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General Aluminum Information

What is an Aluminum Alloy?

An Aluminum alloy is an alloy primarily of pure aluminum, mixed with different alloying elements that give rise to an entire range of materials, each of which is designed to maximize a particular characteristic such as strength, ductility, formability, machinability, or electrical conductivity.

Is it necessary to specify the alloy?

Only if there is some physical characteristic of the alloy that will have some bearing on the success of the project (such as corrosion resistance) is it necessary to specify the actual alloy. Generally, the fabricator will purchase the material on the basis of shape or form, and it will arrive with the most commonly available and least expensive alloy present locally.

If there is any question of the integrity of the material in any way, the designs must be approved by an engineer, but you will be able to accept substitutions of alloys with confidence that the resulting product will be aesthetically acceptable.

What is Temper?

This is the quality of metal that describes its ability to spring back after it is flexed - in effect, the stiffness. It doesn't have anything to do with how hard the metal is. Soft temper means that when it is bent, it stays bent, and it doesn't take much force to do it. Hard temper means that when it is bent, it springs back flat, and it takes a lot of force to put a kink into it. There are several degrees of temper; Soft, 1/4 Hard, 1/2 Hard, 3/4 Hard, and Hard. All metals are subject to temper, and it is a quality of the product that is imparted at the mill. It has no impact on hardness, color, machinability or weldability. However, bending (kinking) and heating to a high temperature can remove the temper and soften the metal at that point. This is called annealing.

What about Finishing?

Finishing aluminum is a little more complex than it seems at first.

Polishing

It can be polished, with an abrasive finish like #4 satin finish, or even a high polish, but the metal itself is comparatively soft, so these finishes mar easily and they are not recommended without applying a clear organic coating to protect them.

Lacquering

Aluminum is an extremely reactive metal. It combines instantly on contact with air to form a thin film of aluminum oxide which in turn is extremely un-reactive and protects the surface from further corrosion. This film is not really visible, but if the metal is touched, it comes off on your hands as a black smudge. The metal does not stain or visibly corrode (except in extreme chemical environments like salt spray from winter street salt or exposure to seawater) but this smudging is undesirable in most environments. Having said that, there are many architectural environments in which bare aluminum extruded shapes are used with acceptable results.

The best way for a fabricator keep the silvery look of the parent metal is to abrade the surface with the abrasive finish you require, and then lacquer the piece with a clear organic finish. Be sure to use an organic finish that is specifically designed for use with aluminum - conventional finishes will either react with the metal, or will not adhere correctly.

Anodizing

This was invented for aluminum (it also works with titanium). It is a process of dipping the aluminum into a liquid solution that contains chemicals that clear the metal surface of its coating of aluminum oxide whereupon a dye is introduced into the solution which can now penetrate the surface of the metal to some depth. The process requires a high current to pass through the metal during the process in order to fix the dye and seal the aluminum with a hard surface, so it must be done in anodizing shops and cannot be touched up on site. It produces an extremely durable tint to the metal, the color of which can be specified (and there are scores available). However, be aware that most of the anodizing colors available are meant to be used in interiors and will fade in the sunlight. There is a broad range of exterior colors available, but you must specify them as such.

Clear Anodizing

This is the finish that is most common on natural-colored pre-finished aluminum sheet, available from many architectural metal suppliers. It is simply a non-dyed version of the anodizing process described above, and one of the most common methods to render large aluminum surfaces wear-resistant and corrosion resistant.

Bronze Anodizing

This is the extremely common method for producing the extremely durable dark “bronze” finish on architectural aluminum extrusions used in window frames. The process is identical to those above, and the color is light fast for exterior purposes. The shade of bronze can be specified from extremely light to almost black.

Hard Anodizing

The same process, but not for color - it is a method for creating an extremely hard surface to any aluminum material. This is used for example for bolts, sheets that need abrasion resistance etc., or to minimize galvanic reaction between aluminum surfaces and other metals. It is not really architecturally interesting, and somewhat expensive, but has many uses in Industry. It is used in very expensive cookware to impart a hard non-stick surface to pots and pans.

*To be used as a guideline only