

**THERMAL PERFORMANCE
COMPUTER SIMULATION REPORT**

Rendered to:

TUBELITE, INC.

**400 Series CW (E5TB223)
TYPE: Glazed Wall System**

Report No.: 67785.02-116-45
Report Date: 01/09/07
Expiration Date: 01/09/11

**THERMAL PERFORMANCE
COMPUTER SIMULATION REPORT**

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TUBELITE, INC.
4878 Mackinaw Trail
Reed City, Michigan 49677

Report No.: 67785.02-116-45
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Project Summary: Architectural Testing, Inc. (ATI) was contracted to conduct a computer model thermal analysis. ATI utilized the THERM 5.2 and WINDOW 5.2 computer software developed by Lawrence Berkeley Laboratory. Simulations were conducted to determine an estimated condensation resistance factor (CRF).

Note: This report is prepared for research and informational purposes only. This report was completed using computer simulation and may not be considered to be an official CRF test report. An official CRF can only be determined by a physical test in an AAMA accredited test laboratory. The results of computer simulation may vary from the results achieved during an actual test under identical conditions.

Simulation Specimen Description:

Project: 400 Series CW (E5TB223)

Type: Glazed Wall System

Glazing Description: 1" Overall IG Unit consisting of
1/4" PPG Solarban 60 (#2, e=0.043) Outer Layer
1/2" Gap - 98.5% Xenon Filled with aluminum spacer
1/4" PPG Solarban 60 (#3, e=0.043) Inner Layer

Note: This glass composition was used to ensure that the frame CRF would control the overall CRF value and is not a currently approved glass configuration for certification.

Modeling Assumptions:

1. Models were constructed at ideal conditions. Hardware, fasteners, and weep holes were not modeled.
2. All simulations were completed using supplied AutoCAD drawings.
3. The modeling procedure is two-dimensional. It does not take into account three-dimensional heat flow, as might occur at the corners of an assembly.

Modeling Conditions:

Exterior Air Temperature: 0°F
Exterior Wind Velocity: 15 mph (Perpendicular Flow)
Interior Air Temperature: 70°F

References:

THERM 5.2 Program:

This software was developed by the Lawrence Berkeley Laboratory. The program calculates heat loss through frame and edge-of-glass components using finite difference analysis. The program solves for temperature and heat flow distribution throughout the cross section. The temperature distribution can then be used to determine overall heat loss, total and component U-factors, and local temperatures at points of interest.

WINDOW 5.2 Program:

This software was developed by the Lawrence Berkeley Laboratory. The program calculates U-factor and temperatures for the center-of-glazing are using two-dimensional heat flow analysis.

Results:

CRF Calculation: The condensation resistance factor (CRF) of the glazed wall system was determined by analyzing the intermediate horizontal and vertical mullion components contained in the system. Appendix A contains complete calculation data used to determine the estimated CRF. The temperature information used was derived from the computer simulation models.

	CRF
Frame	69
Glass	74
Total Product	69

When reviewing this simulation, it should be noted that the frame temperature (FT) was colder than the glass temperature (GT) therefore controlling the CRF number.

Detailed drawings, simulation data disks, and a copy of this report will be retained by ATI for a period of four years. The above results are the exclusive property of the client so named herein and are applicable to the sample simulated. This report does not constitute an opinion or endorsement by this laboratory. This report may not be reproduced except in full without the approval of ATI.

For ARCHITECTURAL TESTING, INC.:

SIMULATED BY:

REVIEWED BY:

Kevin S. Louder
Project Engineer

Michael J. Thoman
Director - Simulations & Thermal Testing
Simulator-In-Responsible Charge

KSL:ksl
67785.02-116-45

Attachments (pages):

- Appendix A: CRF Calculations (1)
- Appendix B: Project and Cross-sectional Drawings (2)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
.01 R0	1/9/2007	All	Original Report Issue

CRF Calculations

Appendix A

CRF Calculations
400 Series CW (E5TB223)

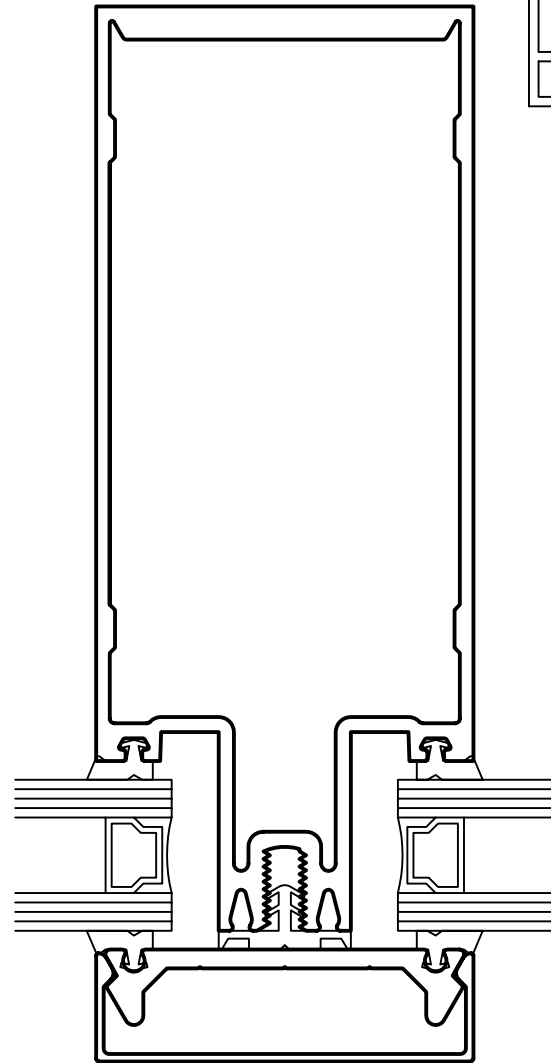
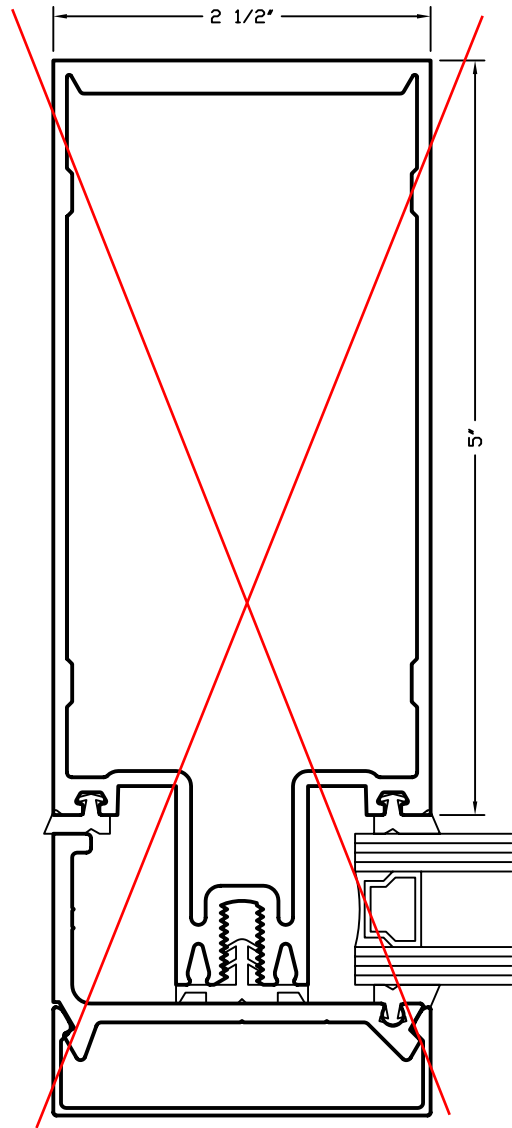
Tc #	Loc	Temp	Tc	Tw
1	Sill	49.1	0	70
2	Sill	49.1		
3	Sill	49.1		
4	Head	49.1		
5	Head	49.1		
6	Head	49.1		
7	Jamb	48.0		
8	Jamb	48.0		
9	Jamb	48.0		
10	Jamb	48.0		
11	Jamb	48.0		
12	Jamb	48.0		
13	Mullion	48.0		
14	Mullion	48.0		
15	Glass-Corner	48.4		
16	Glass-Center	58.4		
17	Glass-Corner	48.3		
18	Glass-Corner	48.4		
19	Glass-Center	58.4		
20	Glass-Corner	48.3		

GT=	51.7	Average Glass Temperature
FTp=	48.5	Average Prespecified Frame Temperature
FTr=	43.1	Average Roving Frame Temperature
W=	0.0558	Weighting Factor
FT=	48.2	Average Weighted Frame Temperature
CRFg=	74	Glass CRF
CRFf=	69	Frame CRF

CRF=	69	Overall CRF
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21	Cold Point	43.1
22	Cold Point	43.1
23	Cold Point	43.1
24	Cold Point	43.1

Project and Cross-sectional Drawings



T932-2

AAMA 503-07 THERMAL SIMULATION

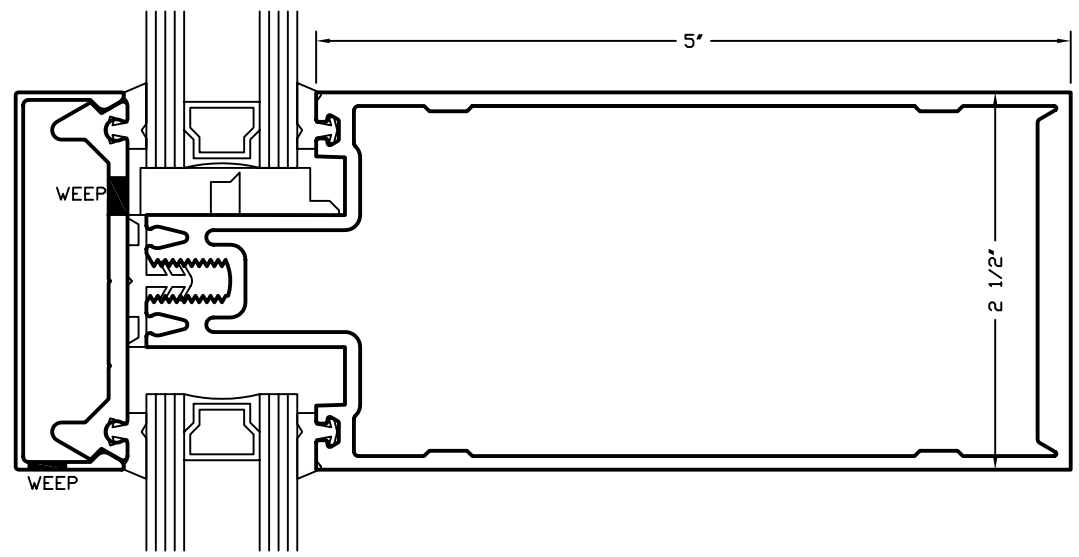
TUBELITE[®]
 STOREFRONT, CURTAINWALL & ENTRANCES
 DEPENDABLE

400 SERIES CW (E5TB223)
 AAMA 507-03 THERMAL SIMULATION
 JAMB/INTERMEDIATE VERTICAL DETAILS

DRAWN BY LDD	DRWG DATE 09/13/06	APPV'D BY	DATE APPV'D	REV
DRWG SCALE 1"=1'	PRODUCT CODE 290	T932-2		

ATI
 Report # 67785
 Date 9/18/06
 Simulator *Ken Lamb*

T932-3



AAMA 503-07 THERMAL SIMULATION

TUBELITE[®]
STOREFRONT, CURTAINWALL & ENTRANCES
DEPENDABLE

400 SERIES CW (E5TB223)
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	T932-3		REV	

ATI
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