose use for differing training lengths and pool divisions for swimming, diving or polo. All steel work was self finish after-fabrication galvanized to meet the severe service where regular maintenance could not be accepted.

Power Transmission Towers Victoria

SECV 220kV transmission towers, part of the Newport to Fishermens Bend major transmission loop system, were erected in 1988. These fully galvanized 90-metre high towers are situated in an industrial mild marine environment only five kilometres west of Melbourne's CBD. No maintenance has been required to date and based on previous experience, none will be required for many years.

Zinc – The Vital Micronutrient for Healthy, High-Value Crops

Zinc is absolutely essential for the normal healthy growth and reproduction of all higher plants, animals and humans and is therefore called an "essential trace element" or a "micronutrient". Even where optimum amounts of manures and/or fertilizer nutrients (N, P and K)[1] and water requirements have been satisfied, a crop will not achieve its full potential yield if its supply of zinc in inadequate. A very wide range of crops are affected by zinc deficiency, including: cereals, fodder crops, pulses, bush and tree fruits, nuts, vegetables and non-food crops such as cotton and tobacco.

When crops have a deficient supply of zinc, yield will be reduced and quality of the crop product may also suffer. Losses of up to 30% in the yield of cereal grains in crops such as maize, wheat and rice can occur as a result of "latent" or "hidden" deficiencies without the appearance of any obvious visible symptoms of stress. However, more severe deficiencies (manifested by leaf symptoms) can result in much greater yield losses and even complete crop failure. Zinc treatments have given yield responses of up to 4 tonnes/hectare in wheat and rice and up to 2 t/ha in maize[2].

Why is Zinc Essential for Crop Growth?

Zinc is required in small but critical concentrations to allow several key plant physiological pathways to function normally. These pathways have important roles in photosynthesis and sugar formation, protein synthesis, fertility and seed production, growth regulation and defence against disease. Where zinc is deficient, these physiological functions will be impaired and the health and productivity of the plants will be adversely affected, resulting in lower yields (or even crop failure) and frequently in poorer quality crop products.

Animals and humans also have critical zinc requirements and in areas where zinc deficiency in crops is widespread there is a high risk that the health of livestock and people will also be affected. However, in addition to the zinc content of the diet, its availability to humans and some species of farm livestock is also affected by other dietary components such as the relative amounts of calcium and phytate (a phosphorus-containing compound present in many crops, especially cereals).

Several important food crops can be seriously affected by zinc deficiency. Maize and rice are the most sensitive with wheat being moderately sensitive. Nevertheless, where soils are deficient in zinc, whatever the crop species' relative sensitivity to the problem, if the zinc supply is inadequate, the crops will be affected by deficiency.

Extent of Crop Zinc Deficiency Problems in the World

A study for the Food and Agriculture Organization of the United Nations (FAO) involved 190 field trials in 15 countries around the world by Sillanpää[3] showed that zinc deficiency was the most commonly occurring micronutrient deficiency problem. Zinc deficiency was recorded in 49% of the trials and 25% of these were acute forms with visible symptoms and 24% were latent or hidden deficiencies confirmed by yield responses to zinc amendments. In India and Pakistan, between 50 and 70% of crop-growing soils are affected by zinc deficiency.

The figure below shows the general distribution of the problem but localized deficiencies can occur in many other parts of the world where crops are grown and the soil factors mentioned above occur.

The above is an extract from an article by Brian Alloway, an Emeritus Professor of Soil Science at the University of Reading in England and an independent consultant.

[1] Nitrogen(N), phosphorous(P) and potassium(K).

[2] World average cereal yield is 2.9 t/ha and typical yields of both wheat and rice can range from <1 to 9 t/ha depending on growing conditions and crop management

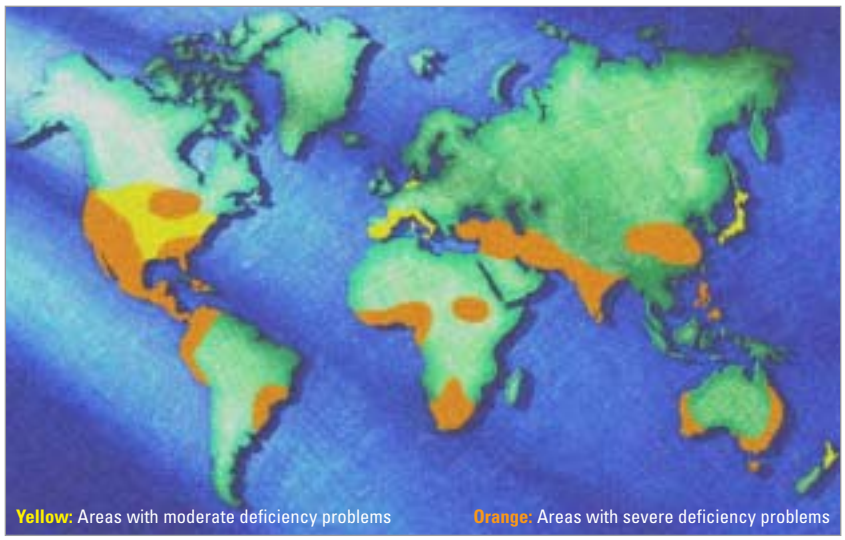
[3] Sillanpää, M. Micronutrient assessment at the country level; an international study. FAO Soils Bulletin No. 63, Food and Agriculture Organization of the United Nations, Rome, 1990.

Source: Zinc Protects, International Zinc Association

Field with severe deficiency of zinc

Adequate zinc status

World zinc deficiency in soil: major areas of reported problems



Based on data from Robson, A.D. (editor) Zinc in Soils and Plants. Kluwer Academic Publishers, Dordrecht, Boston and London, 1993. Other areas may also be affected to varying extents.

For further information about zinc, please visit www.zincworld.org
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