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SIMULATION TEST REPORT

NCTL-610-23419-1$_{E0A0}$

REPORT TO:
ClimateGuard Manufacturing
2500 North Pulaski
Chicago, IL 60639

SIMULATION DATE: 08/26/20

PRODUCT:
2500 Double Hung

PRODUCT CPD DESIGNATION:
RSC-A-7

This report is for recertification of an existing product line.

SIMULATION TEST REPORT

Simulation Standards	ANSI/NFRC 100-2017 "Procedure for Determining Fenestration Product U-factors" ANSI/NFRC 200-2017 "Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence" NFRC 500-2017 "Procedure for Determining Fenestration Product Condensation Resistance Values" THERM 7 / WINDOW 7 NFRC Simulation Manual (July 2017) NFRC 2010 Technical Interpretations Manual (November 2017)
Approved Simulation Software	Center of Glass: Window 7.4 2-D Heat Transfer: THERM 7.4 Total Product Calculations: Window 7.4

Note: All dimensions are in the order (Width x Height) unless otherwise noted.

Report Number	NCTL-610-23419-1$_{E0A0}$
Model/ Series	2500 Double Hung
Operator Type	Vertical Slider Double Hung (VSDH)
Simulation Size	1200 mm x 1500 mm (47" x 59")
Frame Type	Vinyl (VY) Vinyl with Foam Filling (VF)
Nail Fin	Not applicable
Sash/Vent/Panel Type	Vinyl (VY) Vinyl with Foam Filling (VF)
Frame/Sash Material & Finish	Rigid vinyl (PVC)
Reinforcement	Not applicable
Thermal Break(s)	Not applicable
Weather Seal(s)	Head (4) Strips mohair Upper Jamb (3) Strips mohair Meeting Rail (3) Strips mohair Lower Jamb (3) Strips mohair

Sill	(3) Strips mohair, (1) flexible vinyl bulb seal
Foam Fill	Head (2) Largest cavities in frame and exterior most cavities in sash as represented in assembly Upper Jamb (2) Largest cavities in frame and exterior most cavities in sash as represented in assembly Meeting Rail (1) Exterior most cavities in rails Lower Jamb (2) Largest cavities in frame and exterior most cavities in sash as represented in assembly Sill (2) Largest cavities in frame and exterior most cavities in sash as represented in assembly
Foam Type	Polystyrene expanded (EPS) with a conductivity of 0.0240 W/m-K
Edge of Glass	Interior glazed with flexible vinyl fin back bedding on glazing leg, and snap-in dual durometer rigid vinyl glazing bead with dual leaf.
Spacer System(s)	Coated steel U-shaped spacer system - dual sealed (CU-D)
Gas Fillings	Argon 90% single probe per the client (ARG)
Divider(s)	Grid 1 .1875" x .610" painted aluminum rectangle
Divider Notes	Where the space between lite and divider is greater than 3 mm, dividers are not modeled. Solar Heat Gain Coefficient (SHGC) and Visible Light Transmittance (VT) are calculated using default dividers of less than 1" and greater than/ equal to 1". For U-factor, SHGC, and VT calculations the standard default grid pattern of 12" is used, as established by the Window 7 program.

Notes, Additional Information, Comments, and Assumptions

All simulations use the emissivity from the approved ANSI/NFRC spectral data files with the International Glazing Database (IGDB).

For Solar Heat Gain and Visible Light Transmittance; all frame, divider and glass options are grouped using the best case center of glass/ worst-case frame values from the "U" Factor calculations as required by ANSI/NFRC 200-2017.

A default frame absorptance of 0.30 is assumed for all products except glazing window walls, glazing curtain walls, and slopped glazing wall - all of which will have a frame absorptance of 0.50

Supporting information including THERM 7 and WINDOW 7 files are being submitted as part of this report. The simulation matrix is being submitted electronically.

Detailed assembly drawings, horizontal and vertical cross-sectional drawings, profile drawings, parts drawings, and a bill of materials as supplied by the client were used as the basis for performing the simulations. Copies are attached to this report. The results were secured by using the designated methods and NFRC approved simulation programs as required by, and in full compliance with, NFRC procedures.

This report does not constitute certification of this product. The results in this report apply only to the sample as shown in the attached drawings, using the components and construction methods described herein. NCTL does not warrant the accuracy of the computer programs used to obtain the results. Client request for work performed by NCTL and its associated documentation constitute approval by client for Inspection Agency (IA) submission.

Ratings values included in this report are for submittals to an NFRC-licensed IA and are not meant to be used directly for labeling purposes. Only those options identified on a valid Certificate of Authorization (CA) by an NFRC accredited Inspection Agency (IA) are to be used for labeling purposes.

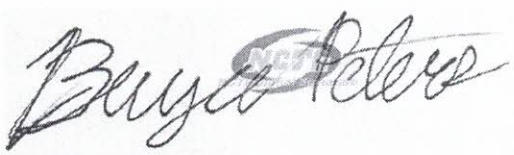
The Condensation Resistance results obtained from this procedure are for controlled laboratory conditions and do not include the effects of air movement through the specimen, solar radiation and the thermal bridging that may occur due to the specific design and construction of the fenestration system opening.

Units and rounding is in accordance with NFRC 601, *Units and Measurement Policy* except that all units may be reported in IP as the primary units after conversion and any matrix is reported in IP units only unless requested otherwise by the client.

The manufacturer is capable of producing, in its normal manufacturing process, products in sizes identical to the model sizes listed in the ANSI/NFRC 100 Table 4-3 and have a least deviation of 0 within the tolerances of ANSI/NFRC 100. All simulations are performed in the sizes and configurations listed in ANSI/NFRC 100 Table 4-3 except that a non-standard size may be simulated and identified in the matrix to match the manufacturer's physical test sample. Glass and glazing types, Low-E placement, finishes and other required information is included in the NFRC U-Factor Simulation Summary Report and/ or the NFRC SHGC/ VT Simulation Summary Report included in this document. Additional supporting information and modeling assumptions are included in the individual reports obtained from the approved simulation programs and in the notes following the required summary reports.

National Certified Testing Laboratories

Performed by:



BRYCE PETERS
NFRC Certified Simulator

Reviewed by:

MARK BENNETT
NFRC Certified Simulator
Simulator-In-Responsible-Charge

Attachments
Glazing Matrix
Appendix A - Revision Summary
Appendix B - Product Drawings

PRODUCT	Product Number	Pane ID #1	Pane ID #2	Pane ID #3	Pane Thickness #1	Pane Thickness #2	Pane Thickness #3	Gap 1	Gap 2	Gap Fill 1	Gap Fill 2	% of Gap Fill 1	% of Gap Fill 2	Emissivity Surface 1	Emissivity Surface 2	Emissivity Surface 3	Emissivity Surface 4	Emissivity Surface 5	Emissivity Surface 6	Tint	Spacer	Grid Type	Grid Size	U-factor	Condensation Resistance		SHGC NO GRID	SHGC GRID<1"	SHGC GRID>=1"	VT NO GRID	VT GRID<1"	VT GRID >=1"	
Grids/ No Grids	1	2 mm Clear	2 mm Clear		0.087	0.087		0.678		AIR										CL	CU-D	N,G	0.75	0.46	43		0.61	0.55		0.64	0.57		
Grids/ No Grids	2	3 mm Clear	3 mm Clear		0.118	0.118		0.639		AIR										CL	CU-D	N,G	0.75	0.46	43		0.60	0.54		0.63	0.57		
No Grids	3	2 mm Clear	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	AIR	AIR									CL	CU-D	N		0.37	52		0.56			0.59			
Grids/ No Grids	4	2 mm i89	2 mm Clear		0.087	0.087		0.678		ARG		5		0.149						CL	CU-D	N,G	0.75	0.44	45		0.55	0.49		0.63	0.56		
Grids/ No Grids	5	3 mm i89	3 mm Clear		0.117	0.118		0.639		ARG		5		0.149						CL	CU-D	N,G	0.75	0.44	45		0.54	0.48		0.62	0.55		
No Grids	6	2 mm i89	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5	0.149						CL	CU-D	N		0.34	55		0.50			0.58			
Grids/ No Grids	7	2 mm LoE 366	2 mm Clear		0.087	0.087		0.678		ARG		5			0.020					CL	CU-D	N,G	0.75	0.29	55		0.21	0.19		0.50	0.45		
Grids/ No Grids	8	3 mm LoE 366	3 mm Clear		0.118	0.118		0.639		ARG		5			0.020					CL	CU-D	N,G	0.75	0.29	54		0.21	0.19		0.50	0.44		
No Grids	9	2 mm LoE 366	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.020					CL	CU-D	N		0.27	61		0.20			0.46			
No Grids	10	2 mm LoE 366	2 mm Clear	2 mm LoE 366	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.020			0.020		CL	CU-D	N		0.23	65		0.19			0.37			
Grids/ No Grids	11	2 mm LoE 270	2 mm Clear		0.087	0.087		0.678		ARG		5			0.035					CL	CU-D	N,G	0.75	0.29	54		0.29	0.26		0.55	0.49		
Grids/ No Grids	12	3 mm LoE 270	3 mm Clear		0.118	0.118		0.639		ARG		5			0.035					CL	CU-D	N,G	0.75	0.29	54		0.29	0.26		0.54	0.48		
No Grids	13	2 mm LoE 270	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035					CL	CU-D	N		0.27	61		0.27			0.50			
No Grids	14	2 mm LoE 270	2 mm Clear	2 mm LoE 270	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035			0.035		CL	CU-D	N		0.23	65		0.25			0.43			
Grids/ No Grids	15	2 mm LoE 270	2 mm i89		0.087	0.087		0.678		ARG		5			0.035		0.149			CL	CU-D	N,G	0.75	0.25	43		0.28	0.26		0.53	0.47		
Grids/ No Grids	16	3 mm LoE 270	3 mm i89		0.118	0.117		0.639		ARG		5			0.035		0.149			CL	CU-D	N,G	0.75	0.25	45		0.28	0.25		0.53	0.47		
0.1875" x 0.610" Rectangle Grid	17	2 mm Clear	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	AIR	AIR									CL	CU-D	G	0.75	0.37	52			0.50			0.53		
0.1875" x 0.610" Rectangle Grid	18	2 mm i89	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5	0.149						CL	CU-D	G	0.75	0.34	55			0.45			0.51		
0.1875" x 0.610" Rectangle Grid	19	2 mm LoE 366	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.020					CL	CU-D	G	0.75	0.27	61			0.18			0.41		
0.1875" x 0.610" Rectangle Grid	20	2 mm LoE 366	2 mm Clear	2 mm LoE 366	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.020			0.020		CL	CU-D	G	0.75	0.23	65			0.17			0.33		
0.1875" x 0.610" Rectangle Grid	21	2 mm LoE 270	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035					CL	CU-D	G	0.75	0.27	61			0.24			0.45		
0.1875" x 0.610" Rectangle Grid	22	2 mm LoE 270	2 mm Clear	2 mm LoE 270	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035			0.035		CL	CU-D	G	0.75	0.24	65			0.22			0.38		
Foam Filled, Grids/ No Grids	23	2 mm Clear	2 mm Clear		0.087	0.087		0.678		AIR										CL	CU-D	N,G	0.75	0.45	43		0.61	0.55		0.64	0.57		

PRODUCT	Product Number	Pane ID #1	Pane ID #2	Pane ID #3	Pane Thickness #1	Pane Thickness #2	Pane Thickness #3	Gap 1	Gap 2	Gap Fill 1	Gap Fill 2	% of Gap Fill 1	% of Gap Fill 2	Emissivity Surface 1	Emissivity Surface 2	Emissivity Surface 3	Emissivity Surface 4	Emissivity Surface 5	Emissivity Surface 6	Tint	Spacer	Grid Type	Grid Size	U-factor	Condensation Resistance		SHGC NO GRID	SHGC GRID<1"	SHGC GRID>=1"	VT NO GRID	VT GRID<1"	VT GRID >=1"
Foam Filled, Grids/ NoGrids	24	3 mm Clear	3 mm Clear		0.118	0.118		0.639		AIR										CL	CU-D	N,G	0.75	0.45	43		0.60	0.54		0.63	0.57	
Foam Filled, No Grids	25	2 mm Clear	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	AIR	AIR									CL	CU-D	N		0.36	52		0.56			0.59		
Foam Filled, Grids/ NoGrids	26	2 mm i89	2 mm Clear		0.087	0.087		0.678		ARG		5		0.149						CL	CU-D	N,G	0.75	0.43	45		0.55	0.49		0.63	0.56	
Foam Filled, Grids/ NoGrids	27	3 mm i89	3 mm Clear		0.117	0.118		0.639		ARG		5		0.149						CL	CU-D	N,G	0.75	0.43	45		0.54	0.48		0.62	0.55	
Foam Filled, No Grids	28	2 mm i89	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5	0.149						CL	CU-D	N		0.33	55		0.50			0.58		
Foam Filled, Grids/ NoGrids	29	2 mm LoE 366	2 mm Clear		0.087	0.087		0.678		ARG		5			0.020					CL	CU-D	N,G	0.75	0.28	55		0.21	0.19		0.50	0.45	
Foam Filled, Grids/ NoGrids	30	3 mm LoE 366	3 mm Clear		0.118	0.118		0.639		ARG		5			0.020					CL	CU-D	N,G	0.75	0.28	54		0.21	0.19		0.50	0.44	
Foam Filled, No Grids	31	2 mm LoE 366	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.020					CL	CU-D	N		0.26	62		0.20			0.46		
Foam Filled, No Grids	32	2 mm LoE 366	2 mm Clear	2 mm LoE 366	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.020			0.020		CL	CU-D	N		0.22	65		0.19			0.37		
Foam Filled, Grids/ NoGrids	33	2 mm LoE 270	2 mm Clear		0.087	0.087		0.678		ARG		5			0.035					CL	CU-D	N,G	0.75	0.29	54		0.29	0.26		0.55	0.49	
Foam Filled, Grids/ NoGrids	34	3 mm LoE 270	3 mm Clear		0.118	0.118		0.639		ARG		5			0.035					CL	CU-D	N,G	0.75	0.29	54		0.29	0.26		0.54	0.48	
Foam Filled, No Grids	35	2 mm LoE 270	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035					CL	CU-D	N		0.26	61		0.27			0.50		
Foam Filled, No Grids	36	2 mm LoE 270	2 mm Clear	2 mm LoE 270	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035			0.035		CL	CU-D	N		0.22	65		0.25			0.43		
Foam Filled, Grids/ NoGrids	37	2 mm LoE 270	2 mm i89		0.087	0.087		0.678		ARG		5			0.035		0.149			CL	CU-D	N,G	0.75	0.24	43		0.28	0.26		0.53	0.47	
Foam Filled, Grids/ NoGrids	38	3 mm LoE 270	3 mm i89		0.118	0.117		0.639		ARG		5			0.035		0.149			CL	CU-D	N,G	0.75	0.24	45		0.28	0.25		0.53	0.47	
Foam Filled, 0.1875" x 0.610" Rectangle Grid	39	2 mm Clear	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	AIR	AIR									CL	CU-D	G	0.75	0.36	52			0.50			0.53	
Foam Filled, 0.1875" x 0.610" Rectangle Grid	40	2 mm i89	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5	0.149						CL	CU-D	G	0.75	0.33	55			0.45			0.51	
Foam Filled, 0.1875" x 0.610" Rectangle Grid	41	2 mm LoE 366	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.020					CL	CU-D	G	0.75	0.26	62			0.18			0.41	
Foam Filled, 0.1875" x 0.610" Rectangle Grid	42	2 mm LoE 366	2 mm Clear	2 mm LoE 366	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.020			0.020		CL	CU-D	G	0.75	0.22	65			0.17			0.33	
Foam Filled, 0.1875" x 0.610" Rectangle Grid	43	2 mm LoE 270	2 mm Clear	2 mm Clear	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035					CL	CU-D	G	0.75	0.26	61			0.24			0.45	
Foam Filled, 0.1875" x 0.610" Rectangle Grid	44	2 mm LoE 270	2 mm Clear	2 mm LoE 270	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035			0.035		CL	CU-D	G	0.75	0.23	65			0.22			0.38	
Validation, No Grids	0	2 mm LoE 270	2 mm Clear	2 mm LoE 270	0.087	0.087	0.087	0.290	0.290	ARG	ARG	5	5		0.035			0.035		CL	CU-D	N		0.23	65		0.25			0.43		

Appendix A

Revision Summary

Identification	Date	Revision
Original Issue	08/26/20	Report to ClimateGuard Manufacturing and Inspection Agency