

**AAMA 1503-09 THERMAL PERFORMANCE
TEST REPORT**

Rendered to:

UNITED STATES ALUMINUM

SERIES/MODEL: HP3252 Curtain Wall

TYPE: Glazed Wall Systems (Site-built)

Summary of Results	
Thermal Transmittance (U-Factor)	0.28
Condensation Resistance Factor - Frame (CRF _f)	77
Condensation Resistance Factor - Glass (CRF _g)	74
Unit Size	78-3/4" x 78-3/4" (2000 mm x 2000 mm)
Layer 1	1/4" Cardinal LoE 272 (e=0.042*, #2)
Gap 1	0.25" Gap, Coated Steel Spacer (CS-D), 95% Krypton-Filled*
Layer 2	0.003 Southwall Technologies TC88 Heat Mirror (e=0.127*, #3 / 0.109*, #4)
Gap 2	0.25" Gap, Coated Steel Spacer (CS-D), 95% Krypton-Filled*
Layer 3	1/4" Clear

Reference must be made to Report No. 99979.02-201-46, dated 10/12/10 for complete test specimen description and data.

AAMA 1503-09 THERMAL PERFORMANCE TEST REPORT

Rendered to:

UNITED STATES ALUMINUM
200 Singleton Drive
Waxahachie, Texas 75165

Report Number: 99979.02-201-46
Test Date: 08/16/10
Report Date: 08/16/10
Revision 1 Date: 10/12/10
Test Record Retention Date: 08/16/14

Test Sample Identification:

Series/Model: HP3252 Curtain Wall

Type: Glazed Wall Systems (Site-built)

Test Sample Submitted by: Client

Test Procedure: The condensation resistance factor (CRF) and thermal transmittance (U) were determined in accordance with AAMA 1503-09, *Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections*

- | | |
|---|---------|
| 1. Average warm side ambient temperature | 69.73 F |
| 2. Average cold side ambient temperature | -0.12 F |
| 3. 15 mph dynamic wind applied to test specimen exterior. | |
| 4. 0.0" $\pm$ 0.04" static pressure drop across specimen. | |

Test Results Summary:

- | | |
|---|------|
| 1. Condensation resistance factor - Frame (CRF _f) | 77 |
| Condensation resistance factor - Glass (CRF _g) | 74 |
| 2. Thermal transmittance due to conduction (U) | 0.28 |
| (U-factors expressed in Btu/hr·ft ² ·F) | |

Test Sample Description:

CONSTRUCTION	Frame
Size (in.) Non-Standard	78-3/4 x 78-3/4
Daylight Opening (in.)	35-1/2 x 73-1/4 (x2)
CORNERS	Butt
Fasteners	Screws
Sealant	Yes
MATERIAL	AT (0.24")
Color Exterior	Gray
Finish Exterior	Paint
Color Interior	Gray
Finish Interior	Paint
GLAZING METHOD	Pressure

Glazing Information:

Layer 1	1/4" Cardinal LoE 272 (e=0.042*, #2)
Gap 1	0.25" Gap, Coated Steel Spacer (CS-D), 95% Krypton-Filled*
Layer 2	0.003 Southwall Technologies TC88 Heat Mirror (e=0.127*, #3 / 0.109*, #4)
Gap 2	0.25" Gap, Coated Steel Spacer (CS-D), 95% Krypton-Filled*
Layer 3	1/4" Clear
Gas Fill Method	Evacuated Chamber*
Desiccant	Yes

**Stated per Client/Manufacturer*

NA Non-Applicable

See Description Table Abbreviations

Test Sample Description: (Continued)

COMPONENTS			
	Type	Quantity	Location
WEATHERSTRIP			
	No weatherstrip		
HARDWARE			
	No hardware		
DRAINAGE			
	No drainage		

Test Duration:

1. The environmental systems were started at 14:30 hours, 08/15/10.
2. The thermal performance test results were derived from 03:16 hours, 08/16/10 to 07:16 hours, 08/16/10.

Condensation Resistance Factor (CRF):

The following information, condensed from the test data, was used to determine the condensation resistance factor:

T_h	=	Warm side ambient air temperature	69.73 F
T_c	=	Cold side ambient air temperature	-0.12 F
FT_p	=	Average of pre-specified frame temperatures (14)	53.66 F
FT_r	=	Average of roving thermocouples (4)	49.21 F
W	=	$[(FT_p - FT_r) / (FT_p - (T_c + 10))]$ x 0.40	0.041
FT	=	$FT_p(1-W) + W (FT_r)$ = Frame Temperature	53.48 F
GT	=	Glass Temperature	51.88 F
CRF_g	=	Condensation resistance factor – Glass	74
		$CRF_g = (GT - T_c) / (T_h - T_c)$ x 100	
CRF_f	=	Condensation resistance factor – Frame	77
		$CRF_f = (FT - T_c) / (T_h - T_c)$ x 100	

The CRF number was determined to be 74 (on the size as reported). When reviewing this test data, it should be noted that the glass temperature (GT) was colder than the frame temperature (FT) therefore controlling the CRF number. Refer to the 'CRF Report' page and the 'Thermocouple Location Diagram' page of this report.

Thermal Transmittance (U_o):

T_h	=	Average warm side ambient temperature	69.73 F
T_c	=	Average cold side ambient temperature	-0.12 F
P	=	Static pressure difference across test specimen	0.00 psf
		15 mph dynamic perpendicular wind at exterior	
Nominal sample area			43.07 ft ²
Total measured input to calorimeter			952.15 Btu/hr
Calorimeter correction			111.31 Btu/hr
Net specimen heat loss			840.84 Btu/hr
U	=	Thermal Transmittance	0.28 Btu/hr·ft ² ·F

Glazing Deflection (in.):

	Left Glazing	Right Glazing
Edge Gap Width	0.25 / 0.25	0.25 / 0.25
Estimated center gap width upon receipt of specimen in laboratory (after stabilization)	0.30 / 0.30	0.30 / 0.30
Center gap width at laboratory ambient conditions on day of testing	0.30 / 0.30	0.30 / 0.30
Center gap width at test conditions	0.24 / 0.23	0.25 / 0.23

The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed no evidence of condensation/frost at the conclusion of the test.

A calibration of the Architectural Testing Inc. 'thermal test chamber' (ICN N000235) in St. Paul, Minnesota was conducted in October 2009 in accordance with Architectural Testing Inc. calibration procedure.

Prior to testing the specimen was sealed with silicone on the interior side and checked for air infiltration per Section 9.3.4.

CRF Report

Time: 05:16 05:46 06:16 06:46 07:16 AVERAGE

Pre-specified Thermocouples - Frame

1	52.46	52.46	52.44	52.47	52.46	52.46
2	52.54	52.54	52.52	52.53	52.55	52.54
3	48.78	48.78	48.81	48.79	48.79	48.79
4	57.12	57.11	57.11	57.11	57.14	57.12
5	55.22	55.16	55.17	55.21	55.23	55.20
6	51.08	51.09	51.09	51.07	51.14	51.10
7	52.91	52.93	52.92	52.94	52.97	52.93
8	56.62	56.63	56.63	56.68	56.67	56.65
9	53.74	53.75	53.73	53.76	53.79	53.75
10	55.32	55.34	55.33	55.35	55.35	55.34
11	50.66	50.67	50.67	50.68	50.69	50.67
12	51.40	51.44	51.41	51.44	51.43	51.42
13	58.25	58.27	58.27	58.27	58.31	58.27
14	55.04	55.04	55.04	55.06	55.04	55.05
FT _p	53.65	53.66	53.65	53.67	53.68	53.66

Pre-specified Thermocouples - Glass

15	39.95	39.94	39.92	39.97	39.94	39.94
16	60.56	60.58	60.56	60.58	60.60	60.58
17	54.48	54.44	54.45	54.47	54.48	54.46
18	44.01	44.02	44.02	44.01	44.04	44.02
19	62.25	62.28	62.26	62.27	62.26	62.26
20	49.99	49.97	50.00	49.99	49.98	49.99
GT	51.87	51.87	51.87	51.88	51.88	51.88

Cold Point (Roving) Thermocouples

21	47.17	47.15	47.16	47.16	47.19	47.17
22	48.78	48.78	48.81	48.79	48.79	48.79
23	50.23	50.21	50.22	50.21	50.21	50.22
24	50.66	50.67	50.67	50.68	50.69	50.67
FT _R	49.21	49.20	49.21	49.21	49.22	49.21
W	0.04	0.04	0.04	0.04	0.04	0.04
FT	53.47	53.48	53.47	53.49	53.50	53.48

Warm Side - Room Ambient Air Temperature

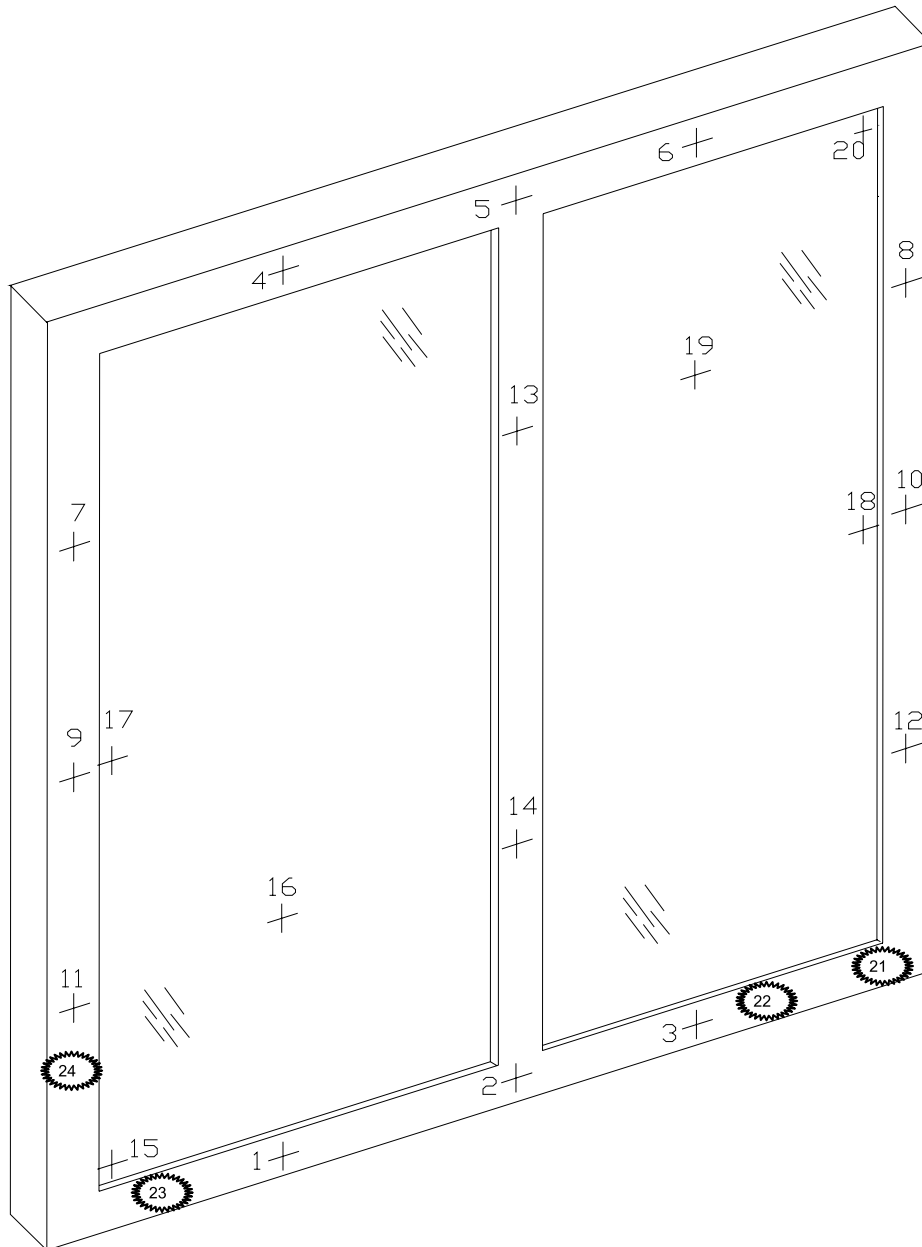
	69.76	69.64	69.76	69.77	69.71	69.73
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Cold Side - Room Ambient Air Temperature

	-0.13	-0.09	-0.11	-0.11	-0.11	-0.11
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CRF _f	77	77	77	77	77	77
CRF _g	74	75	74	74	74	74

Thermocouple Location Diagram



Cold Point Locations

21	21. 47.17
22	22. 48.79
23	23. 50.22
24	24. 50.67

Detailed drawings, data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period such materials shall be discarded without notice and the service life of this report by Architectural Testing will expire. Results obtained are tested values and were secured by using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.



Digitally Signed by: John A. Westlund

John A. Westlund
Technician



Digitally Signed by: Michael Resech

Michael P. Resech
Senior Project Manager
Individual-In-Responsible-Charge

JAW:_jaw
99979.02-201-46

Attachments (pages): This report is complete only when all attachments listed are included.

Appendix-A: Description Table Abbreviations (1)

Appendix-B: Drawings (11)