SELECTING METAL ENCLOSURE MATERIAL

The use of metal enclosures along the Australian coast is common, but frequently incorrect materials, selected on price, fail due to corrosion, with resulting chaos and misery for all. Typically the corrosion is caused by chloride attack from salt water.

Corrosion caused by chloride attack can dramatically affect mild steel and even lower grades stainless enclosures. To help select the correct material for the application we have put together the guidelines below.

SELECTING THE CORRECT MATERIAL

It is difficult to know how to select the type of material required, and whether you can use powder coated steel or you need stainless. Most suppliers are also cagey about recommendations as they are not aware of the particular circumstances of the installation. However there are some good independent guidelines you can use.

AS2699.1 specifies that stainless steel should be used for structures in areas where there is salt deposition of over 60mg/m^2/day. Although enclosures are not exactly structural, this can be used as a rule of thumb.

To find out what the salt deposition rate is in your area probably the best resource is http://www.ingal.com.au/cms.htm the Industrial Galvanisers website. You need a user account, but this gives you access to their database of salt deposition information accessed via a map. The best map to look at is probably that for estimating the mass loss of zinc coating (http://www.cmit.csiro.au/biex/indgalv/atmos.cfm?dist=300 or **http://tinyurl.com/5w4uws**) as this is interactive and also shows a figure for the salt deposition (see Figure 1).

The salt deposition is shown on the map for a particular location. However care should be taken as there can be local effects such as rough seas in a particular area that can add further to the problem. If this is the case it is worth designing on the safe side and picking stainless steel.

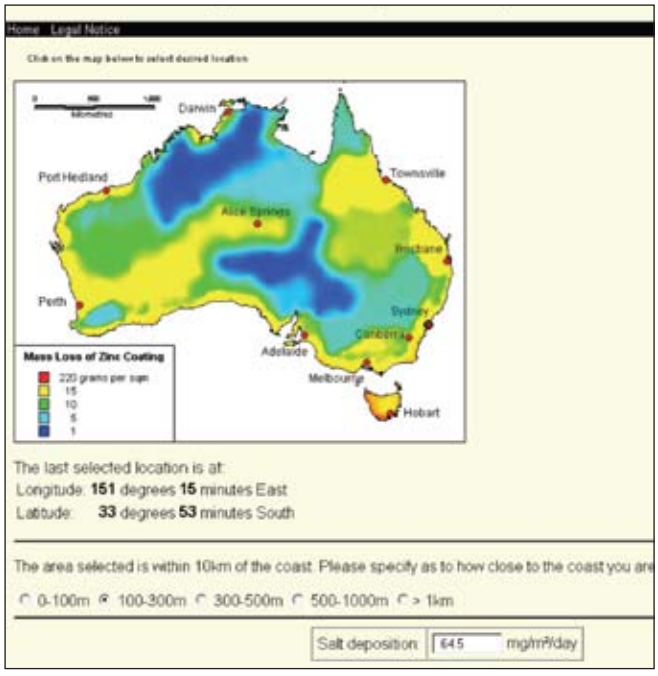
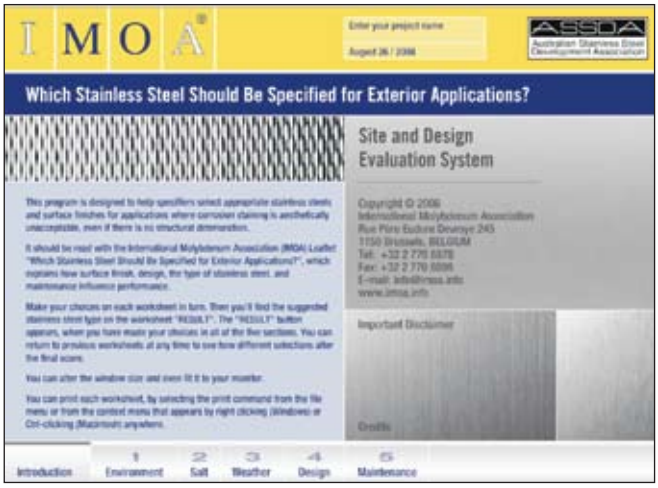


Figure 1
Estimated mass loss of galvanised coating due to atmospheric corrosion

SURFACE FINISH OF AN ENCLOSURE

As an alternative to this map you can consult ASSDA's (Australian Stainless Steel Development Association) stainless steel in architecture guide on the web at http://www.imoa.info/_files/stainless_steel_selection_sw.html or **http://tinyurl.com/67exv9**. This takes you through a more structured approach, but is not so localised, and can require additional information from a manufacturer on the surface finish of an enclosure.

B&R Enclosures for example, manufactures specifically for Australian conditions and finish their 316 stainless steel enclosures to a maximum Ra of 0.4 µm (required in the calculations). However they are far from the general case and most other manufacturers would have a rating of 0.5 µm or worse.



INSTALLATION POSITION

As you can see from ASSDA's website, one factor they look at is the installation location of the enclosure. Typically enclosures are kept under the eaves of a house, or similarly hidden away. Although this can make sense for security, for corrosion it is the worst place. Natural washing from rainfall is a big advantage and can dramatically decrease salt deposition, however this can be offset by a program of maintenance.

ENCLOSURE MAINTENANCE

Most enclosure manufacturers can only economically make enclosures from the more common stainless grades such as 316. However the ASSDA website can often recommend higher grades such as 317, which is not in common use. If this is the case a program of maintenance can dramatically reduce the effects of salt deposition. Simply washing regularly can be enough, even when the installation is in such a location that it is not washed naturally with rain.

TEA STAINING

Surface corrosion called 'tea staining' can take place if maintenance is not carried out. In general this is not structural, but can be a cosmetic issue (see Figure 2).

Figure 2 *Tea staining is actually caused by salt building up in the crevices on the metal surface. This effectively concentrates corrosive chlorides in small areas, which can then be seen this corrosion.*

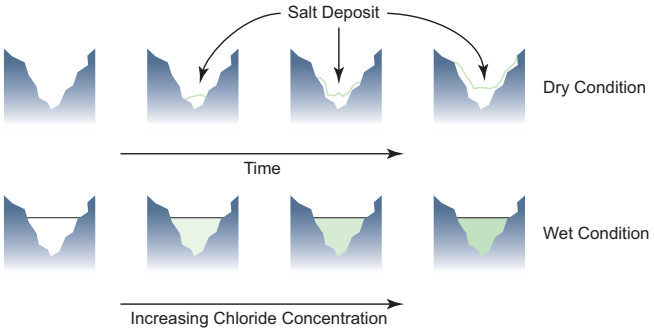


Figure 3 *Showing the increasing chloride concentration with time*

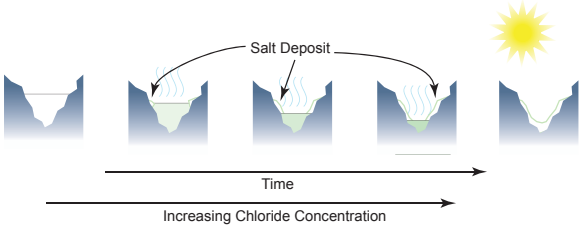


Figure 4 Showing the increasing chloride concentration as the water evaporates over time

If the metal has already experienced some tea staining then this must be removed with a suitable deoxidant such as a 2% solution of phosphoric acid (care should be taken to follow the manufacturer's instructions when diluting and applying phosphoric acid). After leaving the deoxidant for a few minutes, some 'elbow grease' also needs to be applied, and the surface rubbed with a non-metallic cleaning pad in the direction of the grain of the material. Do not rub across the grain as this will burr the polish lines and dull the surface. After this more frequent maintenance washing program should keep the material in peak condition.

Note: This article is for guidance only and does not constitute a definitive recommendation. When looking at the materials you should always take into account particular conditions at the site. The best indication of material requirements is often to look at existing metal surfaces to see how they are performing.