AAMA/WDMA/CSA 101/I.S.2/A440
Performance Test Report

Rendered To:
Ram Windows and Doors

Report No.:
QCT23-7079.03-R2

Series/Product(s):
3100 Inswing Standard SHD
Side-Hinged Door

Test Date(s):
September 27, 2023 through February 20, 2024

Revised Report Date:
July 11, 2024

QUAST CONSULTING AND TESTING, INC.
Exterior Façade/Fenestration Consulting Testing
1055 Indianhead Drive • Mosinee, WI 54455-0241 • Phone: 715-693-TEST (8378) • Fax: 715-693-0689
www.qct-usa.com

MANUFACTURER: Ram Windows and Doors
5615 W Fuqua St
Houston, TX 77085

SERIES/MODEL: 3100 Inswing Standard SHD
PRODUCT TYPE: Side-Hinged Door

Summary of Results	
Test Procedure/Standard	**Details**
AAMA/WDMA/CSA 101/I.S.2/A440-22	Class LC - PG45: Size Tested 2134 x 2438 mm (~84 x 96 in) - Type SHD
AAMA/WDMA/CSA 101/I.S.2/A440-17	Class LC - PG45: Size Tested 2134 x 2438 mm (~84 x 96 in) - Type SHD
CSA A440S1-19	Class LC - PG45: Size Tested 2134 x 2438 mm (~84 x 96 in) - Type SHD
CSA A440S1-17	Class LC - PG45: Size Tested 2134 x 2438 mm (~84 x 96 in) - Type SHD
Force to Latch/Engage (NAFS 6.4.5.1-2)	See Results, PASS
Air Infiltration Resistance (ASTM E283-04)	0.9 L/s/m² (0.18 cfm/ft²) @ 75 Pa (1.57 psf), PASS
Air Exfiltration Resistance (ASTM E283-04)	1.0 L/s/m² (0.20 cfm/ft²) @ 75 Pa (1.57 psf), PASS
Canadian Air Infiltration/Exfiltration (ASTM E283-04)	1.0 L/s/m² (0.19 cfm/ft²) Average @ 75 Pa (1.57 psf), Level A2
Cyclic Water Penetration Resistance (ASTM E547-00)	No Penetration @ 360 Pa (7.52 psf), PASS
Uniform Load Deflection (ASTM E330-14)	+2160 Pa (45.1 psf) / -2160 Pa (45.1 psf), PASS
Uniform Load Structural (ASTM E330-14)	+3240 Pa (67.6 psf) / -3240 Pa (67.6 psf), PASS
Forced Entry Resistance (AAMA 1304-18)	See Results, PASS
Vertical Load Resistance (AAMA 925-13)	See Results, PASS
Operation/Slam Testing (AAMA 920-16)	See Results, PASS

Reference Report No. QCT23-7079.03-R2 for complete specimen description and test results.

Project Summary:

Quast Consulting and Testing, Inc. was contracted by Ram Windows and Doors to perform testing per AAMA/WDMA/CSA 101/I.S.2/A440 on a 3100 Inswing Standard SHD. The specimen was supplied by Ram Windows and Doors. Testing was conducted at Quast Consulting and Testing Located in Mosinee, WI. Specimen description and test results are reported herein.

Procedure:

Testing and reporting were conducted in accordance with the following standards/specifications:

AAMA/WDMA/CSA 101/I.S.2/A440	*North American Fenestration Standard/Specification for Windows, Doors and Skylights*
CSA A440S1	*Canadian Supplement to North American Fenestration Standard/Specification for Windows, Doors and Skylights*
ASTM E283-04 (2012)	*Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*
ASTM E330-14 (2021)	*Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*
ASTM E547-00 (2016)	*Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference*
ASTM E2068-00 (2016)	*Test Method for Determination of Operating Force of Sliding Windows and Doors*
AAMA 920-16	*Specification for Operating Cycle Performance of Side-Hinged Exterior Door Systems*
AAMA 925-17	*Specification for Determining Vertical Load Resistance of Side-Hinged Door Leaves*
AAMA 1304-18	*Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems*

Side-Hinged Door Primary Designators:

AAMA/WDMA/CSA 101/I.S.2/A440-22	Class LC - PG45: Size Tested 2134 x 2438 mm (~84 x 96 in) - Type SHD
AAMA/WDMA/CSA 101/I.S.2/A440-17	Class LC - PG45: Size Tested 2134 x 2438 mm (~84 x 96 in) - Type SHD
CSA A440S1-19	Class LC - PG45: Size Tested 2134 x 2438 mm (~84 x 96 in) - Type SHD
CSA A440S1-17	Class LC - PG45: Size Tested 2134 x 2438 mm (~84 x 96 in) - Type SHD

Side-Hinged Door Secondary Designators:

Water Penetration Resistance Pressure:	360 Pa (7.52 psf)

Test Specimen Description:

Frame Size:	2134 mm (84.00 in) wide x 2438 mm (96.00 in) high
Panel Size:	1053 mm (41.44 in) wide x 2360 mm (92.92 in) high
Glass Size:	924 mm (36.38 in) wide x 2240 mm (88.19 in) high

Frame Construction:

Extruded aluminum frame members were thermally broken using polyamide struts. The head corners were square cut, siliconed, and secured using four #8-32 x 3/4" PH screws per corner. The sill corners were secured using six #8-32 x 3/4" PH screws per corner.

Door Panel Construction:

Extruded aluminum door panel members were thermally broken using polyamide struts. The members were attached using 3/8" threaded rod through the rails. The rods were secured inside the stiles using a clamping block and nut. Aluminum stile caps were attached to the ends of the stiles using two #8 x 1-1/2" FH screws per cap. An aluminum astragal was slid into the active panel lockstile.

Glazing:

The panels were glazed with 1" insulated glass units comprising 1/8" tempered, 3/4" air space with stainless steel spacer, 1/8" tempered. The glass was set from the exterior against a bead of silicone sealant and secured with an aluminum stop and wedge gasket. The glass was set on 1/8" silicone setting blocks with a 5/8" bite.

Reinforcement: None

Weatherstripping:	**Quantity**	**Location**
Weatherstrip (Dwg 32342)	12	Interior perimeter of frame. Exterior perimeter of all panel members exept lockstiles. Interior perimeter of passive panel lockstile. Astragal.
Hinge Gasket (Dwg 30000132)	6	Hinges
1" x 1-1/2" x 0.640" Pile (Dwg 40000043)	1	Sill, between shooltbolt strikes.
1" x 2" x 0.640" Pile (Dwg 40000044)	1	Head, between shootbolt strikes.

Hardware:	Quantity	Location
Hinge	6	6" from top and bottom rail and at center. Attached to the frame using two #10-32 x 3/4" FH screws and attached through the frame into the buck using one #10 x 2" FH screw per hinge. Attached to the door panel using six #10-32 x 3/4" FH screws per hinge.
XY Hinge Backplate	6	Hinge reinforcement on frame.
Brio Hinge Backplate	6	Hinge reinforcement on door panels.
Deadbolt	1	Active panel, 35" from bottom rail.
Latch	1	Active panel, 37" from bottom rail.
Latch Strike	1	Attached to passive door panel using three #8-32 x 1/2" FH screws.
Shootbolt	4	Top and bottom of lockstiles
Shootbolt Strike	4	Head and sill. Attached to frame using two #10-32 x 1/2" FH screw w/rivet nut per strike.

Drainage:	Quantity	Location
1/2" x 1/4" Slot	Varies	See As-Built Drawings

Installation:

The specimen was installed into a nominal 2x10 pine buck with a 1/4" perimeter joint. The specimen was anchored through the frame using #10 x 2" FH screws. See as-built drawings for anchor locations.

Test Results:

NAFS §:	Title of Test	Results	Allowed
8.3.1	**Operational Force Test Per ASTM E2068-00**		
	Active Handle	**PASS**	
	Opening Force	20 N (4.6 lbf)	100 N (22.48 lbf)
	Closing Force	28 N (6.3 lbf)	100 N (22.48 lbf)
	Passive Handle	**PASS**	
	Opening Force	22 N (5.0 lbf)	100 N (22.48 lbf)
	Closing Force	89 N (20.1 lbf)	100 N (22.48 lbf)
	Active Door Panel	**PASS**	
	Breakaway Force	31 N (7.0 lbf)	Reported
	Opening Force	13 N (2.9 lbf)	Reported
	Closing Force	5 N (1.1 lbf)	Reported
	Passive Door Panel	**PASS**	
	Breakaway Force	77 N (17.2 lbf)	Reported
	Opening Force	10 N (2.2 lbf)	Reported
	Closing Force	8 N (1.7 lbf)	Reported
6.4.5.1/2	**Force to Latch/Engage**		
	Active Door Panel		
	Force to Latch	5 N (1.2 lbf)	Reported
	Facilitating Force to Engage Deadbolt	0 N (0.0 lbf)	Reported
	Torque to Engage Deadbolt	0.57 Nm (5.0 in-lbf)	Reported

Test Results (Continued):

NAFS §:	Title of Test	Results	Allowed
8.3.2	**Air Infiltration/Exfiltration per ASTM E283-04**		
	Infiltration	**PASS**	
	75 Pa	0.9 L/s/m^2	1.5 L/s/m^2
	1.57 psf	0.18 cfm/ft^2	0.30 cfm/ft^2
	Exfiltration	**PASS**	
	75 Pa	1.0 L/s/m^2	1.5 L/s/m^2
	1.57 psf	0.20 cfm/ft^2	0.30 cfm/ft^2
A4.4.3.5	**Canadian Air Infiltration/Exfiltration per ASTM E283-04**		
	Specimen #1	**PASS**	
	75 Pa (1.57 psf)	**Level A2**	**Level A2**
	Infiltration	0.9 L/s/m^2	1.5 L/s/m^2
		0.18 cfm/ft^2	0.30 cfm/ft^2
	Exfiltration	1.0 L/s/m^2	1.5 L/s/m^2
		0.20 cfm/ft^2	0.30 cfm/ft^2
	Average	1.00 L/s/m^2	
		0.19 cfm/ft^2	

The tested specimen meets or exceeds the performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440 for air leakage resistance

9.3.3 Cyclic Water Penetration Resistance per ASTM E547-00

Water applied at a rate not less than 5 gallons per square foot per hour
Temperature: 16.9 C (62.4 F)

Specimen #1	**PASS**	
360 Pa (7.52 psf)	No Penetration	No Penetration

Test Results (Continued):

NAFS §:	Title of Test	Results	Allowed
8.3.4.2	**Uniform Load Deflection per ASTM E330-14**		
	2-mil plastic film was used to prevent air leakage during testing. It is the opinion of the test technician that this film did not influence the results of the test		
	Specimen #1		
	Positive Load:	2160 Pa (45.1 psf)	
	Negative Load:	2160 Pa (45.1 psf)	
	Passive Meeting Stile	**PASS**	
	Span (L):	2337 mm (92 in)	Reported
	Positive Deflection:	17.9 mm (0.71 in)	Reported
	Negative Deflection:	20.6 mm (0.81 in)	Reported
8.3.4.3	**Uniform Load Structural per ASTM E330-14**		
	2-mil plastic film was used to prevent air leakage during testing. It is the opinion of the test technician that this film did not influence the results of the test		
	Specimen #1		
	Positive Load:	3240 Pa (67.6 psf)	
	Negative Load:	3240 Pa (67.6 psf)	
	Passive Meeting Stile	**PASS**	
	Span (L):	2337 mm (92 in)	L*0.4%
	Positive Permanent Set:	0.9 mm (0.04 in)	9.4 mm (0.37 in)
	Negative Permanent Set:	0.5 mm (0.02 in)	9.4 mm (0.37 in)
8.3.5	**Forced Entry Resistance per AAMA 1304-18**		
	Specimen #1	**PASS**	
	300 lbf concentrated loads	No Entry/Damage	No Entry/Damage

Test Results (Continued):

NAFS §: **Title of Test** **Results** **Allowed**

6.2.6.3 Vertical Load Resistance per AAMA 925-17

670 N (150 lbf)
Diagonal 1: Top hinged corner to bottom free corner
Diagonal 2: Bottom hinged corner to top free corner

Active Door Panel **PASS**

Dimension	Before Preload	After Preload	During Test Load	After Test Load
Diagonal 1 (in)	101.50	101.50	X	101.50
Diagonal 2 (in)	101.56	101.56	X	101.56
Vert Deflection (in)	X	0.00	0.13	0.06
Force-To-Latch (lbf)	X	X	X	3.50

6.2.6.2 Operation/Cycling-Slam Test per AAMA 920-16

Active Door Panel **PASS**
100,000 Cycles No Damage

List of Official Observers:

Name:	Company:
Arlen Fisher	Quast Consulting and Testing, Inc.
Tim Quast	Quast Consulting and Testing, Inc.
Beau Enochson	Ram Windows and Doors
Ray Watson	Ram Windows and Doors

Test specimen drawings have been reviewed by Quast Consulting and Testing, Inc. and are representative of the test specimen reported herein. Material compositions were supplied by the manufacturer and were not verified by QCT.

The reported results were secured using the designated test methods. Test results relate only to the specimen tested. Statements of conformity are determined using the simple acceptance decision rule per ILAC-G8:09-2019. No conclusions regarding the quality of the glass can be made. 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 may not be reproduced, except in full, without the written approval of Quast Consulting and Testing, Inc.

Electronic records of data sheets, drawings, correspondence, this report, or other pertinent project documentation will be retained for a period of 10 years from the test completion date. Physical representative samples of the test specimen will be retained for a period of 2 years from the test completion date. At the end of this retention period, such material shall be discarded without notice and the service life of this report will expire.

QUAST CONSULTING & TESTING, INC.

Arlen Fisher, P.E.
Author

QUAST CONSULTING & TESTING, INC.

Brian M. Sasman, P.E.
Reviewer

Attachments: This report is complete only when all attachments listed are included.
Appendix A: As-Built Drawings (55 Pages)

Document Control Issue Log

Report #	Date	Description
QCT23-7079.03	6/7/2024	Original Report
QCT23-7079.03-R1	7/9/2024	Changed end test date
QCT23-7079.03-R2	7/11/2024	Changed Series Name