



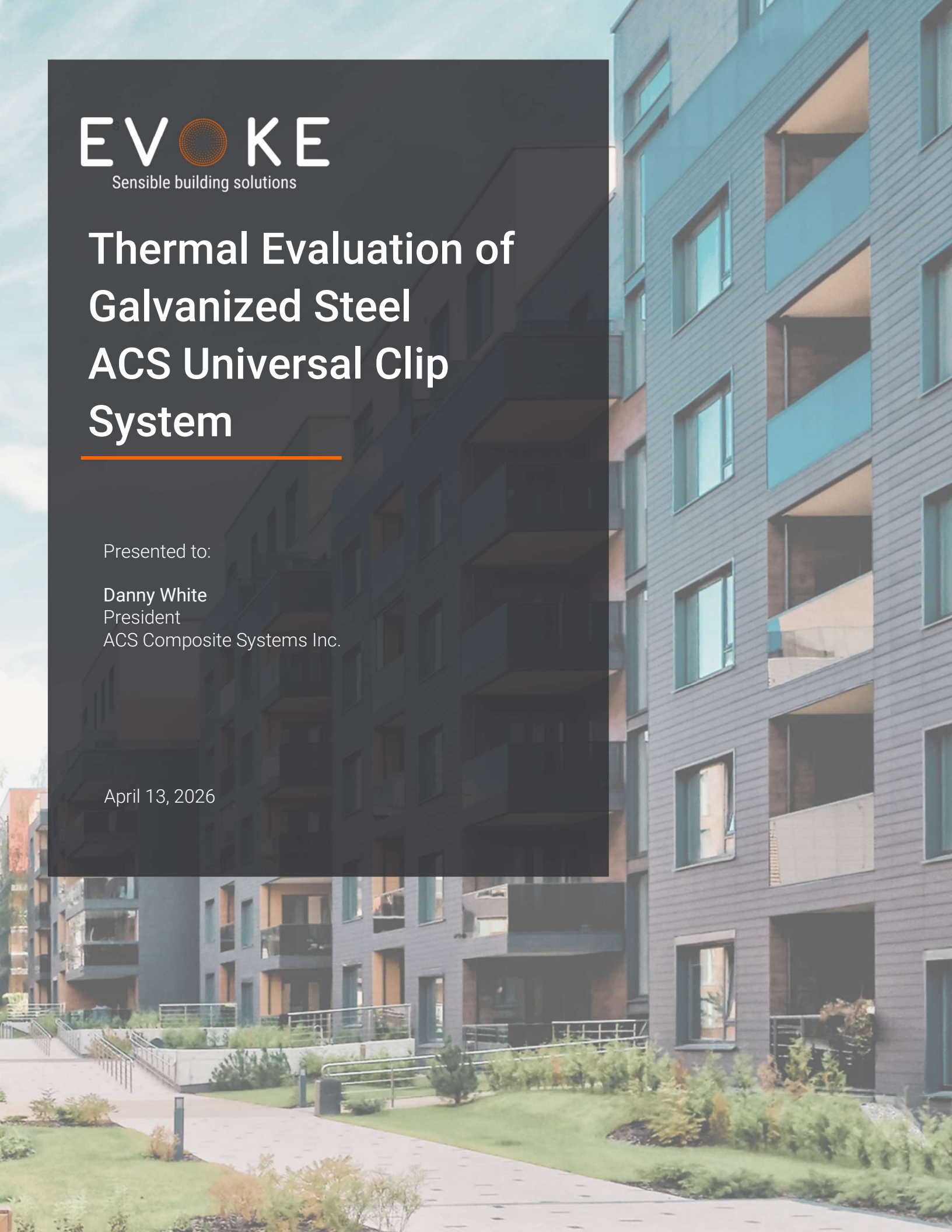
# Thermal Evaluation of Galvanized Steel ACS Universal Clip System

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Presented to:

Danny White  
President  
ACS Composite Systems Inc.

April 13, 2026



## Introduction

Evoked Buildings Engineering Inc. (Evoked) was contracted by ACS Composite Systems Inc. for the thermal evaluation of the ACS Universal Clip® system.

The thermal evaluation considered a range of assemblies and scenarios as follows:

- Backup Wall: 8" Concrete, 6" Steel Framed, 2x6 Wood-Framed
- Exterior Insulation: varies by wall type
- Cavity Insulation: varies by wall type
- Exterior Girt or Rail: 18-gauge Z-bar (1 ½" x 1" x 1 ½") outboard of insulation or L-angle (2" x 1 ½") penetrating the exterior insulation
- Clip type and material: 16-gauge galvanized steel ACS U-Clip® with ½" ACS Thermal Pad (R-2.5)
- Horizontal clip spacing: 16"
- Vertical clip spacing: 24", 36" or 48"

More details of the evaluated assemblies are available in the simulation result section.

## Methodology

The thermal simulation by Evoked was done using 3D thermal simulation using the Simcenter 3D software package from Siemens, which is a general-purpose computer aided design (CAD) and finite element analysis (FEA) package. The thermal solver and modeling procedures utilized for this evaluation were extensively calibrated and validated to within +/- 5% of hotbox testing<sup>1,2</sup>.

The thermal analysis utilized steady-state conditions, published thermal data for materials, and information provided by ACS Composite Systems Inc. is provided in Appendix A.

Additional assumptions for the thermal analysis are provided in Appendix B.

## Simulation Results

The clear field thermal transmittances and assembly effective R-values for the evaluated wall assemblies are presented per wall type in the following tables. Example temperature profiles for each configuration are provided in Appendix C.

**Table 1. Overview of Results for Evaluated Assemblies**

Wall Type	Girt	Result Table
Exterior insulated concrete wall assembly with mineral wool	L-angle	2
Exterior insulated steel-framed wall assembly with mineral wool	Z-bar	3
Exterior insulated steel-framed Soprema Protected wall assembly	Z-bar	4
Split insulated steel-framed wall assembly with mineral wool and R-20 batt	Z-bar	5
Split insulated wood-framed wall assembly with mineral wool and R-22 batt	L-angle	6
Split insulated wood-framed wall assembly with mineral wool and R-22 batt	Z-bar	7

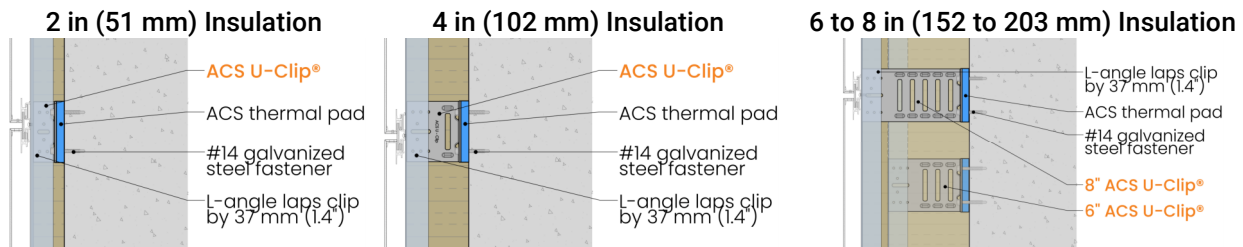
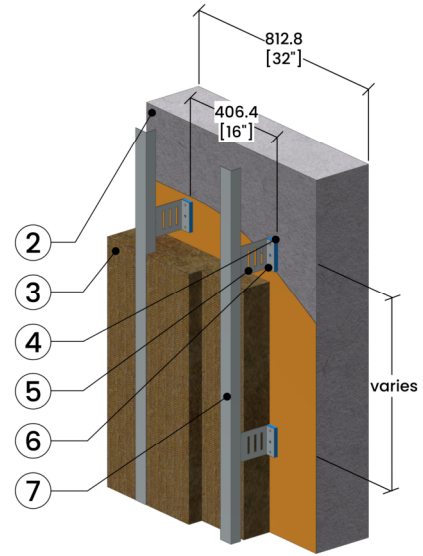
<sup>1</sup> ASHRAE Research Project 1365-RP, Thermal Performance of Building Envelope Details for Mid- and High-Rise Construction, 2011

<sup>2</sup> Building Envelope Thermal Bridging Guide, Version 1.6, 2021

## Exterior Insulated Concrete Wall Assembly with Mineral Wool Insulation and Vertical L-Angle

### Components

1. Interior
2. 8" Concrete wall
3. Exterior mineral wool insulation (R-4.2/inch)
4. 1/2" (13 mm) ACS Thermal Pad (R-2.5)
5. 16-gauge steel ACS U-Clip®
6. 2 x #14 steel fasteners with 38 mm embedment
7. 18-gauge galvanized steel L-angle
8. Cladding with rainscreen cavity (not shown)



**Table 2. Thermal Transmittance for Exterior Insulated Concrete Wall Assembly with Mineral Wool Insulation and Vertical L-Angle**

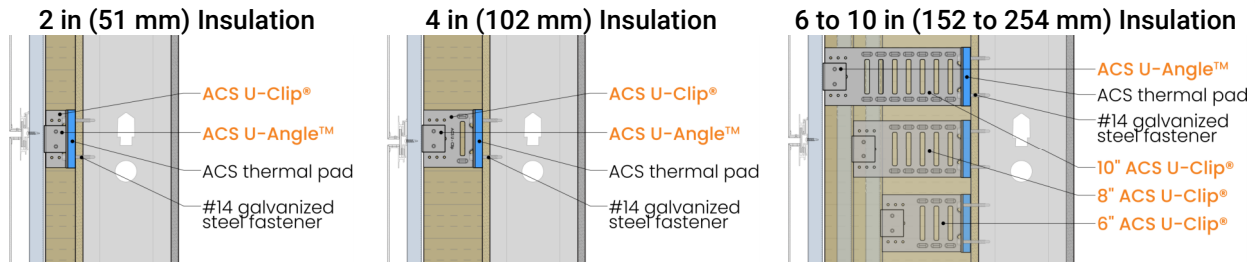
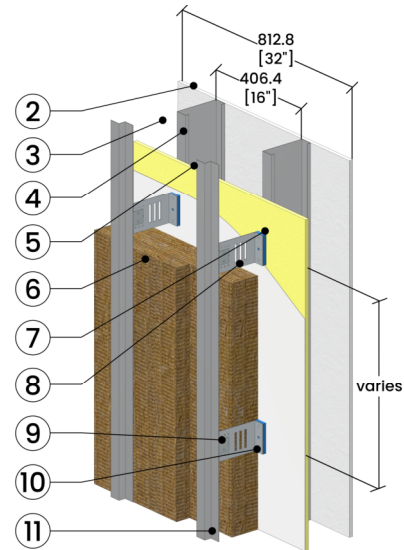
Exterior Insulation Thickness	Exterior Insulation 1D R-Value <sup>3</sup>	16" x 24" Clip Spacing		16" x 36" Clip Spacing		16" x 48" Clip Spacing	
		R-Value	Transmittance	R-Value	Transmittance	R-Value	Transmittance
Inches (mm)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)
2" (51)	8.4 (1.48)	8.4 (1.49)	0.118 (0.672)	8.9 (1.57)	0.112 (0.636)	9.3 (1.63)	0.108 (0.612)
4" (102)	16.8 (2.96)	14.2 (2.50)	0.070 (0.400)	15.5 (2.73)	0.065 (0.366)	16.1 (2.84)	0.062 (0.353)
6" (152)	25.2 (4.44)	19.8 (3.49)	0.050 (0.287)	22.0 (3.87)	0.046 (0.259)	22.9 (4.04)	0.044 (0.247)
8" (203)	33.6 (5.92)	25.6 (4.50)	0.039 (0.222)	28.4 (5.00)	0.035 (0.200)	29.8 (5.25)	0.034 (0.191)

<sup>3</sup> Exterior Insulation 1D R-Value does not include the impact of the concrete back-up wall which adds R-2.0 to the overall nominal R-Value.

## Exterior Insulated Steel-Framed Wall Assembly with Mineral Wool Insulation and Vertical Z-Bar

### Components

1. Interior
2. 1/2" (13 mm) gypsum wall board
3. Air cavity
4. 20-gauge 6" X 1 5/8" (152 x 40 mm) steel-studs at 16" (406 mm) o.c.
5. 1/2" (13 mm) exterior sheathing
6. Exterior ROCKWOOL Cavityrock insulation (R-4.3/inch)
7. 1/2" (13 mm) ACS Thermal Pad (R-2.5)
8. 16-gauge steel ACS U-Clip®
9. 16-gauge steel ACS U-Angle™
10. 2 x #14 steel fasteners
11. 18-gauge galvanized steel Z-bar
12. Cladding with rainscreen cavity (not shown)



**Table 3. Thermal Transmittance for Exterior Insulated Steel-Framed Wall Assembly with Mineral Wool Insulation and Vertical Z-Bar<sup>4</sup>**

Exterior Insulation Thickness	Exterior Insulation 1D R-Value <sup>5</sup>	16" x 24" Clip Spacing		16" x 48" Clip Spacing	
		R-Value	Transmittance	R-Value	Transmittance
Inches (mm)	ft <sup>2</sup> -hr-°F/Btu (m <sup>2</sup> -K/W)	ft <sup>2</sup> -hr-°F/Btu (m <sup>2</sup> -K/W)	Btu/ft <sup>2</sup> -hr-°F (W/m <sup>2</sup> -K)	ft <sup>2</sup> -hr-°F/Btu (m <sup>2</sup> -K/W)	Btu/ft <sup>2</sup> -hr-°F (W/m <sup>2</sup> -K)
2" (51)	8.6 (1.52)	11.0 (1.93)	0.091 (0.517)	11.6 (2.04)	0.086 (0.490)
3" (76)	12.9 (2.27)	14.2 (2.50)	0.070 (0.400)	15.2 (2.68)	0.066 (0.373)
4" (102)	17.2 (3.03)	17.3 (3.06)	0.058 (0.327)	18.8 (3.31)	0.053 (0.302)
5" (127)	21.5 (3.79)	20.5 (3.61)	0.049 (0.277)	22.4 (3.95)	0.045 (0.253)
6" (152)	25.8 (4.55)	23.5 (4.14)	0.043 (0.241)	26.0 (4.58)	0.038 (0.218)
7" (178)	30.1 (5.31)	26.6 (4.68)	0.038 (0.214)	29.6 (5.21)	0.034 (0.192)
8" (203)	34.4 (6.07)	29.5 (5.19)	0.034 (0.193)	33.0 (5.81)	0.030 (0.172)
9" (229)	38.7 (6.82)	32.5 (5.72)	0.031 (0.175)	36.6 (6.45)	0.027 (0.155)
10" (254)	43.1 (7.58)	35.2 (6.21)	0.028 (0.161)	40.1 (7.05)	0.025 (0.142)

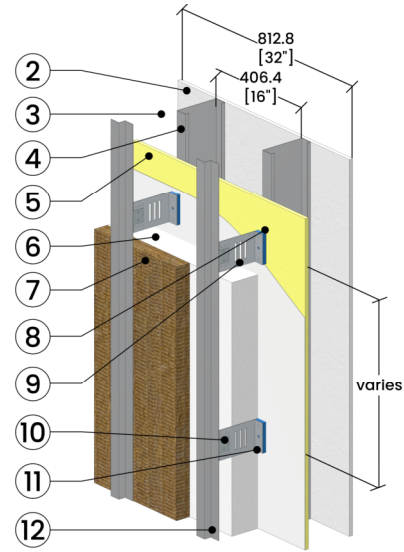
<sup>4</sup> Shaded rows are interpolated results

<sup>5</sup> Exterior Insulation 1D R-Value does not include the impact of the steel framed back-up wall, which adds R-3.2 to the overall nominal R-Value.

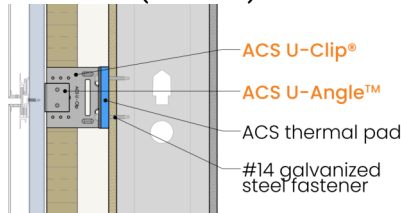
## Exterior Insulated Steel-Framed Soprema Protected Wall Assembly and Vertical Z-Bar

### Components

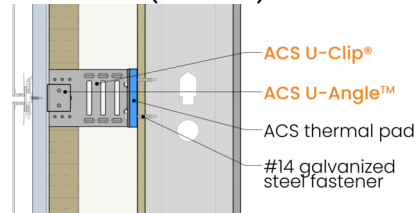
1. Interior
2. 1/2" (13 mm) gypsum wall board
3. Air cavity
4. 20-gauge 6" X 1 5/8" (152 x 40 mm) steel-studs at 16" (406 mm) o.c
5. 1/2" (13 mm) exterior sheathing
6. Exterior SOPRA-ISO V ALU Polyiso Insulation
7. Exterior ROCKWOOL Cavityrock insulation (R-4.3/inch)
8. 1/2" (13 mm) ACS Thermal Pad (R-2.5)
9. 16-gauge steel ACS U-Clip®
10. 16-gauge steel ACS U-Angle™
11. 2 x #14 steel fasteners
12. 18-gauge galvanized steel Z-bar
13. Cladding with rainscreen cavity (not shown)



**Total 4 in (102 mm) Insulation**



**Total 6 in (152 mm) Insulation**



**Table 4. Thermal Transmittance for Exterior Insulated Steel-Framed Soprema Protected Wall Assembly and Vertical Z-Bar**

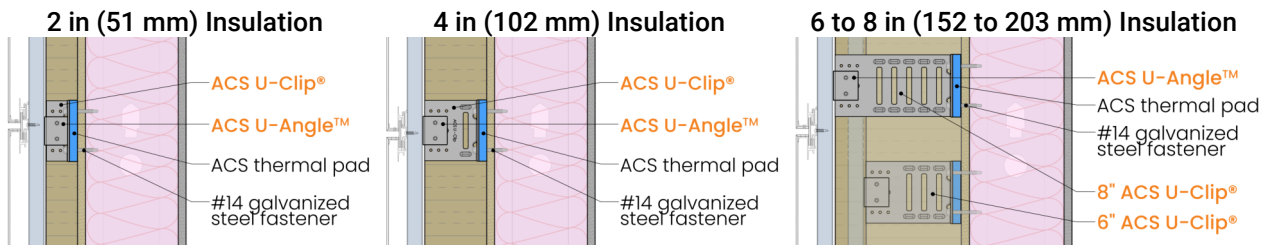
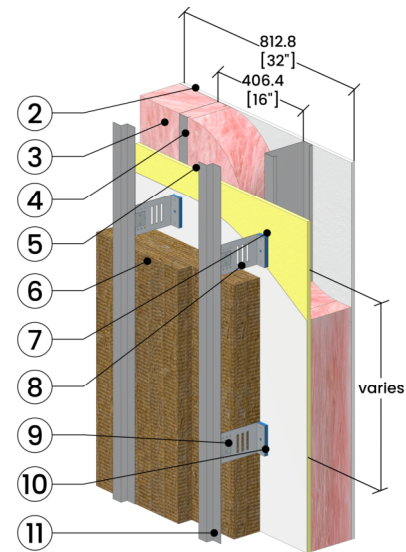
Scenarios	Exterior Insulation 1D R-Value <sup>6</sup> ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	16" x 24" Clip Spacing		16" x 48" Clip Spacing	
		R-Value	Transmittance	R-Value	Transmittance
		ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)
2" (51 mm) Mineral Wool + 2" (51 mm) Polyiso (LTTR)	21.2 (3.73)	20.0 (3.51)	0.050 (0.285)	22.4 (3.94)	0.045 (0.254)
2" (51 mm) Mineral Wool + 4" (102 mm) Polyiso (LTTR)	33.7 (5.93)	28.1 (4.96)	0.036 (0.202)	32.3 (5.68)	0.031 (0.176)

<sup>6</sup> Exterior Insulation 1D R-Value does not include the impact of the steel framed back-up wall, which adds R-3.2 to the overall nominal R-Value.

## Split Insulated Steel-Framed Wall Assembly with Mineral Wool Insulation and Vertical Z-Bar

### Components

1. Interior
2. 1/2" (13 mm) gypsum wall board
3. R-20 batt insulation
4. 20-gauge 6" X 1 5/8" (152 x 40 mm) steel-studs at 16" (406 mm) o.c
5. 1/2" (13 mm) exterior sheathing
6. Exterior ROCKWOOL Cavityrock insulation (R-4.3/inch)
7. 1/2" (13 mm) ACS Thermal Pad (R-2.5)
8. 16-gauge steel ACS U-Clip®
9. 16-gauge steel ACS U-Angle™
10. 2 x #14 steel fasteners
11. 18-gauge galvanized steel Z-bar
12. Cladding with rainscreen cavity (not shown)



**Table 5. Thermal Transmittance for Split Insulated Steel-Framed Wall Assembly with Mineral Wool Insulation and Vertical Z-Bar<sup>7</sup>**

Exterior Insulation Thickness	Exterior Insulation 1D R-Value <sup>8</sup>	16" x 24" Clip Spacing		16" x 48" Clip Spacing	
		R-Value	Transmittance	R-Value	Transmittance
Inches (mm)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)
2" (51)	8.6 (1.52)	19.8 (3.49)	0.051 (0.287)	21.0 (3.71)	0.048 (0.270)
3" (76)	12.9 (2.27)	22.8 (4.01)	0.044 (0.249)	24.4 (4.30)	0.041 (0.232)
4" (102)	17.2 (3.03)	25.8 (4.54)	0.039 (0.220)	27.8 (4.90)	0.036 (0.204)
5" (127)	21.5 (3.79)	28.7 (5.06)	0.035 (0.198)	31.4 (5.52)	0.032 (0.181)
6" (152)	25.8 (4.55)	31.7 (5.58)	0.032 (0.179)	34.9 (6.15)	0.029 (0.163)
7" (178)	30.1 (5.31)	34.7 (6.12)	0.029 (0.163)	38.4 (6.77)	0.026 (0.148)
8" (203)	34.4 (6.07)	37.8 (6.65)	0.026 (0.150)	42.0 (7.40)	0.024 (0.135)

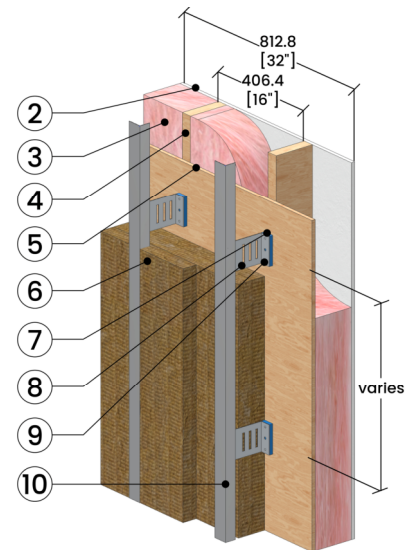
<sup>7</sup> Shaded rows are interpolated results

<sup>8</sup> Exterior Insulation 1D R-Value does not include the impact of the steel framed back-up wall with cavity insulation, which adds R-22.3 to the overall nominal R-Value.

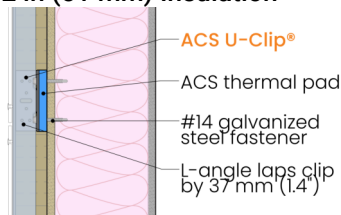
## Split Insulated Wood-Framed Wall Assembly with Mineral Wool Insulation, R-22 Batt Cavity Insulation, and Vertical L-Angle

### Components

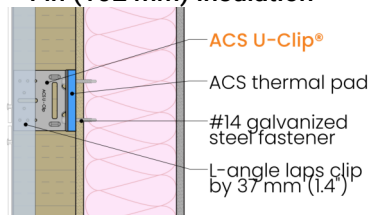
1. Interior
2. 1/2" (13 mm) gypsum wall board
3. R-22 batt insulation
4. 2x6 wood studs
5. 1/2" (13 mm) exterior sheathing
6. Exterior ROCKWOOL Cavityrock insulation (R-4.3/inch)
7. 1/2" (13 mm) ACS Thermal Pad (R-2.5)
8. 16-gauge steel ACS U-Clip®
9. 2 x #14 steel fasteners with 38 mm embedment
10. 18-gauge galvanized steel L-Angle
11. Cladding with rainscreen cavity (not shown)



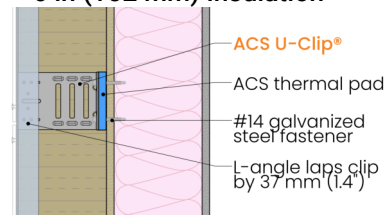
### 2 in (51 mm) Insulation



### 4 in (102 mm) Insulation



### 6 in (152 mm) Insulation



**Table 6. Thermal Transmittance for Split Insulated Wood-Framed Wall Assembly with Mineral Wool Insulation, R-22 Batt Cavity Insulation, and Vertical L-Angle<sup>9</sup>**

Exterior Insulation Thickness	Exterior Insulation 1D R-Value <sup>10</sup>	16" x 24" Clip Spacing		16" x 36" Clip Spacing		16" x 48" Clip Spacing	
		R-Value	Transmittance	R-Value	Transmittance	R-Value	Transmittance
Inches (mm)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)
2" (51)	8.6 (1.52)	28.6 (5.03)	0.035 (0.199)	29.0 (5.10)	0.035 (0.196)	29.1 (5.13)	0.034 (0.195)
3" (76)	12.9 (2.27)	32.0 (5.64)	0.031 (0.177)	32.7 (5.76)	0.031 (0.173)	33.0 (5.82)	0.030 (0.172)
4" (102)	17.2 (3.03)	35.3 (6.21)	0.028 (0.161)	36.4 (6.40)	0.028 (0.156)	36.8 (6.48)	0.027 (0.154)
5" (127)	21.5 (3.79)	38.5 (6.77)	0.026 (0.148)	39.9 (7.03)	0.025 (0.142)	40.5 (7.14)	0.025 (0.140)
6" (152)	25.8 (4.55)	41.5 (7.31)	0.024 (0.137)	43.3 (7.63)	0.023 (0.131)	44.1 (7.77)	0.023 (0.129)

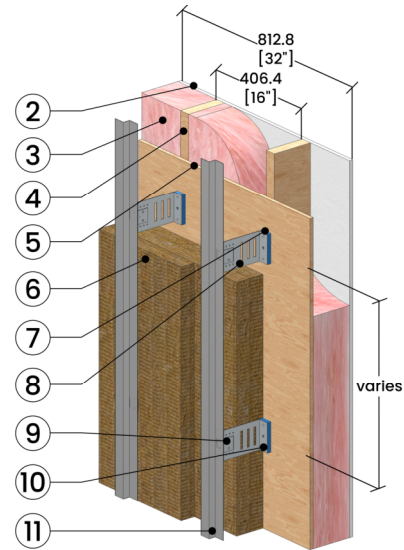
<sup>9</sup> Shaded rows are interpolated results

<sup>10</sup> Exterior Insulation 1D R-Value does not include the impact of the 2x6 wood framed back-up wall with cavity insulation which adds R-24.3 to the overall nominal R-Value.

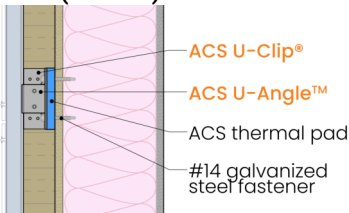
## Split Insulated Wood-Framed Wall Assembly with Mineral Wool Insulation, R-22 Batt Cavity Insulation, and Vertical Z-Bar

### Components

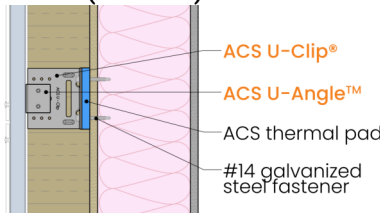
1. Interior
2. 1/2" (13 mm) gypsum wall board
3. R-22 batt insulation
4. 2x6 wood studs
5. 1/2" (13 mm) exterior sheathing
6. Exterior ROCKWOOL Cavityrock insulation (R-4.3/inch)
7. 1/2" (13 mm) ACS Thermal Pad (R-2.5)
8. 16-gauge steel ACS U-Clip®
9. 16-gauge steel ACS U-Angle™
10. 2 x #14 steel fasteners with 38 mm embedment
11. 18-gauge galvanized steel Z-bar
12. Exterior cladding (not shown)



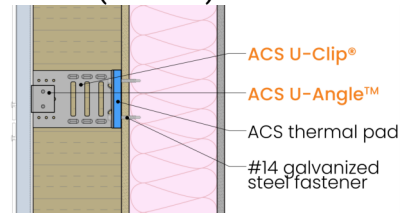
#### 2 in (51 mm) Insulation



#### 4 in (102 mm) Insulation



#### 6 in (152 mm) Insulation



**Table 7. Thermal Transmittance for Split Insulated Wood-Framed Wall Assembly with Mineral Wool Insulation, R-22 Batt Cavity Insulation, and Vertical Z-Bar<sup>11</sup>**

Exterior Insulation Thickness	Exterior Insulation 1D R-Value <sup>12</sup>	16" x 24" Clip Spacing		16" x 36" Clip Spacing		16" x 48" Clip Spacing	
		R-Value	Transmittance	R-Value	Transmittance	R-Value	Transmittance
Inches (mm)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)	ft <sup>2</sup> ·hr·°F/Btu (m <sup>2</sup> ·K/W)	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> ·K)
2" (51)	8.6 (1.52)	29.1 (5.12)	0.034 (0.195)	29.6 (5.21)	0.034 (0.192)	29.8 (5.24)	0.034 (0.191)
3" (76)	12.9 (2.27)	32.5 (5.72)	0.031 (0.175)	33.3 (5.86)	0.030 (0.171)	33.6 (5.92)	0.030 (0.169)
4" (102)	17.2 (3.03)	35.8 (6.30)	0.028 (0.159)	36.9 (6.49)	0.027 (0.154)	37.4 (6.58)	0.027 (0.152)
5" (127)	21.5 (3.79)	39.0 (6.86)	0.026 (0.146)	40.4 (7.11)	0.025 (0.141)	41.1 (7.24)	0.024 (0.138)
6" (152)	25.8 (4.55)	42.0 (7.41)	0.024 (0.135)	43.8 (7.72)	0.023 (0.129)	44.7 (7.88)	0.022 (0.127)

<sup>11</sup> Shaded rows are interpolated results

<sup>12</sup> Exterior Insulation 1D R-Value does not include the impact of the 2x6 wood framed back-up wall with cavity insulation which adds R-24.3 to the overall nominal R-Value.

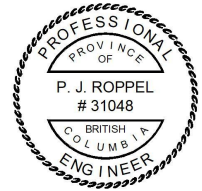
## Closing

We believe that this report meets your request for our thermal evaluation of the ACS Galvanized Steel U-Clip® system. Please do not hesitate to contact us with any questions regarding this evaluation.

Evoke Buildings Engineering Inc.



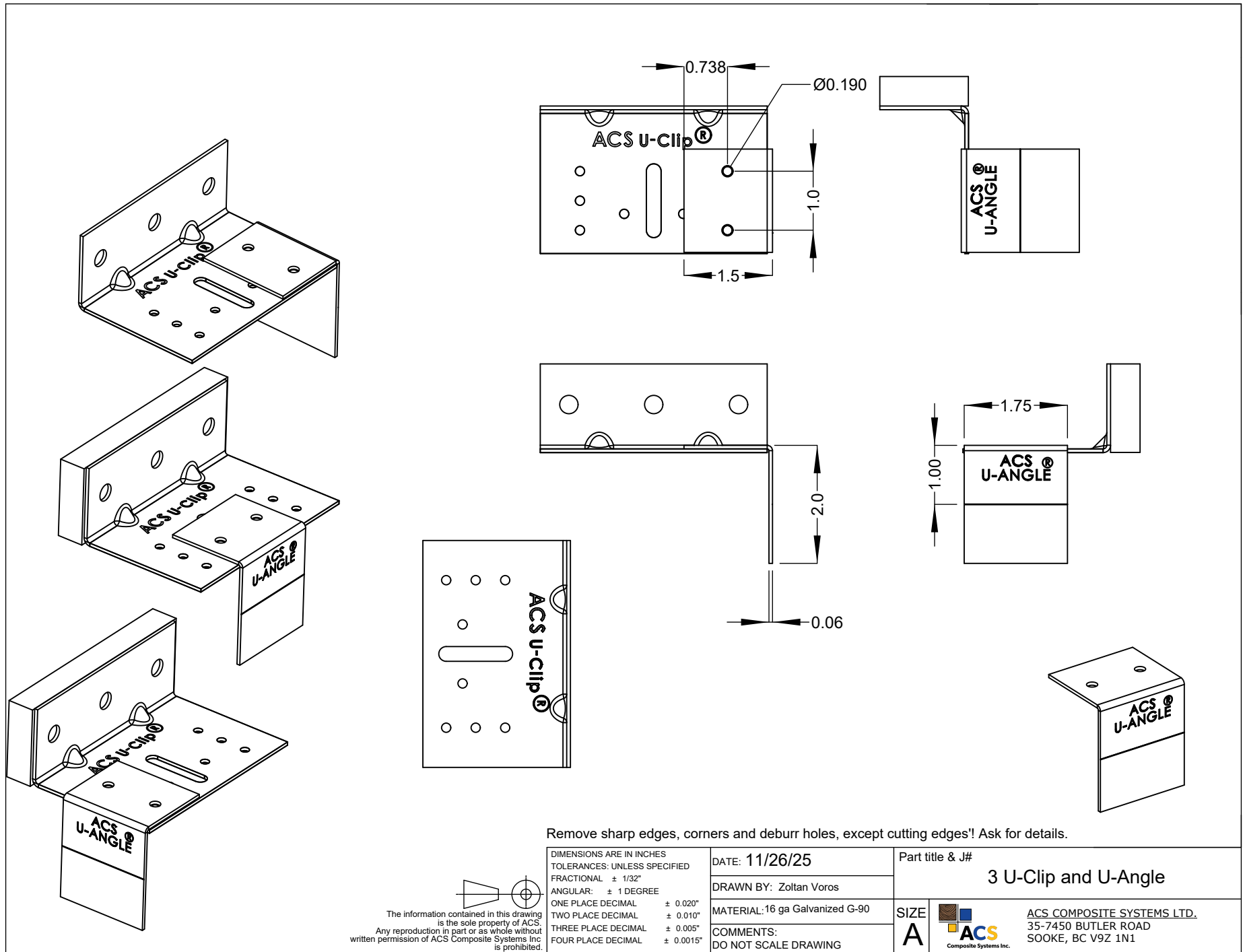
Patrick Angkiriwang, EIT  
Building Science Engineer (EIT)



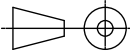
Patrick Roppel, P.Eng.  
Building Science Specialist

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## Appendix A: Detail Drawings




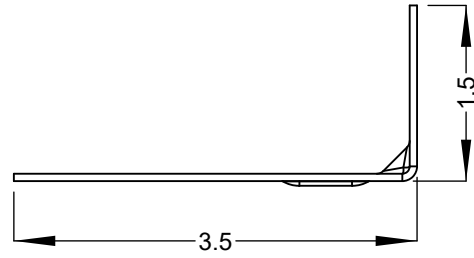
Remove sharp edges, corners and deburr holes, except cutting edges! Ask for details.


  
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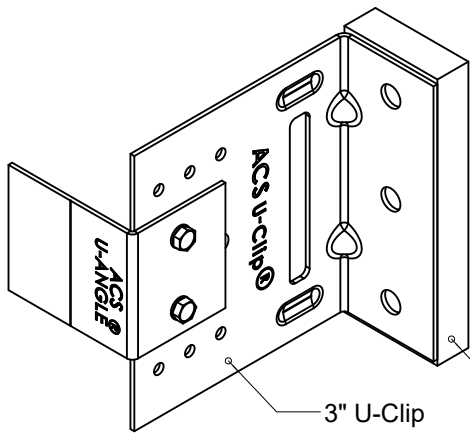
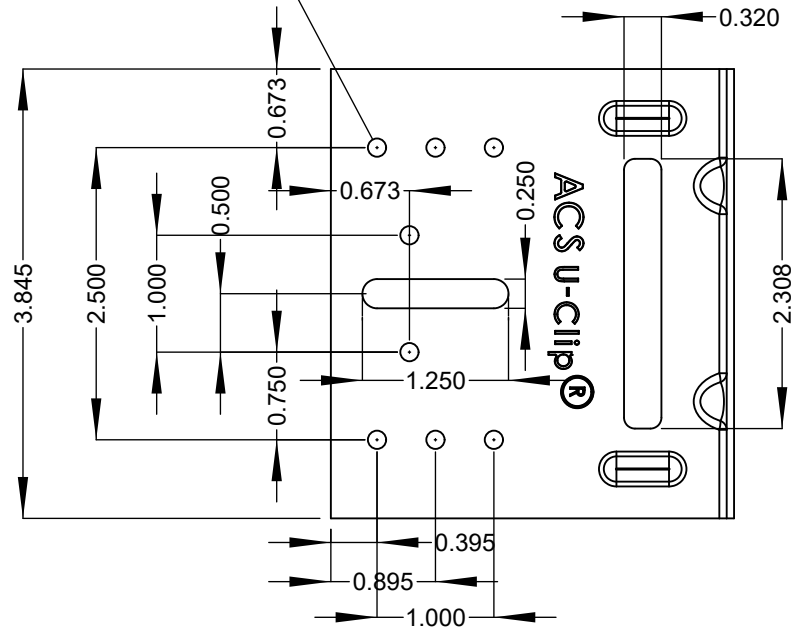
DIMENSIONS ARE IN INCHES  
 TOLERANCES: UNLESS SPECIFIED  
 FRACTIONAL  $\pm 1/32"$   
 ANGULAR:  $\pm 1$  DEGREE  
 ONE PLACE DECIMAL  $\pm 0.020"$   
 TWO PLACE DECIMAL  $\pm 0.010"$   
 THREE PLACE DECIMAL  $\pm 0.005"$   
 FOUR PLACE DECIMAL  $\pm 0.0015"$

DATE: 11/26/25  
 DRAWN BY: Zoltan Voros  
 MATERIAL: 16 ga Galvanized G-90  
 COMMENTS:  
 DO NOT SCALE DRAWING

Part title & J#	
3 U-Clip and U-Angle	
SIZE	 <b>ACS</b> Composite Systems Inc.
A	
ACS COMPOSITE SYSTEMS LTD. 35-7450 BUTLER ROAD SOOKE, BC V9Z 1N1	



8 x 0.156



ACS Thermal Pad

3" U-Clip

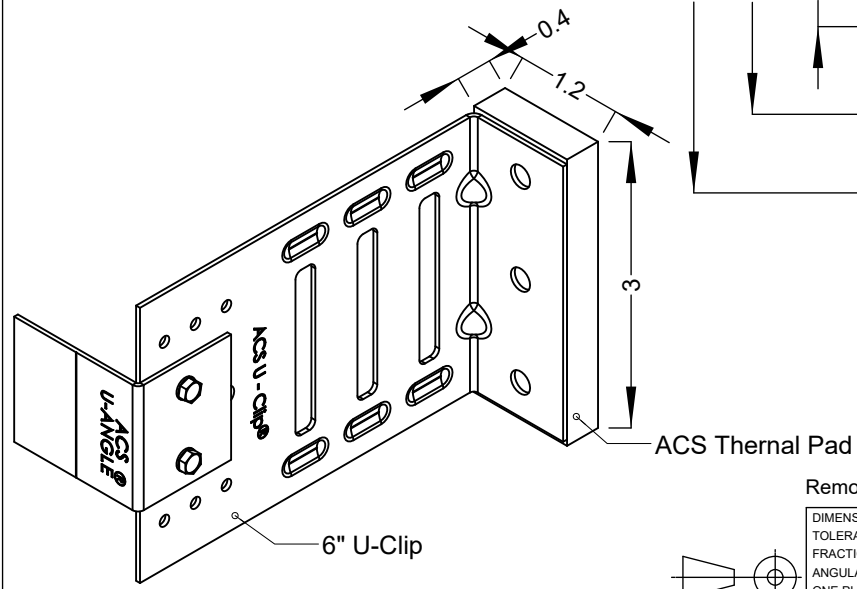
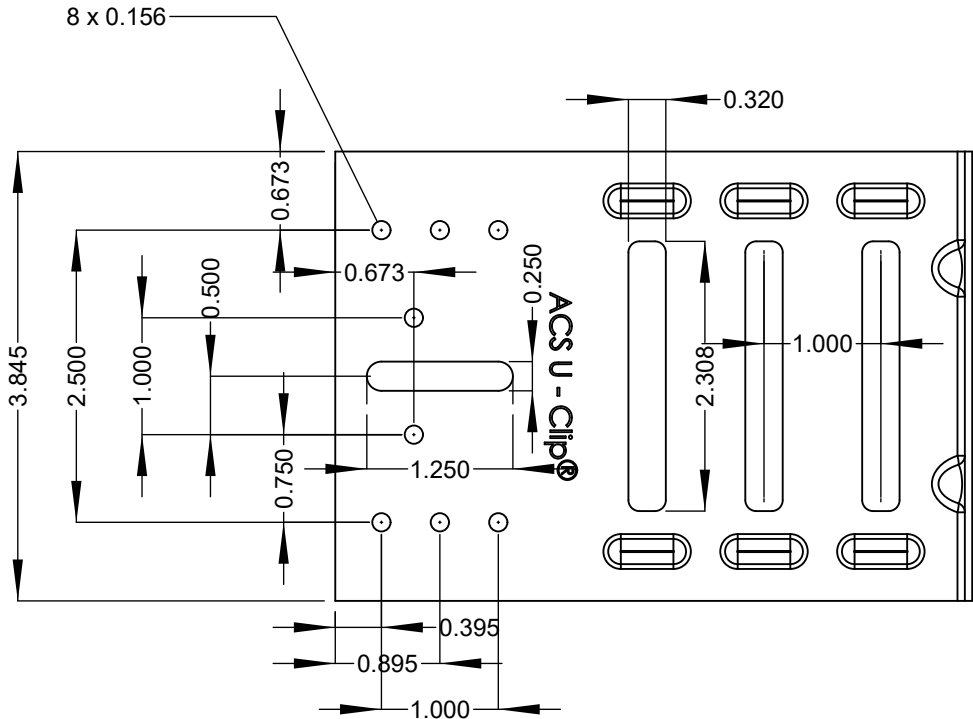
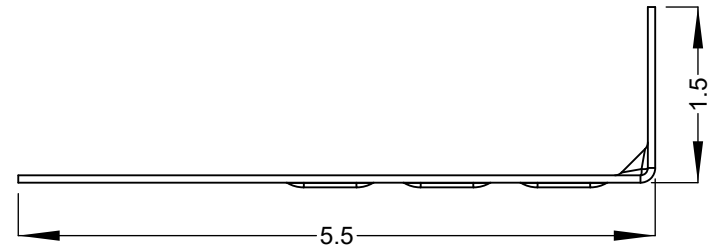
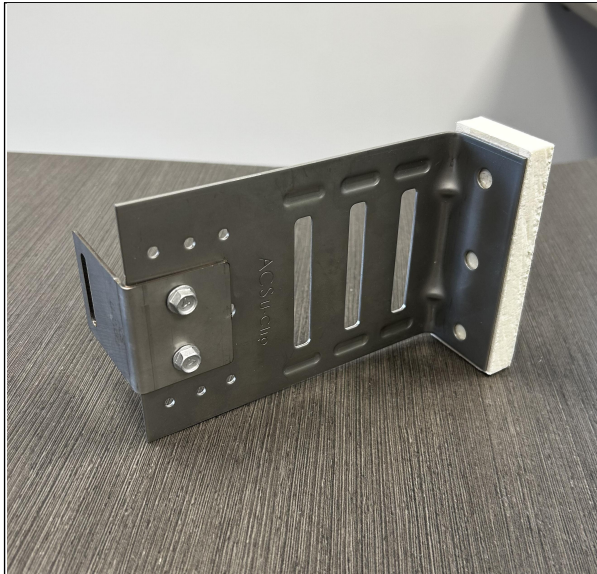
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Remove sharp edges, corners and deburr holes, except cutting edges! Ask for details.

DIMENSIONS ARE IN INCHES  
 TOLERANCES: UNLESS SPECIFIED  
 FRACTIONAL ± 1/32"  
 ANGULAR: ± 1 DEGREE  
 ONE PLACE DECIMAL ± 0.020"  
 TWO PLACE DECIMAL ± 0.010"  
 THREE PLACE DECIMAL ± 0.005"  
 FOUR PLACE DECIMAL ± 0.0015"

DATE: 11/27/25  
 DRAWN BY: Zoltan Voros  
 MATERIAL: 16 ga Galvanized G-90  
 COMMENTS:  
 DO NOT SCALE DRAWING

Part title & J#		 <b>ACS COMPOSITE SYSTEMS LTD.</b> 35-7450 BUTLER ROAD SOOKE, BC V9Z 1N1
4 U-Clip		
SIZE	A	



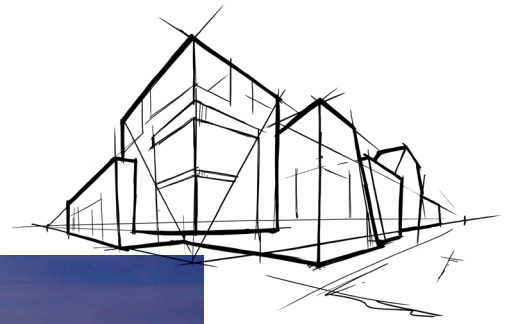
Remove sharp edges, corners and deburr holes, except cutting edges! Ask for details.

DIMENSIONS ARE IN INCHES TOLERANCES: UNLESS SPECIFIED FRACTIONAL ± 1/32" ANGULAR: ± 1 DEGREE ONE PLACE DECIMAL ± 0.020" TWO PLACE DECIMAL ± 0.010" THREE PLACE DECIMAL ± 0.005" FOUR PLACE DECIMAL ± 0.0015"	DATE: 11/27/25	Part title & J#
	DRAWN BY: Zoltan Voros	6 U-Clip
MATERIAL: 16 ga Galvanized G-90	SIZE	<b>ACS</b> Composite Systems Inc. ACS COMPOSITE SYSTEMS LTD. 35-7450 BUTLER ROAD SOOKE, BC V9Z 1N1
COMMENTS: DO NOT SCALE DRAWING	A	

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# Cavityrock®

Exterior Insulation for Cavity Wall  
and Rainscreen Applications



**Cavityrock® Black: now available with black mineral fiber facing for open-joint cladding systems. The facing provides long-term UV stability as outlined on the next page.**

Rush University Medical Center, Chicago, IL

ROCKWOOL Cavityrock® semi-rigid stone wool insulation board available in mono and dual density is designed for exterior cavity wall and rainscreen applications. Choose mono-density insulation in thicknesses up to 2" or dual-density in thicknesses of 2.5" to 6".

Compatible with numerous cladding attachment systems, Cavityrock® is a durable solution with non-combustible characteristics meaning that the insulation will not develop toxic smoke or promote flame spread even when directly exposed to fire. Approved for use in many NFPA 285-compliant designs, it is an important component of fire-resilient exterior wall systems when used as a continuous insulation.

Cavityrock® also offers energy efficiency with reliable thermal performance, improved acoustic comfort, and is moisture resistant to maintain insulating value for the long-term.

Also available in a black mat facer finish for open-joint cladding systems, Cavityrock® Black combines your insulation install with masking in a single step, reducing installation time and material cost to achieve your desired design aesthetic.

Learn more at [rockwool.com/products/cavityrock/](http://rockwool.com/products/cavityrock/)

## Fire Performance

The non-combustible characteristics of Cavityrock® insulation mean that it will not develop toxic smoke or promote flame spread even when directly exposed to fire.



# Cavityrock®

## Exterior Insulation for Cavity Wall and Rainscreen Applications

Technical Data Sheet

Board Insulation 07210\* • Board Insulation 07 21 13\*\*  
Cavity Wall Unit Masonry 04 27 23\*\*

ROCKWOOL Cavityrock® is a semi-rigid stone wool insulation board designed for exterior cavity wall and rainscreen applications. Compatible with numerous cladding attachment systems, Cavityrock® is non-combustible and available with a black mineral fleece facing for open-joint cladding systems.

	Performance	Test Standard
Compliance	Mineral Fiber Block and Board Thermal Insulation - Type IVB Compliant MEA Approval, New York City Approval Mineral Fiber Thermal Insulation for Buildings - Type 1 Compliant	ASTM C612 236 - 05 - M CAN/ULC S702
Reaction to Fire	Flame spread index = 0; Smoke developed index = 0 Flame spread index = 0; Smoke developed index = 0 Determination of Non Combustibility of Building Materials - Non Combustible Behaviour of materials at 750°C - Non Combustible	ASTM E84 (UL 723) CAN/ULC S102 CAN/ULC S114 ASTM E136
Reaction to fire (with black mat facer)	Flame spread index = 10; Smoke developed index = 25 Flame spread index = 10; Smoke developed index = 10	ASTM E84 (UL 723) CAN/ULC S102
Monolithic Density (thickness: 1", 1.5", 2")	> 4.3 lbs/ft³ (>69 kg/m³)* * Density will change with thickness, please contact ROCKWOOL for more information	ASTM C303
Density (thickness ≥ 2.5")	Dual Density - 6.2 lbs/ft³ (100 kg/m³) outer layer and 3.8 lbs/ft³ (61 kg/m³) inner layer	ASTM C303
Dimensional Stability	Linear Shrinkage = 0.7% @ 1200°F (650°C)	ASTM C356
Corrosion Resistance	Stress Corrosion Cracking Tendency of Austenitic Stainless Steel - Passed Corrosion of Steel - Passed	ASTM C795 ASTM C665
Thermal Resistance	R-Value / inch @ 75°F                      4.3 hr.ft².F/Btu RSI value / 25.4 mm @ 24°C                0.75 m²K/W	ASTM C518 (C177)
Reaction to Moisture	Moisture Sorption - 0.03% by volume Water Vapor Transmission, Desiccant Method - 1555ng/Pa.s.m² (27 perm) Determination of Fungi Resistance - Passed	ASTM C1104 ASTM E96 ASTM C1338
Reaction to moisture (with black mat facer)	Moisture Sorption - 0.65% by volume Water Vapor Transmission, Desiccant Method - 2435ng/Pa.s.m² (43 perm) Determination of Fungi Resistance - Passed	ASTM C1104 ASTM E96 ASTM C1338
Dimensions	1" (25.4 mm) to 6" (152.4 mm) in 1/2" increments. 7" (177.8 mm), 8" (203.2 mm)  24" x 48" (610 mm x 1219 mm) and 16" x 48" (406 mm x 1219 mm)	
Dimensions (with black mat facer)	2" (50.8 mm), 3" (76.2 mm), 4" (101.6 mm) available in 16" x 48" (406 mm x 1219 mm) and 24" x 48" (610 mm x 1219 mm) 2.5" (63.5 mm), 3.5" (88.9 mm), 5" (127 mm), 6" (152.4mm) available in 24" x 48" (610 mm x 1219 mm)	
Acoustical Performance	Thickness    125 Hz    250 Hz    500 Hz    1000 Hz    2000Hz    4000 Hz    NRC 1.5"           0.19       0.55       1.03       1.06       1.02       1.01       0.9 2"             0.26       0.71       1.14       1.09       1.04       1.03       1 3"             0.72       0.93       0.88       0.84       0.9       0.97       0.9	ASTM C423
UV Stability (with black mat facer)	Determination of changes in color fastness: achieved rating of 5/5 at 250 hr. and 500 hr. exposure, no perceptible change in color, and a rating of 4/5 at 750 hr. and 1,000 hr. exposure.  For more information and technical reports on ISO 105-A02 results, please contact ROCKWOOL Technical Services.  Unfaced: "tested on 4.0" sample" With Black Mat Facer: "tested on 3.5" sample"	ISO 105-AO2: 1993

Issued: 04-2023  
Supersedes 03-2021



NOTE: \*Master Format 1995 Edition \*\*Master Format 2004 Edition. As ROCKWOOL has no control over installation design and workmanship, accessory materials or application conditions, ROCKWOOL does not warrant the performance or results of any installation containing ROCKWOOL's products. ROCKWOOL's overall liability and the remedies available are limited by the general terms and conditions of sale. This warranty is in lieu of all other warranties and conditions expressed or implied, including the warranties of merchantability and fitness for a particular purpose.



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rockwool.com



INSULATION

APPLICATIONS

WALLS

# SOPRA-ISO V ALU

TECHNICAL DATA SHEET 220413SCANE

(supersedes 210803SCANE)

## DESCRIPTION

SOPRA-ISO V ALU is a closed-cell polyisocyanurate foam insulation board laminated with a radiant barrier quality reflective foil facer on the back side and a non-reflective aluminium facer on the top surface.

SOPRA-ISO V ALU is used as thermal insulation in SOPREMA's wall systems.

## RECOMMENDED SUBSTRATES

This product can be used on most substrates using fasteners or adhesive, such as concrete, wood, wood stud, steel stud, glass-mat gypsum, air/vapour barrier membranes.

## APPLICATION

### MECHANICALLY FASTENED

Mechanically fastened with screws and stress plates for insulation.

Minimum penetration depth depending on the substrate:

- Fasteners for wood studs 19.0 mm (3/4")
- Fasteners for steel studs 6.5 mm (1/4")
- Fasteners for concrete wall 19.0 à 32.0 mm (3/4" à 1 1/4")

**Service temperature:** -60 °C to 93 °C (-76 °F to 199 °F)

## RESTRICTIONS

SOPRA-ISO V ALU is not a structural product. SOPRA-ISO V ALU must not be left exposed for more than 60 days.

FOR COMPLETE INFORMATION ON PRODUCT INSTALLATION, PLEASE CONSULT YOUR SOPREMA REPRESENTATIVE.

## PACKAGING

Specifications	SOPRA-ISO V ALU
Thickness	13.0 to 102.0 mm (0.5 to 4.0 in)*
Dimensions	1.2 x 2.4 m (4 x 8 ft)*
Surface	Non-reflective aluminum facer
Underface	Radiant barrier reflective foil facer

(All values are nominal)

\* Other thicknesses and dimensions available upon request.



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TDS\_SOPRA-ISO\_V\_ALU.indd

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INSULATION

APPLICATIONS

WALLS

# SOPRA-ISO V ALU

TECHNICAL DATA SHEET 220413SCANE

(supersedes 210803SCANE)

## PROPERTIES

SOPRA-ISO V ALU meets or exceeds the following properties.

Properties		Standards	SOPRA-ISO V ALU
Thermal values <sup>(1)</sup>	12.7 mm (0.5 in)	CAN/ULC S770 and CAN/ULC S704.1: 2017 Type 1, Class 1	0.58 RSI (R - 3.30)
	19.1 mm (0.75 in)		0.86 RSI (R - 4.90)
	25.4 mm (1.0 in)		1.14 RSI (R - 6.50)
	38.1 mm (1.5 in)		1.73 RSI (R - 9.80)
	50.8 mm (2.0 in)		2.31 RSI (R - 13.10)
	63.5 mm (2.5 in)		2.89 RSI (R - 16.40)
	76.2 mm (3.0 in)		3.49 RSI (R - 19.80)
	89.0 mm (3.5 in)		4.10 RSI (R - 23.30)
	101.6 mm (4.0 in)	4.72 RSI (R - 26.80)	
Long term thermal resistance (LTTR)	25 mm (1.0 in)	CAN/ULC S770 and CAN/ULC S704.1: 2017 Type 1, Class 1	1.07 RSI (R - 6.11)
	50 mm (2.0 in)		2.14 RSI (R - 12.36)
	75 mm (3.0 in)		3.25 RSI (R - 18.46)
Tensile strength		ASTM D1623	> 24 kPa (3.48 psi)
Compressive strength		ASTM D1621	> 110 kPa (15.95 psi)
Flexural strength		ASTM C203	> 170 kPa (24.66 psi)
Water vapour permeance		ASTM E96 (Method A)	≤ 15.0 ng/Pa·s·m <sup>2</sup> at 25.4 mm (≤ 0.3 perm at 1 in)
Water absorption		ASTM D2842	1.0 % by volume
Dimensional stability: at -29 °C (-20 °F), ambient humidity at 80 °C (176 °F), ambient humidity at 70 °C (158 °F), 97 % relative humidity		ASTM D2126	< 0.5 %
Flame spread		CAN/ULC S102	> 25 < 500
Flame spread			ASTM E84
Smoke development		ASTM E84	< 450

(All values are nominal)

For CCMC product evaluation see CCMC Evaluation listing CCMC 14288-L.

(1) Conditioned thermal values were determined by ASTM Test Method C518 at 23.9 °C (75 °F) mean temperature. Test specimens were conditioned in accordance with procedures outlined in the CAN/ULC S770 and the CAN/ULC S704.1: 2017 standards.



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INSULATION

APPLICATIONS

WALLS

# SOPRA-ISO V ALU

TECHNICAL DATA SHEET 220413SCANE

(supersedes 210803SCANE)

## STORAGE AND HANDLING

SOPRA-ISO V ALU panels are covered with a waterproof packaging for handling the panels in the manufacturing plant and during transit only.

When short-term outdoor storage is necessary SOPRA-ISO V ALU panels must be stacked on skids at least 75 mm (3 in) above the ground, store flat and cover with a waterproof cover such as a canvas tarpaulin. In addition, the temporary SOPREMA applied packaging must be removed to prevent accumulation of condensation.

Refer to PIMA Technical Bulletin No. 109: Storage and Handling Recommendations for Polyiso Roof Insulation at [www.polyiso.org](http://www.polyiso.org).



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## **Appendix B:** Simulation Assumptions and Material Properties

## General Assumptions

Steady-state simulations were utilized for the thermal evaluation outlined in this report with the following assumptions:

1. Material properties were taken from the 2017 ASHRAE Handbook – Fundamentals for common materials, information provided by ACS Composite Systems Inc. for the system components, and datasheets for proprietary products.
2. Interior and exterior heat transfer coefficients were taken from table 10 on page 26.21 of the 2017 ASHRAE Handbook – Fundamentals. Lightweight claddings have an insignificant impact on the overall thermal resistance of insulated wall assemblies, other than shielding the insulation or sheathing from direct wind exposure. The cladding and secondary structure outboard of the sheathing were not explicitly modeled. The impact of lightweight cladding was incorporated into the exterior heat transfer coefficient per ASHRAE 1365-RP and CSA Z5010:21 so that the results can directly apply to any climate.
3. Contact resistances between the sheathing and insulation and steel components were simulated per ASHRAE 1365-RP and CSA Z5010:21 and varied between R-0.01 (0.002 m<sup>2</sup> K/W) and R-0.17 (0.030 m<sup>2</sup> K/W) depending on the materials and interfaces.
4. Insulation is assumed to be installed tight to the framing and sheathing.

## Temperature Index

The temperature index is the ratio of the surface temperature relative to the interior and exterior temperatures. The temperature index has a value between 0 and 1, where 0 is the exterior temperature and 1 is the interior temperature per the following equation:

$$T_i = \frac{T_{surface} - T_{outside}}{T_{inside} - T_{outside}}$$

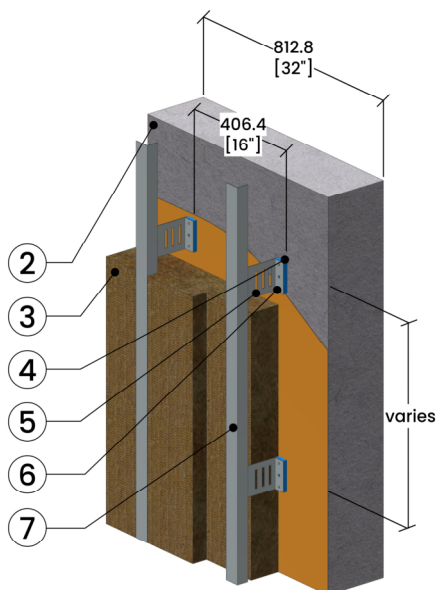
This formula can be rearranged for  $T_{surface}$  to determine the surface temperatures for any climate once the temperature index is known for a critical location to evaluate the condensation risk. The temperature indices shown in the temperature profiles in Appendix C are for general information and not intended to predict in-service temperatures subject to transient conditions, variable heating systems, and/or obstructions that restrict heat getting to the wall system. Refer to ASHRAE 1365-RP for a full discussion on the limitations of using steady-state temperature indices for evaluating condensation risk.

## Boundary Conditions

Boundary Condition	Combined Convective and Radiative Heat Transfer Coefficient
	Btu/ft <sup>2</sup> ·hr·°F (W/m <sup>2</sup> K)
Exterior wall surface with generic cladding	1.5 (8.3)
Interior surface	1.5 (8.3)

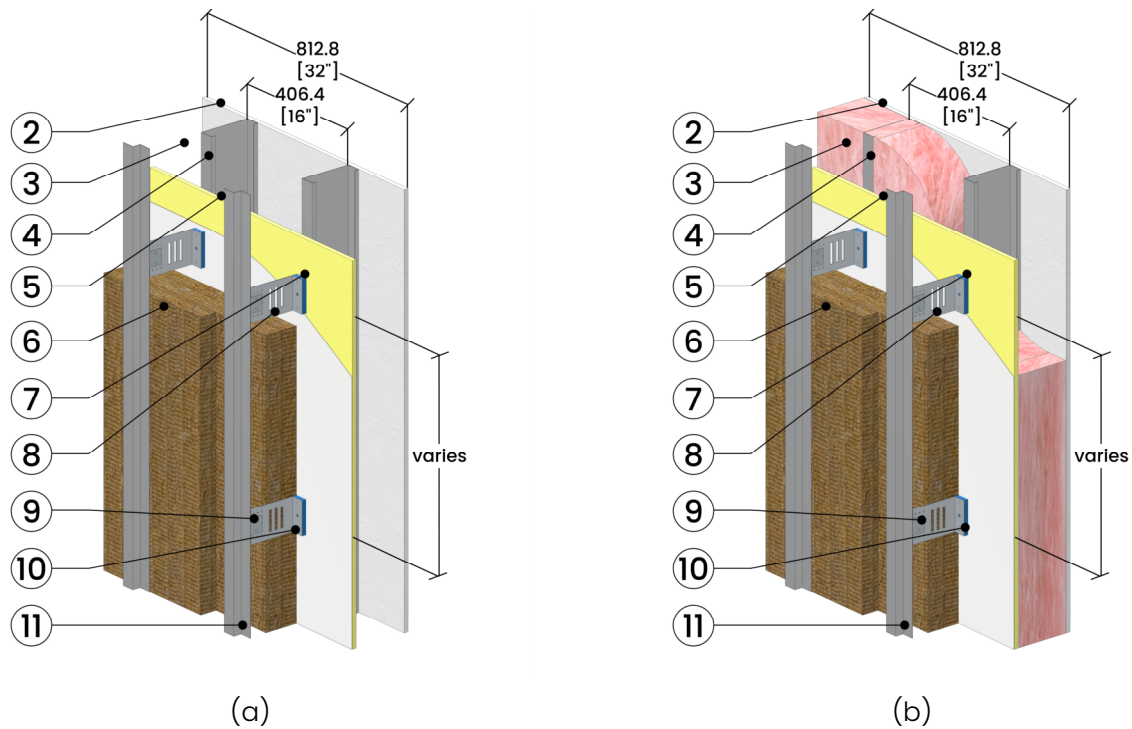
## Material Properties

### Exterior Insulated Concrete Wall Assembly with Mineral Wool Insulation and Vertical L-Angle



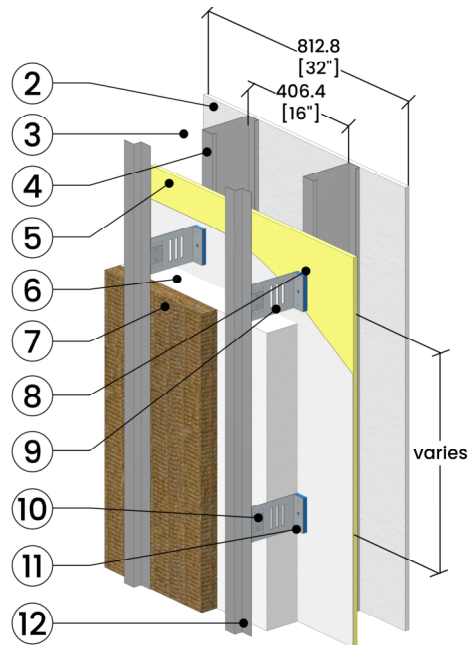
Item	Component	Material	Thermal Conductivity Btu · in/ft <sup>2</sup> · hr·°F (W/m K)	Nominal Resistance ft <sup>2</sup> · hr·°F / Btu (m <sup>2</sup> K/ W)
<b>Backup Wall</b>				
2	8" Concrete Wall	Concrete	12.5 (1.8)	R-0.64 (0.11 RSI)
<b>Exterior Wall</b>				
3	Exterior Insulation	Mineral Wool Insulation (R-4.2/in)	0.24 (0.034)	R-8.4 to R-33.6 (1.48 RSI to 5.92 RSI)
4	ACS Thermal Pad	High-Density Polyiso	0.20 (0.0288)	-
5	ACS U-Clip®	Galvanized Steel	430 (62)	-
6	2 - #14 Fasteners	Galvanized Steel	430 (62)	-
7	L-Angle	Galvanized Steel	430 (62)	-

## Exterior and Split Insulated Steel-Framed Wall Assembly with Mineral Wool Insulation and Vertical Z-Bar



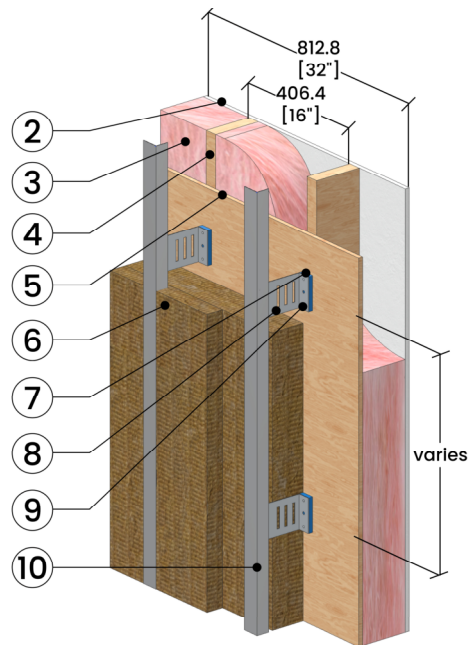
Item	Component	Material	Thermal Conductivity Btu · in/ft <sup>2</sup> · hr·°F (W/m K)	Nominal Resistance ft <sup>2</sup> · hr·°F / Btu (m <sup>2</sup> K/ W)
<b>Backup Wall</b>				
2	13 mm Gypsum Wall Board	Gypsum	1.1 (0.16)	R-0.5 (0.09 RSI)
3a	Stud Cavity	Air	-	R-0.9 (0.16 RSI)
3b		R-20 Batt Insulation	0.30 (0.043)	R-20 (3.52 RSI)
4	Steel Studs	Galvanized Steel	430 (62)	-
5	13 mm Exterior Sheathing	Gypsum	1.1 (0.16)	R-0.5 (0.09 RSI)
<b>Exterior Wall</b>				
6a	Exterior Insulation	ROCKWOOL Cavityrock™ (R-4.3/in)	0.24 (0.034)	R-8.6 to R-43.1 (1.52 RSI to 7.58 RSI)
6b				R-8.6 to R-34.4 (1.52 RSI to 6.07 RSI)
7	ACS Thermal Pad	High-Density Polyiso	0.20 (0.0288)	-
8	ACS U-Clip®	Galvanized Steel	430 (62)	-
9	ACS U-Angle™	Galvanized Steel	430 (62)	-
10	2 - #14 Fasteners	Galvanized Steel	430 (62)	-
11	Z-Bar	Galvanized Steel	430 (62)	-

## Exterior Insulated Steel-Framed Soprema Protected Wall Assembly and Vertical Z-Bar



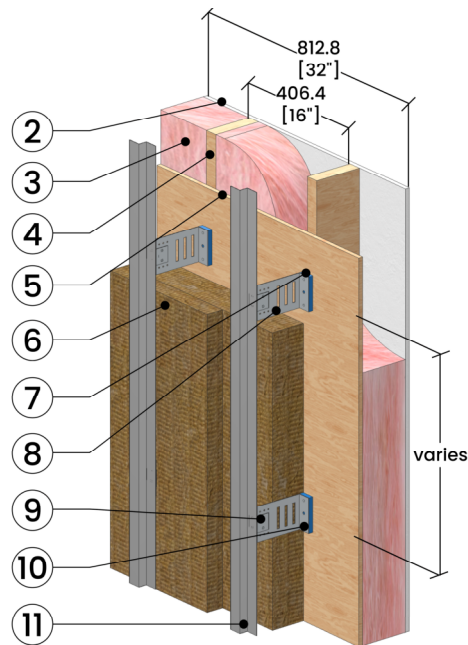
Item	Component	Material	Thermal Conductivity Btu · in/ft <sup>2</sup> · hr·°F (W/m K)	Nominal Resistance ft <sup>2</sup> · hr·°F / Btu (m <sup>2</sup> K/ W)
<b>Backup Wall</b>				
2	13 mm Gypsum Wall Board	Gypsum	1.1 (0.16)	R-0.5 (0.09 RSI)
3	Stud Cavity	Air	-	R-0.9 (0.16 RSI)
4	Steel Studs	Galvanized Steel	430 (62)	-
5	13 mm Exterior Sheathing	Gypsum	1.1 (0.16)	R-0.5 (0.09 RSI)
<b>Exterior Wall</b>				
6	Polyiso Insulation	SOPRA-ISO V ALU - LTR	0.16 (0.023)	R-12.5 to R-25.1 (2.21 RSI to 4.42 RSI)
7	Exterior Insulation	ROCKWOOL Cavityrock™ (R-4.3/in)	0.24 (0.034)	R-8.6 (1.52 RSI)
8	ACS Thermal Pad	High-Density Polyiso	0.20 (0.0288)	-
9	ACS U-Clip®	Galvanized Steel	430 (62)	-
10	ACS U-Angle™	Galvanized Steel	430 (62)	-
11	2 - #14 Fasteners	Galvanized Steel	430 (62)	-
12	Z-Bar	Galvanized Steel	430 (62)	-

## Split Insulated Wood-Framed Wall Assembly with Mineral Wool Insulation, R-22 Batt Cavity Insulation, and Vertical L-Angle



Item	Component	Material	Thermal Conductivity Btu · in/ft <sup>2</sup> · hr·°F (W/m K)	Nominal Resistance ft <sup>2</sup> · hr·°F / Btu (m <sup>2</sup> K/ W)
<b>Backup Wall</b>				
2	13 mm Gypsum Wall Board	Gypsum	1.1 (0.16)	R-0.5 (0.09 RSI)
3	Stud Cavity	R-22 Fiberglass Batt Insulation	0.25 (0.036)	R-22 (3.87 RSI)
4	2x6 Wood Studs	Wood	0.69 (0.10)	-
5	13 mm Exterior Sheathing	Plywood	0.69 (0.10)	R-0.7 (0.13 RSI)
<b>Exterior Wall</b>				
6	Exterior Insulation	ROCKWOOL Cavityrock™ (R-4.3/in)	0.24 (0.034)	R-8.6 to R-25.8 (1.52 RSI to 4.55 RSI)
7	ACS Thermal Pad	High-Density Polyiso	0.20 (0.0288)	-
8	ACS U-Clip®	Galvanized Steel	430 (62)	-
9	2 - #14 Fasteners	Galvanized Steel	430 (62)	-
10	L-Angle	Galvanized Steel	430 (62)	-

## Split Insulated Wood-Framed Wall Assembly with Mineral Wool Insulation, R-22 Batt Cavity Insulation, and Vertical Z-Bar

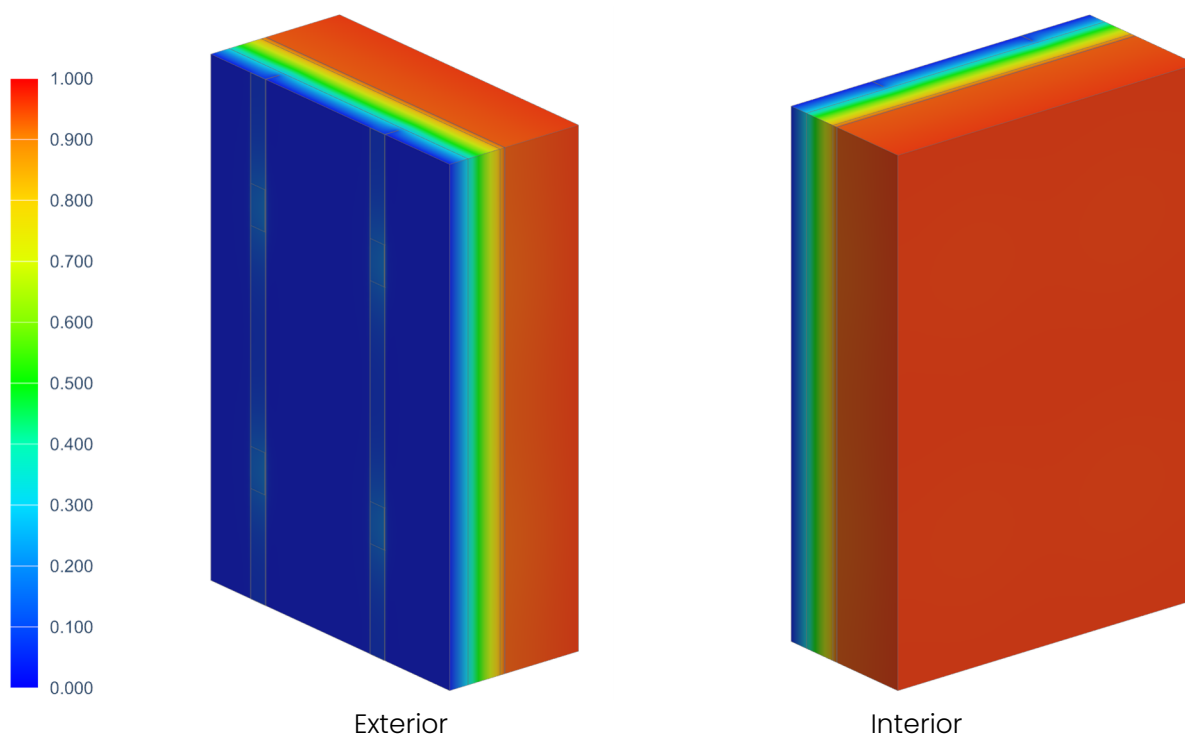


Item	Component	Material	Thermal Conductivity Btu · in/ft <sup>2</sup> · hr·°F (W/m K)	Nominal Resistance ft <sup>2</sup> · hr·°F / Btu (m <sup>2</sup> K/ W)
<b>Backup Wall</b>				
2	13 mm Gypsum Wall Board	Gypsum	1.1 (0.16)	R-0.5 (0.09 RSI)
3	Stud Cavity	R-22 Fiberglass Batt Insulation	0.25 (0.036)	R-22 (3.87 RSI)
4	2x6 Wood Studs	Wood	0.69 (0.10)	-
5	13 mm Exterior Sheathing	Plywood	0.69 (0.10)	R-0.7 (0.13 RSI)
<b>Exterior Wall</b>				
6	Exterior Insulation	ROCKWOOL Cavityrock™ (R-4.3/in)	0.24 (0.034)	R-8.6 to R-25.8 (1.52 RSI to 4.55 RSI)
7	ACS Thermal Pad	High-Density Polyiso	0.20 (0.0288)	-
8	ACS U-Clip®	Galvanized Steel	430 (62)	-
9	ACS U-Angle™	Galvanized Steel	430 (62)	-
10	2 - #14 Fasteners	Galvanized Steel	430 (62)	-
11	Z-Bar	Galvanized Steel	430 (62)	-

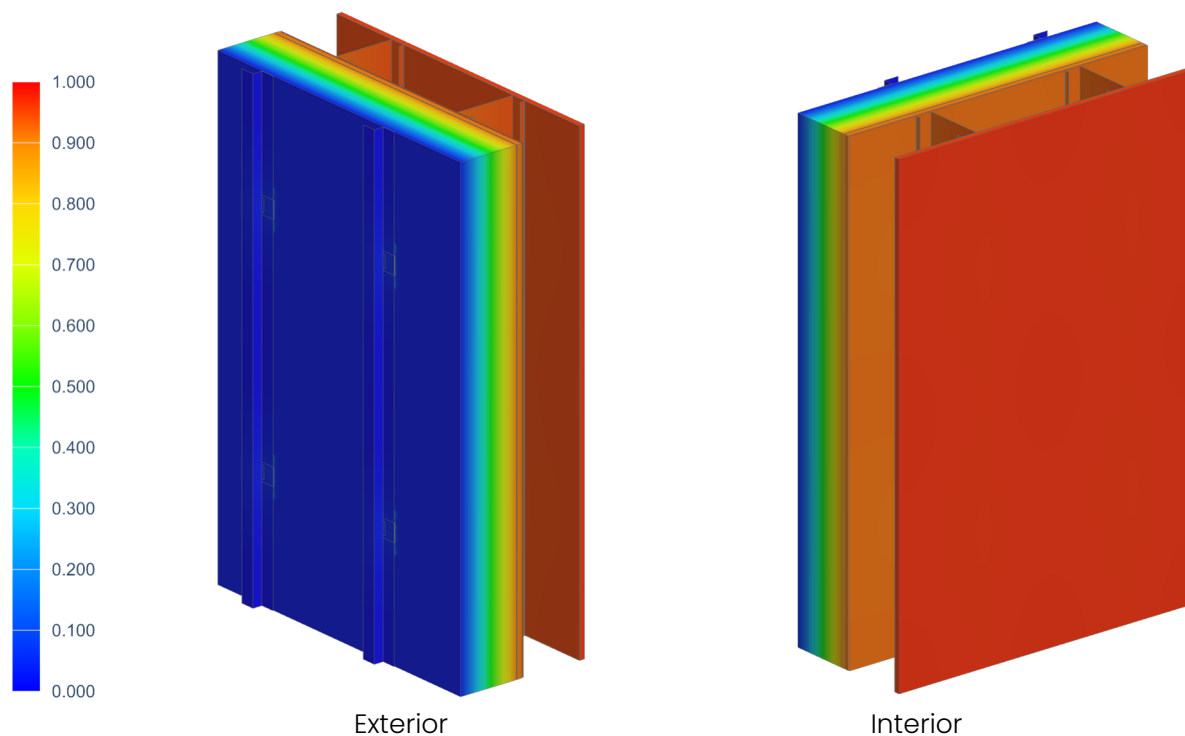
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## Appendix C: Simulated Temperature Profiles

Appendix C illustrates example temperature distribution of the ACS U-Clip® Systems. The following figures are provided for scenarios with a clip spacing of 16" x 24", and 6 inches of exterior insulation. The profiles are presented as a temperature index (between 0 and 1). See Appendix B for more discussion on temperature index.



**Figure C1. Temperature Profile of the ACS U-Clip® System Spaced at 16" x 24" with Vertical L-Angle and 6 inches of Mineral Wool Exterior Insulation, on Concrete Backup Wall**



**Figure C2. Temperature Profile of the ACS U-Clip® System Spaced at 16" x 24" with Vertical Z-Bar and 6 inches of ROCKWOOL Cavityrock™ Exterior Insulation, on Steel-Framed Backup Wall**

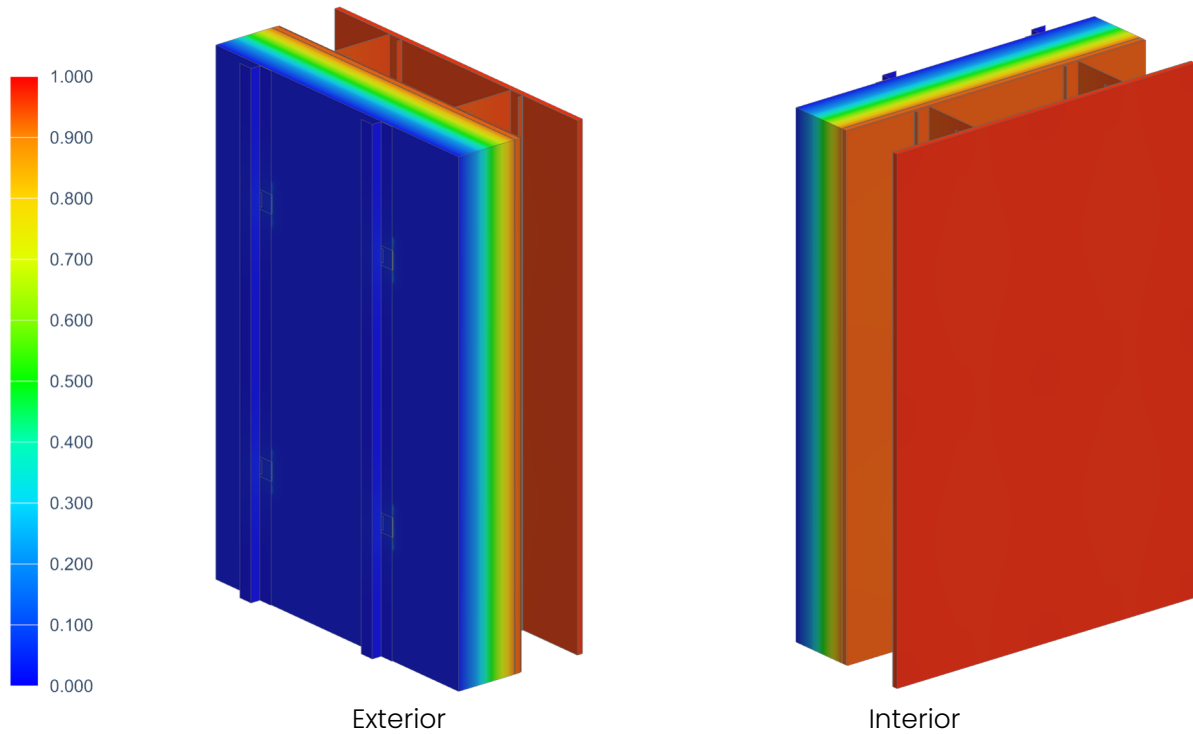


Figure C3. Temperature Profile of the ACS U-Clip® System Spaced at 16"x 24" with Vertical Z-Bar, 2 inches of ROCKWOOL Cavityrock™ Exterior Insulation and 4 inches of SOPRA-ISO V ALU, on Steel-Framed Backup Wall

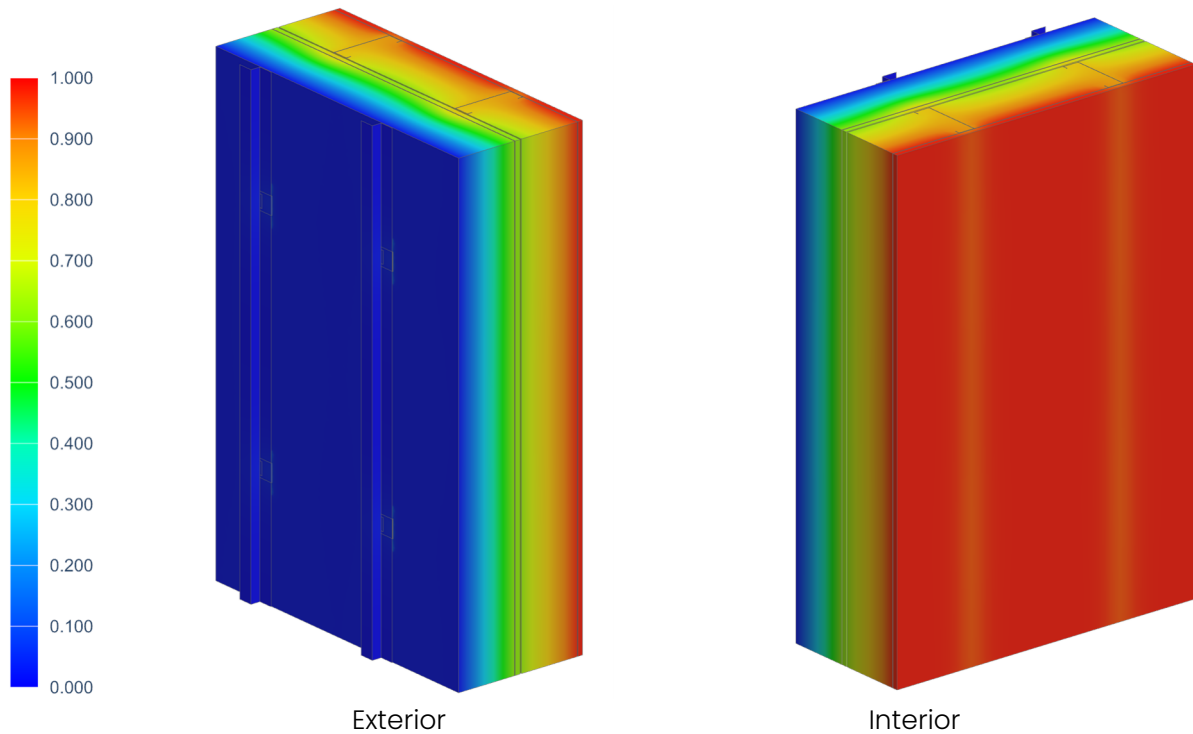


Figure C4. Temperature Profile of the ACS U-Clip® System Spaced at 16"x 24" with Vertical Z-Bar and 6 inches of ROCKWOOL Cavityrock™ Exterior Insulation, on Steel-Framed Backup Wall with R-20 Batt Insulation

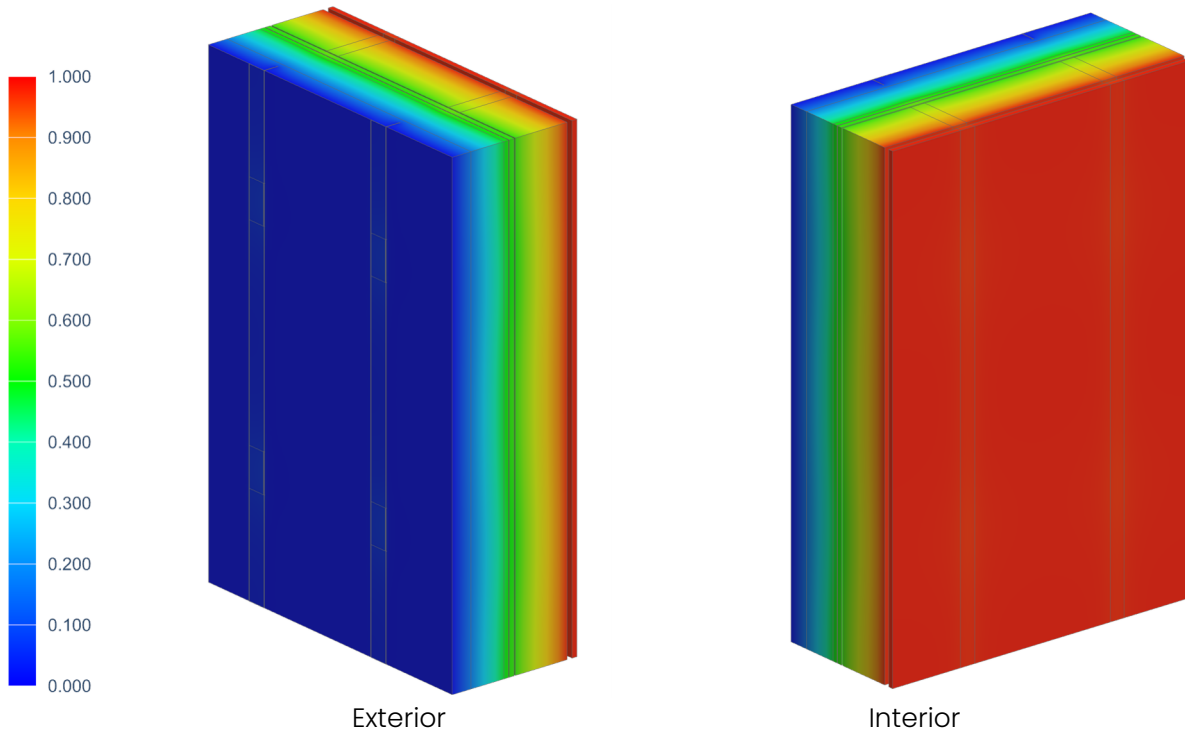


Figure C5. Temperature Profile of the ACS U-Clip® System Spaced at 16" x 24" with Vertical L-Angle and 6 inches of ROCKWOOL Cavityrock™ Exterior Insulation, on Wood-Framed Backup Wall with R-22 Batt Insulation

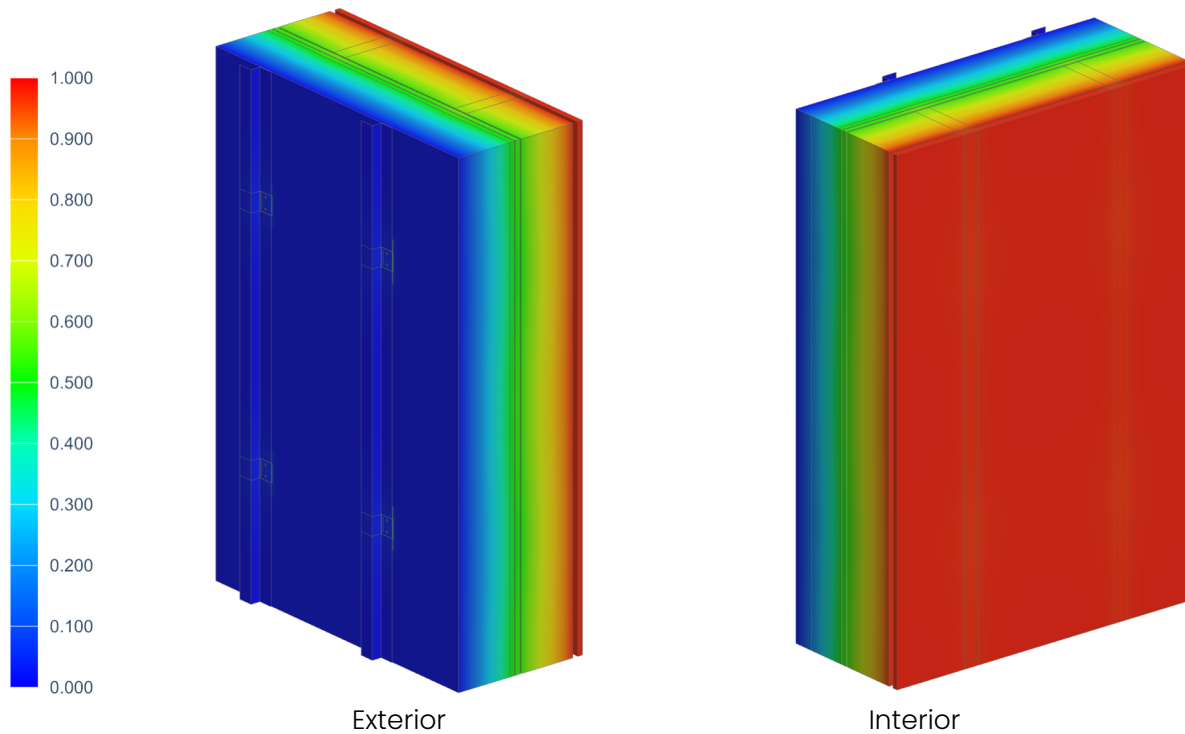


Figure C6. Temperature Profile of the ACS U-Clip® System Spaced at 16" x 24" with Vertical Z-Bar and 6 inches of ROCKWOOL Cavityrock™ Exterior Insulation, on Wood-Framed Backup Wall with R-22 Batt Insulation