



## Therm 7.8 and Window 7.8 Simulation Report

### Zero•Net Zero Sight Line Window w/ 1” IGU and FortMax™ 2200 Thermal Break

\* Thermal modeling analysis was performed on FreMarq’s zero sightline vent framing system. Analysis of the system was performed using the Therm 7.8 and Window 7.8 computer software developed by Lawrence Berkeley Laboratory.

	U-Factor Center of Glass (Btu/h-ft <sup>2</sup> -F)	U-Factor Assembled (Btu/h-ft <sup>2</sup> -F)	SHGC	VT	CR
NFRC SIZE Custom Single Vision 47” x 59”	0.195	0.263	0.313	0.580	49
NFRC SIZE Projected Awning Single 59” x 23”	0.195	0.305	0.286	0.516	48



THERM 7.8 calculates heat loss through frame and edge-of-glazing components using finite element analysis. The program solves for temperature and heat flow distribution throughout the cross section. The temperature distribution can then be used to determine overall heat loss, total and component U-factors, and local temperatures at points of interest.

WINDOW 7.8 calculates U-factor and temperatures for the center-of-glazing using a two-dimensional heat flow analysis.

**Standards:**

NFRC 100-2014: *Procedure for Determining Fenestration Product U-Factors.*

NFRC 200-2014: *Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.*

NFRC 500-2014: *Procedure for Determining Fenestration Product Condensation Resistance Values.*

Standard NFRC environmental conditions were used to analyze the system, which are -0.4°F exterior ambient temperature with a 12.3 mph wind acting perpendicular to the wall. An exterior film coefficient of 4.579 BTU/hr\*ft<sup>2</sup>\*°F was used to represent the exterior wind. Interior conditions were modeled as 69.8°F ambient temperature with natural convection only.

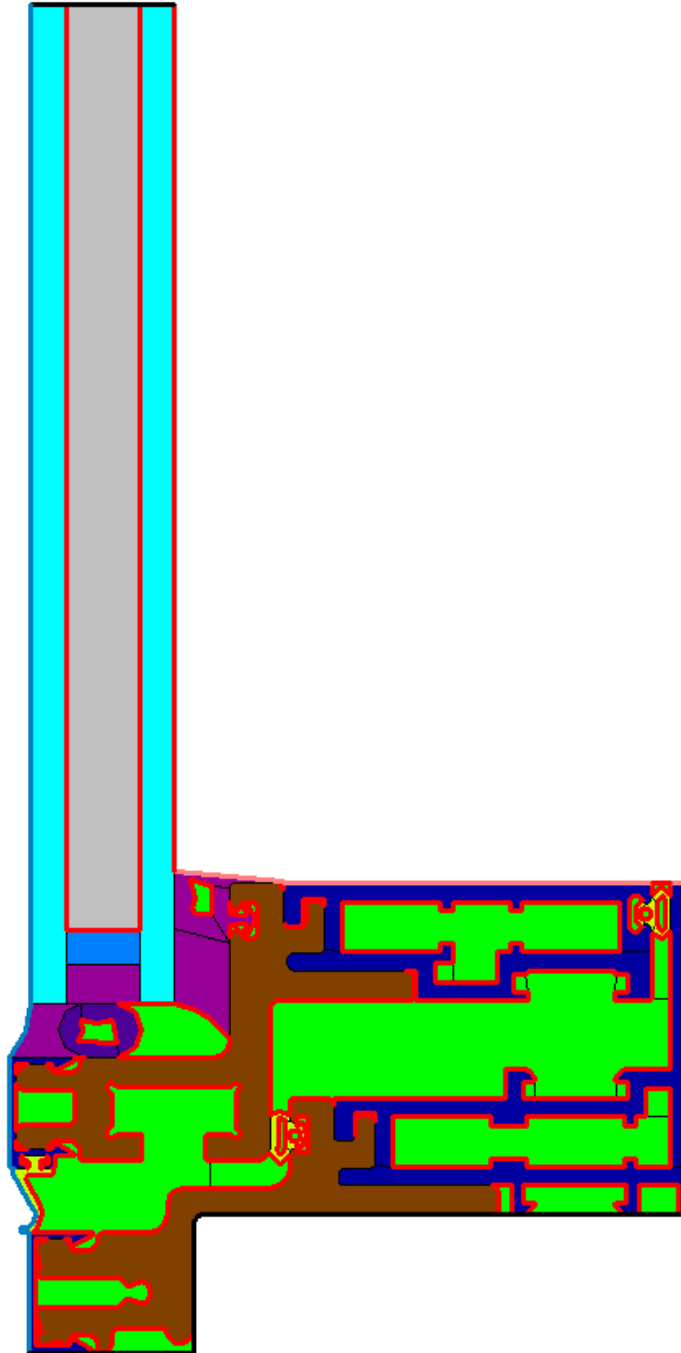
One glass system was used in this analysis. the system consisted of:

- 1/4" Clear Glass with VE12M (#2)
- 1/2" 90% Argon / 10% Air w/ VTS Spacer
- 1/4" Clear Glass with Roomside Low E (#4)

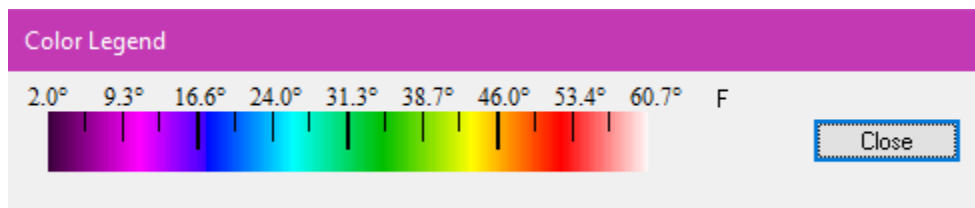
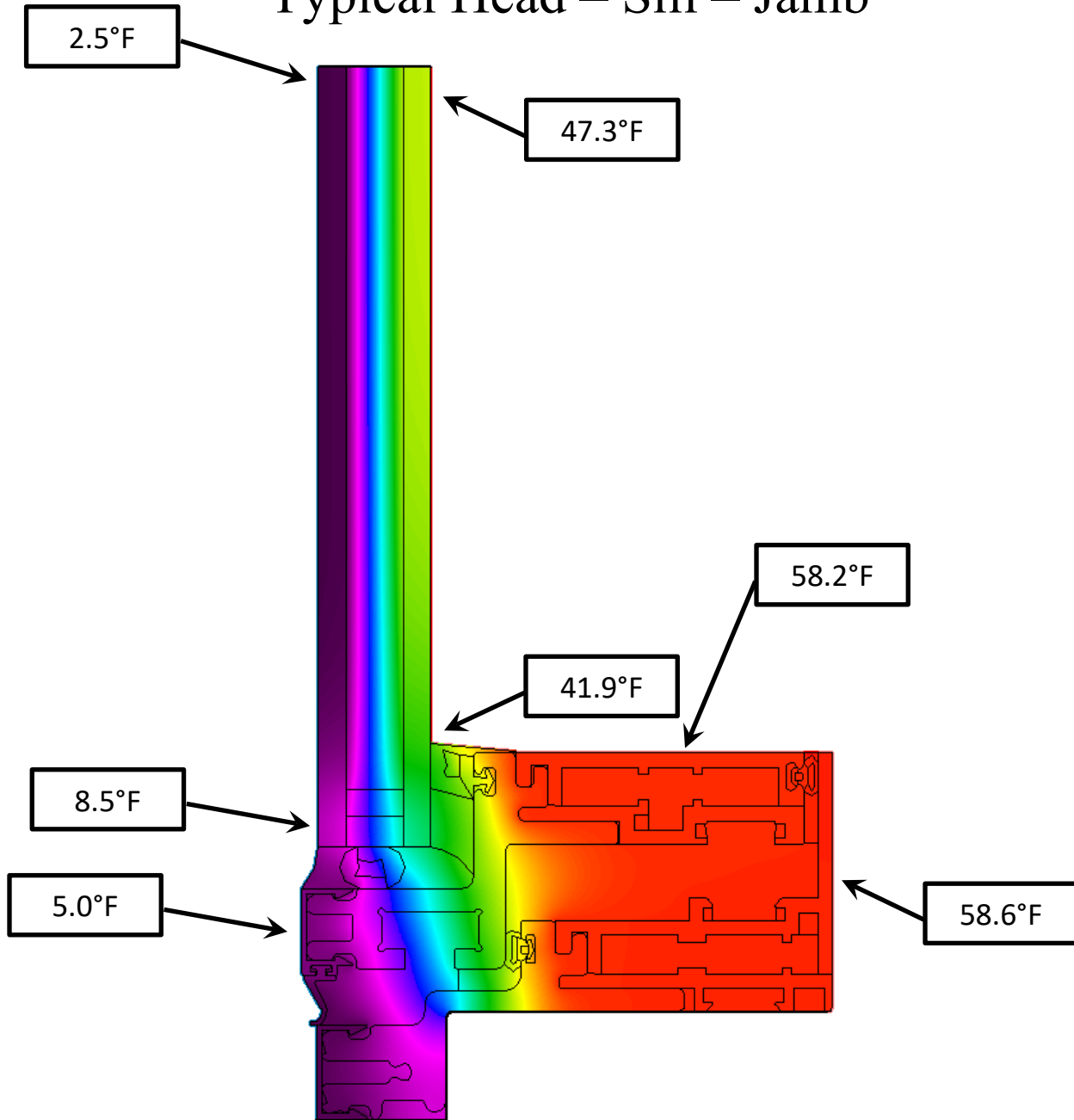
U-factor calculations were performed on standard NFRC rating size consisting of a custom single vision window specimen with an overall size of 47.244" X 59.055".

Thermal model graphical outputs with frame surface temperature identification can be found below.

# Typical Head – Sill – Jamb



### Typical Head – Sill – Jamb



ID #

Name

Mode

Type  >>

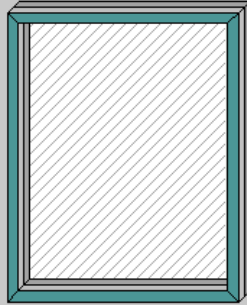
Width  inches

Height  inches

Area  ft<sup>2</sup>

Tilt

Environmental Conditions



**Total Window Results - Normal Incidence**

U-factor  Btu/h-ft<sup>2</sup>-F

SHGC

VT

CR

Click on a component to display characteristics below

**Glazing System**

Name  >>

ID	<input type="text" value="94"/>	Ucenter	<input type="text" value="0.19505"/> Btu/h-ft <sup>2</sup> -F
Nlayers	<input type="text" value="2"/>	SC	<input type="text" value="0.42205"/>
Area	<input type="text" value="12.87689"/> ft <sup>2</sup>	SHGC	<input type="text" value="0.36718"/>
Edge area	<input type="text" value="3.19197"/> ft <sup>2</sup>	Vtc	<input type="text" value="0.69953"/>

ID #

Name

Mode

Type  >>

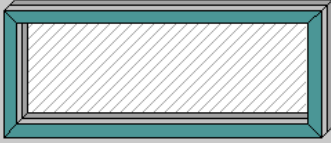
Width  inches

Height  inches

Area  ft<sup>2</sup>

Tilt

Environmental Conditions



**Total Window Results - Normal Incidence**

U-factor  Btu/h-ft<sup>2</sup>-F

SHGC

VT

CR

Click on a component to display characteristics below

**Glazing System**

Name  >>

ID	<input type="text" value="94"/>	Ucenter	<input type="text" value="0.20691"/> Btu/h-ft <sup>2</sup> -F
Nlayers	<input type="text" value="2"/>	SC	<input type="text" value="0.42424"/>
Area	<input type="text" value="4.77816"/> ft <sup>2</sup>	SHGC	<input type="text" value="0.36909"/>
Edge area	<input type="text" value="2.37176"/> ft <sup>2</sup>	Vtc	<input type="text" value="0.69953"/>

## Window Data

ID #:  Name:

#  Tilt:  ° IG Height:  inches

Environmental Conditions:  IG Width:  inches

Comment:

Overall thickness:  inches Mode:

	ID	Name	Mode	Thick	Flip	Tsol	Rsol1	Rsol2	Tvis	Rvis1	Rvis2	Tir	E1	E2	Cond	Comment
▼	Glass 1	6046 VE12M.VIR	#	0.236	<input type="checkbox"/>	0.383	0.286	0.449	0.792	0.060	0.047	0.000	0.840	0.040	0.578	
	Gap 1	9 Air (10%) / Argon (90%) I		0.500												
▼	Glass 2	6025 RoomsideLE.vir	#	0.236	<input type="checkbox"/>	0.706	0.111	0.112	0.880	0.074	0.072	0.000	0.840	0.160	0.578	

Center of Glass Results | Temperature Data | Optical Data | Angular Data | Color Properties | Radiance Results

Ufactor	SC	SHGC	Rel. Ht. Gain	Tvis	Keff	Layer 1 Keff	Gap 1 Keff	Layer 2 Keff
Btu/h-ft <sup>2</sup> -F			Btu/h-ft <sup>2</sup>		Btu/h-ft-F	Btu/h-ft-F	Btu/h-ft-F	Btu/h-ft-F
0.20028	0.42302	0.36803	87.08	0.69953	0.0252	0.5778	0.0132	0.5778

## Glass Data