

Therm 7.8 and Window 7.8 Simulation Report

Zero•Net PW2500 Captured w/ 1” IGU and FortMax™ 2500 Thermal Break and Pressure Plate

*Thermal modeling analysis was performed on FreMarq’s PW2500 framing system with a FortMax 2500 pressure plate (exterior) and 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	0.229	0.331	0.623	51
5’ x 10’ Job Size - Double Low E	0.186	0.212	0.342	0.648	51
NFRC Size – Single Low E	0.243	0.273	0.338	0.630	61
5’ x 10’ Job Size – Single Low E	0.241	0.261	0.350	0.656	62



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)

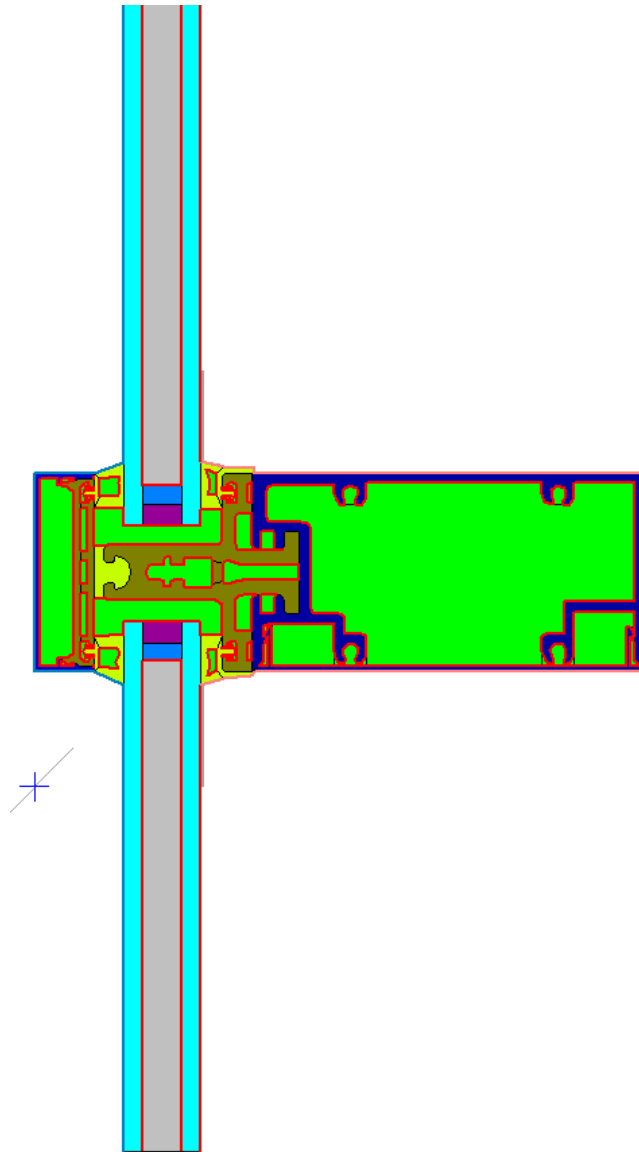
RD030 Glass:

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)

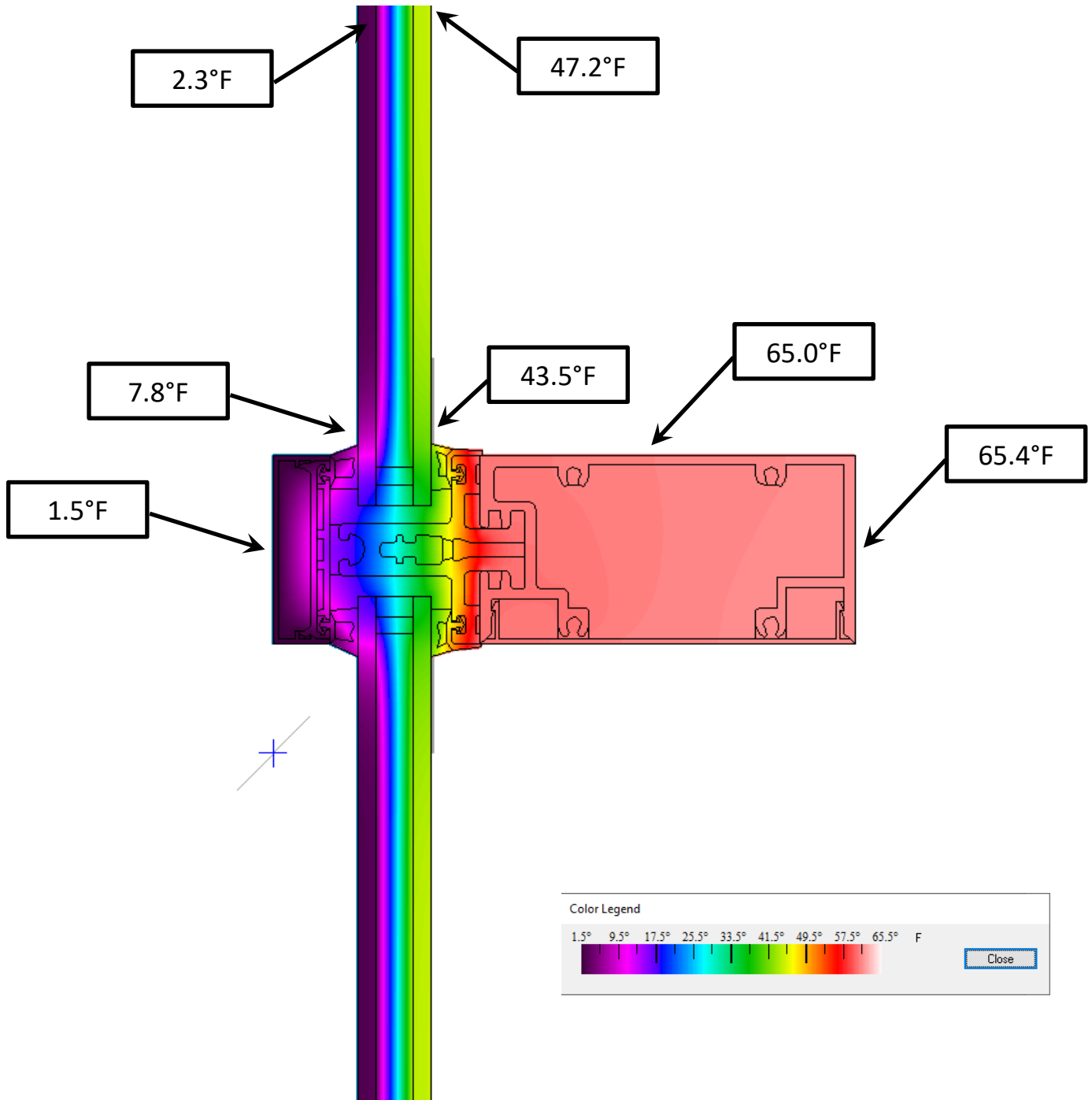
U-factor calculations were performed on standard NFRC rating size consisting of a two lite wide glazed wall system specimen with an overall size of 79" X 79". Job size model was also done at 5' x 10' on a custom single vision.

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

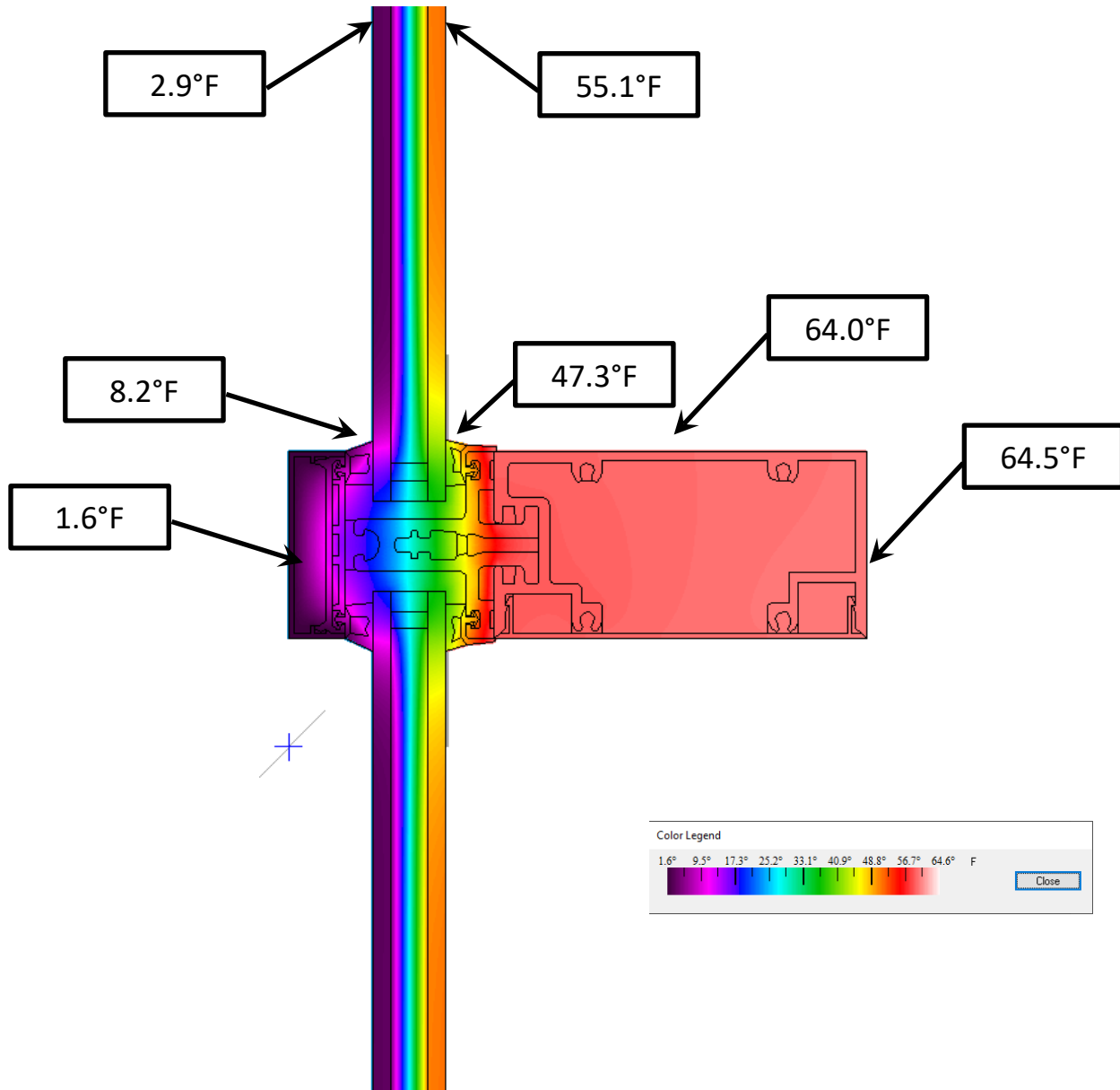
Typical Horizontal



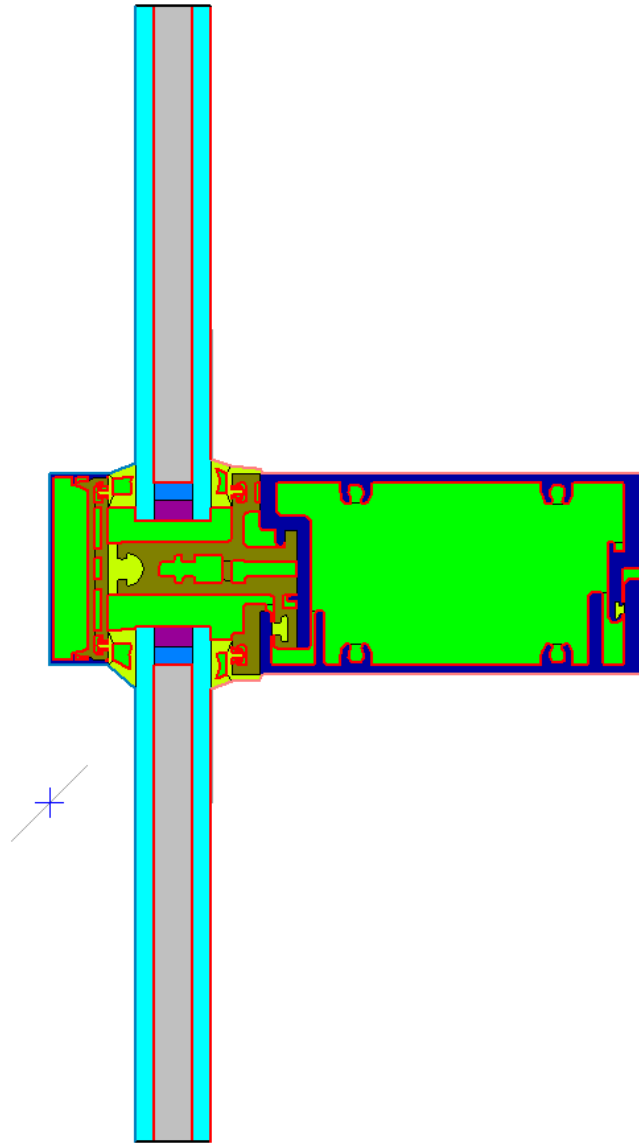
Typical Horizontal – Double Low E



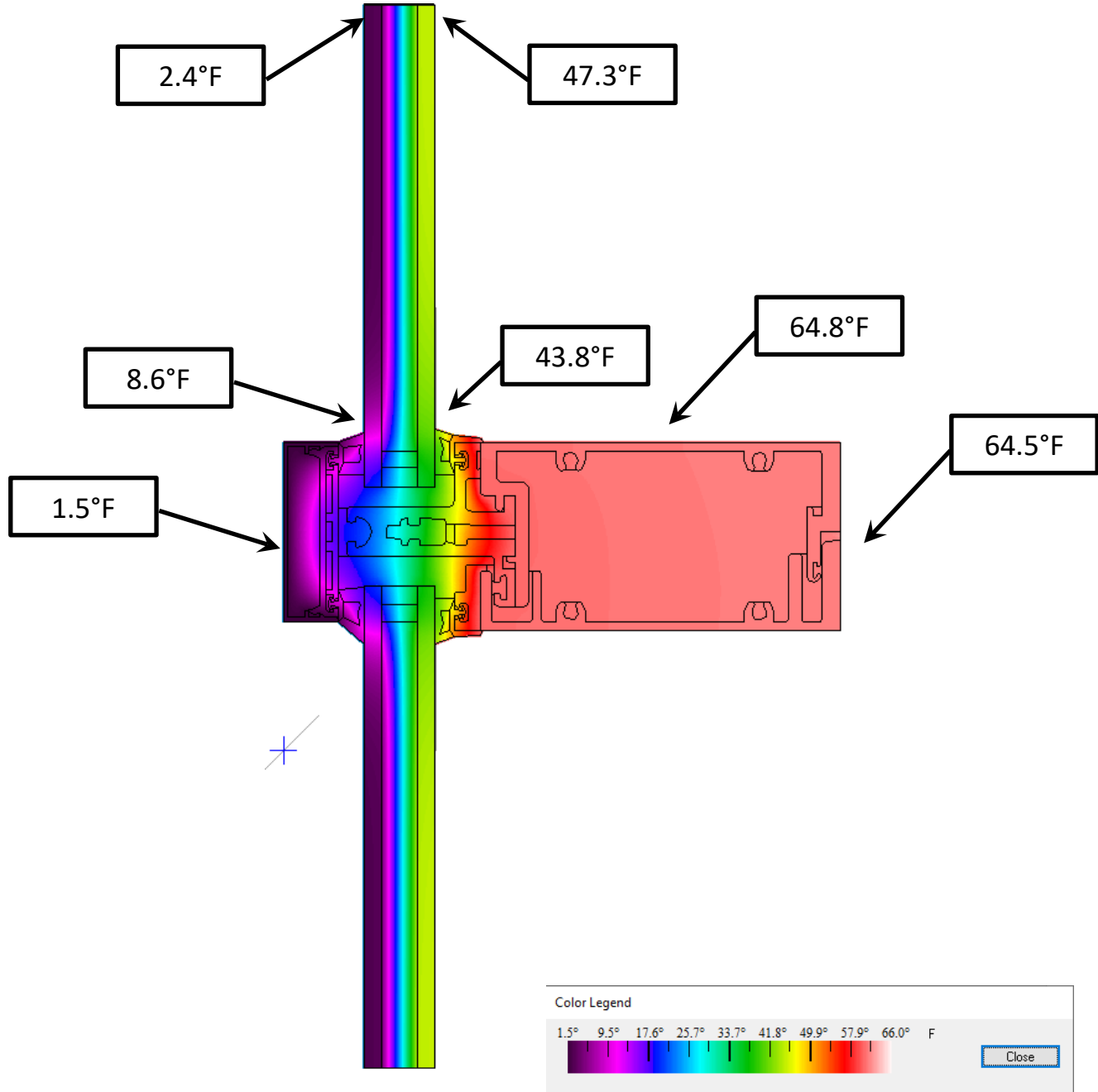
Typical Horizontal – Single Low E



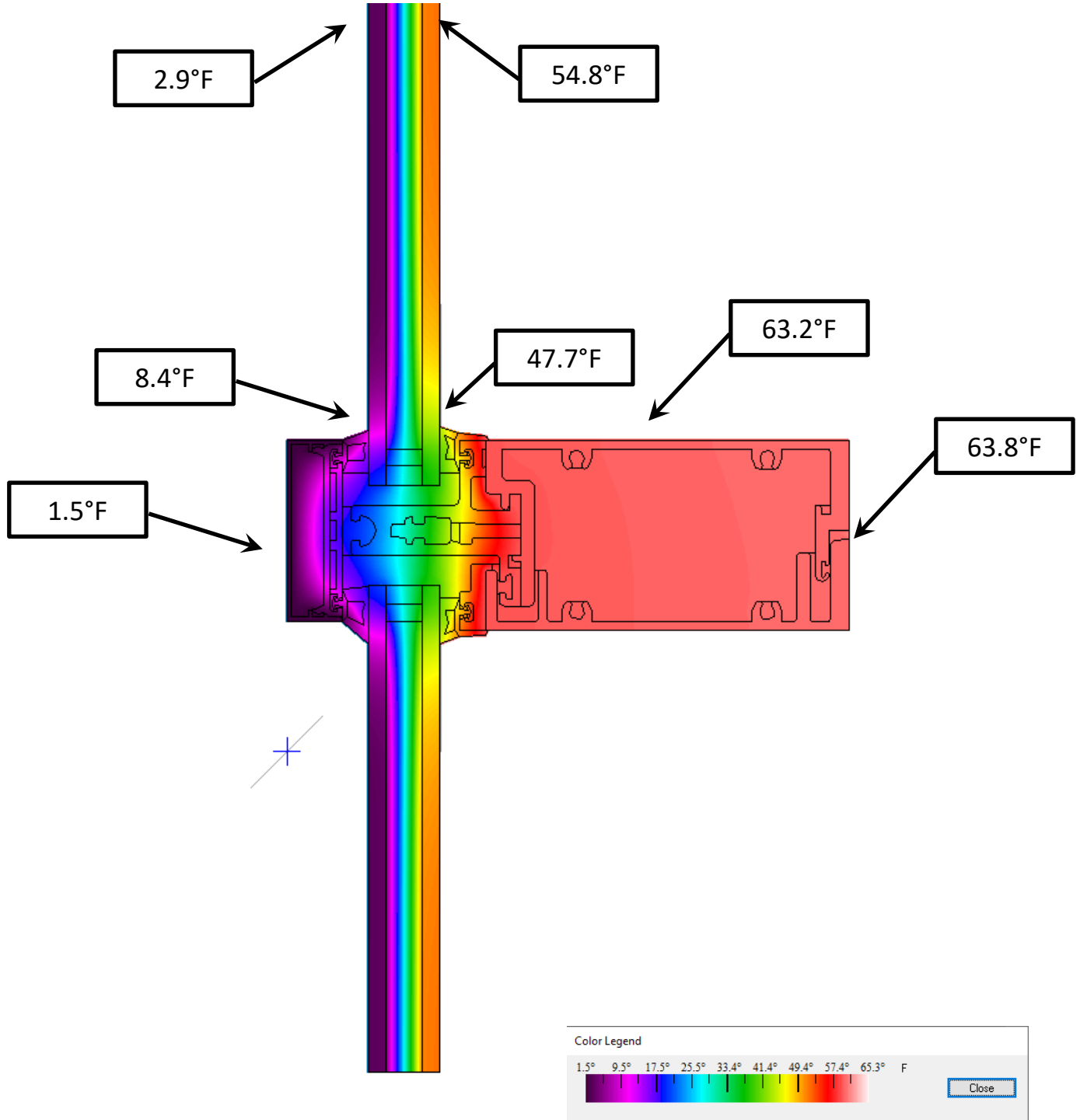
Typical Vertical



Typical Vertical – Double Low E



Typical Vertical – Single Low E



ID #

Name

Mode

Type >>

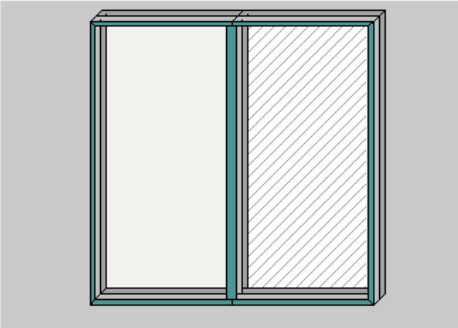
Width inches

Height inches

Area ft2

Tilt

Environmental Conditions



Total Window Results - Normal Incidence

Ufactor Btu/h-ft2-F

SHGC

VT

CR

Click on a component to display characteristics below

Glazing System

Name >>

ID	<input type="text" value="100"/>	Ucenter	<input type="text" value="0.19137"/> Btu/h-ft2-F
Nlayers	<input type="text" value="2"/>	SC	<input type="text" value="0.42136"/>
Area	<input type="text" value="15.44714"/> ft2	SHGC	<input type="text" value="0.36658"/>
Edge area	<input type="text" value="3.72484"/> ft2	Vtc	<input type="text" value="0.69953"/>

ID #

Name

Mode

Type >>

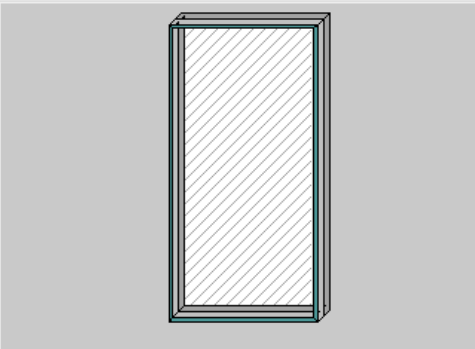
Width inches

Height inches

Area ft2

Tilt

Environmental Conditions



Total Window Results - Normal Incidence

Ufactor Btu/h-ft2-F

SHGC

VT

CR

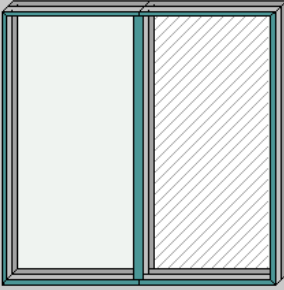
Click on a component to display characteristics below

Glazing System

Name >>

ID	<input type="text" value="100"/>	Ucenter	<input type="text" value="0.18603"/> Btu/h-ft2-F
Nlayers	<input type="text" value="2"/>	SC	<input type="text" value="0.42034"/>
Area	<input type="text" value="40.50721"/> ft2	SHGC	<input type="text" value="0.36570"/>
Edge area	<input type="text" value="5.87389"/> ft2	Vtc	<input type="text" value="0.69953"/>

ID # 26
 Name 01_102723_Cap PW2500 1in I
 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 0.27314 Btu/h-ft2-F
 SHGC 0.33852
 VT 0.63005
 CR 61

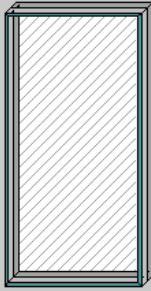
Click on a component to display characteristics below

Glazing System

Name RD030 Glass >>

ID	101	Ucenter	0.24321 Btu/h-ft2-F
Nlayers	2	SC	0.43155
Area	15.44714 ft2	SHGC	0.37545
Edge area	3.72484 ft2	Vtc	0.70742

ID # 27
 Name 01_102723_Cap PW2500 1in I
 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 0.26162 Btu/h-ft2-F
 SHGC 0.35079
 VT 0.65622
 CR 62

Click on a component to display characteristics below

Glazing System

Name RD030 Glass >>

ID	101	Ucenter	0.24135 Btu/h-ft2-F
Nlayers	2	SC	0.43129
Area	40.50721 ft2	SHGC	0.37522
Edge area	5.87389 ft2	Vtc	0.70742

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