Achieving Success with Architectural Anodize

Aluminum is one of the most durable and versatile of all metals and the unique process of anodizing enhances its environmental qualities.

In the 1920s, aluminum turned the metals world upside down with its benefits of light weight, strength, fabrication flexibility and durability. Architectural anodize has been used for nearly 90 years.

The first finishing technology developed was the anodize process, which provided corrosion resistant, long-lasting protection and color on the aluminum surface.

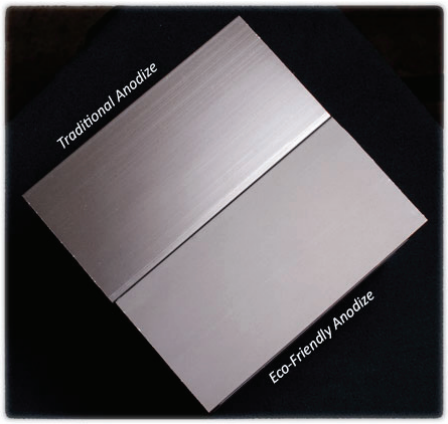
The Anodize Process and its Environmental Characteristics

The anodizing process consists of immersing the aluminum to be anodized in a solution, referred to as an electrolyte, and passing a direct electric current through the electrolyte and into the aluminum, with the aluminum acting as the anode. The result is a controlled formation of a durable oxide coating on the surface of the aluminum. The anodic coating greatly increases resistance to corrosion and abrasion.

Anodized aluminum is 100% recyclable with no intermediate process needed for anodized aluminum to reenter the recycle chain, lending itself to post-consumer recycled content during demolition or restoration of the building. Anodizing is a water-based process and uses no VOCs, making it a light-fast, durable alternative to paints and organic coatings.

Eco-Friendly Architectural Anodize

There are additional environmental aspects when the anodizer utilizes the newest etching technology. Linetec, and other environmentally-conscious finishers, changed from the traditional caustic etching process to a more eco-friendly etch system allowing customers to use secondary (recycled) billet in the anodize process.



Traditional anodize compared to eco-freindly

With eco-friendly anodize, small surface defects are hidden by an aesthetically desirable “frosty” matte finish and the appearance of the aluminum is enhanced. The resulting matte finish reduces glare in bright sunlight, an attribute associated with increased productivity and comfort for occupants. Gloss level reading is typically reduced from 15 to 25 with conventional anodize, down to a gloss level of 3 to 12 for eco-friendly color anodize. Interior comfort and recycled material content are recognized by green building programs such as the LEED® Green Building Rating System™.

The eco-friendly anodize process reduces landfill waste used with conventional etch processes by 75-80 percent. Landfill waste directly relates to the production of greenhouse gas.

The eco-friendly anodize etch process has the viscosity of water and will not collect in the small recesses of aluminum extrusions or narrow aluminum tubes, enhancing the durability and lifecycle of the finished product.

Reducing Variation in the Anodize Process

"All aluminum can be anodized." This is a valid statement, but merely to the extent it is understood that only the aluminum gets anodized while the other metal constituents (i.e. zinc, magnesium, silicon) present in the alloy do not respond in the same manner. Alloy or the variance of metal constituents in aluminum is the major reason for color variation. Other variables affecting color variation in the anodize process include temper, coating thickness, shape geometry and contaminants such as iron.

Anodizers have control over their tank chemistry, including temperatures, solution concentrations and the time material spends in each tank, but they have no control over the alloy, temper or shape of the aluminum parts. These variables can make it extremely difficult to achieve an exact color from run-to-run and load-to-load.

For Best Results

Maintain Metal Consistency. The easiest way to ensure metal consistency is to work with one metal source/extruder per project and request that all metal come from one "lot" of material.

If the product is too big for one "lot," use one lot per elevation and send material to the anodizer to be finished per elevation.

Do not mix aluminum alloys. Mixed alloys, or even mixed tempers, will not produce uniform results. For best results use 6063 alloys for extrusions and 5005 for flat sheet stock and fabricated parts. (6061 and 5052 can be used if structural properties are required, but may not give similarly acceptable results).

- The 6xxx series alloy, and particularly 6063, has good strength and excellent anodizing characteristics, with good luster. The principal alloying elements are magnesium and silicon. It is a high-strength structural alloy with excellent machinability.

- The 5xxx series alloys are high purity aluminum with magnesium added. Alloys of this series are hard-workened and have good form ability. Alloy 5052 is a high-strength alloy, often used in structural applications. It is a good general-purpose architectural sheet alloy.

Perform as much bending and forming as possible prior to finishing. Anodic films are very hard, and as a result most post-production forming or bending causes the film to "craze," which produces a series of small cracks in the finish, giving it a spider-web like appearance.

Be aware of anodizing's effect on welds. The heat developed from the welding process will change the metallurgy on nearby metal or heat-affected zone (HAZ) and cause localized discoloration, often referred to as a "halo" or "ghost" effect, after anodizing. Use the proper 5356 alloy welding wire and the lowest heat possible when welding 6xxx series alloys. A poor choice is 4043 because it will turn a smutty black when anodized.

Prevent solution entrapment. Proper drainage holes are essential for drainage of solutions allowing entrapped gas to escape from the parts. Even the tightest welded joints will cause anodize chemicals to weep out, causing undesirable defects.

Talk racking. The finisher needs to know where parts can be racked. Contact marks will be visible on the aluminum, it is important to define what is acceptable and what is unacceptable with regard to exposed surfaces and rack marks. Keep in mind that the parts cannot simply be hung on hooks.

Store aluminum material properly. Store aluminum in a dry and controlled environment. Do not allow moisture to build-up between the pieces as this will

cause severe corrosion, which will not be removed in the finishing process.

Avoid adhesives. Tape or adhesive on the aluminum may leave a residue that may not be removed in the anodize process.

Specifications should include the requirement of color samples showing the color range to be expected in production.

Select an anodizer who utilizes fully-automated anodize lines to reduce inconsistencies in the process.

Always wear gloves. Do not handle unfinished aluminum with bare hands as oils on skin can cause permanent and severe corrosion.

Care and Cleaning to Maintain Anodized Aluminum

It is crucial that aluminum work be carefully protected at the job site prior to and after installation is complete, and prior to the buildings' final acceptance. Installed aluminum work is considered a "finished product" while the other building components are generally in a rough or unfinished state. Most damage to aluminum work will occur during this time.

To ensure a long-lasting anodize finish consider the following items during installation:

Remove surface protective coatings. All protective coverings, such as adhesive paper and strippable plastic film, should be removed as soon as possible after installation because they can become brittle and unpeelable under sunlight exposure and weather. These conditions can cause staining.

Staining to anodized aluminum from prolonged protective coating

Dissimilar materials. Architectural designs often incorporate many different materials, making possible contact between dissimilar materials an important consideration. If questions occur regarding compatibility, the manufacturer of the aluminum products should be contacted.

Masonry work. The major source of damage to in-place aluminum components usually comes from the splashing, splattering, or run-down from adjacent or overhead masonry work. Acids used for cleaning operations pose a serious problem for anodize finishes. Any mortar, plaster, concrete, fire proofings, sprays, paints or other wet preparations that inadvertently splash upon the aluminum must be immediately wiped clean as permanent damage can occur in minutes. The affected area should be washed liberally with water. Dried splatterings should be removed with wooden or plastic scrapers (not metal), which will not scratch the surface.

Chemical attack to an anodized finished door

Chemical attack. Chemical attack occurs when acid or alkaline materials come in contact with aluminum finishes, especially an anodized finish. The most common occurrence is when mortar or muriatic acid is allowed to dwell, even for a short time, on a window or aluminum building component. If the finish is visually affected, irreversible damage has occurred and the discolored item may need to be replaced.

Tar roofing. When tar roofing is applied, the roofing should be graveled on the same day to minimize staining from run-down. Failure to avoid contact with the aluminum will result in staining that is extremely difficult to remove.

Avoid contact with strong cleaners. If strong cleaners are used to clean brick work and masonry they should be confined to the area being cleaned. Cleaners strong enough to dissolve mortar spots on brick will

damage any aluminum finish and possibly the underlying metal. Accidental contact from these solutions should be flushed from the aluminum surface immediately with clean water.

Damage caused to anodized window from brick wash cleaning agent

Halogenated solvents. Solvents such as methylene chloride should never be used to clean anodized aluminum.

Although anodized aluminum is extraordinarily resistant to corrosion, discoloration and wear, its natural beauty can be marred by strong chemicals, abuse or neglect. Depending on the geographic location and environmental conditions, varying amounts of soil and dirt will be collected on the aluminum surface, therefore cleaning schedules and frequencies also will vary. More frequent cleaning will be required in heavy industrialized areas than in rural settings. In foggy and coastal regions, frequent cycles of condensation and drying can create a heavy buildup of atmospheric salts and dirt, which can adhere tenaciously. Therefore, more frequent cleaning is required.

Photo courtesy of Tampa Museum of Art, Tampa, Florida

Cleaning Procedures for Anodized Aluminum

Cleaning work should start at the top of the building and proceed to the ground level in a continuous drop. Using a forceful water spray, an area the width of the stage or scaffolding should be rinsed as cleaning proceeds from the top down.

Because surface soils may be light or heavy, several progressively stronger cleaning procedures may be employed depending of the severity and tenacity of the soil. The simplest procedure and most mild cleaners to remove the soil is the one that should be used.

For light soils, the simplest procedure is to flush the surface with water using moderate pressure. If soil is still present after air-drying the surface, scrubbing with a brush or sponge and concurrent spraying with water should be tried. If soils still adhere, than a mild detergent cleaner should be used with brushing or sponging. Washing should be done with uniform pressure, first horizontally then vertically. Following washing, the surfaces must be thoroughly rinsed by spraying with clean water.

If it is necessary to remove oil, wax, polish or other similar materials, MEK or an equivalent solvent is recommended for clean up. Extreme care must be exercised when solvents of this type are used since they may damage organic sealants, gaskets and other finishes. These solvents should never be used on anodic finishes protected by clear organic coatings unless the organic coating has been removed.

Removing heavy surface soils may require the use of an abrasive cleaning pad. In this procedure, the pad is thoroughly soaked with clean water or a mild detergent cleaner and the metal surface is hand scrubbed with uniform pressure. Scrubbing action should be in the direction of the metal grain. Scrubbing with a nylon-cleaning pad impregnated with a surface protectant material also is recommended for removing stubborn soils and stains. After scrubbing, the surface should be rinsed thoroughly with clean water to remove all residue.

In some circumstances, it may be desirable to wipe the surface with a solvent. The surface is then permitted

to air dry or is wiped dry with a chamois, squeegee or lint-free cloth.

Using power-cleaning tools may be necessary to remove unusually heavy soils from large areas including panels and column covers. When using such tools, the surface must be continually flushed with clean water or a mild detergent cleaning solution to provide lubrication and a medium for carrying away the dirt. After an area has been machine scrubbed, it must be rinsed with clean water and thoroughly scrubbed with a stiff bristle brush. The surface may then be air dried or wiped dry.

Guide Specifcation - CSI 3-part format

The architect and building owner who specified anodized aluminum wall and window components has done so first because of the beauty, which can be achieved with such anodized finishes, and second because of the long life, durability and low maintenance that these finishes provide.

To ensure a superior and sustainable anodize finish is provided, the following specification and guidelines should be followed:

Guide Specification 05 0513 Shop-Applied Coatings for Metal - download Word doc at www.linetec.com

AAMA 611-12 Voluntary Specification for Anodized Architectural Aluminum

AAMA 609 & 610-09 Cleaning and Maintenance Guide for Architecturally Finished Aluminum

The guide specification coordinates with Division 01 to address various sections pertaining to both polyvinylidene fluoride (PVDF) liquid paint coatings and anodize finishes for architectural aluminum.

This non-propriety guide spec offering concise language for selecting and specifying high-performance PVDF and anodize finishing in CSI three-part format for shop-applied metal finishes. Beyond the stringent standards and regulations, this guide spec offers specifiable differences that contribute to a project's long life, durability and sustainability.

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