



Therm 7.8 and Window 7.8 Simulation Report

Zero•Net UCW3500 SSG w/ 1” IGU and Fiberglass Thermal Break

*Thermal modeling analysis was performed on FreMarq’s UCW3500 framing system with a fiberglass thermal break (interior). 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 ² -F)	U-Factor Assembled (Btu/h-ft ² -F)	SHGC	VT	CR
NFRC Size – Double Low E	0.191	0.259	0.323	0.594	53
5’ x 10’ Job Size - Double Low E	0.186	0.232	0.337	0.629	53
NFRC Size – Single Low E	0.243	0.299	0.330	0.601	63
5’ x 10’ Job Size – Single Low E	0.241	0.279	0.345	0.636	63



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*ft²*°F was used to represent the exterior wind. Interior conditions were modeled as 69.8°F ambient temperature with natural convection only.

Two insulating glass systems were used in this analysis. The systems consisted of:

RD006 Glass:

1/4" VE-12M on Clear (#2)	(IGDB # 6046)
1/2" VTS Spacer with 90% Argon - 10% Air	(IGDB # 0009)
1/4" Room side Low E (#4)	(IGDB # 6025)

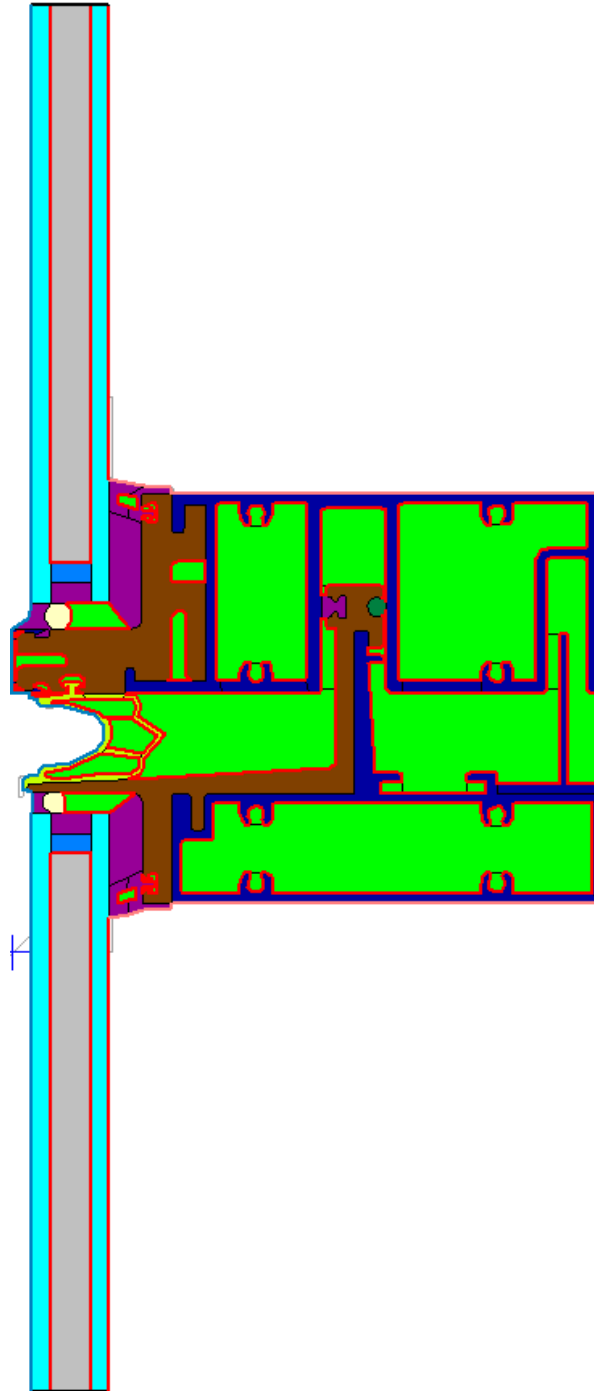
RD030 Glass:

1/4" VE-12M on Clear (#2)	(IGDB # 6046)
1/2" VTS Spacer with 90% Argon - 10% Air	(IGDB # 0009)
1/4" Clear	(IGDB # 2004)

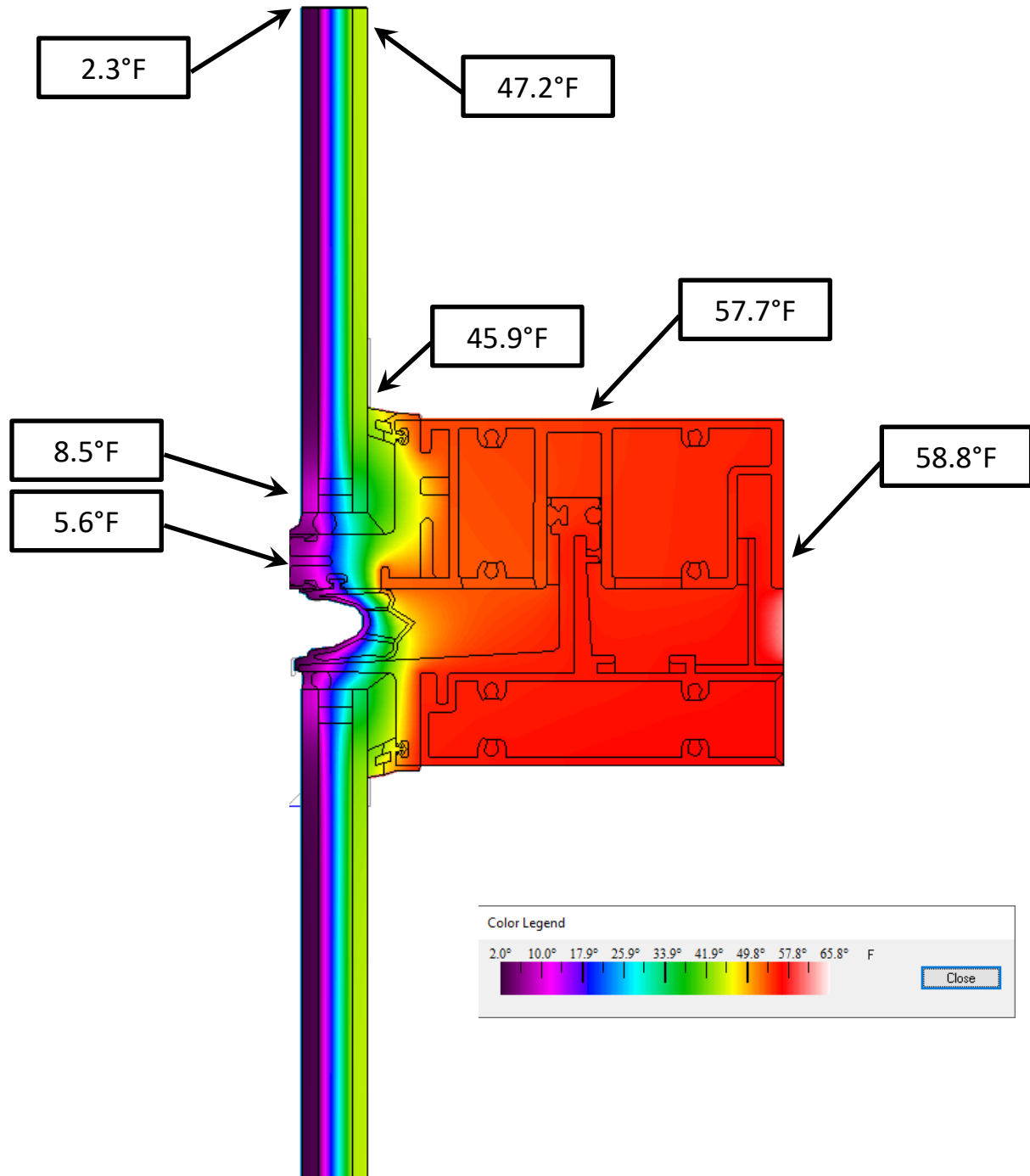
U-factor calculations were performed on standard NFRC rating size consisting of a two lite wide glazed wall system specimen with an overall size of 79" X 79". Job size model was also done at 5' x 8' on a custom single vision.

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

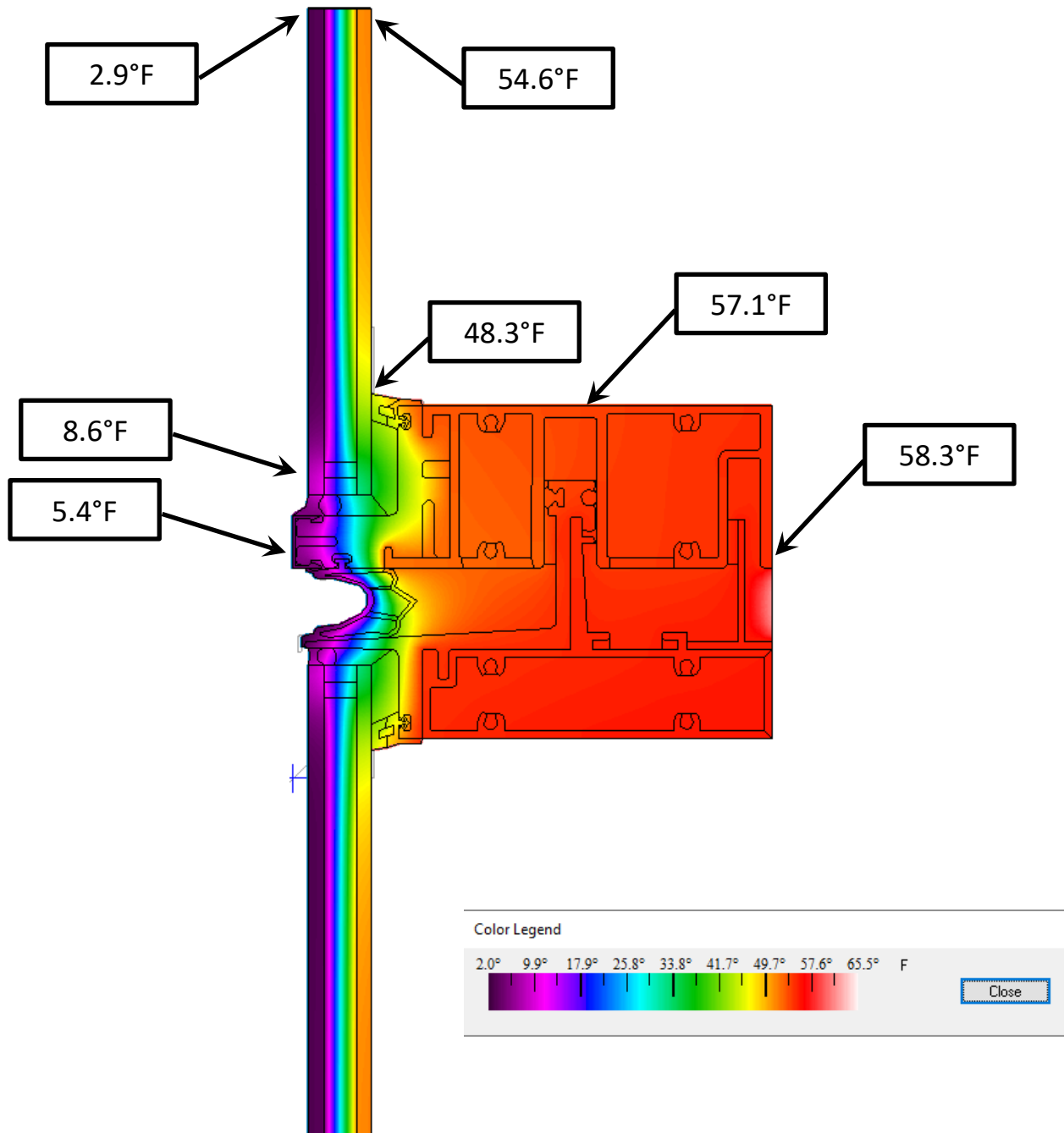
Typical Horizontal



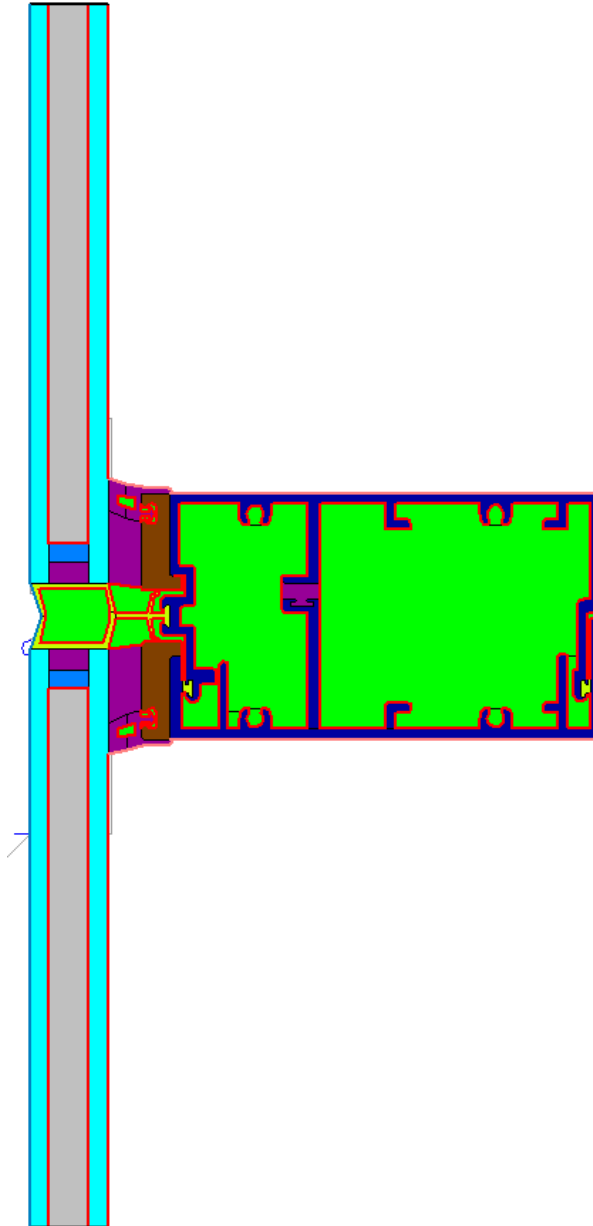
Typical Horizontal – Double Low E



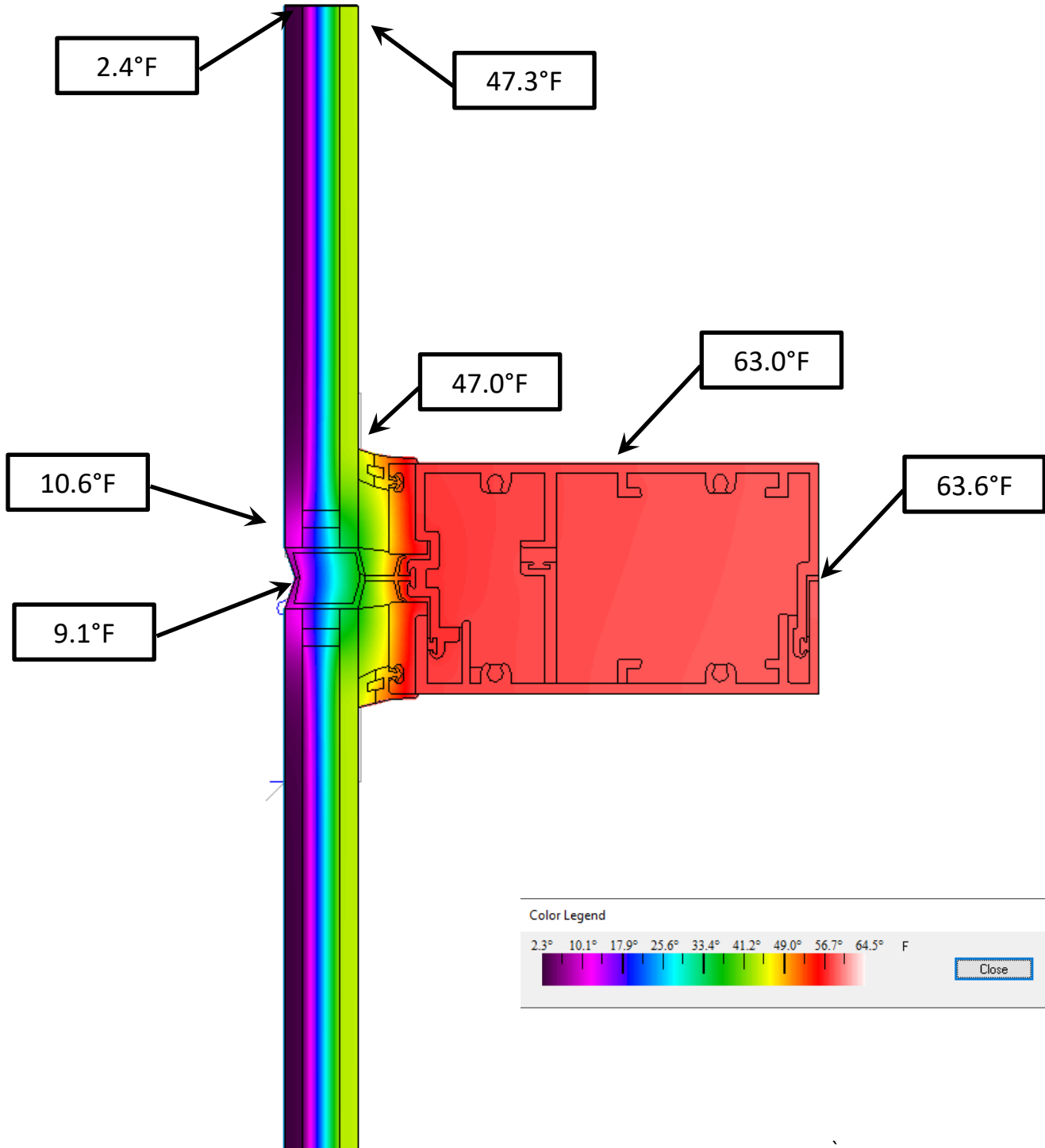
Typical Horizontal – Single Low E



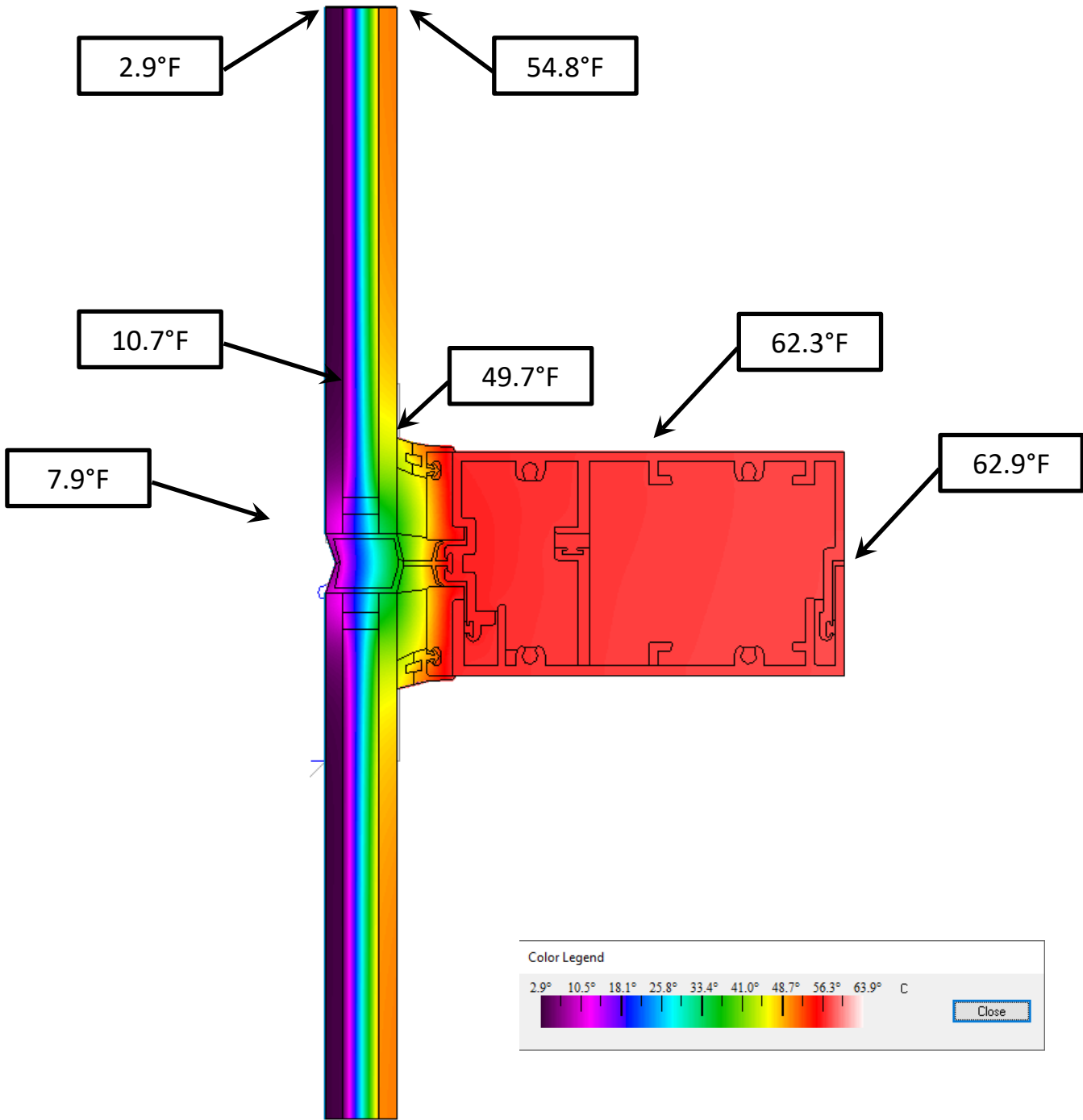
Typical Vertical



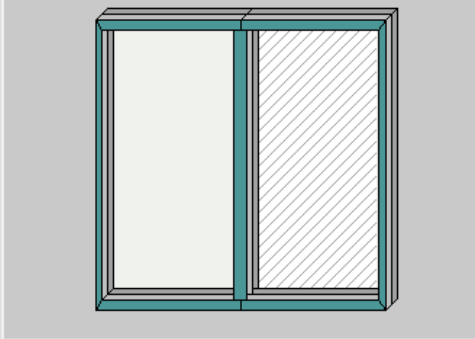
Typical Vertical – Double Low E



Typical Vertical – Single Low E



ID #	8	
Name	03_102523_SSGUCW3500 1ir	
Mode	NFRC	
Type	Glazed Wall System	>>
Width	78.740	inches
Height	78.740	inches
Area	43.06	ft2
Tilt	90	
Environmental Conditions	NFRC 100-2010	



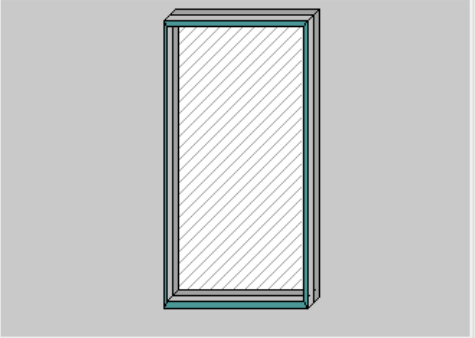
Total Window Results - Normal Incidence

U-factor	0.259	Btu/h-ft2-F
SHGC	0.323	
VT	0.594	
CR	53	

Click on a component to display characteristics below

Glazing System			
Name	RD006 Glass		
ID	100	Ucenter	0.191 Btu/h-ft2-F
Nlayers	2	SC	0.421
Area	14.662	SHGC	0.367
Edge area	3.618	Vtc	0.700

ID #	9	
Name	03_102523_SSGUCW3500 1ir	
Mode	NFRC	
Type	Custom Single Vision	>>
Width	60.000	inches
Height	120.000	inches
Area	50.00	ft2
Tilt	90	
Environmental Conditions	NFRC 100-2010	



Total Window Results - Normal Incidence

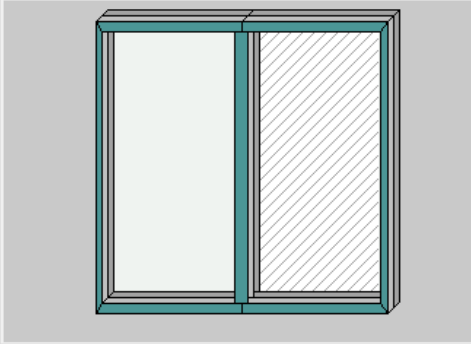
U-factor	0.232	Btu/h-ft2-F
SHGC	0.337	
VT	0.629	
CR	53	

Click on a component to display characteristics below

Glazing System			
Name	RD006 Glass		
ID	100	Ucenter	0.186 Btu/h-ft2-F
Nlayers	2	SC	0.420
Area	39.213	SHGC	0.366
Edge area	5.767	Vtc	0.700



ID #	10
Name	03_102523_SSGUCW3500 1ir
Mode	NFRC
Type	Glazed Wall System >>
Width	78.740 inches
Height	78.740 inches
Area	43.06 ft2
Tilt	90
Environmental Conditions	NFRC 100-2010



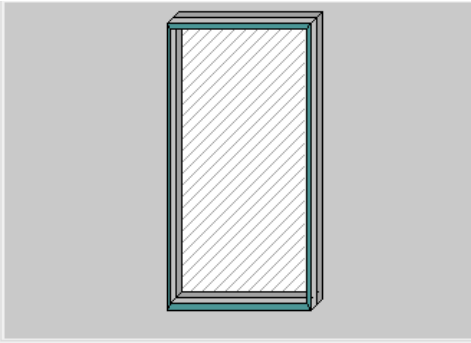
Total Window Results - Normal Incidence

Ufactor	0.299	Btu/h-ft2-F
SHGC	0.330	
VT	0.601	
CR	63	

Click on a component to display characteristics below

Glazing System			
Name	RD030 Glass	>>	
ID	101	Ucenter	0.243 Btu/h-ft2-F
Nlayers	2	SC	0.432
Area	14.662 ft2	SHGC	0.375
Edge area	3.618 ft2	Vtc	0.707

ID #	11
Name	03_102523_SSGUCW3500 1ir
Mode	NFRC
Type	Custom Single Vision >>
Width	60.000 inches
Height	120.000 inches
Area	50.00 ft2
Tilt	90
Environmental Conditions	NFRC 100-2010



Total Window Results - Normal Incidence

Ufactor	0.279	Btu/h-ft2-F
SHGC	0.345	
VT	0.636	
CR	63	

Click on a component to display characteristics below

Glazing System			
Name	RD030 Glass	>>	
ID	101	Ucenter	0.241 Btu/h-ft2-F
Nlayers	2	SC	0.431
Area	39.213 ft2	SHGC	0.375
Edge area	5.767 ft2	Vtc	0.707

Window Data



ID #: 100 Name: RD006 Glass
 # 2 Tilt: 90° IG Height: 39.37 inches
 Environmental Conditions: NFRC 100-2010 IG Width: 39.37 inches
 Comment: Viracon Double Low E Glass
 Overall thickness: 0.972 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 ² -F			Btu/h-ft ²		Btu/h-ft-F	Btu/h-ft-F	Btu/h-ft-F	Btu/h-ft-F
0.200	0.423	0.368	87.1	0.700	0.0252	0.5778	0.0132	0.5778

ID #: 101 Name: RD030 Glass
 # 2 Tilt: 90° IG Height: 39.37 inches
 Environmental Conditions: NFRC 100-2010 IG Width: 39.37 inches
 Comment: Viracon Single Low E Glass
 Overall thickness: 0.972 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 ▶▶	2004 Clr-6.CIG	#	0.236	<input type="checkbox"/>	0.793	0.073	0.073	0.889	0.080	0.080	0.000	0.840	0.840	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 ² -F			Btu/h-ft ²		Btu/h-ft-F	Btu/h-ft-F	Btu/h-ft-F	Btu/h-ft-F
0.246	0.432	0.376	89.5	0.707	0.0265	0.5778	0.0139	0.5778

Glass Data