

**AAMA 1503-98 THERMAL PERFORMANCE
TEST REPORT**

Rendered to:

UNITED STATES ALUMINUM

SERIES/MODEL: 2200 Glazed Wall System

TYPE: Glazed Wall Systems (Site-built)

Summary of Results	
Thermal Transmittance (U-Factor)	0.65
Condensation Resistance Factor - Frame (CRFf)	64
Condensation Resistance Factor - Glass (CRFg)	59
Glazing Description:	1/4" Clear Tempered, 0.50" Gap, Aluminum Spacer (A1), Air-Filled*, 1/4" Clear Tempered

Reference should be made to ATI Report No. 72682.02-301-46 for complete test specimen description and data.

AAMA 1503-98 THERMAL PERFORMANCE TEST REPORT
Architectural Testing

Rendered to:

UNITED STATES ALUMINUM
200 Singleton Drive
Waxahachie, Texas 75165

Report No: 72682.02-301-46
Test Date: 04/21/07
Report Date: 05/30/07
Expiration Date: 04/21/11

Test Sample Identification:

Series/Model: 2200 Glazed Wall System

Type: Glazed Wall Systems (Site-built)

Test Procedure: The condensation resistance factor (CRF) and thermal transmittance (U) were determined in accordance with AAMA 1503-98, *Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections*

- | | |
|---|---------|
| 1. Average warm side ambient temperature | 69.80 F |
| 2. Average cold side ambient temperature | -0.53 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) | 64 |
| Condensation resistance factor - Glass (CRF _g) | 59 |
| 2. Thermal transmittance due to conduction (U _c) | 0.65 |
| (U-factors expressed in Btu/hr-ft ² -F) | |

Test Sample Description:

CONSTRUCTION	Frame
Size(in.)	79 x 79
Daylight Opening (in.)	36 1/4 x 74 5/8 (x2)
CORNERS	Square Cut
Fasteners	Screws
Sealant	No
MATERIAL	Thermally Improved AL (0.15")
Color Exterior	Gray
Finish Exterior	Mill Finish
Color Interior	Gray
Finish Interior	Mill Finish
GLAZING METHOD	Exterior

Glazing Information

Layer 1	1/4" Clear Tempered
Gap	0.50" Gap, Aluminum Spacer (A1), Air-Filled*
Layer 2	1/4" Clear Tempered
Gas Fill Method	NA*

**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 visible weeps		

Test Duration:

1. The environmental systems were started at 17:46 hrs., 04/20/07
2. The thermal performance test results were derived from 07:37 hrs., 04/21/07 to 09:37 hrs., 04/21/07.

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	69.80 F
T_c	=	Cold side ambient air temperature	-0.53 F
FT_p	=	Average of pre-specified frame temperatures (14)	44.60 F
FT_r	=	Average of roving thermocouples (4)	40.23 F
W	=	$(FT_p - FT_r) / [FT_p - (T_c + 10)] \times 0.40$	0.050
FT	=	$FT_p(1-W) + W (FT_r) =$ Frame Temperature	44.39 F
GT	=	Glass Temperature	40.96 F
CRF_g	=	Condensation resistance factor – Glass	59
		$CRF_g = (GT - T_c) / (T_h - T_c) \times 100$	
CRF_f	=	Condensation resistance factor – Frame	64
		$CRF_f = (FT - T_c) / (T_h - T_c) \times 100$	

The CRF number was determined to be 59 (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_c):

T_h	=	Average warm side ambient temperature	69.80 F
T_c	=	Average cold side ambient temperature	-0.53 F
P	=	Static pressure difference across test specimen	0.00 psf
		15 mph dynamic perpendicular wind at exterior	
Nominal sample area			43.34 ft ²
Total measured input to calorimeter			2106.35 Btu/hr
Calorimeter correction			122.61 Btu/hr
Net specimen heat loss			1983.74 Btu/hr
U_c	=	Thermal Transmittance	0.65 Btu/hr-ft ² -F

Glazing Deflection (in.):

	Left Glazing*	Right Glazing*
Actual Gap Width	0.50	0.50
Effective gap width upon receipt of specimen in laboratory (after stabilization)	0.55	0.55
Effective gap width at laboratory ambient conditions on day of testing	0.55	0.55
Effective gap width at test conditions	0.55	0.55

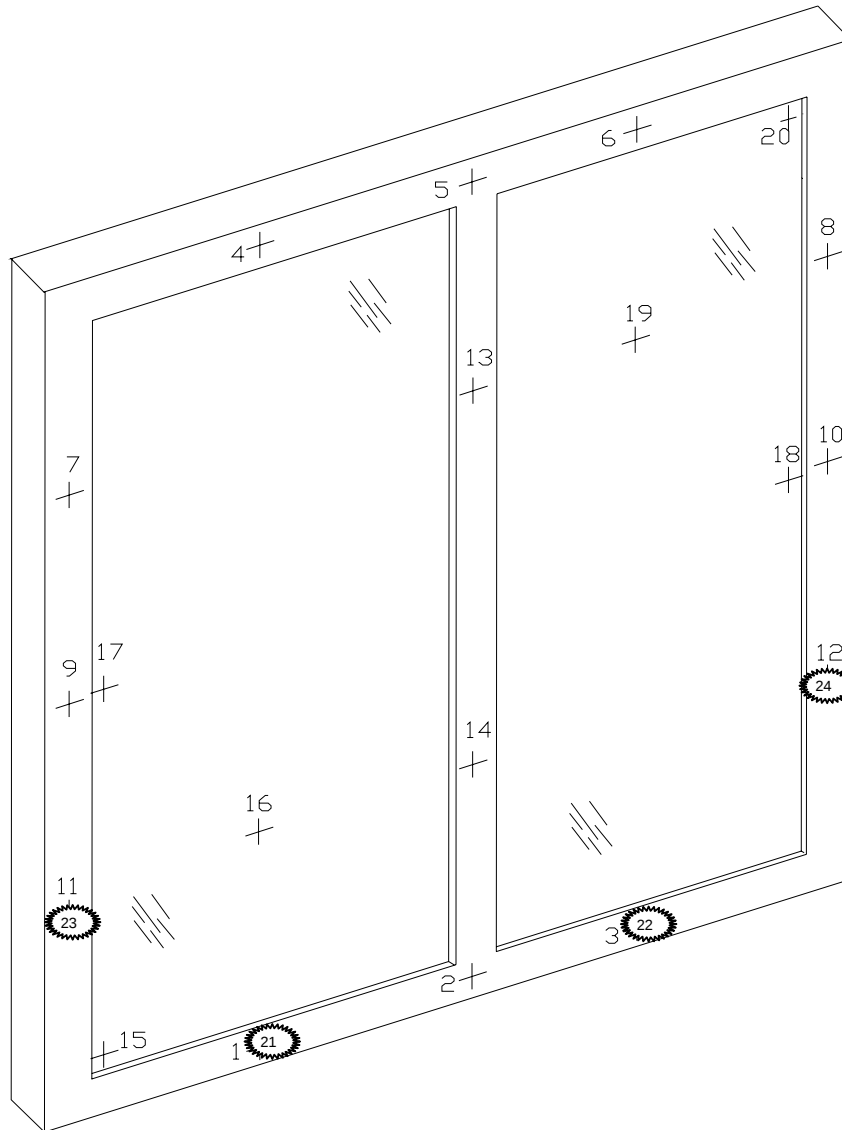
The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed evidence of frost on the interior side of the sill and the interior side of the bottom half of the vertical members at the conclusion of the test.

A calibration of the ATI 'thermal test chamber' in Fresno, California was conducted in February 2007.

CRF Report

Time:	07:37	08:07	08:37	09:07	09:37	AVERAGE
Pre-specified Thermocouples - Frame						
1	40.20	40.17	40.22	40.23	40.24	40.21
2	40.88	40.96	40.93	40.96	40.95	40.94
3	40.31	40.31	40.31	40.31	40.31	40.31
4	48.63	48.65	48.69	48.69	48.70	48.67
5	47.75	47.79	47.85	47.83	47.86	47.82
6	50.15	50.15	50.15	50.19	50.15	50.16
7	47.85	47.85	47.85	47.85	47.85	47.85
8	47.35	47.32	47.36	47.34	47.35	47.34
9	43.09	43.13	43.13	43.15	43.14	43.13
10	43.25	43.25	43.25	43.25	43.25	43.25
11	40.23	40.24	40.28	40.23	40.27	40.25
12	40.14	40.14	40.14	40.14	40.14	40.14
13	49.13	49.15	49.13	49.14	49.12	49.14
14	45.26	45.26	45.26	45.26	45.26	45.26
FTP	44.59	44.60	44.61	44.61	44.61	44.60
Pre-specified Thermocouples - Glass						
15	30.16	30.06	30.09	30.14	30.09	30.11
16	44.10	44.10	44.10	44.10	44.10	44.10
17	39.99	40.01	40.01	40.00	39.92	39.99
18	42.46	42.43	42.40	42.47	42.41	42.44
19	46.40	46.45	46.38	46.44	46.34	46.40
20	42.65	42.71	42.77	42.69	42.72	42.71
GT	40.96	40.96	40.96	40.97	40.93	40.96
Cold Point (Roving) Thermocouples						
21	40.21	40.21	40.21	40.21	40.21	40.21
22	40.31	40.31	40.31	40.31	40.31	40.31
23	40.25	40.25	40.25	40.25	40.25	40.25
24	40.14	40.14	40.14	40.14	40.14	40.14
FT _R	40.23	40.23	40.23	40.23	40.23	40.23
W	0.05	0.05	0.05	0.05	0.05	0.050
FT	44.37	44.38	44.39	44.39	44.39	44.39
Warm Side - Room Ambient Air Temperature						
	69.80	69.81	69.81	69.82	69.80	69.81
Cold Side - Room Ambient Air Temperature						
	-0.53	-0.53	-0.53	-0.53	-0.53	-0.53
CRF _f	63.84	63.85	63.87	63.85	63.88	64
CRF _g	58.99	58.99	58.98	58.99	58.95	59

Thermocouple Location Diagram



Cold Point Locations

21	21. 40.21
22	22. 40.31
23	23. 40.25
24	24. 40.14

Detailed drawings, representative samples of the test specimen and a copy of this report will be retained by ATI for a period of four years. This report is the exclusive property of the client so named herein and relates only to the fenestration product tested. This report may not be reproduced, except in full, without the approval of the laboratory. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory.

For ARCHITECTURAL TESTING, INC.

Darrin A. Spencer
Technician

Kenny C. White
Laboratory Manager
Individual-In-Responsible-Charge

DAS:sj
72682.02-301-46

Attachments:
Drawings

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	05/30/07	All	Original Report Issue. Work requested by Mr. Michael Brown of United States Aluminum.

Description Table Abbreviations

CODE	Frame / Sash Types
AI	Aluminum w/ Vinyl Inserts (Caps)
AL	Aluminum
AP	Aluminum w/ Thermal Breaks - Partial
AS	Aluminum w/ Steel Reinforcement
AT	Aluminum w/ Thermal Breaks - All Members
AV	Aluminum / Vinyl Composite
AW	Aluminum-clad Wood
FG	Fiberglass
PA	ABS Plastic w/ All Members Reinforced
PC	ABS Plastic-clad Aluminum
PF	ABS Plastic w/ Foam-filled Insulation
PH	ABS Plastic w/ Horizontal Members Reinforced
PI	ABS Plastic w/ Reinforcement - Interlock
PL	ABS Plastic
PP	ABS Plastic w/ Reinforcement - Partial
PV	ABS Plastic w/ Vertical Members Reinforced
PW	ABS Plastic-clad Wood
ST	Steel
VA	Vinyl w/ All Members Reinforced
VC	Vinyl-clad Aluminum
VF	Vinyl w/ Foam-filled Insulation
VH	Vinyl w/ Horizontal Members Reinforced
VI	Vinyl w/ Reinforcement - Interlock
VP	Vinyl w/ Reinforcement - Partial
VV	Vinyl w/ Vertical Members Reinforced
VW	Vinyl-clad Wood
VY	Vinyl
WA	Aluminum / Wood composite
WD	Wood
WV	Vinyl / Wood composite
WF	Fiberglass/Wood Combination
WC	Composite/Wood Composite (Shaped vinyl/wood composite members)
CW	Vinyl/Wood Composite Material

CODE	Spacer Types (See sealant)
A1	Aluminum
A2	Aluminum (Thermally-broken)
A3	Aluminum-reinforced Polymer
A4	Aluminum / Wood
A5	Aluminum-reinforced Butyl
A6	Aluminum / Foam / Aluminum
A7	Aluminum U-shaped
A8	Aluminum-Butyl (Corrugated)
ER	EPDM Reinforced Butyl
FG	Fiberglass
GL	Glass
OF	Organic Foam
PU	Polyurethane Foam
SU	Stainless Steel, U-shaped
CU	Coated Steel, U-shaped
S2	Steel (Thermally-broken)
S3	Steel / Foam / Steel
S5	Steel-reinforced Butyl
S6	Steel U-channel w/ Thermal Cap
SS	Stainless Steel
CS	Coated Steel
TP	Thermo-plastic
V1	Vinyl U-shaped
WD	Wood
ZF	Silicone Foam
ZS	Silicone / Steel

CODE	Spacer Sealant
D	Dual Seal Spacer System
S	Single Seal Spacer System

CODE	Gap Fill Codes
AIR	Air
AR3	Argon / Krypton / Air
ARG	Argon/Air
CO2	Carbon Dioxide
KRY	Krypton/Air

CODE	Grid Description
N	No Muntins
G	Grids between glass
S	Simulated Divided Lites
T	True Muntins

CODE	Grid Size Codes
	Blank for no grids
0.75	Grids < 1"
1.5	Grids >= 1"

DOOR DETAILS	
CODE	Door Type
EM	Embossed
FL	Flush
LF	Full Lite
LH	1/2 - Lite
LQ	1/4 - Lite
LT	3/4 - Lite
RP	Raised Panel

CODE	Skin
AL	Aluminum
FG	Fiberglass
GS	Galvanized Steel
ST	Steel
WD	Wood

CODE	Panel
FG	Fiberglass
PL	Plastic
WP	Wood - Plywood
WS	Wood - Solid

CODE	Sub-Structure
GS	Galvanized Steel
PL	Plastic
ST	Steel
WD	Wood

CODE	Core Fill
CH	Cellular - Honeycomb
EP	Expanded Polystyrene
PI	Polyisocyanurate
PU	Polyurethane
WP	Wood - Plywood
WS	Wood - Solid
XP	Extruded Polystyrene

CODE	Tint Codes
AZ	Azurlite
BL	Blue
BZ	Bronze
CL	Clear
EV	Evergreen
GD	Gold
GR	Green
GY	Gray

CODE	Thermal Breaks
FO	Foam
UR	Urethane
VY	Vinyl
FB	Fiberglass
RN	Reinforced Nylon
AB	ABS
NE	Neoprene
AI	Air

Report 72682
Test samples
Architectural Test
Samples are noted
MAY 2 2007
used