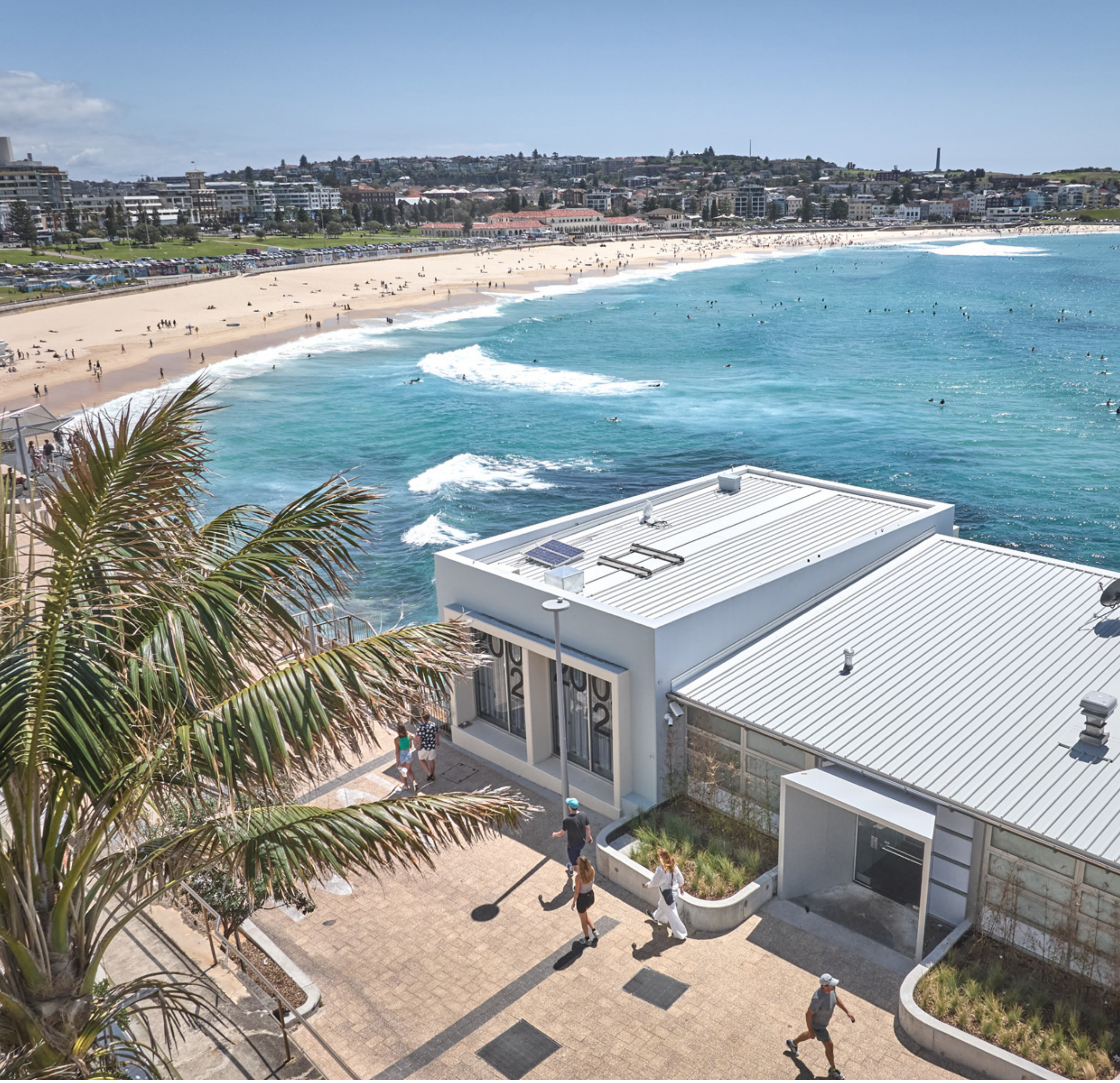

Specifying Pre-Painted Steel for Coastal Environments

Technical Considerations for Architects

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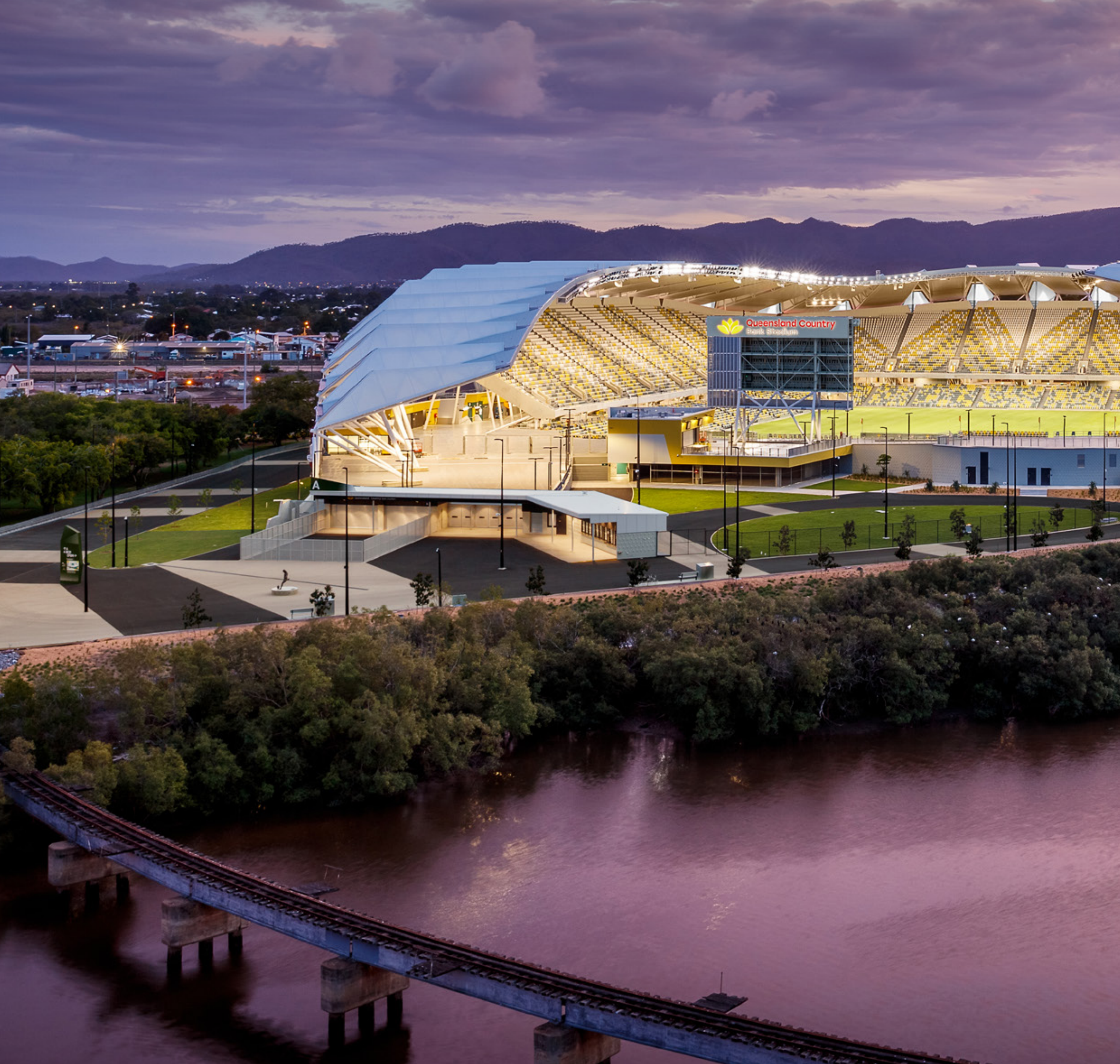
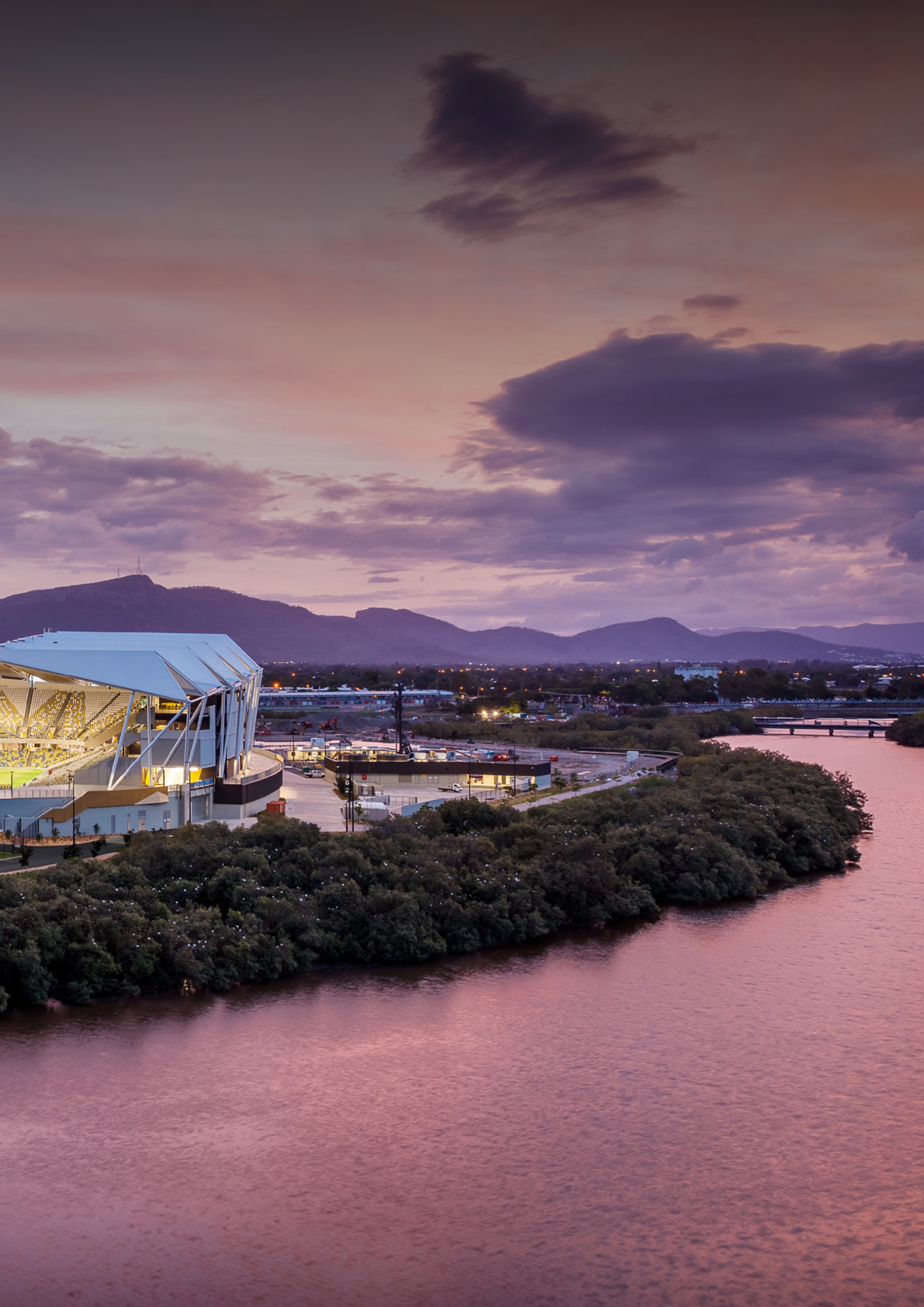
INTRODUCTION

At first glance, pre-painted steel products often appear indistinguishable, yet their performance in coastal environments is determined by far more than surface aesthetics. The corrosive effects of salt spray, humidity and UV exposure place significant stress on protective systems, making coating chemistry and layer thickness critical factors in durability. Without careful specification, architects risk selecting materials that may fail prematurely despite initially meeting visual or cost expectations.

This paper provides architects with a structured framework to evaluate pre-painted steel roofing and cladding for projects located in coastal zones. By clarifying the variables that distinguish high-performance systems from inferior alternatives, this discussion aims to support informed decision-making that enhances building longevity.





How coastal environments affect pre-painted steel roofing and cladding

Coastal environments place severe demands on pre-painted steel roofing and cladding as exposure to chloride-laden air and salt spray accelerates the breakdown of protective systems. Airborne salts settle on surfaces, concentrate at unsealed joints and attack vulnerable cut edges, where they draw in moisture and penetrate microcracks or voids in the coating. This initiates corrosion processes that are far more aggressive than in inland environments.

Constant exposure to moisture further stresses these materials. Overnight humidity creates a damp film on cladding surfaces, which is then rapidly dried by daytime heat, causing repetitive expansion and contraction of coatings. Simultaneously, ultraviolet radiation degrades the chemical structure of topcoat resins, reducing their ability to form an effective barrier. When combined with wind-driven rain, sand and salt particles, these forces can strip away the protective capacity of seemingly robust systems.

The effects of these stressors are evident in a range of common steel roofing and cladding failures. Pitting corrosion begins as localised attack, piercing through coatings to expose and damage the underlying steel. Under-film corrosion develops when moisture breaches paint layers, causing blistering and eventual delamination. At cut edges, red rust can form rapidly if the coating system lacks self-sealing protection, allowing corrosion to progress inward.

The relationship between coating thickness and durability is direct: thicker coatings last longer.

Framework for assessing suitability of pre-painted steel

Assessing pre-painted steel for coastal applications requires understanding of a set of performance criteria. The first step is to establish environmental suitability by confirming the product’s corrosivity classification under ISO 9223.

The second step is to evaluate the coating system in detail. Chemistry, thickness, substrate formulation and the properties of the applied paint system all determine resistance to corrosion, while edge protection is critical to prevent corrosion at cut edges and joints.

Finally, compliance with performance standards must be verified. For example, fire resistance testing to AS 1530.3 and conformity with applicable Bushfire Attack Levels, including BAL-FZ where relevant, ensures that cladding performs in bushfire-prone areas.

Taken together, these steps form a practical framework for architects to assess, compare and specify pre-painted steel products with confidence in coastal projects. Below we discuss these considerations in more detail.

ISO 9223 and corrosivity categories

ISO 9223:2012 provides the international framework for classifying corrosive environments based on the rate of material degradation over time. The standard defines categories from C1, representing very low corrosivity, through to C5 and CX, which denote high to extreme levels of atmospheric aggressiveness. For architects, understanding these classifications is critical to ensuring that specified cladding systems are appropriately matched to site conditions.

Coastal environments are generally classified within the C3 to C5 range due to the heightened presence of salt-laden air and persistent moisture. It is often assumed that any site within 400 metres of the coast should be treated as a marine environment for material specification purposes. However, ISO 9223 does not define exposure by distance alone but instead by measured corrosivity at the site. This means two locations the same distance from the shoreline may fall into different categories depending on prevailing winds, humidity patterns and the local landscape.

Site-specific conditions can greatly influence corrosive potential. Elevated sites such as coastal hilltops may be subjected to uninterrupted salt spray and stronger winds, placing them in a higher corrosivity class than sheltered, low-lying areas situated closer to the water. Similarly, the absence of natural or built barriers, such as vegetation or adjacent buildings, can leave facades and roofs directly exposed to airborne salts and moisture cycling.

By following ISO 9223, rather than relying on simplistic distance thresholds, architects can align specifications more closely with the actual exposure conditions. This approach provides a solid foundation for product selection for pre-painted steel cladding used in coastal projects.

Corrosivity Category	Interior Environments	Exterior Environments
C1 – Very low	Heated buildings with clean atmospheres (e.g. offices, schools, shops, hotels)	Not typically applicable
C2 – Low	Unheated buildings where condensation may occur (e.g. depots, sports halls)	Rural areas and atmospheres with low levels of pollution
C3 – Medium	Production rooms with high humidity and some air pollution (e.g. food processing plants, breweries, laundries, dairies)	Urban and industrial atmospheres with moderate SO_2 levels; coastal areas with low salinity
C4 – High	Buildings with chemical exposure or high humidity (e.g. chemical plants, swimming pools)	Industrial areas and coastal locations with moderate salinity
C5 – Very high	Buildings with almost permanent condensation and high pollution	Industrial areas with high humidity and aggressive atmosphere
C5-M – Very high (Marine)	Buildings with almost permanent condensation and high pollution	Coastal and offshore areas with high salinity
CX – Extreme	Not defined	Offshore structures, splash zones, and buildings directly on water

Understanding metallic substrates

The corrosion resistance of pre-painted steel is influenced by the substrate beneath the paint layer; this metallic alloy coating provides the first line of defence against environmental attack. Three main types are used in cladding applications, each with distinct protective mechanisms and performance outcomes in coastal environments: **hot-dipped zinc (Z coating), aluminium-zinc alloys (AZ) and zinc-aluminium-magnesium alloys (AM).**

Z coatings

Z275 is the designation used for a hot-dip galvanized steel coating. The “Z” indicates that the coating is composed of pure zinc and the number specifies the total coating mass applied to both sides of the sheet, expressed in grams per square metre. In the case of Z275, this means there are 275 g/m² of zinc in total.

Zinc provides sacrificial protection, meaning it corrodes preferentially to protect the underlying steel. While effective in mild inland conditions, Z275 coatings are vulnerable in coastal zones, where salt exposure accelerates corrosion and cut edges in particular break down quickly.

AZ coatings

AZ150 is the designation for a hot-dip aluminium–zinc alloy coating. The “AZ” indicates that the metallic layer is made up of an alloy containing approximately 55% aluminium, 43–44% zinc and 1–2% silicon. The number refers to the total coating mass in grams per square metre applied across both sides of the steel sheet; in this case, 150 g/m².

The high aluminium content improves barrier protection and slows down general corrosion compared to pure zinc. However, AZ150 systems remain prone to cut-edge attack in chloride-rich environments. Therefore they offer limited long-term durability for exposed coastal projects without additional protection measures.

AM coatings

The “AM” identifies the metallic layer as a ternary alloy composed of approximately 90% zinc, 5–11% aluminium and 1.5–3% magnesium. As with other coating standards, the number indicates the total coating mass in grams per square metre applied to both sides of the steel sheet.

The addition of magnesium is the critical differentiator. During weathering, it reacts with zinc and aluminium to form dense, stable corrosion products (such as simonkolleite and hydroxycarbonates) that seal scratches, cut edges and other exposed sites. This creates a self-healing effect that stops rust from spreading; a quality that provides superior performance in C3 to C5 coastal environments.

AM coatings have consistently outperformed Z275 and AZ150 in both laboratory and field testing. Salt spray (ASTM B117, ISO 9227) and cyclic humidity tests (ISO 6270-2) demonstrate higher resistance to red rust formation, while coastal exposure trials confirm superior durability at cut edges and panel surfaces. With higher coating weights such as AM210, the life expectancy of cladding systems is extended, reducing maintenance requirements and delaying replacement cycles.

Alloy coating thickness and why it matters

Coating thickness for pre-painted steel is typically expressed as grams per square metre (g/m²), referring to the total metallic coating mass applied to both sides of the sheet. For example, AM150 represents 150 g/m² in total, or 75 g/m² per side, while AM210 provides 210 g/m², or 105 g/m² per side. A higher coating mass means more protective alloy is present to withstand corrosive attack.

The relationship between coating thickness and durability is direct: thicker coatings last longer. They contain more sacrificial or barrier material, delaying the point at which the steel substrate becomes exposed. This greater reserve of protective metal provides stronger resistance to cumulative environmental stressors.

Other pre-painted steel materials may advertise extended warranties, but these are commonly reduced or excluded altogether when specified for projects in marine or high-corrosivity environments.

In practice, two products may use identical paint systems, yet their performance will diverge if the metallic coating mass differs.

Paint system properties

The durability of pre-painted steel depends not only on the metallic substrate but also on the quality of its paint system. The primer promotes adhesion and adds corrosion resistance by sealing micro-imperfections. The finish coat forms the main barrier against weathering, and provides UV stability, colour retention and surface appearance. On the reverse side, the backing coat offers light protection against condensation and abrasion during handling and installation.

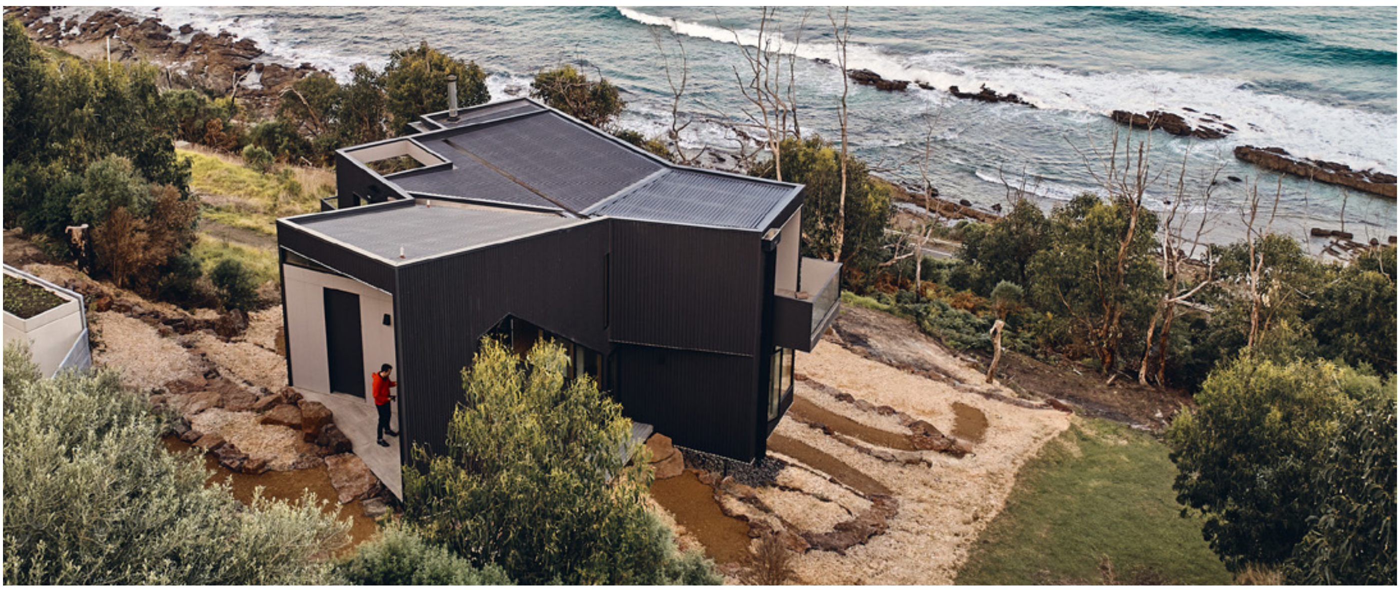
A high-performing paint system for pre-painted steel in coastal environments must combine durability with protective function. Resistance to ultraviolet radiation is essential to prevent chalking, fading and gloss loss, while strong barrier properties stop moisture ingress that can trigger under-film corrosion. Flexibility and adhesion are equally important as they allow the coating to accommodate thermal movement without cracking or peeling. In addition, resistance to airborne salts, pollutants and mechanical abrasion ensures the cladding maintains both structural protection and aesthetic quality throughout its service life.

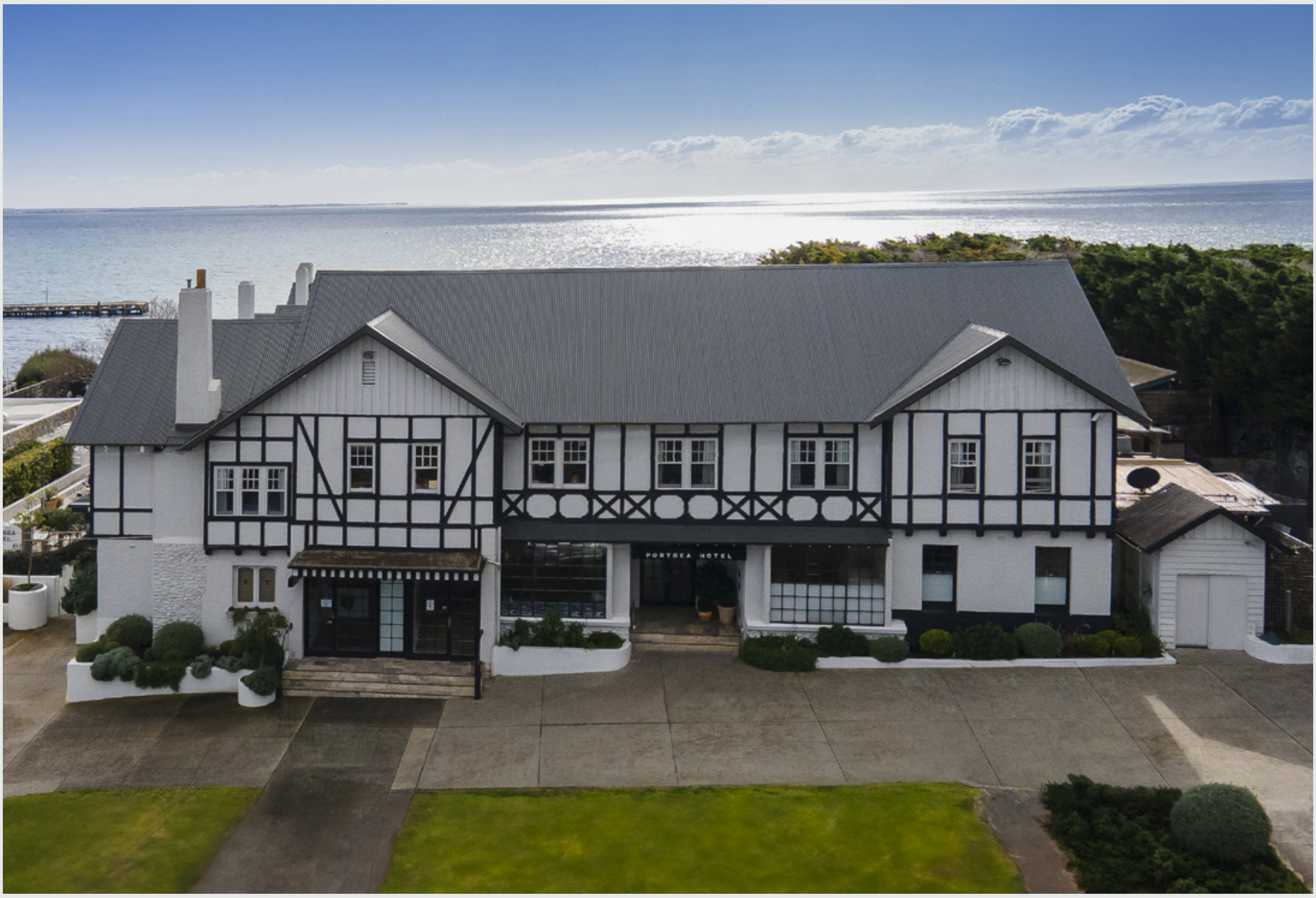
Fire compliance in coastal zones

Many parts of Australia's coastline are not only exposed to marine corrosion but also located in bushfire-prone areas. For projects in the highest risk category, that is BAL-FZ (the highest bushfire risk category defined under AS 3959), compliance requires rigorous testing and documentation.

Pre-painted steel cladding must demonstrate compliance with AS 1530.3, which assesses ignitability, flame spread, heat release and smoke development. In addition, coating systems must meet AS/NZS 2728 (performance requirements for pre-finished metal cladding) and AS 1397 (metallic coating standards). Together, these standards provide the framework that ensures a product's suitability where bushfire and coastal exposure overlap.

It is important to distinguish between marketing claims of "non-combustibility" and tested performance under Australian Standards. While metallic-coated steel with factory-applied finishes can be marketed as non-combustible, only results from accredited fire testing confirm compliance for BAL-FZ applications.





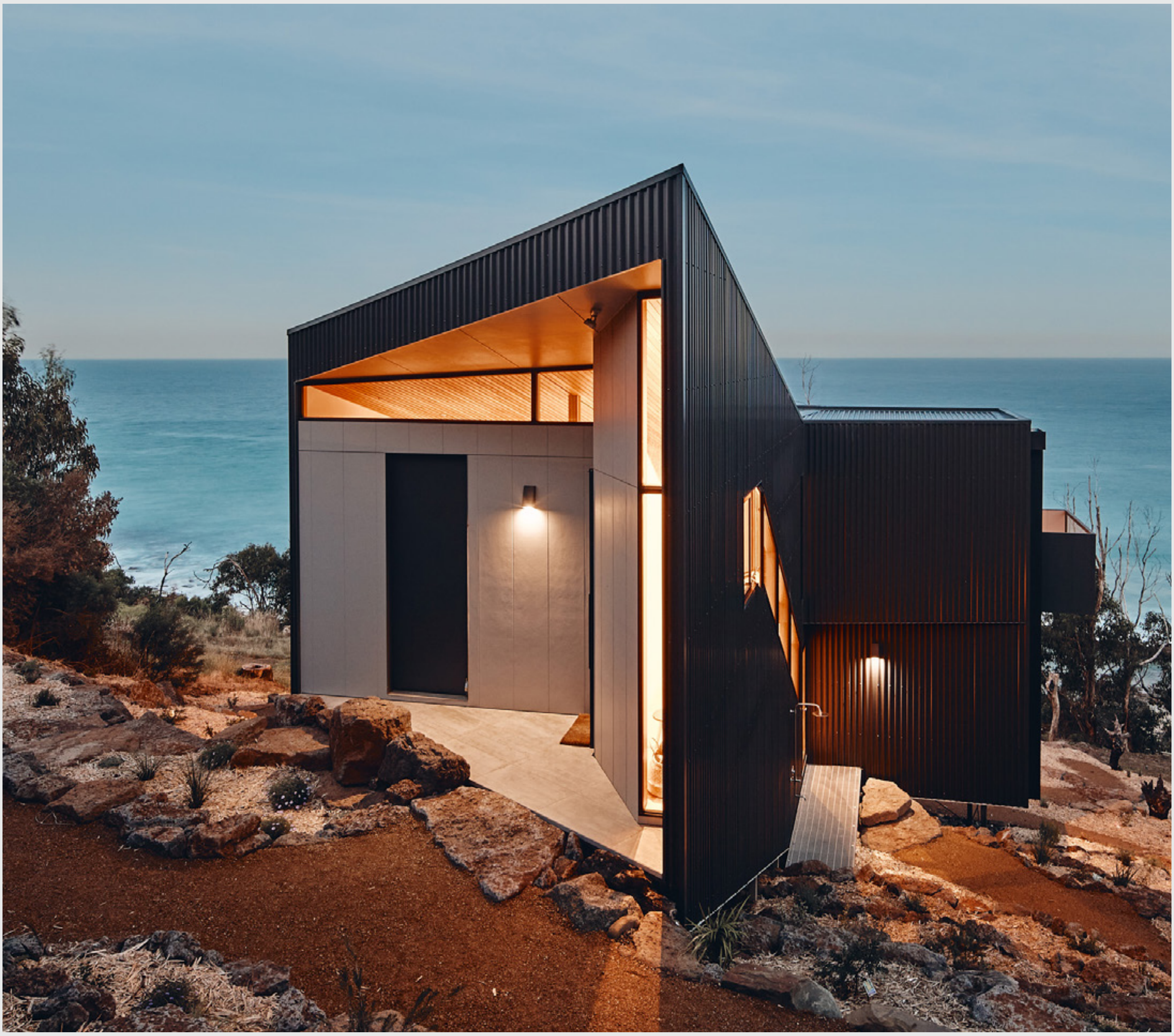
How UniCote® Coastal measures up

Measured against the framework of corrosivity classification, coating thickness, edge protection and fire compliance, UniCote® Coastal meets or exceeds all key performance criteria. This product is engineered for use in aggressive marine environments where conventional Z275 or AZ150 coatings are insufficient. Rated suitable for ISO 9223 C3–C4 corrosivity zones, it covers applications from immediate waterfront exposure through to sites hundreds of metres inland, depending on prevailing winds and shielding.

At its core, UniCote® Coastal uses an AM210 zinc–aluminium–magnesium alloy substrate. With a metallic coating weight of 210 g/m² (around 30–40% thicker than typical AZ150 or AM150 systems) it provides an additional reservoir of protective metal to resist cumulative chloride attack. The inclusion of magnesium delivers a critical performance advantage by enabling self-healing at cut edges and scratches. Independent testing confirms UniCote® Coastal offers exceptional cut-edge resistance in both laboratory trials and field exposure sites. UniCote® Coastal has also been tested to AS 1530.3 and is approved for use in BAL-FZ Flame Zone construction, while also meeting AS/NZS 2728 and AS 1397 requirements.

In addition to its alloy substrate, UniCote® Coastal employs a carefully engineered paint system designed for long-term durability in coastal conditions. A flexible corrosion-resistant primer promotes adhesion and seals micro-imperfections, while the finish coat, a Super Advanced Durable Polyester (SADP), provides UV stability, colour retention and gloss control in demanding conditions. The backing coat adds protection against condensation and handling abrasion. Together, these layers ensure the cladding maintains both performance and appearance over its service life.

UniCote® Coastal has been applied successfully in high-profile projects including Bondi Icebergs, the Brisbane International Cruise Terminal and the Portsea Hotel. Available in a wide range of profiles, from interlocking and standing seam cladding to concealed deck roofing, and with over 60 colour options in standard and extended ranges, it combines technical reliability with design flexibility.



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