



Report No.: QCT-TH-10591.01-CRF

Test Date: 1/16/2016

Report Date: 1/18/16

Expiration Date: 1/18/21

AAMA 1503-09 THERMAL PERFORMANCE TEST REPORT

Rendered To:

FreMarq Innovations

8300 Highland Drive

Wausau, WI 54401

Series/Model: Aluminum Curtainwall

QUAST CONSULTING AND TESTING, INC.

Exterior Façade/Fenestration Consulting Testing

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FreMarq Innovations
8300 Highland Drive
Wausau, WI 54401

Test Sample Identification:

Series/Model: Aluminum Curtainwall
Product Type: Glazed Wall System (Curtain Wall)
Thermal Break: Fiberglass
Overall Size: 2000mm x 2000mm (79" x 79")

Test Sample Submitted by: FreMarq Innovations

Test Procedure:

The condensation resistance factor (CRF) and thermal transmittance (U) were determined in accordance with AAMA 1503-09, *Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections*.

Test Results Summary:

	Quantity	Unit
Thermal Trasmittance Due to Conducton (U_c):	0.32	Btu/(hr·ft ² ·F)
Condensation Resistance Factor - Frame (CRF _f):	82	
Condensation Resistance Factor - Glass (CRF _g):	72	
Overall CRF Number	72	



Test Sample Description:

Size Specification:	Frame	Exterior Sash	Interior Sash
Size (inches) Non-Standard	79" x 79"	N.A.	N.A.
Daylight Opening (inches)	35-3/4" x 75" (2)	N.A.	N.A.

Construction:	Frame	Exterior Sash	Interior Sash
Corners	Square Cut	N.A.	N.A.
Fasteners	Screws	N.A.	N.A.
Sealant	N.A.	N.A.	N.A.

Finish:	Frame	Exterior Sash	Interior Sash
Material	Aluminum	N.A.	N.A.
Exterior Color	Silver	N.A.	N.A.
Exterior Finish	Anodized	N.A.	N.A.
Interior Color	Black	N.A.	N.A.
Interior Finish	Anodized	N.A.	N.A.

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

Screen:	Frame	Exterior Sash	Interior Sash
None	N.A.	N.A.	N.A.

Glazing Information:	
Layer 1	6mm VE2-42 Clear (e= 0.04)
Gap 1	1/2" Argon 90%
Layer 2	6mm Clear
Gap 2	N.A.
Layer 3	N.A.
Gas Fill Method	Single-Probe*
Desiccant	Yes

*Stated per Client/Manufacturer

Not Applicable (N.A.)



Test Data	Quantity	Units
Warm Side Ambient Air Temperature (T_h)	69.80	deg F
Cold Side Ambient Air Temperature (T_c)	-0.40	deg F
Average of 14 Pre-Specified Frame Temperatures (FT_p)	57.38	deg F
Average of 4 Coldest Thermocouples (FT_c)	51.23	deg F
$[(FT_p - FT_r) / (FT_p - (T_c + 10))] \times 0.40 = \text{Weighting Factor} = W$	0.090744	N.A.
$FT_p(1-W) + W(FT_r) = \text{Frame Temperature (FT)}$	56.82	deg F
Average Glass Temperature (GT)	50.06	deg F
Condensation Resistance Factor - Glass $CRF_g = (GT - T_c) / (T_h - T_c) \times 100$	72	
Condensation Resistance Factor - Frame $CRF_f = (FT - T_c) / (T_h - T_c) \times 100$	82	

Test Duration

- The environmental systems were started on:
1/15/2016 16:56
- The test parameters were considered stable for two consecutive four hour test periods from:
1/16/2016 3:11 to 1/16/2016 11:11
- The thermal performance test results were derived from:
1/16/2016 7:11 to 1/16/2016 11:11

Glazing Deflection (inches)*:

Left Glazing	Right Glazing	
0.94	0.93	Edge gap width
0.94	0.91	Center gap width upon receipt of specimen (after stabilization)
0.94	0.91	Center gap width at laboratory ambient conditions before testing
0.94	0.91	Center gap width at test conditions

*Deflection determined using a digital glass and air space meter in accordance with AAMA 1503-09, Section 9.3.5.



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CRF Measured Data

Pre-Specified Thermocouples - Frame

1	52.1
2	54.1
3	53.4
4	61.3
5	61.5
6	61.3
7	60.1
8	60.1
9	60.3
10	57.2
11	57.2
12	53.2
13	61.6
14	57.9
FT _p	57.4

Pre-Specified Thermocouples - Glass

15	38.2
16	56.2
17	48.7
18	49.0
19	58.5
20	49.8
GT	50.1

Cold Point Thermocouples

	FTr 3; 49.65
	FTr 5; 51.06
	FTr 8; 51.32
	FT _p 11; 51.938
FT _c	51.2
W	0.090744
FT	56.8



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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 10/28/2015 in accordance with Quast Consulting and Testing, Inc. calibration procedure. A calibration check was performed in 07/26/2015.

Prior to testing, the specimen was sealed with silicone on the interior side and checked for air infiltration per AAMA 1503-09, Section 9.3.4.

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.

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



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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 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 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: Thermocouple Locations (1)
Appendix B: Drawings (9).

A handwritten signature in black ink, appearing to read 'Andrew Tange', written over a light gray rectangular background.

Technician
Andrew Tange, Test Engineer

A handwritten signature in black ink, appearing to read 'Brian M. Jaraman', written over a light gray rectangular background.

Individual-In-Responsible-Charge



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Revision No.	Date	Description
.01	1/18/16	Original report issued.



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Appendix A: Thermocouple Locaton Diagram

