

Steel the Show:

Preventing Oxidisation of Galvanised Steel
with Efficient Specification



Interpon®
POWDER COATINGS

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Introduction

As the Australia construction industry continues to expand, designers and specifiers are under increased pressure to find high performance building products and deliver high quality building projects. With construction costs in Australia on the rise¹ and growing awareness of environmental issues across the globe, there is demand for buildings that are durable, long-lasting and cost-efficient.

However, creating buildings that meet these stringent criteria is no easy task. Given the quantity and variety of building products and systems on the market, it is often difficult to know which solution will yield the best results in the most important performance categories, including corrosion resistance, longevity and design flexibility. In this context, manufacturing or production processes that can make popular building materials,

such as steel, stronger and more aesthetically appealing are worth closer examination.

Australia is one the world's highest consumers of stainless steel – government reports suggest that Australia consumed 270 kilograms per person in 2017.² The construction industry uses approximately 50% of steel.³ Furthermore, global steel demand is growing, with worldwide steel production forecast to rise to 1.8 billion tonnes in 2020 in line with the accelerating pace of consumption.⁴

In this white paper, we take a closer look at steel and how galvanisation can enhance its strength, durability and appearance. We also address the common misconceptions that galvanised steel cannot be powder coated and that it offers only a limited warranty and design life.



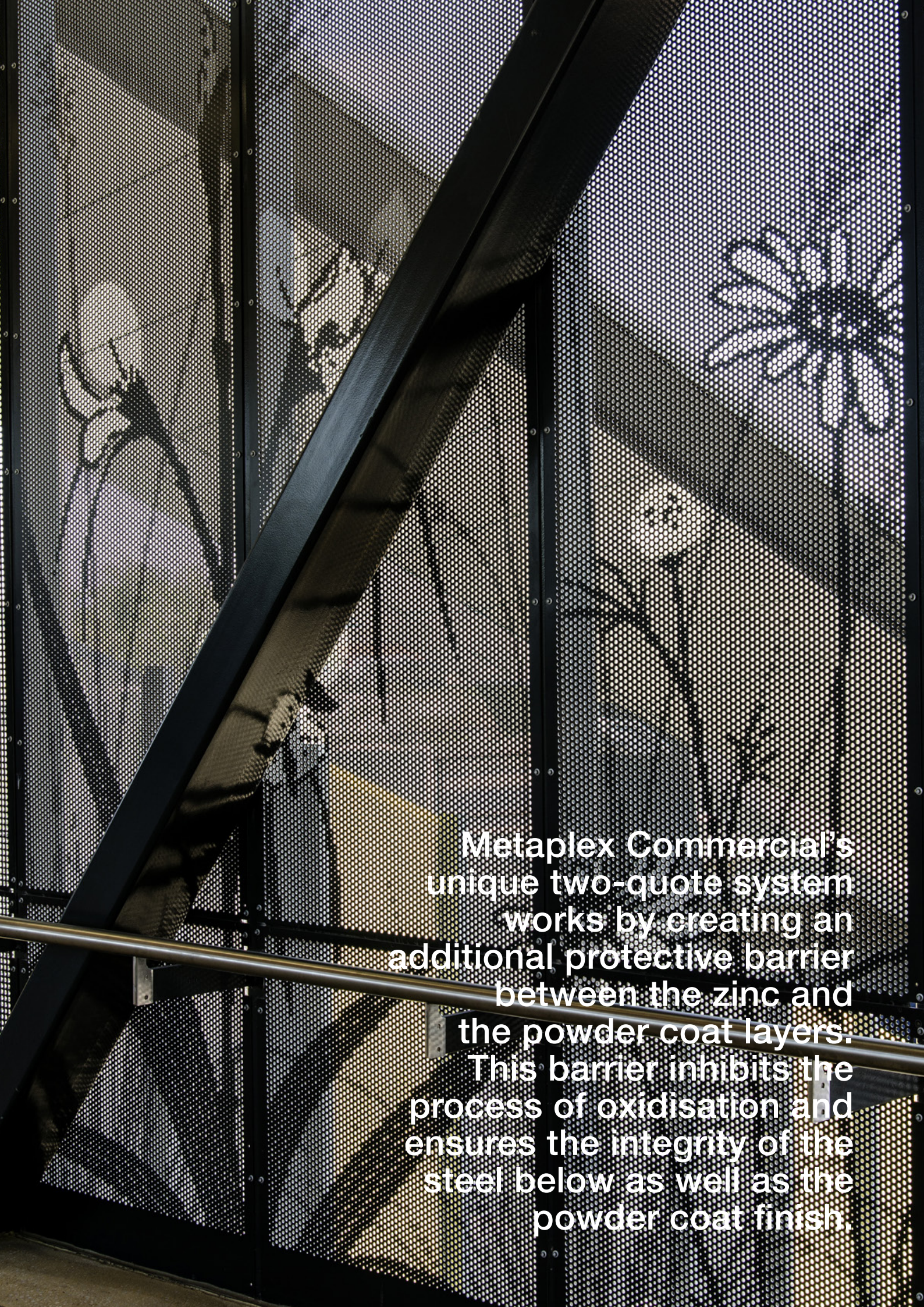
What is Galvanised Steel?

Galvanisation refers to the process of “applying a protective zinc coating to iron or steel, to prevent rusting.”⁵ Steel can be galvanised in a number of ways, including thermal diffusion galvanising (also known as “Sherardizing” after the inventor of the process, Sherard Osborn Cowper-Coles), hot dip galvanising, electro plating, mechanical plating, painting with zinc-rich coatings and zinc-spraying (also known as “metallising”).⁶

Hot dip galvanising is the most common method. This process involves dipping the steel into a bath of molten zinc at high temperatures (approximately 450°C). The zinc reacts to the oxygen in the atmosphere to form zinc oxide and it also reacts with carbon dioxide to form zinc carbonate. The combination of zinc oxide and zinc carbonate gives galvanised steel its characteristic dull grey appearance and prevents corrosion.⁷

Galvanisation is suitable for extruded and sheet metal products.





Metaplex Commercial's
unique two-quote system
works by creating an
additional protective barrier
between the zinc and
the powder coat layers.
This barrier inhibits the
process of oxidation and
ensures the integrity of the
steel below as well as the
powder coat finish.

The Shortcomings of Galvanisation

While galvanisation is an effective means of preventing corrosion, it has several downsides. While inherently durable, in higher corrosivity zones hot dip galvanized steel can undergo accelerated corrosion of the zinc substrate, which reduces its overall service life. The relevant Australian Standards which cover the corrosion rate of steel and zinc under various atmospheric conditions are:

- AS 4312 Atmospheric corrosivity zones in Australia; and
- AS/NZS 2312.2 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Hot dip galvanizing.

Application of a suitable coating to insulate the zinc from the atmosphere and environmental elements can contribute to

a prolonged shelf life provided the coating provides sufficient coverage and integrity.⁸ Powder coatings are a type of coating system that can enhance the durability, performance and resistance to corrosion of galvanised steel.⁹ Such a coating can protect steel substrates by adding a barrier layer with relatively high ohmic resistance between the substrate and the corrosive environment.¹⁰

However, hot dip galvanising and zinc spraying and coating, are inherently unstable. This is because they provide a sacrificial layer atop the steel that can interfere with powder coating finishes. As powder coatings are porous, they allow oxygen to permeate through the zinc layer causing oxidation or rusting. The oxidation process causes the powder coat to chalk, peel or crack, thus diminishing its appearance and performance.



Powder Coatings: Key Considerations

Recent advancements in coating technologies have alleviated some of the issues commonly associated with the use of powder coatings on galvanised steel. Leading powder coat manufacturers offer advanced coating systems that neutralise the shortcomings of galvanising. For example, application of a two-coat system – where a barrier primer is applied to insulate the top powder coat layer from the zinc layer which, in turn, protects the zinc layer from the atmosphere – can provide better uniformity, coverage and protection in comparison to single-coat powder coating methods.

Powder coatings also provide several aesthetic benefits. If applied by a reputable operator, powder coatings can deliver upon more intricate shapes and finishes than conventional paints.¹¹

Conventional paints and other organic materials may also be susceptible to degradation from solar radiation and, if the paint system is too thin, areas of increased zinc thickness may be visible under the finish.¹²

Note that careful surface pre-treatment, uniform coverage and competent thorough application of any coating system is critical to meeting aesthetic and performance requirements. Designers and specifiers should prefer: providers with the relevant expertise and track record in coating systems, products with proven longevity, long term warranties and evidence of performance and compliance with the Australian building code.

Understanding the Risks

The risks of oxidation are serious and can compromise the structural integrity of the steel itself. The University of Illinois reports that rust can weaken steel by degrading its strong mass and replacing it with unstable, flaky powder.¹³ Severe rust can also cause holes in steel sheets and panels. Corroded steel can also impact other structural elements, such as causing cracking, delamination, and spalling in concrete.¹⁴

NACE International, a United States-based corrosion society, reports

that rust causes USD\$276 billion in damage each year in the United States alone.¹⁵ According to research by Curtin University, corrosion costs the Australian economy in excess of AUD\$30 billion each year.¹⁶ These costs can be attributed to downtime, replacement and expensive maintenance regimes. These figures underscore the seriousness of steel corrosion, which can pose large, unplanned project costs if not adequately addressed. Against this backdrop, it is clear that galvanised steel must be adequately protected to ensure structural integrity and cost-efficiency.



Interpon

A division of AkzoNobel, Interpon Powder Coatings is a leading provider of high quality, durable powder coatings for architectural use. The company's genuine commitment to quality and performance is bolstered by its focus on sustainability and cost efficiency. These characteristics are clearly evident in their extensive product catalogue.

The company's range of high quality, versatile products is paired with a comprehensive service offering which includes technical advice and a warranty program.

Interpon Metaplex Commercial – Performance Warranty Systems

The Metaplex Commercial system offers a high performing finishing solution to a range of appropriately-prepared metal substrates. Comprised of the Metaprep Barrier Primer and Interpon D2525 or Interpon 200 products, this system delivers colour and performance on par with all other aluminium powder-coated componentry, with guaranteed performance for up to 15 years (or 10 years if Interpon 200 is used). It is designed for commercial and industrial use and is suitable for mild steel, hot dip galvanising, galvanised tube, hot and cold rolled steel, stainless steel and non-architectural aluminium extrusions.

Metaplex Commercial's unique two-coat system works by creating an additional protective barrier between the zinc and powder coat layers. This barrier inhibits the process of oxidation and ensures the integrity of the steel below as well as the powder coat finish.

While other warranty systems on the market offer corrosion performance for galvanised steel, Interpon Metaplex Commercial is the only powder coat-only performance commercial warranty

for galvanised and stainless steel in Australia and New Zealand. The warranty system includes the primer layer and is only offered when applied by Interpon Approved Applicators.

Manufactured in Australia, Interpon products are specially formulated for Australian and New Zealand environments and feature high UV and color fade resistance and high resistance to mechanical damage.

Compliance

Interpon products required for Metaplex warranties meet the requirements set by the American Architectural Manufacturers Association and Standards Australia, specifically:

- AS 4506 Metal finishing - Thermoset powder coatings;
- AS 3715 Metal finishing - Thermoset powder coating for architectural applications of aluminium and aluminium alloys;
- AAMA 2603 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminium Extrusions and Panels; and
- AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedures for High-Performance Organic Coatings on Aluminium Extrusions and Panels.

Under the Building Code of Australia (BCA), Metaplex Commercial is suitable for all BCA building classifications.

Sustainability

Interpon Powder Coatings are certified by the Green Building Council of Australia and do not contain organic solvents and effectively emit zero volatile organic compounds. Specification of Interpon products can assist sustainable building projects accumulate Green Star points.

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