

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

**Rendered to:
TUBELITE, INC.**

**SERIES/MODEL:
400 Series CW (E4TB223)**

Report Number: 67784.03-116-45
Report Date: 03/19/10
Expiration Date: 09/18/10

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

Rendered to:
TUBELITE, INC.
4878 Mackinaw Trail
Reed City, Michigan 49677

Report Number: 67784.03-116-45
Simulation Date: 09/18/06
Report Date: 03/19/10
Expiration Date: 09/18/10

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 100-2010: Procedure for Determining Fenestration Product U-Factors
NFRC 200-2010: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
NFRC 500-2010: 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: 12.6

Simulations Specimen Description:

Series/Model: 400 Series CW (E4TB223)
Type: Glazed Wall System , Curtain Wall
Frame Material: AU Thermally Improved
Sash Material: NA Not Applicable
Standard Size: 2000mm x 2000mm

Technical Interpretations:

- 1) TI-2003-12 Curtain Wall Simulation

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	0.014042	0.017464	0.020673
SHGC1	0.916290	0.814392	0.718813
VT0	0.000000	0.000000	0.000000
VT1	0.902248	0.796928	0.698139

$$SHGC = SHGC0 + SHGCc (SHGC1 - SHGC0)$$

$$VT = VT0 + VTc (VT1 - VT0)$$

Validation Matrix:

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

<i>Product Line</i>	<i>Report Number</i>
None	-

Spacer Option Description

<i>Spacer Type</i>	<i>Sealant</i>		
	<i>Primary</i>	<i>Secondary</i>	<i>Desiccant</i>
Aluminum Spacer	Butyl Rubber	Butyl Rubber	Yes

Grid Option Description

<i>Grid Size</i>	<i>Grid Type</i>	<i>Grid Pattern</i>
None	-	-

Reinforcement Option Description

<i>Location</i>	<i>Material</i>
None	-

Gas Filling Technique Description

<i>Fill Type</i>	<i>Method</i>
83% Argon	Single Probe Timed
91% Argon	Two Probe
65% Argon	Single Probe Timed
67% Argon	Single Probe Timed
69% Argon	Single Probe Timed
89.4% Argon	Single Probe Timed

Edge-of-Glass Construction

<i>Interior Condition</i>	<i>Exterior Condition</i>
EPDM Gasket	EPDM Gasket

Weatherstripping

<i>Type</i>	<i>Quantity</i>	<i>Location</i>
None	-	-

Frame/Sash Materials Finish

<i>Interior</i>	<i>Exterior</i>
Painted Aluminum	Painted Aluminum

**NFRC 100/200/500 Summary Sheet
400 Series CW (E4TB223)**

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	COG=0.3800											
	0.225	0.500	0.226					ARG83	0.471(#3)	OT	A1-D	N
	U-Factor 0.51			SHGC (N) 0.36				VT (N) 0.14			CR 48	
2	COG=0.3600											
	0.225	0.500	0.221					ARG91	0.399(#3)	SR	A1-D	N
	U-Factor 0.49			SHGC (N) 0.34				VT (N) 0.07			CR 49	
3	COG=0.3200											
	0.225	0.500	0.223					ARG65	0.215(#3)	CL	A1-D	N
	U-Factor 0.46			SHGC (N) 0.61				VT (N) 0.66			CR 51	
4	COG=0.2800											
	0.225	0.500	0.223					ARG67	0.096(#3)	CL	A1-D	N
	U-Factor 0.43			SHGC (N) 0.53				VT (N) 0.65			CR 52	
5	COG=0.2600											
	0.225	0.500	0.223					ARG69	0.043(#3)	CL	A1-D	N
	U-Factor 0.41			SHGC (N) 0.43				VT (N) 0.62			CR 52	
6	COG=0.2400											
	0.223	0.500	0.223					ARG89.4	0.043(#2) / 0.043(#3)	CL	A1-D	N
	U-Factor 0.39			SHGC (N) 0.34				VT (N) 0.54			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 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.:

SIMULATED BY:

REVIEWED BY:

Jason A. Mitzel
Simulation Technician

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

JAM:jam
67784.03-116-45

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Drawings and Bills of Material (3)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
.03R0	3/19/2010	All	Original Report Issued

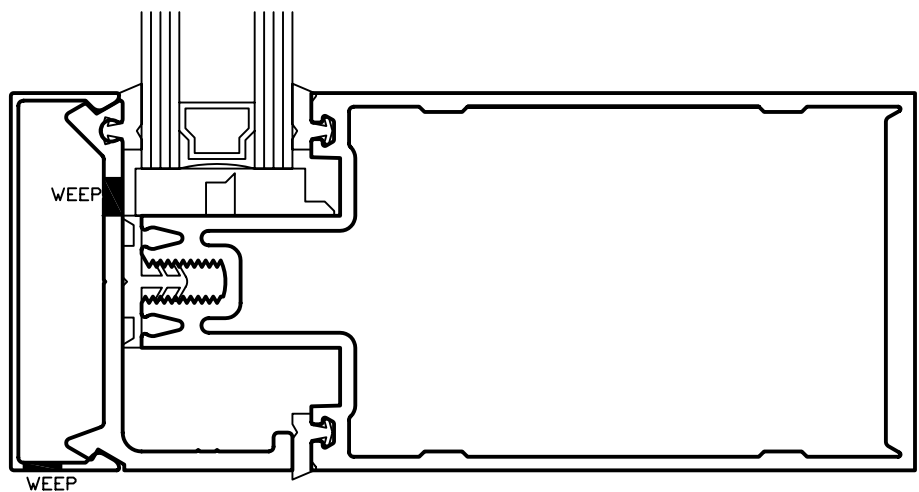
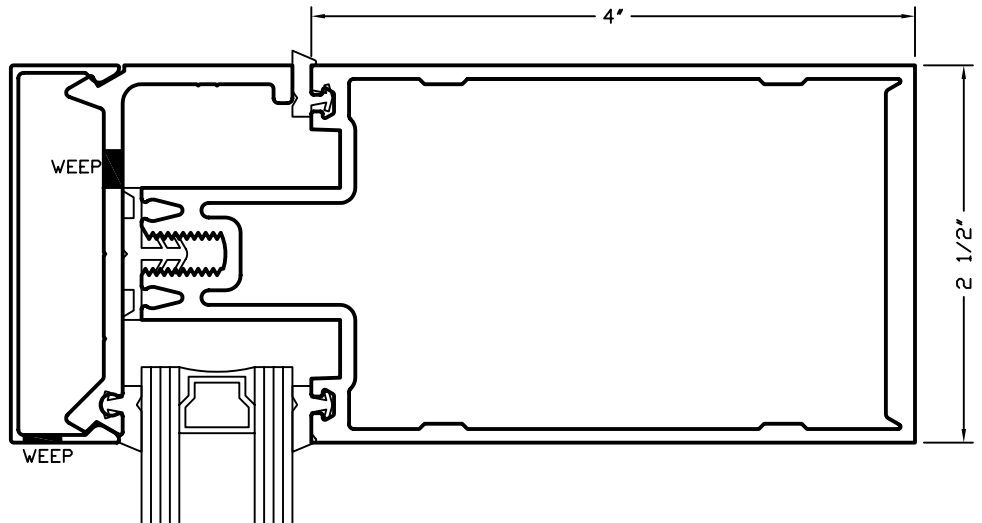


All drawings and Bills of Material used to simulate this product are enclosed in this Appendix

Appendix A

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T931-1



AAMA 503-07 THERMAL SIMULATION

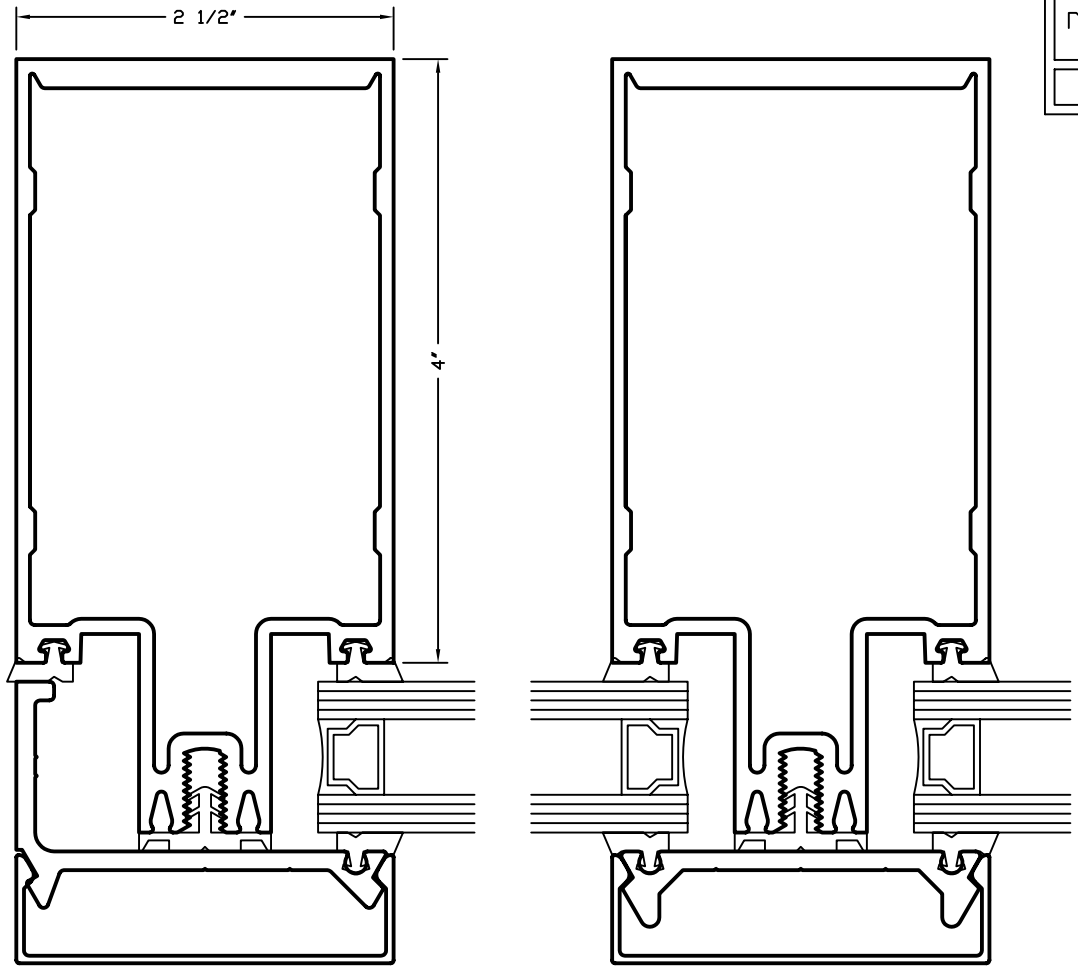
TUBELITE[®]
 STOREFRONT, CURTAINWALL & ENTRANCES
 DEPENDABLE

400 SERIES CW (E4TB223)
 AAMA 507-03 THERMAL SIMULATION
 HEAD / SILL DETAILS

DRAWN BY LDD	DRWG DATE 09/13/06	APPV'D BY	DATE APPV'D	REV
DRWG SCALE 1"=1"	PRODUCT CODE 290	T931-1		

ATI
 Report # 67784
 Date 9/18/06
 Simulator *Ron Lamb*

T931-2



AAMA 503-07 THERMAL SIMULATION

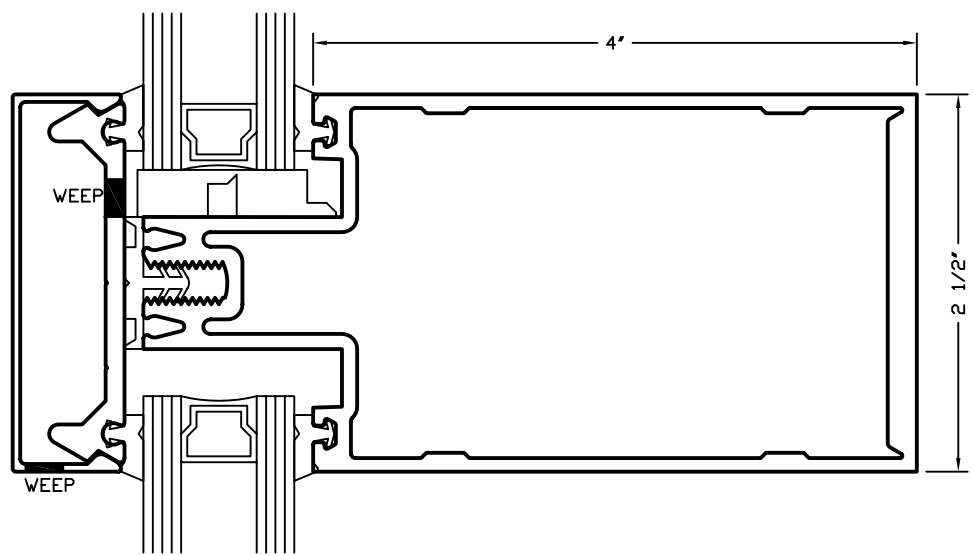
TUBELITE[®]
 STOREFRONT, CURTAINWALL & ENTRANCES
 DEPENDABLE

400 SERIES CW (E4TB223)
 AAMA 507-03 THERMAL SIMULATION
 JAMB/INTERMEDIATE VERTICAL DETAILS

DRAWN BY	LDD	DRWG DATE	09/13/06	APPV'D BY		DATE APPV'D	
DRWG SCALE	1"=1"	PRODUCT CODE	290	T931-2		REV	

ATI
 Report # 67784
 Date 9/18/06
 Simulator *Ron Lamb*

T931-3



AAMA 503-07 THERMAL SIMULATION

TUBELITE[®]
STOREFRONT, CURTAINWALL & ENTRANCES
DEPENDABLE

400 SERIES CW (E4TB223)			
AAMA 507-03 THERMAL SIMULATION			
INTERMEDIATE HORIZONTAL			
DRAWN BY	LDD	DRWG DATE	09/13/06
APPV'D BY		DATE APPV'D	
DRWG SCALE	1"=1"	PRODUCT CODE	290
		T931-3	REV

ATI
Report # 67784
Date 9/18/06
Simulator *Ron Lamb*