AMERICAN ARCHITECTURAL

AAMA 2605-13

Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix)

MANUFACTURERS ASSOCIATION

TABLE OF CONTENTS

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PREFACE

For years, the architectural community has recognized the following standards for testing and performance of organic coatings on architectural aluminum extrusions and panels:

AAMA 2603, "Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels;"

AAMA 2604, "Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels;"

AAMA 2605, "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels."

1.0 SCOPE

1.1 This specification describes test procedures and performance requirements for superior performing organic coatings applied to aluminum extrusions and panels for architectural products.

1.2 This specification covers factory-applied organic coatings only.

1.3 The primary units of measure in this document are metric. The values stated in SI units are to be regarded as the standard. The values given in parentheses are for reference only.

1.4 This document was developed in an open and consensus process and is maintained by representative members of AAMA as advisory information.

2.0 PURPOSE

The specification will assist the architect, owner and contractor to specify and obtain factory-applied organic coatings, which will provide and maintain a superior level of performance in terms of film integrity, exterior weatherability and general appearance over a period of many years.

3.0 REFERENCED STANDARDS

3.1 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 to referring to the latest edition of that code or standard.

3.2 American Architectural Manufacturers Association (AAMA)

AAMA 800-10, Voluntary Specifications and Test Methods for Sealants

AAMA 2603-13 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

AAMA 2604-13, Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels

AAMA AG-12, AAMA Glossary

3.3 ASTM International (ASTM)

ASTM B244-09, 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 C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes

ASTM D523-08, Standard Test Method for Specular Gloss

ASTM D714-02(2009), Standard Test Method for Evaluating Degree of Blistering of Paints

ASTM D968-05(2010), Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

ASTM D1654-08, Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D2244-11, Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM D2247-11, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity

ASTM D2248-01a(2007), Standard Practice for Detergent Resistance of Organic Finishes

ASTM D3359-09e2, Standard Test Methods for Measuring Adhesion by Tape Test

ASTM D3363-05(2011)e2, Standard Test Method for Film Hardness by Pencil Test

ASTM D4145-10, Standard Test Method for Coating Flexibility of Prepainted Sheet

ASTM D4214-07, Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D4585-07, Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation

ASTM D5723-95(2010), Standard Practice for Determination of Chromium Treatment Weight on Metal Substrates by X-Ray Fluorescence

ASTM D7091-12, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals

ASTM G7/G7M-13, Standard Practice for Atmospheric Environmental Exposure Testing of Nonmetalic Materials

ASTM G85-11, Standard Practice for Modified Salt Spray (Fog) Testing

4.0 DEFINITIONS

4.1 Please refer to AAMA Glossary (AG-12) for all definitions except for those appearing below (which apply only to this specification).

4.1.1 COIL-APPLIED COATING: The process of applying a resinous coating onto a coil of aluminum, and curing it into a continuous film, prior to the fabrication process.

4.2 The terms "film" and "coating" are used interchangeably in this specification and are defined as meaning the layer of organic material applied to the surface of the aluminum.

5.0 GENERAL

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

5.2 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 3 m (10 ft) from the metal surface and inspected at an angle of 90 degrees to the surface.

5.3 The total dry-film thickness shall be assessed utilizing the ASTM D7091 method. Eighty percent of measurements on primary exposed surfaces shall meet or exceed 30 microns (1.2 mil) total film thickness. Paint process capability may result in readings below 25 microns (1.0 mil). No more than 5% of the total readings, on primary exposed surfaces, shall be below 25 microns (1.0 mil) (or, 85% of film thickness specified), assuming appropriate color and hide. Film thickness specified may be increased to be consistent with color selection and type of coating as recommended by the coating manufacturer.

NOTE 1: *Due to the complexities of extrusion dies and limitations of application equipment, it may not be possible to achieve minimum recommended dry film thickness on all areas of an extrusion, such as inside corners and channels. For details of these affected areas, contact the coating applicator prior to painting.*

5.4 Cleaning and metal preparation shall be in compliance with Section 7.0 of this specification.

5.5 Minor scratches and blemishes shall be repairable with the coating manufacturer's recommended product or system. Such repairs shall match the original finish for color and gloss and shall adhere to the original finish when tested as outlined in Sections 8.4.1.1 and 8.4.1.2. After application, allow the repair coating to dry for at least 72 hours at 18°C to 27°C (65°F to 80°F) before conducting the film adhesion test.

NOTE 2: *The size and number of touch-up repairs should be kept to a minimum.*

5.6 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 3: *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.*

6.0 TEST SPECIMENS

Test specimens shall consist of finished panels or extrusions representative of the production coated aluminum. A sufficient number of specimens on which to conduct instrument measurements with flat coated surfaces of at least 150 mm (6 in) long and 75 mm (3 in) wide, shall be submitted to the testing laboratory. The coating applicator or fabricator shall indicate exposed surfaces or submit drawings. Tests shall be performed on exposed areas as indicated on drawings or as marked on test specimens.

7.0 METAL PREPARATION AND PRE-TREATMENT

NOTE 4: *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.*

7.1 The pre-treatment when used in conjunction with a baked organic coating shall produce a total finishing system capable of meeting impact, adhesion, detergent, humidity and salt spray performance as specified in the appropriate test method.

7.2 CHEMICAL CONVERSION COATING WEIGHT

7.2.1 Procedure

Measure in accordance with the latest issue of ASTM D5723 using x-ray fluorescence or other standard methods for determining coating weights.

7.2.2 Performance

Chromium chromate or chromium phosphate coating weights should be a minimum of 431 mg/m^2 (40 mg/ft^2). Alternative chrome and/or non-chrome conversion coating weights should be maintained according to supplier's recommendations.

NOTE 5: *Frequent in-plant testing and control of pretreatment is required to insure satisfactory performance of the coating system.*

8.0 TESTS

8.1 COLOR UNIFORMITY

8.1.1 Procedure
Check random samples visually under a uniform light source. Viewing should be done at multiple angles. In conjunction, instrumental methods are imperative.

8.1.2 Performance
Color uniformity shall be consistent with the color range or numerical value established between the approval source and the applicator. Suggested maximum deviation is 2ΔE per ASTM D2244, Appendix X1.1, from agreed upon color standard.

NOTE 6: *Color and finish appearance may vary upon factory application due to differences in spray equipment, line conditions or day-to-day process variations. It is strongly recommended that final color approval be made with actual production line samples or mock-ups, not laboratory prepared panels*

Pearlescent mica and metallic flakes reflect and scatter light in random patterns; therefore, exact color uniformity should not be expected. Slight color shifting should also be expected when viewing from varying angles and distances. Equipment considerations affect color and are especially critical with multiple applicators.

ASTM D2244 no longer recommends the Hunter scale except for legacy users. However due to the large amount of valuable historical color data in the Hunter scale, AAMA recommends continued use of the Hunter scale now referenced in Appendix X1.1 in ASTM D2244. Other color systems may be used as outlined in ASTM D2244. As stated in ASTM D2244, CIELAB has found wide acceptance in the coatings, plastics, textiles and related industries. CMC may be another alternative to evaluating color as it is based on the more intuitive perceptual variables of lightness, chroma and hue and more closely relates to how the human eye perceives color. No color tolerances for measurements in the CMC color space are recommended in this specification.

8.2 SPECULAR GLOSS

8.2.1 Procedure
Measure in accordance with the latest issue of ASTM D523 using a 60 degree gloss meter. Samples must meet minimum dry film thickness requirements.

8.2.2 Performance
Gloss values shall be within ± 5 units of the manufacturer's specification.

EXAMPLE: *If coatings manufacturer's specification is a range of 25-35, the ± 5 allowance would permit 20-40 off the production line.*

NOTE 7: *Standard gloss range reference values are:*

Gloss Colors	*Specular Gloss Value*
High	*80-Over*
Medium	*20-79*
Low	*19 or less*

8.3 DRY FILM HARDNESS

8.3.1 Procedure
Strip the wood from a Berol Eagle Turquoise pencil or equivalent, grade F minimum hardness, leaving a full diameter of lead exposed to a length of 6 mm (1/4 in) minimum to 10 mm (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 6 mm (1/4 in) using as much downward pressure as can be applied without breaking the lead. Reference ASTM D3363.

8.3.2 Performance
No rupture of film per ASTM D3363.

8.4 FILM ADHESION

8.4.1 Procedure

8.4.1.1 Dry Adhesion
Make 11 parallel cuts, 1 mm (1/16 in) apart through the film. Make 11 similar cuts at 90 degrees to and crossing the first 11 cuts.

8.4.1.2 Tape Pull-Off
Apply tape (tape specified per ASTM D3359) 20 mm (3/4 in) 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 18°C to 27°C (65°F to 80°F)].

8.4.1.3 Wet Adhesion
Immerse the sample in distilled or deionized water at 38°C (100°F) for 24 hours. Remove and wipe the sample dry. Repeat the test specified in Section 8.4.1.2 within five minutes.

8.4.1.4 Boiling Water Adhesion
Immerse the sample in boiling distilled or deionized water 99°C to 100°C (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 8.4.1.2 within five minutes.

8.4.2 Performance
No removal of film under the tape within or outside of the cross-hatched area or blistering anywhere on the test specimen. Report loss of adhesion as a percentage of squares affected, (i.e., 10 squares lifted is 10% failure).

8.5 IMPACT RESISTANCE

8.5.1 Procedure
Using a 16 mm (5/8 in) diameter round-nosed impact tester 18 N-m (160 in-lb) range such as a Gardner impact tester, apply a load directly to the coated surface of sufficient force to deform the test sample a minimum of 3 mm ± 0.3 mm (0.10 in ± 0.01 in). Apply tape (tape specified per ASTM D3359) 20 mm (3/4 in) 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 18°C to 27°C (65°F to 80°F).

8.5.2 Performance
No removal of film from substrate.

NOTE 8: *Minute cracking at the perimeter of the concave area of the test panel is permissible but no coating pick-off should be apparent.*

8.6 ABRASION RESISTANCE

8.6.1 Procedure
Using the falling sand test method, ASTM D968, the Abrasion Coefficient shall be calculated according to the formula which follows.

ABRASION COEFFICIENT - LITERS PER MIL = V/T

where: V = volume of sand used in liters
T = thickness of coating in mils

8.6.2 Performance
The Abrasion Coefficient Value of the coating shall be 40 minimum.

8.7 CHEMICAL RESISTANCE

8.7.1 Muriatic Acid Resistance (15-Minute Spot Test)

8.7.1.1 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 18°C to 27°C (65°F to 80°F). After a 15-minute exposure, wash off with running tap water.

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

8.7.2 Mortar Resistance (24-Hour Pat Test)

8.7.2.1 Procedure
Prepare mortar by mixing 75 g (2.6 oz) of building lime (conforming to ASTM C207) and 225 g (7.9 oz) of dry sand, both passing through a 10-mesh wire screen with sufficient water, approximately 100 g (3.5 oz), to make a soft paste. Immediately apply wet pats of mortar about 1300 mm^2 (2 in^2) in area and 12 mm (1/2 in) 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 38°C (100°F).

8.7.2.2 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 8.7.1.1. There shall be no loss of film adhesion or visual change in appearance when examined by the unaided eye.

NOTE 9: *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.*

8.7.3 Nitric Acid Resistance

8.7.3.1 Procedure
Fill a 237 ml (8 oz) wide-mouth bottle one-half full of nitric acid, 70% ACS reagent grade[1]. Place the test panel completely over the mouth of the bottle painted side down, for 30 minutes. The acid solution and test shall be conducted at 18°C to 27°C (65°F to 80°F) with a relative humidity of <50%. Rinse the sample with tap water, wipe it dry, and measure any color change after a one-hour recovery period.

8.7.3.2 Performance
Not more than 5ΔE Units (Hunter) of color change, calculated in accordance with ASTM D2244, when comparing measurements on the acid-exposed painted surface and the unexposed surface.

8.7.4 Detergent Resistance

8.7.4.1 Procedure
Prepare a 3% (by weight) solution of detergent as prescribed in ASTM D2248, and distilled water. Immerse at least two test specimens in the detergent solution at 38°C (100°F) for 72 hours. Remove and wipe the samples dry. Immediately apply tape (tape specified per ASTM D3359) 20 mm (3/4 in) wide by pressing down firmly against the coating to eliminate voids and air pockets. Place the tape longitudinally along the entire length of the test specimens. If blisters are visible, then the blistered area must be taped and rated. Sharply pull off at a right angle to the plane of the surface being tested, per ASTM D3359. A typical solid detergent composition is as follows:

[1] *The assay of the nitric acid (HNO_3) should be Fisher A-200 or equivalent; minimum 69.0%, maximum 71.0%.*

	Parts by Weight
Tetrasodium pyrophosphate ($Na_4P_2O_7$) anhydrous	53.0
Sodium sulfate (Na_2SO_4), anhydrous	19.0
Sodium metasilicate (Na_2SiO_3), anhydrous	7.0
Sodium carbonate (Na_2CO_3), anhydrous	1.0
Sodium salt of a linear alkylarylsulfonate (90% flake grade)	20.0
TOTAL	100.0

8.7.4.2 Performance
No loss of adhesion of the film to the metal. No blistering and no significant visual change in appearance when examined by the unaided eye.

8.7.5 Window Cleaner Resistance

8.7.5.1 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 Sections 8.4.1.1 and 8.4.1.2.

All purpose glass cleaner composition is 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 18°C to 27°C (65°F to 80°F).

8.7.5.2 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.

8.8 CORROSION RESISTANCE

NOTE 10: *In highly corrosive and high humidity environments such as, but not limited to, seacoast or industrial environments, performance may be diminished.*

8.8.1 Humidity Resistance

8.8.1.1 Procedure
Expose the sample in a controlled heat-and-humidity cabinet for 4,000 hours at 38°C (100°F) and 100% RH with the cabinet operated in accordance with ASTM D2247 or ASTM D4585.

8.8.1.2 Performance
No formation of blisters to extent greater than "Few" blisters Size No. 8, as shown in Figure No. 4, ASTM D714.

8.8.2 Cyclic Corrosion Testing

NOTE 11: *Section 8.8.2 previously addressed Salt Spray Resistance requirements. This section has been updated to use the ASTM G85, Annex A5 test instead of the B117 test.*

8.8.2.1 Procedure
Score the film sufficiently deep to expose the base metal using a sharp knife or blade instrument. Expose the sample for 2,000 hours according to ASTM G85, Annex A5, dilute electrolyte cyclic fog/dry test. Remove and wipe sample dry.

Immediately apply tape (tape specified per ASTM D3359) 20 mm (3/4 in) 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.

8.8.2.2 Performance
Minimum rating of 7 on scribe or cut edges, and a minimum blister rating of 8 within the test specimen field, in accordance with the following Table 1 and Table 2 (Reference ASTM D1654).

Representative Mean Creepage From Scribe		
Millimeters	Inches (Approx.)	Rating Number
Zero	0	10
Over 0 to 0.5	0 to 1/64	9
Over 0.5 to 1.0	1/64 to 1/32	8
Over 1.0 to 2.0	1/32 to 1/16	7
Over 2.0 to 3.0	1/16 to 1/8	6
Over 3.0 to 5.0	1/8 to 3/16	5
Over 5.0 to 7.0	3/16 to 1/4	4
Over 7.0 to 10.0	1/4 to 3/8	3
Over 10.0 to 13.0	3/8 to 1/2	2
Over 13.0 to 16.0	1/2 to 5/8	1
Over 16.0	Over 5/8	0

TABLE 1: Rating of Failure at Scribe (Procedure A)

Area Failed, %	**Rating Number**
No Failure	10
0 to 1	9
2 to 3	8
4 to 6	7
7 to 10	6
11 to 20	5
21 to 30	4
31 to 40	3
41 to 55	2
56 to 75	1
Over 75	0

TABLE 2: Rating of Unscribed Areas (Procedure B)

NOTE 12: *The use of a ruled plastic grid is recommended as an aid in evaluating this type of failure. A 6 mm (1/4 in) grid is suggested as most practical for the usual specimen. In using the grid, the number of squares in which one or more points of failure are found is related to the total number of squares covering the significant area of the specimen to get a percentage figure as used in the tabulation. In some instances, the rating numbers may be used as factors with exposure time intervals related thereto, to produce a performance index number which very accurately indicates relative quality.*

8.9 WEATHERING

8.9.1 South Florida Exposure

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

8.9.1.1 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 10 years, maintained and operated in accordance with ASTM G7. Time elapsed when the coating is off the test fence for evaluation, or other purposes, shall not be counted as part of the 10-year exposure minimum.

8.9.1.2 Color Retention

8.9.1.2.1 Performance

Maximum of 5ΔE Units (Hunter) of color change as calculated in accordance with ASTM D2244, Appendixes X1.1 after the minimum 10-year exposure test per Section 8.9.1.1. 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 or the unexposed flap area of the 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 8.9.1.1, provided that they are produced with the same pigments in the same coating resin system as a color on which acceptable 10 year test data is available and which is within the ±10 Hunter Units in lightness (L).

8.9.1.3 Chalk Resistance

8.9.1.3.1 Performance

Chalking shall be no more than that represented by a No. 8 rating for colors, No. 6 for whites, based on ASTM D4214, Test Method A (Method D 659) after test site (weathering) exposure (per Section 8.9.1.1) for 10 years. Chalking shall be measured on an exposed, unwashed painted surface.

8.9.1.4 Gloss Retention

8.9.1.4.1 Procedure

After weathering exposure (per Section 8.9.1.1), measure 60 degree gloss of exposed and unexposed areas of a test site exposure panel following ASTM D523. The exposure panel may be washed lightly with clear water and a soft cloth to remove loose surface dirt. Heavy scrubbing or any polishing to restore the surface is not permitted where gloss measurements are made.

8.9.1.4.2 Performance

Gloss retention shall be a minimum of 50% after the 10 year exposure test per Section 8.9.1.1 expressed as:

$$\% \text{ Retention} = \left[\left(\frac{60° \text{ Gloss Exposed}}{60° \text{ Gloss Unexposed}}\right) \text{ x } 100\%\right]$$

8.9.1.5 Resistance to Erosion

8.9.1.5.1 Procedure

After weathering exposure (per Section 8.9.1.1), measure dry film thickness of exposed and adjacent unexposed areas of exposure panels using an Eddy Current Meter as defined in ASTM B244 or other instrumental methods of equal precision.

8.9.1.5.2 Performance

Less than 10 percent film loss after the exposure test per Section 8.9.1.1 expressed as a percent loss of total film:

$$\text{Loss} = 100\% - \left[\left(\frac{\text{Dry Film Thickness Exposed}}{\text{Dry Film Thickness Unexposed}}\right) \text{ x } 100\%\right]$$

9.0 TEST REPORTS

9.1 Test reports on file with the applicator shall include the following information:

9.1.1 Date when tests were performed and date of issue of report.

9.1.2 Identification of organic coating and/or coating system tested, including production date, batch or lot number, cure conditions, pre-treatment data, manufacturer's name and name of company submitting coated samples used in test.

9.1.3 Copy of drawings submitted showing exposed surfaces.

9.1.4 Test results.

9.1.5 A statement indicating that the organic coating and/or coating system tested passed all tests or failed one or more.

9.1.6 In the case of a failure, which test(s) and a description of the failure(s).

9.1.7 Statement that all tests were conducted in accordance with this standard.

9.1.8 Name and address of the laboratory which conducted tests and issued the report.

APPENDIX FOR COIL COATING

A1.0 SCOPE

A1.1 This appendix describes differences in test procedures and performance requirements for AAMA 2605 for superior performing organic coatings, applied on a coil coating line, to aluminum architectural products.

A1.2 This appendix covers factory-applied coil coatings.

A2.0 PURPOSE

This appendix to AAMA 2605 will assist the architect, owner and contractor to specify and obtain factory-applied organic coatings, which will provide and maintain a superior level of performance in terms of film integrity, exterior weatherability and general appearance over a period of many years.

This appendix speaks specifically to modifications of the AAMA 2605 specification based upon the differences between spray-applied and coil-applied coatings. Unless otherwise modified by this addendum, the AAMA 2605 specification applies in its entirety.

A3.0 GENERAL

A3.1 The total dry-film thickness shall be assessed utilizing the ASTM D7091 method.

A3.2 Eighty percent (80%) of measurements on primary exposed surfaces shall meet or exceed 23 microns (0.9 mil) total film thickness.

A3.3 Paint process capability may result in readings below 19 microns (0.75 mil). No more than 5% of the total readings, on primary exposed surfaces, shall be below 19 microns (0.75 mil) (or, 83% of film thickness specified), assuming appropriate color and hide.

A3.4 Film thickness specified may be increased to be consistent with color selection and type of coating as recommended by the coating manufacturer.

A4.0 METAL PREPARATION AND PRE-TREATMENT

A4.1 PERFORMANCE
The cleaning/pre-treatment process and coating weights shall be within the performance range approved by the cleaning and pre-treatment chemical supplier.

A4.2 QUALITY ASSURANCE
The in-plant testing and control of cleaning and pretreatment shall meet or exceed the minimum requirements established by the cleaning and pretreatment chemical manufacturers.

A5.0 TESTS

A5.1 T-BEND TEST FOR COATING FLEXIBILITY

A5.1.1 Procedure

A5.1.1.1 Using the T-bend test method (in accordance with ASTM D4145), the coated sample shall be at least 51 mm (2 in) across the bend direction, by 152 mm (6 in).

A5.1.1.2 The test specimen temperature shall be 18º to 27ºC (65º to 80ºF).

A5.1.1.3 Secure approximately 13 to 19 mm (½ to ¾ in) of the sample in the jaws of a bench vise or holding jig. Bend the free end of the specimen 90 degrees in a smooth and uniform manner so that the coating is on the outside of the specimen after it is bent. Continue bending so the metal is completely bent upon itself, forming a 180-degree arc. This is a 0-T bend.

NOTE A1: *If needed, the vise can be used to help flatten the metal upon itself so that the apex of the bend is as flat as can be reasonably achieved.*

A5.1.1.4 Secure the bent end of the specimen in the vise and bend the free end 90 degrees. Continue to bend the free end around the first (0-T) bend to complete a 180-degree bend; this forms a 1-T bend. Continue to bend the free end around the first (0-T) bend to form a 90-degree bend; this forms a 2-T bend.

A5.1.1.5 After each bend has been completed, apply 19 mm (3/4 in.) wide pressure-sensitive tape (tape specified per ASTM D3359) along the bend. Rub the tape flat; then, holding the specimen firmly, remove the tape with a rapid movement at an angle of 180 degrees to the bend surface. Examine the tape for coating removed from the surface of the specimen (called pick-off).

A5.1.2 Performance
Minimum of 2-T flexibility with no pick-off at the area of the bend. Express the T-bend to no pick-off as the number of thicknesses around which the metal is being bent. For example, if no pick-off occurs when the metal is bent back upon itself once, the paint would take a 0-T bend.

NOTE A2: *Minute cracking at the edge of the bent area of the test panel is permissible but no paint pick-off shall be apparent. The test is valid to the point of substrate rupture.*

A5.2 IMPACT RESISTANCE

A5.2.1 Direct Impact
Using a 15 mm (5/8 in) diameter round-nosed impact tester 18 N-m (160 in-lb) range, such as a Gardner impact tester, apply a load directly to the coated surface which creates a minimum of 3 mm ± 0.3 mm (0.10 in ± 0.01 in) deformation . After deformation, apply 20 mm (3/4 in) wide tape (tape specified per ASTM D3359) of sufficient size to cover the test area to the front of the coating by pressing down firmly against the coating to eliminate voids and air pockets under the tape. Sharply pull tape off at a right angle to the plane of the surface being tested. Test pieces should be at ambient temperature, approximately 18ºC to 27ºC (65ºF to 80ºF).

A5.2.1.1 Performance
There shall be no removal of film to substrate.

A5.2.2 Reverse Impact
Using a 15 mm (5/8 in) diameter round-nosed impact tester 18 N-m (160 in-lb) range, such as a BYK-Gardner impact tester, apply a load to the back side the coated surface which creates a deformation which is three times the thickness of the metal (see formula in Example below). After deformation, apply 20 mm (3/4 in) wide tape (tape specified per ASTM D3359) of sufficient size to cover the test area to the front of the coating by pressing down firmly against the coating to eliminate voids and air pockets under the tape. Sharply pull tape off at a right angle to the plane of the surface being tested. Test pieces should be at ambient temperature, approximately 18ºC to 27ºC (65ºF to 80ºF).

EXAMPLE: *If the aluminum thickness is 0.70 mm (0.0276 in), multiply the metal thickness by 0.45 (1000) to obtain a load in m-kg (in-lbs).*

0.70 x 0.45 = 0.315 m-kg required
Drop a 1 kg weight a distance of 0.315 m

(0.0276 x 1000 = 27.6 in-lbs required)
(Drop a 2 lb weight a distance of 13.8 in)

NOTE A3: *The industry standard for impact resistance uses a factor of 0.45 (1000) for aluminum. Higher performance is possible. Deformation depth will differ according to the yield strength of the aluminum.*

A5.2.2.1 Performance
There shall be no removal of film to substrate.

NOTE A4: *Minute cracking at the perimeter of the convex area of the test panel is permissible but no paint pick-off should be apparent. Test is valid to the point of substrate rupture.*

Changes from AAMA 2605-11 to AAMA 2605-13

- Various editorial changes were made
- Added new Section 1.4
- Added requirement repair scratches per Section 8.4.1.2 in Section 5.5
- Changed language in Section 7.2.2 to reference “chromium chromate or chromium phosphate”
- Range of 2ΔE in Section 8.1.2 was made a maximum deviation
- Added language about ASTM D2244 no longer recommending the Hunter scale in NOTE 6
- Changed reference from “Permacel 99 or equivalent” tape to “tape specified per ASTM D3359” in Sections 8.4.1.2, 8.5.1, 8.7.4.1, 8.8.2.1, A5.1.1.5, A5.2.1, A5.2.2
- Added reference to Section 8.4.1.2 in Section 8.7.5.1
- Added new NOTE 10 & NOTE 11
- Added requirement to utilize ASTM G7 in Section 8.9.1.1
- Changed Section A5.1.1.4 to better define a 2-T bend
- Updated EXAMPLE in Section A5.2.2

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