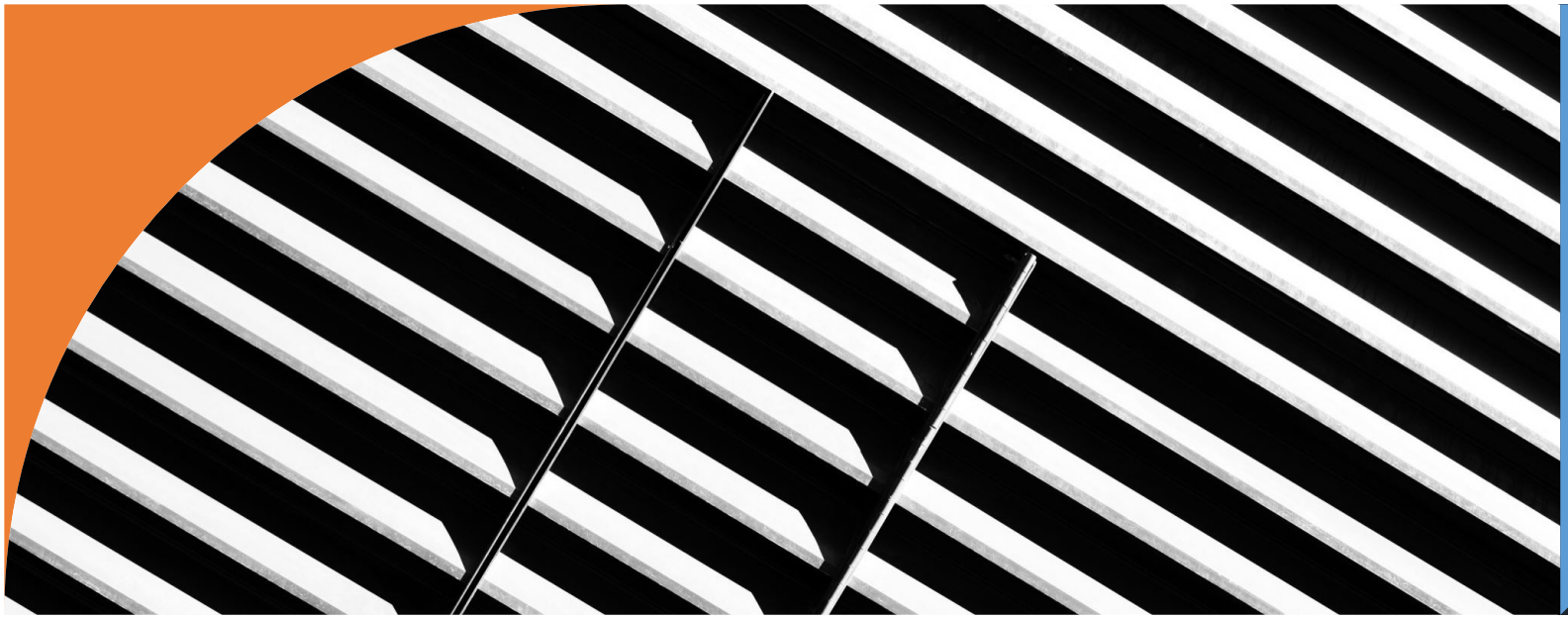

Aluminium in Buildings

Understanding Corrosion and its Prevention

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Why Use Aluminium?

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- Very good extrudability – therefore complex shapes can be produced
- Light weight
- Does not support combustion
- Good reflectivity – roofing and foil insulation products
- Suitable for a variety of surface finishes
- Durability

Aluminium Durability

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- Aluminium is extremely reactive
- Oxide layer forms almost immediately
- Unlike steel and rust the oxide layer adheres firmly to the substrate
- Generally, the oxide layer is stable in the pH range 4.0 – 8.5
- Alloys used in the building and construction sector amongst the most resistant to corrosion

Types of Corrosion

(Excluding corrosion specific to the high strength aircraft alloys)

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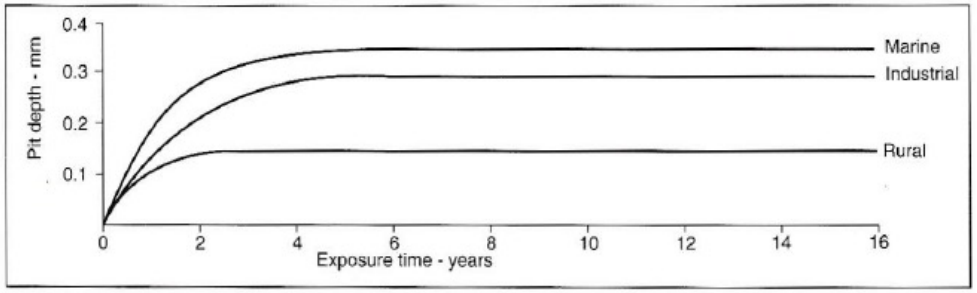
a) Pitting Corrosion

- Forms at local discontinuities of oxide film on aluminium exposed to atmosphere, fresh or salt water
- In most environments the rate of pitting rapidly diminishes and becomes self-limiting
- However, in severe marine environments, chloride ions can lead to a breakdown of the oxide film
- A saturated solution of $AlCl_3$ has a pH of about 3.5 so if present pit will not re-passivate and stop corroding

Graph 1.1: Pit Depth v Exposure Time – Alloy 6005A – T6 (mill finish)



Types of Corrosion

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b) Galvanic Corrosion

- Dissimilar metals connected in a conductive environment
- Rate of attack influenced by
  - Difference in corrosion potentials
  - Conductivity of the electrolyte
  - Cathode, anode area ratio
  - Polarisation characteristics (the galvanic influence of stainless steel on aluminium is significantly reduced because of polarisation)

Types of Corrosion

c) Crevice corrosion

- Crevice formed with two faying aluminium surfaces (or one aluminium and one non-metallic surface)
- Electrolyte present
- Differential oxygen concentration between inside and outside of crevice
- In window and door installations serious corrosion can occur at sill level

WHY ?

- Water under sill cannot drain away – design or installation
- Source of chlorides – usually from the mortar but can be other sources such as bore water
- High pH destroys oxide layer and continuing moisture prevents oxide layer reforming

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Prevention of Crevice Corrosion

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- Ensure adequate drainage under sill. No impedance from sill bricks or tiling
- Remove source of chlorides where possible
- Minimise excessive use of mortar under sill
- Consider using a membrane or painting the underside of the sill. Remember that powder coating is specified for the visible faces and the underside of the sill could be uncoated except for overspray

Surface Finishing

- Why?
- Appearance and protection

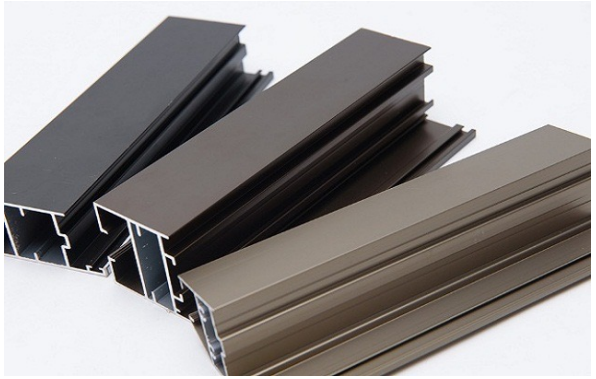
Options

- Anodising to AS1231

Film thickness 15-25 microns depending upon location, project etc

- Powder coating to AS3715

  - Pretreatment essential for adherence
  - Appropriate powder for environmental conditions
  - Film thickness 60 micron (minimum average)



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Cleaning and Maintenance

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- Necessary to retain original appearance and minimise corrosion rate
- Frequency is dependent upon the severity of the environment
- For corrosivity factors C1 and C2 - 12 months max.
- For corrosivity factor C3 - 6 to 9 months max.
- For corrosivity factors C4, C5, CX - 1 to 6 months max.
- Cleaning procedures rated MILD, MODERATE and HEAVY
- Always start with MILD

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THANK YOU

Questions?