



# NATIONAL CERTIFIED TESTING LABORATORIES

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## U-Factor, Solar Heat Gain Coefficient, Visible Transmittance and Condensation Resistance Calculation Report

**REPORT NO:** NCTL-110-18034-1  
**SIMULATION DATE:** 11/30/15  
**REPORT DATE:** 11/30/15

**Client:** ClimateGuard Manufacturing  
2500 North Pulaski  
Chicago, IL 60639

**Product Line:** ClimateGuard Manufacturing's 500 Vinyl Single Hung

**Specification:** ANSI/NFRC 100-2014: "Procedure for Determining Fenestration Product U-Factors".  
ANSI/NFRC 200-2014: "Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence".  
NFRC 500-2014: "Procedure for Determining Fenestration Product Condensation Resistance Values".  
Therm 6.x / Window 6.x NFRC Simulation Manual (Approved at test date)  
Technical Interpretation Manual (2010)

**Procedures and Compliance:** All U-factor, Solar Heat Gain Coefficients, Visible Transmittance and Condensation Resistance values were calculated using the following characteristics: a default value of 0.30 solar absorptance for all products other than window glazed wall and sloped glazing which have a solar absorptance of 0.50. The best glazing option was used as the configuration for SHGC and VT specialty products table. NCTL is a NFRC accredited simulation laboratory and this simulation was conducted in full compliance with NFRC requirements. This report does not constitute an opinion or endorsement by the laboratory. Ratings values included in this report are for submittal to an NFRC-licensed IA and are not meant to be used directly for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) by an NFRC accredited Inspection Agency (IA) are to be used for labeling purposes. Rounding per NFRC 601-2014: "NFRC Unit and Measurement Policy". The values included in this report are not considered in compliance with ANSI/NFRC 100, ANSI/NFRC 200, and/or NFRC 500 unless the associated validation test requirements have been satisfied, as applicable. Component 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 values approved and identified on a valid CMA Label Certificate are to be used for labeling purposes. The component(s) values included in this report are not considered in compliance with ANSI/NFRC 100 or ANSI/NFRC 200 unless the associated validation test requirements have been satisfied, as applicable.

**PRODUCT LINE DESCRIPTION**

**General:** The product line modeled is ClimateGuard Manufacturing's 500 Vinyl Single Hung

Model Size Simulations: 1200 mm x 1500 mm (47.244" x 59.055")

**Weatherseals:**

Location	Weather Seal Description
Head	Not Applicable
Lower Jamb	(2) Mohair
Meeting Rail	(2) Mohair
Sill	(1) Mohair, (1) Flexible PVC bulb
Upper Jamb	Not Applicable

**Gas Fillings:**

Gas Type	Filling Technique	Percentage
Argon	Double probe	95%

**Reinforcement:** A mill finish aluminum extrusion located in the Active meeting Rail

**Edge – of - Glass – Construction:**

Fixed Sash: Interior Glazed with a silicone back bedding and interior rigid vinyl glazing bead  
Active Sash: Exterior glazed with a silicone back bedding and interior rigid vinyl glazing bead

**Finish:** Vinyl

**Frame Description:**

Code	Type	Definition
VY	Vinyl	All members are vinyl with no reinforcements

**Sash Description:**

Code	Type	Definition
VI	Vinyl w/ Reinforcement - Interlock	Interlock member reinforced only

**Spacer and Sealant:**

Code	Type	Definition
CU-D	Coated Steel U-Shaped	Coated Steel (galvanized or tinplated) U-shaped spacer system embedded in sealant

**Dividers:** Where applicable, dividers were not modeled because the gap between dividers and lites were greater than 3mm. For Solar Heat Gain and Visual Light Transmittance default dividers less than 1" and greater or equal to 1" and default patterns were used for simulations.

**Divider Description:** 0.1875" x 0.610" Painted Aluminum Rectangular.

**Continuous Hardware Description:** Not applicable.

**Group Leaders:** The following group leaders are actual simulated individual products per NFRC 4.2.4 and the NFRC Technical Interpretations where applicable. All remaining individual products' U-factors in the corresponding groups are represented by the group leader's U-factor.

**Frame Group Leader:** Determined by ANSI/NFRC 100-2014 Section 4.2.4.3.

Frame ID	Frame Description	U <sub>FRAME</sub>
F1	Without Fin	0.232
F2	With Fin	0.2348*
F3	With Fin & Sill Extender	0.2345

\* Group Leader

### Modeling Assumptions and Comments Deemed Important:

#### Sealing Rules:

All cavities that are opened to the exterior within a frame section shall be modeled according to ISO 15099, Section 6.7.1, which states that cavities greater than 2mm but equal to or less than 10 mm shall be modeled as "slightly ventilated air cavities". For physical testing purposes the product is sealed at the inside surface with tape or equivalent to prevent air infiltration. Air cavities created by this sealing technique must be simulated with the standard NFRC "Frame Cavity" material. If cavities on the frame are sealed (covered) to the surround panel with tape or equivalent, those cavities are also filled with NFRC "Frame Cavity" material within the simulation model. If the frame is not covered or sealed, those areas are left hollow or opened within the simulation model.

#### Continuous elements:

All elements continuous within the product line are identified from the Bill-of-Materials and detailed drawings via the referenced dimensions and cut lengths as compared to the overall size of the product.

#### General Notes:

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.

#### Modeling assumptions:

The product was modeled with a nominal 1" x 4" wood stud attached to the nail flange.

#### Miscellaneous assumptions:

1. The screen extrusions were not modeled.
2. All radii are simulated at angles.
3. The modeling was performed in accordance with the manufacturer's assembly drawing.

#### Component Area and Frame Heights:

Frame heights, calculated areas, area weighted values for U-factor, SHGC, and VT, and center –of-glazing are located in approved NFRC simulation programs for all individual products.

### NCTL Therm Section Filename Methodology

Filename Codes Example: HD-CU-D-F1_003.THM	
HD	Frame Section (Head)
CU-D	Spacer (Intercept)
F1	Frame Description
_003	Glazing ID #3

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"
Frame Grouping,	1	2 mm Clear	2 mm Clear		0.086	0.086		0.699		AIR											CL	CU-D	N,G	0.75	0.48	48	0.64	0.57	0.65	0.58	
Frame Grouping,	2	3 mm Clear	3 mm Clear		0.123	0.123		0.639		AIR											CL	CU-D	N,G	0.75	0.47	43	0.62	0.56	0.65	0.58	
Frame Grouping,	3	2 mm Clear	2 mm Clear	2 mm Clear	0.086	0.086	0.086	0.306	0.306	AIR	AIR										CL	CU-D	N		0.38	53	0.58		0.60		
Frame Grouping,	4	2 mm Comfort Select 73	2 mm Clear		0.087	0.086		0.699		ARG		95		0.148							CL	CU-D	N,G	0.75	0.34	52	0.54	0.48	0.61	0.54	
Frame Grouping,	5	3 mm Comfort Select 73	3 mm Clear		0.123	0.123		0.639		ARG		95		0.148							CL	CU-D	N,G	0.75	0.34	54	0.51	0.46	0.58	0.52	
Frame Grouping,	6	2 mm Comfort Select 73	2 mm Clear	2 mm Clear	0.087	0.086	0.086	0.306	0.306	ARG	ARG	95	95	0.148							CL	CU-D	N		0.29	60	0.50		0.56		
Frame Grouping,	7	2 mm LoE <sup>3</sup> 366	2 mm Clear		0.087	0.086		0.699		ARG		95		0.022							CL	CU-D	N,G	0.75	0.30	55	0.22	0.20	0.51	0.46	
Frame Grouping,	8	3 mm LoE <sup>3</sup> 366	3 mm Clear		0.117	0.123		0.639		ARG		95		0.022							CL	CU-D	N,G	0.75	0.30	54	0.22	0.20	0.51	0.45	
Frame Grouping,	9	2 mm LoE <sup>3</sup> 366	2 mm Clear	2 mm Clear	0.087	0.086	0.086	0.306	0.306	ARG	ARG	95	95	0.022							CL	CU-D	N		0.27	62	0.21		0.47		
Frame Grouping,	10	2 mm LoE <sup>2</sup> 270	2 mm Clear		0.087	0.086		0.699		ARG		95		0.037							CL	CU-D	N,G	0.75	0.31	54	0.29	0.27	0.56	0.50	
Frame Grouping,	11	3 mm LoE <sup>2</sup> 270	3 mm Clear		0.118	0.123		0.639		ARG		95		0.037							CL	CU-D	N,G	0.75	0.30	54	0.29	0.26	0.55	0.49	
Frame Grouping,	12	2 mm LoE <sup>2</sup> 270	2 mm Clear	2 mm Clear	0.087	0.086	0.086	0.306	0.306	ARG	ARG	95	95	0.037							CL	CU-D	N		0.28	61	0.28		0.51		
Frame Grouping,	13	2 mm LoE <sup>2</sup> 270	2 mm Comfort Select 73		0.087	0.087		0.699		ARG		95		0.037	0.148						CL	CU-D	N,G	0.75	0.26	43	0.28	0.25	0.52	0.46	
Frame Grouping,	14	3 mm LoE <sup>2</sup> 270	3 mm Comfort Select 73		0.118	0.123		0.639		ARG		95		0.037	0.148						CL	CU-D	N,G	0.75	0.26	45	0.28	0.25	0.50	0.44	
Frame Grouping,	15	2 mm LoE <sup>2</sup> 270	2 mm Clear	2 mm LoE <sup>2</sup> 270	0.087	0.086	0.087	0.306	0.306	ARG	ARG	95	95	0.037			0.037				CL	CU-D	N		0.23	65	0.25		0.43		
Frame Grouping,	16	2 mm LoE <sup>2</sup> 272	2 mm Clear		0.087	0.086		0.699		ARG		95		0.042							CL	CU-D	N,G	0.75	0.31	54	0.33	0.30	0.57	0.51	
Frame Grouping,	17	3 mm LoE <sup>2</sup> 272	3 mm Clear		0.117	0.123		0.639		ARG		95		0.042							CL	CU-D	N,G	0.75	0.31	54	0.33	0.30	0.57	0.50	
Frame Grouping,	18	2 mm LoE <sup>2</sup> 272	2 mm Clear	2 mm Clear	0.087	0.086	0.086	0.306	0.306	ARG	ARG	95	95	0.042							CL	CU-D	N		0.28	61	0.31		0.52		
Frame Grouping,	19	2 mm LoE <sup>2</sup> 272	2 mm Comfort Select 73		0.087	0.087		0.699		ARG		95		0.042	0.148						CL	CU-D	N,G	0.75	0.26	43	0.32	0.29	0.53	0.48	
Frame Grouping,	20	3 mm LoE <sup>2</sup> 272	3 mm Comfort Select 73		0.117	0.123		0.639		ARG		95		0.042	0.148						CL	CU-D	N,G	0.75	0.26	45	0.31	0.28	0.51	0.46	
Frame Grouping,	21	2 mm LoE <sup>2</sup> 272	2 mm Clear	2 mm LoE <sup>2</sup> 272	0.087	0.086	0.087	0.306	0.306	ARG	ARG	95	95	0.042			0.042				CL	CU-D	N		0.24	65	0.28		0.46		
Frame Grouping,	22	2 mm Comfort Select™ 63	2 mm Comfort Select 73		0.088	0.087		0.699		ARG		95		0.070	0.148						CL	CU-D	N,G	0.75	0.27	43	0.44	0.40	0.59	0.52	
Frame Grouping,	23	3 mm Comfort Select™ 63	3 mm Comfort Select 73		0.124	0.123		0.639		ARG		95		0.071	0.148						CL	CU-D	N,G	0.75	0.27	44	0.43	0.38	0.56	0.50	

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"
Frame Grouping, .1875" x .610" Rectangular Grid	24	2 mm Clear	2 mm Clear	2 mm Clear	0.086	0.086	0.086	0.306	0.306	AIR	AIR									CL	CU-D	G	0.75	0.38	53		0.52			0.54	
Frame Grouping, .1875" x .610" Rectangular Grid	25	2 mm Comfort Select 73	2 mm Clear	2 mm Clear	0.087	0.086	0.086	0.306	0.306	ARG	ARG	95	95	0.148						CL	CU-D	G	0.75	0.30	60		0.45			0.50	
Frame Grouping, .1875" x .610" Rectangular Grid	26	2 mm LoE <sup>3</sup> 366	2 mm Clear	2 mm Clear	0.087	0.086	0.086	0.306	0.306	ARG	ARG	95	95	0.022						CL	CU-D	G	0.75	0.28	62		0.19			0.42	
Frame Grouping, .1875" x .610" Rectangular Grid	27	2 mm LoE <sup>2</sup> 270	2 mm Clear	2 mm Clear	0.087	0.086	0.086	0.306	0.306	ARG	ARG	95	95	0.037						CL	CU-D	G	0.75	0.28	61		0.25			0.46	
Frame Grouping, .1875" x .610" Rectangular Grid	28	2 mm LoE <sup>2</sup> 270	2 mm Clear	2 mm LoE <sup>2</sup> 270	0.087	0.086	0.087	0.306	0.306	ARG	ARG	95	95	0.037				0.037		CL	CU-D	G	0.75	0.24	65		0.23			0.39	
Frame Grouping, .1875" x .610" Rectangular Grid	29	2 mm LoE <sup>2</sup> 272	2 mm Clear	2 mm Clear	0.087	0.086	0.086	0.306	0.306	ARG	ARG	95	95	0.042						CL	CU-D	G	0.75	0.29	61		0.28			0.47	
Frame Grouping, .1875" x .610" Rectangular Grid	30	2 mm LoE <sup>2</sup> 272	2 mm Clear	2 mm LoE <sup>2</sup> 272	0.087	0.086	0.087	0.306	0.306	ARG	ARG	95	95	0.042				0.042		CL	CU-D	G	0.75	0.24	65		0.26			0.41	
VALIDATION,	0	2 mm LoE <sup>2</sup> 270	2 mm Clear	2 mm LoE <sup>2</sup> 270	0.087	0.086	0.087	0.306	0.306	ARG	ARG	95	95	0.037				0.037		CL	CU-D	N		0.23	65	0.25		0.43			

A baseline product test in accordance with the "NFRC 102: Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems" is required in order to validate the "Model Size Matrix of U-Values" as previously indicated. Per Section 1.4.3 of ANSI/NFRC 100-2014, "the baseline product is the individual product selected for validation testing". **The individual product selected as the baseline product shall be the lowest simulated individual product or an individual product having a simulated U-factor within 0.60 W/ (m<sup>2</sup>\*K) (0.10 BTU/HR/ft<sup>2</sup>/°F) or 20% of the listed lowest simulated U-factor.**

**Note:**

1. For lowest U-factor listings where multiple individual products are shown, validation testing can be conducted on any within 20% of the lowest simulated u-factor.
2. Actual simulated individual products are required for product line validation testing.

-----> Res sizes

For the purposes of validation testing, production line units and sizes shall be used to represent the baseline product. Per the client, the model size is manufactured as part of their product line; therefore the previously listed model size can be used for baseline product validation testing.

-----> Deviation Sizes

For the purposes of validation testing, production line units and sizes shall be used to represent the baseline products. Representative sizes are therefore defined as the production sizes with the least deviation (D) from the model sizes, calculated per ANSI/NFRC 100. The previously listed model sizes shall be used for baseline product validation testing.

Copies of this report and the detailed product drawings will be retained by NCTL for a period of four (4) years. This report may not be reproduced, except in full, without the approval of NCTL. Results apply only to the fenestration product simulated. The attached diskette(s) contain(s) all required NFRC data and software files.

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