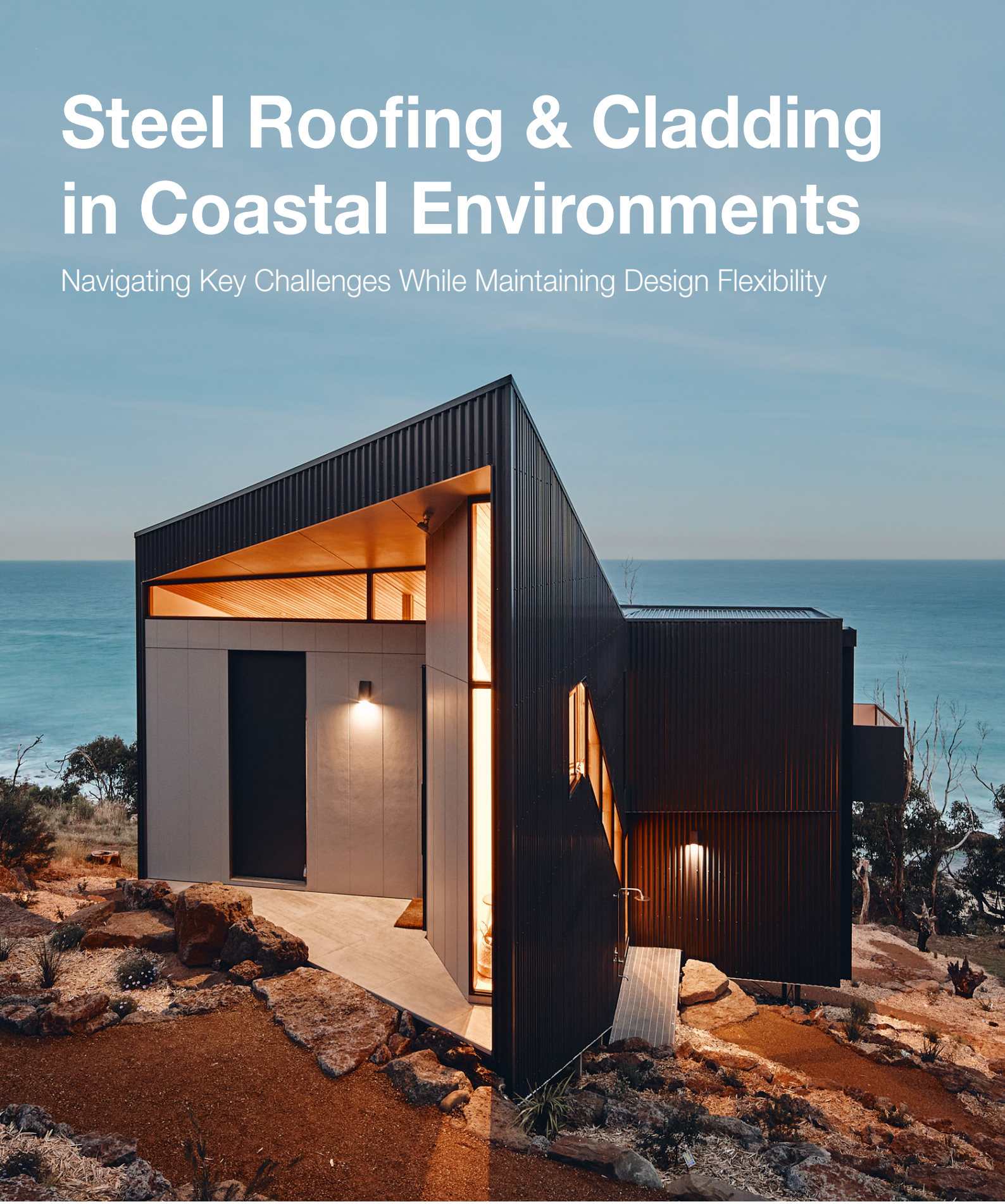
Steel Roofing & Cladding in Coastal Environments

Navigating Key Challenges While Maintaining Design Flexibility



Wye House
UniCote® Coastal | Monolith

UniCote®

INTRODUCTION

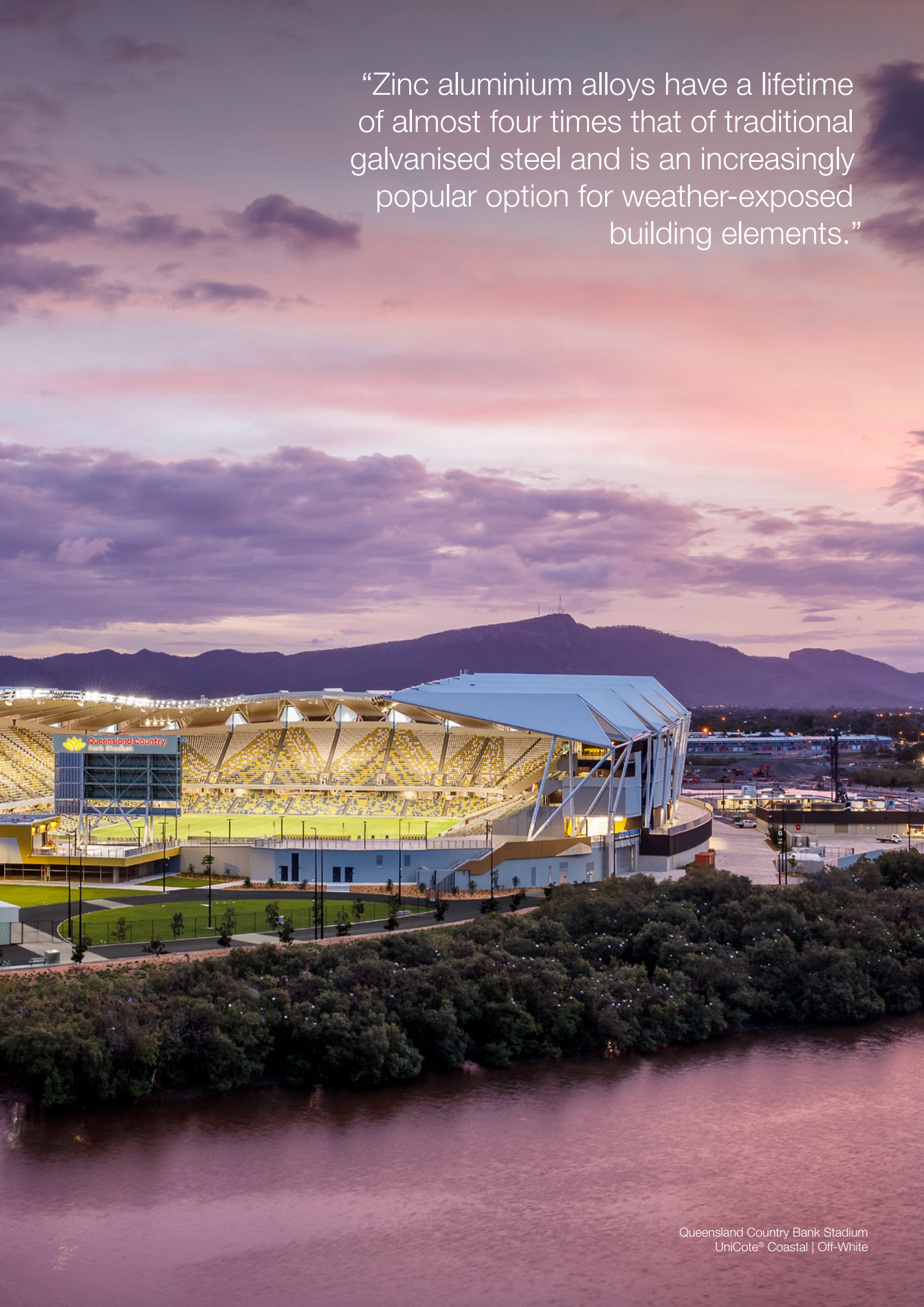
Buildings and other infrastructure close to the ocean can experience issues due to the aggressive, corrosive environment. While the rate of deterioration varies among metal roofs and walls, without the right protection, they can succumb to the effects of humidity and salty sea air.

For these reasons, architects are sometimes hesitant to use steel for buildings near the coast. There are concerns not only about corrosion but also the effects it will have on warranties and the perception that there are limited design options. Architects may choose to use other materials, even if they do not offer the same performance, functional or aesthetic benefits as steel.

However, today there is a greater range of design options than is commonly thought. Brands like UniCote provide a range of solutions for different environmental conditions, with an expanding selection of colours, finishes and textures. Architects and designers now have the flexibility to realise their design intent, even in the most challenging environments.

In this whitepaper, we discuss the design considerations when using steel in coastal environments. By using the right corrosion-resistant metals and coatings and understanding the range of design options available, architects will be able to achieve their creative vision without having to forfeit form, function or aesthetics.

“Zinc aluminium alloys have a lifetime of almost four times that of traditional galvanised steel and is an increasingly popular option for weather-exposed building elements.”



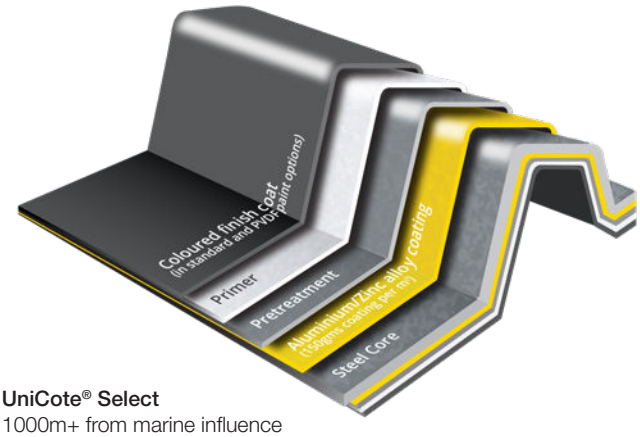
Queensland Country Bank Stadium
UniCote® Coastal | Off-White

Designing for coastal environments

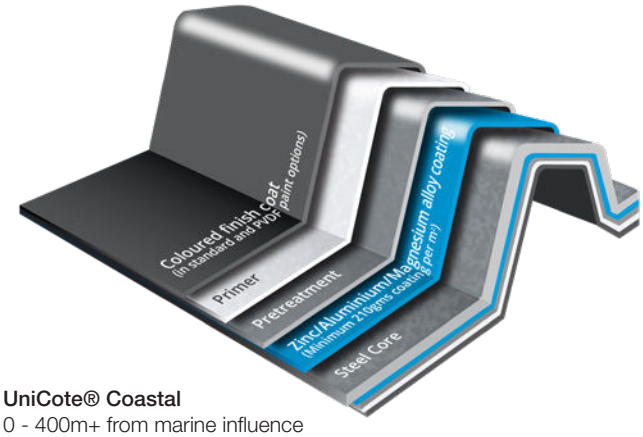
Coastal environments are the areas with the highest levels of atmospheric corrosion. The aggressive corrosive environment is due to the presence of salt water as well as hydrostatic forces such as wind, currents, tides, waves, and ice. Salt water is a great catalyst for metal oxidation and corrodes metal five times faster than fresh water.

The National Construction Code outlines the specifications that must be adhered to in order to prevent corrosion in coastal structures. The requirements call for the use of materials that are specifically made for marine environments or materials that have undergone special treatment.

The strictest requirements apply to structures that are situated within 1km of breaking surf or within 100m of a non-surf coastline, such as a river coast. The Australian Standards also provide the requirements when building within 10km of breaking surf or 1km of a non-surf coastline.



UniCote® Select
1000m+ from marine influence



UniCote® Coastal
0 - 400m+ from marine influence

Why use steel?

There are several reasons why steel remains an excellent choice for coastal structures:

- **Durability and longevity.** Steel has a long lifespan of several decades when specified, installed and maintained correctly, offering excellent return on investment. UniCote steel, for example, can withstand exposure to the elements, including extreme temperatures, high winds, and heavy rain or snow. These qualities mean that it can be used in corrosive environments and does not need to be regularly repaired or replaced.
- **Low maintenance.** Low maintenance requirements go hand-in-hand with selecting a fit-for-purpose steel product. Unlike wood, steel cladding and roofing do not require regular staining or painting to maintain their appearance. Products like UniCote steel are easy to care for, only requiring a regular wash with water to remove any accumulated dirt or debris. This ease of maintenance means that steel is a popular choice for buildings in areas with high levels of pollution or dust, as it does not require any additional upkeep.
- **Lightweight and cost-effective.** In comparison to some alternative materials, steel is lightweight, which facilitates and expedites installation. Additionally, lightweight materials are less expensive and easier to transport, which reduces a project's carbon footprint.
- **Architectural expression.** Metals can be fabricated in an almost limitless range of shapes and forms. Leading cladding systems allow for customisation to match the project's intended stylistic vision by providing colour, texture, and profile options.
- **Performance and fire resistance.** Due to its excellent strength-to-weight ratio, it is possible to configure the size and shape of steel building components to provide a level of robustness that is difficult to achieve with other, more brittle building materials. In addition, steel is non-combustible, thus allowing structures to more easily meet fire resistance requirements and requirements for construction in bushfire zones.
- **Sustainability.** Steel can drastically lengthen the lifespan of a structure in comparison to other building materials, which reduces the need for replacement. Steel is the world's most recycled material, with around 680 Mt recycled in 2021.[1] The reusable nature nature of steel promotes a circular economy and the industry continues to improve steel production technology to address environmental challenges.

Design considerations for specifying steel cladding and roofing

What type of metal materials are better suited to coastal regions and why?

Properly designed and constructed steel structures provide long-term durability, even in coastal environments. The corrosion resistance of normal raw steel is relatively low, but there are other metals that provide better performance.

Galvanised steel is coated with zinc or zinc alloy during the manufacturing process to provide corrosion protection. Zinc has the ability to completely cover a surface in protective layers. The zinc layer shields the base metal, and the sacrificial nature of the coating produces a durable steel product.

Compared to galvanised steel, stainless steel is significantly more resistant to corrosion in coastal environments. However, galvanised steel can be more workable and malleable than stainless steel, and it is typically less expensive. The process of manufacturing stainless steel is more complicated, which drives up the price.

Pre-painted coloured steel used for roofing and cladding, such as those from UniCote, have a hot dipped aluminium/zinc alloy coated steel coil. Zinc aluminum alloys have a lifetime of almost four times that of galvanised steel and is an increasingly popular option for weather-exposed building elements.

For increased corrosion resistance, magnesium can also be added to the hot dipped zinc/aluminium alloy. Magnesium compounds promote the development of a stronger barrier, which reduces the rate of subsequent corrosion even further.

Steel roofing and cladding are most susceptible to the elements along the cut edges. Magnesium increases cut edge corrosion protection through the creation of compounds which slow the corrosion reaction. This is a feature of higher-performing products, such as Unicote Coastal, that are designed for the harshest coastal conditions.

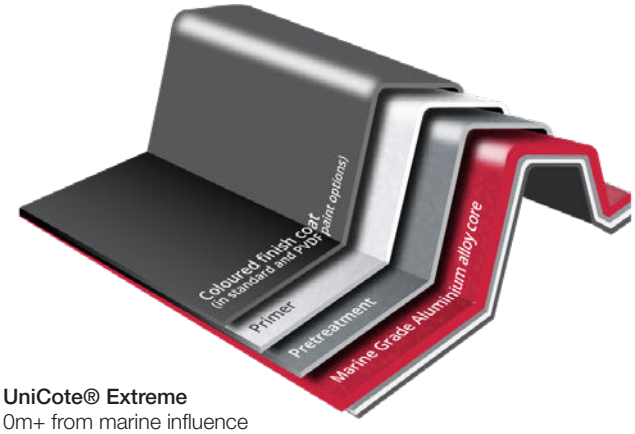
Aluminium is another metal that exhibits good corrosion resistance when exposed to most natural environments. The metal is protected from corrosion by its resilient aluminum oxide coating, which also renews itself in the event of damage.

What do architects and specifiers need to know about coatings and paint systems?

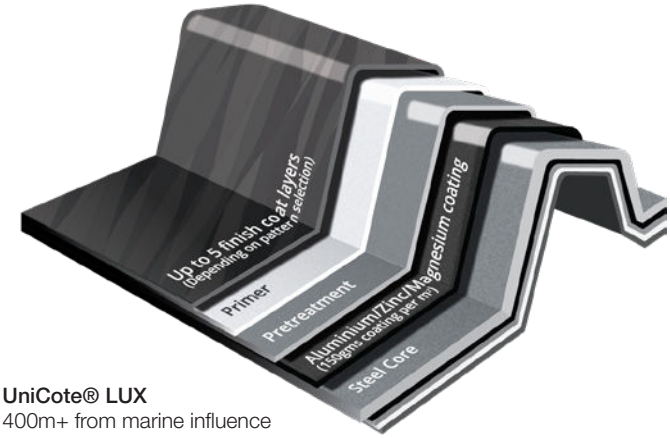
Steel coating systems have evolved over time to meet the needs of building owners seeking increased durability. Barrier coatings shield the steel surface from oxygen and water. In the absence of oxygen and water, steel cannot corrode.

The most common types of barrier coatings are paint, plastic, or powder. Powders, including urethane, nylon and epoxy, can be applied to the metal surface using an electrostatic or compressed air method to form a thin protective layer. Metal surfaces are sprayed with plastic and waxes to achieve a similar effect. Modern paint systems are composed of various paint layers; a primer coat that acts as an inhibitor, an intermediate coat to build the overall thickness of the system, and a finish coat that provides environmental resistance.

Coated steel makes an excellent choice for coastal regions when combined with sound installation practices, suitable panel selection, building design, and thorough cleaning and maintenance procedures. Higher-performing coatings are available for environments with severe exposure conditions, like industrial and marine settings. Reputable panel suppliers will be able to help ensure the best possible product is supplied by providing technical documentation that covers corrosive environments in detail.



UniCote® Extreme
0m+ from marine influence



UniCote® LUX
400m+ from marine influence

Bondi Icebergs | UniCote® Off White

What factors are in play when choosing metal materials for coastal regions?

Several factors need to be discussed early to ensure that the appropriate materials are specified for any given application. Along with the actual distance from saltwater, other factors to consider are the amount of fog, average rainfall, breaking surf or calm waters, and prevailing winds.

Reputable panel suppliers should be able to assess whether the particular building site falls within the definition of a coastal environment and offer solutions specifically designed for marine or coastal conditions. These factors need to be discussed in advance to guarantee that the right products are specified and available within the project timeframe.

The design of the structure also plays an important role in corrosion protection. Profiles that allow for good water drainage can prolong service life. Over time, standing salt water can lead to panel or cladding failure.

As noted earlier, cut edges are particularly susceptible to corrosion, so they should be covered with an edge clear coat seal. Alternatively, products with enhanced corrosion resistance along the steel's cut edge, such as UniCote Coastal, should be selected.

What about warranties?

There is a perception that steel cannot be used near the water, particularly as the corrosion risk leads to limited product warranties. Certain steel suppliers may advertise a lengthy warranty, but the closer you get to the coast, the shorter it becomes.

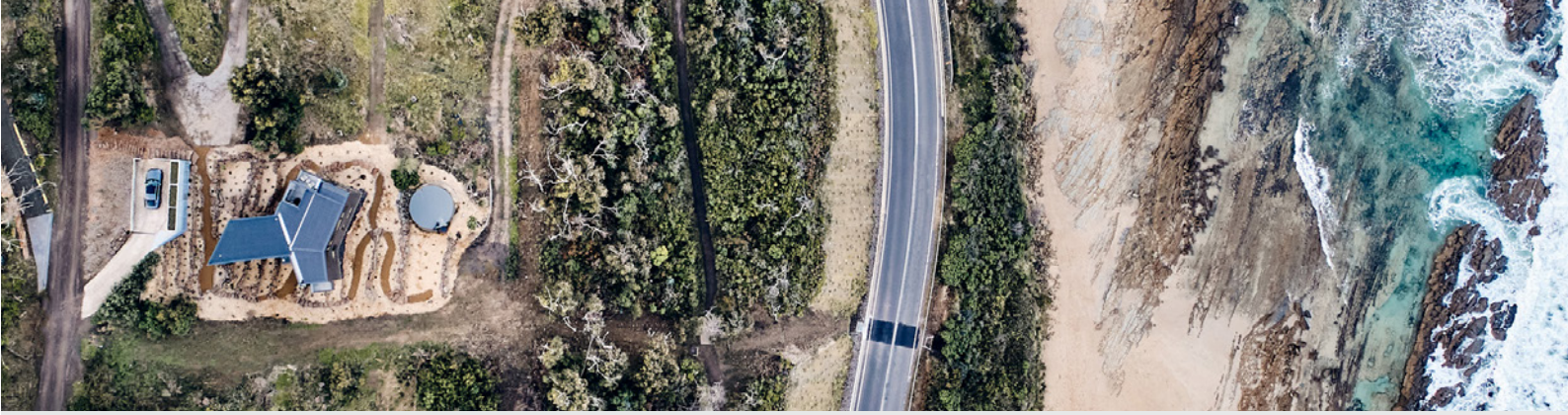
There are, however, some notable exceptions. UniCote provides strong warranties specific to the location and design. The company's range of steel products has been rigorously tested and approved to withstand the test of time in challenging environments, which makes them a safe and reliable choice when specifying for Australian conditions.

What colours, finishes and textures are available?

There are few steel brands within this product category, resulting in the overuse of certain colours and tones. Due to the widespread belief among practitioners that there are only a limited number of stock finishes available, many projects have a uniform appearance. This contradicts the current need for "authentic" and unique building designs that help homes, workplaces and businesses stand out in a crowded market.

To meet the demand for unique and personalised aesthetics, architects need to be aware of brands like UniCote. The company's range of over 70 colours and patterns provides ample freedom for architectural creativity, without compromising performance or durability. Unique textures and patterns can be baked on to the steel using coil coating technology.

UniCote's LUX range caters to current design trends. Corten Red and Weathered Iron provide the aesthetics of real Corten but will not bleed rust. UniCote's selection of timber patterns will not fade like real timber, and they do not need to be sanded or varnished to retain their attractive appearance. Unlike natural timber, they are also non-combustible, which means they can be used safely for bushfire zone construction.



Wye House | UniCote® Coastal | Monolith

Delivering genuine choice for demanding applications

UniCote® Steel solutions

For nearly a decade, UniCote Steel has been a trusted choice of Australians when it comes to safeguarding their most prized possession or bringing their visionary designs to life. While extremely popular for roofing, UniCote goes beyond this; ever increasing its popularity with exterior cladding and offering a contemporary aesthetic that pairs seamlessly with materials like wood and concrete.

Four-Tier Steel Solution

A variety of environmental factors specific to the Australian landscape are crucial in selecting the ideal UniCote® Steel solution for your project. UniCote® offers a Four-Tier metal Solution (Select, Coastal, Extreme, and LUX) to enable architects, builders, and designers to break free from the constraints of a one-size-fits-all approach.

- **UniCote Select.** UniCote Select effortlessly combines durability with aesthetic flexibility, showcasing an extensive array of colours and profiles. UniCote Select is suitable in atmospheric environments up to ISO 9223 - Category 3: Marine and can be used in areas 1000 m+ from marine influence.
- **UniCote Coastal.** UniCote Coastal takes the standard aluminium/zinc alloy-coated steel substrate to the next level with the addition of magnesium. This enables the zinc to ‘flow’, which seals the cut edges, preventing exposure to premature corrosion. To ensure optimum performance near the coast, UniCote Coastal also has a 30% thicker alloy coating to further improve the corrosion resistance; the thicker coating provides longer lasting protection. This product is ideal for roofing and cladding in severe marine environments up to ISO 9223 - Category 4 and can be used within 0–400 m+ from marine influence.
- **UniCote Extreme.** UniCote Extreme sets a new standard for aluminium materials, designed for use in very severe marine environments and industrial applications. Made from marine-grade aluminium, this product can be used in areas 0 m+ from marine influence. UniCote Extreme is available to order in 23 UniCote Essential Colours and 29 UniCote Tasman Colours, with an 8 week lead time (half the time offered by the market) and 1 ton MOQ.
- **UniCote LUX.** UniCote LUX is a premium pre-painted steel product designed to suit Australian high-end architecture. Combining the world's best coil coating technology with rigorous testing to Australian Standards, it ensures not only superior performance in the harsh Australian environment but also a stunning patterned and textured finish. It is suitable for atmospheric environments up to ISO 9223 - Category 4: Severe Marine and can be used in areas 400 m+ from marine influence (warranties below 400m will be considered on application).

Over 70 colours and textured patterns

UniCote offers a wide range of colours and patterns to choose from, including the timeless classics and contemporary modern shades familiar to the Australian landscape. The Essential range offers a diverse palette of 23 captivating colours that enhance the beauty of the Australian landscape, from timeless classics to modern shades to coastal Hamptons-inspired colors. The Tasman range includes 39 additional colours inspired by the Pacific Region New Zealand landscape. Designed to suit Australian high-end architecture, LUX offers a unique premium range of modern patterned and textured steel finishes, serving as a substitute for natural timbers, Corten, zinc and exotic finishes.

Tested to Australian conditions

UniCote ensures their steel will perform in the harshest conditions with real world testing sites in Birdsville and Rockhampton for UV performance, Shellharbour and Muriwai (NZ) to stand up against punishing coastal environments.

UniCote products are comprehensively tested to meet the strict requirements of AS/NZS 2728:2013 for salt spray, humidity, and UV resistance to provide customers with warranties up to 30 years.

Mercedes Benz, Breakfast Creek
UniCote® Coastal | Ebony

Harness the Power of Coastal Excellence with UniCote. Engineered for peak performance from zero up to 1000m from the coast, UniCote is your premier choice for coastal projects. Delivering robust warranties, versatile colours, and premium corrosion resilience, UniCote redefines the definition of performance in coastal construction – A true testament to durability and design.

REFERENCES

[1] World Steel Association. “Steel is at the core of a green economy.” World Steel. https://worldsteel.org/about-steel/steel-industry-facts/steel-core-green-economy (accessed 20 November 2023).

All information provided correct as of November 2023

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