# TECHNICAL BULLETIN

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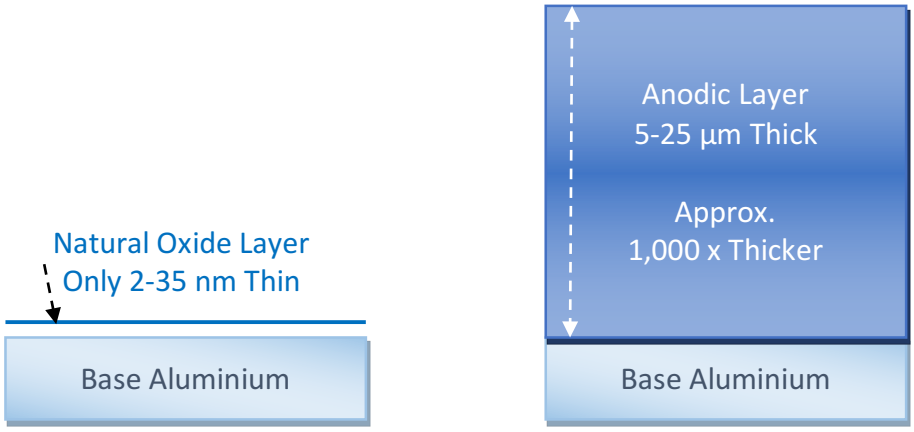
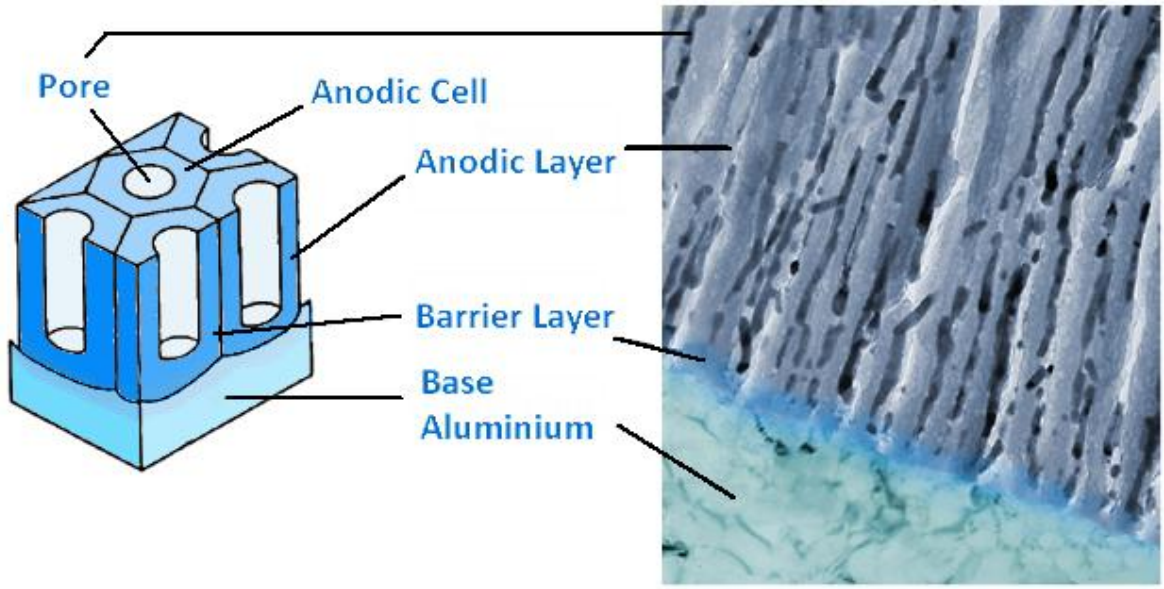
## THICKNESS OF THE ANODIC FILM

The moment aluminium is exposed to oxygen in air it instantly forms a very thin (≅ 2-35 nanometres) aluminium oxide layer, giving aluminium its good corrosion resistance. However, the Aluminium Oxide layer that forms as a result of the anodise process, is about 1,000 times thicker (5-25 microns) as well as much harder than that which naturally forms, significantly improving its protective ability.




## STRUCTURE OF AN ANODIC LAYER



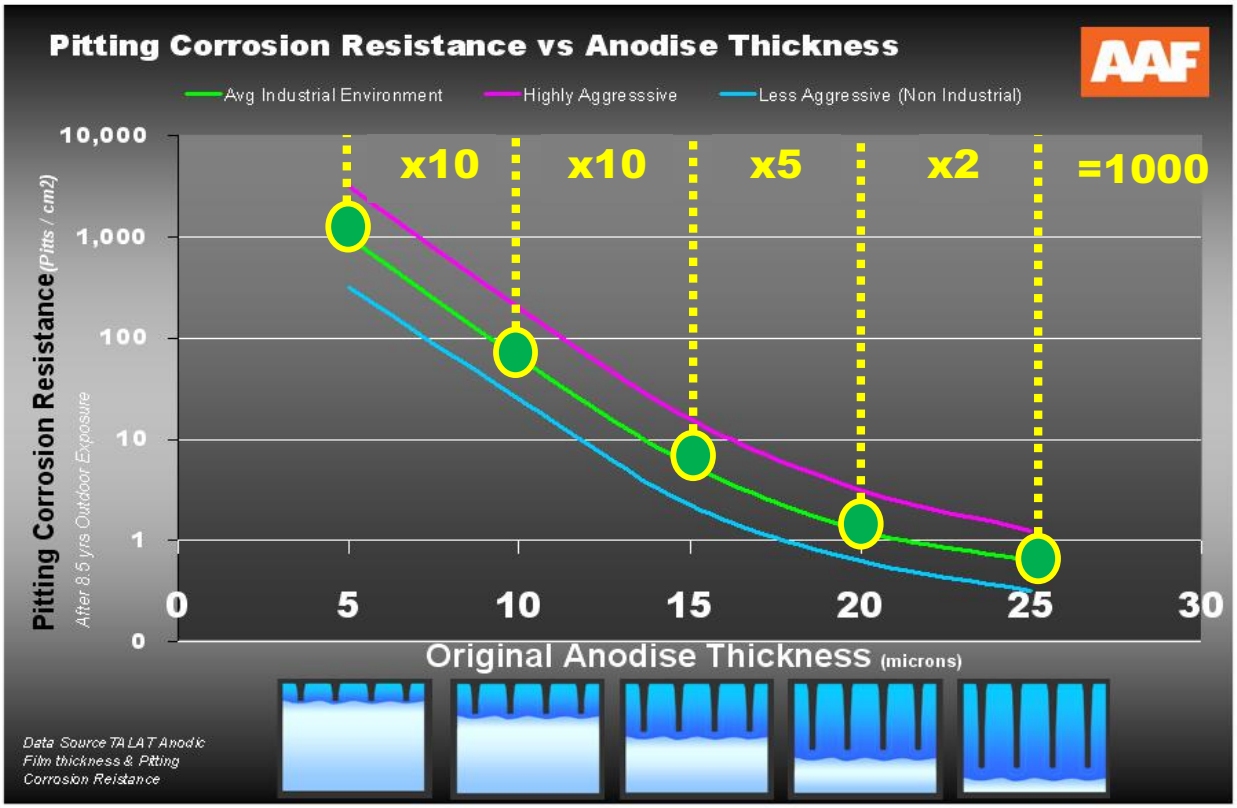

Did you know? Aluminium Oxide ($Al_2O_3$) is also known as Corundum. Gem varieties of Corundum include Ruby, Sapphire, & Emery. Among the natural gems only Diamond is harder than Corundum. This explains why the Anodised Aluminium surface is so hard!

## PITTING CORROSION RESISTANCE

All metals are susceptible to a natural process known as corrosion. Both natural and man-made environments help reduce metals to their natural form, though the extent at which this occurs can vary considerably.

Of all the various types of corrosion, pitting corrosion is the more common type that can occur on aluminium alloy products. They can occur when negatively charged ions (e.g. Cl-, from salt water) accumulate on the metal surface at microscopic discontinuities such as scratches or inclusions and can cause breakdown of the protective oxide. Each pit is discrete and minute in size and are more or less round, with a cavity which is roughly hemispherical.

In increasing the level of aluminium oxide thickness by anodising, the corrosion resistance offered of an aluminium alloy is substantially higher. In the chart below, test samples were subjected to 8 ½ years outdoor exposure in three different environment types, from less aggressive (non-industrial) through to highly aggressive. It is clearly seen that the higher anodic thicknesses provide the greatest Pitting Corrosion resistance. Note Pitting rate Scale on the Y-axis is logarithmic. So the improvement in pitting corrosion protection from 20 microns to 25 microns is approximately double and from 5 microns to 25 microns is approximately a 1,000 fold improvement.



## AS1231-2000 RECOMMENDATIONS FOR CHOICE OF ANODIC THICKNESS

| ISO 9223: ATMOSPHERIC CLASSIFICATIONS, Referenced in: AS1231-2000 | | Examples | Thickness Grade Recommendation |
|---|---|---|---|
| *Summary based on Appendix H - Guidance on the Choice of Coating Thickness Grades & Appendix I - Atmospheric Environments* | | | |
| Category 1: | Interior Environments | not subject to moisture condensation | 5 |
| Category 2: | Interior Environments | subject to moisture condensation | 10, 15 |
| | Interior Severe* | Indoor Swimming Pool | 20 |
| | Interior Very Severe* | Indoor Swimming Pool | 25 |
| Category 3: | Exterior Mild (to Moderate) | Areas remote from the coast (> 5km from marine coastline), industrial fallout and the tropics. E.g. rural, urban, light industrial | 15, 20, 25 |
| Category 4: | Exterior Tropical | Remote from coastal activity & Industrial Fallout. Typically 65-100% humidity year round. Coastal areas of nth QLD, NT, n-w WA, PNG & Pacific islands, except where directly affected by salt spray. | 25 |
| Category 5: | Severe Industrial | Around major industrial complexes inland from the sea. E.g. around smelters in Port Pirie and Newcastle | 25 |
| | Severe Coastal Marine | Moderate influence by coastal salts (sea spray) upto 5 km inland. E.g. Areas of Perth, Wollongong, Sydney and Newcastle | 25 |
| | Very Severe Coastal Marine* | Beachfront near rough seas or surf beaches | 25 |

** These could not be defined in AS1231-2000*

## SUMMARY

### Higher Thickness;

- 25µm should be specified for Moderate to Severe environments (AS1231)
- Is the single most critical factor in achieving superior Pitting Corrosion Resistance
- Are a better Electrical Insulator
- Can be more prone to excess heat induced Crazing (under certain conditions)

### Lower Thickness;

- Can Achieve Brighter Lustres
- Have some influence on Lowering risk of excess heat induced Crazing (under certain conditions)
- Offers Lower level of protection from Weathering, Traffic & Harmful materials
- Not recommended for exterior moderate to severe environments

All else being equal, thicker Anodic layers provide significantly superior Pitting Corrosion Resistance and provide greater level of protection from weathering, natural and urban pollutants. Further, Specialised grades of Evershield anodising can be specified. These not only offer higher anodic layer thicknesses, but are further advance in producing an even more durable finish via thermo-electrochemical process controls.

## REFERENCE


- Australian Standard (AS) Australia, (AS 1231-2000, App. H - Guidance on the Choice of Coating Thickness Grades & Appendix I – Atmospheric Environments)
- Corrosion of Aluminum and Aluminum Alloys, ASM International, Edited by J.R. Davis


## NOTE

Details contained herewith do not constitute specific advice, merely they are provided as a matter of courtesy and as general information only. You should seek your specialist's advice, to ensure that any information or suggestion meet your specific requirements. Reference should be made to the respective standards for the finish concerned as well as Australian Aluminium Finishing Pty Ltd (AAF) Terms and Conditions of Sale. Latest releases of Australian Standards are available for purchase via the following website; www.standards.com.au

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and powder coating please visit:

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