



CONSIDERATIONS FOR PREVENTIVE MAINTENANCE

This document is intended to assist those who manage office structures clad with anodized aluminum curtain wall systems (AACWS). Specifically, its purpose to help them in decision making relative to planning and budgeting preventive maintenance (PM). The goal of this report is to raise awareness about the cost benefit of proactively caring for this critical and often overlooked major building system.

Why and when should one consider the condition of their aging anodized building façade?

Why:

- **Protect Future Value and Effectively Manage Operating Costs** – Generally, the cost to care for something and keep it for a long time is far less than to let it deteriorate to a point where major repair or replacement is required. A well-maintained building tends to command a higher value when marketed.
- **Avoid Duplication of Cost** – Planned PM can be bundled and scheduled with other similar activities. One service provider may be able to provide significant cost savings by a comprehensive approach that eliminates what would otherwise be redundant costs (such as rigging) and multiple contracts to administer.
- **The “Curb Appeal” Factor: Image and Appearance Boost Prestige and Tenant Retention** – Newer “Class A” surrounding buildings are presenting competition for attracting and retaining tenants.

When:

- **Plan, as Far Ahead as Possible** – Metal and glass curtain wall clad structures, particularly those located in large cities where air quality is poor, will require certain and specific maintenance. Eventually, a system failure will occur (i.e. leaks, window seals or weep systems fail, portions of the façade become detached). When this is the case, the repairs will become urgent. If repairs of this nature have not been factored into the building’s operating plans, cost control and effectiveness suffer. Using long term planning, management recognizes that time spent in planning saves time and expense in execution.
- **Act before Deterioration is Abundantly Evident** – Care for a building façade is akin to maintaining healthy teeth. Regular cleaning and inspection keeps you smiling, whereas a deferred visit to the dentist is sure to be painful and expensive. Deferred PM leads to restoration or replacement.
- **Increased Frequency of PM Minimizes Complexity** – Regular PM is generally very simple and rapidly executed. Restoration and replacement involves longer planning, testing, demolition and significant disruption to normal building activities.

MAINTENANCE OPTIONS

During the life of an AACWS, the options for the maintenance and restoration of such facades are limited. The chart below illustrates the three general options with a relationship to benefits and cost.

Time Intervals ¹	Maintenance or Restoration Action ²	Benefits	Cost Factor Relative to Replacement
2-5 years	Maintain³ <ul style="list-style-type: none"> Gently clean all surfaces to remove soil that detracts from the facades appearance and contains corrosive compounds Apply a clear protectant/sealer 	<ul style="list-style-type: none"> Maintains like-new appearance Helps prevent corrosion 	<1/10
15-30 years	Restore⁴ <ul style="list-style-type: none"> Field-apply a high performance architectural coating system Replace façade weather seals⁵ 	<ul style="list-style-type: none"> Provides a new finish Effective corrosion barrier and water proofing 	+/- 1/5
30-40 years	Major Restoration or Replace⁶ <ul style="list-style-type: none"> New façade/curtain wall system 	<ul style="list-style-type: none"> New modern appearance 	1.0 +

Typical factors that Drive AACWS Maintenance, Restoration or Replacement

- Architectural anodized aluminum declines in appearance and corrodes relative to:
 - Initial design, system components/products and installation quality⁷
 - Environmental exposure (natural elements, urban/industrial corrosive pollutants)⁸
 - PM history, frequency and methods⁹
 - Physical damage caused by window cleaning chemicals and equipment¹⁰
 - Time in service
- The ability to maintain or restore the appearance of an AACWS, relative to its original condition, directly relates to the five factors identified above.
- The cost to maintain or restore the appearance of an AACWS, relative to its original condition, directly relates to the five factors identified above.
- The effects of deferred PM include:
 - Irreparable damage the finish of the metal - (when you see it, it's too late).
 - Ever-increasing rate of corrosion following the breaching of the protective anodic layer (see Attachment on page 5).
 - Loss of structural design integrity.
 - The ingress of water through holes in the building façade caused by corrosion. This condition can necessitate the need to remove and replace portions of the building façade and lead to the need for major structural repairs.

- e. At a certain point, curtain wall system metal deterioration can only be corrected by the field application of high performance architectural finish systems, involving:
 - i. A cost at least three to four times the cost of regular PM treatments
 - ii. Work schedule duration two to four times longer than regular PM
 - iii. Highly weather sensitive applications that make completion time uncertain
 - iv. Potential significant impact and disruption to the occupants of the building
 - v. High-risk factors difficult to quantify related to public safety/environmental issues

As a service provider of the subject work, Stuart Dean provides information within its condition reports for clients to establish what can and cannot be achieved through the cleaning process. Here is how:

*“The above detailed cleaning process is designed to improve the overall appearance and surface conditions of the façade without damaging the anodized finish. **Cleaning and scrubbing cannot correct areas with conditions such as etched stains, as well as surface corrosion evidenced by pitting, particularly when advanced and widespread. These locations have suffered irreparable anodic finish damage.** Existing surfaces deteriorated as such can only be cleaned and not more than lightly abraded. Further abrasive cleaning will expose more raw aluminum that has no natural corrosion resistance due to loss of the original anodic protective layer. The application of a clear curtain wall protectant is important as a corrosion inhibitor to surfaces compromised as mentioned above, as well as weathered yet undamaged surfaces, however existing corrosion damage will show through.”*

For buildings that have received the benefit of regular PM, the above concerns do not apply.

- 1 Typical time horizons based on Stuart Dean's 70 years of metal maintenance/restoration experience
- 2 The three examples shown reflect the primary façade treatment categories
- 3 Regular effective PM suggested at five-year cycles, or more frequently
- 4 Lack of PM drives restoration. Effective PM can defer restoration and replacement almost indefinitely
- 5 Weather seals (caulking) have an average service life of 10-20 years (silicone sealant is 20 years plus)
- 6 With little or no PM, significant façade component replacement is likely
- 7 Initial building design and construction factors include: façade complexity, extent of horizontal surfaces that collect harmful contaminants, access limitations, and relative quality of specified system components and their installation.
- 8 Typical rainfall, sun exposure, range of annual thermal cycle (min/max temps), buildings proximity to sources of acid rain and harmful airborne particulate matter
- 9 Poorly executed cleaning methods and material may cause permanent damage
- 10 The chemicals and equipment used in periodic window cleaning can seriously damage surrounding metal

CONCLUSION

Today, most building facades constructed with AACWS suffer from a lack of attention and scheduled cleaning. The reason is that corrosion problems related to air pollution and deferred maintenance are just now beginning to be understood. Unfortunately, many building managers and owners have operated under the belief that AACWS was virtually maintenance free. Many of these buildings are now reaching a critical point: The need to improve appearance and correct serious corrosion and water infiltration problems can no longer be postponed.

The good news is that with prompt action, many of these structures can have their façade appearance dramatically improved and their service life extended. To accomplish this, those responsible must find the right service provider who has the specialized knowledge and experience required. To save time and money, exercise care and choose a company that has a proven record of accomplishment, good references, and the information required to make wise decisions. This type of work is not well suited to inexperienced companies who simply submit the low bid. Many facades have suffered severe and permanent damage at the hands of those who thought, “this is just another cleaning job.”

Modern office towers constructed with anodized aluminum and glass, are very durable, yet they do require certain maintenance actions. These actions are inevitable if the cladding system is to remain attractive and provide the essential functions integral to their original design and safety. With good planning and prudent investment, these critical systems will continue to perform their vital role for many trouble-free years.

SUMMARY

Stuart Dean Company has been helping to maintain and restore many of our nations’ most important buildings since 1932. The firm has the people and the information that building managers need to make wise and important decisions. Aware of how important façade services are to its clients, Stuart Dean has a team of industry specialists dedicated exclusively to this challenging field. The Special Services Group of the company consists of people with special skills and expertise related to building facades. They are devoted to responding to the complex and specific needs of each client’s façade enhancement and protection project. Stuart Dean Company has the people, experience, and desire to meet the requirements unique to each client.

ATTACHMENT

The following attachments contain charts and illustrations that further detail issues relative to the effective maintenance management of anodized aluminum building façades.

**COMPARISON OF SURFACE STRUCTURE CHARACTERISTICS
New / well maintained versus poorly maintained architectural
anodized aluminum**

Figure 1. New / Well Maintained

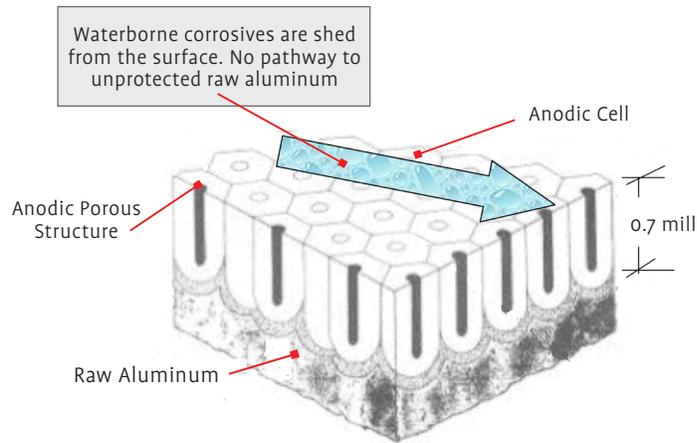


Figure 2. Poorly Maintained

Pits: Areas where anodic protection is lost (condition cannot be reversed)

