

COATING PERFORMANCE TEST REPORT

Rendered to:

DECORAL SYSTEM ITALIA

**PRODUCT: DS 402 (9060/401) Wood Grain,
Powder Coated Aluminum Panels**

Report No:	55336.01-106-31
Report Date:	06/24/05
Expiration Date:	12/23/06
Revision 1	07/22/06

PERFORMANCE TEST REPORT

Rendered to:

DECORAL SYSTEM ITALIA
Viale del Lavoro, 5
37040 Arcole (Verona), Italy

Report No: 55336.01-106-31
Test Date: 02/09/05
Through: 06/23/05
Report Date: 06/24/05
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Revision 1: 07/22/06

Product: DS 402 (9060/401) Wood Grain, Powder Coated Aluminum Panels

Project Summary: Architectural Testing, Inc. (ATI) was contracted by Decoral System Italia to conduct testing on coated aluminum panels with overall dimensions of 6" long by 3" wide, supplied by Decoral System Italia. The coated aluminum panels were visually inspected before testing for surface flaws. The panels supplied meet all performance requirements listed in AAMA 2604-02.

Test Procedure: The following list of tests were performed in accordance with AAMA 2604-02, *Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels*.

1. **Color Uniformity**

Procedure: Extrusions were selected randomly and visually inspected under a uniform light source. Color must be consistent within a specified range. (This test was performed to evaluate the consistency of coating coloring between pieces).

2. **Specular Gloss**

Procedure: This procedure was performed in accordance with ASTM-D523, using a 60° Gloss Meter. Gloss values must be within ± 5 of a specified value except for the High Gloss Range, which must be a minimum of 80. Three duplicate tests are conducted.

3. **Dry Film Hardness**

Procedure: An Eagle Turquoise Pencil, grade "F" minimum hardness is stripped leaving full diameter of lead exposed to length of 1/4" to 3/8" maximum. The end of the pencil is flattened to 90° of the pencil axis using fine grade emery paper. The pencil is held at 45° to film surface and then pushed forward 1/4" using as much downward pressure as can be applied without breaking lead, reference specification ASTM-D3363. Three duplicate tests are conducted. No film rupture is allowed.

Test Procedure: (Continued)

4. Film Adhesion

Dry Procedure: Eleven parallel cuts are made 1/16" apart through the film. Eleven similar cuts are made at 90° to and crossing the first eleven cuts. Permacel 99 or equivalent tape 3/4" wide is applied over the area of the cuts by pressing down firmly against coating to eliminate voids and air pockets. The tape is then sharply pulled off at a right angle to the plane of the surface being tested. Three duplicate tests are conducted. Test pieces are kept at room temperature, (approximately 74°F).

Wet Procedure: The procedure is the same as above except that the aluminum panels are immersed in distilled water at 100°F for 24 hours. Samples are then removed and wiped dry. The test must be performed within five minutes after removal from water bath. Three duplicate tests are conducted. No removal of film under tape within or outside of crosshatched area or blistering anywhere on wet samples. Number of squares affected shall be reported as the failure percentage.

Boiling Water Procedure: The procedure is the same as above except that the aluminum panels are immersed in boiling distilled water at 100°C for 20 minutes. Samples are then removed and wiped dry. The test must be performed within five minutes after removal from water bath. Three duplicate tests are conducted. No removal of film under tape within or outside of crosshatched area or blistering anywhere on wet samples. Number of squares affected shall be reported as the failure percentage.

5. Impact Resistance

Procedure: A 5/8" diameter round nosed impactor is used to perform the impact test. The impact load is applied directly to coated surface using a Gardner Variable Impact Tester (160 inch-pound range) of sufficient force to deform test sample a minimum of 0.10". Permacel 99 or equivalent tape 3/4" wide is applied over deformed area and firmly pressed against the surface to alleviate voids and air pockets. The tape is sharply pulled off at a right angle to the plane of the surface being tested. Three duplicate tests are conducted. Test pieces are kept at room temperature, (approximately 74°F).

6. Abrasion Resistance

Procedure: This procedure was performed in accordance with the falling sand test method in ASTM D 968. The Abrasion Coefficient shall be calculated as follows: Liters of sand used to wear through / thickness of coating in mils = Liters per Mil. Three duplicate tests are conducted. The abrasion coefficient value of the coating shall be 20 minimum.

Test Method: (Continued)

7. Chemical Resistance

Muriatic Acid Procedure: Ten drops of 10% (by volume) muriatic solution (37% commercial grade hydrochloric acid) in tap water is applied to the surface to be tested and covered with a watch glass to prevent evaporation. The acid solution and test are conducted at 74°F. After 15 minutes of exposure, the sample was rinsed with running tap water. Three duplicate tests are conducted. No blistering and no visual change in appearance are allowed when examined by the unaided eye.

Mortar Procedure: Mortar is prepared by mixing 75 grams of building lime and 225 grams of dry sand, both passing through 10 mesh wire screen and sufficient water, approximately 100 grams, to make a soft paste. The mortar is immediately applied to an area 2" square and 1/2" thick onto the surface of the aluminum extrusions at two separate locations. The test sections are then immediately exposed for 24 hours to 100% relative humidity at 100°F. Three duplicate tests are conducted. The mortar shall dislodge easily and residue must be removable with 10% muriatic acid solution.

Nitric Acid Procedure: An 8 ounce wide mouth bottle is filled half full of 70% ACS reagent grade Nitric Acid. A test panel is placed painted side down over the mouth of the bottle for 30 minutes. The panels are then rinsed, wiped dry and read for color change after one hour. Three duplicate tests are conducted. No more than 5 ΔE units (Hunter) of color change when calculated in accordance with ASTM D 2244 when comparing acid exposed surfaces to unexposed surfaces.

Detergent Resistance Procedure: A 3% (by weight) solution was prepared of detergent and distilled water. Three test samples were then immersed in the solution at 100°F for 72 hours. Samples were removed and wiped dry. Tape (Permacel 99, or equivalent 3/4" wide) was immediately applied by pressing down firmly against the coating to alleviate voids and air pockets. The tape was placed longitudinally along the entire length of the test samples. Visibly blistered areas were taped and rated. The tape is sharply pulled off at right angle to the surface being tested, per ASTM D3359. Three duplicate tests are conducted. No loss of adhesion of film to metal, no blistering and no significant visual change in appearance when examined by the unaided eye.

Window Cleaner Resistance Procedure: An all purpose glass cleaner solution was prepared according to the specification. Ten drops of the solution were applied to each test panel and then covered with a watch glass for 24 hours. Samples were then rinsed, wiped dry and allowed to sit for four hours. The test panels are then evaluated per the dry adhesion method as outlined above. Three duplicate tests are conducted.

Test Method: (Continued)

8. Corrosion Resistance

Humidity Procedure: Samples are exposed in a controlled heat and humidity chamber for 3,000 hours at 100°F and 100% RH with chamber operated in accordance with ATSM D2247. Three duplicate tests are conducted. No formation of blisters to an extent greater than "Few" of Size No. 8 as depicted in Figure No. 4 of ASTM D714.

Salt Spray Procedure: Film was scored sufficiently deep to expose base metal using a sharp knife. The sample was exposed for 3,000 hours according to ASTM B117 using a 5% salt solution. Samples were removed and wiped dry. Tape (Permacel 99, or equivalent 3/4" wide) was placed over scored area by pressing down firmly against coating to eliminate voids and air pockets. The tape is then sharply pulled off at right angle to the plane of surface being tested. Three duplicate tests are conducted. Minimum rating of seven for scribed areas and eight for blistered areas.

Outdoor Weathering: Six specimens were subcontracted to South Florida Test Services, Inc. to perform outdoor weathering exposure. The test specimens were subjected to 60 months of direct exposure in South Florida at a 45° angle rack at as required by AAMA 2603. The specimens were evaluated by Architectural Testing, Inc. (ATI) upon completion of exposure and return of the specimen.

Test Results: Individual test results are reported in the following table.

Test	Results	Requirements / Comments
Color Uniformity	Pass	Visually uniform
Specular Gloss	Pass 21.7 Average (grain pattern)	Medium Gloss Range Target Range 20-79.9
Dry Film Hardness	Pass	No rupture of film
Dry Film Adhesion	Pass 100% Adhesion	No film removal
Wet Film Adhesion	Pass 100% Adhesion	No film removal
Impact Resistance	Pass	No film removal
Abrasion Resistance	Pass	Abrasion Coefficient Value > 20
Muriatic Acid Resistance	Pass	No blistering or visual change
Mortar Resistance	Pass	No loss of adhesion or visual change
Nitric Acid Resistance	Pass 1.012 ΔE Average	No more than 5 ΔE units (Hunter) of color change
Detergent Resistance	Pass	No loss of adhesion, blistering or visual change
Window Cleaner Resistance	Pass	No loss of adhesion, blistering or visual change
Humidity Resistance	Pass	No blistering greater than Size 8 and "Few"
Salt Spray Resistance	Pass	Minimum rating of 7 on scribe, and 8 within the test specimen field
Outdoor Weathering (Five years)		
Color Retention	60 months Due 3/10/10	No more than 5 ΔE units (Hunter) of color change
Chalk Resistance		Not more than a No. 8 rating per ASTM D 4214
Gloss Retention		Minimum of 30% gloss retention at 60°
Resistance to Erosion		Not more than 10% film thickness loss

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For ARCHITECTURAL TESTING, INC.:

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Attachments (pages)
Appendix A - Photographs (2)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	06/24/05	N/A	Original report issue
1	07/22/05	5	Changed Specular Gloss description

APPENDIX A

Photographs



Photo No. 1
Adhesion Detail

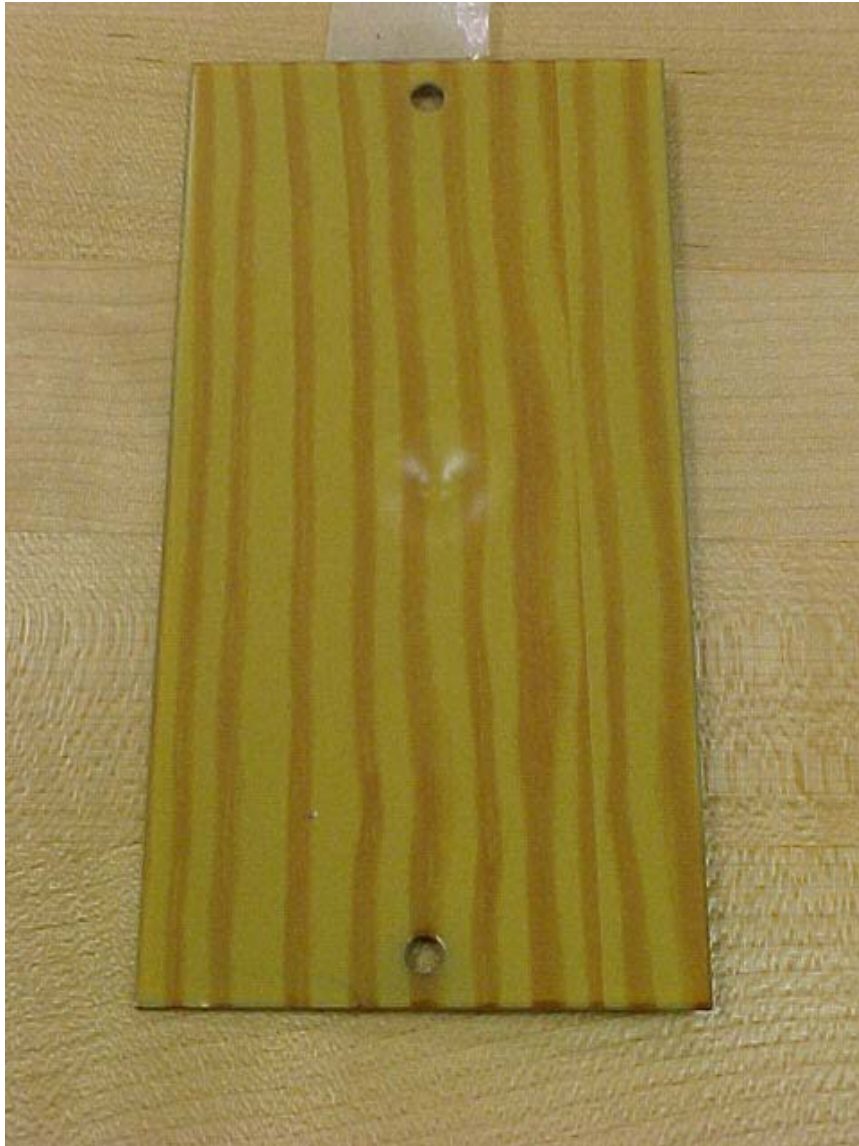


Photo No. 2
Impact Detail