Aluminum Alloy Response to Anodizing

Anodized finishes are the original long-term protective finish employed on architectural aluminum components, with projects dating back to the 1920s. Over the decades, the greater majority of these projects have been successful. Unfortunately, a small number of these installations displayed excessive color variation. These occurrences have caused a fear among some architects, designers and specifiers that precludes them from using anodizing. This fear is unfounded if proper planning takes place prior to purchasing and fabrication of these components.

Pure aluminum is a very soft, ductile metal with limited practical uses. In order for aluminum to be a viable option for most applications, something must be done to transform it into a stronger material. When aluminum is used in products for manufacturing and construction applications, it is generally in the form of an alloy. An alloy is a mixture of two or more metals. Mixing small amounts of other metals with aluminum greatly increases its strength properties and other characteristics. Because of the many different applications for aluminum, hundreds of aluminum alloy recipes exist in order to meet the numerous requirements.

Anodizing converts the outermost surface of an aluminum component into a film of aluminum oxide, but it also incorporates all of the alloying constituents into this film. The oxide coating produced on pure aluminum surface is nearly transparent. Every metal added to an aluminum alloy will have a different effect on the resulting color and opacity of its anodic coating. For example, silicon gives a grey cast to the coating, while manganese lends a brownish tint. The sheen of the coating is also affected by certain elements. Elevated copper content will produce a brighter look, while higher levels of iron give a duller appearance. As the concentrations of these metals increase, thus does the effect on appearance of the coating. The Aluminum Association sets standards for all alloys, but the ranges allowed within these standards are significant. This can cause anodized coatings from different aluminum lots of the same alloy to vary in color.

Aluminum building panels are one of the most color-sensitive applications for aluminum anodizing, and require the most planning during the design and manufacturing processes. Color variation can be negligible if all panels on an elevation of a building are from the same parent coil of material. If this is not possible due to project scale, multiple coils should be tested for anodize coating color prior to fabrication in order to ensure cross compatibility. It is also important to exclusively use "Anodize Quality" grade sheet stock for anodized projects. This special grade of material is processed at the mill specifically to eliminate potential surface defects visible only after anodizing.

Anodized finish color consistency can be assured if the appropriate procedure is followed for aluminum alloy selection and utilization. Guidance through this process is available from AaCron's Technical Service experts.

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