



## Corrosion Resistance of Metal Connectors

Metal connectors such as strapping/bracing, framing, joist hangers and truss plates are used extensively in timber framed construction/buildings. These products are susceptible to atmospheric corrosion just as metal fasteners are. Therefore it is crucial to ensure their durability is appropriate to the environment in which they are used. The majority of metal connectors are expected to perform satisfactorily for the life of the building; typically 50 years for normal buildings.

This document serves as a guide to determine the applicable corrosion rate for differing environments and the most suitable protection coating for that environment.

Atmospheric corrosion of metals occurs in the presence of oxygen and an electrolyte, usually water. Hence, the percentage of time that the materials' surface is exposed to moisture determines the rate of corrosion. Salts also have a major influence on corrosion rates by absorbing moisture and creating a layer of electrolyte. This also increases the conductivity of the metal.

Corrosion rates are very low in dry, non-contaminated environments, are higher in damp but non-polluted environments, and are very high in the presence of moisture and salt (or other contaminants).

### Selection Guide for Correct Finish of Metal Connectors

**Step 1.** Determine the **Corrosion Zone** and **Corrosivity Categories**. Refer to summary in Table 1 and details in Table 2.

**Step 2.** Determine the **Exposure Conditions**. Refer Fig. 1, 2, 3.

**Step 3.** Select the **Minimum Corrosion Protection**. Refer to Table 1.

**Table 1.** Minimum corrosion protection for connector

Corrosion Zone	Corrosivity Categories	Exposure Condition	Minimum Corrosion Protection
Seaspray zone – High and very high	C4/C5/CX	Enclosed	Galvanised Z275
		Sheltered	Stainless Steel 304 or 316
		Exposed	Stainless Steel 304 or 316
Industrial Zone - High	C5/CX	Enclosed	Galvanised Z275
		Sheltered	Galvanised Z275 with soft seal coating or equivalent (OR) Stainless Steel 304 or 316
		Exposed	Stainless Steel 304 or 316 (OR) Hot Dipped Galvanising
Pool Splash Zone (within 2m of pool edge) – High	C5	Enclosed	Stainless Steel 316
		Sheltered	
		Exposed	
Coastal Zone – Medium	C3/C4	Enclosed	Galvanised Z275
		Sheltered	Galvanised Z275 with soft seal coating or equivalent (OR) Stainless Steel 304 or 316
		Exposed	Stainless Steel 304 or 316 (OR) Hot Dipped Galvanising
Very Low and Low Hazard Zones	C1/C2	Enclosed	Zinc Plated
		Sheltered	Galvanised Z275
		Exposed	Stainless Steel 304 or 316 (OR) Hot Dipped Galvanising



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**Table 2.** AS4312 Atmospheric Corrosivity Zones

The table below outlines ISO 9223 corrosivity categories, the one year corrosion rate for mild steel and examples of typical environment.

Corrosivity Categories	ISO categories	Corrosivity	Corrosion rate <sup>a</sup> (µm/year)		Typical Environment	Example
			Mild steel	Zinc		
C1	C1	Very low	<1.3	<0.1	Dry indoors	<ul style="list-style-type: none"> <li>• Heated or air conditioned commercial buildings</li> </ul>
C2	C2	Low	1.3-25	0.1-0.7	Arid/urban inland	<ul style="list-style-type: none"> <li>• Most areas of Australia 50kms from coast</li> <li>• 3km to 6kms from a less sheltered bay or gulf</li> <li>• Within 1km from quieted sheltered seas</li> </ul>
C3	C3	Medium	25-50	0.7-2.1	Coastal or industrial, affected by wind, topography, vegetation	<ul style="list-style-type: none"> <li>• 1km to 10kms inland along ocean front areas with breaking surf and significant salt spray, maybe extended to 50kms inland with prevailing winds and local conditions</li> <li>• From 100m to 3km to 6kms inland for less sheltered bay or gulf</li> <li>• 50m to 1km inland around sheltered bays</li> </ul>
C4	C4	High	50-80	2.1-4.2	Sea-shore (calm)	<ul style="list-style-type: none"> <li>• 200m to 1km inland in areas with rough sea and surf, maybe extended inland with prevailing winds and local conditions</li> <li>• From shoreline to 50m inland around sheltered bays</li> <li>• In immediate vicinity of calm salt water such as harbour foreshores</li> </ul>
C5	C-5I	Very high-industrial	80-200	4.2-8.4	-	<ul style="list-style-type: none"> <li>• Aggressive industrial areas where environment maybe acidic with pH &lt; 5</li> </ul>
C5	C-5M	Very high-marine			Sea shore (surf)	<ul style="list-style-type: none"> <li>• Within a few hundred metres of rough seas and surf beaches, maybe extended inland with prevailing winds and local conditions</li> </ul>
CX	-	Extreme	200-700	8.4-25	Ocean/ Off-shore	<ul style="list-style-type: none"> <li>• Surf beach shoreline regions with very high salt deposition</li> </ul>
-	T	Tropical	.. <sup>b</sup>	.. <sup>b</sup>	Inland Tropical	<ul style="list-style-type: none"> <li>• Monsoonal areas</li> </ul>

<sup>a</sup> Corrosion rate is the amount of penetration or weight loss of material that occurs in a given time. Usually measured in micrometres (µm) per year

<sup>b</sup> Tropical category is relevant only to a selection of organic coatings. Selection is affected by factors outside of AS4312

There are two major criteria that need to be considered in selecting the correct corrosion resistance for metal framing connectors;

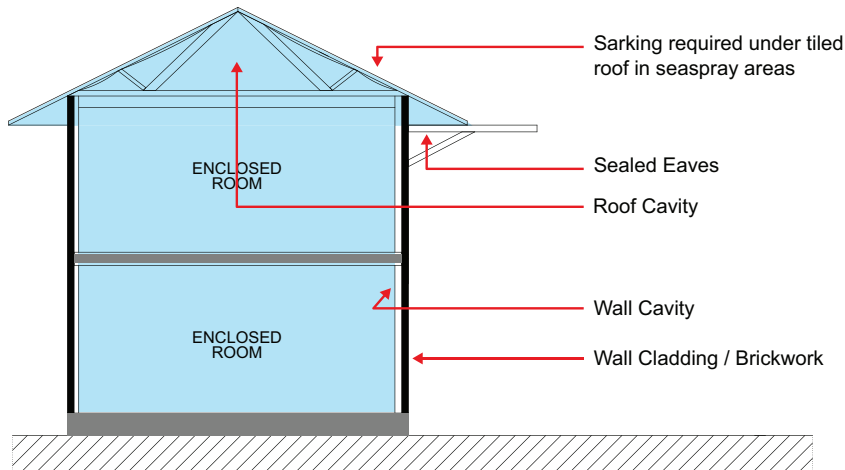
1. Corrosion zones
2. Exposure conditions



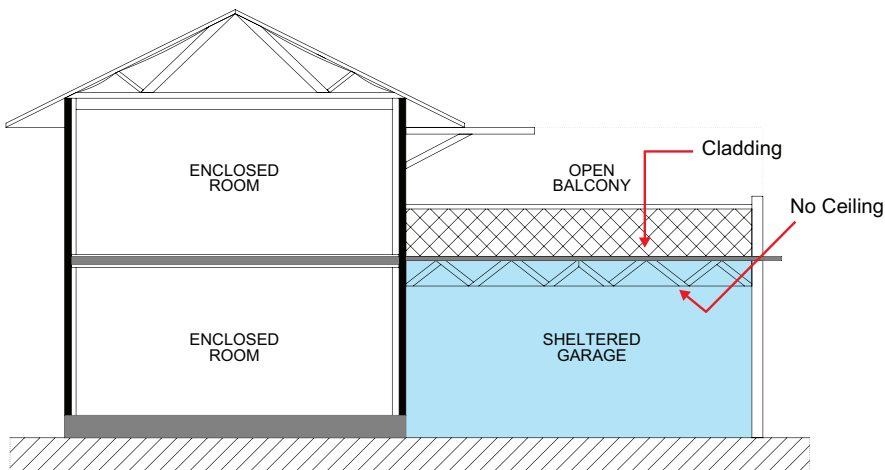
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### Exposure Conditions

**Figure 1:** Enclosed - within a fully enclosed building envelope.



**Figure 2:** Sheltered - locations not exposed to rainwater but subjected to wind-blown salts, etc.





## Corrosion Resistance of Metal Connectors

### Exposure Conditions (continued.)

**Figure 3:** Exposed - locations exposed to weather and rain i.e. decks, pergolas, open sub-floors, etc.

