Architectural Testing

NFRC U-FACTOR, SHGC, VT, & CONDENSATION RESISTANCE COMPUTER SIMULATION REPORT

(Revised)

Rendered to:
UNITED STATES ALUMINUM CORPORATION

SERIES/MODEL:
2200 Glazed Wall System

Report Number:	**72681.02-116-45**
Original Report Date:	**06/29/07**
Expiration Date:	**06/29/11**
Revised Report Date:	**02/28/11**

130 Derry Court
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200 Singleton Drive
Waxahachie, Texas 75165

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Project Summary:

Architectural Testing, Inc. was contracted to perform U-Factor, Solar Heat Gain Coefficient, Visible Transmittance, and Condensation Resistance* computer simulations in accordance with the National Fenestration Rating Council (NFRC). The products were evaluated in full compliance with NFRC requirements to the standards listed below.

**NFRC's Condensation Resistance rating is NOT equivalent to a Condensation Resistance Factor (CRF) determined in accordance with AAMA 1503.*

Standards:

NFRC 100-2004:	*Procedure for Determining Fenestration Product U-Factors*
NFRC 200-2004:	*Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence*
NFRC 500-2004:	*Procedure for Determining Fenestration Product Condensation Resistance Values*

Software:

Frame and Edge Modeling:	THERM 5.2.14
Center-of-Glass Modeling:	WINDOW 5.2.17
Total Product Calculations:	WINDOW 5.2.17
Spectral Data Library:	18.0

Simulations Specimen Description:

Series/Model:	2200 Glazed Wall System
Type:	Glazed Wall System , Curtain Wall
Frame Material:	AU Thermally Improved
Sash Material:	NA Not Applicable
Standard Size:	2000mm x 2000mm

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Technical Interpretations:

None

Modeling Assumptions:

1) To prevent air infiltration, tape was applied to all interior sash crack locations.

Specialty Products Table:

The specialty products method allow the manufacturer to determine the overall product SHGC and VT for any glazing option. The center of glass SHGC and/or VT must be determined using WINDOW 5.2. The method gives overall product SHGC and VT indexed on center of glass properties. All values used in the calculations are truncated to six decimal place precision.

	No Dividers	Dividers < 1	Dividers > 1
SHGC0	0.013871	0.017317	0.020551
SHGC1	0.930336	0.827627	0.731237
VT0	0.000000	0.000000	0.000000
VT1	0.916465	0.810310	0.710685

SHGC = SHGC0 + SHGCc (SHGC1 - SHGC0)

VT = VT0 + VTc (VT1 - VT0)

Validation Matrix:

The following products are part of a validation matrix. Only one is required for validation testing.

Product Line	*Report Number*
None	-

Spacer Option Description

	Sealant		
Spacer Type	*Primary*	*Secondary*	*Desiccant*
Standard Aluminum Spacer	Butyl Rubber	Butyl Rubber	Yes
Edgetech TriSeal Premium Super Spacer	Polyisobutylene	Butyl Rubber	No
Technoform TGI Wave Spacer	Polyisobutylene	Silicone	Yes

Grid Option Description

Grid Size	*Grid Type*	*Grid Pattern*
None	-	-

Reinforcement Option Description

Location	*Material*
None	-

Gas Filling Technique Description

Fill Type	*Method*
90% Argon	Single Probe Timed

Edge-of-Glass Construction

Interior Condition	EPDM gasket between frame and glass
Exterior Condition	EPDM gasket between frame and glass

Weatherstripping

Type	*Quantity*	*Location*
None	-	-

Frame/Sash Materials Finish

Interior	Painted Aluminum
Exterior	Painted Aluminum

NFRC 100/200/500 Summary Sheet
2200 Glazed Wall System

ID	Pane Thickness 1	Gap Width 1	Pane Thickness 2	Gap Width 2	Pane Thickness 3	Gap Width 3	Pane Thickness 4	Gap Fill	Low-e (Surface#)	Tint	Spacer	Grid Type
	U-Factor			Solar Heat Gain Coefficient (SHGC) Grids (None / <1 / >=1)					Visible Transmittance (VT) Grids (None / <1 / >=1)		Condensation Resistance	
1	Clear / air / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					AIR		CL	A1-D	N
	U-Factor		**0.60**	**SHGC (N)**				**0.66**	**VT (N)**	**0.73**	**CR**	**40**
2	Clear / arg / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90		CL	A1-D	N
	U-Factor		**0.58**	**SHGC (N)**				**0.66**	**VT (N)**	**0.73**	**CR**	**41**
3	PPG Solarban 60 / air / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					AIR	0.035(#2)	CL	A1-D	N
	U-Factor		**0.45**	**SHGC (N)**				**0.36**	**VT (N)**	**0.64**	**CR**	**48**
	Atlantica / air / PPG Solarban 60 (6mm/6mm) - 1"											
	0.223	0.500	0.223					AIR	0.035(#3)	GR	A1-D	N
	U-Factor		**0.45**	**SHGC (N)**				**0.29**	**VT (N)**	**0.49**	**CR**	**48**
4	PPG Solarban 60 / arg / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.035(#2)	CL	A1-D	N
	U-Factor		**0.41**	**SHGC (N)**				**0.36**	**VT (N)**	**0.64**	**CR**	**50**
5	PPG Solarban 70XL / air / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					AIR	0.018(#2)	CL	A1-D	N
	U-Factor		**0.44**	**SHGC (N)**				**0.26**	**VT (N)**	**0.59**	**CR**	**48**
6	PPG Soalrban 70XL on Starphire / arg / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.018(#2)	CL	A1-D	N
	U-Factor		**0.40**	**SHGC (N)**				**0.26**	**VT (N)**	**0.59**	**CR**	**50**
	Starphire / arg / PPG Solarban 70XL on Starphire (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.018(#3)	CL	A1-D	N
	U-Factor		**0.40**	**SHGC (N)**				**0.37**	**VT (N)**	**0.60**	**CR**	**50**
7	Viracon VE185 / air / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					AIR	0.088(#2)	CL	A1-D	N
	U-Factor		**0.46**	**SHGC (N)**				**0.51**	**VT (N)**	**0.70**	**CR**	**47**
8	Viracon VE185 / arg / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.088(#2)	CL	A1-D	N
	U-Factor		**0.43**	**SHGC (N)**				**0.51**	**VT (N)**	**0.70**	**CR**	**50**

NFRC 100/200/500 Summary Sheet
2200 Glazed Wall System

ID	Pane Thickness 1	Gap Width 1	Pane Thickness 2	Gap Width 2	Pane Thickness 3	Gap Width 3	Pane Thickness 4	Gap Fill	Low-e (Surface#)	Tint	Spacer	Grid Type
	U-Factor			Solar Heat Gain Coefficient (SHGC) Grids (None / <1 / >=1)					Visible Transmittance (VT) Grids (None / <1 / >=1)		Condensation Resistance	
9	Cardinal E272 / arg / Cardinal i81 (6mm/6mm) - 1"											
	0.224	0.500	0.223					ARG90	0.042(#2) / 0.149(#4)	CL	ZF-D	N
	U-Factor		0.35	SHGC (N)				0.35	VT (N)	0.57	CR	49
10	Cardinal E366 / arg / Cardinal i81 (6mm/6mm) - 1"											
	0.225	0.500	0.223					ARG90	0.022(#2) / 0.149(#4)	CL	ZF-D	N
	U-Factor		0.34	SHGC (N)				0.24	VT (N)	0.51	CR	50
11	Cardinal E366 / arg / PPG Sungate 500 (6mm/6mm) - 1"											
	0.225	0.500	0.223					ARG90	0.022(#2) / 0.215(#4)	CL	ZF-D	N
	U-Factor		0.35	SHGC (N)				0.25	VT (N)	0.53	CR	50
12	Cardinal Solarban 60 / arg / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.035(#2)	CL	TS-D	N
	U-Factor		0.39	SHGC (N)				0.36	VT (N)	0.64	CR	52
	Clear / arg / PPG Solarban 60 (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.035(#3)	CL	TS-D	N
	U-Factor		0.39	SHGC (N)				0.43	VT (N)	0.64	CR	52
13	PPG Sungate 500 / arg / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.215(#2)	CL	TS-D	N
	U-Factor		0.44	SHGC (N)				0.58	VT (N)	0.67	CR	51
	Clear / arg / PPG Sungate 500 (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.215(#3)	CL	TS-D	N
	U-Factor		0.44	SHGC (N)				0.62	VT (N)	0.67	CR	51
14	PPG Sungate 400 / arg / Clear (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.115(#2)	CL	TS-D	N
	U-Factor		0.42	SHGC (N)				0.56	VT (N)	0.70	CR	52
	Clear / arg / PPG Sungate 400 (6mm/6mm) - 1"											
	0.223	0.500	0.223					ARG90	0.115(#3)	CL	TS-D	N
	U-Factor		0.42	SHGC (N)				0.60	VT (N)	0.70	CR	52

The Condensation Resistance results obtained from this procedure are for controlled laboratory conditions and do not include the effects of air movement through the specimen, solar radiation, and the thermal bridging that may occur due to the specific design and construction of the fenestration system opening.

Ratings values included in this report are for submittals to an NFRC-licensed IA and are not meant to be used directly for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) by an NFRC accredited Inspection Agency (IA) are to be used for labeling purposes. The ratings values were rounded in accordance to NFRC 601, NFRC Unit and Measurement Policy.

Architectural Testing, Inc. is an NFRC accredited simulation laboratory and all simulations were conducted in full compliance with NFRC approved procedures and specifications. The NFRC procedure requires that the computational results be verified through actual test results.

Detailed drawings, simulation data files, 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 will expire. Results obtained are simulated 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 product simulated. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.:

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Kristen L. Livelsberger
Senior Simulation Technician
Simulator-In-Responsible-Charge

KSL:ksl
72681.02-116-45

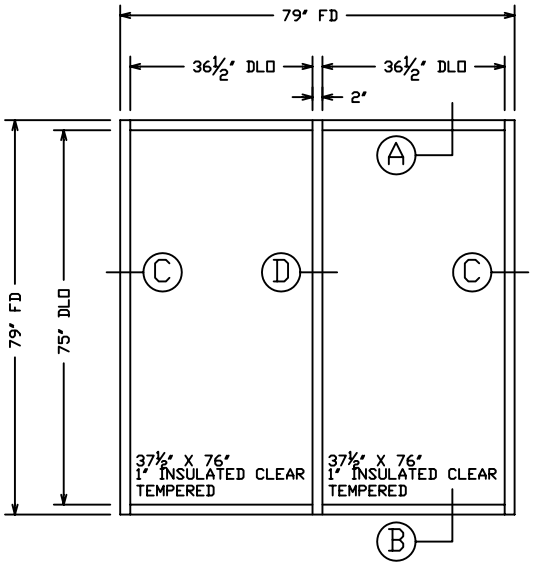
Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Drawings and Bills of Material (1)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
.01R0	6/29/2007	All	Original Issue Report
.01R1	2/8/2008	4	Added Glass Descriptions
.02 R0	2/28/2011	5	Added options #9 - #14 to report

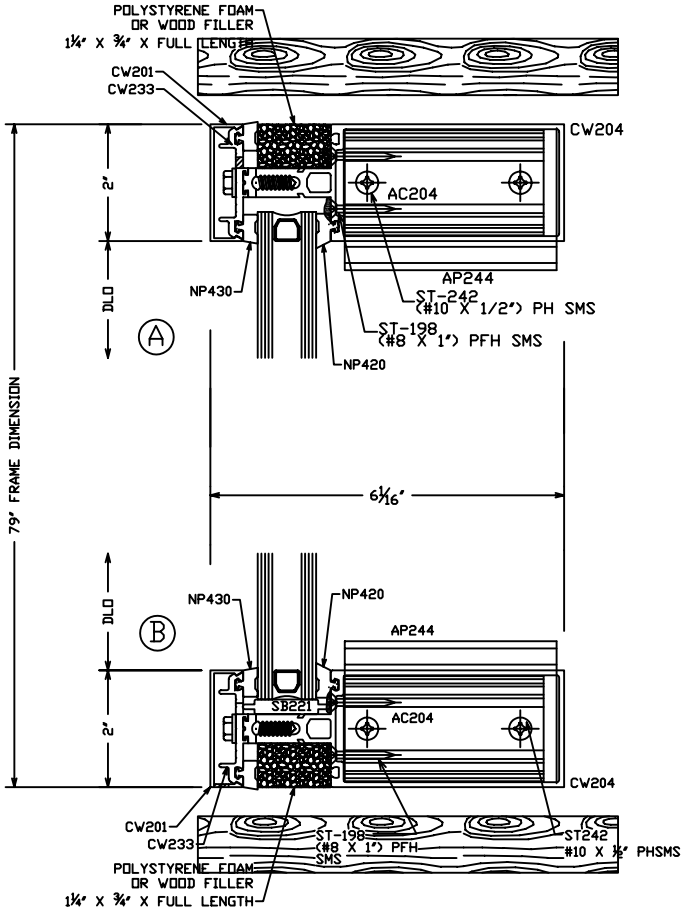
All drawings and Bills of Material used to simulate this product are enclosed in this Appendix

Appendix A

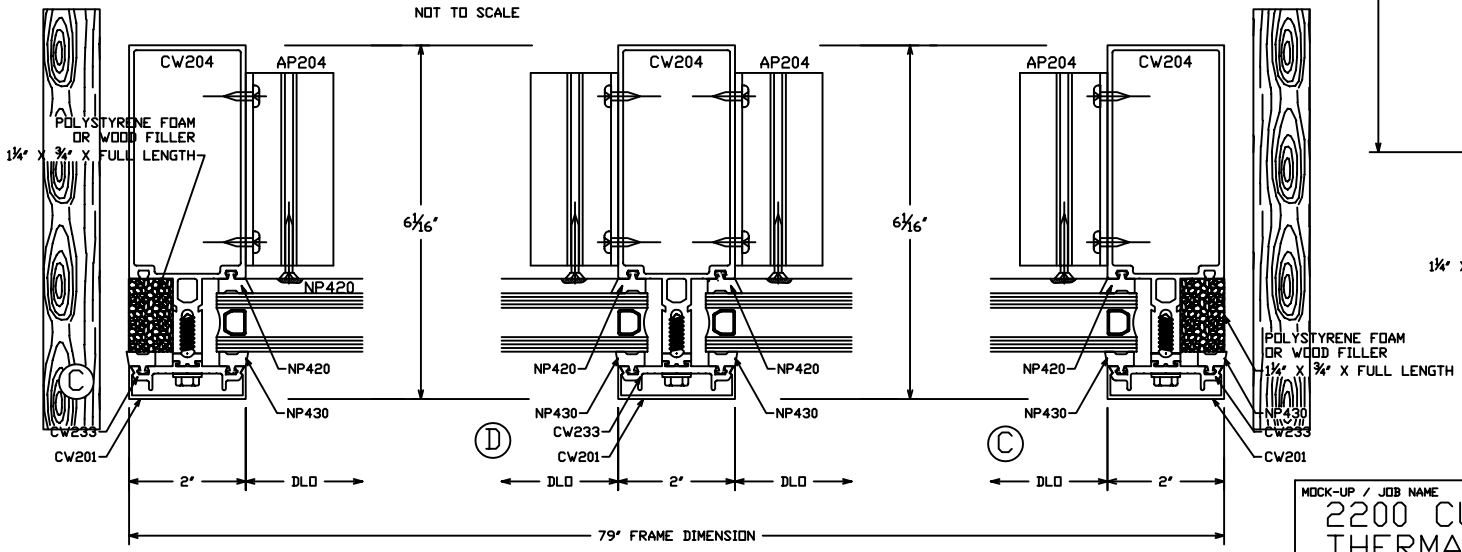


ELEVATION DRAWING

Architectural Testing, Inc.
Report # 72681
Date 7/9/07
Simulator Eric Lutz



NOT TO SCALE



MOCK-UP / JOB NAME
2200 CURTAINWALL
THERMAL TEST

United States ALUMINUM
COMMERCIAL PRODUCTS GROUP

NAME	JSM
DATE	3-13-2007
SCALE	1:1 (ARCH D)

DESCRIPTION
2200 CURTAINWALL
ELEVATION AND DETAILS