

NFRC 102-2017 THERMAL PERFORMANCE TEST REPORT

Series/Model: Zero Sightline Vent Type: Projected (Awning)

> <u>Rendered To:</u> FreMarq Innovations, Inc. 8300 Highland Drive Wausau, WI 54401

> > QCT Project No.: QCT-TH-11298.02

> > > Report Date: 4/12/2019



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NFRC 102-2017 THERMAL PERFORMANCE TEST REPORT

Rendered To: FreMarq Innovations, Inc. 8300 Highland Drive Wausau, WI 54401

Test Sample Identification:

Series/Model:	Zero Sightline Vent

Product Type:	Projected (Awning)
Thermal Break:	Thermally broken
Thermal Break Material:	Fiberglass
Overall Size:	1535mm x 955mm (60-1/2" x 37-1/2")
NFRC Standard Size:	1500mm x 600mm (59" x 24")
Test Sample Submitted by:	FreMarq Innovations, Inc.
Test Sample Submitted for:	Validation for Initial Certification (prototype only) no plant qualification

Test Procedure:

U-factor tests were performed in a Guarded Hot Box in accordance with NFRC 102-2017, *Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems*.

Test Results Summary:

 $\label{eq:standardized U-factor (U_{st}): 0.33 \qquad Btu/(hr\cdot ft^2 \cdot F) \qquad CTS \ Method$



Test Sample Description:

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Size Specification:	Frame	Exterior Sash	Interior Sash
Size (inches)	60-1/2" x 37-1/2"	60-1/2" x 37-1/2"	N.A.
Daylight Opening (inches)	N.A.	55-1/2" x 31-1/2"	N.A.

Construction:	Frame	Exterior Sash	Interior Sash
Corners	Mitered	Mitered	N.A.
Fasteners	Keyed	Keyed	N.A.
Sealant	Yes	Yes	N.A.

Properties:	Frame	Exterior Sash	Interior Sash
Material	Aluminum	Aluminum	N.A.
Exterior Color	Blue	Blue	N.A.
Exterior Finish	Paint	Paint	N.A.
Interior Color	Blue	Blue	N.A.
Interior Finish	Paint	Paint	N.A.

Spacer:

Code	Spacer Type	Primary Sealant	Secondary Sealant	Desiccant
A1-D	Aluminum	PIB	Silicone	Yes

Reinforcement Description:

Location	Material
None	N.A.

Grid:

Size	Туре	Pattern
None	N.A.	N.A.

	Frame	Exterior Sash	Interior Sash
Glazing Method:	N.A.	Exterior	N.A.

Glazing Information:

Layer 1	LowE 366 (#2) - 0.225"
Gap 1	Argon 90% - 0.5"
Layer 2	Clear - 0.375"
Gap 2	N.A.
Layer 3	N.A.
Gas Fill Method	N.A.*

*Stated per Client/Manufacturer

Not Applicable (N.A.)



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Weatherstrip:

Туре	Quantity	Location
Gasket	1 Row	Sash perimeter
Gasket	2 Row	Frame perimeter
Fin	3 Row	Sash perimeter

Hardware:

Туре	Quantity	Location
Multipoint lock	1	Sill
4-bar hinges	2	Jambs
Snubbers	2	Head

Drainage:

Туре	Quantity	Location
None	N.A.	N.A.

Insulation:

Туре	Location
None	N.A.



0.33

 $Btu/(hr \cdot ft^2 \cdot F)$

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Measured Test Data:		
Heat Flows	Quantity	Units
1. Total Measured Metering Box Input (Qtotal)	498.86	Btu/hr
2. Surround Panel Thickness	5	inches
3. Surround Panel Conductivity (Csp)	0.0376	Btu/(hr·ft ² ·F)
4. Surround Panel Heat Flow (Qsp)	122.38	Btu/hr
5. Metering Box Wall Plus Flanking Loss (Qmb+fl)	0.02	Btu/hr
6. EMF vs. Heat Flow Equation (Equivalent Information)	6827.4	(EMF)+42.031
7. Test Specimen Heat Flow (Qs)	376.47	Btu/hr
Areas	Quantity	Units
8 Specimen Projected Area (A _s)	15.76	ft^2
9. Specimen Interior Total (3-D) Surface Area (A _h)	20.56	ft^2
10. Specimen Exterior Total (3-D) Surface Area (A _c)	15.88	ft^2
11. Metering Box Opening Area (A _{mb})	64.00	ft^2
12. Metering Box Baffle Area Warm Side (A _{b1})	58.50	ft^2
13. Climate Room Baffle Area Cold Side (A _{b2})	80.00	ft^2
14. Surround Panel Interior Exposed Area (A_{sp})	48.24	ft^2
Test Conditions	Quantity	Units
15. Metering Room Air Temperature (t _h)	69.80	deg F
16. Climate Room Air Temperature (tc)	-0.40	deg F
17. Guard Room Air Temperature (tg)	75.99	deg F
18. Metering Room Average Relative Humidity	12.84	%
18-5. Metering Room Maximum Relative Humidity	13.22	%
18-6. Metering Room Minimum Relative Humidity	12.65	%
19. Climate Room Wind Speed (Perpendicular Flow)	15.46	mph
20. Total Pressure Differential Across Test Specimen	0.00	psf
23. Surround Panel Warm Side Surface Temperature (t_{sp1})	68.02	deg F
24. Surround Panel Cold Side Surface Temperature (t_{sp2})	0.56	deg F
Thermal Transmittance	Quantity	Units
25. Specimen Thermal Transmittance (U _S)	0.34	Btu/(hr·ft ² ·F)

26. Standardized Thermal Transmittance $(U_{ST}(CTS))$



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Calculated Test Data:

CTS Method	Quantity	Units
27. Test Specimen Room Side Surface Emittance (\mathcal{E}_1)	0.84	N.A.
28. Metering Box Baffle Emittance (\mathcal{E}_{b1})	0.95	N.A.
29. Equivalent Room Side Surface Temperature (t ₁)	52.63	deg F
30. Equivalent Climate Side Surface Temperature (t ₂)	4.15	deg F
31. Room Side Baffle Temperature (t_{b1})	68.95	deg F
32. Climate Side Baffle Temperature (t_{b2})	0.40	deg F
33. Room Side Surface Heat Transfer Coefficient (h _h)	1.39	$Btu/(hr \cdot ft^2 \cdot F)$
34. Climate Side Surface Heat Transfer Coefficient (h _c)	5.26	$Btu/(hr \cdot ft^2 \cdot F)$
35. Test Specimen Conductance (C _s)	0.4928	Btu/(hr·ft ² ·F)
36. Convection Coefficient (K _c)	0.32	$Btu/(hr \cdot ft^2 \cdot F)$
37. Room Side Radiative Heat Flow (Q_{rl})	200.16	Btu/hr
38. Room Side Convective Heat Flow (Q _{c1})	176.30	Btu/hr
39. Room Side Radiative Heat Flux (q_{r1})	12.70	$Btu/(hr \cdot ft^2)$
40. Room Side Convective Heat Flux (q _{c1})	11.19	$Btu/(hr \cdot ft^2)$
41. Standardized Warm Side Surface Conductance (h _{STh})	1.27	Btu/(hr·ft ² ·F)
42. Standardized Cold Side Surface Conductance (h _{STc})	5.28	Btu/(hr·ft ² ·F)

Test Duration

1. The environmental systems were started on

4/8/19 4:49 PM

2. The test parameters were considered stable for two consecutive four hour test periods from

4/9/19 11:04 PM	to	4/10/19 7:04 AM
1/ // 1/ 11:01 11:01	10	1/10/19 /.01/1101

3. The thermal performance test	t results were	derived from
4/10/19 3:04 AM	to	4/10/19 7:04 AM

Glazing Deflection (inches)*:

D.L.O. 1	D.L.O. 2	
1.086		Overall IG thickness at edge
0.974		Overall IG thickness of center upon receipt of specimen (after stabilization)
0.627		Gap thickness upon receipt of specimen in laboratory (after stabilization)
0.974		Overall IG thickness of center at laboratory ambient conditions before testing
0.894		Overall IG thickness of center at test conditions

*Deflection determined using glass and gap meter



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References:

The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed no evidence of condensation at the conclusion of the test.

A full calibration of the Quast Consulting and Testing, Inc. 'thermal test chamber' in Mosinee, Wisconsin was conducted in 10/31/2018 in accordance with Quast Consulting and Testing, Inc. calibration procedure. A calibration check was performed in 09/16/2018.

"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 consequence, the thermal transmittance results obtained do not reflect performances which are expected from field installations due to not accounting for solar radiation, air leakage effects, and the thermal bridge effects that have the potential to occur due to the specific design and construction of the fenestration system opening. The latter can only be determined by in-situ measurements. Therefore, it is important to recognize 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."

The test sample was installed in a vertical orientation, the exterior of the specimen was exposed to the cold side. The direction of heat transfer was from the interior (warm side) to the exterior (cold side) of the specimen.

"Rating included in this report are for submittal to an NFRC licensed Inspection Agency (IA) 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." The rating values were rounded in accordance to the NFRC unit conversions and rounding policy document (NFRC 601-2010).

Quast Consulting and Testing, Inc. is a NFRC accredited testing laboratory and all tests conducted in full compliance with NFRC approved procedures.

The Standardized Thermal Transmittance (Ust) was determined using CTS Method per NFRC 102, Section 8.2.A.

The experimental uncertainty associated for this test was 3.5%.



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Detailed drawings, data files, a copy of this report and other pertinent project documentation will be retained by Quast Consulting and Testing, Inc. for a period of five 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 were secured by using the designated testing methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. This report is the exclusive property of the client so named herein and represents only the product tested. This report may not be reproduced, except in full, without the written consent of Quast Consulting and Testing, Inc.

This report is not complete without all attachments; see Appendix. Appendix A: Drawings (11 pages).

Individual-In-Responsible-Charge Jeff Zibton



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Revision No.

Date

.02

Description04/12/19Original report issued.



Appendix A: Drawings



D01















SCALE = 2X



REV. NO.	DATE	DESCRIPTION	MATERIAL: ALU	IM ALLOY 6063-T6	FreMarq Innovations	TITLE: SASH	I COVER
Λ	9/12/18	DECREASED OVERALL HEIGHT	TOLERANCE: INDUSTRY STANDARD		8300 Highland Drive	DRAWN BY: TAF	
\triangle	10/16/18	CORRECTED ALUM. DIE #, PRP-1010 WAS PRP-1009	Perimeter = 3.541" RADIUS: .015" UNO		wausau, wi 54401	DATE: 7-12-	-18
\bigtriangleup			AREA= 0.084	WEIGHT= 0.100 lb/ft		PART NO.	9020







CUSTOMER APPROVAL:

DATE:





Drawings represent specimen as tested QCT-TH-11298 QCT-TH-11298 02/27/2019 Consulting 02/27/2019

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