

What happens when it gets too salty?

A quick guide to corrosion protection of timber connectors.
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In timber construction, connections play an important role in ensuring the overall structural integrity and functionality of a building. They enable effective load transfer and enhance design flexibility, and come in the form of connectors (joist hangers, etc) and fasteners (nails, screws, etc), manufactured mainly from steel.

When specifying timber connectors, there are a few factors that need to be considered. None more important than the design capacity, which must be checked for adequacy to resist the applied loads, and its suitability to the environment, meaning its resistance to corrosion.

Many environments and materials can cause corrosion including ocean salt air, preservative-treated timber, fertilisers, fire-retardants, dissimilar metals and more. Steel connectors and fasteners could degrade and lose load-carrying capacity when installed in corrosive environments or when installed in contact with corrosive materials.

In this article, we will discuss how to select

the appropriate connector for different environments, addressing a common gap in understanding. A key consideration is the level of corrosion protection required, which depends on factors such as weather exposure and the presence of salt in the atmosphere. This involves assessing the location—whether it is inside or outside a building envelope (exposure condition) and its proximity to a corrosive environment (corrosion zone). For guidance, Australian Standard AS 1720.5-2015 (Appendix B6) – *Timber structures – Part 5: Nailplated timber roof trusses* offers valuable insights. This standard draws on decades of collective expertise from industry leaders such as Pryda, Mitek, and Multinail in supplying timber connectors. Wood Solutions Technical Guide #05 - *Timber Service Life Design – Design Guide for Durability* and Timber Queensland's Technical Data Sheet 35 – *Corrosion Resistance of Metal Connectors* may be referenced for additional information.

EXPOSURE CONDITIONS

According to AS 1720.5, exposure conditions are categorized as Closed, Sheltered, and Exposed (see Fig. 1):

- **Closed Condition:** Refers to an internal environment within a building envelope that is effectively sealed and permanently dry.
- **Sheltered Condition:** Includes environments other than Closed and Exposed, such as those prone to airborne salts, like an open sub-floor or carport roof.
- **Exposed Condition:** Refers to an external environment outside a building envelope that is subject to weather and repeated wetting.

CORROSION ZONES

Corrosion management considers five zones:

- **Sea Spray Zone:** Areas within 1 km of a surf coastline or less than 100 m from a sheltered bay, subject to airborne salts.
- **Coastal Zone:** Areas located between 1 km and 10 km from a surf coastline or between 100 m and 1 km from a sheltered bay.
- **Industrial Zone:** Environments within 100 m of heavy industrial complexes where corrosive gases may be emitted (e.g., Port Pirie or Newcastle).

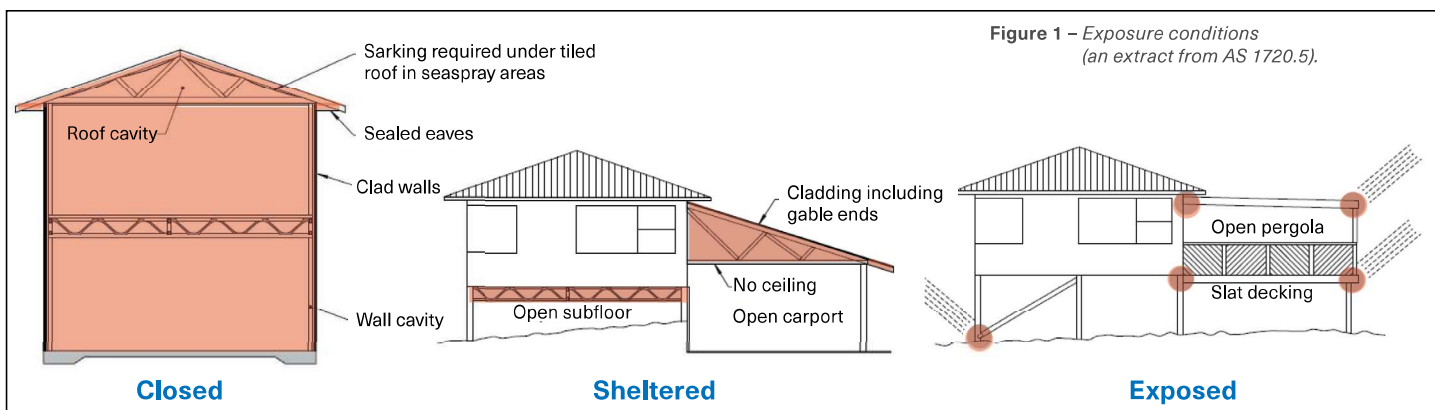


Figure 1 – Exposure conditions (an extract from AS 1720.5).

- **Hazardous Zone:** Internal environments that can significantly affect the durability of connectors, such as enclosed swimming pools or fertilizer sheds, leading to rapid corrosion of galvanized components.
- **Low Hazard Zone:** Normal environments that do not fall into any of the above categories.

For the purpose of corrosion specification, coastal and industrial zones are treated the same. In a hazardous zone, specification is not straightforward and requires expert advice.

Z275 CORROSION PROTECTION

Galvanized Z275 is the standard corrosion protection commonly provided for timber connectors and is the minimum requirement for structural connections as specified in AS 1684 (clause 1.15). Its application is further outlined in AS 1720.5 (Table B1) and summarized in Figure 2. Z275 is generally suitable for use in an internal “Closed” environment, with limited exceptions in Low Hazard zones, where it may be used in a “Sheltered” condition.

It must be noted that Z275 coating may not provide sufficient protection when connectors, in the presence of moisture, come into contact with timber that is preservative-treated to H3 or higher, such as in open sub-floor environments in low-hazard zones. Copper-based timber preservatives, including CCA, ACQ, and Copper Azole, can accelerate the corrosion of connectors and fasteners in moist environments. To mitigate this, Z275 connectors require additional protective coatings, such as epoxy paint or fusion-bonded epoxy, to prevent interaction between the zinc in the galvanizing and the copper in the preservative. Alternatively, stainless steel should be used. In contrast, LOSP timber preservatives have a negligible impact on corrosion, and no additional corrosion protection measures are necessary for timber treated with LOSP.

Also, roof spaces that are not adequately sealed need careful consideration when specifying corrosion protection, and it is prudent to treat this space as “sheltered”.

STAINLESS STEEL CONNECTORS

As shown in Figure 2, stainless steel connectors, specifically Grade 316, are commonly used in exposed

Corrosion Zone	Exposure Condition		
	Closed	Sheltered	Exposed
Sea Spray	Z275	SS	SS
Coastal or Industrial	Z275	SS ⁽¹⁾	SS ⁽²⁾
Hazardous	X	X	X
Low Hazard	Z275	Z275	SS ⁽³⁾

Z275	Galvanized Z275 or equivalent
SS	Stainless steel Grade 316 or equivalent
X	Special protection. Seek advice from corrosion specialist.

Notes:
 (1) Z275 with additional suitable coating protection may be used in lieu of stainless steel.
 (2) Hot dipped galvanized 600+ gsm may be used in lieu of stainless steel.
 (3) Hot dipped galvanized 300+ gsm may be used in lieu of stainless steel.

Figure 2 – Corrosion Protection Requirement.

and sheltered environments. However, project documentation often fails to provide detailed specifications for these connectors, leaving decisions about corrosion protection to the builders. As a result, builders frequently choose Z275, likely due to limited understanding or, more commonly, cost and supply constraints. This issue has been underscored by investigations conducted by the Queensland Building and Construction Commission (QBCC) into balcony and deck collapses.

While leading timber connector suppliers offer a limited range of stainless steel products, the demand for these items is low, and their higher costs mean retail hardware outlets typically do not stock them, often requiring special orders. Therefore, it is crucial to confirm their specification during the design stage to ensure sufficient time for ordering.

Although stainless steel connectors are resistant to rust, they are susceptible to stress corrosion in chemically aggressive environments, such as enclosed swimming pools without proper air quality management. In such conditions, relying solely on stainless steel connectors is usually insufficient, and additional protective measures against corrosion are necessary.

When specifying corrosion protection, it’s essential to consider the importance of the connection as well as the cost of maintenance and replacement.

STRUCTURAL STEEL MEMBERS

A discussion on corrosion would be incomplete without addressing the

requirements for structural steel members used in timber constructions. The deemed-to-satisfy provisions in the NCC 2022 mandate that all structural steel in Class 1 and 10 buildings must have industrial-grade corrosion protection. The specified systems necessitate abrasive blast cleaning to achieve a high standard of surface cleanliness.

A key update in NCC 2022 is the introduction of minimum requirements for corrosion protection coatings. These now include options such as Hot-Dip Galvanizing (HDG), paint systems, and duplex coatings. All coatings must comply with the standards outlined in AS 2312.1 or AS/NZS 2312.2, ensuring consistent and reliable performance. Importantly, the practice of applying two coats of generic “house paint” or bituminous paint to unprepared steel is no longer acceptable; the new code enforces strict adherence to these specified standards for all coating applications.

We spend time when detailing timber to make sure that the durability is matched to the level of exposure, but many times when we specify the ancillary items such as connectors we revert back to inadequate coatings. Outdoor structures such as deck and balconies are prone to overloading and should be treated with the utmost care to minimise any chance of future failures. This is one of those times when you say no to the phrase “Would you like salt with that?”. **T**



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