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COEUR D'ALENE WINDOW
TEST REPORT

SCOPE OF WORK
AAMA 613 EVALUATION OF ORGANIC COATING ON A PLASTIC PROFILE

REPORT NUMBER
J0098.01-106-31 R3

TEST DATES
11/29/18 - 01/15/21

ISSUE DATE **REVISED DATE**
03/13/19 04/14/21

RECORD RETENTION END DATE
01/15/24

PAGES
22

DOCUMENT CONTROL NUMBER
ATI 00231 (09/05/17)
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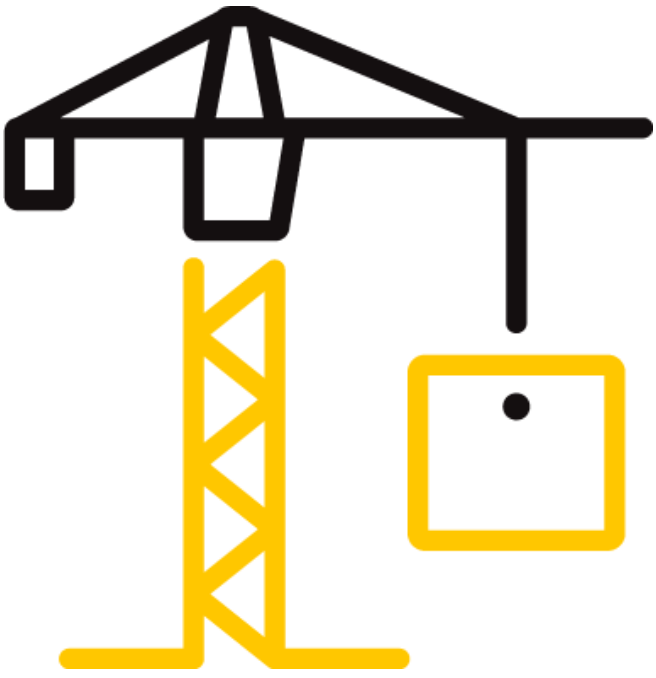

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TEST REPORT FOR COEUR D'ALENE WINDOW

Report No.: J0098.01-106-31 R3
Date: 03/13/19

REPORT ISSUED TO

COEUR D'ALENE WINDOW
3808 North Sullivan Road
Spokane Valley, Washington 99216

SECTION 1

SCOPE

Product: Euro Bronze Organic coating on Energi vinyl extrusions

Intertek Building & Construction (B&C) was contracted by Coeur d'Alene Window to evaluate Euro Bronze organic coating in accordance with AAMA 613 for coating properties. Results obtained are tested values and were secured by using the designated test methods. Testing was conducted at the Intertek B&C test facility in York, Pennsylvania.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	J. Rich Hammons	**REVIEWED BY:**	Joseph M. Brickner
TITLE:	Technician III Materials Laboratory	**TITLE:**	Laboratory Supervisor Materials Laboratory
SIGNATURE:	Digitally Signed by: James Hammons	**SIGNATURE:**	Digitally Signed by: Joseph M. Brickner
DATE:	04/14/21	**DATE:**	04/14/21

JRH:jmb/kf/als

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SECTION 2
TEST METHODS

The specimens were evaluated in accordance with the following:

> **AAMA 613-17a**, *Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles*

SECTION 3
MATERIAL SOURCE

The materials were provided by Coeur d' Alene Windows on October 17, 2018. The Energi vinyl extrusions were fabricated and coating was applied by Royalbond Spectra Coat. Refer to the product description photos in Section 9 and the drawings in Section 10. The material was tested as received except for preparing the smaller test specimens from the materials. Representative materials/test specimens will be retained by Intertek B&C for a minimum of four years from the test completion date.

SECTION 4
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
J. Rich Hammons	Intertek B&C
Joseph M. Brickner	Intertek B&C

SECTION 5
TEST PROCEDURES

All conditioning of test specimens and test conditions were at standard laboratory conditions unless otherwise reported.

AAMA 613 - Coating Visible Defects, Section5.2
Specimens were observed at a distance of 3 m (10 ft) from the plastic surface and inspected at an angle of 90° to the surface.

AAMA 613 - Total Dry Film Thickness, Section5.3
Total film thickness was measured in accordance with ASTM D4138 utilizing an AmScope microscope (ICN: 005574) to digitally capture the total dry film thickness.

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TEST REPORT FOR COEUR D'ALENE WINDOW
Report No.: J0098.01-106-31 R3
Date: 03/13/19

AAMA 613 - Repairability, Section 5.5
Specimen preparation was performed per manufacturer's suggested reparability guidelines. Specimen was prepped using 240 grit sand paper, followed by wet sanding with 400 grit sand paper. Using the touch up paint provided, the imperfection was painted over and then lightly blended with a second coat.

AAMA 613 - Color Uniformity, Section7.1
Color measurements were recorded for each type of material using a Gretag Macbeth Color i5 Spectrophotometer (ICN: 004725) with a diffuse spherical geometry and a xenon lamp, Hunter scale in accordance with ASTM D2244.

AAMA 613 - Specular Gloss, Section 7.2
Specimens were measured for gloss in accordance with ASTM D523 using a 60° Gloss Meter (ICN: 005609).

AAMA 613 - Scratch Hardness, Section 7.3.1.1
Specimens were evaluated in accordance with ASTM D3363 to determine the lead hardness that produces scratches.

AAMA 613 - Cut Hardness, Section 7.3.1.2
Specimens were evaluated in accordance with ASTM D3363 to determine the lead hardness that produces both cuts and gouges.

AAMA 613 - Dry Adhesion, Section 7.4.1.1
Specimens were prepared with two 1.5" cuts through the film that intersect in the middle at a 30°. Specimens were tested in accordance with ASTM D3330 utilizing a 90-second dwell time and tape was rapidly pulled back upon itself at an angle as close to possible of 180°.

AAMA 613 - Wet Adhesion, Section 7.4.1.2
Specimens were prepared the same as 7.4.1.1 followed by a 24-hour water immersion in an oven (ICN: 005980) maintained at 38°C ±2°C (100°F). Within 5 minutes of removal, tape was applied as specified per ASTM D3359 and pulled sharply at 90°to the surface.

AAMA 613 - Impact Resistance, Section 7.5
Specimens were evaluated using a 16 mm (5/8") diameter round-nosed impact tester on a 18 N-m (160 in-lb) range Gardner impact tester (ICN: ??????). Sufficient load was applied to the center of panel to deform a minimum of 3 mm ±0.3 mm. Tape was applied as specified per ASTM D3359 to the test area and pulled sharply at 90° from surface.

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Report No.: J0098.01-106-31 R3
Date: 03/13/19

AAMA 613 - Muriatic Acid Resistance, Section 7.6.1
Ten drops of a 3.7% (by volume) solution of muriatic acid and tap water were applied to specimens and covered with watch glass for 15 minutes. After the 15-minute exposure, specimens were washed with tap water and evaluated for gloss and color change.

AAMA 613 - Mortar Resistance, Section 7.6.2
Wet pats of mortar approximately 1300 mm2 (2 in2) in area by 12 mm (0.5 in) in thickness were applied to profile panels followed by 24 hours at 38°C ±2°C (100°F) and 95% R.H. or greater. After the exposure, specimens were washed with a damp cloth and evaluate for gloss and color change.

AAMA 613 - Detergent Resistance, Section 7.7
A 1% (by weight) detergent and distilled water solution was prepared as prescribed in ASTM D2248 followed by immersion of specimens in detergent solution for 2 hours Specimens were then cleaned with distilled water and allowed to recover for 30 minutes. Specimens were evaluated for gloss and color change after the 30-minute recovery time and then again after 24 hours.

AAMA 613 - Humidity Resistance, Section 7.8
Specimens were exposed in a controlled heat and humidity cabinet for 1,500 hours of exposure at 38°C ±2°C (100°F) and greater than 95% R.H. operated in accordance with ASTM D2247. Specimens were then evaluated for the formation of blisters as shown in Figure No. 4 of ASTM D714.

AAMA 613 - Cold Crack Cycle, Section 7.9
Specimens were subjected to 15 cycles of the following:

- 24 ±1/2 hours at 38°C ±2°C (100°F) and greater than 95% R.H. in a controlled heat and humidity cabinet
- 20 ±1/2 hours at -23°C ±2°C (-10°F) in a freezer (ICN: INT000209)
- 4 ±1/2 hours at room temperature

AAMA 613 - Oven Aging, Section 7.10
Two sets of test specimens were conditioned at 60°C ±2°C (140°F) for 7 days in an oven (ICN: 005318). Within 1 hour of removal, the specimens were placed in a 95% or greater humidity chamber for 96 hours One set of specimens were then tested for Film Hardness as per section 7.3.1 and the second set was tested for Film Hardness as per section 7.4.1.1.

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AAMA 613 - Weather Exposure, Section 7.11
(5) Specimens:
6 month South Florida Exposure only followed by minimum impact of 2670 J/m (0.60 in-lb/mil)

(5) Specimens:
1 year South Florida Exposure only followed by minimum impact of 2670 J/m (0.60 in-lb/mil)
(5) Specimens:
2 year South Florida Exposure only followed by minimum impact of 2670 J/m (0.60 in-lb/mil)

AAMA 613 - Heat Build-Up, Section 7.12
Specimens were evaluated in accordance with ASTM D4803 using a heat buildup box (ICN: 005926) and a thermocouple reader (ICN: INT01294).

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Report No.: J0098.01-106-31 R3
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SECTION 6
TEST SPECIMEN DESCRIPTION

TEST METHOD	NUMBER OF SPECIMENS	NOMINAL SPECIMEN DIMENSIONS	VISUAL CHARACTERISTICS
Coating Visible Defects - Section 5.2	3	3" x 6"	Euro Bronze Energi Coated Vinyl Extrusion
Total Dry Film Thickness - Section 5.3	3		
Repairability - Section 5.5	3		
Color Uniformity - Section 7.1	3		
Specular Gloss - Section 7.2	3		
Scratch Hardness - Section 7.3.1.1	2		
Cut Hardness - Section 7.3.1.2	2		
Dry Adhesion - Section 7.4.1.1	3		
Wet Adhesion - Section 7.4.1.2	3		
Impact Resistance - Section 7.5	3		
Muriatic Acid Resistance - Section 7.6.1	4		
Mortar Resistance - Section 7.6.2	4		
Detergent Resistance - Section 7.7	2		
Humidity Resistance - Section 7.8	3		
Cold Crack Cycle - Section 7.9	3		
Oven Aging - Section 7.10	3 - each of 2 conditions		
Weather Exposure - Section 7.11	5 - 6 month 5 - 12 month 5 - 24 month		
Heat Build-Up - Section 7.12	3		

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SECTION 7
TEST RESULTS

AAMA 613 - Coating Visible Defects, Section 5.2

SPECIMEN NO.	RESULTS	REQUIREMENT
1	Meets as Stated	No streaks, blisters, imperfections from 10 ft
2	Meets as Stated	
3	Meets as Stated	

Pass

AAMA 613 - Total Dry Film Thickness, Section 5.3

SPECIMEN NO.	RESULTS	REQUIREMENT
	mil (Microns)	
1	2.2 mil (55.9 Microns)	1.97 ±0.49 mil (50 Microns ±12.5 microns)
2	2.1 mil (53.3 Microns)	
3	1.9 mil (48.2 Microns)	
Average	**2.1 mil (52.5 Microns)**	

Pass

AAMA 613 - Repairability, Section 5.5

SPECIMEN NO.	POST RESULTS			REQUIREMENT
	ΔGLOSS UNITS	ΔE	ADHESION	
1	-0.9	0.19	0 - No Loss	No gloss or color change ±5 units No loss of Adhesion
2	-2.0	0.24	0 - No Loss	
3	-4.4	0.22	0 - No Loss	
Average	**-2.4**	**0.22**	**0 - No Loss**	

Pass

AAMA 613 - Color Uniformity, Section 7.1

SPECIMEN NO.	RESULTS	REQUIREMENT
1	0.08 ΔE	Color should match the master color reference panel within ΔE 0.5 units
2	0.31 ΔE	
3	0.08 ΔE	

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Report No.: J0098.01-106-31 R3
Date: 03/13/19

AAMA 613 - Specular Gloss, Section 7.2

SPECIMEN NO.	60° GLOSS RESULTS	REQUIREMENT
1	11.2 (-3.1)	±5 Gloss Units of Manufactures master color reference panel (14.3 Gloss Units)
2	13.0 (-1.3)	
3	10.6 (-3.7)	
Average	**11.6 (-2.7)**	

Pass

AAMA 613 - Scratch Hardness, Section 7.3.1.1

SPECIMEN NO.	RESULTS	REQUIREMENT
1	B	Minimum allowable hardness "B"
2	B	

Pass

AAMA 613 - Cut Hardness, Section 7.3.1.2

SPECIMEN NO.	RESULTS	REQUIREMENT
1	B	No minimum allowable hardness
2	B	

Pass

AAMA 613 - Dry Adhesion, Section 7.4.1.1

SPECIMEN NO.	RESULTS	REQUIREMENT
1	5 - No Peeling or Removal	"5" - No removal of film under the tape within or outside the cross hatch
2	5 - No Peeling or Removal	
3	5 - No Peeling or Removal	

Pass

AAMA 613 - Wet Adhesion, Section 7.4.1.2

SPECIMEN NO.	RESULTS	REQUIREMENT
1	5 - No Peeling or Removal	"5" - No removal of film under the tape within or outside the cross hatch
2	5 - No Peeling or Removal	
3	5 - No Peeling or Removal	

Pass

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Report No.: J0098.01-106-31 R3
Date: 03/13/19

AAMA 613 - Impact Resistance, Section 7.5

SPECIMEN NO.	RESULTS	REQUIREMENT
1	No Coating Removed	No removal of film from substrate
2	No Coating Removed	
3	No Coating Removed	

Pass

AAMA 613 - Muriatic Acid Resistance, Section 7.6.1

SPECIMEN NO.	RESULTS		REQUIREMENT
	GLOSS UNITS	ΔE	
1	Δ0.6	0.07	No gloss or color change ±5 units, and a maximum color change of 5 ΔE
2	Δ0.1	0.07	
3	Δ1.4	0.11	
4	Δ1.3	0.06	
Average	**Δ0.9**	**0.08**	

Pass

AAMA 613 - Mortar Resistance, Section 7.6.2

SPECIMEN NO.	RESULTS		REQUIREMENT
	GLOSS UNITS	ΔE	
1	Δ-0.2	0.26	No gloss or color change ±5 units, and a maximum color change of 5 ΔE
2	Δ-0.1	0.63	
3	Δ0.4	0.39	
4	Δ0.7	0.39	
Average	**Δ0.2**	**0.42**	

Pass

AAMA 613 - Detergent Resistance, Section 7.7 - Post 30 Minutes

SPECIMEN NO.	RESULTS		REQUIREMENT
	GLOSS UNITS	ΔE	
1	Δ0.6	0.29	No gloss or color change ±5 units, and a maximum color change of 5 ΔE
2	Δ0.5	0.36	
Average	**Δ0.6**	**0.33**	

Pass

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Report No.: J0098.01-106-31 R3
Date: 03/13/19

AAMA 613 - Detergent Resistance, Section 7.7 - Post 24 Hours

SPECIMEN NO.	RESULTS		REQUIREMENT
	GLOSS UNITS	ΔE	
1	Δ1.1	0.21	No gloss or color change ±5 units, and a maximum color change of 5 ΔE
2	Δ0.2	0.11	
Average	**Δ0.6**	**0.16**	

Pass

AAMA 613 - Humidity Resistance, Section 7.8

SPECIMEN NO.	RESULTS	REQUIREMENT
1	0 - No Blisters Observed	No Formation of Blisters ≤ No.8 of Fig. 4 of ASTM D714
2	0 - No Blisters Observed	
3	0 - No Blisters Observed	

Pass

AAMA 613 - Cold Crack Cycle, Section 7.9

SPECIMEN NO.	RESULTS	REQUIREMENT
1	Meets as Stated	No cracking, loss of adhesion, or detrimental Effects
2	Meets as Stated	
3	Meets as Stated	

Pass

AAMA 613 - Oven Aging, Section 7.10 - Scratch Hardness, Section 7.3.1

SPECIMEN ID	RESULTS	REQUIREMENT
Test 1 - 1	B	Minimum allowable hardness "B"
Test 1 - 2	B	
Test 1 - 3	B	

Pass

AAMA 613 - Oven Aging, Section 7.10 - Dry Adhesion, Section 7.4.1.1

SPECIMEN ID	RESULTS	REQUIREMENT
Test 2 - 1	0 % Loss	No Loss of Adhesion
Test 2 - 2	0 % Loss	
Test 2 - 3	0 % Loss	

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AAMA 613 - Weather Exposure, Section 7.11

WEATHER EXPOSURE	RESULTS				REQUIREMENT
	LOCATION	IMPACT (in·lb/mil)	ΔE CHANGE	ADHESION LOSS CHECKING, OR CRACKING	
Initial	PA	1.3	N/A	None	Minimum impact of 5340 J/m (1.2 in-lb/mil)
6-Month	PA	1.7	0.20	None	Minimum impact of 2670 J/m (0.60 in-lb/mil), ΔE ≤5, and show no checking, cracking or loss of adhesion after taping and only slight chalking
	FL	0.90	0.26	None	
	AZ	1.3	0.37	None	
12-Month	PA	1.2	0.42	None	
	FL	1.2	0.67	None	
	AZ	1.2	0.69	None	
24-Month	PA	1.1	0.64	None	
	FL	1.3	0.99	None	
	AZ	1.2	1.02	None	

AAMA 613 - Heat Build-Up, Section 7.12

SPECIMEN NO.	TEMPERATURES (°F)		HEAT BUILDUP (°F)	
	PEAK	RISE ABOVE AMBIENT	HORIZONTAL	VERTICAL
1	157.9	87.1	59.0	48.5
2	156.1	84.1	57.0	46.9
3	160.6	88.6	60.0	49.4
Average	**158.2**	**86.6**	**58.7**	**48.3**

Pass

SECTION 8
CONCLUSION

The Euro Bronze organic coating met the specified performance requirements for AAMA 613.

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Report No.: J0098.01-106-31 R3
Date: 03/13/19

SECTION 9
PHOTOGRAPHS

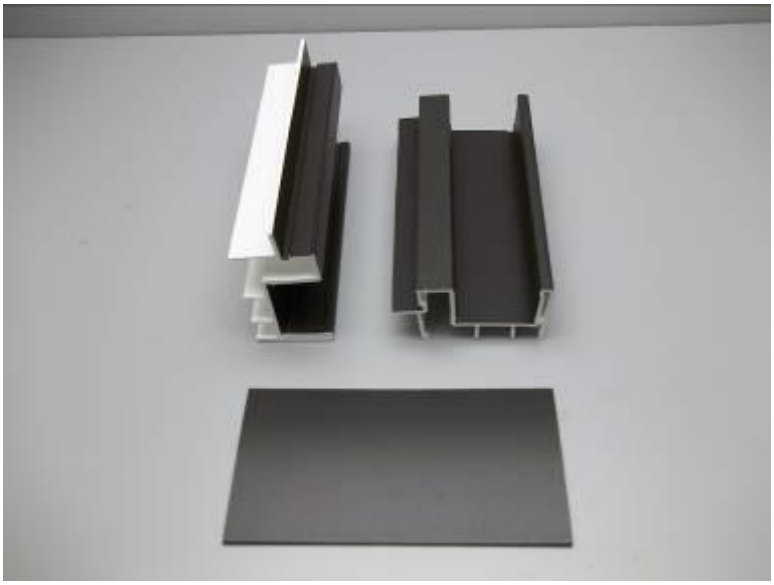

Photo No. 1
Test Profile As-Received (Top); Machined Test Specimen (Bottom)

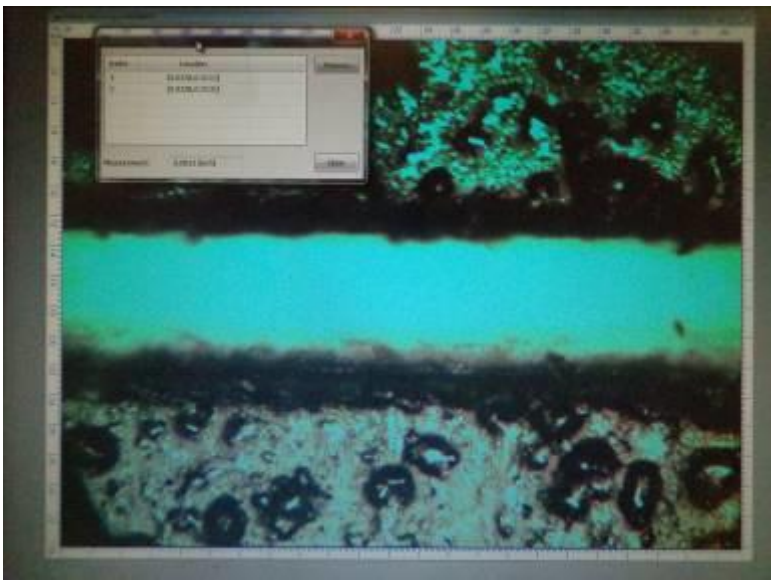

Photo No. 2
Total Dry Film Thickness Digital Thickness Measurement Image from AMScope Microscope Detail (Typical)

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TEST REPORT FOR COEUR D'ALENE WINDOW
Report No.: J0098.01-106-31 R3
Date: 03/13/19

Photo No. 3
Scratch Hardness and Cut Hardness Test In Progress

Photo No. 4
Wet and Dry Adhesion Post Exposure Specimens Detail (Typical)

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Photo No. 5
Impact Resistance Specimens Post Adhesion Evaluation

Photo No. 6
Muriatic Acid Post Exposure Test Specimen Detail (Typical)

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Report No.: J0098.01-106-31 R3
Date: 03/13/19

Photo No. 7
Mortar Resistance Specimens Post Exposure Detail (Typical)

Photo No. 8
Detergent Specimens Post Exposure Detail (Typical)

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Photo No. 9
Oven Aging Specimens; (Left) Post Adhesion Evaluation;
(Right) Post Hardness Evaluation Detail (Typical)

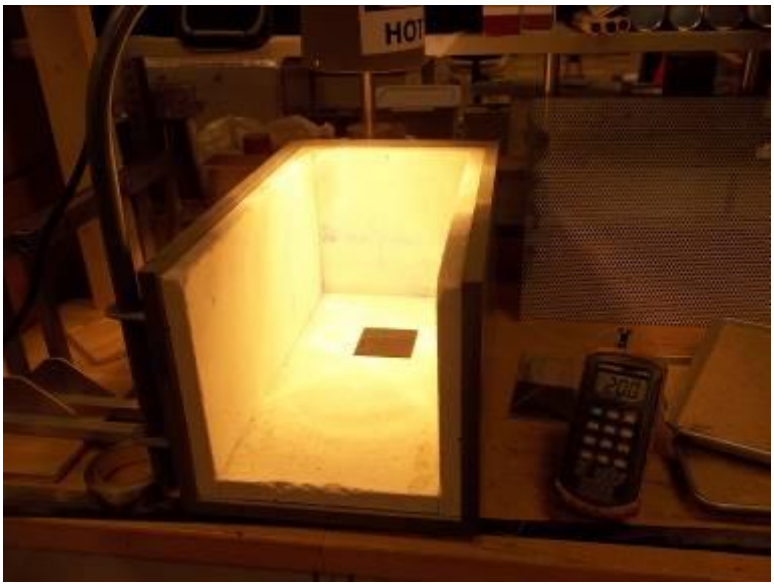

Photo No. 10
ASTM D4803 Heat Build-Up Test Setup

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TEST REPORT FOR COEUR D'ALENE WINDOW
Report No.: J0098.01-106-31 R3
Date: 03/13/19

Photo No. 11
12 Month Accelerated Weathering Specimens; (Left) Florida; (Center) Control; (Right) Pennsylvania Detail (Typical)

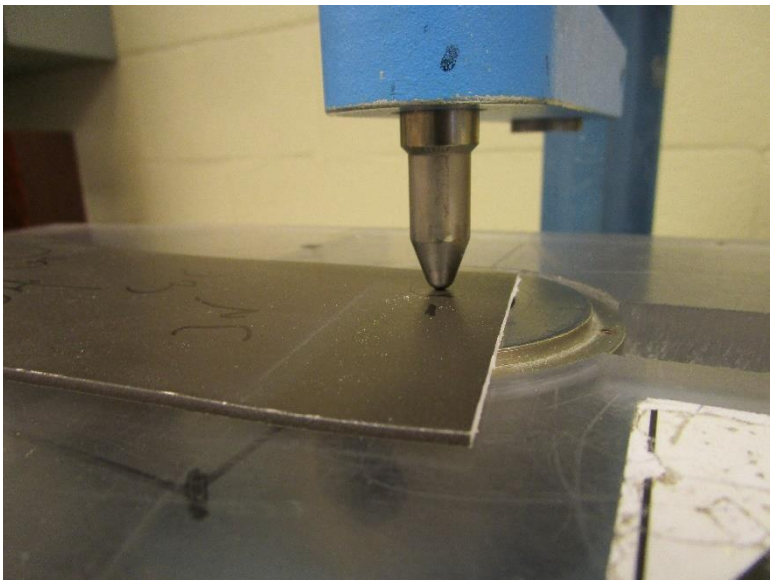

Photo No. 12
Accelerated Weathering Impact Resistance Test Setup

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Date: 03/13/19

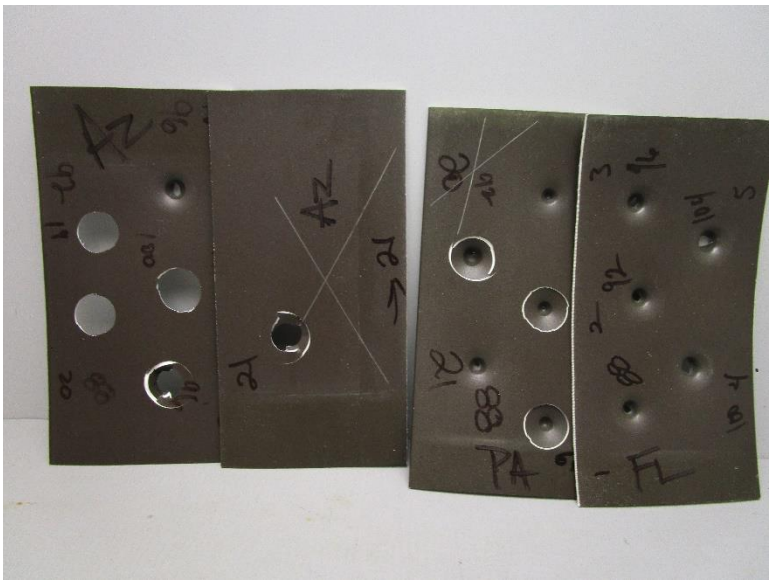

Photo No. 13
12 Month Accelerated Weathering Post Impact Resistance; (Left) Arizona; (Center) Pennsylvania; (Right) Florida Detail (Typical)

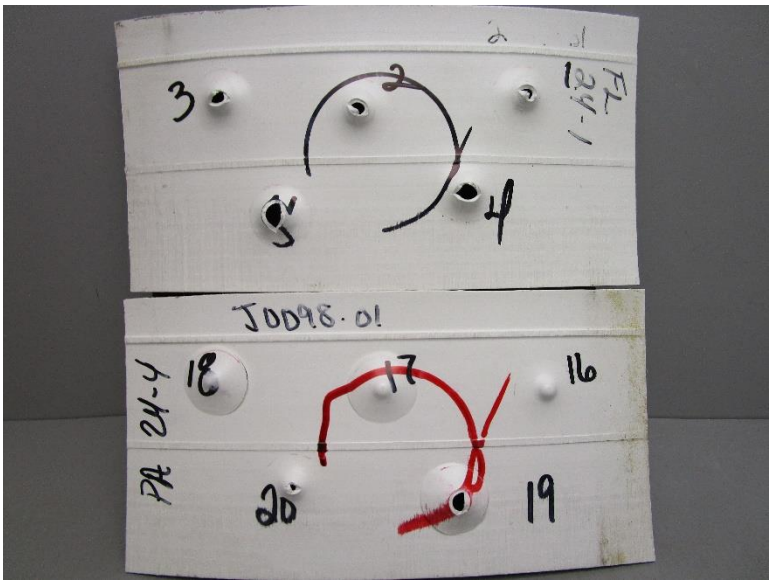

Photo No. 14
12 Month Accelerated Weathering Post Impact Resistance Detail (Typical)

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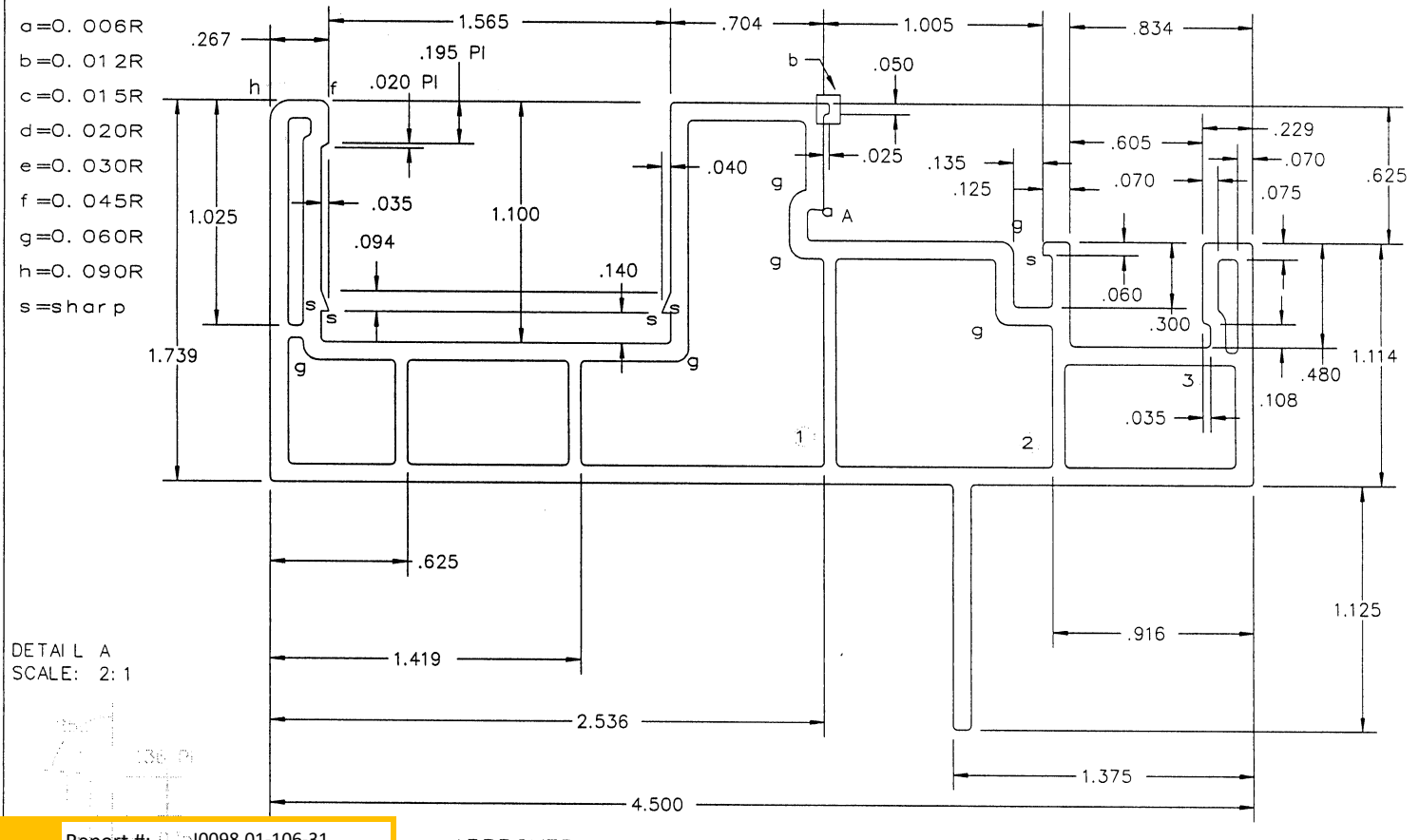
SECTION 10
DRAWING

SCALE : 1.5:1

a=0.006R
b=0.012R
c=0.015R
d=0.020R
e=0.030R
f=0.045R
g=0.060R
h=0.090R
s=sharp



DETAIL A
SCALE: 2:1

REV	DATE	REMARKS
3	01-18-98	RETAINER DETAL ADDED; WT WAS .954
2	01-18-98	WALL MOVED; DIM WAS 0.954
1	01-18-98	WALL MOVED; DIM WAS 2.716

FAB REF			FIT TO				
308-F2	308-F2A	308-F5A	308-D13	305-035	308-D18	181-08	308-D19
308-F2	308-F3			308-D15	308-D20	181-D15	291-07

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Report #: J0098.01-106-31
Date: 04/14/2021
Verified by: James R Hammond Jr

APPROVED
16-FEB-98
CYCLOID DESIGNS

CYCLOID DESIGNS	DWG: 308-D1	DATE: 11-FEB-98
TITLE: FRAME WITH FIN		RS1295

EXTERNAL WALL: 0.082
INTERNAL WALL: 0.056
CORNER TYP: 0.020R
WEIGHT: 0.953 LB/FT

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TEST REPORT FOR COEUR D'ALENE WINDOW
Report No.: J0098.01-106-31 R3
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SECTION 11
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	03/13/19	N/A	Original Report Issue
1	04/12/19	2; 3; 7; 18	Product Updated; Material Source Added; Product Description Updated; Drawings Added
2	01/10/20	12; 18; 19	Updated Result Table for Weather Exposure; Weathering Photos Added
3	04/14/20	12; 18; 19	Updated Result Table for Weather Exposure and Conclusion Statement; Weathering Photos Added