October 24, 2025

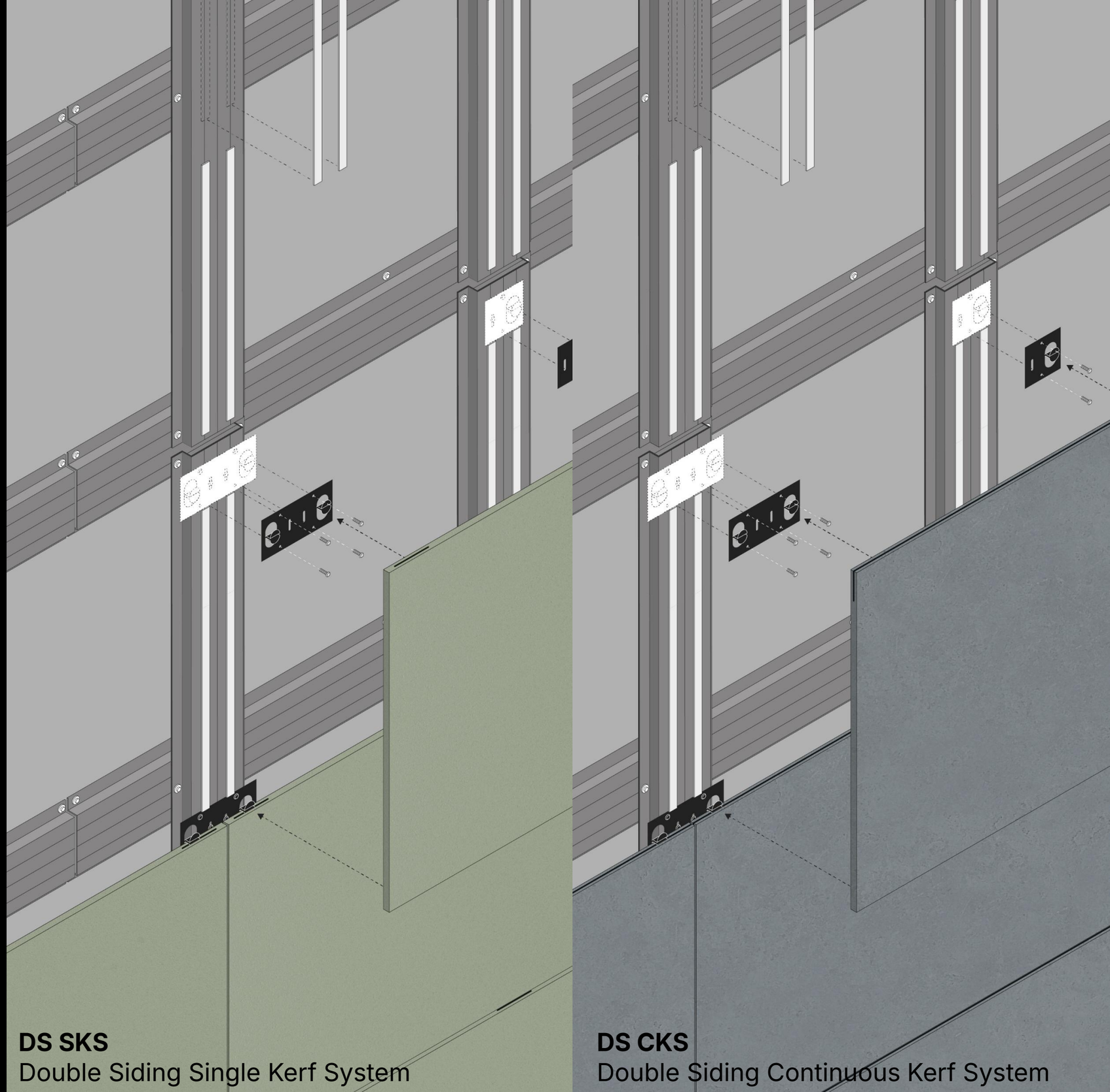
PORCELANOSA FACADES

3D Thermal Simulation of DS SKS/CKS/UKS Cladding Attachment Systems

PREPARED FOR

PORCELANOSA FACADES

RDH BUILDING SCIENCE

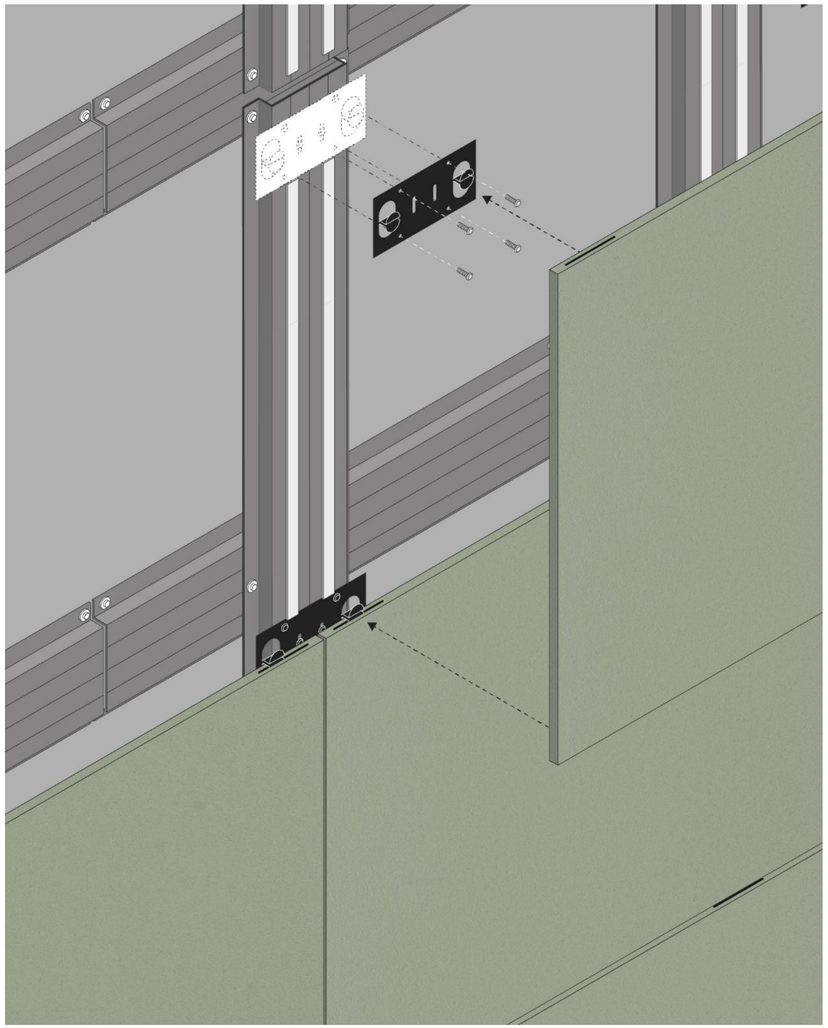


DS SKS
Double Siding Single Kerf System

DS CKS
Double Siding Continuous Kerf System

SYSTEM DESCRIPTION | Double-Siding (DS) SKS/CKS/UKS

The Double Siding (DS) system consists of a grid-like substructure made of horizontal and vertical profiles. Only the first rail is fastened through the insulation layer. For the typical SKS and CKS configuration, the substructure consists of horizontal and vertical omega profiles to which the cladding clips are attached. The typical UKS system is substantially similar in that it also consists of crossing rails; however, a vertical Omega bar profile or hat tack is the first rail followed by a continuous horizontal rail. Insulation depths up to 2″ are accommodated with all three.

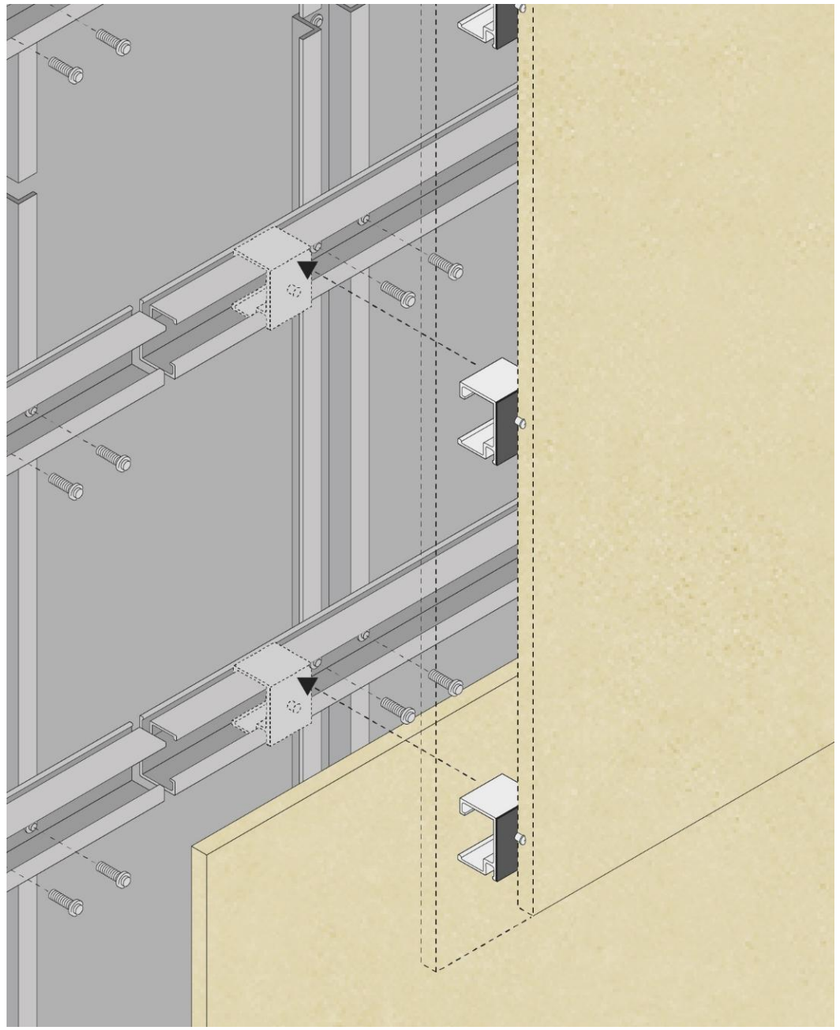


DS-SKS

Double Siding SKS

DS-CKS

Double Siding CKS



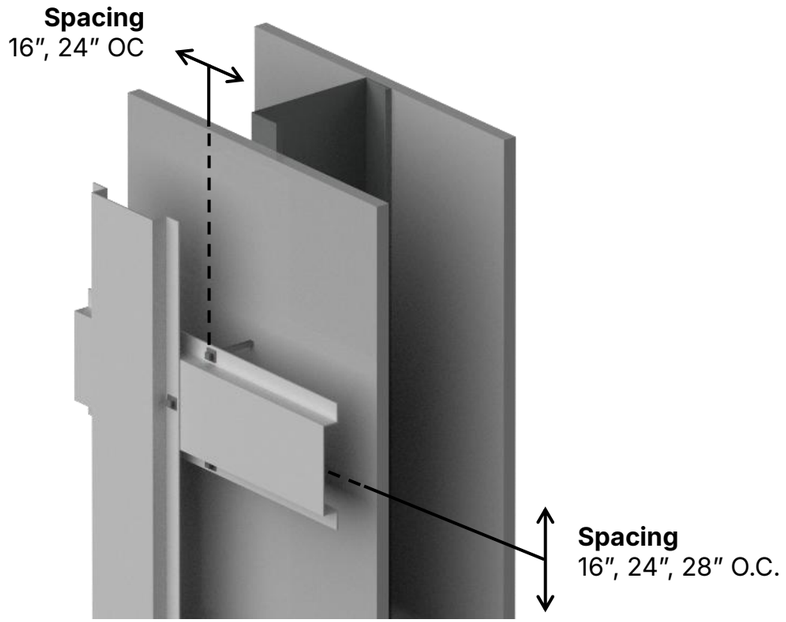
DS-UKS

Double Siding UKS

PORCELANOSA FACADE

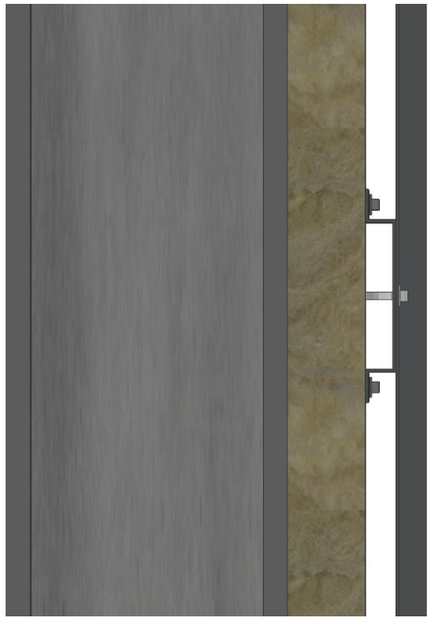
SYSTEM DESCRIPTION | Double-Siding (DS) SKS/CKS/UKS

The Double Siding (DS) features a grid-like substructure made of horizontal and vertical omega profiles. Variations in insulation depth up to 2″ are accommodated with varying of fasteners through the insulation. The fasteners are nominally provided with a non-conductive shim between the rail and the fastener.

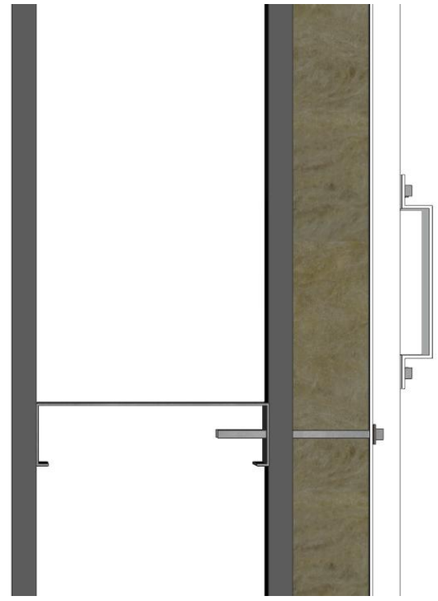


DS-SKS/CKS System

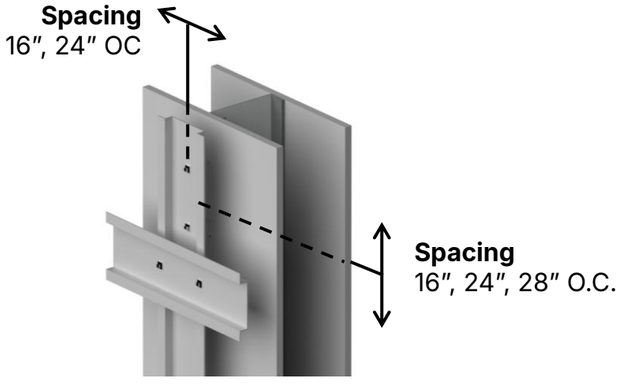
(Insulation Hidden)



Section View



Plan View

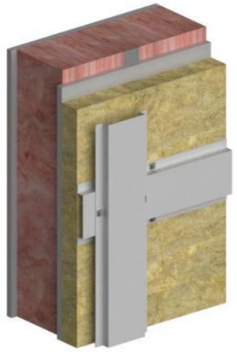


DS-UKS System

(Insulation Hidden)

PORCELANOSA FACADE/

SYSTEM CONFIGURATION | Double Siding Scenarios



6” Steel Stud Wall With and Without R-19 Batt

- **Sheathing:** 1/2” Interior gypsum board; 1/2” Exterior sheathing board
- **Steel Stud:** 18 gauge, 6” x 1 5/8” steel studs with air or R-19 Batt in stud cavity at 16” o.c. horizontal spacing
- **Fasteners:** #14 galvanized-steel fasteners x2 spaced vertically 12” o.c.
- **Washers:** EPDM Washers
- **Omega Profile:** Continuous aluminum hat-shaped girt (OMEGA Bar) oriented horizontally at 24” o.c. vertical spacing
- **Exterior Insulation:** R-4.3/in mineral wool insulation at 2” thickness

6” Wood Stud Wall With and Without R-19 Batt

- **Sheathing:** 5/8” Interior gypsum board; 5/8” Exterior sheathing board
- **Wood Stud:** 2×6 wood studs with air or R-19 Batt in stud cavity at 16” o.c. horizontal spacing
- **Fasteners:** #14 galvanized-steel fasteners x2 spaced vertically 12” o.c.
- **Washers:** EPDM Washers
- **Omega Profile:** Continuous aluminum hat-shaped girt (OMEGA Bar) oriented horizontally at 24” o.c. vertical spacing
- **Exterior Insulation:** R-4.3/in mineral wool insulation at 2” thickness

8” CMU Block Wall

- **CMU Wall:** 8”x16” CMU blocks with air in cavity
- **Fasteners:** #14 galvanized-steel fasteners x2 spaced vertically 12” o.c.
- **Washers:** EPDM Washers
- **Omega Profile:** Continuous aluminum hat-shaped girt (OMEGA Bar) oriented horizontally at 24” o.c. vertical spacing
- **Exterior Insulation:** R-4.3/in mineral wool insulation at 2” thickness

METHODOLOGY & ASSUMPTIONS

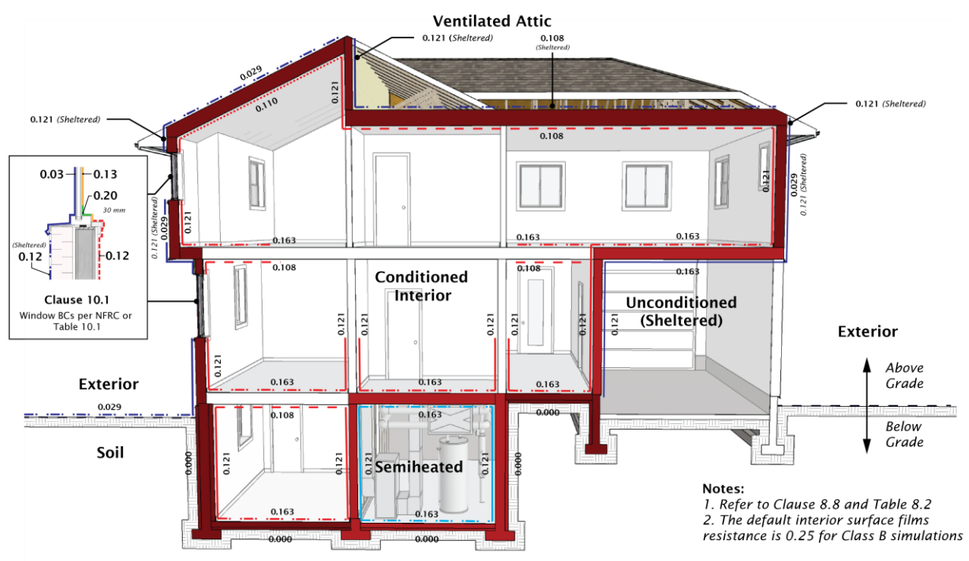
3D THERMAL SIMULATION

The assemblies and details were evaluated using three-dimensional thermal modelling. This method allows for the analysis of complex 3D geometries, such as point connections, pipes, and framing, which cannot be captured completely in a single plan or section detail.

Thermal modelling was performed in general conformance with ASHRAE 1365-RP, CSA Z5010: Thermal Bridging Calculation Methodology and the ASHRAE Handbook Fundamentals. Per industry standard modelling practices, the analysis was conducted under steady-state heat flow using published material properties assuming isotropic and temperature independent thermal conductivities.

BOUNDARY CONDITIONS

The thermal simulations assumed boundary condition surface film coefficients consistent with CSA Z5010.



MATERIALS

The thermophysical properties of all materials included in the thermal simulation were based on data provided in ASHRAE HB Fundamentals, NFRC 101, or independent third-party tested values in accordance with ASTM C518.

Material	Thermal Conductivity Btu·in / ft^2·hr·^{o}F (W/m K)
Drywall / Sheathing	1.1 (0.16)
Galvanized Steel	360.6 (52)
Aluminum	1109.4 (160)
Mineral Wool (R4.3/in.)	0.24 (0.034)
Fiber Batt (R-19)	0.32 (0.045)
HDPE Thermal Pad	3.5 (0.5)
Stainless Steel	117.9 (17)
Wood	0.97 (0.14)
CMU Block	10.4 (1.5)

TEMPERATURE INDEX

The thermal simulations were performed using a Temperature Index (I). The Temperature Index is a non-dimensional ratio of the surface temperature over the change in temperature across the assembly.

$$I = \frac{T_s - T_e}{T_i - T_e}$$

As the material properties are assumed independent of temperature, the temperature profile can be estimated for project specific temperature differences.

$$T_s = I \cdot (T_i - T_e) + T_e$$

SOFTWARE

The thermal modelling was performed using the NX software package from Siemens. NX is a three-dimensional multi-physics finite element analysis software tool. This software was validated as part of ASHRAE 1365-RP and the Building Envelope Thermal Bridging Guide.

REFERENCE DOCUMENTS

RDH relied on the Porcelanosa CAD drawings and brochures received June 11, 2025

RESULTS | DS - SKS / CKS – Uninsulated Steel Stud

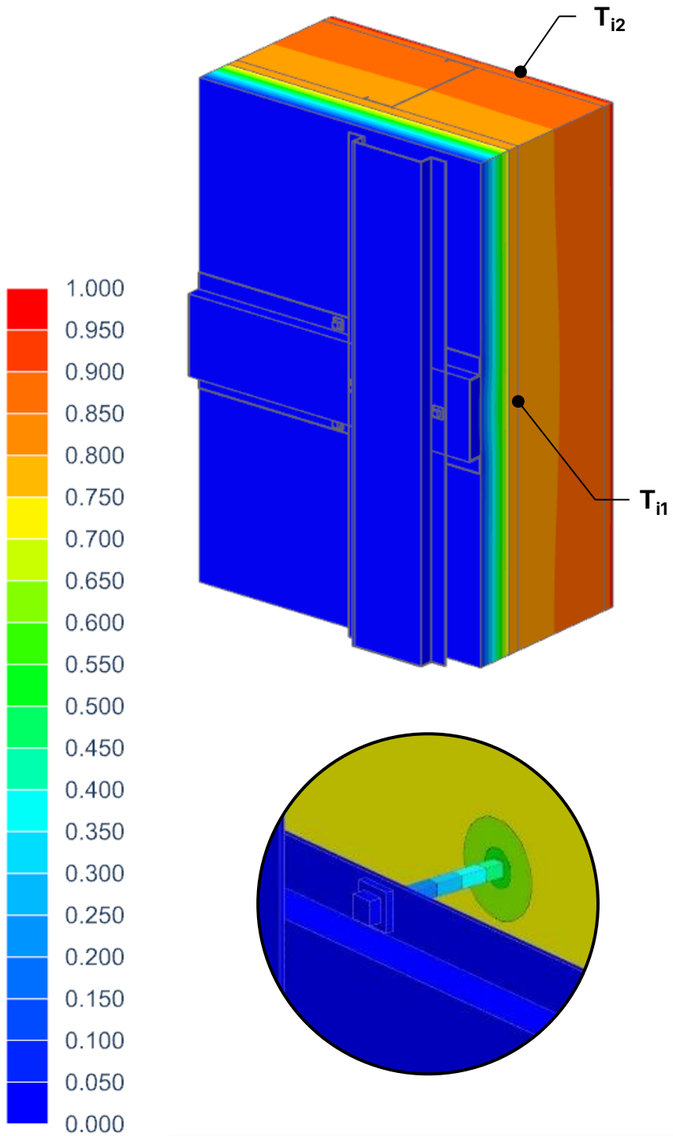


TABLE 1	THERMAL RESULTS FOR UNINSULATED STEEL STUD BACKUP WALL							
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	16" x 24" Spacing		24" x 24" Spacing		24" x 28" Spacing		Chi Factor
		R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	Btu / ft·°F (W/K)
R-8.4 (1.5)	R-11.8 (2.1)	R-10.1 (1.8)	U-0.10 (0.56)	R-10.7 (1.9)	U-0.09 (0.53)	R-11.3 (2.0)	U-0.09 (0.50)	0.26 (0.14)

TABLE 2	TEMPERATURE INDICES FOR UNINSULATED STEEL STUD BACKUP WALL				
Temperature Indices	R-8.4		R-25.2		Location
	16" x 24"	24" x 24"	16" x 24"	24" x 24"	
T_{i1}	0.77	0.77	0.89	0.89	Min T on exterior side in air cavity.
T_{i2}	0.93	0.93	0.97	0.97	Min T on interior face of sheathing.

Scenario	Description
A	EPDM Washers
B	Galvanized Steel Washers w/ Spray Foam Over Fasteners

RESULTS | DS - SKS / CKS – Insulated Steel Stud

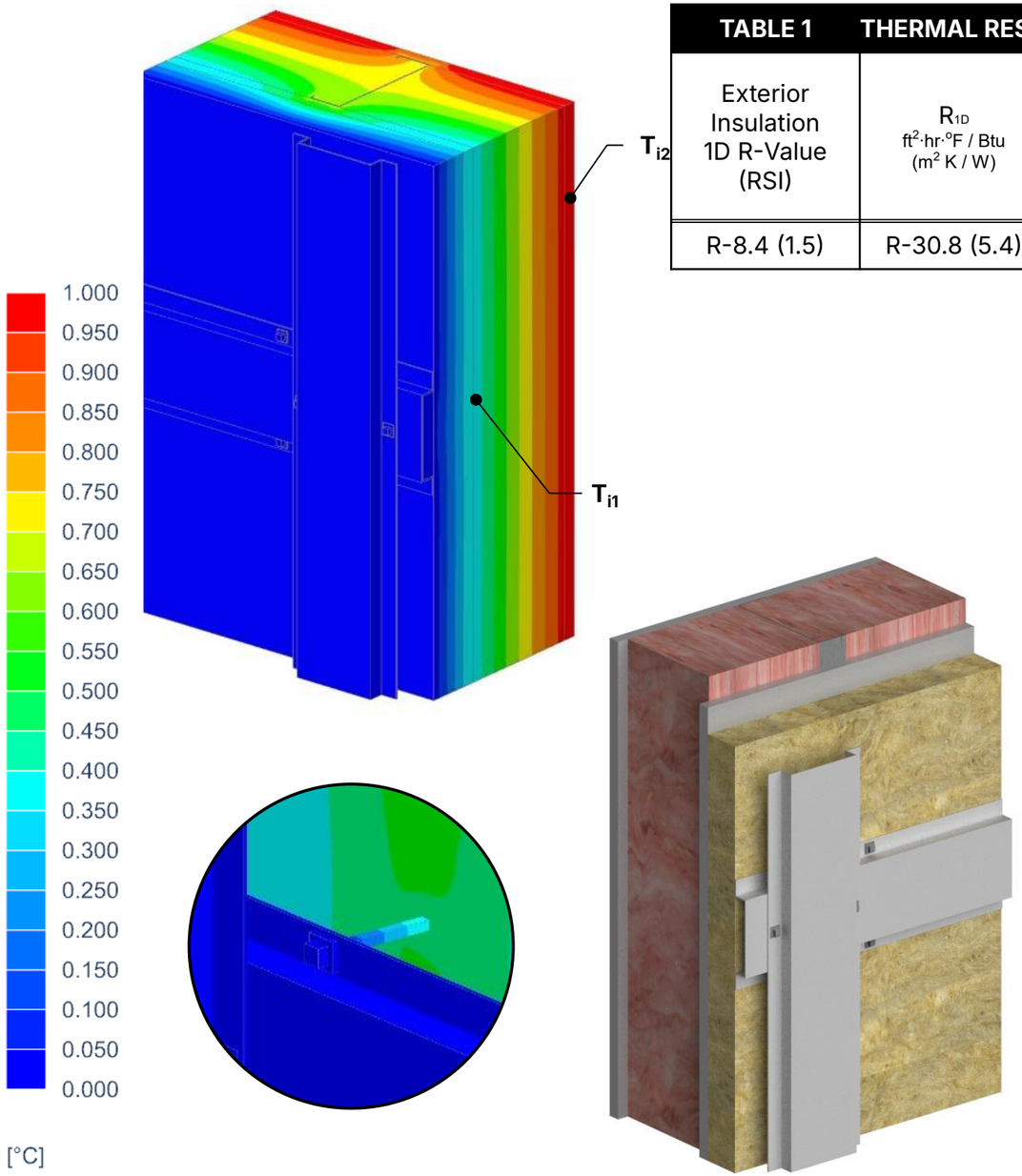


TABLE 1	THERMAL RESULTS FOR INSULATED STEEL STUD BACKUP WALL								
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	16" x 24" Spacing		24" x 24" Spacing		24" x 28" Spacing		Chi Factor
		R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	Btu / ft·°F (W/K)
R-8.4 (1.5)	R-30.8 (5.4)	R-18.2 (3.2)	U-0.06 (0.31)	R-21.2 (3.7)	U-0.05 (0.27)	R-24.7 (4.3)	U-0.04 (0.23)	0.15 (0.08)

TABLE 2	TEMPERATURE INDICES FOR INSULATED STEEL STUD BACKUP WALL				
Temperature Indices	R-8.4		R-25.2		Location
	16" x 24"	24" x 24"	16" x 24"	24" x 24"	
T_{i1}	0.52	0.51	0.72	0.72	Min T on exterior side in air cavity.
T_{i2}	0.89	0.89	0.94	0.95	Min T on interior face of sheathing.

RESULTS | DS - SKS / CKS – Uninsulated Wood Stud

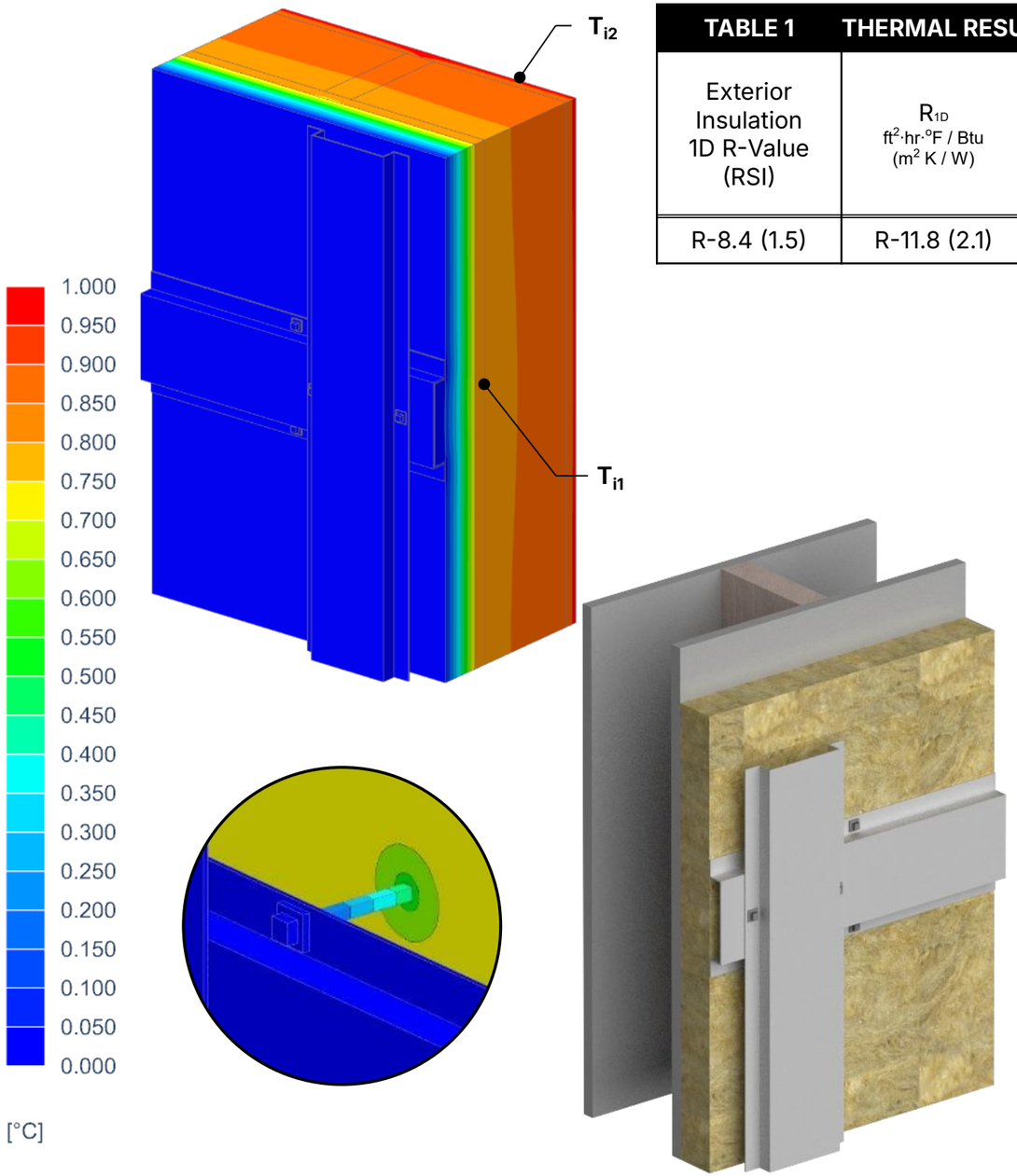


TABLE 1	THERMAL RESULTS FOR UNINSULATED WOOD STUD BACKUP WALL							
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	16" x 24" Spacing		24" x 24" Spacing		24" x 28" Spacing		Chi Factor
		R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	Btu / ft·°F (W/K)
R-8.4 (1.5)	R-11.8 (2.1)	R-10.9 (1.9)	U-0.09 (0.52)	R-11.2 (2.0)	U-0.09 (0.51)	R-11.5 (2.0)	U-0.09 (0.49)	0.24 (0.13)

TABLE 2	TEMPERATURE INDICES FOR UNINSULATED WOOD STUD BACKUP WALL				
Temperature Indices	R-8.4		R-25.2		Location
	16" x 24"	24" x 24"	16" x 24"	24" x 24"	
T_{i1}	0.49	0.5	0.72	0.73	Min T on exterior side in air cavity.
T_{i2}	0.95	0.95	0.97	0.98	Min T on interior face of sheathing.

RESULTS | DS - SKS / CKS – Insulated Wood Stud

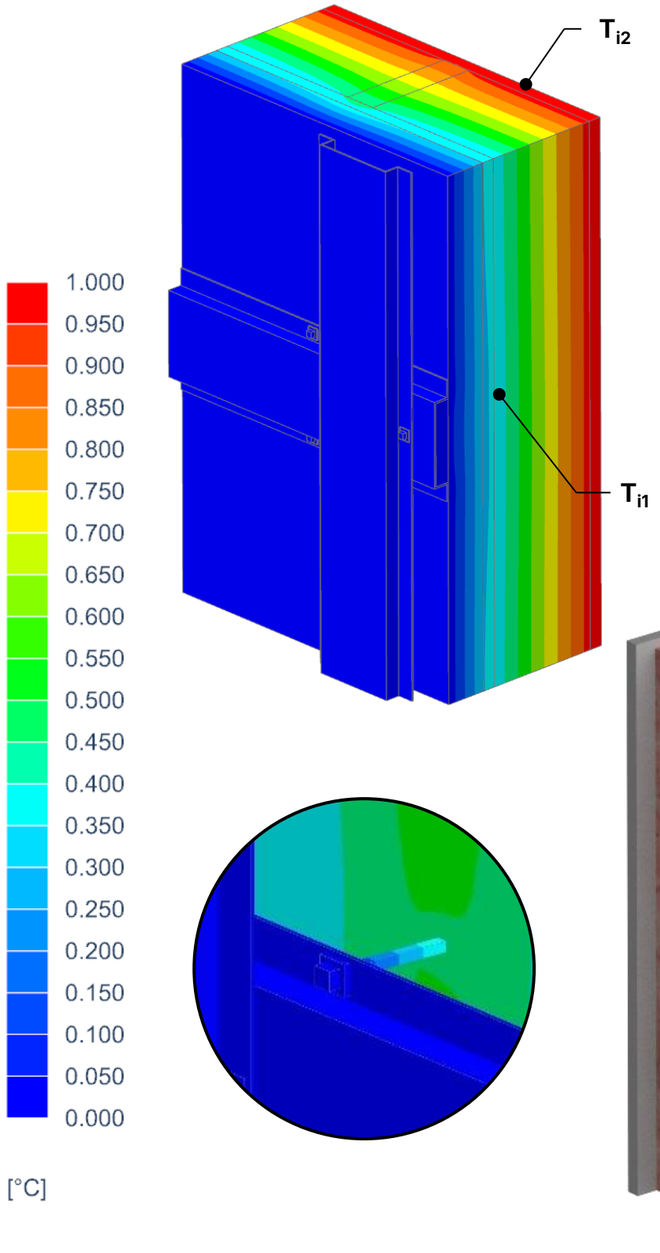


TABLE 1	THERMAL RESULTS FOR INSULATED WOOD STUD BACKUP WALL							
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	16" x 24" Spacing		24" x 24" Spacing		24" x 28" Spacing		Chi Factor
		R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	Btu / ft·°F (W/K)
R-8.4 (1.5)	R-30.8 (5.4)	R-24.2 (4.3)	U-0.04 (0.23)	R-25.5 (4.5)	U-0.04 (0.22)	R-29.7 (5.2)	U-0.03 (0.19)	0.11 (0.06)

TABLE 2	TEMPERATURE INDICES FOR INSULATED WOOD STUD BACKUP WALL				
Temperature Indices	R-8.4		R-25.2		Location
	16" x 24"	24" x 24"	16" x 24"	24" x 24"	
T_{i1}	0.24	0.25	0.46	0.47	Min T on exterior side in air cavity.
T_{i2}	0.95	0.95	0.97	0.97	Min T on interior face of sheathing.

RESULTS | DS - SKS / CKS – Uninsulated CMU Wall

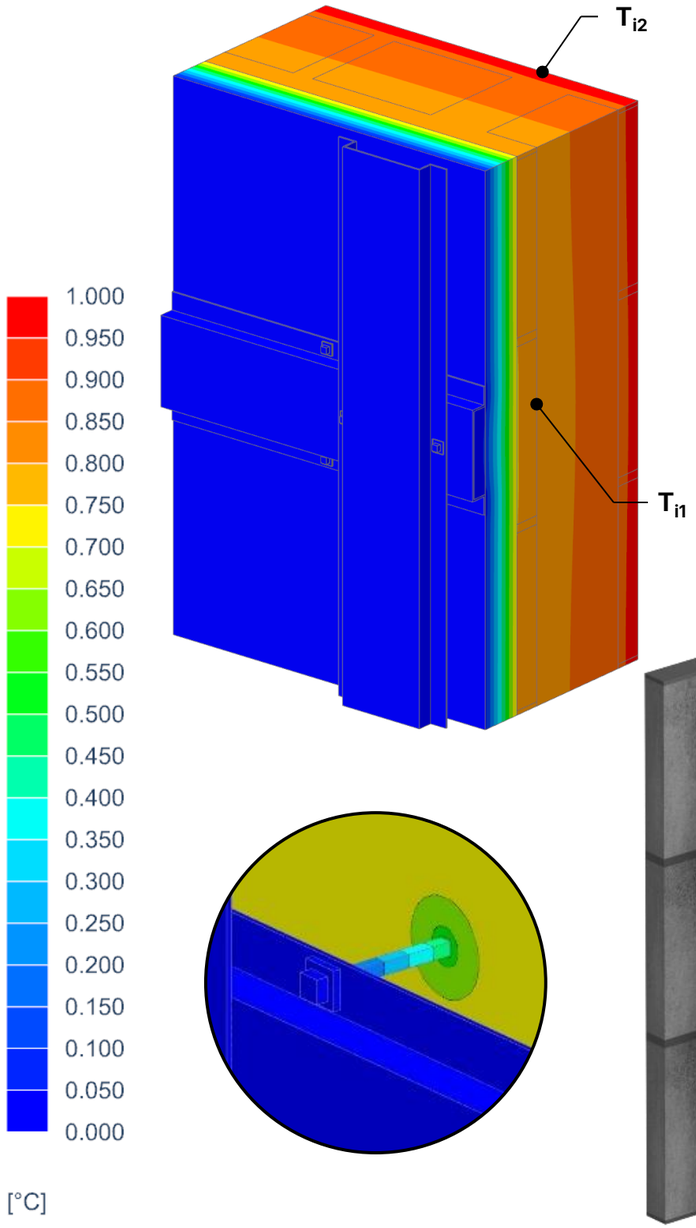


TABLE 1	THERMAL RESULTS FOR UNINSULATED CMU BACKUP WALL							
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	16" x 24" Spacing		24" x 24" Spacing		24" x 28" Spacing		Chi Factor
		R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu / $ft^2 \cdot hr \cdot °F$ (W/m^2 K)	Btu / ft·°F (W/K)
R-8.4 (1.5)	R-10.7 (1.9)	R-9.6 (1.7)	U-0.10 (0.59)	R-10.1 (1.8)	U-0.10 (0.56)	R-10.4 (1.8)	U-0.10 (0.54)	0.28 (0.15)

TABLE 2	TEMPERATURE INDICES FOR UNINSULATED CMU BACKUP WALL				
Temperature Indices	R-8.4		R-25.2		Location
	16" x 24"	24" x 24"	16" x 24"	24" x 24"	
T_{i1}	0.7	0.74	0.87	0.89	Min T on exterior side in air cavity.
T_{i2}	0.93	0.93	0.97	0.97	Min T on interior face of sheathing.

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DISCLAIMER

Thermal simulation is not a guarantee of exact performance. The details were assessed for simulated heat flow. The details were not evaluated with respect to other building enclosure functions such as moisture control, air leakage, structural, or durability as part of this report. RDH and its employees neither endorse nor warrant the suitability of the simulated products or details.