Architectural Testing

AAMA 1503-98 THERMAL PERFORMANCE
TEST REPORT

Rendered to:

TUBELITE, INC.

SERIES/MODEL: FW3700 Fixed Window

TYPE: Fixed

Summary of Results	
Thermal Transmittance (U-Factor)	0.56
Condensation Resistance Factor - Frame (CRFf)	51
Condensation Resistance Factor - Glass (CRFg)	57
Glazing Description:	DS Clear Tempered, 0.72" Gap, Aluminum Spacer (A1), Air Filled*, DS Clear Tempered

Reference should be made to ATI Report No. 69821.01-116-46 for complete test specimen description and data.

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
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www.archtest.com

Architectural Testing

AAMA 1503-98 THERMAL PERFORMANCE TEST REPORT

Rendered to:

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

Report No:	69821.01-116-46
Test Date:	12/08/06
Report Date:	01/16/07
Expiration Date:	12/08/10

Test Sample Identification:

Series/Model: FW3700 Fixed Window

Type: Fixed

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	69.76 F
2. Average cold side ambient temperature	-0.39 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)	51
Condensation resistance factor - Glass (CRF_g)	57
2. Thermal transmittance due to conduction (U_c)	0.56
(U-factors expressed in Btu/hr-ft^2-F)	

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Test Sample Description:

CONSTRUCTION	**Frame**
Size(in.) Non-Standard	40" x 72"
Daylight Opening (in.)	37-1/4" x 69-1/4"
CORNERS	Coped
Fasteners	Screws
Sealant	Yes
MATERIAL	AU (0.19")
Color Exterior	Gray
Finish Exterior	Anodized
Color Interior	Gray
Finish Interior	Anodized
GLAZING METHOD	Interior

Glazing Information

Layer 1	DS Clear Tempered
Gap 1	0.72" Gap, Aluminum Spacer (A1), Air Filled*
Layer 2	DS 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		
EPDM wedge gasket	1 row	Interior glazing perimeter
HARDWARE		
No hardware		
DRAINAGE		
No visible weeps		

Test Duration:

1. The environmental systems were started at 17:35 hrs., 12/07/06

2. The thermal performance test results were derived from 05:44 hrs., 12/08/06 to 07:44 hrs., 12/08/06.

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	69.76 F
T_c	=	Cold side ambient air temperature	-0.39 F
FT_p	=	Average of pre-specified frame temperatures (14)	35.80 F
FT_r	=	Average of roving thermocouples (4)	32.13 F
W	=	$(FT_p - FT_r) / [FT_p - (T_c + 10)] \times 0.40$	0.056
FT	=	$FT_p(1-W) + W (FT_r)$ = Frame Temperature	35.60 F
GT	=	Glass Temperature	39.87 F
CRF_g	=	Condensation resistance factor – Glass	57
		$CRF_g = (GT - T_c) / (T_h - T_c) \times 100$	
CRF_f	=	Condensation resistance factor – Frame	51
		$CRF_f = (FT - T_c) / (T_h - T_c) \times 100$	

The CRF number was determined to be 51 (on the size as reported). When reviewing this test data, it should be noted that the frame temperature (FT) was colder than the glass temperature (GT) 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	69.76	F
T_c	=	Average cold side ambient temperature	-0.39	F
P	=	Static pressure difference across test specimen	0.00	psf
		15 mph dynamic perpendicular wind at exterior		
Nominal sample area			20.00	ft^2
Total measured input to calorimeter			883.18	Btu/hr
Calorimeter correction			91.97	Btu/hr
Net specimen heat loss			791.21	Btu/hr
U_c	=	Thermal Transmittance	0.56	Btu/hr-ft^2-F

Glazing Deflection (in.):

	Fixed Glazing*
Actual Gap Width	0.72
Effective gap width upon receipt of specimen in laboratory (after stabilization)	0.47
Effective gap width at laboratory ambient conditions on day of testing	0.47
Effective gap width at test conditions	0.30

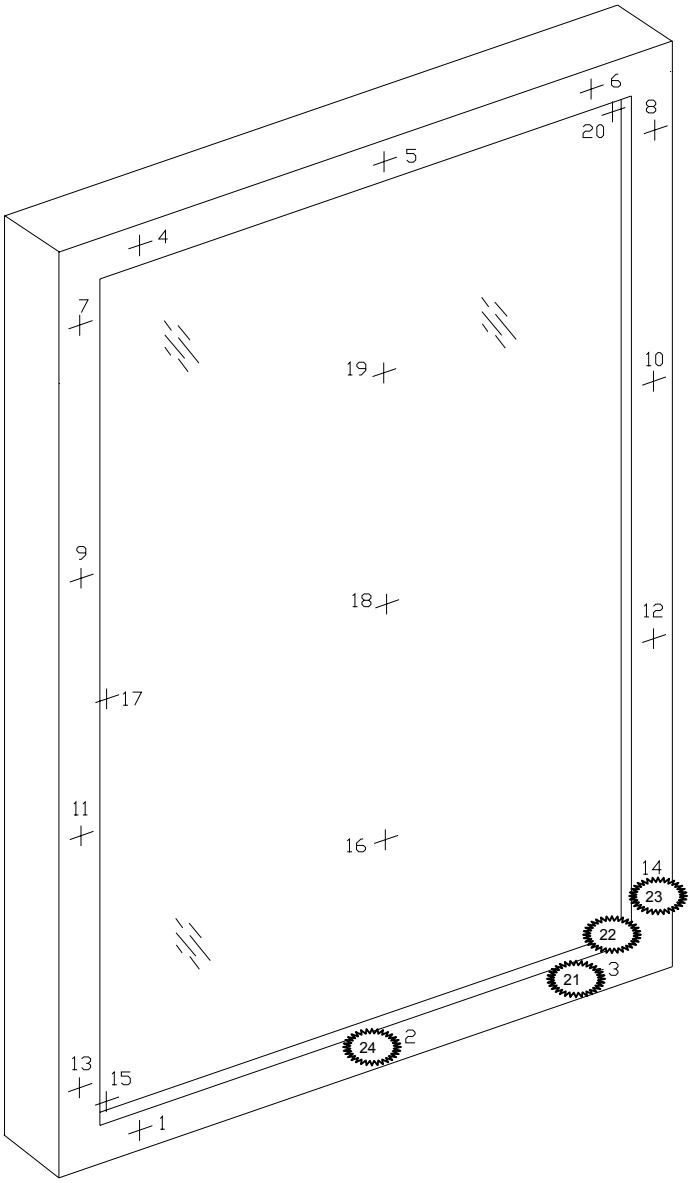
The test sample was inspected for the formation of frost or condensation which may influence the surface temperature measurements. Any observed condensation/frost is indicated on the 'Thermocouple Location Diagram.'

A calibration of the ATI 'thermal test chamber' in York, Pennsylvania was conducted in March 2006.

CRF Report

Time:	05:44	06:14	06:44	07:14	07:44	AVERAGE
Pre-specified Thermocouples - Frame						
1	32.54	32.58	32.63	32.63	32.64	32.60
2	32.45	32.42	32.44	32.52	32.48	32.46
3	31.65	31.66	31.64	31.65	31.68	31.66
4	38.30	38.31	38.34	38.29	38.31	38.31
5	38.55	38.63	38.62	38.61	38.62	38.61
6	38.75	38.70	38.72	38.72	38.71	38.72
7	40.33	40.41	40.42	40.37	40.37	40.38
8	40.33	40.32	40.33	40.33	40.31	40.32
9	36.78	36.81	36.80	36.81	36.79	36.80
10	35.95	35.95	36.02	35.96	35.98	35.97
11	35.59	35.60	35.64	35.62	35.66	35.62
12	34.27	34.30	34.34	34.31	34.31	34.31
13	33.15	33.19	33.21	33.20	33.23	33.20
14	32.27	32.30	32.34	32.35	32.35	32.32
FTP	35.78	35.80	35.82	35.81	35.82	35.80
Pre-specified Thermocouples - Glass						
15	28.67	28.70	28.72	28.72	28.73	28.71
16	44.20	44.24	44.14	44.16	44.21	44.19
17	37.84	37.89	37.93	37.89	37.92	37.89
18	42.02	42.05	42.01	42.04	42.06	42.04
19	44.40	44.38	44.38	44.38	44.35	44.38
20	42.15	42.00	41.93	42.08	41.94	42.02
GT	39.88	39.88	39.85	39.88	39.87	39.87
Cold Point (Roving) Thermocouples						
21	31.70	31.70	31.70	31.70	31.70	31.70
22	32.00	32.00	32.00	32.00	32.00	32.00
23	32.30	32.30	32.30	32.30	32.30	32.30
24	32.50	32.50	32.50	32.50	32.50	32.50
FT_R	32.13	32.13	32.13	32.13	32.13	32.13
W	0.06	0.06	0.06	0.06	0.06	0.056
FT	35.57	35.59	35.61	35.60	35.61	35.60
Warm Side - Room Ambient Air Temperature						
	69.74	69.79	69.80	69.78	69.80	69.78
Cold Side - Room Ambient Air Temperature						
	-0.42	-0.40	-0.37	-0.40	-0.38	-0.39
CRF_f	51.30	51.27	51.28	51.30	51.28	51
CRF_g	57.44	57.38	57.32	57.39	57.35	57

Thermocouple Location Diagram



Cold Point Locations

21. 31.70
22. 32.00
23. 32.30
24. 32.50

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.

Ryan P. Moser Technician	Michael J. Thoman Director - Simulations and Thermal Individual-In-Responsible-Charge

RPM:kmm
69821.01-116-46

Attachments:
Table, Drawings, (5)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
.02R0	01/16/07	All	Original Report Issue. Work requested by Les Olds of Tubelite, Inc..

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 ($\geq$ 0.21")
AU	Aluminum Thermally Improved - All Members (0.062" - 0.209")
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	Copper Clad Wood
CO	Vinyl/Wood Composite Material

DOOR DETAILS	
N	**Not Applicable**
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
VY	Vinyl
CODE	**Panel**
FG	Fiberglass
PL	Plastic
WP	Wood - Plywood
WS	Wood - Solid
CODE	**Sub-Structure**
GS	Galvanized Steel
ST	Steel
WD	Wood
VY	Vinyl
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
LE	Low 'e' Coating
OT	Other (use comment field)
RC	Solar or Reflective Coating
RG	Roller Shades between glazing
RS	Silver (reflective coating)
SF	Suspended Polyester Film
SR	Silver
BG	Blinds between the Glazing
DV	Dynamic Glazing-Variable
DY	Dynamic Glazing-NonVariable

CODE	Spacer Types (See sealant)
A1	Aluminum
A2	Aluminum (Thermally-broken)
A3	Aluminum-reinforced Polymer
A4	Aluminum / Wood
A5	Aluminum-reinforced Butyl (Swiggle)
A6	Aluminum / Foam / Aluminum
A7	Aluminum U-shaped
A8	Aluminum-Butyl (Corrugated) (Duraseal)
ER	EPDM Reinforced Butyl
FG	Fiberglass
GL	Glass
OF	Organic Foam
PU	Polyurethane Foam
SU	Stainless Steel, U-shaped
CU	Coated Steel, U-shaped (Intercept)
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
WD	Wood
ZF	Silicone Foam
ZS	Silicone / Steel
N	Not Applicable
TS	Thermo-plastic w/ stainless steel substrate

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

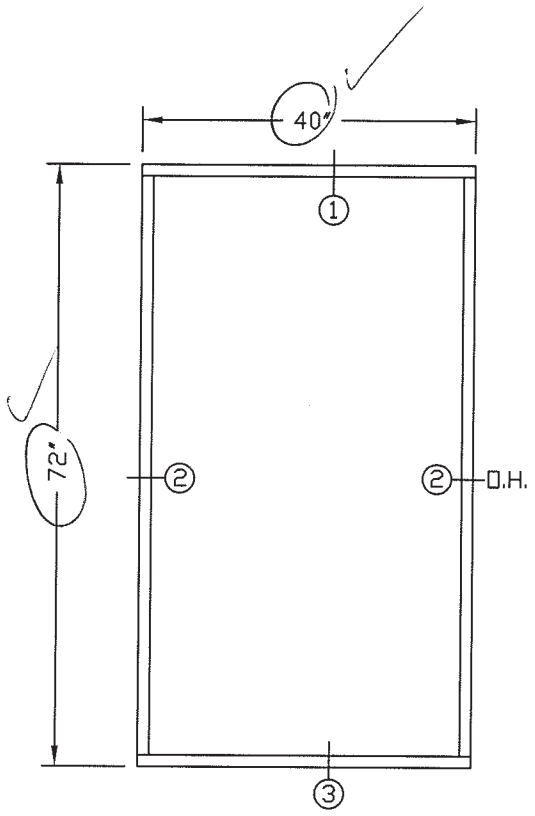
CODE	Grid Description
N	No Muntins
G	Grids between glass
S	Simulated Divided Lites
T	True Muntins

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

CODE	Gap Fill Codes
AIR	Air
AR2	Argon/Krypton Mixture
AR3	Argon / Krypton / Air
ARG	Argon/Air
CO2	Carbon Dioxide
KRY	Krypton/Air
SF6	Sulfur Hexaflouride
XE2	Xenon/Krypton/Air
XE3	Xenon/Argon/Air
XEN	Xenon/Air
N	Not Applicable

CODE	Thermal Breaks
F	Foam
U	Urethane
V	Vinyl
FB	Fiberglass
O	Other
AB	ABS
NE	Neoprene
AI	Air
N	Not Applicable
P	Polyamide

T929



THERMAL PERFORMANCE TEST ELEVATION
FW3700 FIXED VENT WINDOW

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# 69821

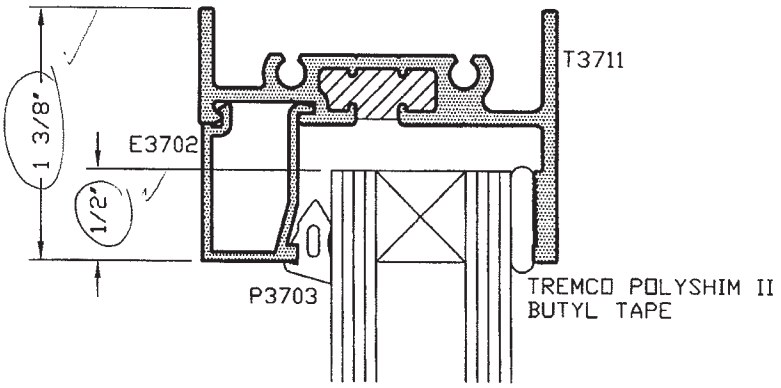
Date 1/15/07 Tech RPM

HW3700 THERMAL PERFORMANCE PER AAMA 1503

FW3700 FIXED VENT WINDOW
THERMAL PERFORMANCE TEST
ELEVATION

DRAWN BY	LDO	DRWG DATE	09/26/06	APPV'D BY		DATE APPV'D	
DRWG SCALE	1/2"=1"	PRODUCT CODE	120	T929			REV

T929-1



Architectural Testing

Test sample complies with these details.
Deviations are noted.

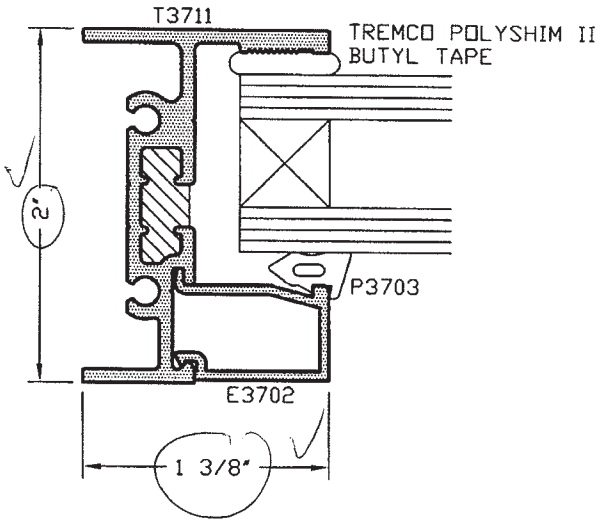
Report# 69821

Date 1/15/07 Tech RPM

FW3700 FIXED VENT WINDOW
THERMAL PERFORMANCE TEST
HEAD DETAIL

DRAWN BY	DRWG DATE	APPV'D BY	DATE APPV'D	
LDO	09/08/06			
DRWG SCALE 1"=1"	PRODUCT CODE 120	T929-1		REV

T929-2



Architectural Testing

Test sample complies with these details.
Deviations are noted.

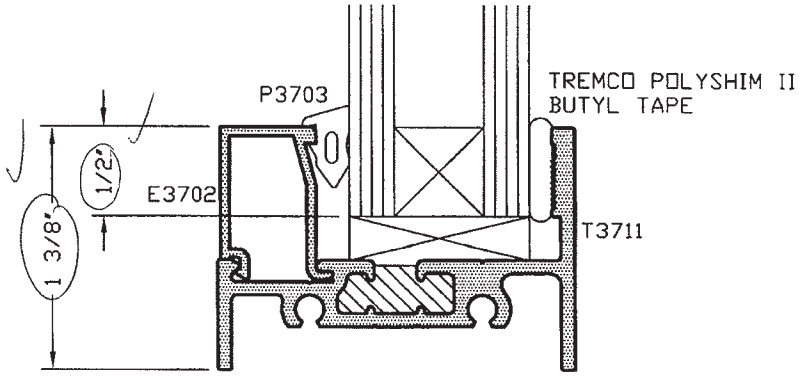
Report# 69821

Date 1/16/07 Tech RPM

FW3700 FIXED VENT WINDOW
THERMAL PERFORMANCE TEST
JAMB DETAIL

DRAWN BY LDD	DRWG DATE 09/07/06	APPV'D BY	DATE APPV'D
DRWG SCALE 1"=1"	PRODUCT CODE 120	T929-2	REV

T929-3



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report# 69821

Date 1/15/07 Tech EPM

	FW3700 FIXED VENT WINDOW THERMAL PERFORMANCE TEST SILL DETAIL		
DRAWN BY LDO	DRWG DATE 09/08/06	APPV,D BY	DATE APPV'D
DRWG SCALE 1"=1"	PRODUCT CODE 120	T929-3	REV