

# TESSERACT DRAFTING & DESIGN INC.

## THERMAL SIMULATION REPORT: ALPINE 55, ALPINE 55+

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### Disclaimer

Please note that the fenestration system details were modeled and assessed for thermal heat transmittance only. The details were not evaluated with respect to other building enclosure functions such as moisture control, air leakage, or durability as part of this report. TESSERACT DRAFTING + DESIGN and its employees neither endorse nor warrant the suitability of the simulated products. The scope of work is to determine U-factors for the system as it was provided to TESSERACT DRAFTING + DESIGN. Furthermore, the effective U-factors provided in this report are for the fenestration product only, in general conformance with the requirements of NFRC 100. The effective U-factors do not account for thermal bridging of attachment anchors, floors slabs, and other installation realities.

Thermal simulation is not a guarantee of exact performance. The effective U-values presented in this report are not intended to certify the modeled products, or to be used for labeling purposes. The results are the exclusive property of Siber Facade for use on the identified building and may not be reproduced except in full, without the written approval of TESSERACT DRAFTING + DESIGN. Commercially reasonable business efforts were made to accurately model the thermal performance of the fenestration products documented in this report, but because of the large amount of input data and analyses, it is possible that non-material errors or omissions could remain.

### Product Description

Tested product is a punch out type window with options for full size operable vent or an operable vent insert. Mullions, head sill and intermediate extrusions are thermally broken by a thermal break and rolled.

A + Series feature additional phenolic foam inserts.

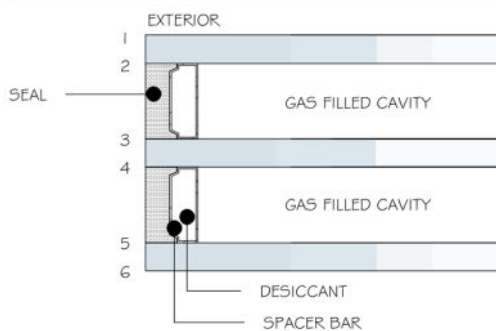


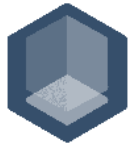
## Glass Types

The system was modeled with triple glazed IGUs per Siber Façade provided make ups. Typical unit make up consists of 6mm Clear lite, 12mm Argon Filled Spacer Cavity, 6mm Clear Lite, 12mm Argon Filled Spacer Cavity, 6mm Clear Lite. Four different Low E coating configurations were simulated. As summarized in the table below.

TAG	MAKE UP	U(W/m2-K)	U <sub>c</sub> (Btu/hft2-F)
Alpine 01	6mm CLR PDE67A #2 12mm Ar 95% Air 5% 6mm CLR PLE88A #4 12mm Ar 95% Air 5% 6mm CLR	0.756	0.133
Alpine 02	6mm CLR PDE80A #2 12mm Ar 95% Air 5% 6mm CLR 12mm Ar 95% Air 5% 6mm CLR PDE 80A #5	0.642	0.113
Alpine 03	6mm CLR GY70 #2 12mm Ar 95% Air 5% 6mm CLR GY70#4 12mm Ar 95% Air 5% 6mm CLR	0.693	0.122
Alpine 04	6mm CLR PDE80A #2 12mm Ar 95% Air 5% 6mm CLR 12mm Ar 95% Air 5% 6mm CLR	0.951	0.167

## Typical Sealed Unit





## Results

### Fixed Window Alpine 55 (W/m<sup>2</sup>-K)

Name	U <sub>frame</sub>	U <sub>edge</sub>	Projected Frame Dimension
Window Head Alpine 01	1.953699	1.281836	50.5mm
Window Head Alpine 02	1.961360	1.188226	50.5mm
Window Head Alpine 03	1.956455	1.229996	50.5mm
Window Head Alpine 04	1.929372	1.490665	50.5mm
Window Jamb Alpine 01	2.154480	1.292277	50.5mm
Window Jamb Alpine 02	2.162801	1.198714	50.5mm
Window Jamb Alpine 03	2.157621	1.240536	50.5mm
Window Jamb Alpine 04	2.128526	1.501106	50.5mm
Window Sill Alpine 01	1.952580	1.281404	50.5mm
Window Sill Alpine 02	1.960197	1.187794	50.5mm
Window Sill Alpine 03	1.955308	1.229564	50.5mm
Window Sill Alpine 04	1.928365	1.490319	50.5mm

### Fixed Window Alpine 55 (Btu/hft<sup>2</sup>-F)

Name	U <sub>frame</sub>	U <sub>edge</sub>	Projected Frame Dimension
Window Head Alpine 01	0.344082247	0.225754843	1.99 in
Window Head Alpine 02	0.34543149	0.209268404	1.99 in
Window Head Alpine 03	0.344567629	0.216624868	1.99 in
Window Head Alpine 04	0.339797816	0.262533462	1.99 in
Window Jamb Alpine 01	0.379443466	0.227593695	1.99 in
Window Jamb Alpine 02	0.380908947	0.211115534	1.99 in
Window Jamb Alpine 03	0.379996654	0.218481155	1.99 in
Window Jamb Alpine 04	0.37487249	0.264372314	1.99 in
Window Sill Alpine 01	0.343885171	0.22567876	1.99 in
Window Sill Alpine 02	0.345226664	0.209192321	1.99 in
Window Sill Alpine 03	0.344365622	0.216548785	1.99 in
Window Sill Alpine 04	0.339620465	0.262472526	1.99 in

### System U-Value

Type: Picture, 1200mm x 1500mm

Name	U-Value (W/m <sup>2</sup> -K)	U-Value (Btu/hft <sup>2</sup> -F)
Alpine 01	1.034	0.182
Alpine 02	0.942	0.166
Alpine 03	0.982	0.173
Alpine 04	1.198	0.211



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## Fixed Window Alpine 55+ (W/m<sup>2</sup>-K)

Name	U <sub>frame</sub>	U <sub>edge</sub>	Projected Frame Dimension
Window Head Alpine 01	1.953699	1.281836	50.5mm
Window Head Alpine 02	1.96136	1.188226	50.5mm
Window Head Alpine 03	1.956455	1.229996	50.5mm
Window Head Alpine 04	1.929372	1.490665	50.5mm
Window Jamb Alpine 01	2.15448	1.292277	50.5mm
Window Jamb Alpine 02	2.162801	1.198714	50.5mm
Window Jamb Alpine 03	2.157621	1.240536	50.5mm
Window Jamb Alpine 04	2.128526	1.501106	50.5mm
Window Sill Alpine 01	1.95258	1.281404	50.5mm
Window Sill Alpine 02	1.960197	1.187794	50.5mm
Window Sill Alpine 03	1.955308	1.229564	50.5mm
Window Sill Alpine 04	1.928365	1.490319	50.5mm

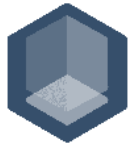
## Fixed Window Alpine 55+ (Btu/hft<sup>2</sup>-F)

Name	U <sub>frame</sub>	U <sub>edge</sub>	Projected Frame Dimension
Window Head Alpine 01	0.304082776	0.224744276	1.99 in
Window Head Alpine 02	0.305327052	0.2082205	1.99 in
Window Head Alpine 03	0.304508101	0.215590525	1.99 in
Window Head Alpine 04	0.300058824	0.261636668	1.99 in
Window Jamb Alpine 01	0.31154403	0.225998063	1.99 in
Window Jamb Alpine 02	0.31281578	0.20945597	1.99 in
Window Jamb Alpine 03	0.311987848	0.216837619	1.99 in
Window Jamb Alpine 04	0.307454033	0.262974111	1.99 in
Window Sill Alpine 01	0.303866855	0.224668193	1.99 in
Window Sill Alpine 02	0.305101268	0.208143713	1.99 in
Window Sill Alpine 03	0.304283727	0.215513913	1.99 in
Window Sill Alpine 04	0.29986069	0.261568334	1.99 in

## System U-Value

Type: Picture, 1200mm x 1500mm

Name	U-Value (W/m <sup>2</sup> -K)	U-Value (Btu/hft <sup>2</sup> -F)
Alpine 01	0.986	0.174
Alpine 02	0.894	0.158
Alpine 03	0.936	0.165
Alpine 04	1.151	0.203



# TESSERACT DRAFTING & DESIGN INC.

## Operable Window Alpine 55 (W/m<sup>2</sup>-K)

Name	U <sub>frame</sub>	U <sub>edge</sub>	Projected Frame Dimension
Operable Head Alpine 01	2.110183	1.113646	83.4mm
Operable Head Alpine 02	2.114361	1.021796	83.4mm
Operable Head Alpine 03	2.111201	1.062903	83.4mm
Operable Head Alpine 04	2.095968	1.318641	83.4mm
Operable Jamb Alpine 01	2.240992	1.12915	83.4mm
Operable Jamb Alpine 02	2.245398	1.036921	83.4mm
Operable Jamb Alpine 03	2.24217	1.078239	83.4mm
Operable Jamb Alpine 04	2.226381	1.335432	83.4mm
Operable Sill Alpine 01	2.241848	1.129313	83.4mm
Operable Sill Alpine 02	2.24621	1.037033	83.4mm
Operable Sill Alpine 03	2.243004	1.078398	83.4mm
Operable Sill Alpine 04	2.227364	1.33569	83.4mm

## Operable Operable Alpine 55 (Btu/hft<sup>2</sup>-F)

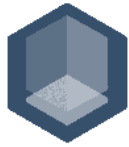
Name	U <sub>frame</sub>	U <sub>edge</sub>	Projected Frame Dimension
Operable Head Alpine 01	0.371641951	0.196133498	3.28 in
Operable Head Alpine 02	0.372377774	0.179957027	3.28 in
Operable Head Alpine 03	0.37182124	0.187196724	3.28 in
Operable Head Alpine 04	0.369138429	0.232236879	3.28 in
Operable Jamb Alpine 01	0.394679817	0.198864037	3.28 in
Operable Jamb Alpine 02	0.395455794	0.182620817	3.28 in
Operable Jamb Alpine 03	0.394887284	0.189897675	3.28 in
Operable Jamb Alpine 04	0.392106552	0.235194082	3.28 in
Operable Sill Alpine 01	0.394830574	0.198892744	3.28 in
Operable Sill Alpine 02	0.395598802	0.182640542	3.28 in
Operable Sill Alpine 03	0.395034167	0.189925678	3.28 in
Operable Sill Alpine 04	0.392279676	0.235239521	3.28 in

## System U-Value

Type: Casement, 600mm x 1500mm (23.622in x 59.055in)

Type: Dual Action, 1200 x 1500 (23.622in x 59.055in)

Name	Casement		Dual Action	
	U-Value (W/m <sup>2</sup> -K)	U-Value (Btu/hft <sup>2</sup> -F)	U-Value (W/m <sup>2</sup> -K)	U-Value (Btu/hft <sup>2</sup> -F)
Alpine 01	1.366	0.241	1.154	0.203
Alpine 02	1.300	0.229	1.072	0.189
Alpine 03	1.330	0.234	1.109	0.195
Alpine 04	1.488	0.262	1.301	0.229



# TESSERACT DRAFTING & DESIGN INC.

## Operable Window Alpine 55+ (W/m<sup>2</sup>-K)

Name	U <sub>frame</sub>	U <sub>edge</sub>	Projected Frame Dimension
Operable Head Alpine 01	2.013583	1.107343	83.4mm
Operable Head Alpine 02	2.017757	1.015467	83.4mm
Operable Head Alpine 03	2.014603	1.056613	83.4mm
Operable Head Alpine 04	1.999448	1.312441	83.4mm
Operable Jamb Alpine 01	2.06413	1.117676	83.4mm
Operable Jamb Alpine 02	2.068389	1.025417	83.4mm
Operable Jamb Alpine 03	2.065207	1.066731	83.4mm
Operable Jamb Alpine 04	2.049796	1.324109	83.4mm
Operable Sill Alpine 01	2.065009	1.117844	83.4mm
Operable Sill Alpine 02	2.069238	1.025529	83.4mm
Operable Sill Alpine 03	2.066074	1.066895	83.4mm
Operable Sill Alpine 04	2.050795	1.324367	83.4mm

## Operable Operable Alpine 55+ (Btu/hft<sup>2</sup>-F)

Name	U <sub>frame</sub>	U <sub>edge</sub>	Projected Frame Dimension
Operable Head Alpine 01	0.354628919	0.195023424	3.28 in
Operable Head Alpine 02	0.355364037	0.178842374	3.28 in
Operable Head Alpine 03	0.354808559	0.18608894	3.28 in
Operable Head Alpine 04	0.352139486	0.231144945	3.28 in
Operable Jamb Alpine 01	0.363531173	0.196843255	3.28 in
Operable Jamb Alpine 02	0.364281261	0.180594752	3.28 in
Operable Jamb Alpine 03	0.363720852	0.187870905	3.28 in
Operable Jamb Alpine 04	0.361006692	0.233199894	3.28 in
Operable Sill Alpine 01	0.363685981	0.196872843	3.28 in
Operable Sill Alpine 02	0.364430785	0.180614477	3.28 in
Operable Sill Alpine 03	0.363873547	0.187899789	3.28 in
Operable Sill Alpine 04	0.361182635	0.233245333	3.28 in

## System U-Value

Type: Casement, 600mm x 1500mm (23.622in x 59.055in)

Type: Dual Action, 1200 x 1500 (23.622in x 59.055in)

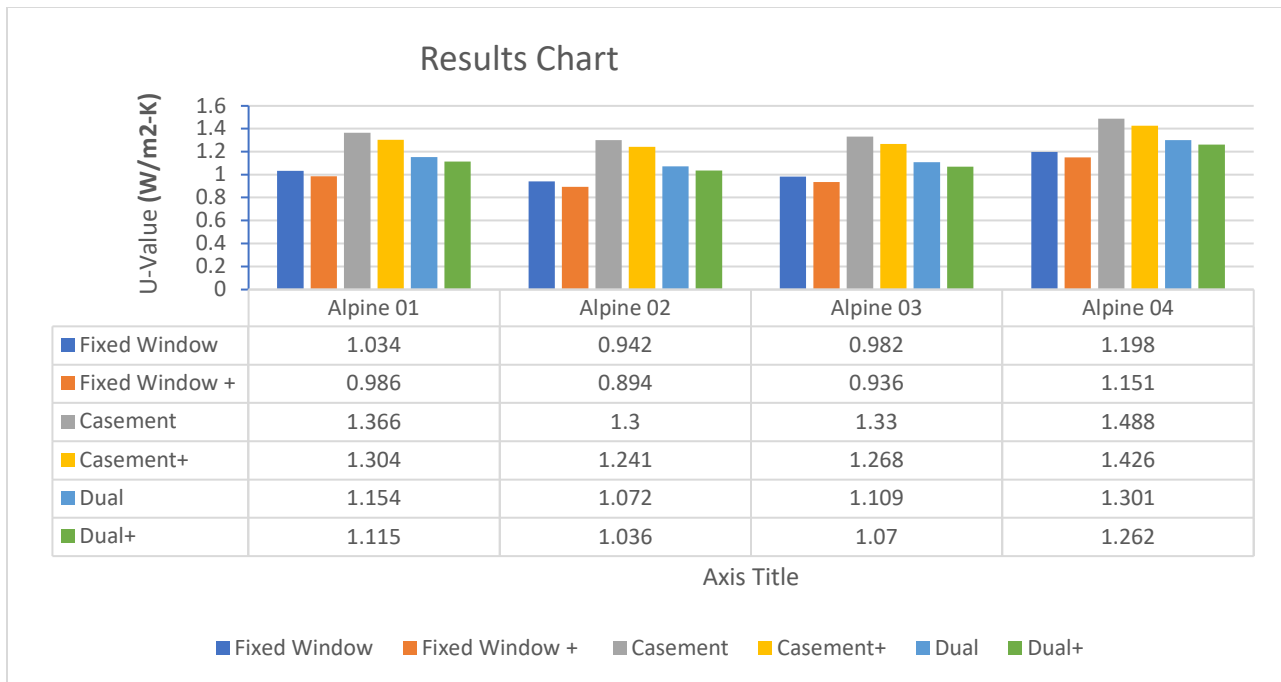
Name	Casement		Dual Action	
	U-Value (W/m <sup>2</sup> -K)	U-Value (Btu/hft <sup>2</sup> -F)	U-Value (W/m <sup>2</sup> -K)	U-Value (Btu/hft <sup>2</sup> -F)
Alpine 01	1.304	0.230	1.115	0.196
Alpine 02	1.241	0.219	1.036	0.183
Alpine 03	1.268	0.223	1.070	0.188
Alpine 04	1.426	0.251	1.262	0.222



## Acronyms and Symbols

- U<sub>frame</sub>**            **Frame U-Value**
- U<sub>edge</sub>**            **Edge of Glass U-Value**
- U<sub>cog</sub>**            **Center of Glass U-Value**

## Data Comparison



## Simulation Materials

	<b>Name</b>	<b>Conductivity (W/m2-K)</b>	<b>Conductivity (Btu/hft2-F)</b>
	Frame Cavity NFRC 100		
	Polyamide 6.6 25% Glass Fiber	0.1980	0.114
	Aluminum (Painted)	160	92.4463
	Silicone	0.35	0.202
	EPDM	0.2500	0.1444
	Polyurethane Foam	0.0500	0.0289
	Phenolic Foam	0.0230	0.0133

