



Crystal Window & Door

*SIMULATION PERFORMANCE &
SOLAR HEAT GAIN REPORT*

*"5500"
Double Hung*

NCTL-110-12505-01A



NATIONAL CERTIFIED TESTING LABORATORIES

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

REPORT NO: NCTL-110-12505-01A
SIMULATION DATE: 11/12/09
REPORT DATE: 11/12/09
REVISION DATE: 02/18/10

Client: Crystal Window & Door
31-10 Whitestone Expressway
Flushing, NY 11354

Product Line: Crystal Window & Door's 5500 Double Hung

Specification: NFRC 100-2004: "Procedure for Determining Fenestration Product U-Factors".
NFRC 200-2004: "Procedure for Determining Fenestration Product Solar Heat
Gain Coefficients and Visible Transmittance at Normal Incidence".
NFRC 500-2004: "Procedure for Determining Fenestration Product
Condensation Resistance Values".
Therm 5.x / Window 5.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
IEEE/ASTM SI 10-1997 except section 5.4.1.3.

PRODUCT LINE DESCRIPTION

General: The product line modeled is Crystal Window & Door's 5500 Double Hung.

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

Weatherseals:

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

Gas Fillings:

Gas Type	Filling Technique	Percentage
Krypton	Single probe	90%
Argon	Single probe	90%

Reinforcement: Not applicable.

Edge – of - Glass – Construction: Channel Glazing Bead.

Spacer and Sealant: Coated Steel U-Shaped with Butyl Primary and Secondary Seal.

Finish: Painted Aluminum

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: Individual products which differ from another (base) individual product in glazing tint and/or obscenity (including obscure glass, fritted glass, and wired glass) only may be assumed to have the same U-factor as the base product unless this change is associated with a change in coating properties.

COG Group Leader:

Glazing ID	Glazing Description	U _{COG}
001	S500#3_Air_3mm	0.356*
025	Clr_5m_Air_S500#3_3m	0.360*
007	S500#3_Air_5mm	0.354*
003	SB60#3_Air_3mm	0.312*
005	SB70#3_Air_3mm	0.306*
033	Clr_6m_Air_SB60#3_3m	0.302*
035	Clr_6m_Air_SB70#3_3m	0.297*
002	S500#3_Arg_3mm	0.326*
026	Clr_5m_Arg_S500#3_3m	0.321*
008	S500#3_Arg_5mm	0.316*
004	SB60#3_Arg_3mm	0.263*
028	Clr_5m_Arg_SB60#3_3m	0.258*
010	SB60#3_Arg_5mm	0.252*
036	Clr_6m_Arg_SB70#3_3m	0.249*

* 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.

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: CU_HD2_003.THM	
CU	Spacer (Intercept)
HD	Frame Section (Head)
2	Glass Size (2.5mm)
_003	Glazing ID #3

Individual Product Descriptions and Model Size Matrix of U-Factors, SHGC, VT & CR*All U-factors are given in BTU/HR/ft²/°F*

Product Description	Product Number	Pane ID 1	Pane ID 2	Pane Thickness 1	Pane Thickness 2	Gap	Gap Fill	% of Gap Fill	Emissivity Surface 2	Emissivity Surface 3	Tint	Spacer	Grid Type	U-factor	Condensation Resistance	Solar Heat Gain Coefficient (ND)	Visual Transmittance (ND)
S500#3_Air_3mm	001	5242	5009	0.118	0.118	0.764	AIR			0.215	LE	CU-D	N	0.57	32	0.53	0.55
S500#2_Air_3mm		5242	5009	0.118	0.118	0.764	AIR		0.215		LE	CU-D	N	0.57	32	0.49	0.55
Clr_5m_Air_S500#3_3m	002	5011	5242	0.197	0.118	0.685	AIR			0.215	LE	CU-D	N	0.56	32	0.51	0.54
S500#2_5m_Air_Clr_3m		5246	5099	0.197	0.118	0.685	AIR		0.215		LE	CU-D	N	0.56	32	0.47	0.54
Clr_6m_Air_S500#3_3m		5012	5242	0.236	0.118	0.646	AIR			0.215	LE	CU-D	N	0.56	32	0.50	0.54
S500#2_6m_Air_Clr_3m		5248	5009	0.236	0.118	0.646	AIR		0.215		LE	CU-D	N	0.56	32	0.46	0.54
S500#3_Air_5mm	003	5246	5011	0.197	0.197	0.606	AIR			0.215	LE	CU-D	N	0.56	32	0.50	0.54
S500#2_Air_5mm		5246	5011	0.197	0.197	0.606	AIR		0.215		LE	CU-D	N	0.56	32	0.47	0.54
SB60#3_Air_3mm	004	5281	5009	0.118	0.118	0.764	AIR			0.035	LE	CU-D	N	0.53	32	0.35	0.52
SB60#2_Air_3mm		5281	5009	0.118	0.118	0.764	AIR		0.035		LE	CU-D	N	0.53	32	0.29	0.52
SB70#3_Air_3mm	005	5432	5009	0.118	0.118	0.764	AIR			0.018	LE	CU-D	N	0.53	32	0.29	0.46
SB70#2_Air_3mm		5432	5009	0.118	0.118	0.764	AIR		0.018		LE	CU-D	N	0.53	32	0.21	0.46
Clr_5m_Air_SB60#3_3m		5011	5281	0.197	0.118	0.685	AIR			0.035	LE	CU-D	N	0.53	32	0.34	0.52
SB60#2_5m_Air_Clr_3m		5282	5009	0.197	0.118	0.685	AIR		0.035		LE	CU-D	N	0.53	32	0.29	0.52
Clr_6m_Air_SB60#3_3m	006	5012	5281	0.236	0.118	0.646	AIR			0.035	LE	CU-D	N	0.53	32	0.34	0.51
SB60#2_6m_Air_Clr_3m		5284	5009	0.236	0.118	0.646	AIR		0.035		LE	CU-D	N	0.53	32	0.29	0.51
Clr_5m_Air_SB70#3_3m		5011	5432	0.197	0.118	0.685	AIR			0.018	LE	CU-D	N	0.53	32	0.28	0.46
SB70#2_5m_Air_Clr_3m		5434	5009	0.197	0.118	0.685	AIR		0.018		LE	CU-D	N	0.53	32	0.21	0.46
SB60#3_Air_5mm		5282	5011	0.197	0.197	0.606	AIR			0.035	LE	CU-D	N	0.53	32	0.34	0.51
SB60#2_Air_5mm		5282	5011	0.197	0.197	0.606	AIR		0.035		LE	CU-D	N	0.53	32	0.29	0.51
Clr_6m_Air_SB70#3_3m	007	5012	5432	0.236	0.118	0.646	AIR			0.018	LE	CU-D	N	0.52	32	0.28	0.46
SB70#2_6m_Air_Clr_3m		5439	5009	0.236	0.118	0.646	AIR		0.018		LE	CU-D	N	0.52	32	0.21	0.47

Product Description	Product Number	Pane ID 1	Pane ID 2	Pane Thickness 1	Pane Thickness 2	Gap	Gap Fill	% of Gap Fill	Emissivity Surface 2	Emissivity Surface 3	Tint	Spacer	Grid Type	U-factor	Condensation Resistance	Solar Heat Gain Coefficient (ND)	Visual Transmittance (ND)
SB70#3_Air_5mm		5434	5011	0.197	0.197	0.606	AIR			0.018	LE	CU-D	N	0.52	32	0.28	0.46
SB70#2_Air_5mm		5434	5011	0.197	0.197	0.606	AIR		0.018		LE	CU-D	N	0.52	32	0.21	0.46
S500#3_Arg_3mm	008	5424	5009	0.118	0.118	0.764	ARG	90		0.215	LE	CU-D	N	0.54	32	0.53	0.55
S500#2_Arg_3mm		5424	5009	0.118	0.118	0.764	ARG	90	0.215		LE	CU-D	N	0.54	32	0.49	0.55
Clr_5m_Arg_S500#3_3m	009	5011	5424	0.197	0.118	0.685	ARG	90		0.215	LE	CU-D	N	0.54	32	0.51	0.54
S500#2_5m_Arg_Clr_3m		5246	5009	0.197	0.118	0.685	ARG	90	0.215		LE	CU-D	N	0.54	32	0.47	0.54
Clr_6m_Arg_S500#3_3m		5012	5242	0.236	0.118	0.646	ARG	90		0.215	LE	CU-D	N	0.54	32	0.50	0.54
S500#2_6m_Arg_Clr_3m		5248	5009	0.236	0.118	0.646	ARG	90	0.215		LE	CU-D	N	0.54	32	0.46	0.54
S500#3_Arg_5mm	010	5246	5011	0.197	0.197	0.606	ARG	90		0.215	LE	CU-D	N	0.54	32	0.51	0.54
S500#2_Arg_5mm		5246	5011	0.197	0.197	0.606	ARG	90	0.215		LE	CU-D	N	0.54	32	0.47	0.54
SB60#3_Arg_3mm	011	5281	5009	0.118	0.118	0.764	ARG	90		0.035	LE	CU-D	N	0.50	32	0.35	0.52
SB60#2_Arg_3mm		5281	5009	0.118	0.118	0.764	ARG	90	0.035		LE	CU-D	N	0.50	32	0.29	0.52
Clr_5m_Arg_SB60#3_3m	012	5011	5281	0.197	0.118	0.685	ARG	90		0.035	LE	CU-D	N	0.50	32	0.35	0.52
SB60#2_5m_Arg_Clr_3m		5282	5009	0.197	0.118	0.685	ARG	90	0.035		LE	CU-D	N	0.50	32	0.29	0.52
SB70#3_Arg_3mm		5432	5009	0.118	0.118	0.764	ARG	90		0.018	LE	CU-D	N	0.50	32	0.29	0.46
SB70#2_Arg_3mm		5432	5009	0.118	0.118	0.764	ARG	90	0.018		LE	CU-D	N	0.50	32	0.21	0.46
SB60#2_6m_Arg_Clr_3m		5284	5009	0.236	0.118	0.646	ARG	90	0.035		LE	CU-D	N	0.50	32	0.29	0.51
Clr_6m_Arg_SB60#3_3m		5012	5281	0.236	0.118	0.646	ARG	90		0.035	LE	CU-D	N	0.50	32	0.34	0.51
SB60#3_Arg_5mm	013	5282	5011	0.197	0.197	0.606	ARG	90		0.035	LE	CU-D	N	0.49	33	0.34	0.51
SB60#2_Arg_5mm		5282	5011	0.197	0.197	0.606	ARG	90	0.035		LE	CU-D	N	0.49	33	0.29	0.51
Clr_5m_Arg_SB70#3_3m		5011	5432	0.197	0.118	0.685	ARG	90		0.018	LE	CU-D	N	0.49	33	0.29	0.46
SB70#2_5m_Arg_Clr_3m		5434	5009	0.197	0.118	0.685	ARG	90	0.018		LE	CU-D	N	0.49	33	0.21	0.46
Clr_6m_Arg_SB70#3_3m	014	5012	5432	0.236	0.118	0.646	ARG	90		0.018	LE	CU-D	N	0.49	32	0.28	0.46
SB70#2_6m_Arg_Clr_3m		5439	5009	0.236	0.118	0.646	ARG	90	0.018		LE	CU-D	N	0.49	32	0.21	0.47
SB70#3_Arg_5mm		5434	5011	0.197	0.197	0.606	ARG	90		0.018	LE	CU-D	N	0.49	32	0.29	0.46

Product Description		Product Number		Pane ID 1	Pane ID 2	Pane Thickness 1	Pane Thickness 2	Gap	Gap Fill	% of Gap Fill	Emissivity Surface 2	Emissivity Surface 3	Tint	Spacer	Grid Type	U-factor	Condensation Resistance	Solar Heat Gain Coefficient (ND)	Visual Transmittance (ND)
SB70#2_Arg_5mm			5434	5011	0.197	0.197	0.197	0.606	ARG	90	0.018		LE	CU-D	N	0.49	32	0.21	0.46

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	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"
	48	5mm SB70XL	5mm CLEAR		0.184	0.184		0.606		ARG		90			0.018					CU	N		0.49	33		0.21	0.19	0.17	0.46	0.40	0.36
	49	6mm SG500	6mm CLEAR		0.223	0.223		0.528		AIR					0.215					CU	N		0.56	33		0.46	0.41	0.37	0.53	0.47	0.42
	50	6mm SG500	6mm CLEAR		0.223	0.223		0.528		ARG		90			0.215					CU	N		0.53	33		0.46	0.41	0.37	0.53	0.47	0.42
	51	6mm SB60	6mm CLEAR		0.223	0.223		0.528		AIR					0.035					CU	N		0.52	33		0.29	0.26	0.23	0.51	0.45	0.40
	52	6mm SB60	6mm CLEAR		0.223	0.223		0.528		ARG		90			0.035					CU	N		0.49	33		0.29	0.26	0.23	0.51	0.45	0.40
	53	5mm CLEAR	3mm SG500		0.184	0.129		0.685		AIR					0.215					CU	N		0.56	32		0.51	0.45	0.40	0.54	0.48	0.42
	54	5mm CLEAR	3mm SG500		0.184	0.129		0.685		ARG		90			0.215					CU	N		0.54	32		0.51	0.45	0.41	0.54	0.48	0.42
	55	5mm CLEAR	3mm SB60		0.184	0.129		0.685		AIR					0.035					CU	N		0.53	32		0.34	0.31	0.28	0.52	0.46	0.40
	56	5mm CLEAR	3mm SB60		0.184	0.129		0.685		ARG		90			0.035					CU	N		0.50	32		0.35	0.31	0.28	0.52	0.46	0.40
	57	5mm CLEAR	3mm SB70XL		0.184	0.129		0.685		AIR					0.018					CU	N		0.52	32		0.28	0.26	0.23	0.46	0.41	0.36
	58	5mm CLEAR	3mm SB70XL		0.184	0.129		0.685		ARG		90			0.018					CU	N		0.49	32		0.29	0.26	0.23	0.46	0.41	0.36
	59	6mm CLEAR	3mm SG500		0.223	0.129		0.646		AIR					0.215					CU	N		0.56	32		0.49	0.44	0.39	0.54	0.48	0.42
	60	6mm CLEAR	3mm SG500		0.223	0.129		0.646		ARG		90			0.215					CU	N		0.54	32		0.50	0.44	0.40	0.54	0.48	0.42
	61	6mm CLEAR	3mm SB60		0.223	0.129		0.646		AIR					0.035					CU	N		0.53	32		0.34	0.31	0.27	0.51	0.46	0.40
	62	6mm CLEAR	3mm SB60		0.223	0.129		0.646		ARG		90			0.035					CU	N		0.49	32		0.34	0.31	0.27	0.51	0.46	0.40
	63	6mm CLEAR	3mm SB70XL		0.223	0.129		0.646		AIR					0.018					CU	N		0.52	32		0.28	0.25	0.23	0.46	0.40	0.36
	64	6mm CLEAR	3mm SB70XL		0.223	0.129		0.646		ARG		90			0.018					CU	N		0.49	32		0.28	0.26	0.23	0.46	0.40	0.36

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	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"
	65	5mm SG500	3mm CLEAR		0.184	0.129		0.685		AIR				0.215						CU	N		0.56	32		0.47	0.42	0.38	0.54	0.48	0.42
	66	5mm SG500	3mm CLEAR		0.184	0.129		0.685		ARG		90		0.215						CU	N		0.54	32		0.47	0.42	0.38	0.54	0.48	0.42
	67	5mm SB60	3mm CLEAR		0.184	0.129		0.685		AIR				0.035						CU	N		0.53	32		0.29	0.26	0.24	0.52	0.46	0.40
	68	5mm SB60	3mm CLEAR		0.184	0.129		0.685		ARG		90		0.035						CU	N		0.50	32		0.29	0.26	0.23	0.52	0.46	0.40
	69	5mm SB70XL	3mm CLEAR		0.184	0.129		0.685		AIR				0.018						CU	N		0.52	32		0.21	0.19	0.17	0.46	0.41	0.36
	70	5mm SB70XL	3mm CLEAR		0.184	0.129		0.685		ARG		90		0.018						CU	N		0.49	32		0.21	0.19	0.17	0.46	0.41	0.36
	71	6mm SG500	3mm CLEAR		0.223	0.129		0.646		AIR				0.215						CU	N		0.56	32		0.46	0.42	0.37	0.54	0.48	0.42
	72	6mm SG500	3mm CLEAR		0.223	0.129		0.646		ARG		90		0.215						CU	N		0.54	32		0.46	0.41	0.37	0.54	0.48	0.42
	73	6mm SB60	3mm CLEAR		0.223	0.129		0.646		AIR				0.035						CU	N		0.53	32		0.29	0.26	0.23	0.51	0.46	0.40
	74	6mm SB60	3mm CLEAR		0.223	0.129		0.646		ARG		90		0.035						CU	N		0.49	32		0.29	0.26	0.23	0.51	0.46	0.40
	75	5mm SB60	5mm SG500		0.184	0.184		0.606		ARG		90		0.035			0.215			CU	N		0.46	33		0.27	0.25	0.22	0.48	0.42	0.37
	76	3mm SB60	3mm SG500		0.129	0.129		0.764		ARG		90		0.035			0.215			CU	N		0.46	32		0.28	0.25	0.23	0.48	0.43	0.38
	77	5mm SB70XL	5mm SG500		0.184	0.184		0.606		ARG		90		0.018			0.215			CU	N		0.45	33		0.20	0.18	0.16	0.42	0.38	0.33
	78	3mm SB70XL	3mm SG500		0.129	0.129		0.764		ARG		90		0.018			0.215			CU	N		0.46	32		0.20	0.18	0.16	0.43	0.38	0.34
	79	5mm SB70XL	5mm E-PS		0.184	0.185		0.606		ARG		90		0.018			0.148			CU	N		0.45	32		0.20	0.18	0.16	0.42	0.37	0.33
	80	3mm SB70XL	3mm E-PS		0.129	0.123		0.764		ARG		90		0.018			0.148			CU	N		0.45	32		0.20	0.18	0.16	0.42	0.37	0.33

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	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"	
	81	5mm SB70XL	5mm SG500		0.184	0.184		0.606		KRY		90			0.018		0.215			CU	N		0.45	33		0.20	0.18	0.16	0.42	0.38	0.33
	82	3mm SB70XL	3mm SG500		0.129	0.129		0.764		KRY		90			0.018		0.215			CU	N		0.45	32		0.20	0.18	0.16	0.43	0.38	0.34
	83	5mm CLEAR	5mm SB60	5mm SB60	0.184	0.184	0.184	0.205	0.205	ARG	ARG	90	90			0.035		0.035		CU	N		0.47	34		0.28	0.25	0.23	0.41	0.36	0.32
	84	3mm CLEAR	3mm SB60	3mm SB60	0.129	0.129	0.129	0.323	0.323	ARG	ARG	90	90			0.035		0.035		CU	N		0.43	34		0.29	0.26	0.23	0.42	0.37	0.33
	85	5mm CLEAR	5mm SB70XL	5mm SB70XL	0.184	0.184	0.184	0.205	0.205	ARG	ARG	90	90			0.018		0.018		CU	N		0.47	34		0.22	0.20	0.18	0.32	0.29	0.25
	86	3mm CLEAR	3mm SB70XL	3mm SB70XL	0.129	0.129	0.129	0.323	0.323	ARG	ARG	90	90			0.018		0.018		CU	N		0.42	34		0.23	0.20	0.18	0.33	0.29	0.26
	87	5mm SB60	5mm CLEAR	5mm SB60	0.184	0.184	0.184	0.205	0.205	ARG	ARG	90	90			0.035		0.035		CU	N		0.47	34		0.25	0.23	0.20	0.41	0.36	0.32
	88	3mm SB60	3mm CLEAR	3mm SB60	0.129	0.129	0.129	0.323	0.323	ARG	ARG	90	90			0.035		0.035		CU	N		0.43	34		0.25	0.23	0.21	0.42	0.37	0.33
	89	5mm SB70XL	5mm CLEAR	5mm SB70XL	0.184	0.184	0.184	0.205	0.205	ARG	ARG	90	90			0.018		0.018		CU	N		0.47	34		0.19	0.17	0.15	0.32	0.29	0.25
	90	3mm SB70XL	3mm CLEAR	3mm SB70XL	0.129	0.129	0.129	0.323	0.323	ARG	ARG	90	90			0.018		0.018		CU	N		0.42	34		0.18	0.17	0.15	0.33	0.29	0.26
	91	3mm SB70XL	3mm SB70XL	3mm SG500	0.129	0.129	0.129	0.323	0.323	ARG	ARG	90	90			0.018		0.018		CU	N		0.41	33		0.16	0.15	0.13	0.31	0.27	0.24
	92	3mm SB70XL	3mm SB70XL	3mm SG500	0.129	0.129	0.129	0.323	0.323	KRY	KRY	90	90			0.018		0.018		CU	N		0.38	34		0.16	0.14	0.13	0.31	0.27	0.24
	93	3mm CLEAR	3mm CLEAR		0.129	0.129		0.764		AIR										P1	N		0.64	33		0.56	0.50	0.45	0.59	0.52	0.46
	94	3mm CLEAR	3mm CLEAR		0.129	0.129		0.764		ARG		90								P1	N		0.62	33		0.56	0.50	0.45	0.59	0.52	0.46
	95	3mm CLEAR	3mm SG500		0.129	0.129		0.764		AIR						0.215				P1	N		0.55	34		0.52	0.47	0.42	0.55	0.48	0.43
	96	3mm CLEAR	3mm SG500		0.129	0.129		0.764		ARG		90				0.215				P1	N		0.52	34		0.53	0.47	0.42	0.55	0.48	0.43
	97	3mm CLEAR	3mm SB60		0.129	0.129		0.764		AIR						0.035				P1	N		0.52	34		0.35	0.32	0.28	0.52	0.46	0.41

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	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"
	98	3mm CLEAR	3mm SB60		0.129	0.129		0.764		ARG		90				0.035				P1	N		0.48	34	0.35	0.32	0.28	0.52	0.46	0.41
	99	3mm CLEAR	3mm SB70XL		0.129	0.129		0.764		AIR						0.018				P1	N		0.51	34	0.29	0.26	0.23	0.46	0.41	0.36
	100	3mm CLEAR	3mm SB70XL		0.129	0.129		0.764		ARG		90				0.018				P1	N		0.48	34	0.29	0.26	0.23	0.46	0.41	0.36
	101	5mm CLEAR	5mm CLEAR		0.184	0.184		0.606		AIR										P1	N		0.63	33	0.54	0.48	0.43	0.58	0.51	0.45
	102	5mm CLEAR	5mm CLEAR		0.184	0.184		0.606		ARG		90								P1	N		0.61	34	0.54	0.48	0.43	0.58	0.51	0.45
	103	5mm CLEAR	5mm SG500		0.184	0.184		0.606		AIR						0.215				P1	N		0.55	34	0.50	0.45	0.40	0.54	0.48	0.42
	104	5mm CLEAR	5mm SG500		0.184	0.184		0.606		ARG		90				0.215				P1	N		0.52	34	0.50	0.45	0.40	0.54	0.48	0.42
	105	5mm CLEAR	5mm SB60		0.184	0.184		0.606		AIR						0.035				P1	N		0.51	34	0.34	0.31	0.28	0.51	0.46	0.40
	106	5mm CLEAR	5mm SB60		0.184	0.184		0.606		ARG		90				0.035				P1	N		0.48	34	0.34	0.31	0.28	0.51	0.46	0.40
	107	5mm CLEAR	5mm SB70XL		0.184	0.184		0.606		AIR						0.018				P1	N		0.50	34	0.28	0.26	0.23	0.46	0.40	0.36
	108	5mm CLEAR	5mm SB70XL		0.184	0.184		0.606		ARG		90				0.018				P1	N		0.47	35	0.28	0.26	0.23	0.46	0.40	0.36
	109	6mm CLEAR	6mm CLEAR		0.223	0.223		0.528		AIR										P1	N		0.63	33	0.52	0.47	0.41	0.57	0.51	0.45
	110	6mm CLEAR	6mm CLEAR		0.223	0.223		0.528		ARG		90								P1	N		0.61	34	0.52	0.47	0.42	0.57	0.51	0.45
	111	6mm CLEAR	6mm SG500		0.223	0.223		0.528		AIR						0.215				P1	N		0.54	34	0.49	0.44	0.39	0.53	0.47	0.42
	112	6mm CLEAR	6mm SG500		0.223	0.223		0.528		ARG		90				0.215				P1	N		0.52	34	0.49	0.44	0.39	0.53	0.47	0.42
	113	6mm CLEAR	6mm SB60		0.223	0.223		0.528		AIR						0.035				P1	N		0.51	34	0.34	0.30	0.27	0.51	0.45	0.40

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	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"
	114	6mm CLEAR	6mm SB60		0.223	0.223		0.528		ARG		90				0.035				P1	N		0.47	34		0.34	0.31	0.27	0.51	0.45	0.40
	115	3mm SG500	3mm CLEAR		0.129	0.129		0.764		AIR					0.215					P1	N		0.55	34		0.49	0.44	0.39	0.55	0.48	0.43
	116	3mm SG500	3mm CLEAR		0.129	0.129		0.764		ARG		90			0.215					P1	N		0.52	34		0.49	0.44	0.39	0.55	0.48	0.43
	117	3mm SB60	3mm CLEAR		0.129	0.129		0.764		AIR					0.035					P1	N		0.52	34		0.29	0.26	0.24	0.52	0.46	0.41
	118	3mm SB60	3mm CLEAR		0.129	0.129		0.764		ARG		90			0.035					P1	N		0.48	35		0.29	0.26	0.24	0.52	0.46	0.41
	119	3mm SB70XL	3mm CLEAR		0.129	0.129		0.764		AIR					0.018					P1	N		0.51	34		0.21	0.19	0.17	0.46	0.41	0.36
	120	3mm SB70XL	3mm CLEAR		0.129	0.129		0.764		ARG		90			0.018					P1	N		0.48	35		0.21	0.19	0.17	0.46	0.41	0.36
	121	5mm SG500	5mm CLEAR		0.184	0.184		0.606		AIR					0.215					P1	N		0.55	34		0.47	0.42	0.38	0.54	0.48	0.42
	122	5mm SG500	5mm CLEAR		0.184	0.184		0.606		ARG		90			0.215					P1	N		0.52	34		0.47	0.42	0.38	0.54	0.48	0.42
	123	5mm SB60	5mm CLEAR		0.184	0.184		0.606		AIR					0.035					P1	N		0.51	34		0.29	0.26	0.23	0.51	0.46	0.40
	124	5mm SB60	5mm CLEAR		0.184	0.184		0.606		ARG		90			0.035					P1	N		0.48	35		0.29	0.26	0.23	0.51	0.46	0.40
	125	5mm SB70XL	5mm CLEAR		0.184	0.184		0.606		AIR					0.018					P1	N		0.50	34		0.21	0.19	0.17	0.46	0.40	0.36
	126	5mm SB70XL	5mm CLEAR		0.184	0.184		0.606		ARG		90			0.018					P1	N		0.47	35		0.21	0.19	0.17	0.46	0.40	0.36
	127	6mm SG500	6mm CLEAR		0.223	0.223		0.528		AIR					0.215					P1	N		0.54	34		0.46	0.41	0.37	0.53	0.47	0.42
	128	6mm SG500	6mm CLEAR		0.223	0.223		0.528		ARG		90			0.215					P1	N		0.52	34		0.46	0.41	0.37	0.53	0.47	0.42
	129	6mm SB60	6mm CLEAR		0.223	0.223		0.528		AIR					0.035					P1	N		0.51	34		0.29	0.26	0.23	0.51	0.45	0.40
	130	6mm SB60	6mm CLEAR		0.223	0.223		0.528		ARG		90			0.035					P1	N		0.47	35		0.29	0.26	0.23	0.51	0.45	0.40

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	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"
	131	5mm CLEAR	3mm SG500		0.184	0.129		0.685		AIR						0.215				P1	N		0.55	34	0.51	0.45	0.40	0.54	0.48	0.42
	132	5mm CLEAR	3mm SG500		0.184	0.129		0.685		ARG		90				0.215				P1	N		0.52	34	0.51	0.45	0.41	0.54	0.48	0.42
	133	5mm CLEAR	3mm SB60		0.184	0.129		0.685		AIR						0.035				P1	N		0.51	34	0.34	0.31	0.28	0.52	0.46	0.40
	134	5mm CLEAR	3mm SB60		0.184	0.129		0.685		ARG		90				0.035				P1	N		0.48	34	0.35	0.31	0.28	0.52	0.46	0.40
	135	5mm CLEAR	3mm SB70XL		0.184	0.129		0.685		AIR						0.018				P1	N		0.51	34	0.28	0.26	0.23	0.46	0.41	0.36
	136	5mm CLEAR	3mm SB70XL		0.184	0.129		0.685		ARG		90				0.018				P1	N		0.48	34	0.29	0.26	0.23	0.46	0.41	0.36
	137	6mm CLEAR	3mm SG500		0.223	0.129		0.646		AIR						0.215				P1	N		0.55	33	0.49	0.44	0.39	0.54	0.48	0.42
	138	6mm CLEAR	3mm SG500		0.223	0.129		0.646		ARG		90				0.215				P1	N		0.52	34	0.50	0.44	0.40	0.54	0.48	0.42
	139	6mm CLEAR	3mm SB60		0.223	0.129		0.646		AIR						0.035				P1	N		0.51	34	0.34	0.31	0.27	0.51	0.46	0.40
	140	6mm CLEAR	3mm SB60		0.223	0.129		0.646		ARG		90				0.035				P1	N		0.48	34	0.34	0.31	0.27	0.51	0.46	0.40
	141	6mm CLEAR	3mm SB70XL		0.223	0.129		0.646		AIR						0.018				P1	N		0.51	34	0.28	0.25	0.23	0.46	0.40	0.36
	142	6mm CLEAR	3mm SB70XL		0.223	0.129		0.646		ARG		90				0.018				P1	N		0.48	34	0.28	0.26	0.23	0.46	0.40	0.36
	143	5mm SG500	3mm CLEAR		0.184	0.129		0.685		AIR						0.215				P1	N		0.55	34	0.47	0.42	0.38	0.54	0.48	0.42
	144	5mm SG500	3mm CLEAR		0.184	0.129		0.685		ARG		90				0.215				P1	N		0.52	34	0.47	0.42	0.38	0.54	0.48	0.42
	145	5mm SB60	3mm CLEAR		0.184	0.129		0.685		AIR						0.035				P1	N		0.51	34	0.29	0.26	0.24	0.52	0.46	0.40
	146	5mm SB60	3mm CLEAR		0.184	0.129		0.685		ARG		90				0.035				P1	N		0.48	34	0.29	0.26	0.23	0.52	0.46	0.40

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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 100-2004, "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.

NATIONAL CERTIFIED TESTING LABORATORIES

Zachary Mundorff
DIGITAL SIGNATURE

Zachary Mundorff
Simulator

Steven H. Coble
DIGITAL SIGNATURE

STEVEN H. COBLE
NFRC Accredited Simulator
Simulator-In-Responsible-Charge

Report Log

Product Line: *Crystal Window & Door's 5500 Double Hung*

Date:

11/12/09 *- Original Report issued to Crystal Window & Door.*

02/18/10 *Additional Glazing Option added.*

NFRC CODES

Door	
Code	Description
EM	Embossed
FL	Flush
LF	Full Lite
LH	1/2 - Lite
LQ	1/4 - Lite
LT	3/4 - Lite
N	Not Applicable
RP	Raised Panel

Grid	
Code	Description
G	Grids between the glass
N	No Muntins
S	Simulated Divided Lites
T	True Muntins

Sealant	
Code	Description
D	Dual Seal Spacer System
N	Not Applicable
S	Single Seal Spacer System

Gap Fill	
Code	Description
AIR	Air
AR3	Argon/Krypton/Air Mixture
ARG	Argon
KRY	Krypton
N	Not Applicable

Glass Tint	
Code	Description
AZ	Azurlite
BG	Blinds between the Glazing
BL	Blue
BZ	Bronze
CL	Clear
DV	Dynamic Glazing (Variable)
DY	Dynamic Glazing (Non-Variable)
EV	Evergreen
GC	Gold (reflective coating)
GD	Gold
GR	Green
GY	Gray
LE	Low 'e' Coating
OT	Other (use comment field)
RC	Solar or Reflective Coating
RG	Roller shades between Glazing
RS	Silver (reflective coating)
SF	Suspended Polyester Film
SR	Silver

Spacer		
Code	Type	Definition
A1-D	Aluminum	Aluminum spacer system - dual sealed.
A1-S	Aluminum	Aluminum spacer system - single sealed.
A2-D	Aluminum (thermally-broken)	Thermally improved aluminum spacer system - dual sealed.
A2-S	Aluminum (thermally-broken)	Thermally improved aluminum spacer system - single sealed.
A3-D	Aluminum-reinforced polymer	Polymer spacer material with aluminum substance - dual sealed.
A3-S	Aluminum-reinforced polymer	Polymer spacer material with aluminum substance - single sealed.
A4-D	Aluminum/Wood	Composite spacer system of two materials - dual sealed.
A4-S	Aluminum/Wood	Composite spacer system of two materials - single sealed.
A5-D	Aluminum-reinforced butyl	Butyl spacer material with aluminum substrate - dual sealed.
A5-S	Aluminum-reinforced butyl	Butyl spacer material with aluminum substrate - single sealed.
A6-D	Aluminum/Foam/Aluminum	Two aluminum spacers separated by foam-type material - dual sealed
A6-S	Aluminum/Foam/Aluminum	Two aluminum spacers separated by foam-type material - single sealed
A7-D	Aluminum U-shaped	U-shaped spacer system embedded in sealant - dual sealed.
A7-S	Aluminum U-shaped	U-shaped spacer system embedded in sealant - single sealed.
A8-D	Aluminum-Butyl Composite	Exposed corrugated aluminum spacer with butyl - dual sealed.

Spacer		
Code	Type	Definition
A8-S	Aluminum-Butyl Composite	Exposed corrugated aluminum spacer with butyl - single sealed.
CS-D	Coated Steel	Coated Steel (galvanized or tinplated) - Dual seal
CS-S	Coated Steel	Coated Steel (galvanized or tinplated) - Single seal
CU-D	Coated Steel U-Shaped	Coated Steel (galvanized or tinplated) U-shaped spacer system embedded in sealant - Dual sealed
CU-S	Coated Steel U-Shaped	Coated Steel (galvanized or tinplated) U-shaped spacer system embedded in sealant - Single sealed
ER-D	EPDM Reinforced Butyl	EPDM reinforced butyl spacer system - dual sealed.
ER-S	EPDM Reinforced Butyl	EPDM reinforced butyl spacer system - single sealed.
FG-D	Fiberglass	Fiberglass - dual sealed.
FG-S	Fiberglass	Fiberglass - single sealed.
GL-S	Glass	Welded glass edge condition at glazing perimeter.
N	Not Applicable	
OF-D	Organic Foam	Organic-based foam spacer system - dual sealed.
OF-S	Organic Foam	Organic-based foam spacer system - single sealed.
P1-D	Polycarbonate- Butyl Composite	Exposed corrugated polycarbonate spacer with butyl - dual sealed.
P1-S	Polycarbonate- Butyl Composite	Exposed corrugated polycarbonate spacer with butyl - single sealed.
PU-D	Polyurethane foam	Polyurethane foam - dual sealed.
PU-S	Polyurethane foam	Polyurethane foam - single sealed.
S2-D	Steel (thermally-broken)	Stainless steel spacer with urethane thermal break - dual sealed.
S2-S	Steel (thermally-broken)	Stainless steel spacer with urethane thermal break - single sealed.
S3-D	Steel/Foam/Steel	Two steel spacers separated by foam-type material - dual sealed.
S3-S	Steel/Foam/Steel	Two steel spacers separated by foam-type material - single sealed.
S5-D	Steel reinforced butyl	Butyl spacer material with stainless steel substrate - dual sealed.
S5-S	Steel reinforced butyl	Butyl spacer material with stainless steel substrate - single sealed.
S6-D	Steel U-channel w/ thermal cap	U-shaped steel spacer system with a thermal cap - dual sealed.
S6-S	Steel U-channel w/ thermal cap	U-shaped steel spacer system with a thermal cap - single sealed.
SS-D	Stainless Steel	Stainless Steel - Dual Seal
SS-S	Stainless Steel	Stainless Steel - Single Sealed
SU-D	Stainless Steel U-Shaped	Stainless Steel U-shaped spacer system embedded in sealant - Dual sealed
SU-S	Stainless Steel U-Shaped	Stainless Steel U-shaped spacer system embedded in sealant - Single sealed
TP-D	Thermo-plastic	Thermo-plastic - dual sealed.
TP-S	Thermo-plastic	Thermo-plastic - single sealed.
TS-D	Thermo-plastic	Thermoplastic spacer with stainless steel substrate - dual-sealed
TS-S	Thermo-plastic	Thermoplastic spacer with stainless steel substrate - single-sealed
WD	Wood	Wood spacer system
ZF-D	Silicone Foam	Silicone foam spacer system - dual sealed.
ZF-S	Silicone Foam	Silicone foam spacer system - single sealed.
ZS-D	Silicone/Steel	Combination of two separate spacers: a steel spacer and silicone spacer - dual sealed.
ZS-S	Silicone/Steel	Combination of two separate spacers: a steel spacer and silicone spacer - single sealed.