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

Rendered To:
Ram Windows and Doors

Report No.:
QCT23-7078.02-R2

Series/Product(s):
S3000/4000 XO Performance SGD
Sliding Door

Test Date(s):
September 27, 2023 through September 29, 2023

Revised Report Date:
July 11, 2024

QUAST CONSULTING AND TESTING, INC.
Exterior Façade/Fenestration Consulting Testing
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Quast Consulting & Testing INC.

Revised Report Date: 07/11/24
Test Dates: 09/27/23
Through: 09/29/23

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

SERIES/MODEL: S3000/4000 XO Performance SGD
PRODUCT TYPE: Sliding Door

Summary of Results	
Test Procedure/Standard	**Details**
AAMA/WDMA/CSA 101/I.S.2/A440-22	Class LC - PG50: Size Tested 2438 x 2438 mm (~96 x 96 in) - Type SD
AAMA/WDMA/CSA 101/I.S.2/A440-17	Class LC - PG50: Size Tested 2438 x 2438 mm (~96 x 96 in) - Type SD
CSA A440S1-19	Class LC - PG50: Size Tested 2438 x 2438 mm (~96 x 96 in) - Type SD
CSA A440S1-17	Class LC - PG50: Size Tested 2438 x 2438 mm (~96 x 96 in) - Type SD
Operating Force (ASTM E2068-00/NAFS-	See Results, PASS
Air Infiltration Resistance (ASTM E283-04)	1.5 L/s/m² (0.29 cfm/ft²) @ 75 Pa (1.57 psf), PASS
Air Exfiltration Resistance (ASTM E283-04)	1.1 L/s/m² (0.22 cfm/ft²) @ 75 Pa (1.57 psf), PASS
Canadian Air Infiltration/Exfiltration (ASTM E283-04)	1.3 L/s/m² (0.26 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)	+2400 Pa (50.1 psf) / -2400 Pa (50.1 psf), PASS
Uniform Load Structural (ASTM E330-14)	+3600 Pa (75.2 psf) / -3600 Pa (75.2 psf), PASS
Forced Entry Resistance (ASTM F842-17)	Grade: 10, Assembly Type: A, PASS
Deglazing Resistance (ASTM E987-88)	See Results, PASS

Reference Report No. QCT23-7078.02-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 an S3000/4000 XO Performance SGD. 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 E987-88 (2017)	*Test Method for Deglazing Force of Fenestration Products*
ASTM F842-17 (2023)	*Standard Test Methods for Measuring the Forced Entry Resistance of Sliding Door Assemblies, Excluding Glazing Impact*
ASTM E2068-00 (2016)	*Test Method for Determination of Operating Force of Sliding Windows and Doors*

Sliding Door Primary Designators:

AAMA/WDMA/CSA 101/I.S.2/A440-22	Class LC - PG50: Size Tested 2438 x 2438 mm (~96 x 96 in) - Type SD
AAMA/WDMA/CSA 101/I.S.2/A440-17	Class LC - PG50: Size Tested 2438 x 2438 mm (~96 x 96 in) - Type SD
CSA A440S1-19	Class LC - PG50: Size Tested 2438 x 2438 mm (~96 x 96 in) - Type SD
CSA A440S1-17	Class LC - PG50: Size Tested 2438 x 2438 mm (~96 x 96 in) - Type SD

Test Specimen Description:

Frame Size:	2438 mm (96.00 in) wide x 2438 mm (96.00 in) high
Panel Size:	1245 mm (49.00 in) wide x 2327 mm (91.63 in) high
Glass Size:	1122 mm (44.19 in) wide x 2254 mm (88.75 in) high

Frame Construction:

The extruded aluminum frame members were thermally broken using polyamide struts. The corners were square cut and sealed with silicone. Aluminum end plates were attached to the head using two #8-32 x 3/4" PH screws and attached to the sill using four #8-32 x 3/4" PH screws.

Door Panel Construction:

The extruded aluminum door panel members were square cut and attached using 3/8" threaded rods through the top rails and 5/16" threaded rods through the bottom rails. The rods were secured inside the stiles using a clamping block and nut. Aluminum rail extensions were attached to the bottom of both panel interlock stiles using two #8-32 x 3/4" PH screws per extension. An aluminum stile cap was attached to the tops of both stationary panel stiles using four #6 x 3/4" FH screws per cap. A silicone fillet seal was applied to the stationary panel to frame interface at the exterior head, sill, and jamb.

Glazing:

The panels were glazed with 1" insulated glass units comprising 5/32" tempered, 11/16" air space with stainless steel spacer, 5/32" tempered. The glass was set from the interior against a bead of silicone and secured with an aluminum stop and wedge gasket. The glass was set on 1/8" silicone setting blocks with a 1/2" bite.

Reinforcement: None

Weatherstripping:	Quantity	Location
0.190" Single Fin Pile Gasket	16	Frame, interior and exterior legs and both sides of parting stops.
0.150" Single Fin Pile Gasket	2	Both panel interlocks.
Foam-Filled Vinyl Gasket	2	Both panel interlocks.
Closed-Cell Dust Plug	1	Head, above operable panel interlock stile.
1/2" x 1/2" x 2-1/2" Open-Cell Foam Block	1	Sill, interior parting stop channel under operable panel interlock stile.
Head Interlock Notch Foam	1	Operable stile interlock, top rail extension.
Sill Interlock Notch Foam	1	Operable stile interlock, bottom rail extension.
Roll-In Wedge Gasket	8	Glazing stops.

Hardware:	Quantity	Location
1000 Quad Series Rollers	2	Attached to roller mounts using two 1/4-20 x 1/2" FH screws per roller.
Roller Mount	2	1 per roller. Attached to operable panel rails using four #8-32 x 3/4" PH screws per mount.
Locking Handle	1	Operable panel lock stile, 36" from bottom rail.
Lock Strike	1	Anchored through the jamb into the buck using two #10 x 2-2/3" FH screws.

Drainage:	Quantity	Location
1/4" x 1/4" Notch	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 head using four rows and the jambs using three rows of #10 x 2" FH screws. See As-Built Drawings for anchorage spacing.

Test Results:

NAFS §:	Title of Test	Results	Allowed
8.3.1	**Operational Force Test Per ASTM E2068-00**		
	Latch	**PASS**	
	Opening Force	30 N (6.7 lbf)	100 N (22.48 lbf)
	Closing Force	44 N (9.8 lbf)	100 N (22.48 lbf)
	Operable Door Panel	**PASS**	
	Breakaway Force	59 N (13.3 lbf)	135 N (30.25 lbf)
	Opening Force	35 N (7.9 lbf)	90 N (20.23 lbf)
	Closing Force	41 N (9.3 lbf)	90 N (20.23 lbf)
8.3.2	**Air Infiltration/Exfiltration per ASTM E283-04**		
	Infiltration	**PASS**	
	75 Pa	1.5 L/s/m^2	1.5 L/s/m^2
	1.57 psf	0.29 cfm/ft^2	0.30 cfm/ft^2
	Exfiltration	**PASS**	
	75 Pa	1.1 L/s/m^2	1.5 L/s/m^2
	1.57 psf	0.22 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	1.5 L/s/m^2	1.5 L/s/m^2
		0.29 cfm/ft^2	0.30 cfm/ft^2
	Exfiltration	1.1 L/s/m^2	1.5 L/s/m^2
		0.22 cfm/ft^2	0.30 cfm/ft^2
	Average	1.30 L/s/m^2	
		0.26 cfm/ft^2	

Test Results (Continued):

NAFS §:	Title of Test	Results	Allowed
	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: 120 C (248 F)		
	Specimen #1 360 Pa (7.52 psf)	**PASS** No Penetration	 No Penetration
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:	2400 Pa (50.1 psf)	
	Negative Load:	2400 Pa (50.1 psf)	
	Stile Interlock	**PASS**	
	Span (L):	2337 mm (92 in)	Reported
	Positive Deflection:	17.9 mm (0.71 in)	Reported
	Negative Deflection:	17.7 mm (0.70 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:	3600 Pa (75.2 psf)	
	Negative Load:	3600 Pa (75.2 psf)	
	Stile Interlock	**PASS**	
	Span (L):	2337 mm (92 in)	L*0.4%
	Positive Permanent Set:	0.5 mm (0.02 in)	9.4 mm (0.37 in)
	Negative Permanent Set:	0.0 mm (0.00 in)	9.4 mm (0.37 in)

Test Results (Continued):

NAFS §:	Title of Test	Results	Allowed
8.3.5	**Forced Entry Resistance per ASTM F842-17**		
	Disassembly and Lock/Hardware Manipulation Tools 5" long #2 Phillips screwdriver Standard slot-type pliers 6-7" in length Putty Knife with 24 Ga x 3/4" wide x 3-1/2" blade 16 Ga x 9" long black annealed wire		
	Concentrated Load Tools Drill operated cable winch Chatillion 150 and 500 lbf spring scales, Pelouze 220 lbf spring scales		
	Specimen #1	**PASS**	
	Grade: 10 Assembly Type: A T1 = 5 min, L1 = 1334 N (300 lbf), L2 = 778 N (175 lbf) L3 = 133 N (30 lbf), L4 = 222 N (50 lbf) + Panel wt		
	Disassembly Test	No Entry/Damage	No Entry/Damage
	Concentrated Load Tests	No Entry/Damage	No Entry/Damage
	Lock/Hardware Manipulation Test	No Entry/Damage	No Entry/Damage
	Sash Manipulation Test	No Entry/Damage	No Entry/Damage
8.3.6.2	**Deglazing Test per ASTM E987-88**		
	Active Panel	**PASS**	
	Product Type:		
	Horizontal Member Load	230 N (51.7 lbf)	
	Vertical Member Load	320 N (71.9 lbf)	
	Horizontal Member Glazing Bite	12.7 mm (0.50 in)	90%*Bite
	Vertical Member Glazing Bite	12.7 mm (0.50 in)	
	Top Rail Deflection	0.0 mm (0.00 in)	11.4 mm (0.45 in)
	Bottom Rail Deflection	0.3 mm (0.01 in)	11.4 mm (0.45 in)
	Left Stile Deflection	0.0 mm (0.00 in)	11.4 mm (0.45 in)
	Right Stile Deflection	0.0 mm (0.00 in)	11.4 mm (0.45 in)

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 (67 Pages)

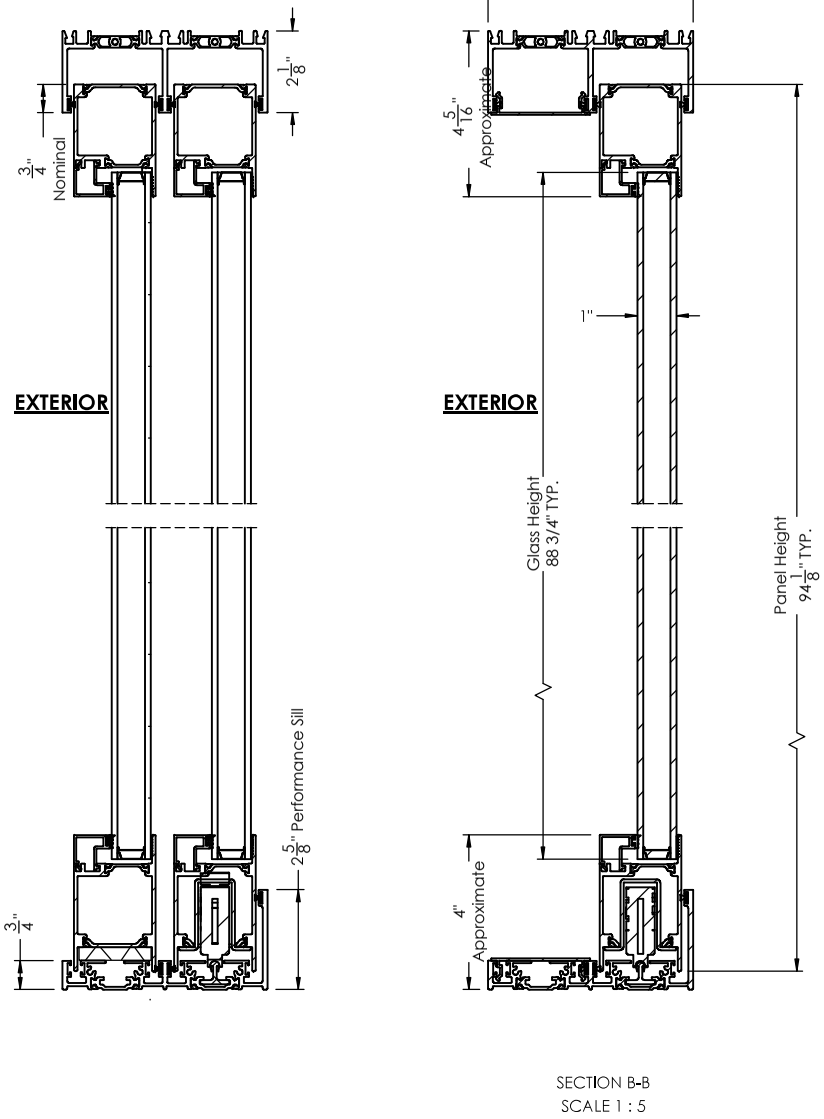
Document Control Issue Log

Report #	Date	Description
QCT23-7078.02	5/3/2024	Original Report
QCT23-7078.02-R1	7/11/2024	Changed Series Name.
QCT23-7078.02-R2	2/23/2026	Updated installation description and drawings.

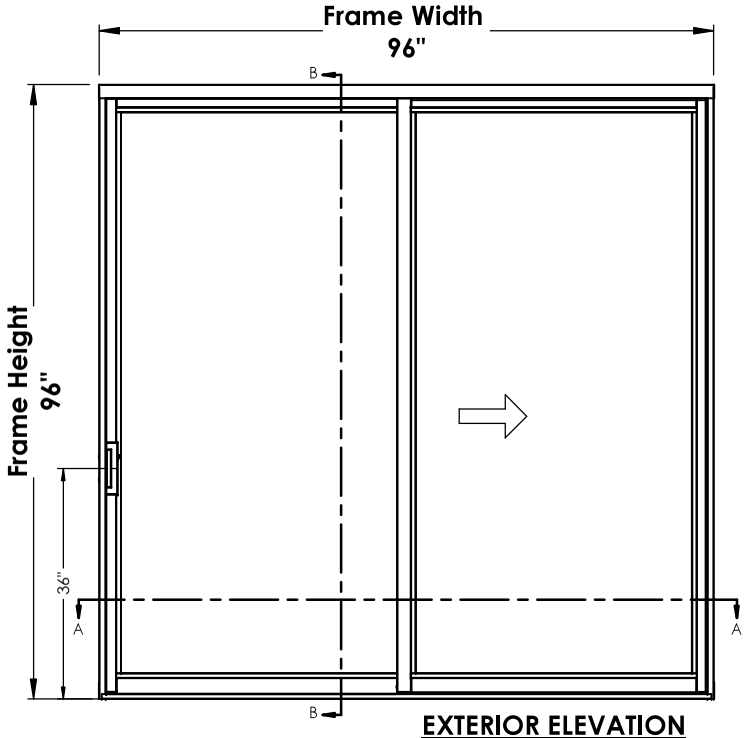
RAM S3000, XO SLIDING DOOR

REVISIONS		
REV	DESCRIPTION	DATE
0	INITIAL RELEASE	03/12/2024

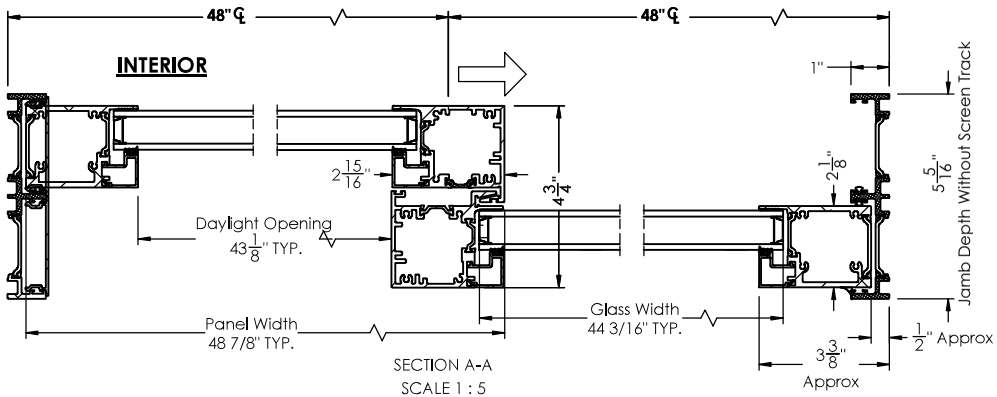
PANELS STACKED



SECTION B-B
SCALE 1 : 5



EXTERIOR ELEVATION



SECTION A-A
SCALE 1 : 5

PROPRIETARY AND CONFIDENTIAL

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Drawings represent specimen as-tested
QCT23-7078.02
Date: 02/23/2026
Reviewed by: AF

Quast Consulting & Testing Inc.

RAM WINDOWS & DOORS

LEAD TIME		CUSTOMER	RAM S3000
GLASS WARRANTY		PROJECT	XO SLIDING DOOR
FRAME WARRANTY		CITY	
FINISH WARRANTY		STATE	
U-FACTOR		OUTER GLASS	
SHGC		AIR SPACE	
OA GLASS THICKNESS	1"	INNER GLASS	

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES:

FRACTIONAL: ± 1/16
ANGULAR: MACH/BEND: ± 1
TWO PLACE DECIMAL ± 0.01
THREE PLACE DECIMAL ± 0.005

MATERIAL:

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	BE	3/14/2024
ENG		
MARK		
QTY.		
FINISH		
DP		
SCALE: 1:30		

RAM WINDOWS AND DOORS

TITLE: RAM S3000, XO SLIDING DOOR

SIZE	WTS NUMBER	REV
A	XO-Top-Assembly-71103-2-AWS	0
	WEIGHT: 350.928	SHEET 1 OF 4