

תקציר

ניתוח מערכות חזית והשוואתן נעשה ל- 9 מערכות של קבוצת הבנייה אלומיניום קונסטרוקשיין.

מסמך זה מציג רק 4 מהם בקיצור ועוסק בהשוואה בין כל ה- 9.

המחקר בחן את ביצועי המערכות והשפעתן על:

טמפרטורות, נוחות תרמית, צריכת חשמל למיזוג בכל החזיתות, בקיץ ובחורף.

הניתוח נעשה באמצעות תוכנות מתקדמות Design-Build , Term ו- WINDOW 7.7.



Comparative research

Façade system analysis



Aluminum Construction Group
Simply Professional



אוסטרליץ אדריכלות
תכנון, ייעוץ והתייעלות

General Data



Systems Analysis



Comparison



SINGLE SKIN
DGU SN 60/28



SINGLE SKIN
DGU SN 70/37

SINGLE SKIN
TDGU SN 70/37
+Shading



Single Skin
DGU SN 70/37
+Shading



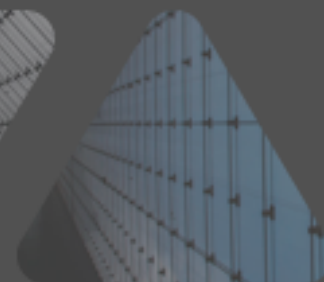
DSNV SN 70/37
+Shading

DSMV
SN 70/37
+Shading



CCF DGU
SN 70/37

CCF Vacuum
SN 70/37






Triple Vacuum
SN 70/37

Comparative research

Façade system analysis



Environmental Conditions - Solar Radiation

	Façade Orientation	Peak Solar Radiation (W/m ²)	Winter Solar Radiation (kWh/m ² /year)	Summer Solar Radiation (kWh/m ² /year)	Yearly Solar Radiation (kWh/m ² /year)
	South	892	418	245	954
	West	780	184	461	879
	North	205	51	134	233
	East	760	164	339	674

Comparative research

Façade system analysis



אוסטראליה אוניברסיטת אדריכלות

ARCHITECTURE
URBANISM
SUSTAINABILITY

Standards Set Environmental Conditions

Comparative Base requirements in order to satisfy NFRC standards:

ANSI/NFRC 100: Procedure for Determining Fenestration Product U-Factors

ANSI/NFRC 200: Determining Fenestration Product Solar Heat Gain Coefficient

Comparative research

Façade system analysis



אוסטדניץ אדריכלות AUS

ARCHITECTURE
URBANISM
SUSTAINABILITY

Thermal Comfort

The condition of mind that expresses satisfaction with the thermal environment and is assessed by **subjective** evaluation.

(as defined in ASHRAE standard 55)

- Many studies show that thermal comfort have a significant impact on building occupants' **productivity and health**. Office workers who are satisfied with their thermal environment are more productive.
- Building envelope, and specifically glazed facades, have a great influence on the thermal comfort of the building occupants in proximity to the façade.

Comparative research

Façade system analysis



אוניברסיטת ארצות הברית AUS

ARCHITECTURE
URBANISM
SUSTAINABILITY

Factors effecting Thermal perception

Environmental Factors

Personal Factors



Comparative research

Façade system analysis



Selected systems

General Data

Systems Analysis

Comparison

SINGLE SKIN
DGU SN 60/28

SINGLE SKIN
DGU SN 70/37

Single Skin
DGU SN 70/37
+Shading

SINGLE SKIN
TDGU SN 70/37
+Shading

DSNV SN 70/37
+Shading

DSMV
SN 70/37
+Shading

CCF DGU
SN 70/37

CCF Vacuum
SN 70/37

Triple Vacuum
SN 70/37

Comparative research

Façade system analysis





SS DGU SN 70/37 + shading

Single skin double glazing unit

Comparative research

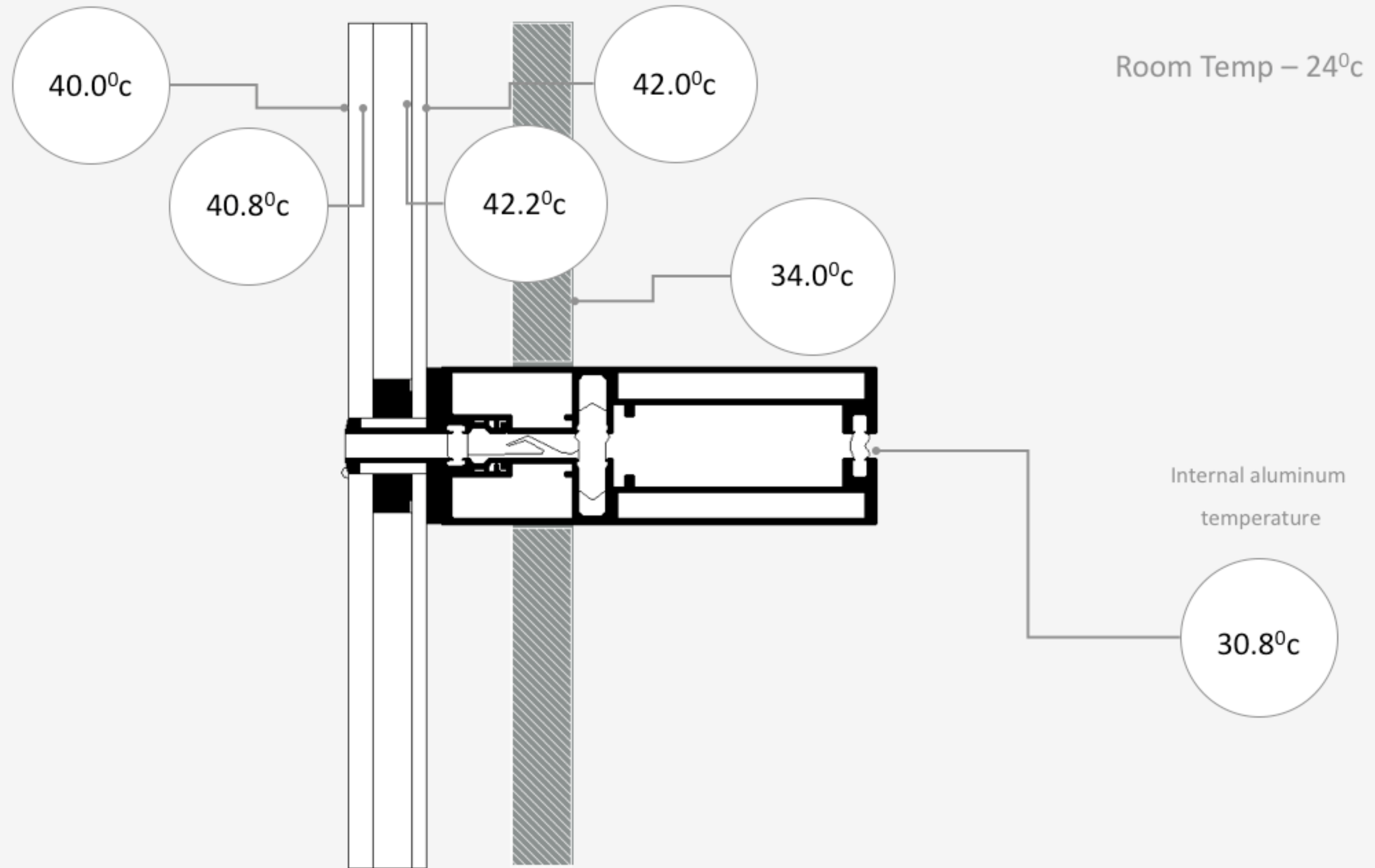
Façade system analysis



Vertical Sill

Outside Temp – 32⁰c

Solar Radiation
783 W/m²



Frame U-Value
14.03 w/m²K

Comparative research

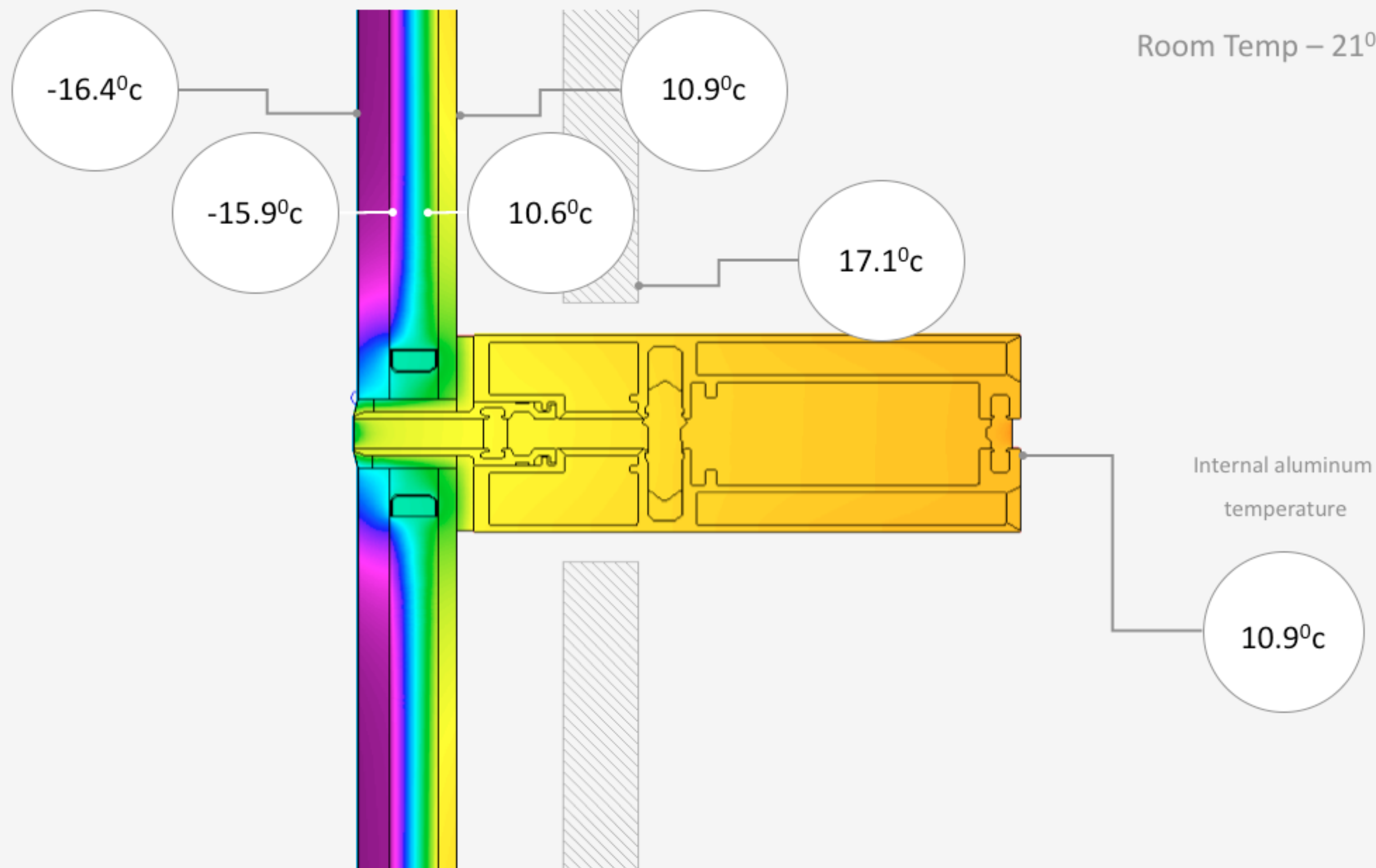
Façade system analysis



Vertical Sill

Outside Temp – -18°C

Room Temp – 21°C



Frame U-Value
14.03 w/m²K

Legend

Comparative research

Façade system analysis



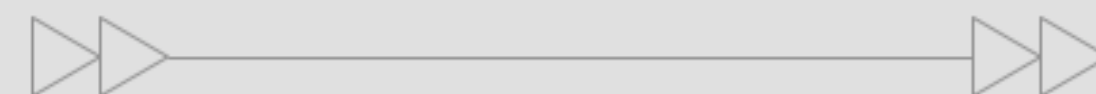


DSNV SN 70/37 + shading







Double skin natural ventilated

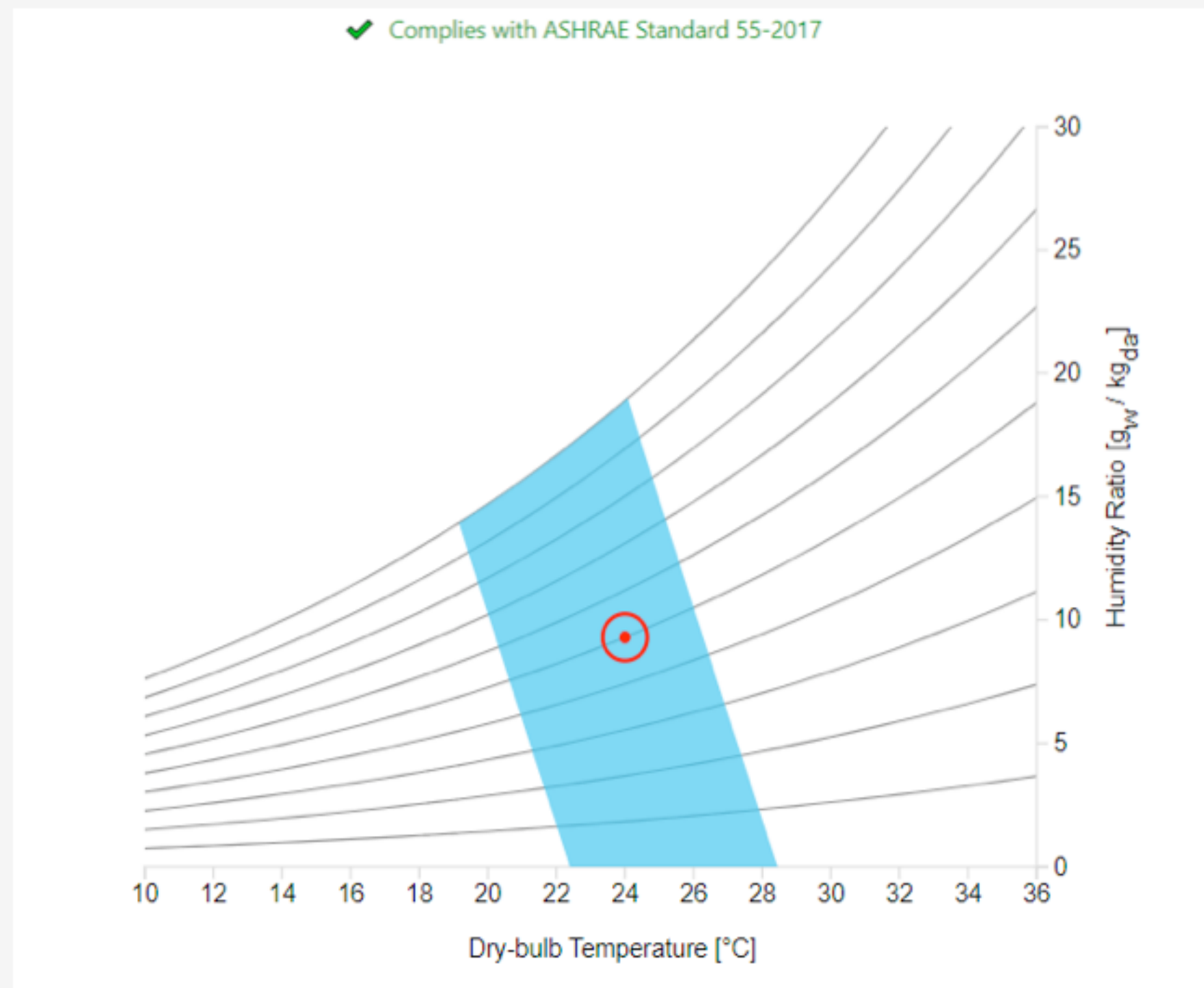
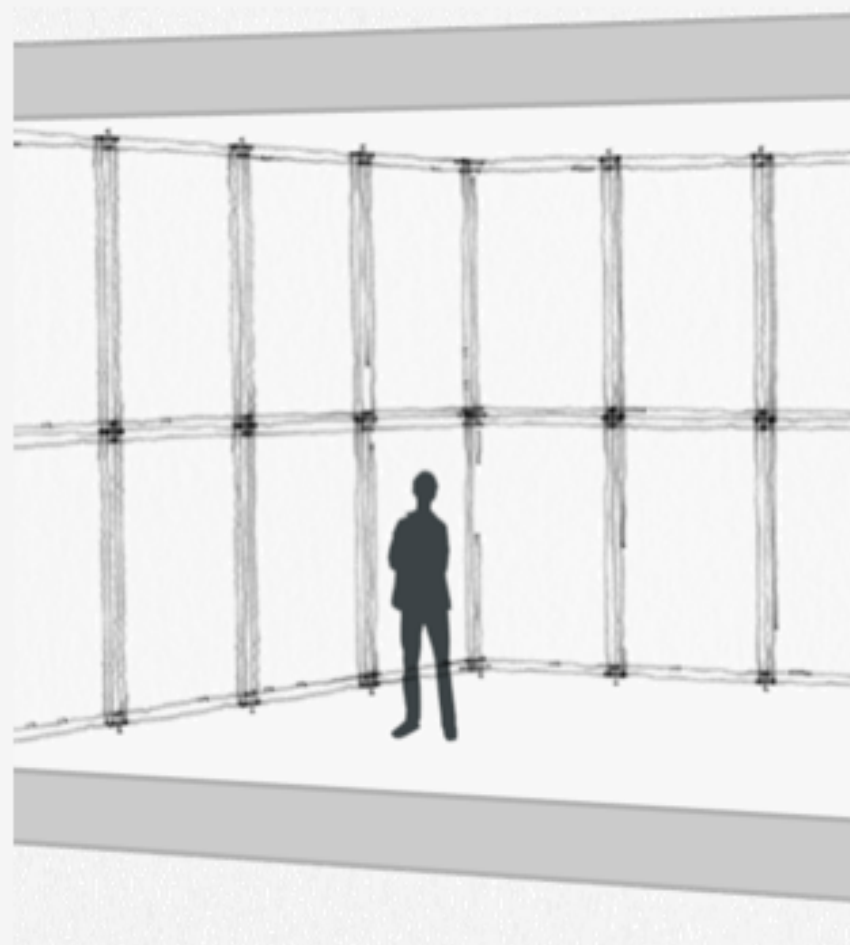
Comparative research

Façade system analysis



Thermal Comfort

-  24°C
-  28.5°C
(By Simulation)
-  0.1 m/s
-  50%
-  1.1 met
(Sedentary work)
-  0.5 clothing
(Summer work clothing)



PMV = 0.12 PPD = 5%

Comparative research

Façade system analysis

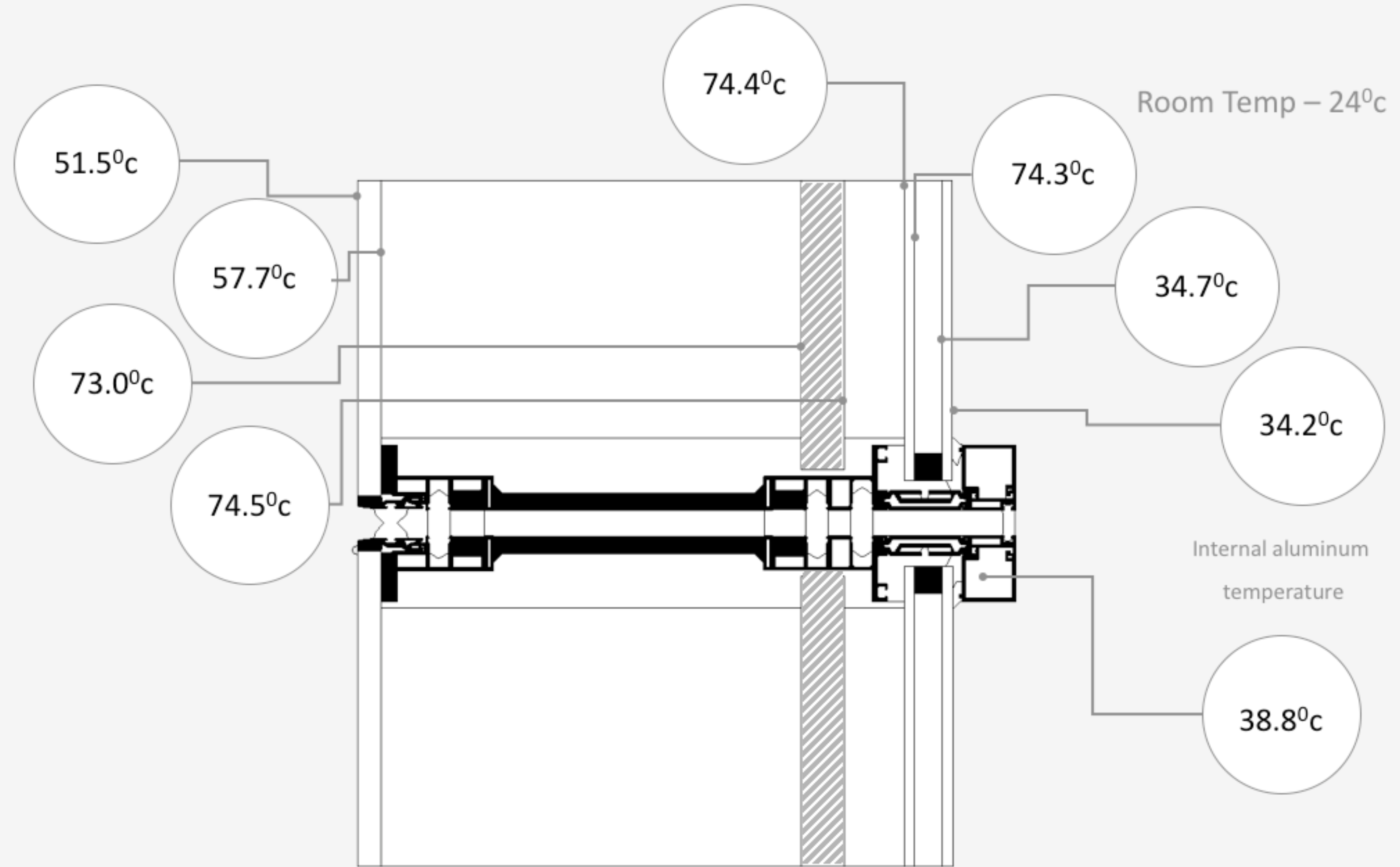


Vertical Sill

Outside Temp – 32⁰c

Solar Radiation
783 W/m²

Frame U-Value
3.36 w/m²K



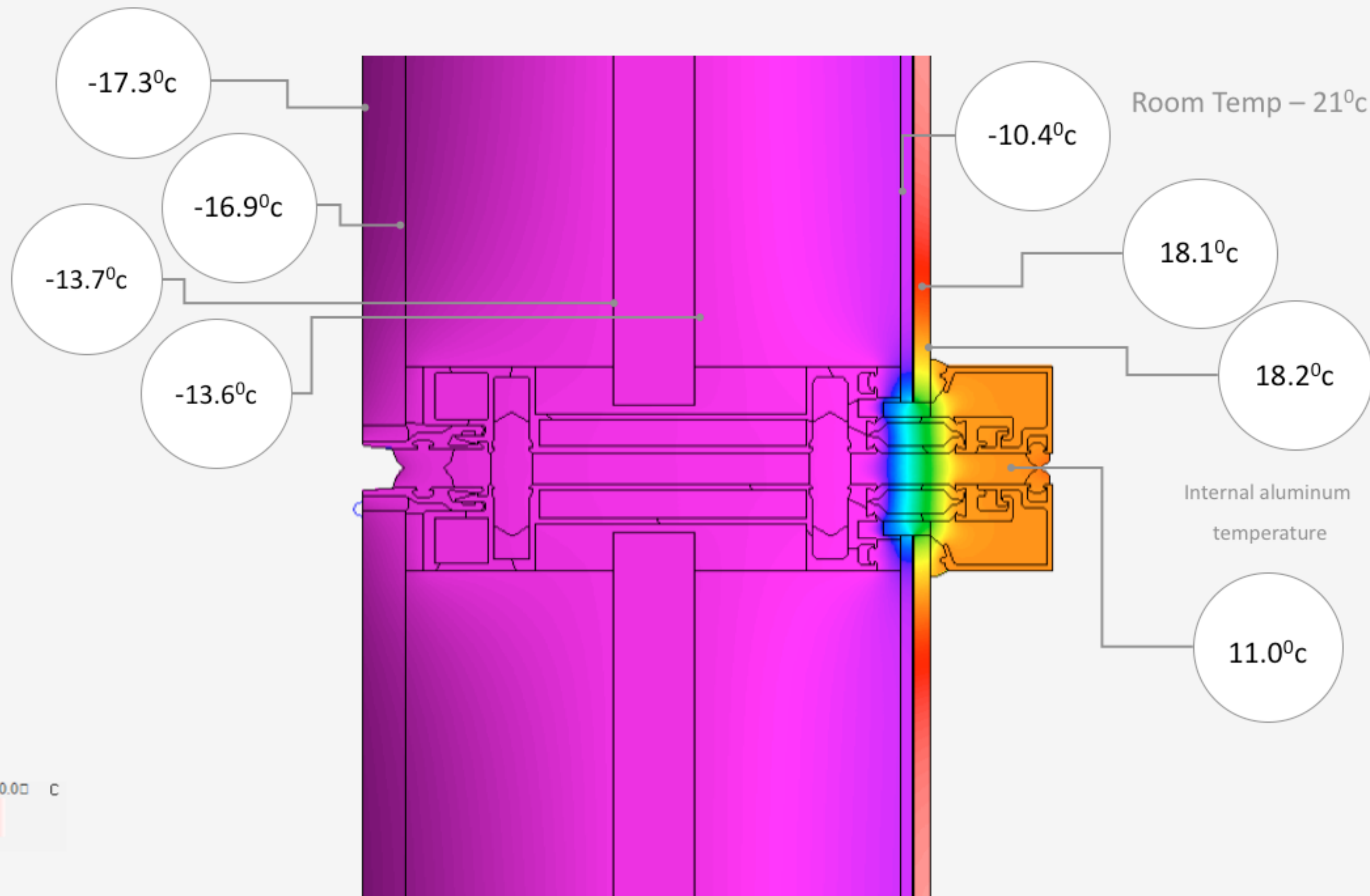
Comparative research

Façade system analysis



Vertical Sill

Outside Temp – -18°C



Frame U-Value
 $3.89 \text{ w/m}^2\text{K}$

Legend



Comparative research

Façade system analysis



Triple Vacuum SN 70/37 + shading



Comparative research

Façade system analysis



Thermal Comfort



24°C



27.8°C
(By Simulation)



0.1 m/s



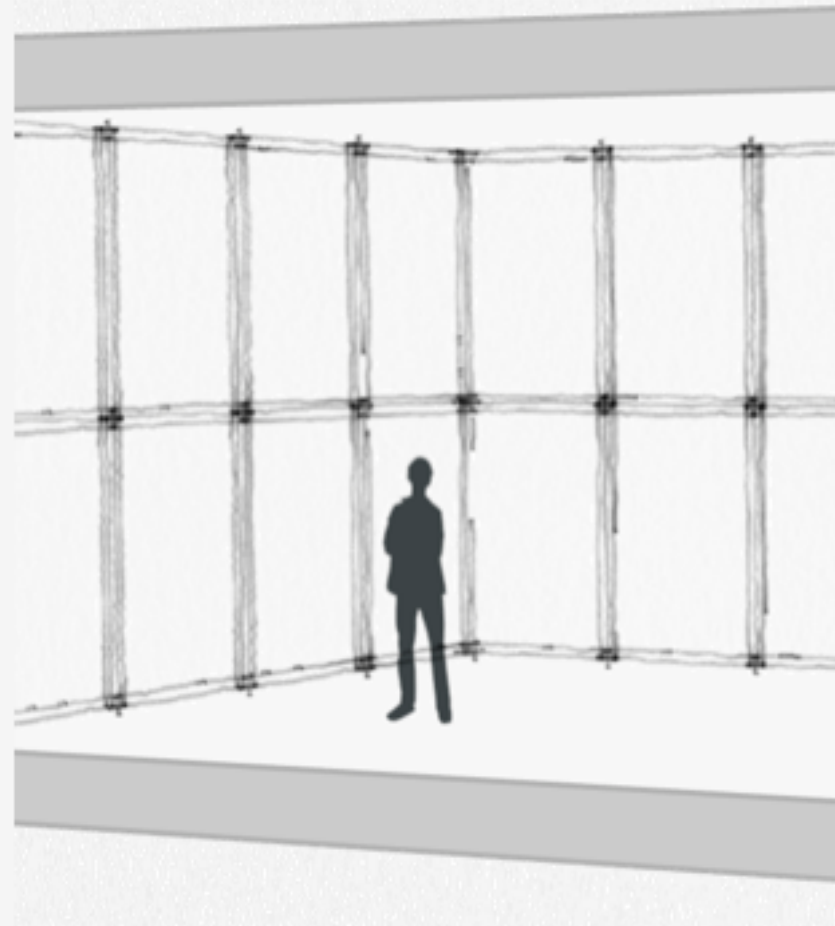
50%



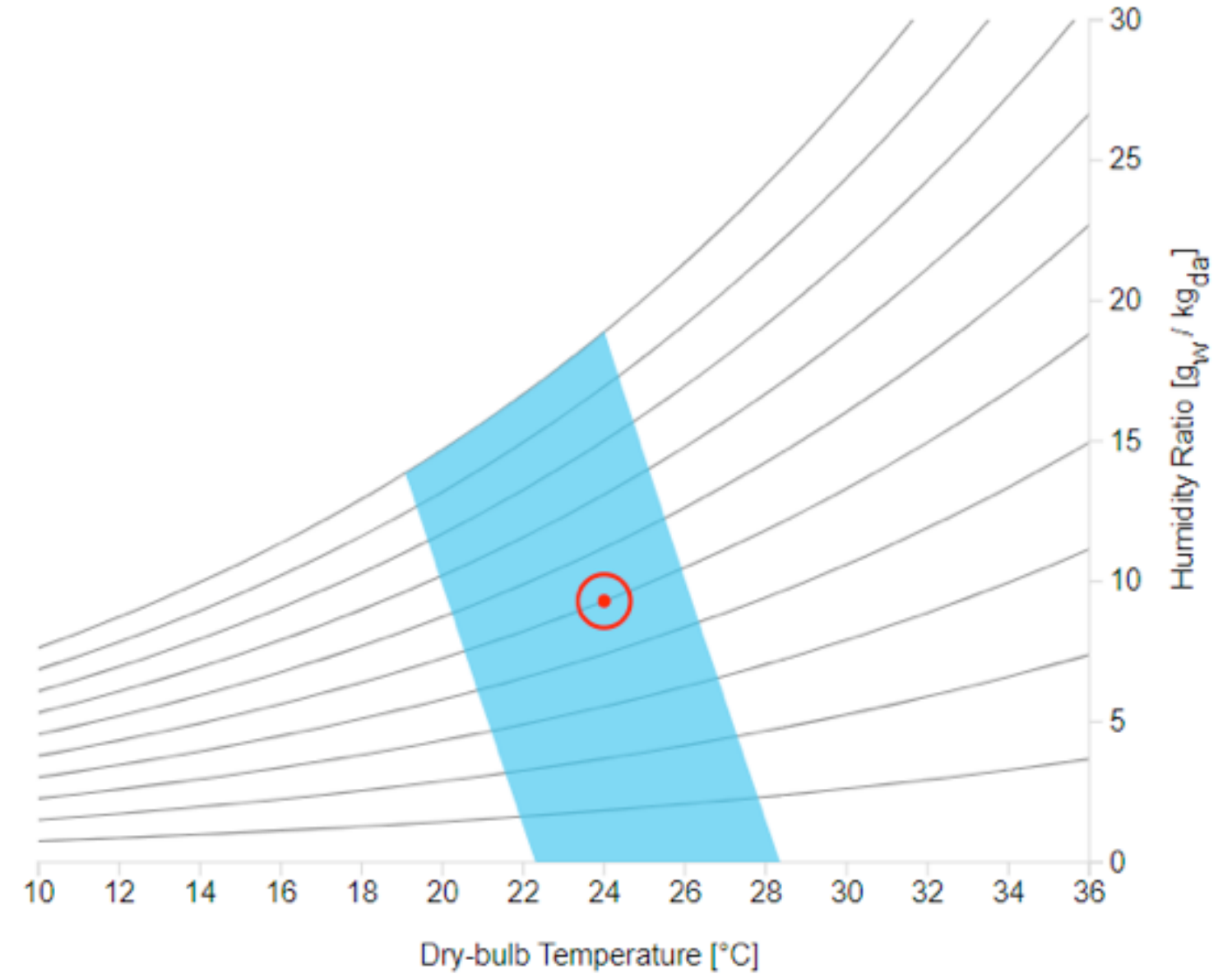
1.1 met
(Sedentary work)



0.5 clo
(Summer work clothing)



✓ Complies with ASHRAE Standard 55-2017



PMV = 0.01

PPD = 5%

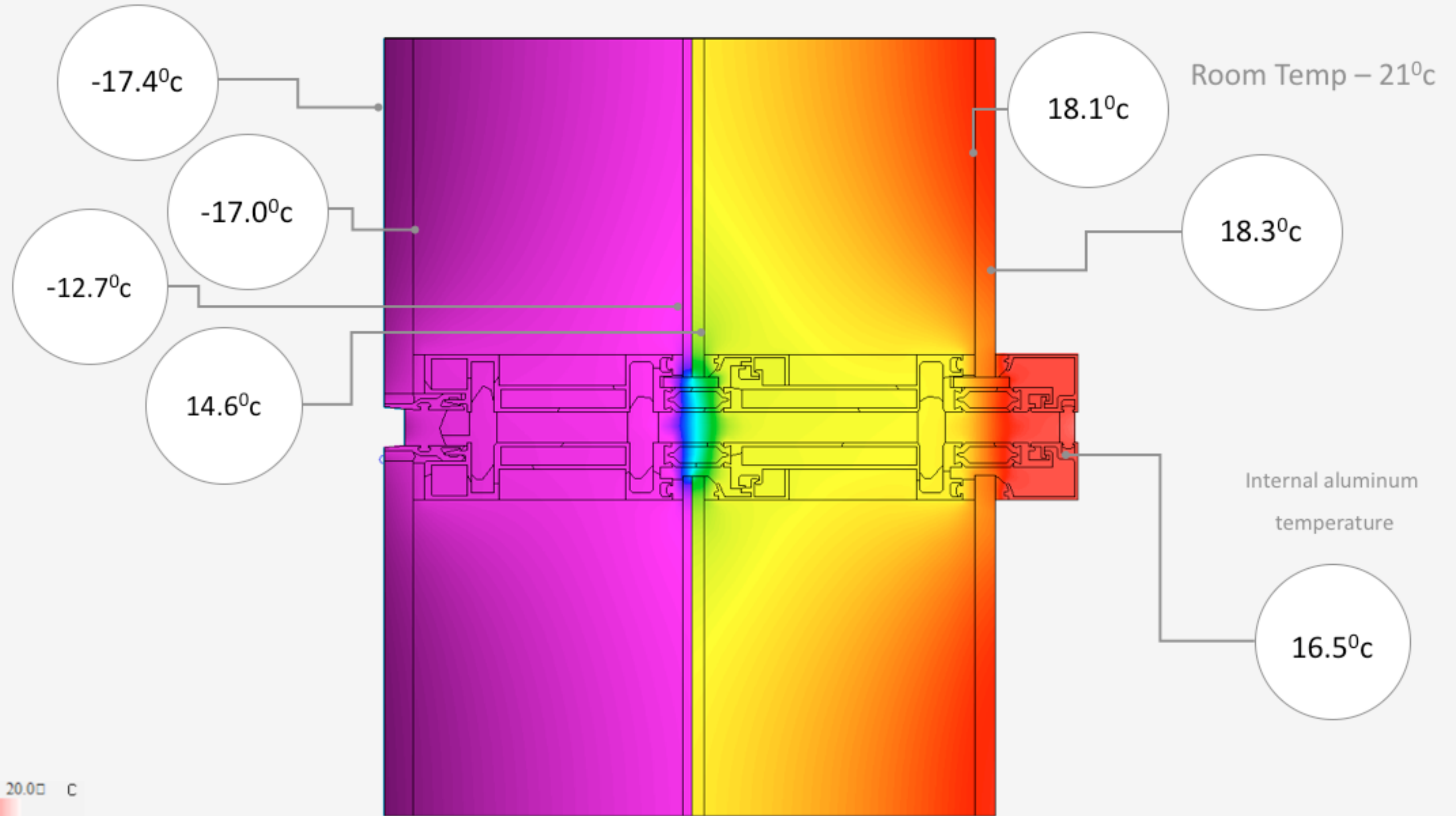
Comparative research

Façade system analysis



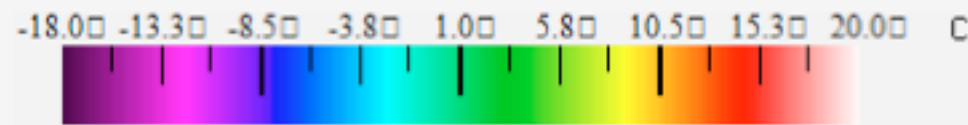
Vertical Sill

Outside Temp – -18°C



Frame U-Value
 $1.73 \text{ w/m}^2\text{K}$

Legend



Comparative research- Winter

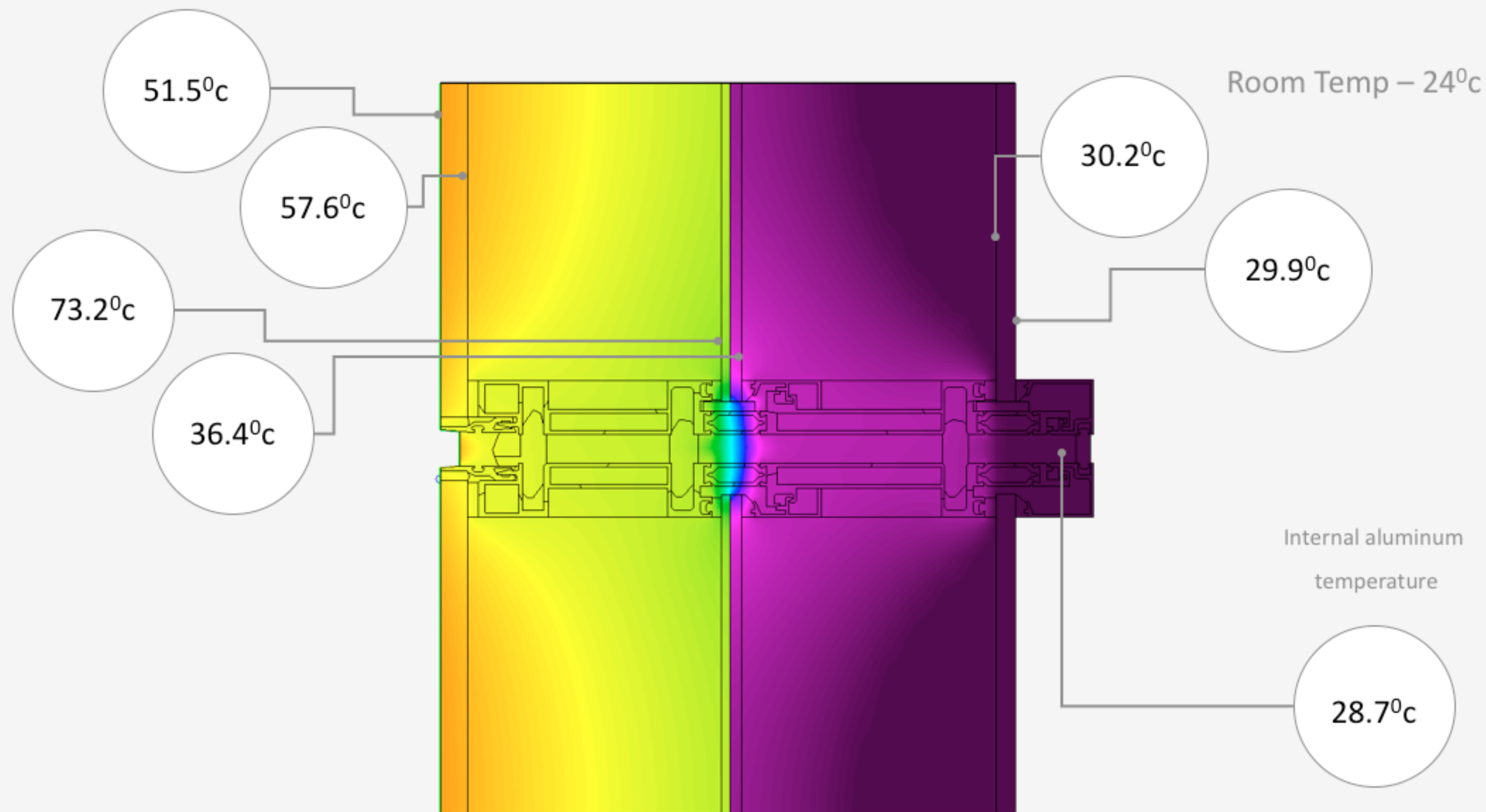
Façade system analysis



Vertical Sill

Outside Temp – 32⁰c

Solar Radiation
783 W/m²



Frame U-Value
1.73 w/m²K

Internal aluminum
temperature

Comparative research- Summer

Façade system analysis



General Data



Systems Analysis



		SINGLE SKIN DGU SN 60/28	SINGLE SKIN TDGU SN 70/37 +Shading	DSMV SN 70/37 +Shading		CCF Vacuum SN 70/37	
	SINGLE SKIN DGU SN 70/37	Single Skin DGU SN 70/37 +Shading	DSNV SN 70/37 +Shading	CCF DGU SN 70/37	Triple Vacuum SN 70/37		

Comparison









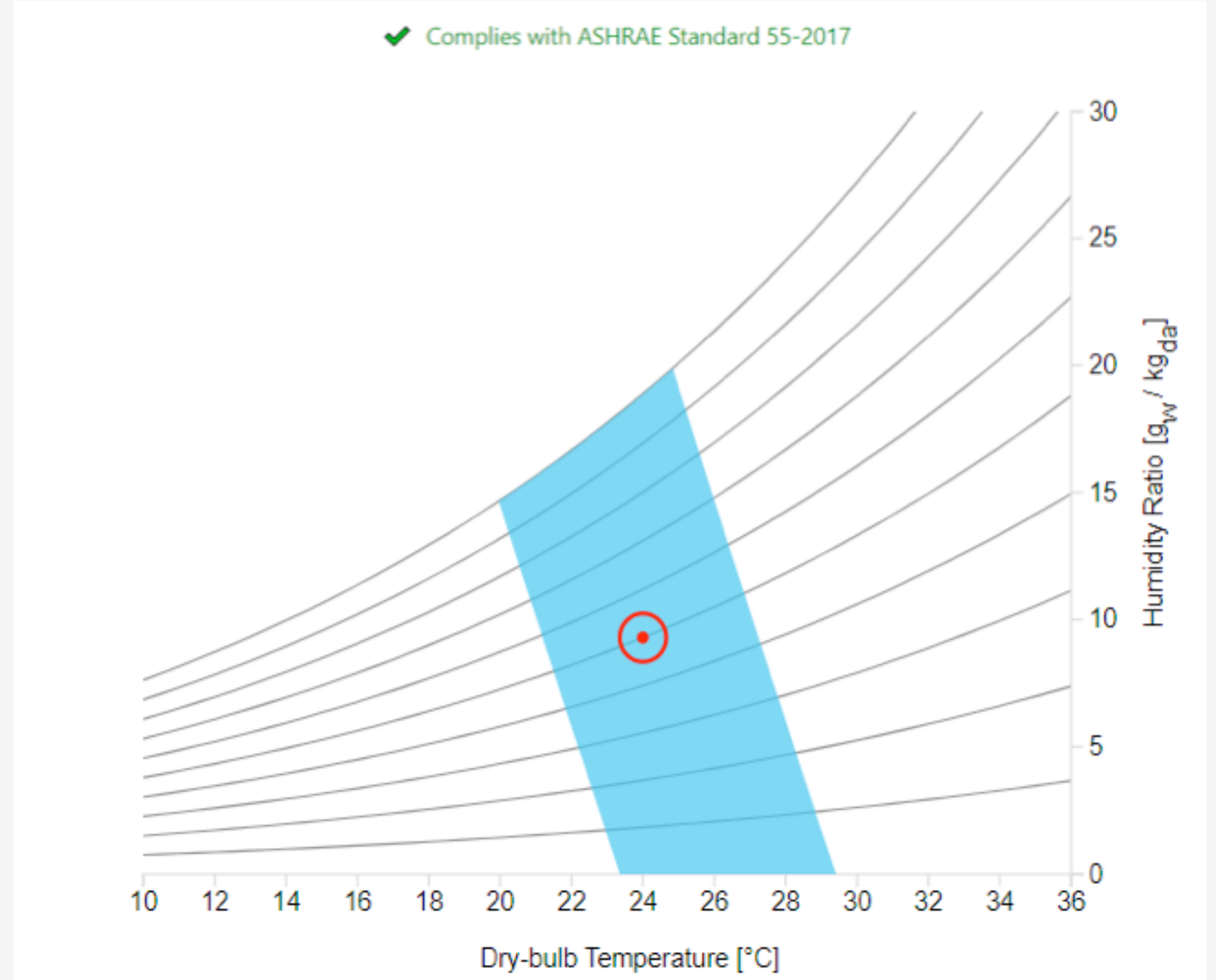
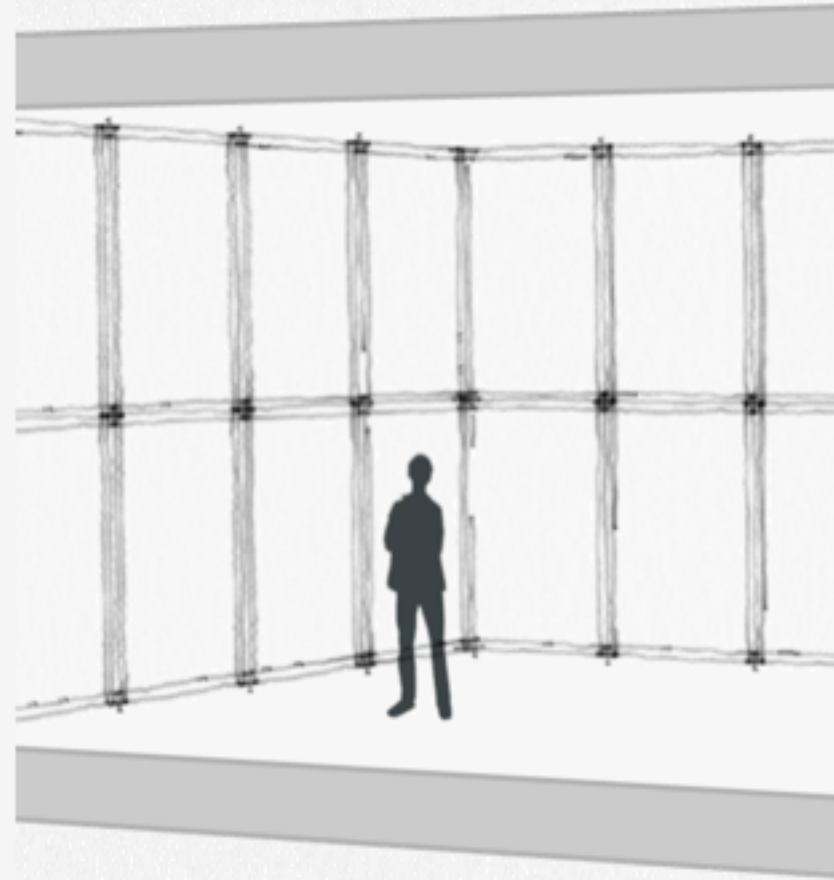
Comparative research

Façade system analysis



Thermal Comfort

-  24°C
-  27.5°C
(By Simulation)
-  0.1 m/s
-  50%
-  1.1 met
(Sedentary work)
-  0.5 clo
(Summer work clothing)



PMV = 0.03

PPD = 5%

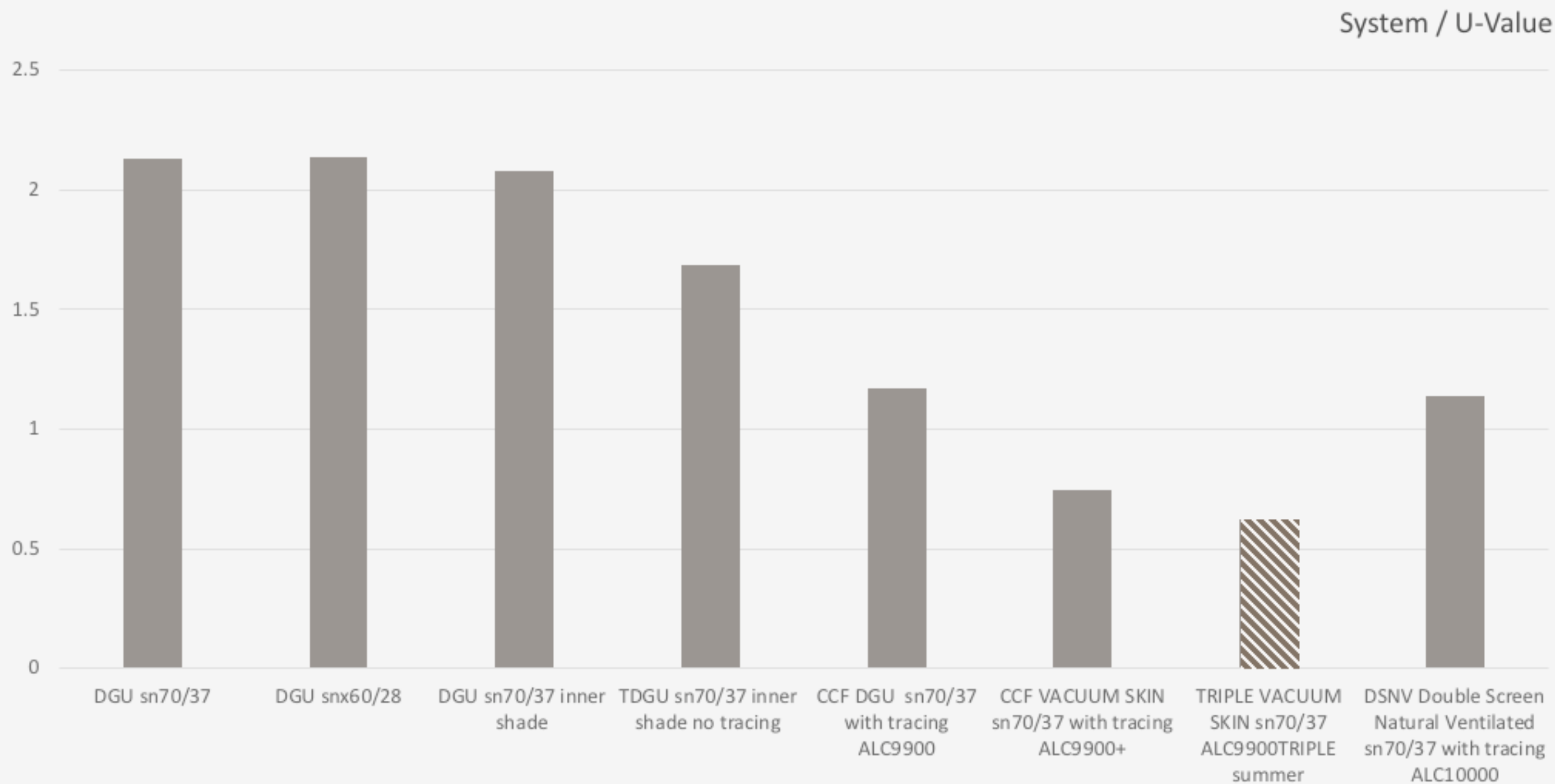
Comparative research

Façade system analysis



U-Value

▶ TRIPLE VACUUM SKIN
U-Value 0.625



Comparative research

Façade system analysis



U-Value

Center of glazing data

		DGU sn70/37	DGU snx60/28	DGU sn70/37 inner shade	TDGU sn70/37 inner shade no tracing	CCF DGU sn70/37 with tracing ALC9900	CCF VACUUM SKIN sn70/37 with tracing ALC9900+	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE - retracted shades	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE summer	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE winter	DSNV Double Screen Natural Ventilated sn70/37 with tracing ALC10000
Open		1.399	1.408	1.251	0.95	0.88	0.48	0.459	0.437	0.44	0.881
45°		-	-	1.217	0.929	0.856	0.474	-	0.432	0.432	0.856
Closed		-	-	1.197	0.913	0.829	0.465	-	0.427	0.41	0.829




Comparative research

Façade system analysis



SHGC

Solar Heat
Gain Coefficient
Center of glazing data

	DGU sn70/37	DGU snx60/28	DGU sn70/37 inner shade	TDGU sn70/37 inner shade no tracing	CCF DGU sn70/37 with tracing ALC9900	CCF VACUUM SKIN sn70/37 with tracing ALC9900+	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE - retracted shades	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE summer	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE winter	DSNV Double Screen Natural Ventilated sn70/37 with tracing ALC10000
Open 	0.342	0.263	0.48	0.315	0.298	0.255	0.274	0.259	0.267	0.298
45° 	-	-	0.386	0.296	0.156	0.088	-	0.105	0.225	0.156
Closed 	-	-	0.377	0.287	0.136	0.066	-	0.06	0.172	0.136

Comparative research

LT

Light
Transmittance
Center of glazing data

Open



45°



Closed



	DGU sn70/37	DGU snx60/28	DGU sn70/37 inner shade	TDGU sn70/37 inner shade no tracing	CCF DGU sn70/37 with tracing ALC9900	CCF VACUUM SKIN sn70/37 with tracing ALC9900+	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE - retracted shades	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE summer	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE winter	DSNV Double Screen Natural Ventilated sn70/37 with tracing ALC10000
Open	0.687	0.6	0.564	0.52	0.495	0.5	0.559	0.509	0.515	0.495
45°	-	-	0.067	0.063	0.058	0.059	-	0.11	0.15	0.058
Closed	-	-	0	0	0	0	-	0	0	0




Comparative research



SC

Shading
Coefficient

Center of glazing data

	DGU sn70/37	DGU snx60/28	DGU sn70/37 inner shade	TDGU sn70/37 inner shade no tracing	CCF DGU sn70/37 with tracing ALC9900	CCF VACUUM SKIN sn70/37 with tracing ALC9900+	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE - retracted shades	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE summer	TRIPLE VACUUM SKIN sn70/37 ALC9900 TRIPLE winter	DSNV Double Screen Natural Ventilated sn70/37 with tracing ALC10000
Open 	0.393	0.302	0.469	0.362	0.342	0.294	0.315	0.298	0.307	0.342
45° 	-	-	0.443	0.341	0.179	0.101	-	0.121	0.259	0.18
Closed 	-	-	0.433	0.33	0.156	0.076	-	0.069	0.198	0.157

Comparative research

Façade system analysis

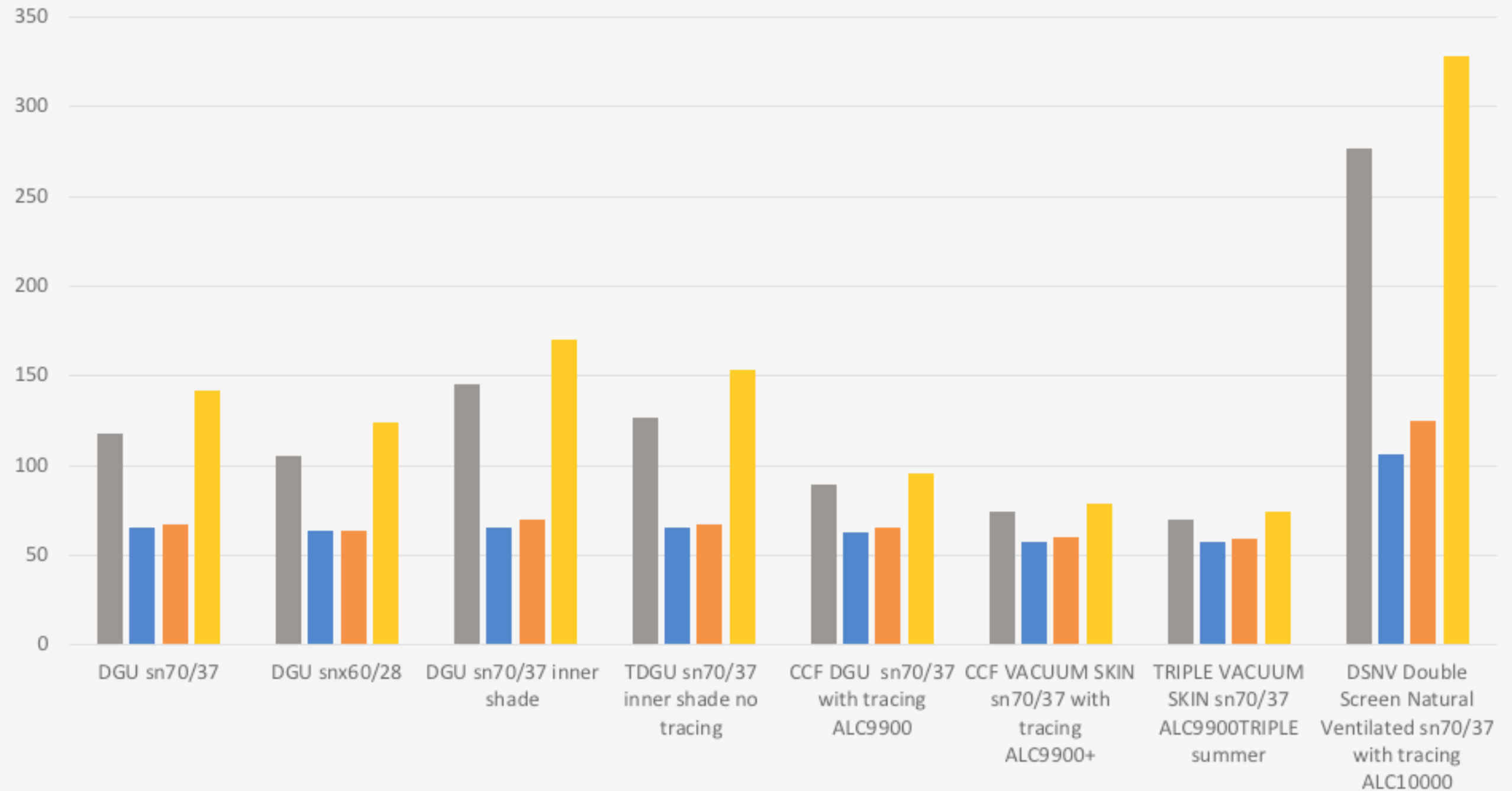


HVAC peak Energy consumption

All Facades

System / Energy Saving (w/m²)

-  South Facade
-  West Facade
-  North Facade
-  East Facade



Comparative research

Façade system analysis



Shade Temperature

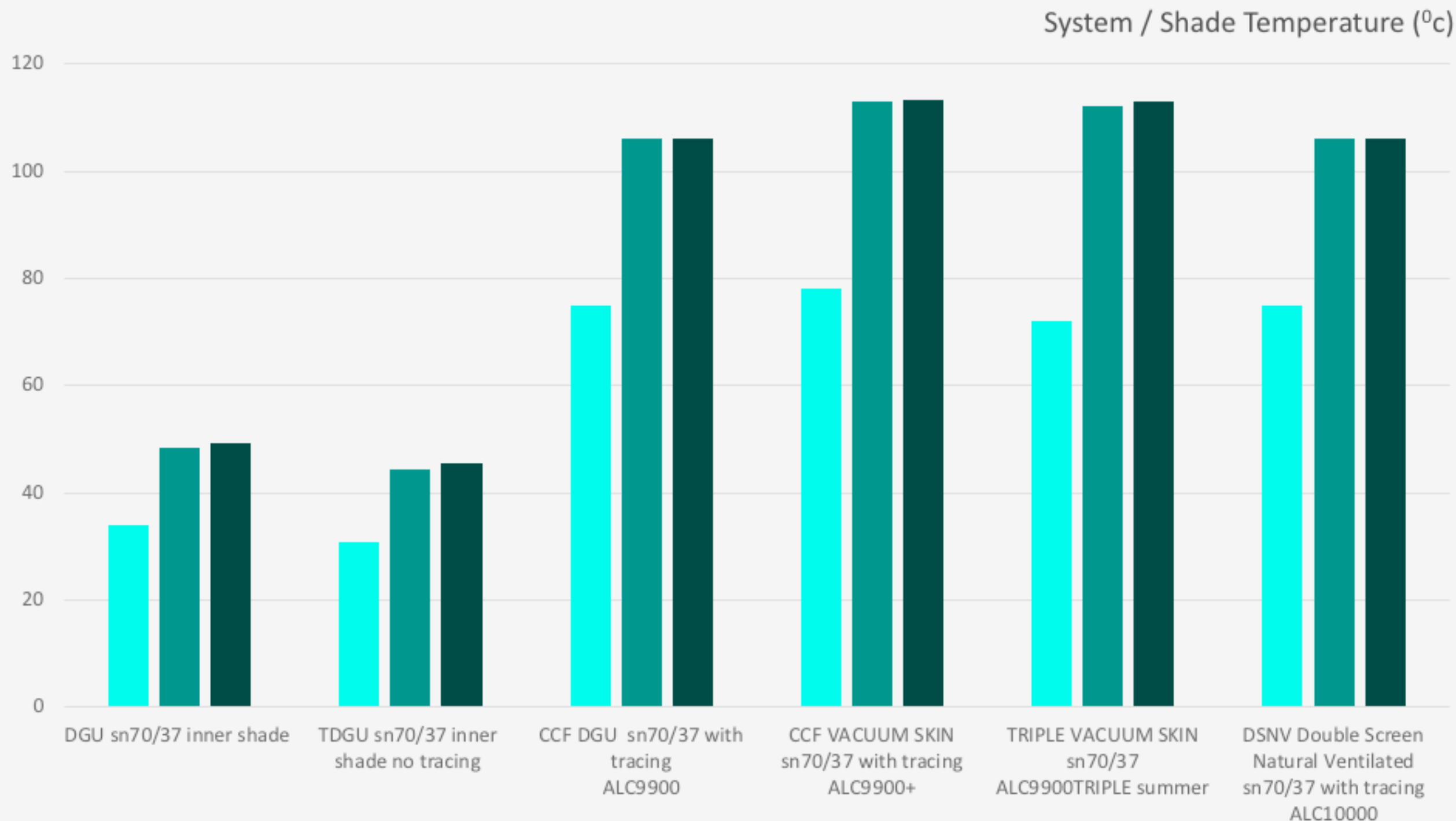
▶ DGU sn70/37 inner shade
Average of 43.90°C



Open

45°

Closed



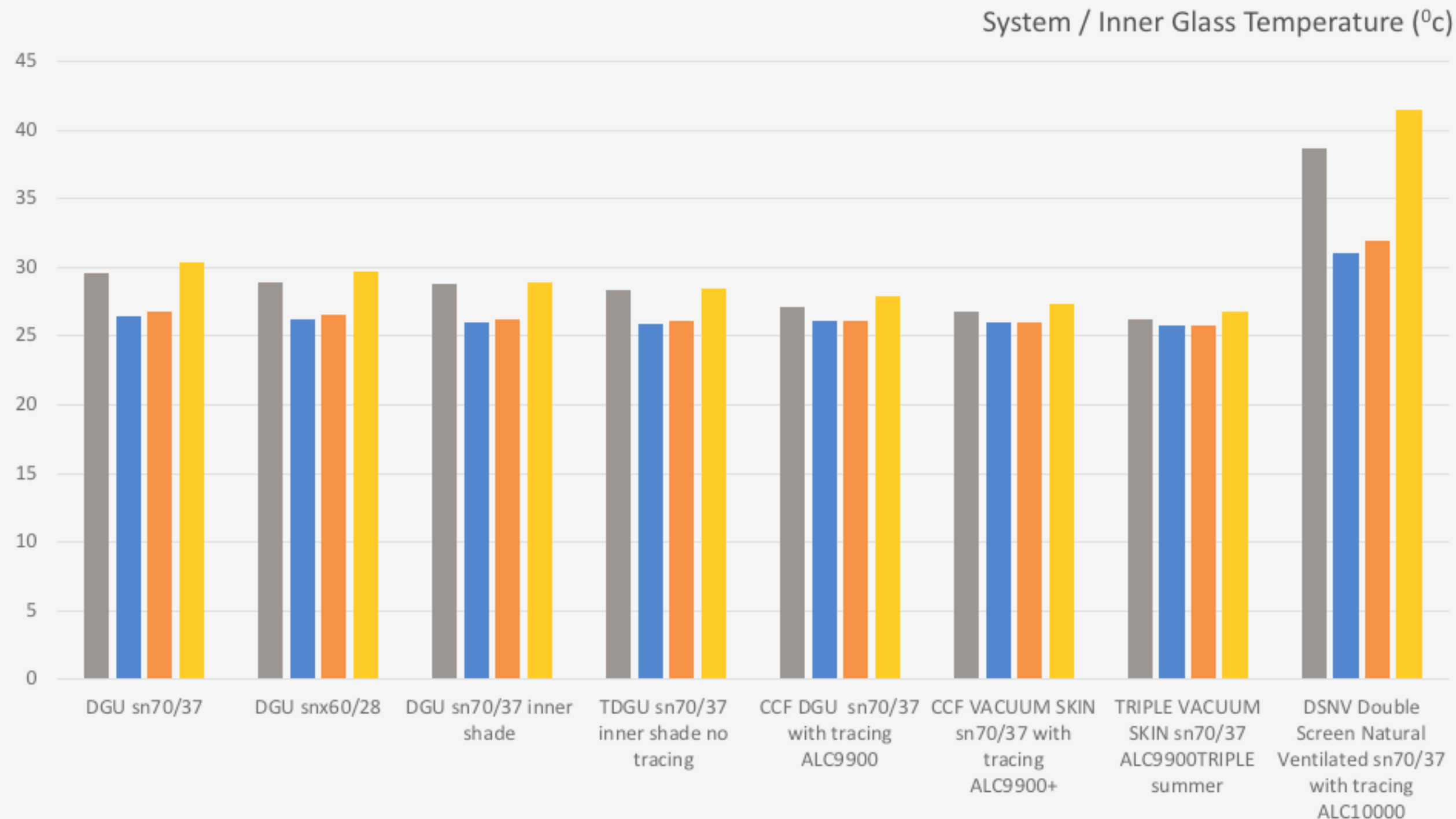
Comparative research - SUMMER



Inner Glass Temperature

All Facades

-  South Facade
-  West Facade
-  North Facade
-  East Facade



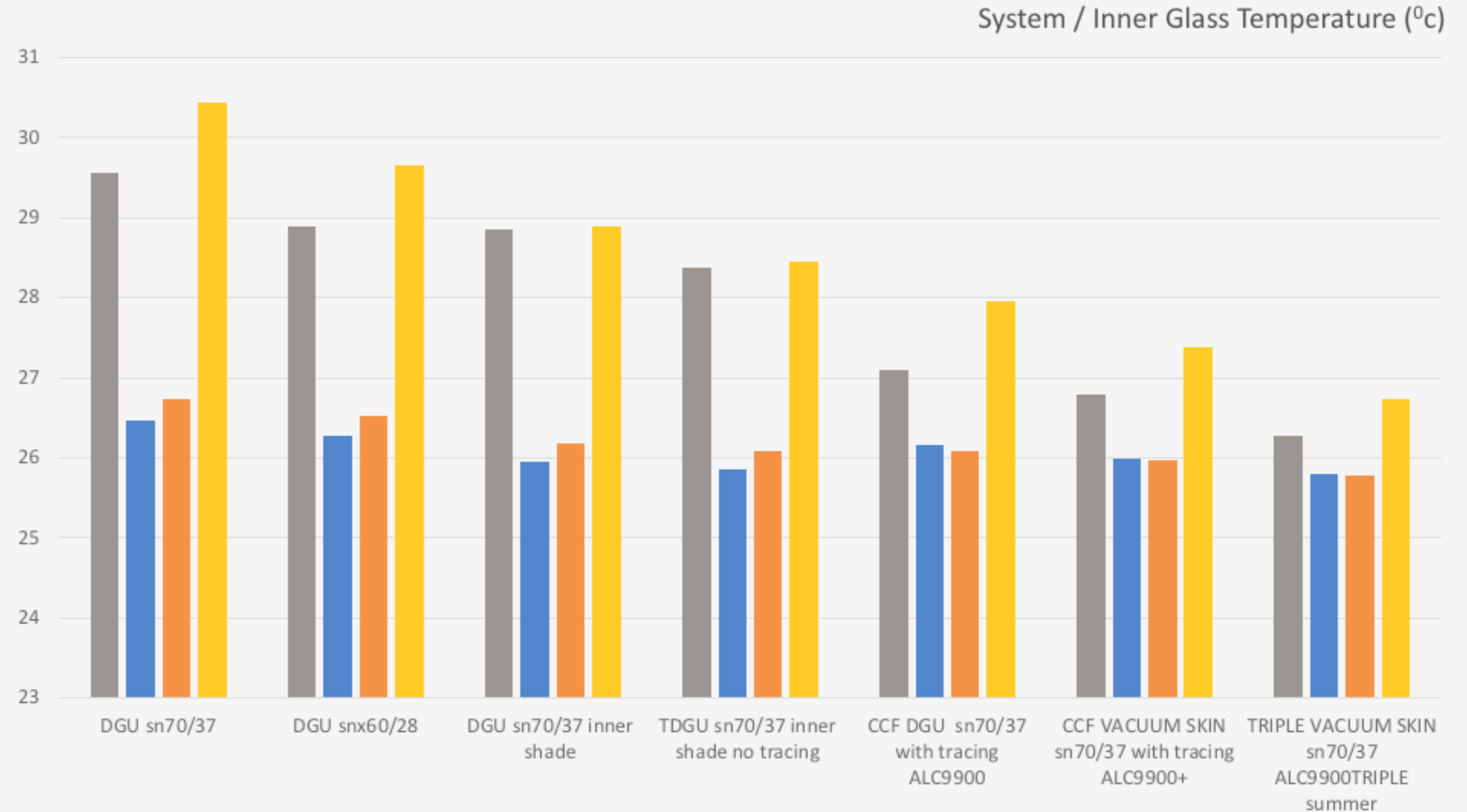
Comparative research - SUMMER

Façade system analysis



Inner Glass Temperature \ Excluding DSNV

All Facades



Comparative research - SUMMER

Façade system analysis

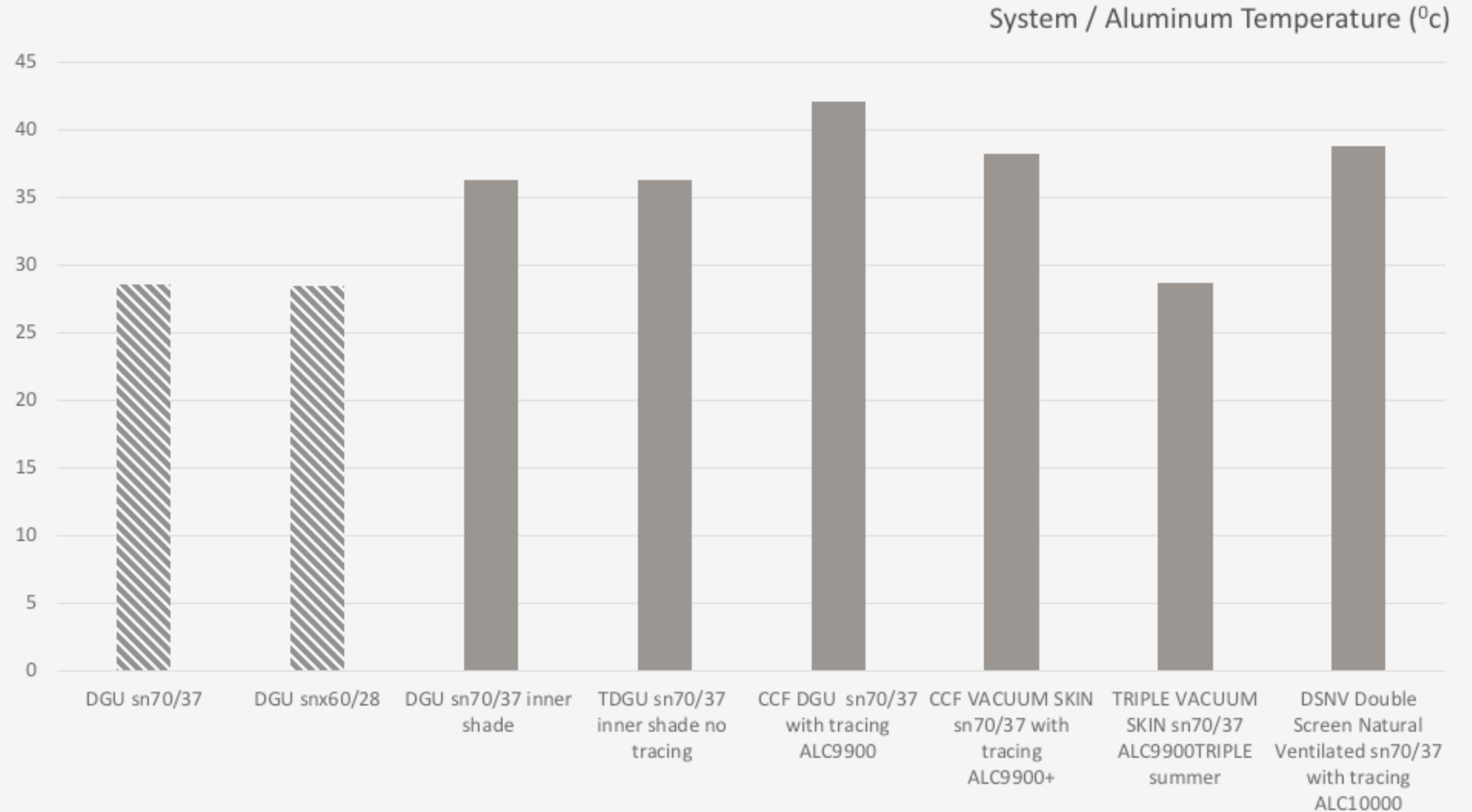


אוסטרליה אדריכלות AUS

ARCHITECTURE
URBANISM
SUSTAINABILITY

Aluminum Temperature

▶ DGU sn70/37 / DGU snx60/28
28.5°C



Comparative research - SUMMER

Façade system analysis

