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*NFRC Accredited Computer Modeling & Simulation Laboratory*

## **NFRC THERMAL SIMULATION REPORT**

U-Factor (ANSI/NFRC 100-2014), CR (NFRC 500-2014)  
SHGC and VT (ANSI/NFRC 200-2014)

**Fenestration Product:** **Vinyl Single Hung Window**

**Report#:** SIM13V-046-3

**Series#:** **Bellagio S-3000/3100 SH**

**Submitted To:** Rey Nea

**Manufacturer:** **GREEN WORLD WINDOWS**

**Address:** 4195 Chino Hills Parkway, Ste. 508, Chino Hills, CA 91709

**Phone#:** (909) 923-8618

**Baseline Product:**

This is a simple addendum report to original simulation report# SIM13V-046, prepared on 02/05/2014 by FSE. Revised to add "SB90 Low-e glass". No other changes were made per client. For baseline product detail, refer to original sim report# SIM13V-046. No additional validation test required.

**Baseline Simulation Date:** 02/05/2014

**Expiration Date:** Five years from the date of the oldest physical test conducted for the latest certification ratings

**Revision Date:** 08/10/2017

**Product Type:** Vertical Slider

**Simulator:** Anis Jan

**Simulator-in-Charge:** Anis Jan

**Simulation Method:** Approved NFRC software THERM7 and WINDOW7 and NFRC WINDOW/THERM simulation manual

<b>Model/Type:</b>	VSSH
<b>Size:</b>	[1200 mm x 1500 mm] / {47 in x 59 in}
<b>Frame Type and Finish:</b>	Vinyl- rigid PVC
<b>Sash Type and Finish:</b>	Vinyl- rigid PVC / reinforced interlocks & bottom sash
<b>IG Glass Parameters:</b>	Glass from PPG. Solarban 90/e=0.023 applied on srf# 2 for dual glazed IG units. (stated per client)
<b>Glazing Method:</b>	Glass is wet glazed onto silicone sealant from exterior, with PVC glazing bead applied full perimeter from exterior.
<b>Gas Fill Method:</b>	Argon 90% & Air 10% gas fill using Evacuated chamber fill technique.
<b>Spacers:</b>	A8-D = supersure seal spacer II, dual sealed with hot melt butyl (with rigid PVC strip for both strips, per client) and A8-D = supersure seal spacer regular, dual sealed with hot melt butyl (with rigid PVC on top strip and corrugated aluminum-mill finish for bottom strip, per client)
<b>Dividers:</b>	Aluminum painted exterior/ mill finish interior Rectangular grid: 0.188" x 0.625" x 0.02" (<1, 0.75 grid size), and Contour grid: 0.313" x 0.984" x 0.02" (<1, 0.75 grid size). Grid pattern: NFRC Standard
<b>Grouping:</b>	
<b>Center-of-Glazing:</b>	Yes, NFRC Rules for grouping (see summary tables)
<b>Frame:</b>	Yes, see original sim report# SIM13V-046 for detail
<b>Spacer:</b>	No
<b>Divider:</b>	No
<b>Miscellaneous:</b>	
<b>SHGC and VT:</b>	Default Frame Absorptivity 0.3, per NFRC 200-2014 Sec. 4.5.D.

## Glazing Matrix

Glz ID	Name	Group	UCOG	Thick.	ID1	Gap fill1	ID2	Gapfill 2	ID3
5	SB90 / AIR / CLEAR - (SS-SS)	L1	0.291	0.697	5443	AIR	5008		
6	SB90 / AIR / CLEAR - (DS-DS)	1	0.29	0.736	5444	AIR	5009		
9	SB90 / AIR / SB90 / AIR / CLEAR - (SS-SS-SS)	L2	0.197	1.045	5443	AIR	5443	AIR	5008
10	SB90 / AIR / SB90 / AIR / CLEAR - (DS-DS-DS)	2	0.196	1.104	5444	AIR	5444	AIR	5009
16	SB90 / ARG / CLEAR - (SS-SS)	L3	0.243	0.697	5443	ARG(90)	5008		
17	SB90 / ARG / CLEAR - (DS-DS)	3	0.243	0.736	5444	ARG(90)	5009		
20	SB90 / ARG / SB90 / ARG / CLEAR - (SS-SS-SS)	L4	0.154	1.045	5443	ARG(90)	5443	ARG(90)	5008
21	SB90 / ARG / SB90 / ARG / CLEAR - (DS-DS-DS)	4	0.154	1.104	5444	ARG(90)	5444	ARG(90)	5009
50	SB70 / ARG / SB70 / ARG / CLEAR - (SS-SS-SS)	L50	0.153	1.045	5431	ARG(90)	5431	ARG(90)	5008

Note: L denotes the group leader per ANSI/NFRC 100-2014.

### SHGC 0 and 1 & VT 0 and 1

	No-divider	Divider < 25.4 mm	Divider >= 25.4 mm
SHGC0	0.003830	0.006612	0.009236
SHGC1	0.799665	0.717035	0.639086
VT0	0	0	0
VT1	0.795835	0.710423	0.629849

SHGC & VT "0 and 1" values were used from original sim report# SIM13V-046, per TI-2010-001.

$$SHGC = SHGC0 + SHGCc * (SHGC1 - SHGC0)$$

$$VT = VT0 + VTc * (VT1 - VT0)$$

Series#: Bellagio S-3000/3100 SH  
 Product: Vinyl Single Hung

## U-Factor, SHGC and VT Summary

Report#: SIM13V-046-3  
 Report Date: 08/10/2017

				<b>Sim Lab Code:</b> SFSE							
		<b>Operator Type:</b>	VSSH	<b>2014 Model Size:</b>	1200 mm x 1500 mm			<b>Sim Report#:</b>	SIM13V-046-3		
<b>Mfr Name:</b>	GREEN WORLD WINDOWS		<b>Frame Type:</b>	VY	<b>Residential Size:</b>			<b>Sim Rpt date:</b>	2/5/2014		
<b>Series/Model#:</b>	Bellagio S-3000/3100 SH		<b>Sash Type:</b>	VI	<b>Non Res Size:</b>			<b>Sim Rpt revision date:</b>	08/10/2017		
				<b>Thermal Break Type:</b>	N			<b>Frame Absorptance:</b>	0.3		
							<b>Rating Procedure:</b>	2014			

Mfr Prod. Code	Product Num	Pane Thick. 1	Pane Thick. 2	Pane Thick. 3	Gap 1	Gap 2	Emiss 1	Emiss 2	Emiss 3	Emiss 4	Emiss 5	Emiss 6	Spacer Type	Grid	Grid Size	U factor cog	SHGC cog	VT cog	Total U-factor	Total SHGC	Total VT	Total CR
SB90 / AIR / CLEAR - (SS-SS)	001	0.098	0.098		0.500			0.023					A8-D	N		0.29	0.230377	0.531174	<b>0.32</b>	0.19	0.42	56
SB90 / AIR / CLEAR - (SS-SS) – rectangular grid	001-0001	0.098	0.098		0.500			0.023					A8-D	G	0.75	0.29	0.230377	0.531174		0.17	0.38	
SB90 / AIR / CLEAR - (DS-DS)	001-0002	0.118	0.118		0.500			0.023					A8-D	N		0.29	0.231486	0.524806		0.19	0.42	
SB90 / AIR / CLEAR - (DS-DS) – rectangular grid	001-0003	0.118	0.118		0.500			0.023					A8-D	G	0.75	0.29	0.231486	0.524806		0.17	0.37	
SB90 / AIR / CLEAR - (SS-SS) -- contour grid	002	0.098	0.098		0.500			0.023					A8-D	G	0.75	0.29	0.230377	0.531174	<b>0.34</b>	0.17	0.38	56
SB90 / AIR / CLEAR - (DS-DS) -- contour grid	002-0001	0.118	0.118		0.500			0.023					A8-D	G	0.75	0.29	0.231486	0.524806		0.17	0.37	
SB90 / AIR / SB90 / AIR / CLEAR - (SS-SS-SS)	003	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	N		0.20	0.175372	0.314613	<b>0.25</b>	0.14	0.25	64
SB90 / AIR / SB90 / AIR / CLEAR - (SS-SS-SS) – rectangular grid	003-0001	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.20	0.175372	0.314613		0.13	0.22	
SB90 / AIR / SB90 / AIR / CLEAR - (DS-DS-DS)	003-0002	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	N		0.20	0.176338	0.308952		0.14	0.25	
SB90 / AIR / SB90 / AIR / CLEAR - (DS-DS-DS) – rectangular grid	003-0003	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.20	0.176338	0.308952		0.13	0.22	
SB90 / AIR / SB90 / AIR / CLEAR - (SS-SS-SS) -- contour grid	004	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.20	0.175372	0.314613	<b>0.26</b>	0.13	0.22	64
SB90 / AIR / SB90 / AIR / CLEAR - (DS-DS-DS) -- contour grid	004-0001	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.20	0.176338	0.308952		0.13	0.22	
SB90 / ARG / CLEAR - (SS-SS)	005	0.098	0.098		0.500			0.023					A8-D	N		0.24	0.225516	0.531174	<b>0.29</b>	0.18	0.42	60
SB90 / ARG / CLEAR - (SS-SS) – rectangular grid	005-0001	0.098	0.098		0.500			0.023					A8-D	G	0.75	0.24	0.225516	0.531174		0.17	0.38	
SB90 / ARG / CLEAR - (DS-DS)	005-0002	0.118	0.118		0.500			0.023					A8-D	N		0.24	0.226010	0.524806		0.18	0.42	
SB90 / ARG / CLEAR - (DS-DS) – rectangular grid	005-0003	0.118	0.118		0.500			0.023					A8-D	G	0.75	0.24	0.226010	0.524806		0.17	0.37	
SB90 / ARG / CLEAR - (SS-SS) -- contour grid	006	0.098	0.098		0.500			0.023					A8-D	G	0.75	0.24	0.225516	0.531174	<b>0.30</b>	0.17	0.38	60
SB90 / ARG / CLEAR - (DS-DS) -- contour grid	006-0001	0.118	0.118		0.500			0.023					A8-D	G	0.75	0.24	0.226010	0.524806		0.17	0.37	
SB90 / ARG / SB90 / ARG / CLEAR - (SS-SS-SS)	007	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	N		0.15	0.172448	0.314613	<b>0.22</b>	0.14	0.25	64
SB90 / ARG / SB90 / ARG / CLEAR - (SS-SS-SS) – rectangular grid	007-0001	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.15	0.172448	0.314613		0.13	0.22	
SB90 / ARG / SB90 / ARG / CLEAR - (DS-DS-DS)	007-0002	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	N		0.15	0.172886	0.308952		0.14	0.25	
SB90 / ARG / SB90 / ARG / CLEAR - (DS-DS-DS) – rectangular grid	007-0003	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.15	0.172886	0.308952		0.13	0.22	
SB90 / ARG / SB90 / ARG / CLEAR - (SS-SS-SS) -- contour grid	008	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.15	0.172448	0.314613	<b>0.22</b>	0.13	0.22	64
SB90 / ARG / SB90 / ARG / CLEAR - (DS-DS-DS) -- contour grid	008-0001	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.15	0.172886	0.308952		0.13	0.22	
SB90 / AIR / CLEAR - (SS-SS)	009	0.098	0.098		0.500			0.023					A8-D	N		0.29	0.230377	0.531174	<b>0.31</b>	0.19	0.42	59
SB90 / AIR / CLEAR - (SS-SS) – rectangular grid	009-0001	0.098	0.098		0.500			0.023					A8-D	G	0.75	0.29	0.230377	0.531174		0.17	0.38	
SB90 / AIR / CLEAR - (DS-DS)	009-0002	0.118	0.118		0.500			0.023					A8-D	N		0.29	0.231486	0.524806		0.19	0.42	
SB90 / AIR / CLEAR - (DS-DS) – rectangular grid	009-0003	0.118	0.118		0.500			0.023					A8-D	G	0.75	0.29	0.231486	0.524806		0.17	0.37	
SB90 / AIR / CLEAR - (SS-SS) -- contour grid	010	0.098	0.098		0.500			0.023					A8-D	G	0.75	0.29	0.230377	0.531174	<b>0.33</b>	0.17	0.38	59
SB90 / AIR / CLEAR - (DS-DS) -- contour grid	010-0001	0.118	0.118		0.500			0.023					A8-D	G	0.75	0.29	0.231486	0.524806		0.17	0.37	

### U-Factor, SHGC and VT Summary

Mfr. Prod. Code	Product Num	Pane Thick. 1	Pane Thick. 2	Pane Thick. 3	Gap 1	Gap 2	Emiss 1	Emiss 2	Emiss 3	Emiss 4	Emiss 5	Emiss 6	Spacer Type	Grid	Grid Size	U factor cog	SHGC cog	VT cog	Total U-factor	Total SHGC	Total VT	Total CR
SB90 / AIR / SB90 / AIR / CLEAR - (SS-SS-SS)	011	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	N		0.20	0.175372	0.314613	<b>0.23</b>	0.14	0.25	67
SB90 / AIR / SB90 / AIR / CLEAR - (SS-SS-SS) – rectangular grid	011-0001	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.20	0.175372	0.314613		0.13	0.22	
SB90 / AIR / SB90 / AIR / CLEAR - (DS-DS-DS)	011-0002	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	N		0.20	0.176338	0.308952		0.14	0.25	
SB90 / AIR / SB90 / AIR / CLEAR - (DS-DS-DS) – rectangular grid	011-0003	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.20	0.176338	0.308952		0.13	0.22	
SB90 / AIR / SB90 / AIR / CLEAR - (SS-SS-SS) – contour grid	012	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.20	0.175372	0.314613	<b>0.24</b>	0.13	0.22	67
SB90 / AIR / SB90 / AIR / CLEAR - (DS-DS-DS) – contour grid	012-0001	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.20	0.176338	0.308952		0.13	0.22	
SB90 / ARG / CLEAR - (SS-SS)	013	0.098	0.098		0.500			0.023					A8-D	N		0.24	0.225516	0.531174	<b>0.27</b>	0.18	0.42	63
SB90 / ARG / CLEAR - (SS-SS) – rectangular grid	013-0001	0.098	0.098		0.500			0.023					A8-D	G	0.75	0.24	0.225516	0.531174		0.17	0.38	
SB90 / ARG / CLEAR - (DS-DS)	013-0002	0.118	0.118		0.500			0.023					A8-D	N		0.24	0.226010	0.524806		0.18	0.42	
SB90 / ARG / CLEAR - (DS-DS) – rectangular grid	013-0003	0.118	0.118		0.500			0.023					A8-D	G	0.75	0.24	0.226010	0.524806		0.17	0.37	
SB90 / ARG / CLEAR - (SS-SS) – contour grid	014	0.098	0.098		0.500			0.023					A8-D	G	0.75	0.24	0.225516	0.531174	<b>0.29</b>	0.17	0.38	63
SB90 / ARG / CLEAR - (DS-DS) – contour grid	014-0001	0.118	0.118		0.500			0.023					A8-D	G	0.75	0.24	0.226010	0.524806		0.17	0.37	
SB90 / ARG / SB90 / ARG / CLEAR - (SS-SS-SS)	015	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	N		0.15	0.172448	0.314613	<b>0.20</b>	0.14	0.25	67
SB90 / ARG / SB90 / ARG / CLEAR - (SS-SS-SS) – rectangular grid	015-0001	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.15	0.172448	0.314613		0.13	0.22	
SB90 / ARG / SB90 / ARG / CLEAR - (DS-DS-DS)	015-0002	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	N		0.15	0.172886	0.308952		0.14	0.25	
SB90 / ARG / SB90 / ARG / CLEAR - (DS-DS-DS) – rectangular grid	015-0003	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.15	0.172886	0.308952		0.13	0.22	
SB90 / ARG / SB90 / ARG / CLEAR - (SS-SS-SS) – contour grid	016	0.098	0.098	0.098	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.15	0.172448	0.314613	<b>0.21</b>	0.13	0.22	67
SB90 / ARG / SB90 / ARG / CLEAR - (DS-DS-DS) – contour grid	016-0001	0.118	0.118	0.118	0.500	0.250		0.023		0.023			A8-D	G	0.75	0.15	0.172886	0.308952		0.13	0.22	

A8-D = supersure seal spacer, dual sealed with hot melt butyl

Product# 001 to 008 with supersure seal spacer regular (see page 2 for more detail)

Product# 009 to 016 with supersure seal spacer II (see page 2 for more detail)

### **WINDOW SIMULATION REPORT:**

The fenestration products documented in this report were simulated in accordance with the ANSI/NFRC 100-2014: Procedure for Determining Fenestration Product Thermal Performance & ANSI/NFRC 500-2014. The fenestration products were simulated using computer programs Therm 7.4.4, Window 7.4.14 & Spectral Data # 55.0 as specified in ANSI/NFRC 100-2014 and ANSI/NFRC 200-2014 (SHGC/VT). The WINDOW program models the one-dimensional heat flow through the center-of-glass portion of the window. The Therm program models the two-dimensional heat flow through the frame, edge-of-glass, divider, and divider-edge portions of the fenestration product. The input data for both programs is based on manufacturer's specifications. Defaults for material thermal and optical properties are given in the computer programs. When values other than defaults were used, they are documented.

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It is the policy for this laboratory to verify as much information about the product being tested and simulated. However, not all information provided to the laboratory can be verified, such as physical properties of low-e coating, heat mirror, gas fills spacer, and others. Therefore, all information provided to the laboratory is the manufacturer's responsibility as to its accuracy.

It is the policy of this laboratory to prepare a report and submit it to the manufacturer for his approval. Upon notification in writing from the manufacturer that he approves of the report, (in approving report, manufacturer takes responsibility of all information provided to this laboratory) the report is sent to the certification agency. The data shall be kept for a period of four years after which they may be destroyed.

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  - F. Name and signature of the individual performing the simulations and accepting the responsibility for the technical accuracy of this simulation report.
- The data shall be kept for a period of five years after which they may be destroyed.

*Anis Jan*

*Anis Jan*

*Simulator-in-responsible-charge*