

July 2015 Newsletter

[When to Use Stainless bolts and Brackets](#)

[New Book Being Written](#)

Dear Reader

When to Use Stainless Bolts and Brackets



Galvanised bolt after 12 months in spotted gum in Gatton

In light of the deteriorating performance of imported galvanised bolts (and they are all imported) and the wide divergence of opinion from different sources of when to use stainless fasteners, I thought it would be useful to give you my observations.

Species	pH	Trouble
Blackbutt	3.6	yes
Mountain ash	4.7	no
Ironbark red NL	4.0	yes
Spotted gum	4.5	no
Rose gum	5.1	no
Jarraah	3.3	yes
Radiata	4.8	no

Source: Embedded Corrosion of Metal Fasteners in Timber Structures FWPA Manual 6

Firstly you have to consider the acidity of the timber. Our hardwoods are all acidic. Spotted gum with a pH of 4.5 is outside of the problem area of 4.3 or less. So if you are just saying F14 hardwood and not being careful about what species you accept, you must anticipate and

design to avoid corrosion on your bolts. The new timber treatments are also more acidic than CCA and are more likely to corrode fasteners. But what are the recommendations?

Timber Preservers Association recommendation:

For higher corrosion resistance in marine, salt or chemical environments hot dipped galvanized nails and screws should be used. Hot dipped galvanising involves the application of a relatively thick sacrificial zinc coating by hot dipping in a zinc bath. The process leaves a rough surface with enhanced withdrawal and corrosion resistance characteristics.

Koppers Micropro

High Hazard Zones. These are zones that are up to 10km from a surf coast or up to 1km from a non surf coast or near swimming pools, brackish water etc. In these zones Type 304 or Type 316 stainless steel hardware is suitable. [Click here for source](#)

Lonza

Copper Azole and CCA Treated Wood ⁽¹⁾

	Indoors Always Dry (<15% MC)	Protected From Weather Dampness OK	Outdoor In Weather Regular Wetting	Coastal Applications	Wood Foundation & Other Critical Applications
AWPA Use Category	UC 1	UC 2	UC 3, UC 4A	UC 3, 4, 5	UC 4B
Fasteners	Mild Steel, EP ⁽²⁾ HDG HDG per ASTM A153 MG per ASTM A695 Class 55 Copper 304/316 SS	HDG per ASTM A153 MG per ASTM A695 Class 55 Copper 304/316 SS	HDG per ASTM A153 MG per ASTM A695 Class 55 Copper 304/316 SS	304/316 SS	304/316 SS
Connectors – Light gauge steel	HDG ⁽³⁾ HDG - ASTM A653 Class G185 Copper 304/316 SS	HDG - ASTM A653 Class G185 304/316 SS	HDG - ASTM A653 Class G185 304/316 SS	304/316 SS	NA

Unlike Koppers Micropro, Lonza do not differentiate between surf coasts and non surf coast. They define coastal as within 8 km from the coast. Source: “Corrosion and hardware recommendations for treated wood” Arch Technical Note.

Pryda

DISTANCE FROM COAST	CORROSION ENVIRONMENT FOR COASTAL AREAS <small>(see note below)</small>	
	OCEAN COAST <small>(Subject to Breaking Surf)</small>	SHELTERED BAYSIDE <small>(Not subjected to Breaking Surf)</small>
Up to 100m	SEVERE MARINE	SEVERE MARINE
100m to 1 km	SEVERE MARINE	MARINE
1 km to 10 km	MARINE	MODERATE
Greater than 10 km	MODERATE	MODERATE

Table 1 – Corrosion Environments

LOCATION	CORROSION PROTECTION REQUIREMENT FOR DIFFERENT ENVIRONMENT		
	SEVERE MARINE	MARINE	MODERATE
INTERNAL	Z275 or equivalent ⁽¹⁾	Z275 or equivalent	No Protection Required ⁽⁴⁾
EXTERNAL ⁽²⁾	Marine Grade 316 stainless steel or equivalent ⁽²⁾	Marine Grade 316 stainless steel or equivalent ⁽³⁾	Marine Grade 316 stainless steel or equivalent ⁽³⁾

Pryda are even more restrictive in the use of stainless. Even if the use is more than 10 km from the coast, if the use is external e.g. a verandah, it must be stainless.

When I was researching this issue in my Timber Preservation Guide (have you purchased your copy yet, and why not if you haven't) I asked the recommendations of another timber treatment supplier. It was referred back to their lawyers in the US. That company refused to give a recommendation and referred me to the bolt manufacturers recommendations - which don't exist. So you could be excused for finding this a difficult area to answer definitively and the implications are very serious. So, what is the answer?



To the rescue comes our New Zealand brothers. They built a series of timber "structures" using a variety of preservatives and screw types and put them in two locations, one just metres from breaking ocean and the other was in what was considered a benign application. They left them there for years to determine what actually happened. There were enough of these units that they could dismantle them to check at corrosion at regular intervals. Their finding in part was:

- Corrosion rates derived from accelerated tests performed at high temperature and high humidity cannot be extrapolated to predict the service life of a specific component exposed to real service conditions
- Given that average corrosion rates of mild steel and zinc-coated items measured were commonly two to three times higher with ACQ or CuAz treated timbers over CCA if the timber gets wet, it is doubtful that hot dipped galvanised nails or mechanically plated screws will be able to meet the durability requirements of the NZBC and relevant New Zealand standards. The use of either AISI 304/316 grades of stainless steel, or durable equivalents such as silicone bronze, for structural components and connections in ACQ and CuAZ treated timbers (H3.2 and above) to meet the 50 year durability requirement would appear to be a sensible interim precaution.

Their real life findings are more in keeping with the recommendations of Lonza and Pryda. A surprising finding was that the shank of the fastener (as opposed to the head) often corroded more in the benign environment than close to breaking sea! The green bars in the graph below is the site close to the ocean. Contact me for a copy of this report.

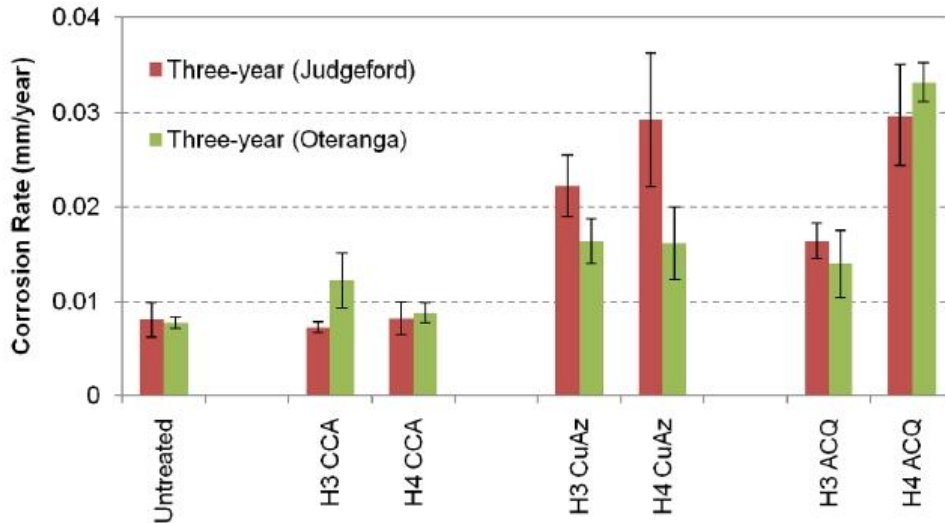


Figure 48: Corrosion rates of hot dip galvanised nails measured after three years of exposure at Judgeford and Oteranga Bay

The practical implications of this are enormous. A boardwalk and deck should be built with stainless fasteners but if you price on stainless you won't get any work!! I know that from bitter experience. That was long before last month I complained about being beaten on price on a boardwalk where the builder only used galvanised triple grips! But as most of my readers are specifiers you have the power to say, "I will only accept stainless". For new products such as our prestige bollards we are only using stainless fasteners.

New Book Almost Complete

My book on architectural timber battens is all but complete and is already at a useful stage if you need it. It will be \$33. **I still need a good image of a clear film finish breaking down, Can you help?**