

We would like to take this opportunity to formally bring to your attention, the potential for an anodising finish to "Craze" under certain atmospheric conditions and when not properly protected from direct heat.

Crazeing appears as 'spider web' shaped micro-cracks across the surface when viewed closely from certain angles.

In our experience, "crazeing" has occurred very infrequently, with only two notable occurrences in the last seven years. Given the Millions of square metres of anodising processed over the same period, its occurrence is quite rare. None-the-less, we feel it important enough to have conducted our own research and tests which provide the basis of information contained within this notification.

Once crazeing has been initiated on a surface, the crazeing can be seen to appear when the metal is at higher temperatures, then disappear once the aluminium becomes cooler. Apart from the aesthetically undesirable appearance, it does not appear to impair the performance of the anodic layer.

In our commercial experience, the risks of "crazeing" are seen to increase when thicker (25µm+) anodic coatings are subjected to hot (and dry) atmospheric conditions and which result in the aluminium becoming heated beyond the 60-70°C range. In the two instances noted above, investigation revealed that the 25µm (microns) anodised material was left unprotected from direct radiant sun (pre-installation), on extremely hot days. This allowed the material to heat up to excessive temperatures where the craze was initiated.

It is important to note that the risk of same occurring on the anodised items post installation is considerably lower due to shading and the heat-sink effect of assembly and building, which would help avoid heat up to excessive temperatures.

In support of our findings we attached the following excerpt from the [NASA - Goddard Space Flight Center, Technical Memorandum 104622, "Preventing Cracking of Anodized Coatings", 1995.](#)

"The coefficient of thermal expansion of aluminum is about five times greater than that of aluminum oxide [3-5]. As a result, anodized coatings tend to craze or crack mainly because of the thermal stresses. Cracking of the coating may occur during fabrication and/or during operation. Any environmental change that causes differential expansion or shrinking between the coating and the substrate will introduce stresses into the coating. If the stresses are large enough, cracking will occur."

"If the crazeing does not occur after anodizing and sealing processes, heating the coating can induce the cracking. The temperature at which the cracks first appear on the anodized coatings, T_{c1} , was evaluated by Alwitt and McClung [5]. It was found that there was a general tendency for 25 µm thick coatings to crack at temperatures about 20° to 25°C lower than for 12.5 µm coatings. This means that thick coatings are more vulnerable to cracking than thin coatings [3,5]."

...“In summary, the factors that affect cracking (crazing) of the anodized coatings are as follows:”

1. “Temperature: Temperature is the most important factor for cracking of anodized coating.”... (the manner in which material is stored and protected from heat, especially pre-installation is critical!)
2. “Humidity of environment. Low humidity causes loss of water from the coating, which generates large stresses in the coating...”
3. “Thickness of the coatings: Thicker coatings tend to crack at lower temperatures [3,5]”...

It is also important to understand that the Australian Standard AS1231-2000 recommendation on thickness is a “minimum average thickness”, with no upper limit on thickness. Given normal process variation, it is not uncommon to find thickness of 29µm+ on production run at a minimum 25µm specification.

In our experience, Anodic films produced to 20µm specification (or lower) thicknesses as per AS1231 have not resulted in a crazed finish. However, if you allow the anodised product to heat up to high enough temperatures, even lower thickness can craze.

In summary, the initiation of “Crazing” can result when a combination of factors spanning various areas of control, occur at once. Ultimately, as this phenomenon is triggered by exposure to atmospheric conditions and the resultant mechanical behaviour, AAF is not in a position to prevent it from occurring.

However, we do want to emphasise the following;

- Ensure that you understand the risks of “Temperature Induced Crazing” occurring
- Ensure that pre-installation, your anodised material is protected from sources of high direct heat
- For projects where you feel you are unable to mitigate the risks, that you consider specifying the lower of the recommended thickness still suitable for your given environment or project type.

Finally, we would like to emphasise that AAF is not recommending the use of thinner anodic thicknesses over thicker anodic thicknesses across the board. The advantages of a tough & durable 25µm anodic layer are well recognised and projects around the world are testament to this.

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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