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Simulation Performance, Solar Heat Gain Coefficient, Visible Transmittance and Condensation Resistance Calculation Report

REPORT NO: NCTL-110-13729-01
SIMULATION DATE: 03/23/2011
REPORT DATE: 03/23/2011

Client: Remodelers Supply
2622 North Pulaski Road
Chicago, IL, 60639

Product Line: Remodelers Supply's 500 Vinyl Double Hung

Specification: NFRC 100-2010: "Procedure for Determining Fenestration Product U-Factors".
NFRC 200-2010: "Procedure for Determining Fenestration Product Solar Heat
Gain Coefficients and Visible Transmittance at Normal Incidence".
NFRC 500-2010: "Procedure for Determining Fenestration Product
Condensation Resistance Values".
Therm 5.x / Window 5.x NFRC Simulation Manual (Approved at test date)
Therm 6.x / Window 6.x NFRC Simulation Manual (Approved at test date)

**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
601-2010: "NFRC Unit and Measurement Policy".

PRODUCT LINE DESCRIPTION

General: The product line modeled is Remodelers Supply's 500 Vinyl Double Hung

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

Weatherseals:

Location	Weather Seal Description
Head	(2) single strips of weather-strip/(1) Bulb Seal
Bottom Jamb	(2) single strips of weather-strip
Meeting Stile	(3) single strips of weather-strip
Top Jamb	(2) single strips of weather-strip
Sill	(1) single strips of weather-strip/(2) Bulb Seal

Gas Fillings:

Gas Type	Filling Technique	Percentage
Argon	Double probe	95%

Reinforcement: steel contour reinforcement in the Meeting Rail and the Left Jamb.

Edge – of - Glass – Construction: Exterior Vinyl Glazing Bead and Interior silicone back bedding.

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: .1875” x .61” Painted Aluminum Rectangular.

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.

COG Group Leader: Determined by NFRC 100-2010 Section 4.2.4.1 (Only the Group Leader is shown).

Glazing ID	Glazing Description	U _{COG}
001	2mmClr_Air	0.485*
002	2mmE-PS#2_Air	0.343*
004	2mm366#2_Air	0.303*
005	2mm270#2_Air	0.308*
006	2mmTiAC-36#2_Air_E-PS#4	0.239*
007	2mmE-PS#2_Arg	0.298*
008	2mmTiAC-36#2_Arg	0.259*
009	2mm366#2_Arg	0.251*
011	2mmTiAC-36#2_Arg_E-PS#4	0.205*
023	2mmClr_Air_TG	0.354*
024	2mmE-PS#2_Air_TG	0.291*
027	2mm270#2_Air_TG	0.273*
029	2mmE-PS#2_Arg_TG	0.244*
030	2mmTiAC-36#2_Arg_TG	0.224*
031	2mm366#2_Arg_TG	0.218*
033	2mmTiAC-36#25_Arg_TG	0.169**

* 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:

Per the client the nail flange is removable.

Miscellaneous assumptions:

- 1. The screen extrusions were not modeled.*
- 2. All radii are simulated at angles.*
- 3. Any spacer simulated using a spacer system from the Frame Spacer Library match the required configurations for this manufacturer's spacer system.*
- 4. The modeling was performed in accordance with the manufacturer's assembly drawing from a DXF file.*

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 Cap Fill 1	% of Cap 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"	
	1	2.5mm CLEAR	2.5mm CLEAR		0.086	0.086		0.678		AIR											CL	CU-D	N,G	0.75	0.47	37	0.62	0.56	N/A	0.64	0.57	N/A
		3mm CLEAR	3mm CLEAR		0.123	0.123		0.639		AIR											CL	CU-D	N,G	0.75	0.47	37	0.61	0.54	N/A	0.63	0.56	N/A
	2	2mm Comfort E-PS	2.5mm CLEAR		0.087	0.086		0.678		AIR				0.148							CL	CU-D	N,G	0.75	0.36	42	0.53	0.47	N/A	0.59	0.53	N/A
		3mm Comfort E-PS	3mm CLEAR		0.123	0.123		0.639		AIR				0.148							CL	CU-D	N,G	0.75	0.36	42	0.50	0.45	N/A	0.57	0.51	N/A
	3	2.5mm CARD-366	2.5mm CLEAR		0.087	0.086		0.678		AIR				0.022							CL	CU-D	N,G	0.75	0.33	43	0.22	0.20	N/A	0.50	0.45	N/A
		3mm CARD-366	3mm CLEAR		0.117	0.123		0.639		AIR				0.022							CL	CU-D	N,G	0.75	0.33	43	0.22	0.19	N/A	0.50	0.44	N/A
	4	2.5mm CARD-270	2.5mm CLEAR		0.087	0.086		0.678		AIR				0.037							CL	CU-D	N,G	0.75	0.34	43	0.29	0.26	N/A	0.54	0.48	N/A
		2.5mm TIAC36	2.5mm CLEAR		0.087	0.086		0.678		AIR				0.034							CL	CU-D	N,G	0.75	0.34	43	0.28	0.26	N/A	0.53	0.47	N/A
		3mm TIAC36	3mm CLEAR		0.118	0.123		0.639		AIR				0.034							CL	CU-D	N,G	0.75	0.34	43	0.28	0.26	N/A	0.52	0.46	N/A
		3mm CARD-270	3mm CLEAR		0.118	0.123		0.639		AIR				0.037							CL	CU-D	N,G	0.75	0.34	43	0.29	0.26	N/A	0.54	0.48	N/A
	5	2.5mm TIAC36	2mm Comfort E-PS		0.087	0.087		0.678		AIR				0.034	0.148						CL	CU-D	N,G	0.75	0.28	36	0.27	0.24	N/A	0.49	0.44	N/A
		3mm TIAC36	3mm Comfort E-PS		0.118	0.123		0.639		AIR				0.034	0.148						CL	CU-D	N,G	0.75	0.28	36	0.27	0.24	N/A	0.47	0.42	N/A
	6	2mm Comfort E-PS	2.5mm CLEAR		0.087	0.086		0.678		ARG	95			0.148							CL	CU-D	N,G	0.75	0.33	44	0.53	0.47	N/A	0.59	0.53	N/A
		3mm Comfort E-PS	3mm CLEAR		0.123	0.123		0.639		ARG	95			0.148							CL	CU-D	N,G	0.75	0.33	44	0.50	0.45	N/A	0.57	0.51	N/A
	7	2.5mm TIAC36	2.5mm CLEAR		0.087	0.086		0.678		ARG	95			0.034							CL	CU-D	N,G	0.75	0.30	45	0.28	0.25	N/A	0.53	0.47	N/A
		2.5mm CARD-270	2.5mm CLEAR		0.087	0.086		0.678		ARG	95			0.037							CL	CU-D	N,G	0.75	0.30	45	0.29	0.26	N/A	0.54	0.48	N/A
		3mm TIAC36	3mm CLEAR		0.118	0.123		0.639		ARG	95			0.034							CL	CU-D	N,G	0.75	0.30	45	0.28	0.25	N/A	0.52	0.46	N/A
		3mm CARD-270	3mm CLEAR		0.118	0.123		0.639		ARG	95			0.037							CL	CU-D	N,G	0.75	0.30	45	0.29	0.26	N/A	0.54	0.48	N/A
	8	2.5mm CARD-366	2.5mm CLEAR		0.087	0.086		0.678		ARG	95			0.022							CL	CU-D	N,G	0.75	0.30	45	0.21	0.19	N/A	0.50	0.45	N/A
		3mm CARD-366	3mm CLEAR		0.117	0.123		0.639		ARG	95			0.022							CL	CU-D	N,G	0.75	0.30	45	0.21	0.19	N/A	0.50	0.44	N/A
	9	2.5mm TIAC36	2mm Comfort E-PS		0.087	0.087		0.678		ARG	95			0.034	0.148						CL	CU-D	N,G	0.75	0.26	37	0.27	0.24	N/A	0.49	0.44	N/A
		3mm TIAC36	3mm Comfort E-PS		0.118	0.123		0.639		ARG	95			0.034	0.148						CL	CU-D	N,G	0.75	0.26	37	0.26	0.24	N/A	0.47	0.42	N/A
	10	2.5mm CLEAR	2.5mm CLEAR	2.5mm CLEAR	0.086	0.086	0.086	0.309	0.309	AIR	AIR										CL	CU-D	N		0.37	51	0.56	N/A	N/A	0.58	N/A	N/A
	11	2mm Comfort E-PS	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	AIR	AIR				0.148						CL	CU-D	N		0.33	56	0.48	N/A	N/A	0.55	N/A	N/A
	12	2.5mm CARD-270	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	AIR	AIR				0.037						CL	CU-D	N		0.31	57	0.27	N/A	N/A	0.50	N/A	N/A
		2.5mm TIAC36	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	AIR	AIR				0.034						CL	CU-D	N		0.31	57	0.27	N/A	N/A	0.48	N/A	N/A
		2.5mm CARD-366	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	AIR	AIR				0.022						CL	CU-D	N		0.31	57	0.20	N/A	N/A	0.46	N/A	N/A

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 Cap Fill 1	% of Cap 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"	
	13	2mm Comfort E-PS	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	ARG	ARG	95	95		0.148						CL	CU-D	N		0.29	58	0.48	N/A	N/A	0.55	N/A	N/A
	14	2.5mm TIAC36	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	ARG	ARG	95	95		0.034						CL	CU-D	N		0.28	60	0.27	N/A	N/A	0.48	N/A	N/A
		2.5mm CARD-270	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	ARG	ARG	95	95		0.037						CL	CU-D	N		0.28	60	0.27	N/A	N/A	0.50	N/A	N/A
	15	2.5mm CARD-366	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	ARG	ARG	95	95		0.022						CL	CU-D	N		0.28	60	0.20	N/A	N/A	0.46	N/A	N/A
	16	2.5mm TIAC36	2.5mm CLEAR	2.5mm TIAC36	0.087	0.086	0.087	0.309	0.309	ARG	ARG	95	95		0.034		0.034				CL	CU-D	N		0.24	63	0.24	N/A	N/A	0.40	N/A	N/A
Rect	17	2.5mm CLEAR	2.5mm CLEAR	2.5mm CLEAR	0.086	0.086	0.086	0.309	0.309	AIR	AIR										CL	CU-D	G	0.75	0.38	51	N/A	0.51	N/A	N/A	0.52	N/A
Rect	18	2mm Comfort E-PS	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	AIR	AIR				0.148						CL	CU-D	G	0.75	0.33	56	N/A	0.43	N/A	N/A	0.49	N/A
Rect	19	2.5mm CARD-270	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	AIR	AIR				0.037						CL	CU-D	G	0.75	0.32	57	N/A	0.25	N/A	N/A	0.44	N/A
Rect		2.5mm TIAC36	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	AIR	AIR				0.034						CL	CU-D	G	0.75	0.32	57	N/A	0.24	N/A	N/A	0.43	N/A
Rect		2.5mm CARD-366	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	AIR	AIR				0.022						CL	CU-D	G	0.75	0.32	57	N/A	0.19	N/A	N/A	0.41	N/A
Rect	20	2mm Comfort E-PS	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	ARG	ARG	95	95		0.148						CL	CU-D	G	0.75	0.30	58	N/A	0.43	N/A	N/A	0.49	N/A
Rect	21	2.5mm TIAC36	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	ARG	ARG	95	95		0.034						CL	CU-D	G	0.75	0.29	60	N/A	0.24	N/A	N/A	0.43	N/A
Rect		2.5mm CARD-270	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	ARG	ARG	95	95		0.037						CL	CU-D	G	0.75	0.29	60	N/A	0.24	N/A	N/A	0.44	N/A
Rect	22	2.5mm CARD-366	2.5mm CLEAR	2.5mm CLEAR	0.087	0.086	0.086	0.309	0.309	ARG	ARG	95	95		0.022						CL	CU-D	G	0.75	0.29	60	N/A	0.18	N/A	N/A	0.41	N/A
Rect	23	2.5mm TIAC36	2.5mm CLEAR	2.5mm TIAC36	0.087	0.086	0.087	0.309	0.309	ARG	ARG	95	95		0.034		0.034				CL	CU-D	G	0.75	0.24	63	N/A	0.22	N/A	N/A	0.36	N/A

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 NFRC 100-2010, "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/(m²*K) (0.10 BTU/HR/ft²/°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 of the configurations listed.
2. Actual simulated individual products are required for product line validation testing.
3. All individual products in the product line were simulated using the approved NFRC THERM program.

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.

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. The results only to the fenestration product simulated. The attached diskette(s) contain(s) all required NFRC data and software files.

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Attachments

Remodelers Supply

NCTL-110-13729-01

Report Log

Product Line: *Remodelers Supply's 500 Vinyl Double Hung*

Date:
03/23/2011 - *Original Report issued to Remodelers Supply and Inspection Agency*