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*Elite Specification for Factory-Applied Spray Coatings  
Placed in Severe and Moderate Coastal Environments*

# Voluntary Elite Specification and Performance Requirements for Severe Coastal Performance on Architectural Aluminum Extrusions and Panels

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## 1.0 Scope

1.1 This specification describes test procedures and performance requirements for high performance organic coatings applied to aluminum extrusions and panels for architectural products. It does not imply warranty.

1.2 This specification covers factory spray applied liquid coatings applied to select series aluminum alloys.

1.3 This specification is not intended for bimetallic applications or bare metal cut edges.

## 2.0 Purpose

The specification will assist the architect, owner, and contractor to specify and obtain factory spray applied organic coatings that will help provide a barrier system in severe coastal environments and maintain a high level of performance in terms of corrosion, film integrity, exterior weatherability and general appearance over a period of many years.

## 3.0 Definitions

3.1 The terms “film” and “coating” are used interchangeably in this specification and are defined as meaning the layer of polymeric material applied to the surface of the aluminum.

3.2 Exposed surfaces are those surfaces which are visible when the coated product is installed. These may include both closed and open positions of operating sash, ventilators, doors or panels.

3.3 Spray Coating: The process of applying a resinous coating by atomizing it into a spray or mist, and curing it into a continuous film.

3.4 Severe marine environments are characterized by strong salt smell and haze salt build-up on unwashed areas. Generally extends 0-600 feet (1/10 of a mile) from marine surf. Actual distances vary based on local geographical conditions.

3.5 Moderate marine environments are characterized by moderate salt smell. Some salt build-up and airborne salt may be present. Areas are generally located 600-1300 feet (1/10 to 1/4 mile) from marine surf.

## 4.0 General

4.1 To qualify as meeting this specification, products tested shall meet all requirements as specified herein.

4.2 Coatings shall be visibly free from flow lines, streaks, blisters or other surface imperfections in the dry-film state on exposed surfaces when observed at a distance of 10 feet from the metal surface and inspected at an angle of 90 degrees to the surface.

*NOTE: It is strongly recommended that the fabricator/installer applies a suitable coating to bare cut metal edges.*

4.3 Cleaning and metal preparation shall be to ensure compliance with the performance requirements.

4.4 Sealant used in contact with an organic coating shall be compatible with the organic coating and meet the performance requirements of AAMA 800 sealant specification. There shall be no evidence of deleterious effects in the organic coating such as staining, coating separation, lifting, discoloration or loss of adhesion of the coating from the substrate.

*NOTE: It is strongly recommended that the fabricator of the finished products consult with the sealant manufacturer in the selection of the appropriate sealant. Peel adhesion testing as described in AAMA 800 is suggested. It is important to understand that the AAMA 800 sealant specification does not ensure adhesion to a specific coating. The best way to ensure adhesion is to submit panel specimens of the specific coating to the sealant manufacturer or an AAMA accredited independent laboratory for tests and recommendations.*

## 5.0 Metal Preparation and Pretreatment

*NOTE: A multi-stage cleaning and pre-treatment system is required to remove organic and inorganic surface soils, remove residual oxides, and apply a chemical conversion coating to which organic coatings will firmly adhere.*

5.1 The products used to form the chemical conversion coating on Series 5052, Series 6063, or Series 6463 aluminum extrusions and paneling shall conform with ASTM D 1730, Type B, Method 5 (Amorphous Chromium Phosphate Treatment).

## 5.2 CHEMICAL CONVERSION COATING WEIGHT

### 5.2.1 Procedure

Measure in accordance with the latest issue of ASTM D 5723, using x-ray fluorescence or other standard methods for determining coating weights.

### 5.2.2 Performance

Chrome phosphate conversion coating weights should be a minimum of 100mg/ft<sup>2</sup> (1077 mg/m<sup>2</sup>).

*NOTE: Frequent in-plant testing and control of pretreatment is required to insure satisfactory performance of the coating system.*

## 6.0 Tests

### 6.1 SPECULAR GLOSS

#### 6.1.1 Procedure

Measure in accordance with the latest issue of ASTM D 523 using a 60 degree gloss meter. Samples must meet minimum dry film thickness requirements.

#### 6.1.2 Performance

Gloss values shall be within  $\pm 5$  units of the manufacturer's specification.

*NOTE: Standard gloss range reference values are:*

| GLOSS LEVEL | SPECULAR GLOSS VALUE |
|-------------|----------------------|
| High        | 80 or higher         |
| Medium      | 20 - 79              |
| Low         | 19 or lower          |

### 6.2 DRY FILM HARDNESS

#### 6.2.1 Procedure

Strip the wood from a Berol Eagle Turquoise pencil or equivalent, grade F to 2H hardness, leaving a full diameter of lead exposed to a length of 1/4" in minimum to 3/8" in maximum. Flatten the end of the lead 90 degrees to the pencil axis using fine-grit sand or emery paper. Hold the pencil at a 45 degree angle to the film surface and push forward about 1/4" using as much downward pressure as can be applied without breaking the lead. Reference ASTM D 3363.

#### 6.2.2 Performance

No rupture of film per ASTM D 3363 using F pencil.

### 6.3 FILM ADHESION

#### 6.3.1 Procedure

##### 6.3.1.1 Dry Adhesion

Make 6 parallel cuts, 1/16" apart through the film. Make 6 similar cuts at 90° to and crossing the first 6 cuts. Apply tape 3/4" wide over area of cuts by pressing down firmly against the coating to eliminate voids and air pockets. Sharply pull the tape off at a right angle to the plane of the surface being tested. Test pieces should be at ambient temperature, approximately 65°F to 80°F.

##### 6.3.1.2 Wet Adhesion

Make cuts as outlined in Section 6.3.1.1. Immerse the sample in distilled or deionized water at 100°F for 24 hours. Remove and wipe the sample dry. Repeat the test specified in Section 6.3.1.1 within five minutes.

##### 6.3.1.3 Boiling Water Adhesion

Make cuts as outlined in Section 6.3.1.1. Immerse the sample in boiling distilled or deionized water 210°F to 212°F for 20 minutes. The water shall remain boiling throughout the test. Remove the sample and wipe it dry. Repeat the test specified in Section 6.3.1.1 within five minutes.

#### 6.3.2 Performance

No removal of film under the tape within or outside of the crosshatched area or blistering anywhere on the test specimen.

### 6.4 IMPACT RESISTANCE

#### 6.4.1 Procedure

Using a 5/8" diameter round-nosed impact tester 160 in-lb (18 N-m) range, such as a Gardner impact tester, apply a load directly (direct impact) to the coated surface of sufficient force to deform the test sample a minimum of 0.10"  $\pm$  0.01". Apply tape 3/4" wide over area of deformation by pressing down firmly against coating to eliminate voids and air pockets. Sharply pull tape off at a right angle to the plane of the surface being tested. Test pieces should be at ambient temperature approximately 65°F to 80°F.

#### 6.4.2 Performance

No removal of film from substrate.



**NOTE:** Minute cracking at the perimeter of the concave area of the test panel is permissible but no coating pickoff should be apparent.

## 6.5 ABRASION RESISTANCE

### 6.5.1 Procedure

Follow the procedural methods of the falling sand test, ASTM D 968.

### 6.5.2 Performance

Total falling sand must be a minimum of 100 liters to bare metal.

## 6.6 CHEMICAL RESISTANCE

### 6.6.1 Muriatic Acid Resistance (15-Minute Spot Test)

#### 6.6.1.1 Procedure

Apply 10 drops of 10% (by volume) solution of muriatic acid (37% commercial grade hydrochloric acid) in tap water and cover it with a watch glass, convex side up. The acid solution and test shall be conducted at 65°F to 80°F. After a 15 minute exposure, wash off with running tap water.

#### 6.6.1.2 Performance

No blistering and no visual change in appearance when examined by the unaided eye.

### 6.6.2 Mortar Resistance (24-Hour Pat Test)

#### 6.6.2.1 Procedure

Prepare mortar by mixing 2.6 oz of building lime (conforming to ASTM C 207) and 7.9 oz of dry sand, both passing through a 10-mesh wire screen with sufficient water, approximately 3.5 oz, to make a soft paste. Immediately apply wet pats of mortar about 2 in<sup>2</sup> in area and 1/2" in thickness to coated aluminum specimens, which have been aged at least 24 hours after coating. Immediately expose test sections for 24 hours to 100% relative humidity at 100°F.

#### 6.6.2.2 Performance

Mortar shall dislodge easily from the painted surface, and any residue shall be removable with a damp cloth. Any lime residue should be easily removed with the 10% muriatic acid solution described in Section 6.6.1.1. There shall be no loss of film adhesion or visual change in appearance when examined by the unaided eye.

**NOTE:** A slight staining or discoloration may be apparent on orange, yellow or metallic coatings. This should be discussed with the specifying source prior to selection of color.

## 6.6.3 Nitric Acid Resistance

### 6.6.3.1 Procedure

Fill an eight-ounce wide-mouth bottle one-half full of nitric acid, 70% ACS reagent grade\*. Place the test panel completely over the mouth of the bottle painted side down, for 30 minutes. Rinse the sample with tap water, wipe it dry, and measure any color change after a one-hour recovery period.

\* The assay of the nitric acid (HNO<sub>3</sub>) should be Fisher A-200 or equivalent; minimum 69.0%, maximum 71.0%.

### 6.6.3.2 Performance

Not more than 5ΔE Units (Hunter) of color change, calculated in accordance with ASTM D 2244, when comparing measurements on the acid-exposed painted surface and the unexposed surface.

## 6.6.4 Window Cleaner Resistance

### 6.6.4.1 Procedure

Prepare a solution of glass cleaner. Apply 10 drops of the window cleaner to the painted surface and immediately cover it with a watch glass, convex side up. Let the test sit for 24 hours, then rinse the specimen with running tap water. Record visual appearance. Let the specimen sit for four hours before conducting the dry adhesion test outlined in Section 6.3.1.1

All purpose glass cleaner composition as follows:

| RAW MATERIALS                                | % BY WEIGHT |
|--|-------------|
| Dowanol PM*                                  | 5           |
| Propylene glycol                             | 5           |
| Isopropanol                                  | 35          |
| Water  | 55          |
| *Dow Chemical, propylene glycol methyl ether |             |

The solution and test should be conducted at 65°F to 80°F.

### 6.6.5.2 Performance

There shall be no blistering or noticeable change in appearance when examined by the unaided eye and no removal of film under the tape within or outside of the cross-hatched area.

## 6.7 CORROSION AND SALT RESISTANCE

### 6.7.1 Humidity Resistance

#### 6.7.1.1 Procedure

Expose the sample in a controlled heat-and-humidity cabinet for 1500 hours at 100°F in accordance with ASTM D 4585.

#### 6.7.1.2 Performance

No formation of blisters to extent greater than “Few” blisters Size No. 8, as shown in Figure No. 4, ASTM D 714.

### 6.7.2 Salt Spray Resistance

#### 6.7.2.1 Procedure

Score the film sufficiently deep to expose the base metal using a sharp knife or blade instrument. Expose the sample for 6,000 hours according to ASTM B 117 using a 5% salt solution. Remove and wipe sample dry. Immediately apply tape 3/4" wide over scored area by pressing down firmly against the coating to eliminate voids and air pockets. Sharply pull the tape off at a right angle to the plane of the surface being tested.

#### 6.7.2.2 Performance

No face blisters and no more than 1/16" average creep from scribe.

### 6.7.3 Accelerated Salt Spray Resistance

#### 6.7.3.1 Procedure

Using Copper Accelerated Acetic Acid-Spray (CASS) test, ASTM B 368, expose sample for 1000 hours using 5% salt solution. Remove and wipe sample dry. Immediately apply tape 3/4" wide over scored area by pressing down firmly against the coating to eliminate voids and air pockets. Sharply pull the tape off at a right angle to the plane of the surface being tested.

#### 6.7.3.2 Performance

No face blisters and an average of 1/16" scribe.

### 6.7.4 Outdoor Corrosion and Salt Exposure

#### 6.7.4.1 Test Site and Duration

Test site for on-fence testing is Battelle Memorial Test Site located in Ponce Inlet, Florida, at a maximum distance of 600 feet from high tide for a minimum of three years.

#### 6.7.4.2 Performance

No face blisters and an average of 1/16" scribe.

## 6.8 WEATHERING

### 6.8.1 South Florida Exposure

The coating shall maintain its film integrity and at a minimum meet the following color retention, chalk resistance, mildew and erosion resistance properties. The architect, owner or contractor should request data relative to the long-term durability of the color(s) selected. Exposure panels must be made available to the architect and/or owner upon request.

#### 6.8.1.1 Test Site and Duration

Test sites for on-fence testing are acceptable as follows: Florida exposure South of latitude 27 degrees North at a 45 degree angle facing South for a minimum of ten (10) years. Time elapsed when the coating is off the test fence for evaluation, or other purposes, shall not be counted as part of the ten (10) year exposure minimum.

#### 6.8.1.2 Color Retention

##### 6.8.1.2.1 Performance

Maximum of 5ΔE Units (Hunter) of color change as calculated in accordance with ASTM D 2244, Section 6.3 after the exposure test per Section 6.8.1.1. Color change shall be measured on the exposed painted surface which has been cleaned of external deposits with clear water and a soft cloth and corresponding values shall be measured on the original retained panel. A portion of the exposed panel may be washed lightly to remove surface dirt only. Heavy scrubbing or any polishing to remove chalk formation or restore the surface is not permitted where color measurements are made. New colors, whether formulated by a paint manufacturer or blended by an applicator according to a paint manufacturer's specifications, may be qualified without the exposure test per Section 6.8.1.1 provided that they are produced with the same pigments in the same coating resin system as a color on which acceptable ten (10) year test data is available and which is within ± 10 Hunter Units in lightness (L).

### 6.8.1.3 Chalk Resistance

#### 6.8.1.3.1 Performance

Chalking shall be no more than that represented by a No. 8 rating based on ASTM D 4214, Test Method A (Method D 659) after test site (weathering) exposure (per Section 6.8.1.1) for ten (10) years. Chalking shall be measured on an exposed, unwashed painted surface.

### 6.8.1.4 Resistance to Erosion

#### 6.8.1.4.1 Procedure

After weathering exposure (per Section 6.8.1.1), measure dry film thickness of exposed and adjacent unexposed areas of exposure panels using an Eddy Current Meter as defined in ASTM B 244 or other instrumental methods of equal precision.

#### 6.8.1.4.2 Performance

Less than 10 percent film loss after the exposure test per Section 6.8.1.1 expressed as a percent loss of total film.

### 6.8.1.5 Resistance to Mildew

#### 6.8.1.5.1 Procedure

Using ASTM D 3456-86 (2002), arrange coated panels on exterior test fence in Central Kentucky for a minimum period of three months that immediately follows seasonal growing conditions. Ratings should be made in accordance with Test Method D 3274. It is suggested that mold ratings are taken after 3, 6, 9, 12, 18, and 24 months and yearly thereafter.

#### 6.8.1.5.2 Performance

Rating of no less than 8 indicating no visible mold growth.

## 7.0 Cleaning and Maintenance

A thorough rinsing with non-salt water should be performed at least every three months in accordance with AAMA 610.

## 8.0 Referenced Standards

References to the standards listed below shall be to the edition indicated. Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

### AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 800-05, Voluntary Specifications and Test Methods for Sealants

### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 117-03, Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM B 244-97 (2002), Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments

ASTM B 368-03 Standard Method for Copper-Accelerated Acetic Acid-Salt Spray (Fog) Testing (CASS Test)

ASTM C 207-05, Standard Specification for Hydrated Lime for Masonry Purposes

ASTM D 523-89(1999), Standard Test Method for Specular Gloss

ASTM D 714-02, Standard Test Method for Evaluating Degree of Blistering of Paints

ASTM D 968-93(2001), Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

ASTM D 1400-00, Standard Test Method for Non-destructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base

ASTM D 1654-05, Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D 2244-02e1, Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM D 2247-02, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity

ASTM D 2248-01a, Standard Practice for Detergent Resistance of Organic Finishes

ASTM D 3274, Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation

ASTM D 3456-86 (2002), Standard Practice for Determining by Exterior Exposure Tests the Susceptibility of Paint Films to Microbiological Attack.

ASTM D 3359-02, Standard Test Methods for Measuring Adhesion by Tape Test

ASTM D 3363-05, Standard Test Method for Film Hardness by Pencil Test

ASTM D 4214-98, Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D 4585-99, Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation

ASTM D 5723-95(2002), Standard Practice for Determination of Chromium Treatment Weight on Metal Substrates by X-Ray Fluorescence





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