

**NFRC 102-2004 THERMAL PERFORMANCE
TEST REPORT**

Rendered to:

UNITED STATES ALUMINUM

SERIES/MODEL: 2200 Glazed Wall System

TYPE: Glazed Wall Systems (Site-built)

Summary of Results	
Standardized Thermal Transmittance (U-Factor)	0.59
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. 72682.01-301-46 for complete test specimen description and data.



NFRC 102-2004 THERMAL PERFORMANCE TEST REPORT

Rendered to:

UNITED STATES ALUMINUM
200 Singleton Drive
Waxahachie, Texas 71565

Report No:	72682.01-301-46
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)

Overall Size: 79" x 79" (2007 mm x 2007 mm) (Model Size)

NFRC Standard Size: 78.7" x 78.7" (2000 mm wide x 2000 mm high)

Test Procedure: U-factor tests were performed in a Guarded Hot Box in accordance with NFRC 102-2004, *Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems*.

Test Results Summary:

Standardized U-factor (U_{st}): 0.59 Btu/hr·ft²·F CTS Method

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		

Thermal Transmittance (U-factor)

Measured Test Data

Heat Flows

1. Total Measured Input into Metering Box (Q_{total})	2106.35 Btu/hr
2. Surround Panel Heat Flow (Q_{sp})	68.88 Btu/hr
3. Surround Panel Thickness	6.00 inches
4. Surround Panel Conductance	0.0375 Btu/hr·ft ² ·F
5. Metering Box Wall Heat Flow (Q_{mb})	38.07 Btu/hr
6. EMF vs Heat Flow Equation (equivalent information)	0.0187*EMF + 4.016
7. Flanking Loss Heat Flow (Q_{fl})	15.66 Btu/hr
8. Net Specimen Heat Loss (Q_s)	1983.74 Btu/hr

Areas

1. Test Specimen Projected Area (A_s)	43.34 ft ²
2. Test Specimen Interior Total (3-D) Surface Area (A_h)	60.94 ft ²
3. Test Specimen Exterior Total (3-D) Surface Area (A_c)	50.83 ft ²
4. Metering Box Opening Area (A_{mb})	69.44 ft ²
5. Metering Box Baffle Area (A_{b1})	60.56 ft ²
6. Surround Panel Interior Exposed Area (A_{sp})	26.10 ft ²

Test Conditions

1. Average Metering Room Air Temperature (t_h)	69.80 F
2. Average Cold Side Air Temperature (t_c)	-0.53 F
3. Average Guard/Environmental Air Temperature	74.00 F
4. Metering Room Average Relative Humidity	6.32 %
5. Measured Cold Side Wind Velocity (Perpendicular Flow)	15.62 mph
6. Measured Static Pressure Difference Across Test Specimen	0.00" ± 0.04"H ₂ O

Results

1. Thermal Transmittance of Test Specimen (U_s)	0.65 Btu/hr·ft ² ·F
2. Standardized Thermal Transmittance of Test Specimen (U_{st})	0.59 Btu/hr·ft ² ·F

Thermal Transmittance (U-factor)

Calculated Test Data

CTS Method

1. Emittance of Glass (e_1)	0.84
2. Warm Side Baffle Emittance (e_{b1})	0.92
3. Equivalent Warm Side Surface Temperature	38.79 F
4. Equivalent Cold Side Surface Temperature	7.78 F
5. Warm Side Baffle Surface Temperature	69.77 F
6. Measured Warm Side Surface Conductance (h_h)	1.48 Btu/hr·ft ² ·F
7. Measured Cold Side Surface Conductance (h_c)	5.51 Btu/hr·ft ² ·F
8. Test Specimen Thermal Conductance (C_s)	1.48 Btu/hr·ft ² ·F
9. Convection Coefficient (K_c)	0.31 Btu/(hr·ft ² ·F ^{1.25})
10. Radiative Test Specimen Heat Flow (Q_{r1})	997.51 Btu/hr
11. Conductive Test Specimen Heat Flow (Q_{c1})	986.23 Btu/hr
12. Radiative Heat Flux of Test Specimen (q_{r1})	23.02 Btu/hr·ft ² ·F
13. Convective Heat Flux of Test Specimen (q_{c1})	22.76 Btu/hr·ft ² ·F
14. Standardized Warm Side Surface Conductance (h_{sth})	1.22 Btu/hr·ft ² ·F
15. Standardized Cold Side Surface Conductance (h_{stc})	5.28 Btu/hr·ft ² ·F
16. Standardized Thermal Transmittance (U_{st})	0.59 Btu/hr·ft ² ·F

Test Duration

1. The environmental systems were started at 17:46 hrs., 04/20/07
2. The test parameters were considered stable for two consecutive four hour test periods
01:37 hrs., 04/21/07 to 09:37 hrs., 04/21/07.
3. The thermal performance test results were derived from 05:37 hrs, 04/21/07
to 09:37 hrs, 04/21/07.

The reported Standardized Thermal Transmittance (U_{st}) was determined using CTS Method, per Section 8.2(A) of NFRC 102.

Glazing Deflection:

	Left Glazing*	Right Glazing*
Edge Gap Width	0.50	0.50
Estimated 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

*Note: All measurements are in inches

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.

"This test method does not include procedures to determine the heat flow due to either air movement through the specimen or solar radiation effects. As a consequence, the thermal transmittance results obtained do not reflect performances which may be expected from field installations due to not accounting for solar radiation, air leakage effects, and the thermal bridge effects that may occur due to the specific design and construction of the fenestration system opening. Therefore, it should be recognized that the thermal transmittance results obtained from this test method are for ideal laboratory conditions and should only be used for fenestration product comparisons and as input to thermal performance analyses which also include solar, air leakage and thermal bridge effects."

Ratings included in this report are for submittal to an NFRC-licensed IA for certification purposes and are not meant to be used for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) are to be used for labeling purposes.

ANSI/NCSL Z540-2-1997 type B uncertainty for this test was 1.56%.

Report was written in compliance with NFRC 102-2004 Section 9.

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. ATI is an NFRC accredited test laboratory. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report does not constitute certification of this product, which may only be granted by an NFRC approved Independent Administrator.

For ARCHITECTURAL TESTING, INC.

Tested By:

Reviewed By:

Darrin A. Spencer
Technician

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

DAS:sj
72682.01-301-46

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

Architectural Testing

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



72682

Report #

Test sample

Architectural Testers are invited to use these sample composite drawings.

MAY 2 2000

dated