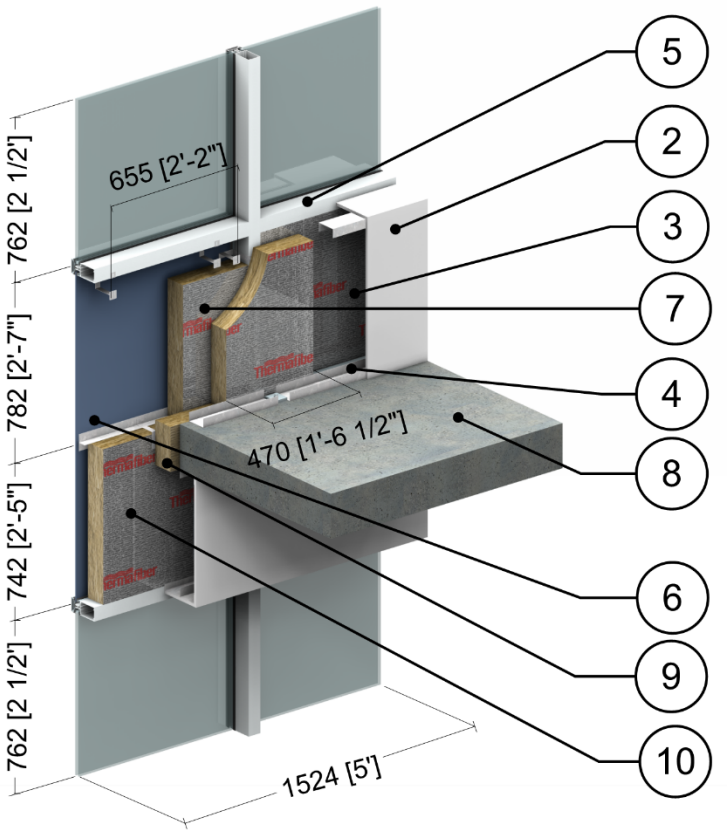
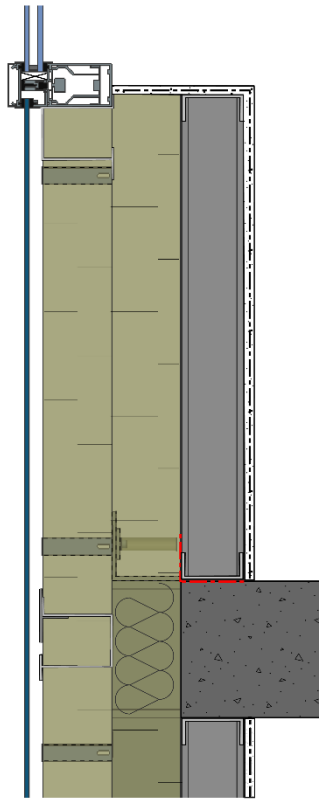
Detail 2.1.14

Conventional Curtain Wall System with Vertical and Horizontal Pressure Plates and 5' x 5' Spandrel Section – Owens Corning Thermafiber Impasse System and Intermediate Floor Intersection



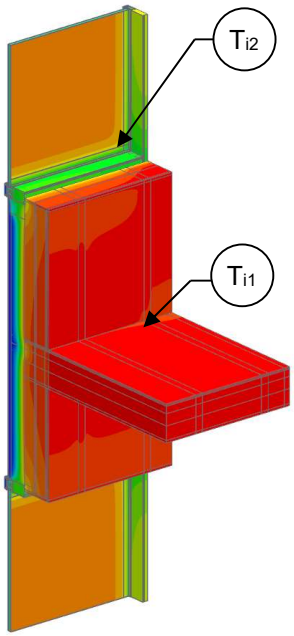


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)
1	Interior Films[1]	-	-	R-0.6 (0.12 RSI) to R-1.1 (0.20 RSI)	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)
3	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)
4	1 5/8" x 1 5/8" Steel Studs (16"o.c.) with Top and Bottom Tracks	18 Gauge	430 (62)	-	489 (7830)
5	5' (1.5m) x 5' (1.5m) Aluminum window: thermally broken, double glazed IGU[2] U_{IGU} = 0.32 BTU/hr.ft².°F (1.82 W/m²K)				
6	5' (1.5m) x 5' (1.5m) Conventional Curtain Wall Spandrel Section with Thermafiber Impasse System[2]				
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Spandrel Insulation	4" (102)	0.24 (0.034)	R-16.8 (2.96 RSI)	4.5 (72)
8	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)
9	Safing Mineral Wool Insulation	3" (76)	0.24 (0.034)	-	4.5 (72)
10	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Mullion Cover Insulation	2" (51)	0.24 (0.034)	R-8.4 (1.48 RSI)	4.5 (72)
11	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-

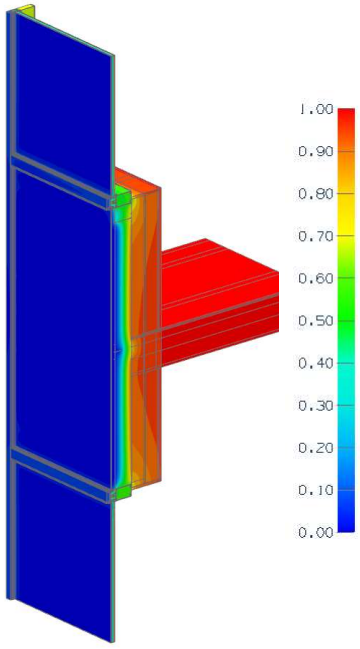
[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces within framing was found using ISO 100077-2

Detail 2.1.14

Conventional Curtain Wall System with Vertical and Horizontal Pressure Plates and 5' x 5' Spandrel Section – Owens Corning Thermafiber Impasse System and Intermediate Floor Intersection



View from Interior



View from Exterior

Thermal Performance Indicators

Transmittance / Resistance	U_s, R_s	Spandrel Section U-value and "Effective" R-value (including slab)
	U_g, R_g	Glazing U-value and "Effective" R-value
	U_t, R_t	Total Assembly U-value and "Effective" R-value

[1]U_t based on a window to wall ratio of 50%, but U_s is valid for all spandrel dimensions.

Nominal (1D) vs. Assembly Performance Indicators

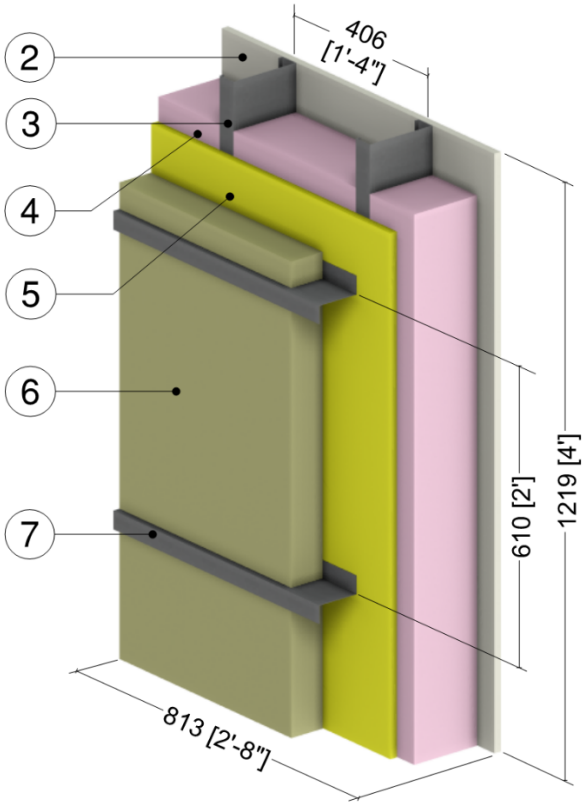
Insulation R-Value (RSI)	U_s Btu/ft^2 ·hr ·°F (W/m^2 K)	R_s ft^2·hr·°F / Btu (m^2 K / W)	U_g Btu/ft^2 ·hr ·°F (W/m^2 K)	R_g ft^2·hr·°F / Btu (m^2 K / W)	U_t[1] Btu/ft^2 ·hr ·°F (W/m^2 K)	R_t ft^2·hr·°F / Btu (m^2 K / W)
R-8.4 (1.48)	0.188 (1.07)	R-5.3 (0.94)	0.455 (2.58)	R-2.2 (0.39)	0.321 (1.83)	R-3.1 (0.55)
R-16.8 (2.96)	0.129 (0.73)	R-7.8 (1.37)	0.455 (2.58)	R-2.2 (0.39)	0.292 (1.66)	R-3.4 (0.60)

Temperature Indices

	R8.4	R16.8	
T_{i1}	0.17	0.28	Min T on interior frame, at vertical mullion behind slab
T_{i2}	0.64	0.60	Min T on interior window, at bottom corner

Detail 5.1.10

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Horizontal Z-Girts (24” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall

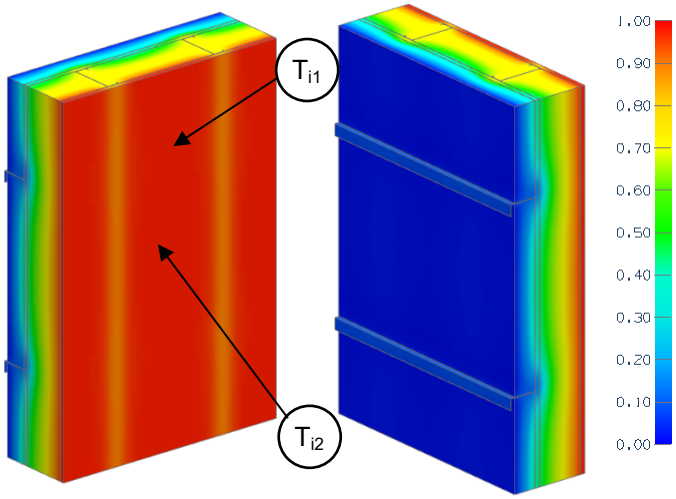


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Max Mineral Wool Semi Rigid Insulation	Varies	0.25 (0.036)	R-4 to R-24 (0.70 to 4.23 RSI)	11 (176)	0.20 (850)
7	Horizontal Z-Girts with 1-1/2” Flange	18 gauge	430 (62)	-	489 (7830)	0.12 (500)
8	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
9	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.10

Exterior and Interior Insulated 6” x 1 /58” Steel Stud (16” o.c.) Wall Assembly with Horizontal Z-Girts (24” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.5 (3.96 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.0 (0.70)	R-26.5 (4.67)	R-15.9 (2.80)	0.063 (0.357)
R-8.0 (1.41)	R-30.5 (5.37)	R-18.4 (3.24)	0.054 (0.308)
R-12.0 (2.11)	R-34.5 (6.08)	R-20.9 (3.68)	0.048 (0.272)
R-16.0 (2.82)	R-38.5 (6.78)	R-22.7 (4.00)	0.044 (0.250)
R-20.0 (3.52)	R-42.5 (7.48)	R-24.5 (4.31)	0.041 (0.232)
R-24.0 (4.23)	R-46.5 (8.19)	R-26.0 (4.58)	0.038 (0.218)

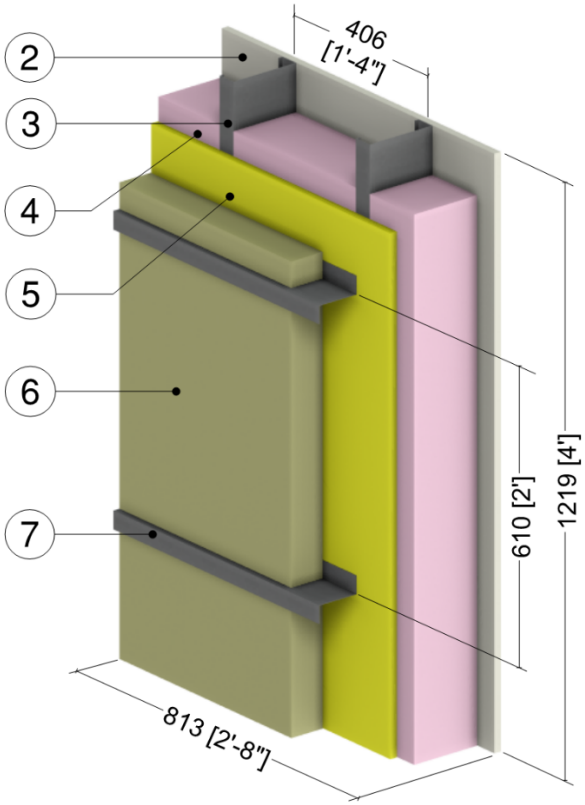
Temperature Indices

	R4	R12	R20	R24	
T_{i1}	0.14	0.23	0.29	0.31	Min T on sheathing, along girts between studs
T_{i2}	0.22	0.43	0.57	0.57	Max T on sheathing, between studs and girt

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.11

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Horizontal Z-Girts (24” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Plus 110 Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall

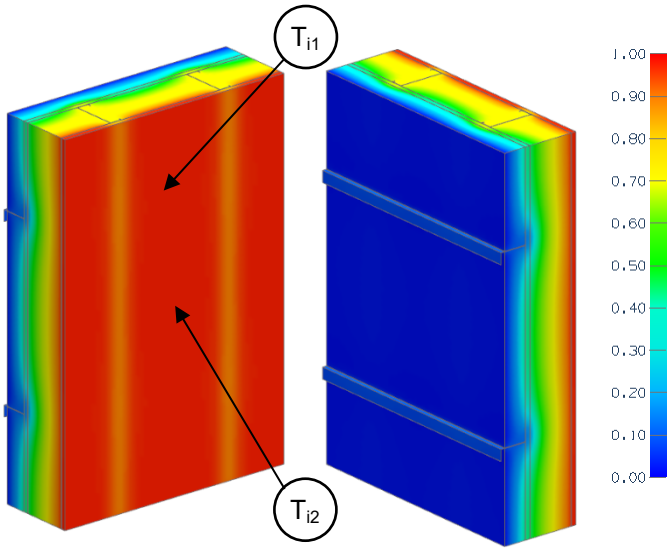


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Plus 110 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.035)	R-4.1 to R-24.6 (0.72 to 4.33 RSI)	8 (128)	0.20 (850)
7	Horizontal Z-Girts with 1-1/2” Flange	18 gauge	430 (62)	-	489 (7830)	0.12 (500)
8	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
9	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.11

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Horizontal Z-Girts (24” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Plus 110 Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.5 (3.96 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.1 (0.72)	R-26.6 (4.68)	R-16.0 (2.82)	0.063 (0.355)
R-8.2 (1.44)	R-30.7 (5.41)	R-18.5 (3.26)	0.054 (0.306)
R-12.3 (2.17)	R-34.8 (6.13)	R-21.1 (3.71)	0.047 (0.270)
R-16.4 (2.89)	R-38.9 (6.85)	R-22.9 (4.03)	0.044 (0.248)
R-20.5 (3.61)	R-43.0 (7.57)	R-24.7 (4.35)	0.041 (0.230)
R-24.6 (4.33)	R-47.1 (8.29)	R-26.2 (4.62)	0.038 (0.217)

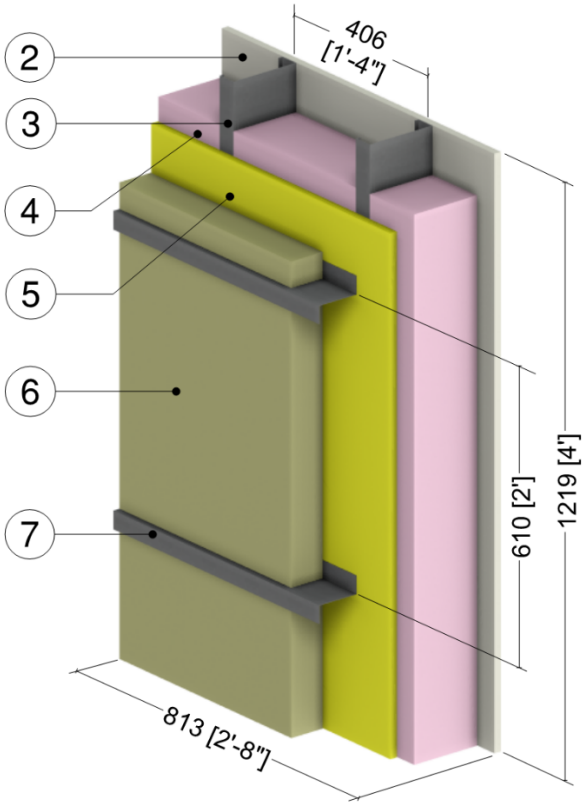
Temperature Indices

	R4.1	R12.3	R20.5	R24.6	
T_{i1}	0.14	0.23	0.29	0.31	Min T on sheathing, along girts between studs
T_{i2}	0.23	0.43	0.58	0.58	Max T on sheathing, between studs and girt

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.12

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Horizontal Z-Girts (24” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall

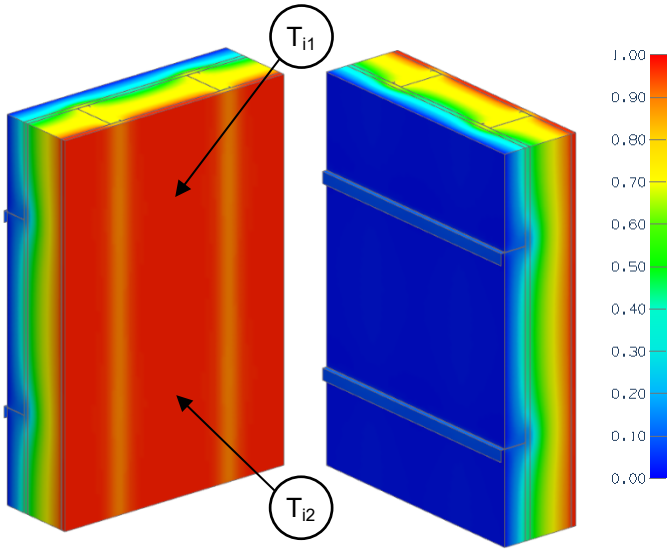


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-25.2 (0.74 to 4.44 RSI)	4.5 (72)	0.20 (850)
7	Horizontal Z-Girts with 1-1/2” Flange	18 gauge	430 (62)	-	489 (7830	0.12 (500)
8	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
9	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.12

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Horizontal Z-Girts (24” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.5 (3.96 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-26.7 (4.70)	R-16.1 (2.83)	0.062 (0.353)
R-8.4 (1.48)	R-30.9 (5.44)	R-18.6 (3.28)	0.054 (0.304)
R-12.6 (2.22)	R-35.1 (6.18)	R-21.2 (3.74)	0.047 (0.268)
R-16.8 (2.96)	R-39.3 (6.92)	R-23.1 (4.06)	0.043 (0.246)
R-21.0 (3.70)	R-43.5 (7.66)	R-24.9 (4.38)	0.040 (0.228)
R-25.2 (4.44)	R-47.7 (8.40)	R-26.4 (4.66)	0.038 (0.215)

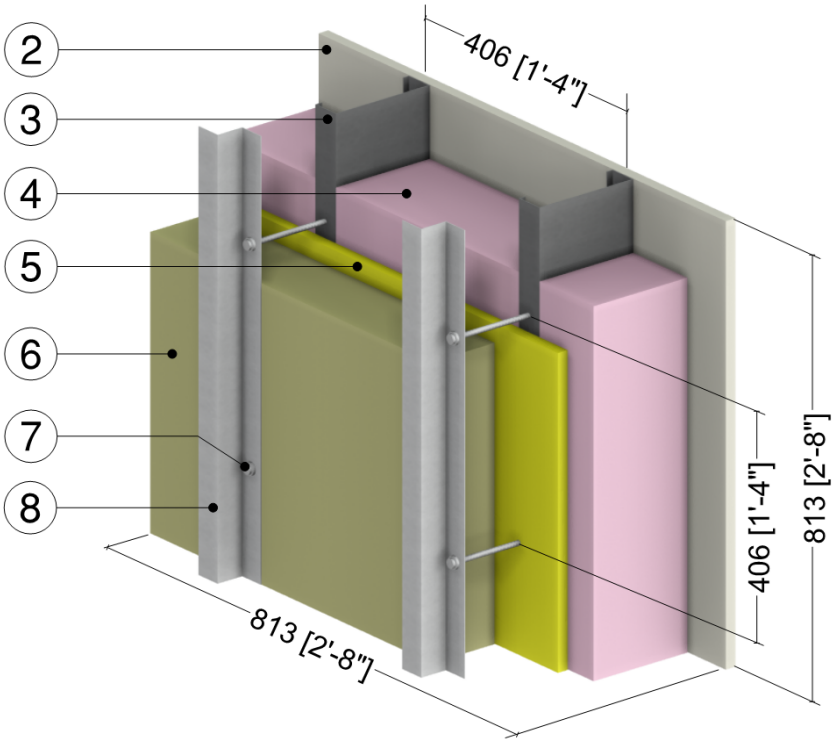
Temperature Indices

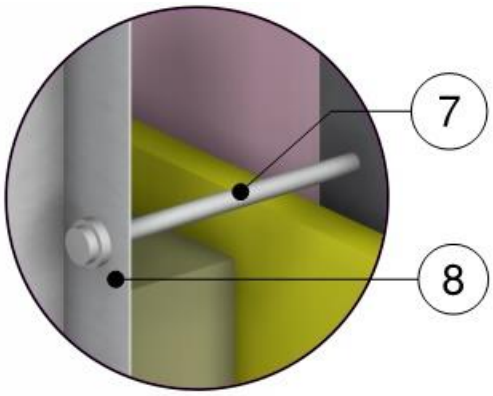
	R4.2	R12.6	R21.0	R25.2	
T_{i1}	0.14	0.23	0.29	0.31	Min T on sheathing, along girts between studs
T_{i2}	0.23	0.44	0.55	0.58	Max T on sheathing, between studs and girt

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.27

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall





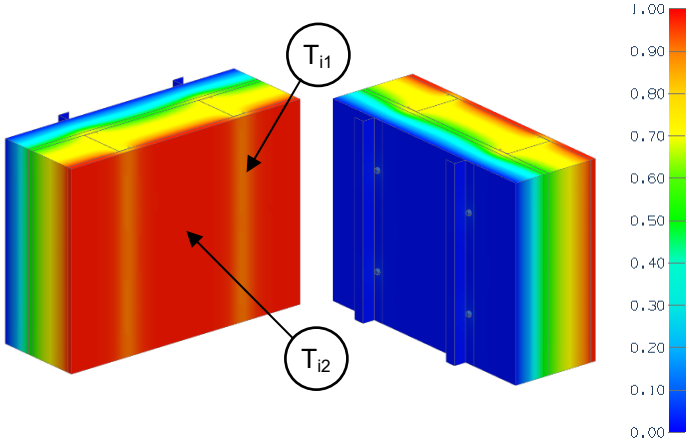
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.28 (0.041)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Max Mineral Wool Semi Rigid Insulation	Varies	0.25 (0.036)	R-4.0 to R-16.0 (0.70 to 2.82 RSI)	11 (176)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.27

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.5 (3.96 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.0 (0.70)	R-26.5 (4.67)	R-15.5 (2.72)	0.065 (0.367)
R-8.0 (1.41)	R-30.5 (5.37)	R-18.5 (3.26)	0.054 (0.307)
R-12.0 (2.11)	R-34.5 (6.08)	R-21.6 (3.80)	0.046 (0.263)
R-16.0 (2.82)	R-38.5 (6.78)	R-24.4 (4.30)	0.041 (0.233)

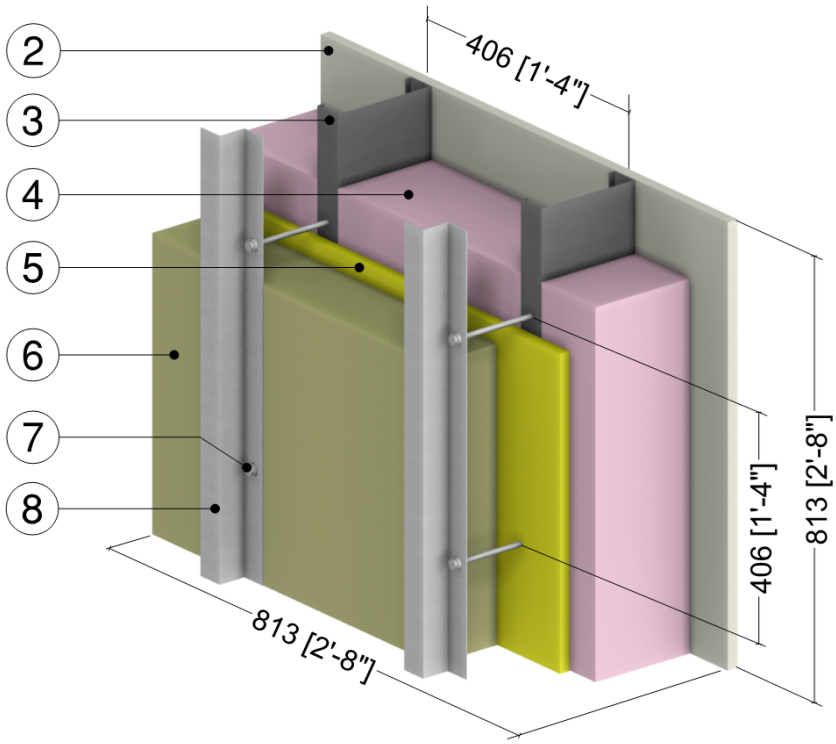
Temperature Indices

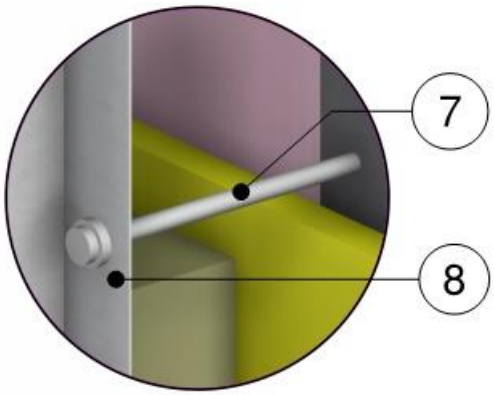
	R4	R12	R16	
T_{i1}	0.27	0.41	0.46	Min T on sheathing, at fastener along studs
T_{i2}	0.22	0.44	0.51	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.28

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Plus 110 Exterior Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall





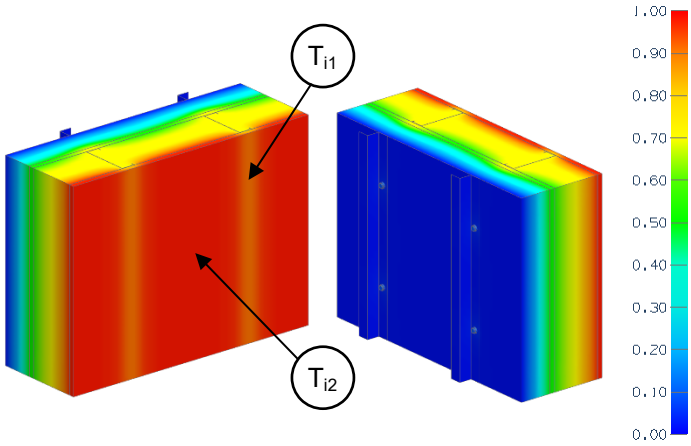
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.28 (0.041)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Plus 110 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.035)	R-4.1 to R-16.4 (0.72 to 2.89 RSI)	8 (128)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.28

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Plus 110 Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.5 (3.96 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.1 (0.72)	R-26.6 (4.68)	R-15.5 (2.74)	0.064 (0.366)
R-8.2 (1.44)	R-30.7 (5.41)	R-18.6 (3.28)	0.054 (0.305)
R-12.3 (2.17)	R-34.8 (6.13)	R-21.8 (3.83)	0.046 (0.261)
R-16.4 (2.89)	R-38.9 (6.85)	R-24.7 (4.34)	0.041 (0.230)

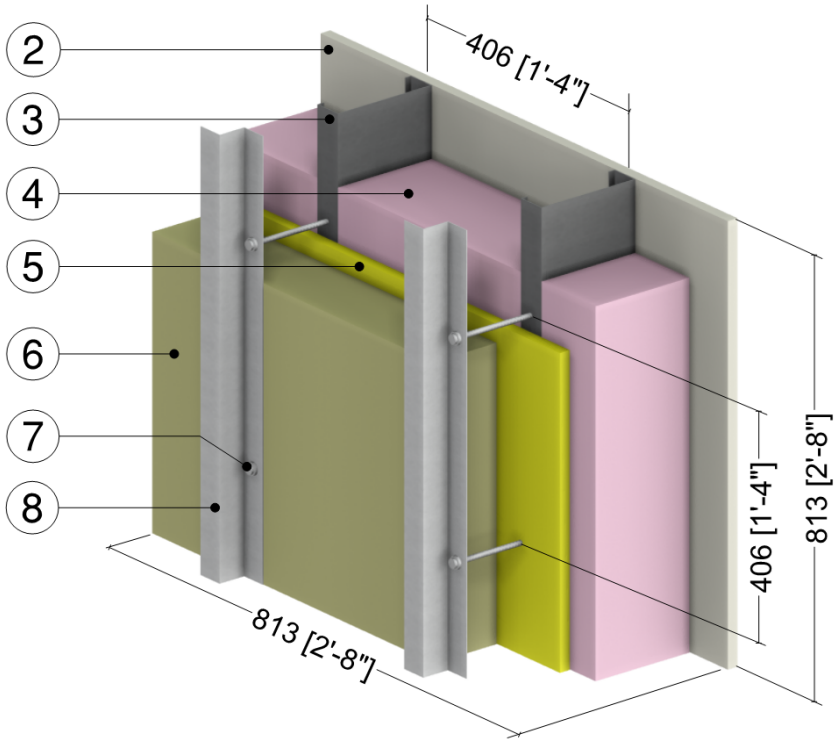
Temperature Indices

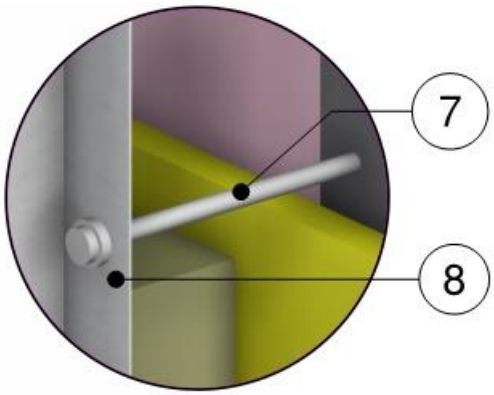
	R4.1	R12.3	R16.4	
T_{i1}	0.27	0.41	0.46	Min T on sheathing, at fastener along studs
T_{i2}	0.23	0.45	0.52	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.29

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall





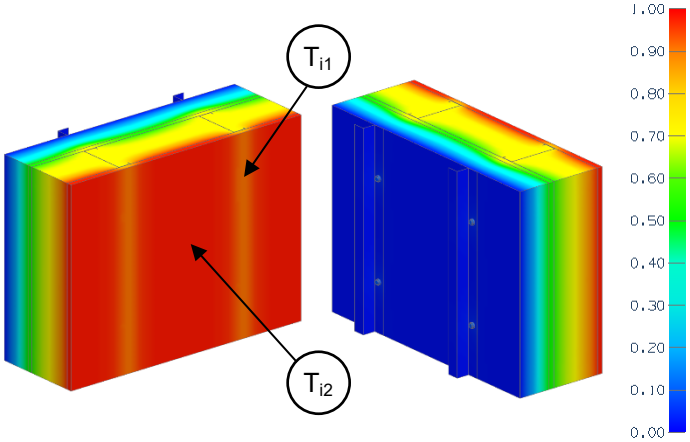
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.28 (0.041)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC 80 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-16.8 (0.74 to 2.96 RSI)	4.5 (72)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.29

Exterior and Interior Insulated 6” 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.5 (3.96 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	R_o $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 $\cdot hr \cdot {}^oF$ (W/m^2 K)
R-4.2 (0.74)	R-26.7 (4.70)	R-15.6 (2.75)	0.064 (0.363)
R-8.4 (1.48)	R-30.9 (5.44)	R-18.8 (3.31)	0.053 (0.302)
R-12.6 (2.22)	R-35.1 (6.18)	R-21.9 (3.86)	0.046 (0.259)
R-16.8 (2.96)	R-39.3 (6.92)	R-24.9 (4.39)	0.040 (0.228)

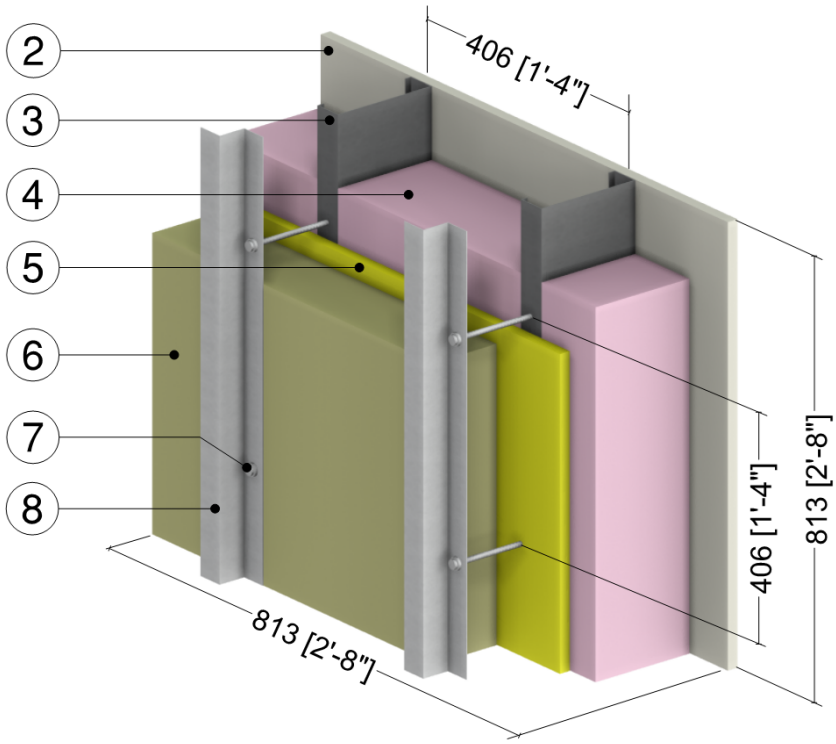
Temperature Indices

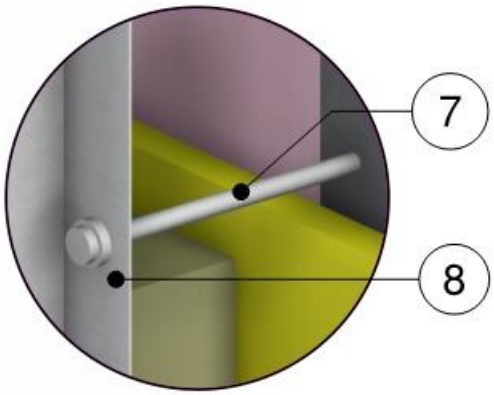
	R4.2	R12.6	R16.8	
T_{i1}	0.27	0.41	0.46	Min T on sheathing, at fastener along studs
T_{i2}	0.23	0.45	0.52	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.30

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-22 Batt Insulation in Stud Cavity – Clear Wall





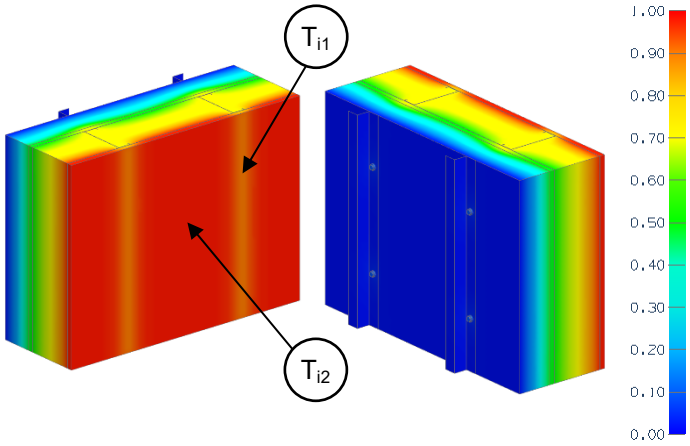
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.27 (0.039)	R-22 (3.87 RSI)	0.91 (14.5)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Max Mineral Wool Semi Rigid Insulation	Varies	0.25 (0.036)	R-4.0 to R-16.0 (0.70 to 2.82 RSI)	11 (176)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.30

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-22 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.5 (4.31 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.0 (0.70)	R-28.5 (5.02)	R-16.0 (2.81)	0.063 (0.355)
R-8.0 (1.41)	R-32.5 (5.72)	R-19.0 (3.35)	0.053 (0.299)
R-12.0 (2.11)	R-36.5 (6.43)	R-22.1 (3.89)	0.045 (0.257)
R-16.0 (2.82)	R-40.5 (7.13)	R-24.9 (4.39)	0.040 (0.228)

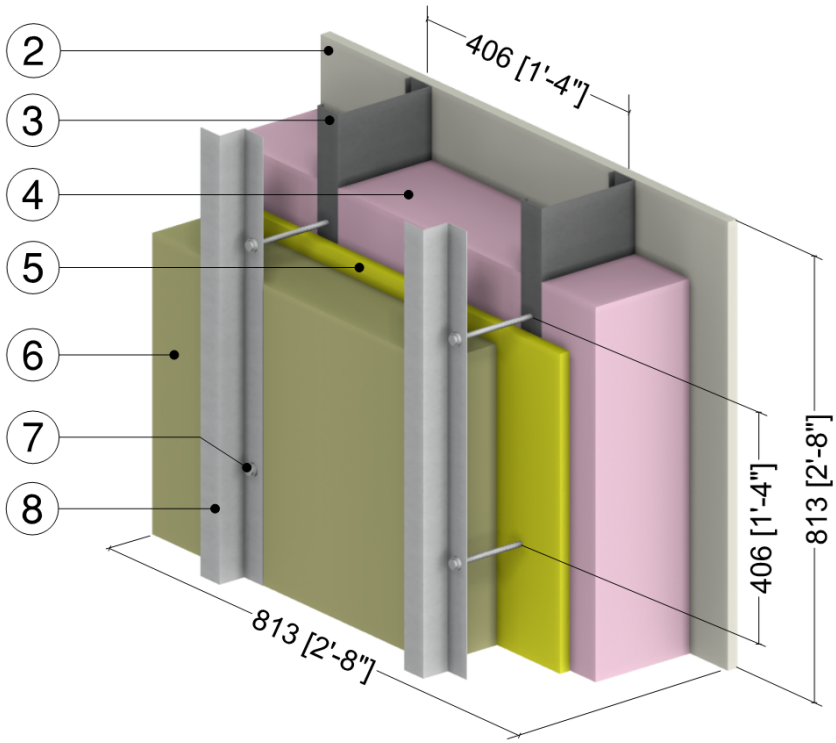
Temperature Indices

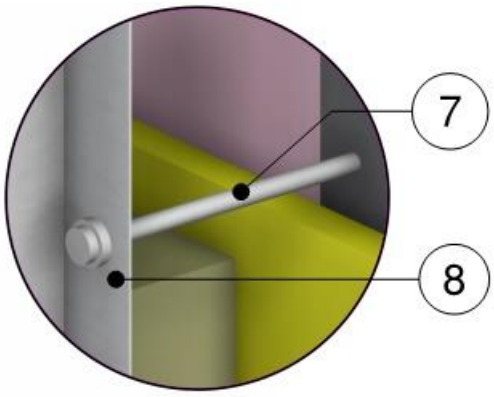
	R4	R12	R16	
T_{i1}	0.27	0.40	0.45	Min T on sheathing, at fastener along studs
T_{i2}	0.21	0.42	0.49	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.31

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Plus 110 Exterior Insulation and R-22 Batt Insulation in Stud Cavity – Clear Wall





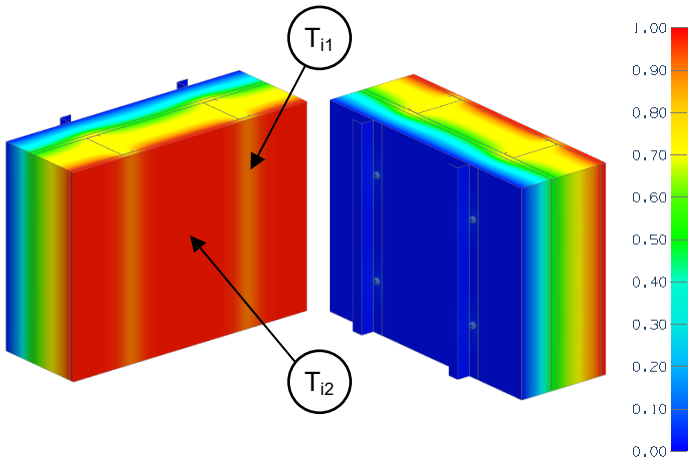
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.27 (0.039)	R-22 (3.87 RSI)	0.91 (14.5)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Plus 110 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.035)	R-4.1 to R-16.4 (0.72 to 2.89 RSI)	8 (128)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.31

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Plus 110 Exterior Insulation and R-22 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.5 (4.31 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.1 (0.72)	R-28.6 (5.04)	R-16.1 (2.83)	0.062 (0.354)
R-8.2 (1.44)	R-32.7 (5.76)	R-19.2 (3.37)	0.052 (0.296)
R-12.3 (2.17)	R-36.8 (6.48)	R-22.3 (3.92)	0.045 (0.255)
R-16.4 (2.89)	R-40.9 (7.20)	R-25.2 (4.43)	0.040 (0.226)

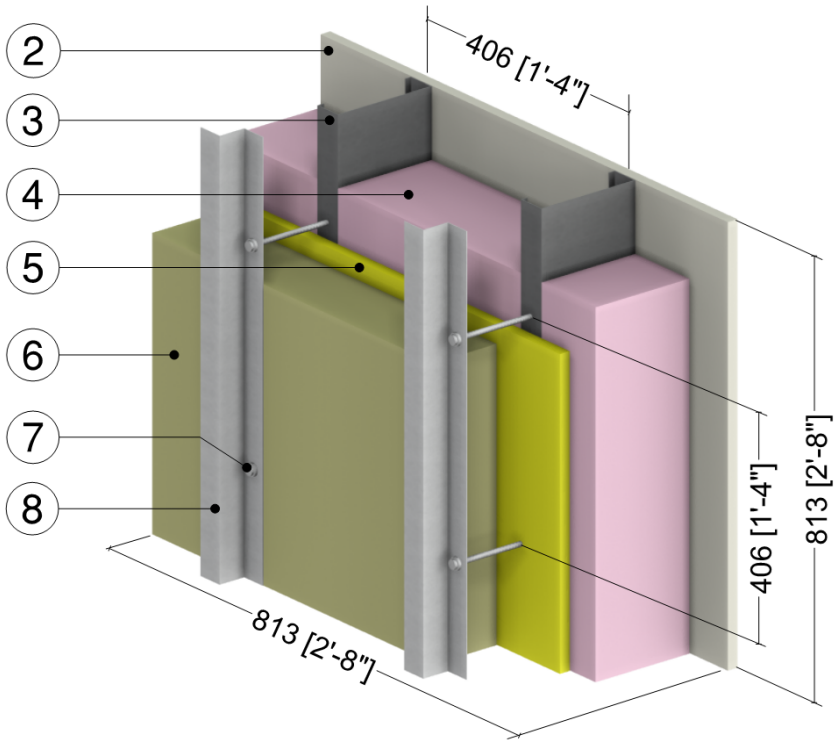
Temperature Indices

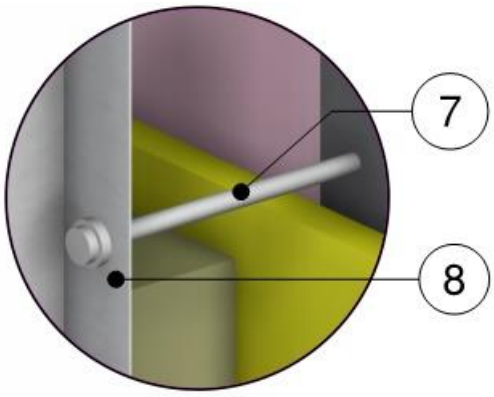
	R4.1	R12.3	R16.4	
T_{i1}	0.27	0.40	0.46	Min T on sheathing, at fastener along studs
T_{i2}	0.21	0.43	0.50	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.32

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation and R-22 Batt Insulation in Stud Cavity – Clear Wall





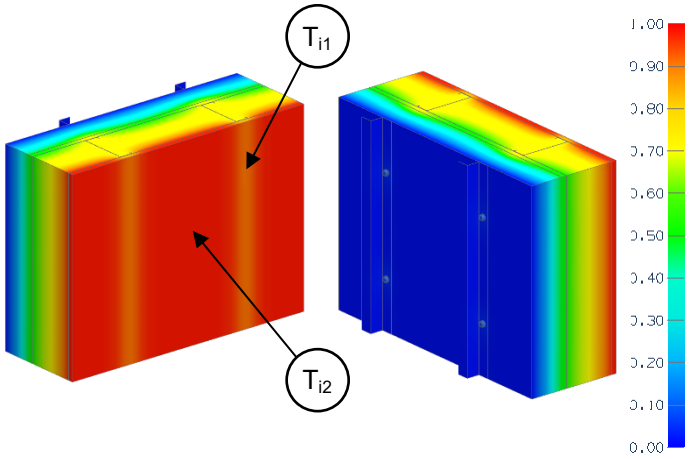
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.27 (0.039)	R-22 (3.87 RSI)	0.91 (14.5)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC 80 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-16.8 (0.74 to 2.96 RSI)	4.5 (72)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.32

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation and R-22 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.5 (4.31 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-28.7 (5.05)	R-16.1 (2.84)	0.062 (0.352)
R-8.4 (1.48)	R-32.9 (5.79)	R-19.3 (3.40)	0.052 (0.294)
R-12.6 (2.22)	R-37.1 (6.53)	R-22.5 (3.95)	0.045 (0.253)
R-16.8 (2.96)	R-41.3 (7.27)	R-25.4 (4.48)	0.039 (0.223)

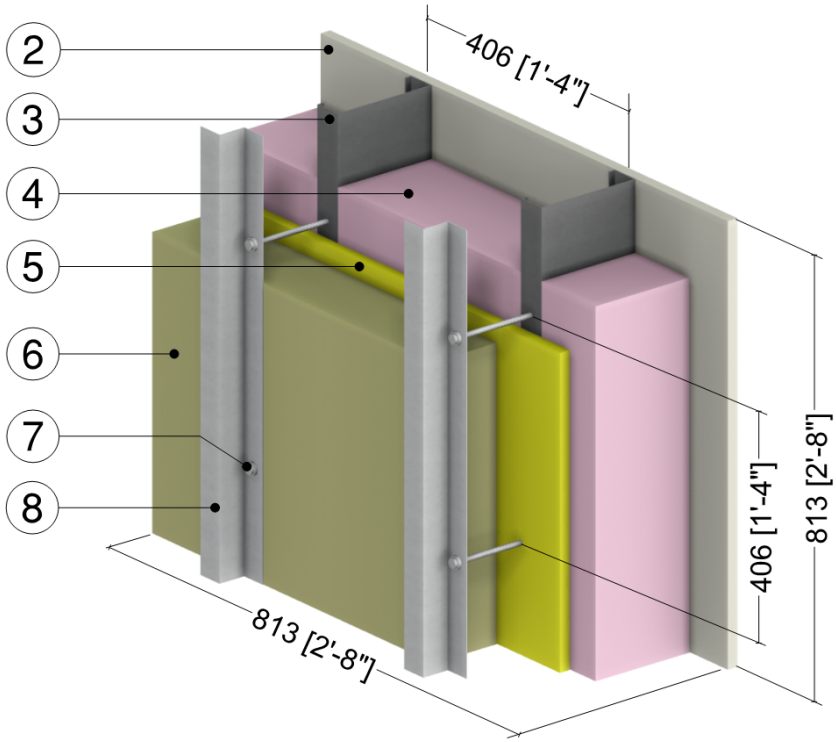
Temperature Indices

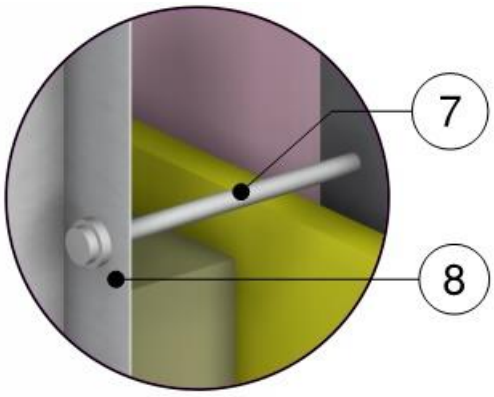
	R4.2	R12.6	R16.8	
T_{i1}	0.27	0.41	0.46	Min T on sheathing, at fastener along studs
T_{i2}	0.22	0.44	0.51	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.33

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-24 Batt Insulation in Stud Cavity – Clear Wall





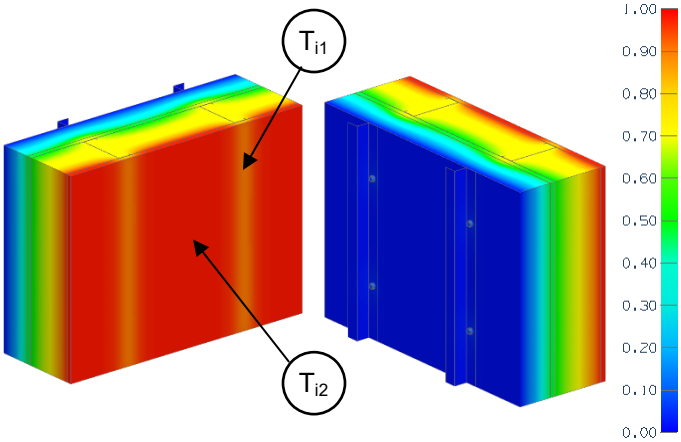
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.25 (0.036)	R-24 (4.23 RSI)	1.42 (22.7)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Max Mineral Wool Semi Rigid Insulation	Varies	0.25 (0.036)	R-4.0 to R-16.0 (0.70 to 2.82 RSI)	11 (176)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.33

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-24 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-26.4 (4.67 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.0 (0.70)	R-30.5 (5.37)	R-16.5 (2.90)	0.061 (0.345)
R-8.0 (1.41)	R-34.5 (6.08)	R-19.5 (3.43)	0.051 (0.291)
R-12.0 (2.11)	R-38.5 (6.78)	R-22.5 (3.97)	0.044 (0.252)
R-16.0 (2.82)	R-42.5 (7.48)	R-25.4 (4.47)	0.039 (0.224)

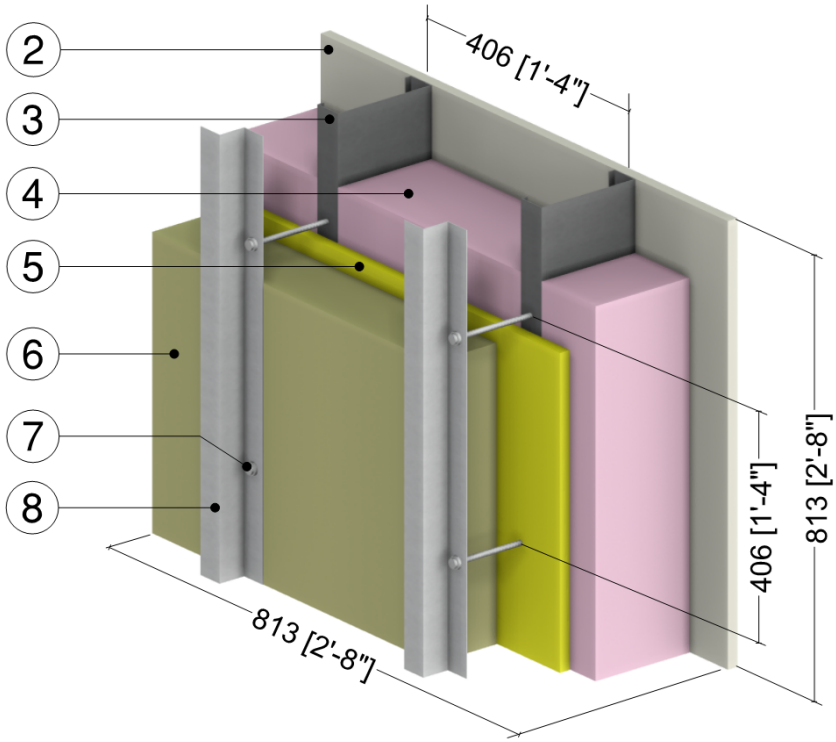
Temperature Indices

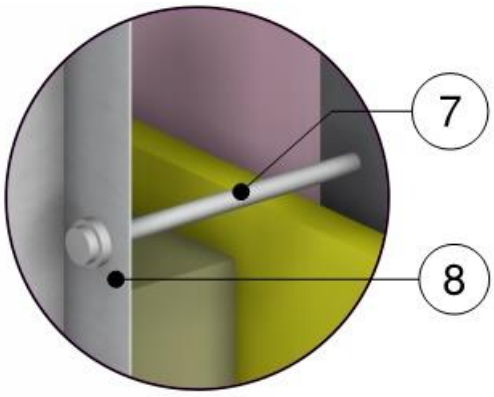
	R4	R12	R16	
T_{i1}	0.26	0.40	0.45	Min T on sheathing, at fastener along studs
T_{i2}	0.20	0.41	0.48	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.34

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Plus 110 Exterior Insulation and R-24 Batt Insulation in Stud Cavity – Clear Wall





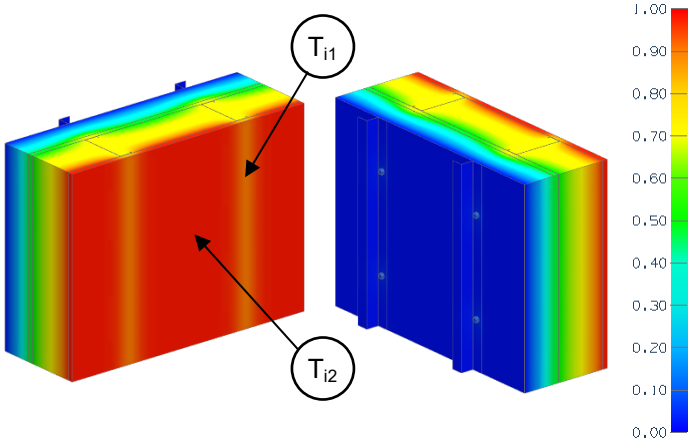
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.25 (0.036)	R-24 (4.23 RSI)	1.42 (22.7)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Plus 110 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.035)	R-4.1 to R-16.4 (0.72 to 2.89 RSI)	8 (128)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.34

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Plus 110 Exterior Insulation and R-24 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-26.4 (4.67 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.1 (0.72)	R-30.6 (5.39)	R-16.5 (2.91)	0.060 (0.344)
R-8.2 (1.44)	R-34.7 (6.11)	R-19.6 (3.46)	0.051 (0.289)
R-12.3 (2.17)	R-38.8 (6.83)	R-22.7 (4.01)	0.044 (0.250)
R-16.4 (2.89)	R-42.9 (7.55)	R-25.6 (4.51)	0.039 (0.222)

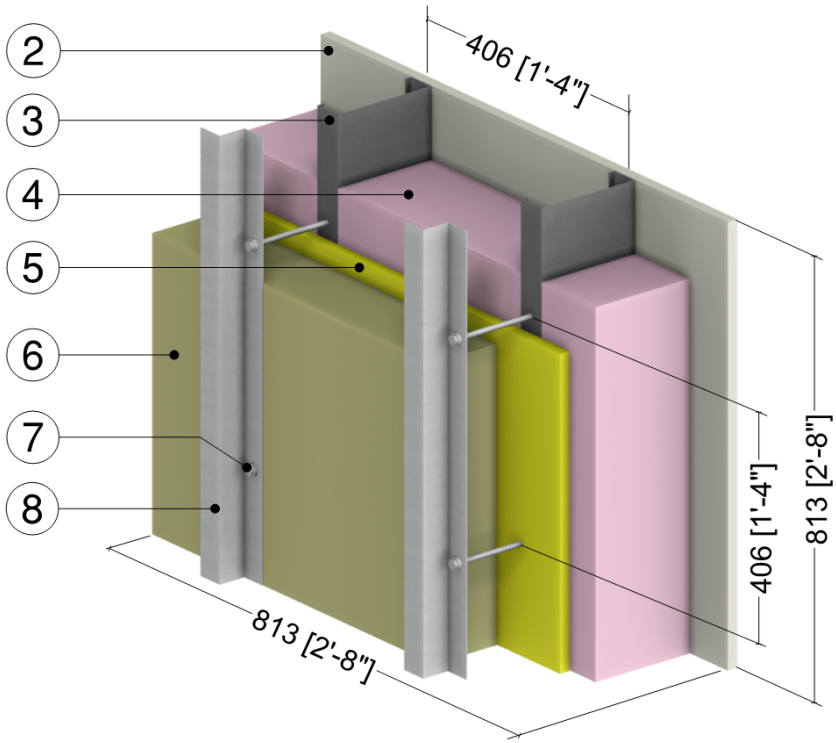
Temperature Indices

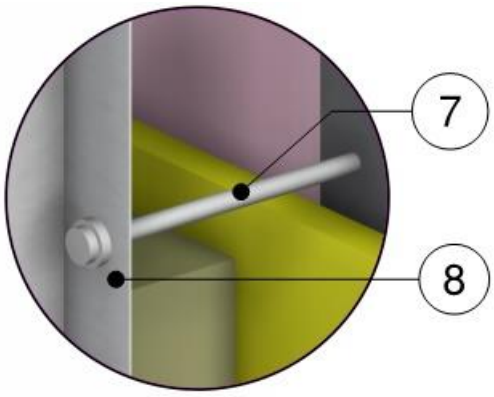
	R4.1	R12.3	R16.4	
T_{i1}	0.27	0.40	0.45	Min T on sheathing, at fastener along studs
T_{i2}	0.20	0.42	0.48	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.35

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation and R-24 Batt Insulation in Stud Cavity – Clear Wall





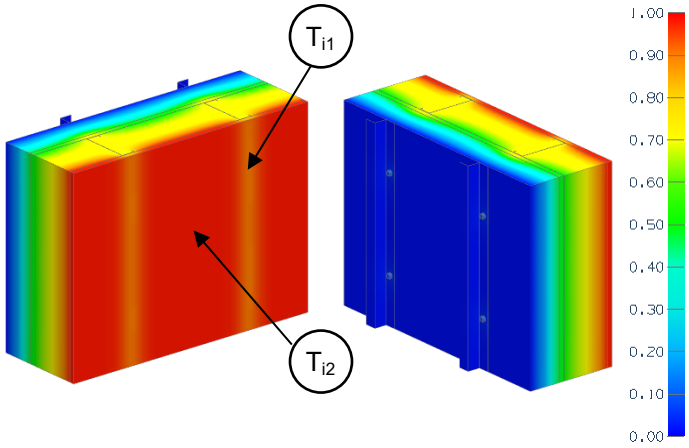
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.25 (0.036)	R-24 (4.23 RSI)	1.42 (22.7)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC 80 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-16.8 (0.74 to 2.96 RSI)	4.5 (72)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.35

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation and R-24 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-26.4 (4.67 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-30.7 (5.41)	R-16.6 (2.93)	0.060 (0.342)
R-8.4 (1.48)	R-34.9 (6.15)	R-19.8 (3.48)	0.051 (0.287)
R-12.6 (2.22)	R-39.1 (6.89)	R-22.9 (4.04)	0.044 (0.248)
R-16.8 (2.96)	R-43.3 (7.63)	R-25.9 (4.56)	0.039 (0.219)

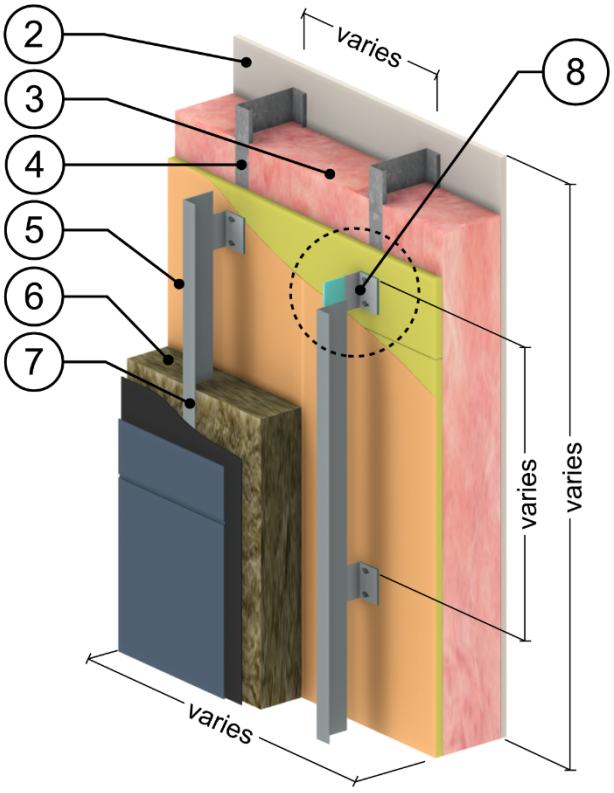
Temperature Indices

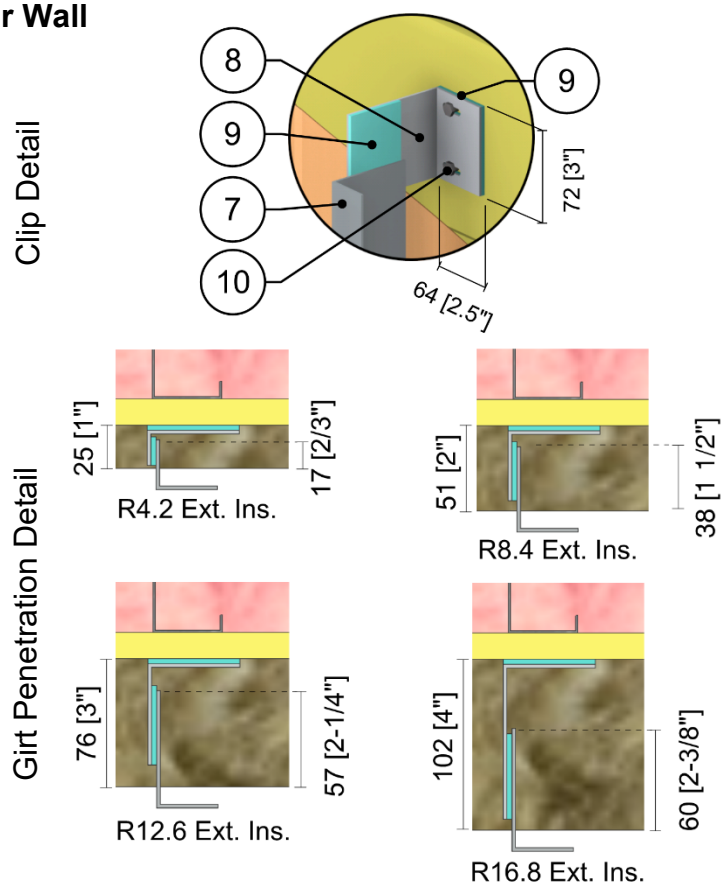
	R4.2	R12.6	R16.8	
T_{i1}	0.27	0.40	0.45	Min T on sheathing, at fastener along studs
T_{i2}	0.21	0.42	0.49	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.54

Exterior and Interior Insulated 6″ x 1 5/8″ Steel Stud (16″ o.c. and 24″ o.c.) Wall Assembly with Vertical Clips (24″ o.c. and 36″ o.c.) Supporting Cladding and Owens Corning R-20 Batt Insulation in Stud Cavity – Clear Wall



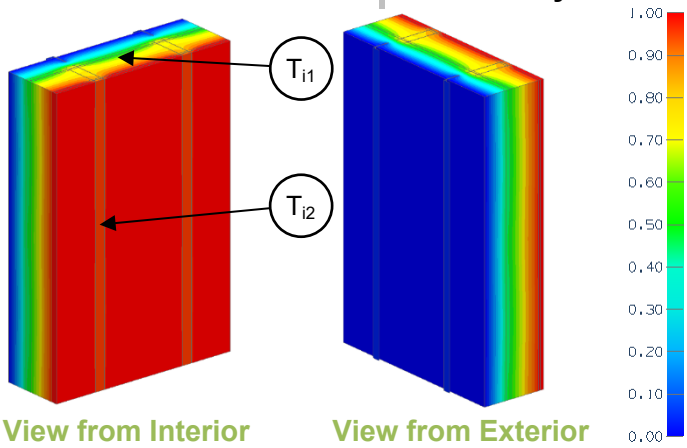


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6” (152)	0.30 (0.043)	R-20 (3.5 RSI)	0.55 (8.8)	0.17 (710)
4	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-16.8 (0.75 to 3.0 RSI)	4.5 (72)	0.20 (850)
7	Vertical Aluminum L-girt	0.09” (2.2)	1340 (193)	-	169 (2700)	0.22 (900)
8	Aluminum Clip	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	HDPE Isolator	1/8” (3)	3.5 (0.5)	-	59 (950)	0.48 (2000)
10	#14 Stainless Steel Fasteners	1/4" (6) Ø	118 (17)	-	500 (8000)	0.12 (500)
11	Cladding with 1/2" vented airspace incorporated into exterior heat transfer coefficient					
12	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.54

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c. and 24" o.c.) Wall Assembly with Vertical Clips (24" o.c. and 36" o.c.) Supporting Cladding and Owens Corning R-20 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.4 (3.94) + insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear field" U- and R-value, without connectors or joint
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature

Nominal (1D) vs. Assembly Performance Indicators

16" o.c. Studs

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	24" Vertical Clip Spacing		36" Vertical Clip Spacing	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-26.6 (4.68)	R-15.7 (2.77)	0.064 (0.36)	R-15.9 (2.80)	0.063 (0.36)
R-8.4 (1.48)	R-30.8 (5.42)	R-18.3 (3.22)	0.055 (0.31)	R-18.7 (3.30)	0.053 (0.30)
R-12.6 (2.22)	R-35.0 (6.16)	R-20.4 (3.59)	0.049 (0.28)	R-21.0 (3.69)	0.048 (0.27)
R-16.8 (2.96)	R-39.2 (6.90)	R-22.9 (4.03)	0.044 (0.25)	R-24.0 (4.23)	0.042 (0.24)

24" o.c. Studs

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	24" Vertical Clip Spacing		36" Vertical Clip Spacing	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-26.6 (4.68)	R-18.2 (3.20)	0.055 (0.31)	R-18.3 (3.23)	0.055 (0.31)
R-8.4 (1.48)	R-30.8 (5.42)	R-21.1 (3.72)	0.047 (0.27)	R-21.5 (3.78)	0.047 (0.26)
R-12.6 (2.22)	R-35.0 (6.16)	R-23.6 (4.16)	0.042 (0.24)	R-24.3 (4.27)	0.041 (0.23)
R-16.8 (2.96)	R-39.2 (6.90)	R-26.5 (4.68)	0.038 (0.21)	R-27.6 (4.86)	0.036 (0.21)

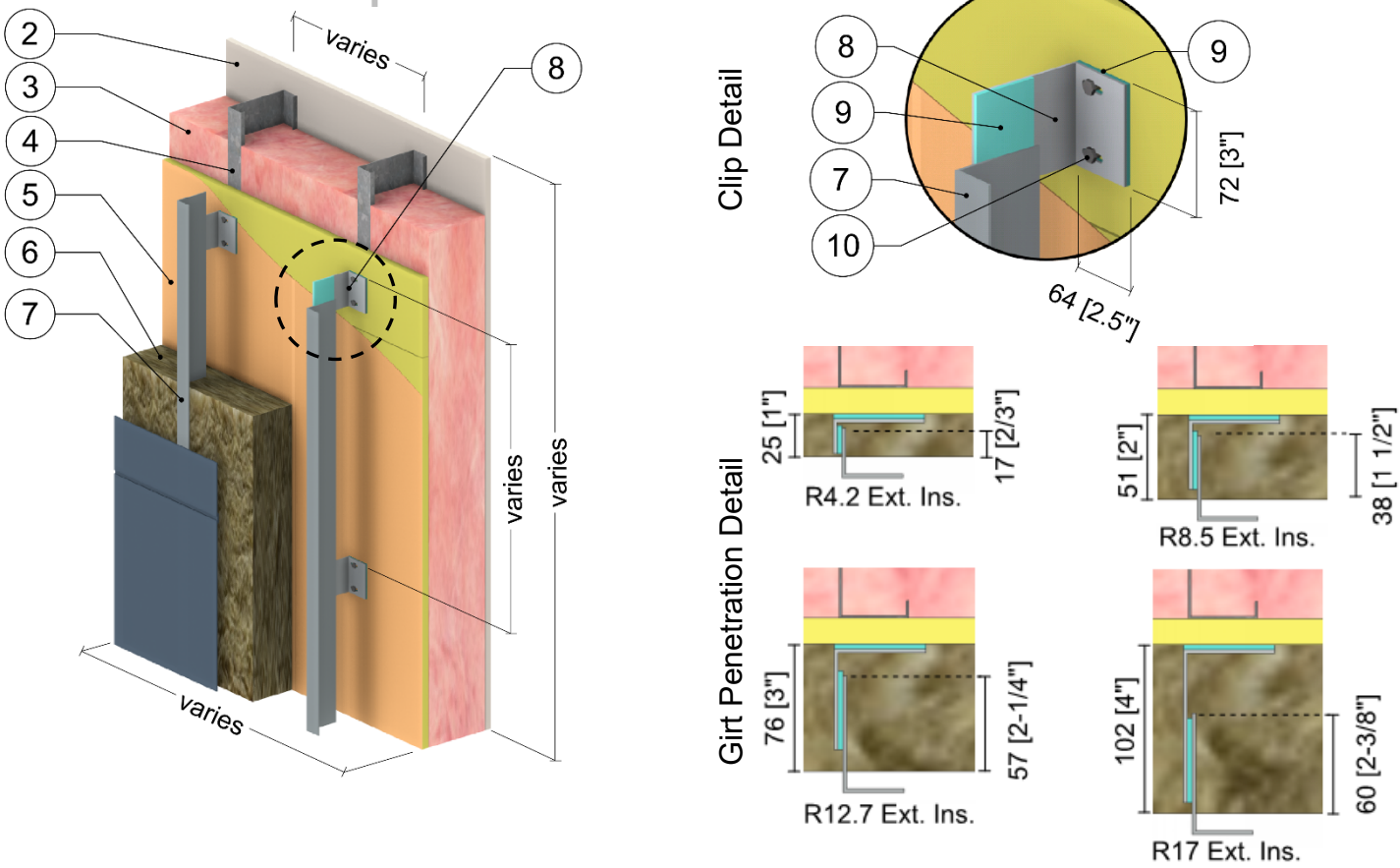
Temperature Indices

	R4.2	R8.4	R12.6	R16.8	
T_{i1}	0.23	0.35	0.43	0.47	Min T on sheathing, between studs
T_{i2}	0.53	0.60	0.65	0.69	Max T on sheathing, at stud, between clips

Temperature indices taken from scenario with 16" o.c. studs with 24" vertical clip spacing. All other scenarios have higher minimum temperature index.

Detail 5.1.55

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c. and 24" o.c.) Wall Assembly with Vertical Clips (24" o.c. and 36" o.c.) Supporting Cladding and Owens Corning R-22.5 Batt Insulation in Stud Cavity– Clear Wall

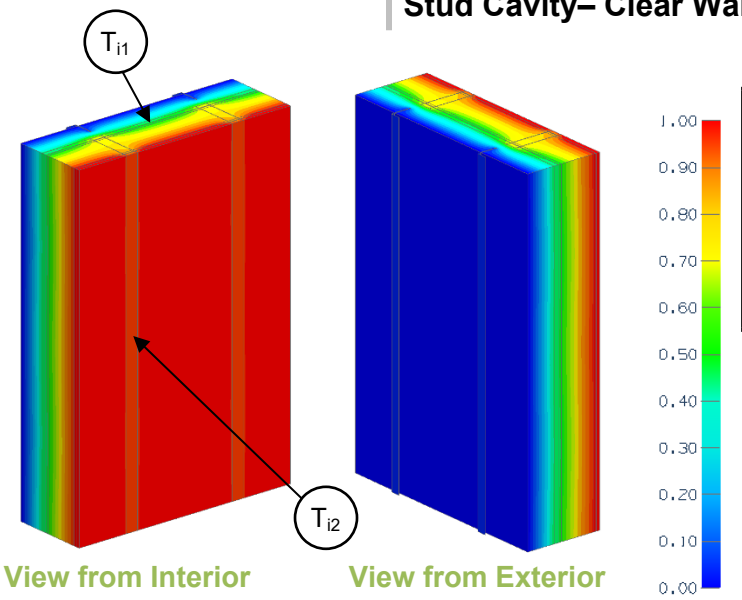


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.09 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6" (152)	0.26 (0.038)	R-22.5 (4.0 RSI)	0.99 (15.9)	0.17 (710)
4	6" x 1 5/8" Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-16.8 (0.75 to 2.96 RSI)	4.5 (72)	0.20 (850)
7	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.21 (900)
8	Aluminum Clip	0.09" (2.2)	1110 (160)	-	171 (2739)	0.21 (900)
9	HDPE Isolator	1/8" (3)	3.5 (0.5)	-	59 (950)	0.48 (2000)
10	Stainless Steel Fastener	1/4" (6) Ø	118 (17)	-	500 (8000)	0.12 (500)
11	Cladding with 1/2" vented airspace incorporated into exterior heat transfer coefficient					
12	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.55

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c. and 24" o.c.) Wall Assembly with Vertical Clips (24" O.C. and 36" o.c.) Supporting Cladding and Owens Corning R-22.5 Batt Insulation in Stud Cavity– Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.9 (4.39 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	"clear wall" U- and R-value
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

16" o.c. Studs

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	24" Vertical Clip Spacing		36" Vertical Clip Spacing	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-29.1 (5.13)	R-16.3 (2.86)	0.062 (0.35)	R-16.4 (2.9)	0.061 (0.35)
R-8.4 (1.48)	R-33.3 (5.86)	R-18.8 (3.32)	0.053 (0.30)	R-19.3 (3.39)	0.052 (0.29)
R-12.6 (2.22)	R-37.5 (6.60)	R-20.9 (3.68)	0.048 (0.27)	R-21.6 (3.81)	0.046 (0.26)
R-16.8 (2.96)	R-41.7 (7.34)	R-23.4 (4.12)	0.043 (0.24)	R-24.7 (4.34)	0.041 (0.23)

24" o.c. Studs

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	24" Vertical Clip Spacing		36" Vertical Clip Spacing	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-29.1 (5.13)	R-18.9 (3.34)	0.053 (0.30)	R-19.1 (3.37)	0.052 (0.30)
R-8.4 (1.48)	R-33.3 (5.86)	R-21.9 (3.85)	0.046 (0.26)	R-22.3 (3.92)	0.045 (0.25)
R-12.6 (2.22)	R-37.5 (6.60)	R-24.4 (4.29)	0.041 (0.23)	R-25 (4.41)	0.040 (0.23)
R-16.8 (2.96)	R-41.7 (7.34)	R-27.3 (4.81)	0.037 (0.21)	R-28.4 (5.0)	0.035 (0.20)

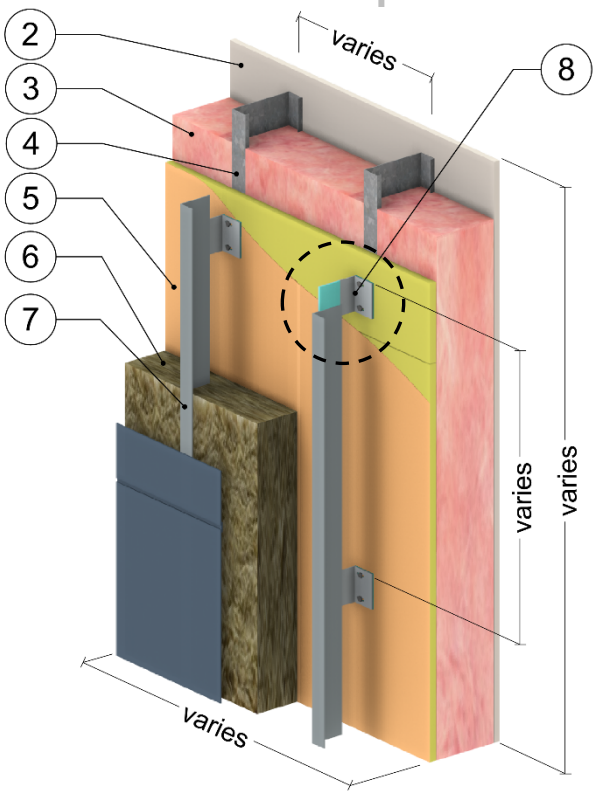
Temperature Indices

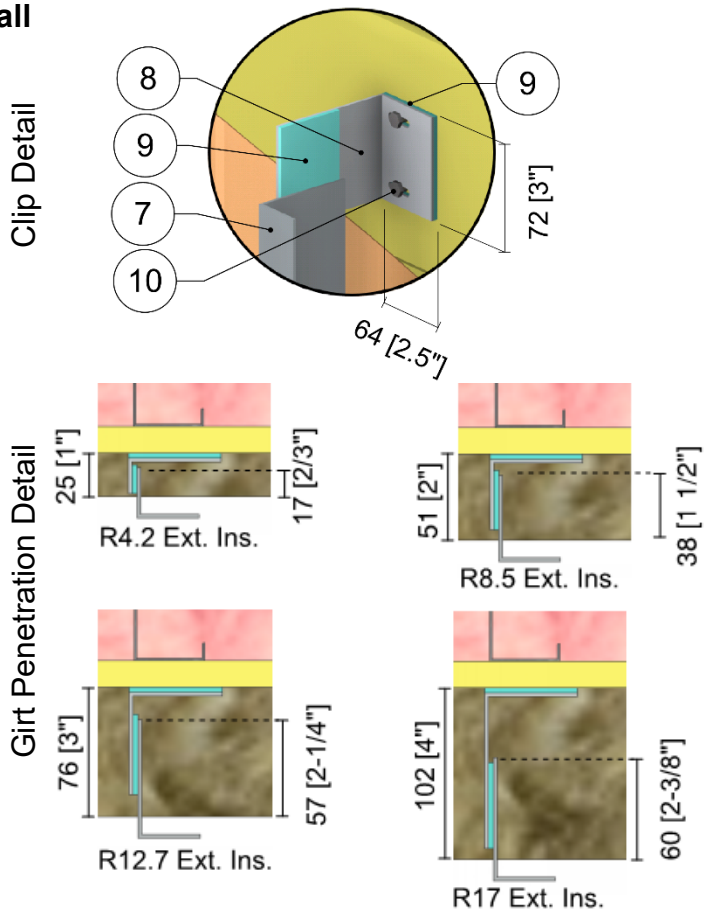
	R4.2	R8.4	R12.6	R16.8	
T_{i1}	0.20	0.32	0.40	0.45	Min T on sheathing, between studs
T_{i2}	0.53	0.60	0.65	0.70	Max T on sheathing, at stud, between clips

Temperature indices taken from scenario with 24" o.c. studs with 36" vertical clip spacing. All other scenarios have higher minimum temperature index.

Detail 5.1.56

Exterior and Interior Insulated 6″ x 1/58” Steel Stud (16″ o.c. and 24” o.c.) Wall Assembly with Vertical Clips (24″ o.c. and 36” o.c.) Supporting Cladding and Owens Corning R-24 Batt Insulation in Stud Cavity– Clear Wall



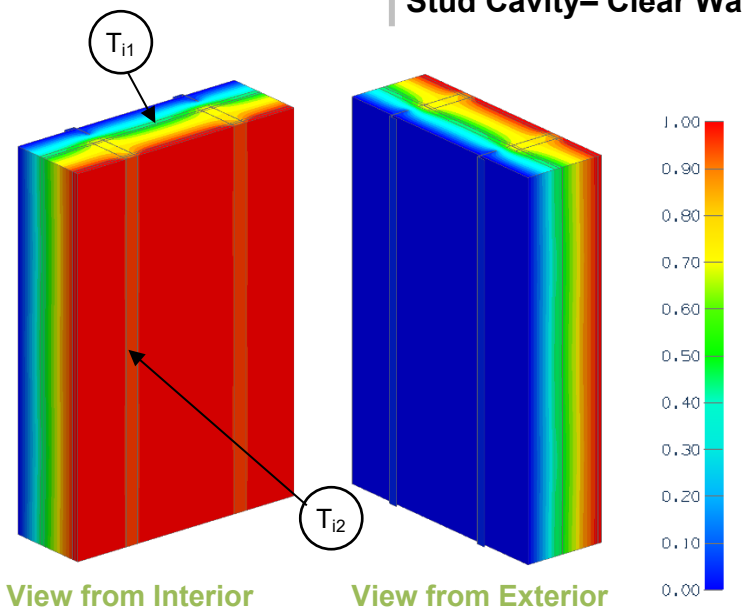


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.09 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6” (152)	0.25 (0.036)	R-24 (4.2 RSI)	1.42 (22.7)	0.17 (710)
4	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulating Sheathing	Varies	0.24 (0.034)	R-4.2 (0.75) to R-16.8 (2.96 RSI)	4.5 (72)	0.20 (850)
7	Vertical Aluminum L-girt	0.09” (2.2)	1110 (160)	-	171 (2739)	0.21 (900)
8	Aluminum Clip	0.09” (2.2)	1110 (160)	-	171 (2739)	0.21 (900)
9	HDPE Isolator	1/8” (3)	3.5 (0.5)	-	59 (950)	0.48 (2000)
10	#14 Stainless Steel Fasteners	1/4" (6) Ø	118 (17)	-	500 (8000)	0.12 (500)
11	Cladding with 1/2" vented airspace incorporated into exterior heat transfer coefficient					
12	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.56

Exterior and Interior Insulated 6" x 1 5/8"Steel Stud (16" o.c. and 24" o.c.) Wall Assembly with Vertical Clips (24" O.C. and 36" o.c.) Supporting Cladding and Owens Corning R-24 Batt Insulation in Stud Cavity– Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-26.4 (4.65 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	"clear wall" U- and R-value
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

16" o.c. Studs

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	24" Vertical Clip Spacing		36" Vertical Clip Spacing	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-30.6 (5.39)	R-16.8 (2.95)	0.060 (0.34)	R-16.9 (2.98)	0.059 (0.34)
R-8.4 (1.48)	R-34.8 (6.13)	R-19.3 (3.40)	0.052 (0.29)	R-19.8 (3.48)	0.051 (0.29)
R-12.6 (2.22)	R-39.0 (6.87)	R-21.3 (3.76)	0.047 (0.27)	R-22.1 (3.89)	0.045 (0.26)
R-16.8 (2.96)	R-43.2 (7.61)	R-23.9 (4.21)	0.042 (0.24)	R-25.1 (4.43)	0.040 (0.23)

24" o.c. Studs

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	24" Vertical Clip Spacing		36" Vertical Clip Spacing	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-30.6 (5.39)	R-19.7 (3.47)	0.051 (0.29)	R-19.8 (3.50)	0.050 (0.29)
R-8.4 (1.48)	R-34.8 (6.13)	R-22.6 (3.98)	0.044 (0.25)	R-23.0 (4.05)	0.043 (0.25)
R-12.6 (2.22)	R-39.0 (6.87)	R-25.1 (4.42)	0.040 (0.23)	R-25.7 (4.53)	0.039 (0.22)
R-16.8 (2.96)	R-43.2 (7.61)	R-28.0 (4.93)	0.036 (0.20)	R-29.1 (5.12)	0.034 (0.20)

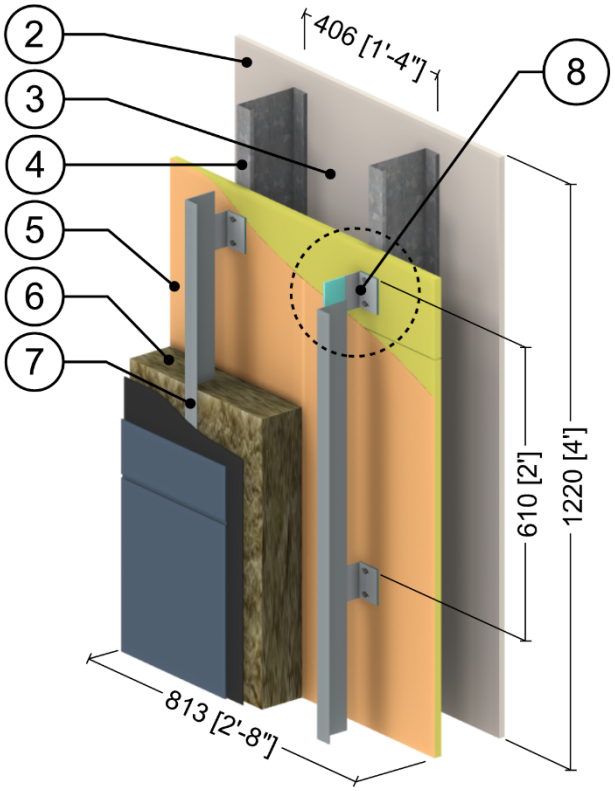
Temperature Indices

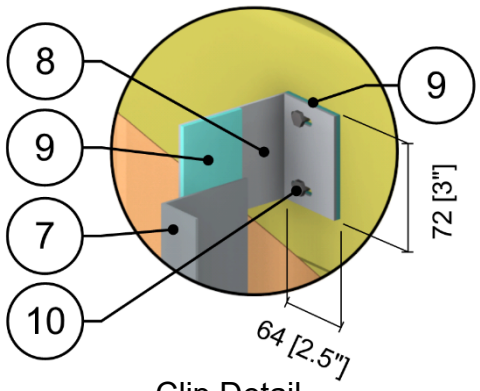
	R4.2	R8.4	R12.6	R16.8	
T_{i1}	0.19	0.30	0.38	0.44	Min T on sheathing, between studs
T_{i2}	0.53	0.56	0.64	0.69	Max T on sheathing, at stud, between clips

Temperature indices taken from scenario with 24" o.c. studs with 36" vertical clip spacing. All other scenarios have higher minimum temperature index.

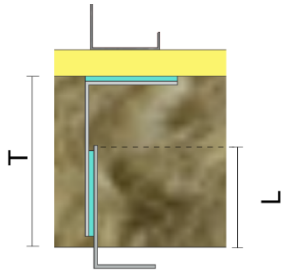
Detail 5.1.58

Owens Corning Exterior Insulated 6″ x 1 5/8” Steel Stud (16″ o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24″ o.c.) Supporting Metal Cladding – Clear Wall





Clip Detail



T	L
2”	1.5”
5”	2-3/8”

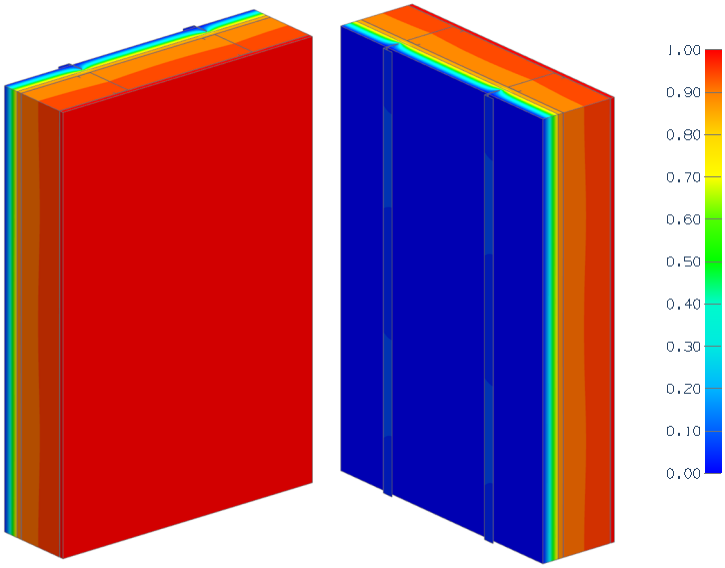
Girt Penetration Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.09 RSI)	50 (800)	0.26 (1090)
3	Air in Stud Cavity	6” (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
4	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-8.4 to R-21.0 (1.11 to 3.70 RSI)	4.5 (72)	0.20 (850)
7	Vertical Aluminum L-girt	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
8	Aluminum Bracket	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	HDPE Isolator	1/8” (3)	3.5 (0.5)	-	59 (950)	0.48 (2000)
10	#14 Stainless Steel Fastener	1/4" (6) Ø	118 (17)	-	500 (8000)	0.12 (500)
11	Cladding with 1/2" vented airspace incorporated into exterior heat transfer coefficient					
12	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.58

Owens Corning Exterior Insulated 6″ x 1 5/8″ Steel Stud (16″ o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24″ o.c.) Supporting Metal Cladding – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.3 (0.58 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

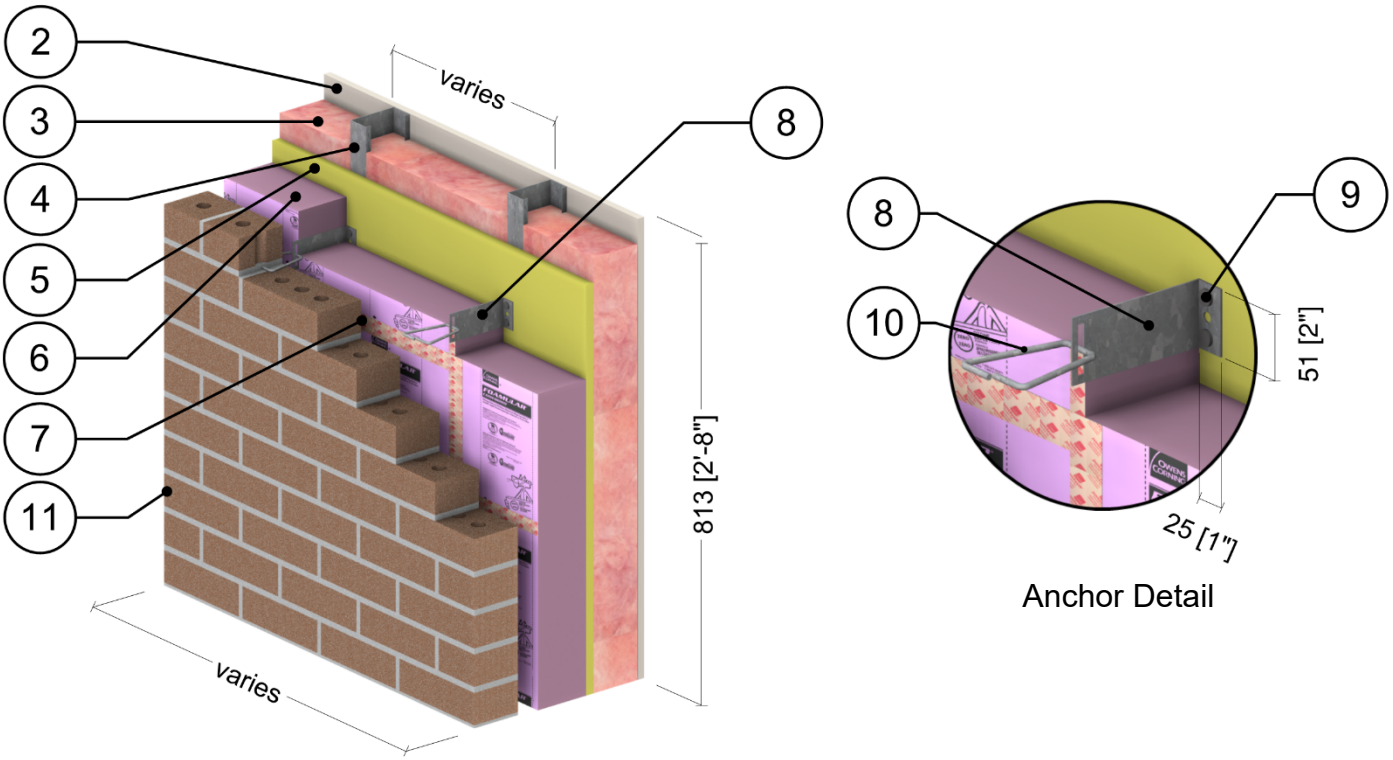
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-11.7 (2.06)	R-10.0 (1.77)	0.100 (0.57)
R-21.0 (3.70)	R-24.3 (4.28)	R-17.6 (3.10)	0.057 (0.32)

Detail 5.1.60

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c. and 24" o.c.) Wall Assembly with Steel Brick Anchors Supporting Brick Veneer and Owens Corning R-20 Batt Insulation in Stud Cavity – Clear Wall

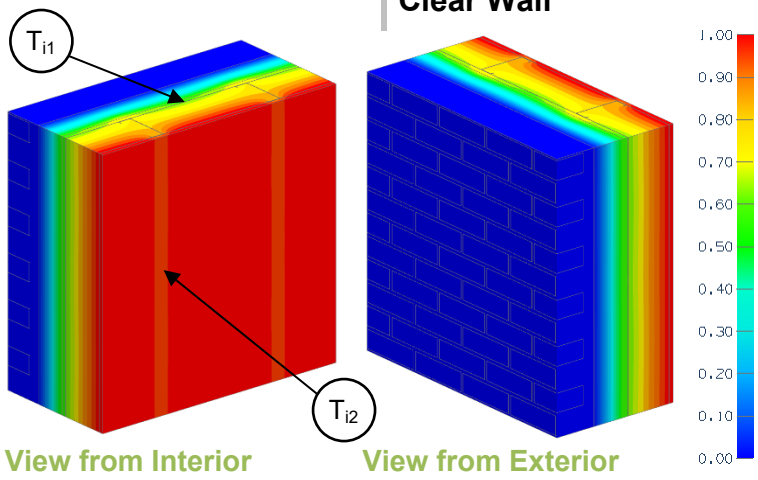


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6" (152)	0.30 (0.043)	R-20 (3.5 RSI)	0.55 (8.8)	0.17 (710)
4	6" x 1 5/8" Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Foamular CodeBord/C-200 Extruded Polystyrene Rigid Insulation (XPS) Type 3	Varies	0.20 (0.029)	R-5 to R-15 (0.88 to 2.64 RSI)	Varies	0.29 (1220)
7	Vented Air Cavity	1 1/2" (38)	-	R-0.4 (0.07 RSI)	0.075 (1.2)	0.24 (1000)
8	Galvanized Steel Veneer Anchor	Varies	430 (62)	-	489 (7830)	0.12 (500)
9	Galvanized Steel Fasteners	0.28" (7) Ø	430 (62)	-	489 (7830)	0.12 (500)
10	Galvanized Steel Wire Pintle	-	430 (62)	-	489 (7830)	0.12 (500)
11	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
12	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.60

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c. and 24" o.c.) Wall Assembly with Steel Brick Anchors Supporting Brick Veneer and Owens Corning R-20 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-23.4 (4.12 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	"clear wall" U- and R-value
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	16" o.c.		24" o.c.	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-5.0 (0.88)	R-28.4 (5.01)	R-16.5 (2.91)	0.061 (0.34)	R-19.2 (3.38)	0.052 (0.30)
R-7.5 (1.32)	R-30.9 (5.45)	R-18.4 (3.23)	0.054 (0.31)	R-21.2 (3.74)	0.047 (0.27)
R-10.0 (1.76)	R-33.4 (5.89)	R-20.1 (3.54)	0.050 (0.28)	R-23.2 (4.09)	0.043 (0.25)
R-15.0 (2.64)	R-38.4 (6.77)	R-23.3 (4.10)	0.043 (0.24)	R-27.0 (4.75)	0.037 (0.21)

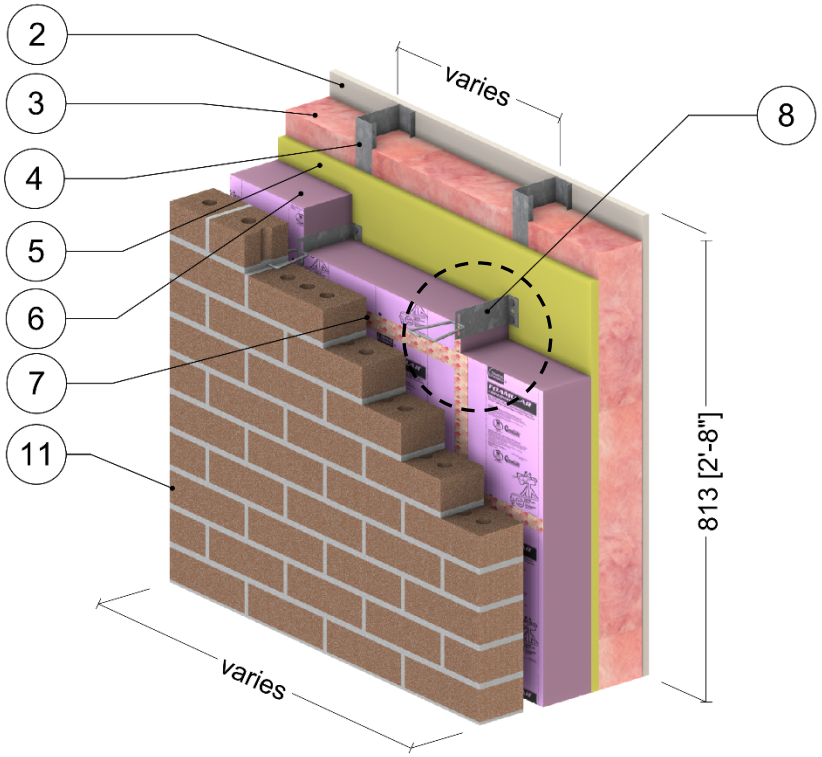
Temperature Indices

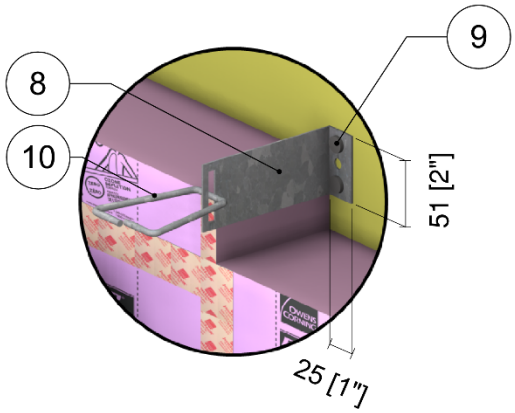
	R5	R7.5	R10	R15	
T_{i1}	0.29	0.36	0.42	0.51	Min T on sheathing, between studs
T_{i2}	0.56	0.61	0.64	0.69	Max T on sheathing, along studs

Temperature indices taken from scenario with 16" o.c. studs. All other scenarios have higher minimum temperature index.

Detail 5.1.61

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c. and 24” o.c.) Wall Assembly with Steel Brick Anchors Supporting Brick Veneer and Owens Corning R-22.5 Batt Insulation in Stud Cavity – Clear Wall





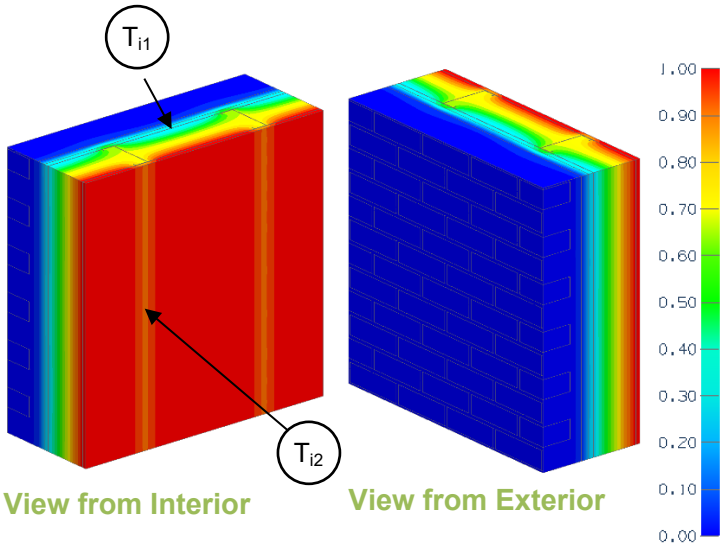
Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.09 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6” (152)	0.26 (0.038)	R-22.5 (4.0 RSI)	0.99 (15.9)	0.17 (710)
4	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Foamular CodeBord/C-200 Extruded Polystyrene Rigid Insulation (XPS) Type 3	Varies	0.20 (0.029)	R-5 to R-15 (0.88 to 2.64 RSI)	Varies	0.29 (1220)
7	Vented Air Cavity	1 1/2" (38)	-	R-0.4 (0.07 RSI)	0.075 (1.2)	0.24 (1000)
8	Galvanized Steel Veneer Anchor	Varies	430 (62)	-	489 (7830)	0.12 (500)
9	Galvanized Steel Fasteners	0.28” (7) Ø	430 (62)	-	489 (7830)	0.12 (500)
10	Galvanized Steel Wire Pintle	-	430 (62)	-	489 (7830)	0.12 (500)
11	Brick Veneer	3 5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
12	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.61

Exterior and Interior Insulation 6” x 1 5/8” Steel Stud (16” o.c. and 24” o.c.) Wall Assembly with Brick Ties Supporting Brick Veneer and Owens Corning R-22.5 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.4 (4.30 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Carbon Steel Anchor, Bolts, and Brick Ties

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	16” o.c.		24” o.c.	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-5 (0.88)	R-29.4 (5.18)	R-17.5 (3.09)	0.057 (0.32)	R-20.3 (3.58)	0.049 (0.28)
R-7.5 (1.32)	R-31.9 (5.62)	R-19.9 (3.51)	0.050 (0.28)	R-22.8 (4.02)	0.044 (0.25)
R-10 (1.76)	R-34.4 (6.06)	R-22.3 (3.93)	0.045 (0.25)	R-25.2 (4.44)	0.040 (0.23)
R-15 (2.64)	R-39.4 (6.94)	R-26.8 (4.72)	0.037 (0.21)	R-30.0 (5.29)	0.033 (0.19)

Stainless Steel Anchor, Bolts, and Brick Ties

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	16” o.c.		24” o.c.	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-5 (0.88)	R-29.4 (5.18)	R-17.6 (3.1)	0.057 (0.32)	R-20.3 (3.58)	0.049 (0.28)
R-7.5 (1.32)	R-31.9 (5.62)	R-20.0 (3.52)	0.050 (0.28)	R-22.8 (4.02)	0.044 (0.25)
R-10 (1.76)	R-34.4 (6.06)	R-22.4 (3.94)	0.045 (0.25)	R-25.3 (4.46)	0.040 (0.22)
R-15 (2.64)	R-39.4 (6.94)	R-27.0 (4.75)	0.037 (0.21)	R-30.1 (5.29)	0.033 (0.19)

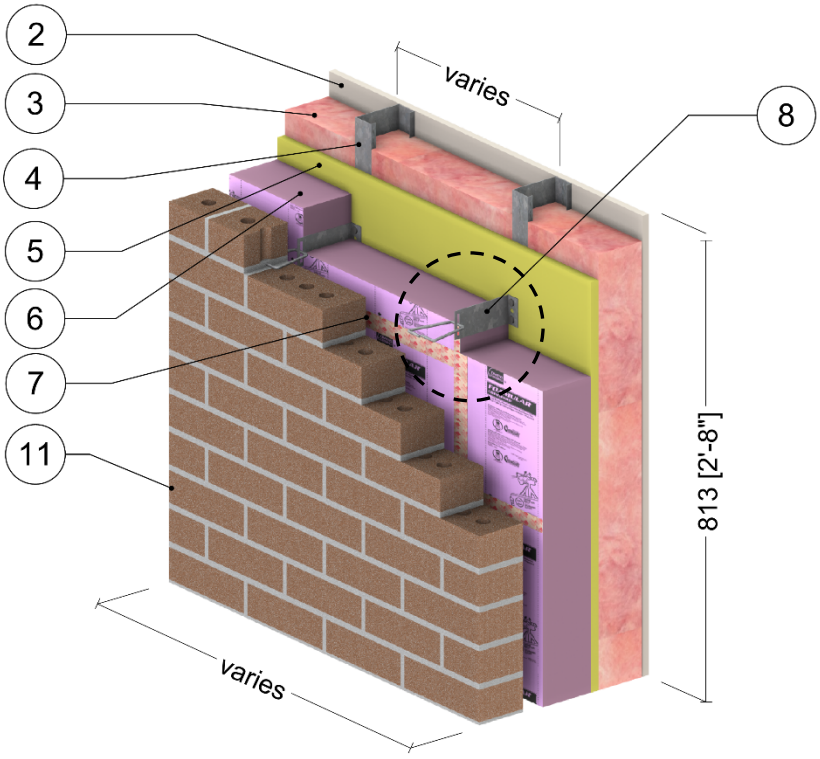
Temperature Indices

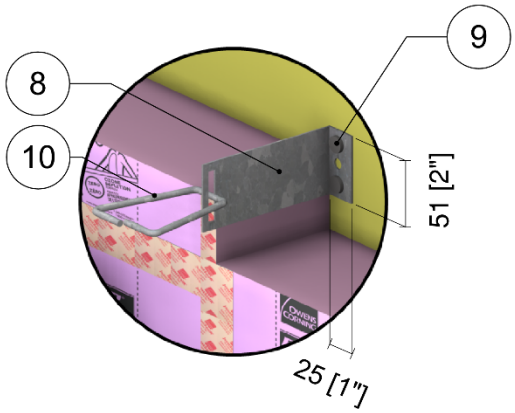
	R5	R7.5	R10	R15	
T_{i1}	0.26	0.33	0.39	0.48	Min T on sheathing, between studs
T_{i2}	0.57	0.64	0.67	0.72	Max T on sheathing, along studs

Temperature indices taken from scenario with 24” o.c. studs. All other scenarios have higher minimum temperature index.

Detail 5.1.62

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c. and 24” o.c.) Wall Assembly with Steel Brick Anchors Supporting Brick Veneer and Owens Corning R-24 Batt Insulation in Stud Cavity – Clear Wall





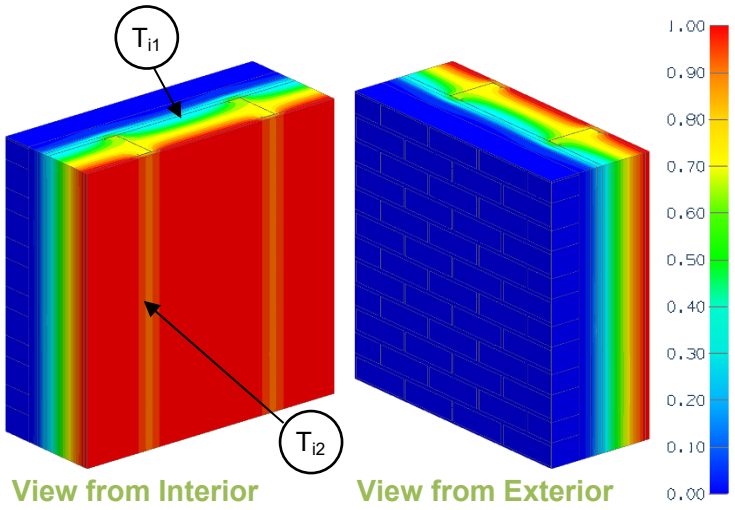
Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.09 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6” (152)	0.25 (0.036)	R-24 (4.2 RSI)	1.42 (22.7)	0.17 (710)
4	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Foamular CodeBord/C-200 Extruded Polystyrene Rigid Insulation (XPS) Type 3	Varies	0.20 (0.029)	R-5 to R-15 (0.88 to 2.64 RSI)	Varies	0.29 (1220)
7	Vented Air Cavity	1 1/2" (38)	-	R-0.4 (0.07 RSI)	0.075 (1.2)	0.24 (1000)
8	Galvanized Steel Veneer Anchor	Varies	430 (62)	-	489 (7830)	0.12 (500)
9	Galvanized Steel Fasteners	0.28" (7) Ø	430 (62)	-	489 (7830)	0.12 (500)
10	Galvanized Steel Wire Pintle	-	430 (62)	-	489 (7830)	0.12 (500)
11	Brick Veneer	3 5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
12	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.62

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c. and 24” o.c.) Wall Assembly with Brick Ties Supporting Brick Veneer and Owens Corning R-24 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R Value	R_{1D}	R-26.4 (4.65 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Carbon Steel Anchor, Bolts, and Brick Ties

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	16” o.c.		24” o.c.	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-5 (0.88)	R-31.4 (5.53)	R-18.0 (3.17)	0.056 (0.32)	R-21.0 (3.70)	0.048 (0.27)
R-7.5 (1.32)	R-33.9 (5.97)	R-20.4 (3.59)	0.049 (0.28)	R-23.5 (4.15)	0.042 (0.24)
R-10 (1.76)	R-36.4 (6.41)	R-22.8 (4.01)	0.044 (0.25)	R-25.9 (4.57)	0.039 (0.22)
R-15 (2.64)	R-41.4 (7.29)	R-27.2 (4.78)	0.037 (0.21)	R-30.6 (5.40)	0.033 (0.19)

Stainless Steel Anchor, Bolts, and Brick Ties

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	16” o.c.		24” o.c.	
		R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-5 (0.88)	R-31.4 (5.53)	R-18.0 (3.17)	0.056 (0.32)	R-21.0 (3.70)	0.048 (0.27)
R-7.5 (1.32)	R-33.9 (5.97)	R-20.4 (3.6)	0.049 (0.28)	R-23.6 (4.15)	0.042 (0.24)
R-10 (1.76)	R-36.4 (6.41)	R-22.8 (4.02)	0.044 (0.25)	R-26.1 (4.59)	0.038 (0.22)
R-15 (2.64)	R-41.4 (7.29)	R-27.2 (4.78)	0.037 (0.21)	R-30.7 (5.41)	0.033 (0.18)

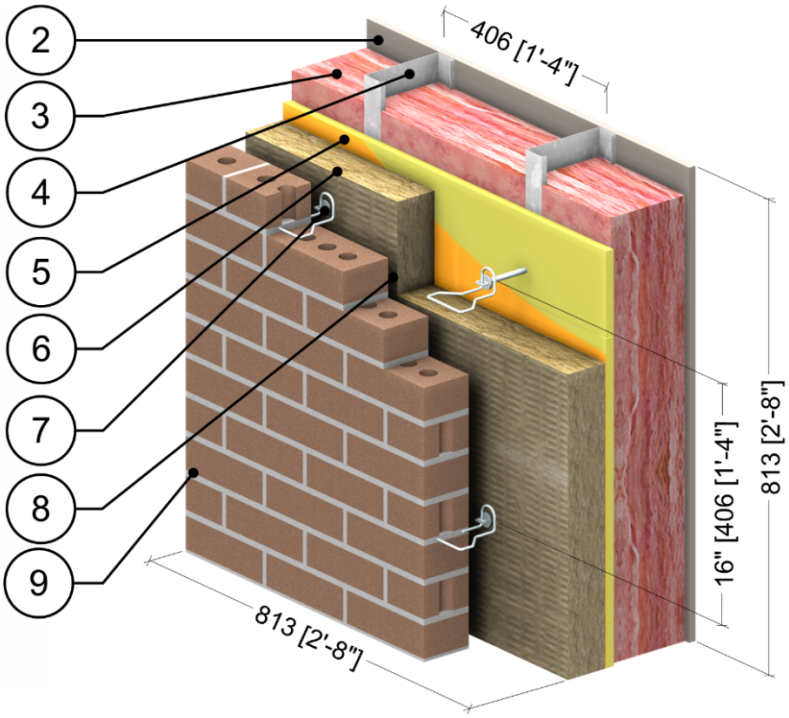
Temperature Indices

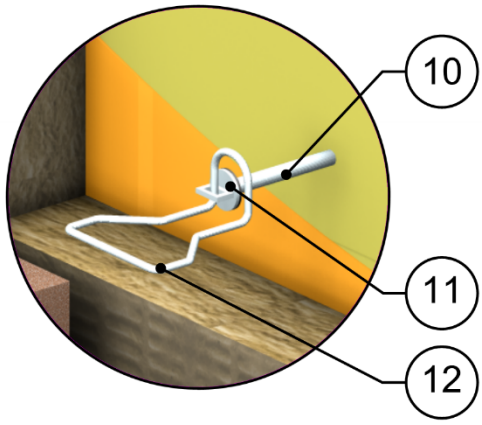
	R5	R7.5	R10	R15	
T_{i1}	0.25	0.32	0.37	0.47	Min T on sheathing, between studs
T_{i2}	0.57	0.63	0.67	0.72	Max T on sheathing, along studs

Temperature indices taken from scenario with 24” o.c. studs. All other scenarios have higher minimum temperature index.

Detail 5.1.63

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-20 Batt Insulation in Stud Cavity – Clear Wall





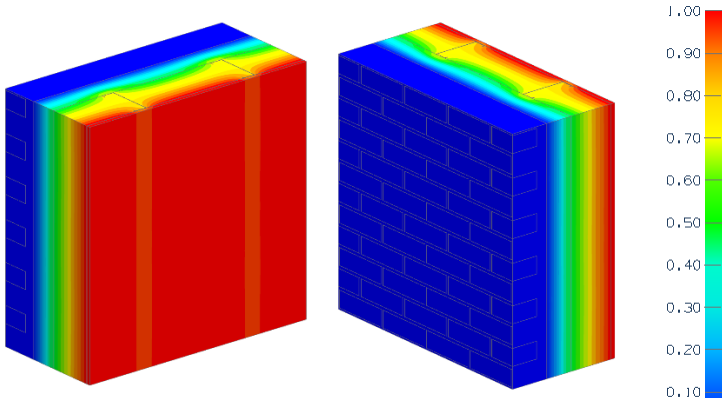
Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6” (152)	0.30 (0.043)	R-20 (3.5 RSI)	0.55 (8.8)	0.17 (710)
4	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-6.3 to R-21.0 (1.11 to 3.70 RSI)	4.5 (72)	0.29 (1220)
7	Heckmann Pos-I-Tie Masonry Tie 16” (406) o.c.	Varies	-	-	-	-
8	Vented Air Cavity[2]	1.5” (38)	-	R-0.4 (0.07 RSI)	0.075 (1.2)	0.24 (1000)
9	Brick Veneer	3 5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
10	Zinc Barrel	-	726 (105)	-	412 (6600)	-
11	Rubber Washer (EPDM)	1/16” (1.59)	1.7 (0.25)	-	62 (997)	-
12	Galvanized Steel Wire Pintle	3/16” (5) Ø	645 (93)	-	489 (7830)	0.12 (500)
13	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.1.63

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-20 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-23.4 (4.12 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

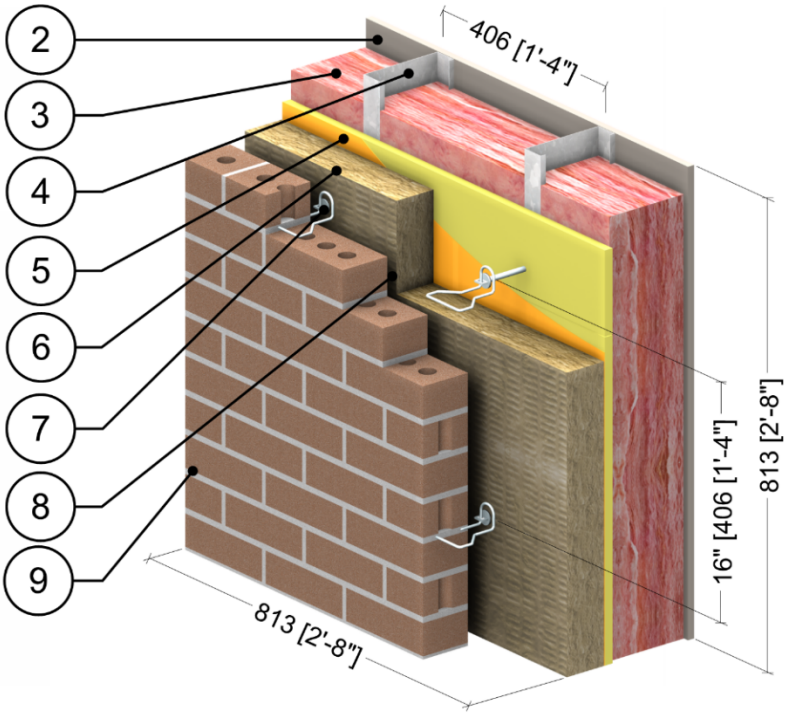
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

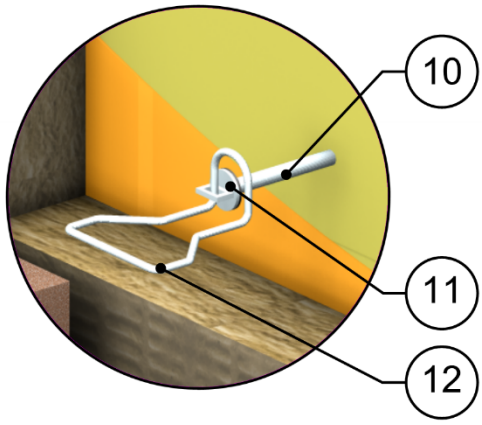
Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	R_o $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 $\cdot hr \cdot {}^oF$ (W/m^2 K)
R-6.3 (1.11)	R-29.7 (5.23)	R-17.1 (3.02)	0.058 (0.33)
R-8.4 (1.48)	R-31.8 (5.60)	R-18.6 (3.28)	0.054 (0.31)
R-12.6 (2.22)	R-36.0 (6.34)	R-21.3 (3.75)	0.047 (0.27)
R-16.8 (2.96)	R-40.2 (7.08)	R-23.7 (4.17)	0.042 (0.24)
R-21.0 (3.70)	R-44.4 (7.82)	R-26.3 (4.62)	0.038 (0.22)

Detail 5.1.64

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-22.5 Batt Insulation in Stud Cavity – Clear Wall





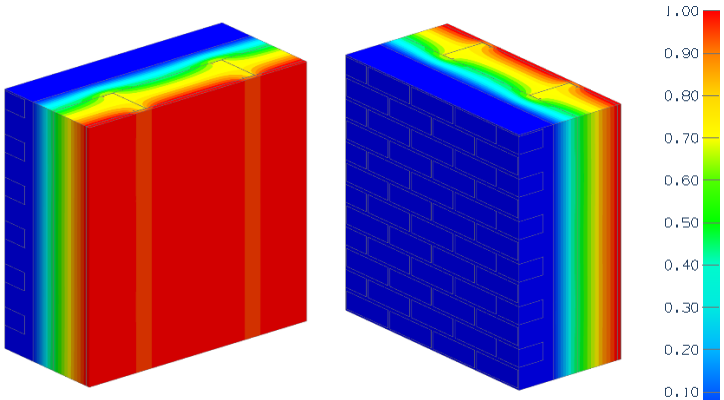
Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6” (152)	0.26 (0.038)	R-22.5 (4.0 RSI)	0.99 (15.9)	0.17 (710)
4	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-6.3 to R-21.0 (1.11 to 3.70 RSI)	4.5 (72)	0.29 (1220)
7	Heckmann Pos-I-Tie Masonry Tie 16” (406) o.c.	Varies	-	-	-	-
8	Vented Air Cavity[2]	1.5” (38)	-	R-0.4 (0.07 RSI)	0.075 (1.2)	0.24 (1000)
9	Brick Veneer	3 5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
10	Zinc Barrel	-	726 (105)	-	412 (6600)	-
11	Rubber Washer (EPDM)	1/16” (1.59)	1.7 (0.25)	-	62 (997)	-
12	Galvanized Steel Wire Pintle	3/16” (5) Ø	645 (93)	-	489 (7830)	0.12 (500)
13	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.1.64

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-22.5 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-25.9 (4.56 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

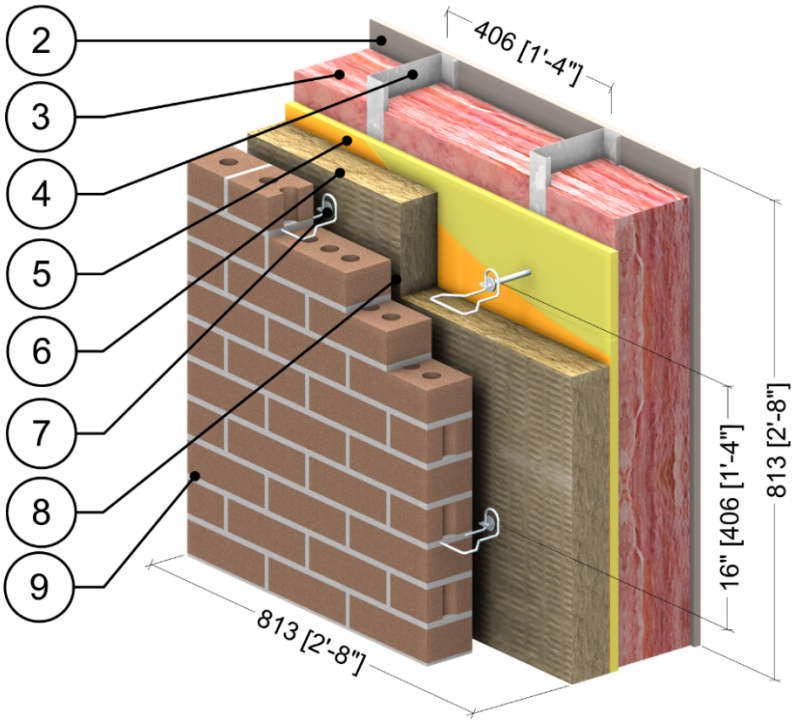
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

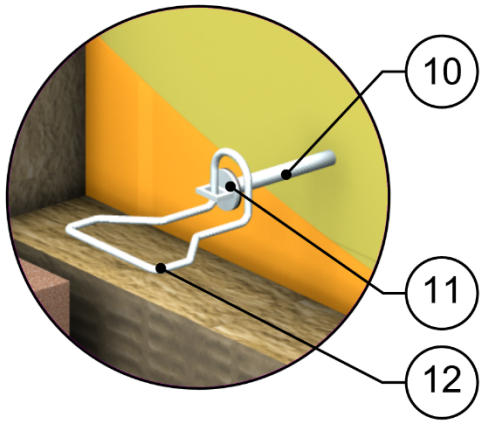
Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-6.3 (1.11)	R-32.2 (5.67)	R-17.7 (3.12)	0.056 (0.32)
R-8.4 (1.48)	R-34.3 (6.04)	R-19.2 (3.38)	0.052 (0.30)
R-12.6 (2.22)	R-38.5 (6.78)	R-21.9 (3.85)	0.046 (0.26)
R-16.8 (2.96)	R-42.7 (7.52)	R-24.2 (4.26)	0.041 (0.24)
R-21.0 (3.70)	R-46.9 (8.26)	R-26.8 (4.71)	0.037 (0.21)

Detail 5.1.65

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-24 Batt Insulation in Stud Cavity – Clear Wall





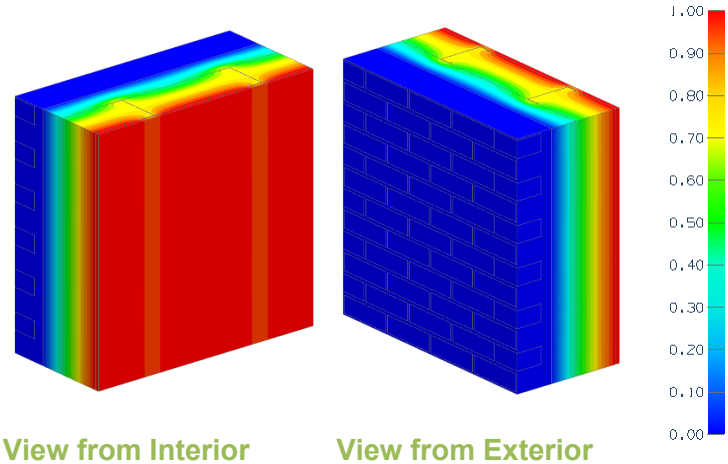
Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	6” (152)	0.25 (0.036)	R-24 (4.2 RSI)	1.42 (22.7)	0.17 (710)
4	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-6.3 to R-21.0 (1.11 to 3.70 RSI)	4.5 (72)	0.29 (1220)
7	Heckmann Pos-I-Tie Masonry Tie 16” (406) o.c.	Varies	-	-	-	-
8	Vented Air Cavity[2]	1.5” (38)	-	R-0.4 (0.07 RSI)	0.075 (1.2)	0.24 (1000)
9	Brick Veneer	3 5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
10	Zinc Barrel	-	726 (105)	-	412 (6600)	-
11	Rubber Washer (EPDM)	1/16” (1.59)	1.7 (0.25)	-	62 (997)	-
12	Galvanized Steel Wire Pintle	3/16” (5) Ø	645 (93)	-	489 (7830)	0.12 (500)
13	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.1.65

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-24 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-27.4 (4.83 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

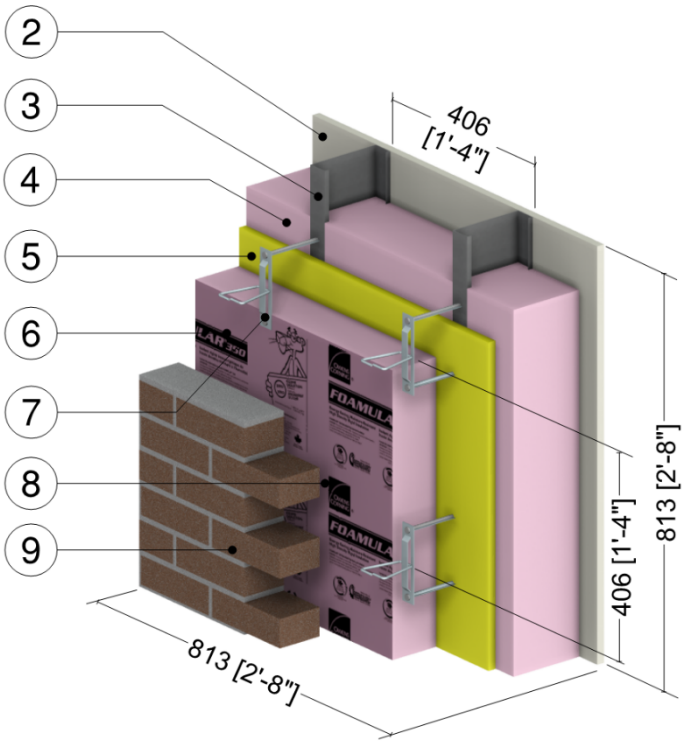
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

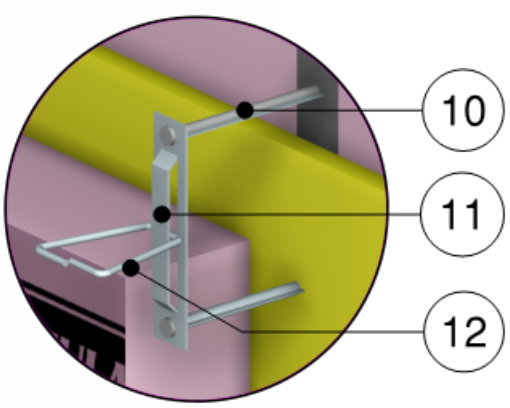
Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·ºF / Btu (m² K / W)	R_o ft²·hr·ºF / Btu (m² K / W)	U_o Btu/ft² ·hr ·ºF (W/m² K)
R-6.3 (1.11)	R-33.7 (5.94)	R-18.0 (3.17)	0.055 (0.32)
R-8.4 (1.48)	R-35.8 (6.31)	R-19.5 (3.43)	0.051 (0.29)
R-12.6 (2.22)	R-40.0 (7.04)	R-22.3 (3.93)	0.045 (0.25)
R-16.8 (2.96)	R-44.2 (7.78)	R-24.5 (4.31)	0.041 (0.23)
R-21.0 (3.70)	R-48.4 (8.52)	R-27.0 (4.76)	0.037 (0.21)

Detail 5.1.66

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Steel Anchor Supporting Brick Veneer, Owens Corning XPS Exterior Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall





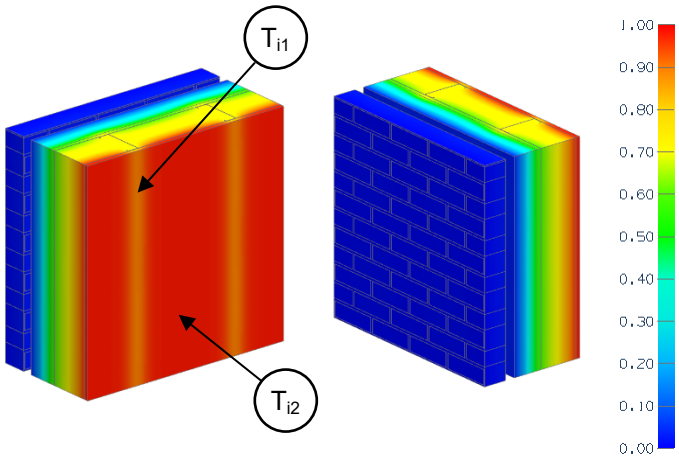
X-Seal Byna-Lok Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	FOAMULAR 250 extruded polystyrene insulation (XPS, Type IV)	Varies	0.20 (0.029)	R-5 to R-25 (0.88 to 4.40 RSI)	1.55 (25)	0.29 (1220)
7	Hohmann and Barnard X-Seal Byna-Lok Anchor	1” to 4” (25 to 102)	347 (50)	-	-	-
8	Vented Air Cavity	1.5” (38)	-	R-0.4 (0.70 RSI)	0.075 (1.2)	0.24 (1000)
9	Brick Veneer	3-5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
10	X-Seal Steel Veneer Anchor	0.31” (8) Ø	347 (50)	-	489 (7830)	0.12 (500)
11	Byna-Lok Steel Tie	-	347 (50)	-	489 (7830)	0.12 (500)
12	Steel Wire	-	347 (50)	-	489 (7830)	0.12 (500)
13	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.66

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Steel Anchor Supporting Brick Veneer, Owens Corning XPS Exterior Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-23.0 (4.06 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-5.0 (0.88)	R-28.0 (4.94)	R-15.7 (2.77)	0.064 (0.361)
R-10.0 (1.76)	R-33.0 (5.82)	R-18.4 (3.24)	0.054 (0.309)
R-15.0 (2.64)	R-38.0 (6.70)	R-21.1 (3.71)	0.047 (0.270)
R-20.0 (3.52)	R-43.0 (7.58)	R-22.9 (4.04)	0.044 (0.247)
R-25.0 (4.40)	R-48.0 (8.46)	R-24.9 (4.39)	0.040 (0.228)

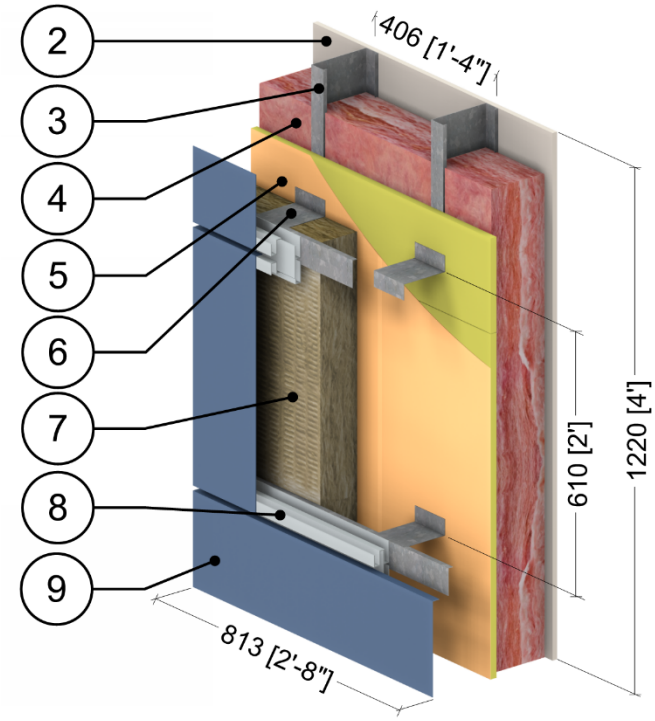
Temperature Indices

	R5	R15	R20	R25	
T_{i1}	0.30	0.44	0.44	0.47	Min T on sheathing, at anchor
T_{i2}	0.28	0.49	0.54	0.59	Min T on sheathing, between studs and anchors

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.96

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Galvanized Horizontal Intermittent Clips (24” o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt Insulation in Stud Cavity – Clear Wall

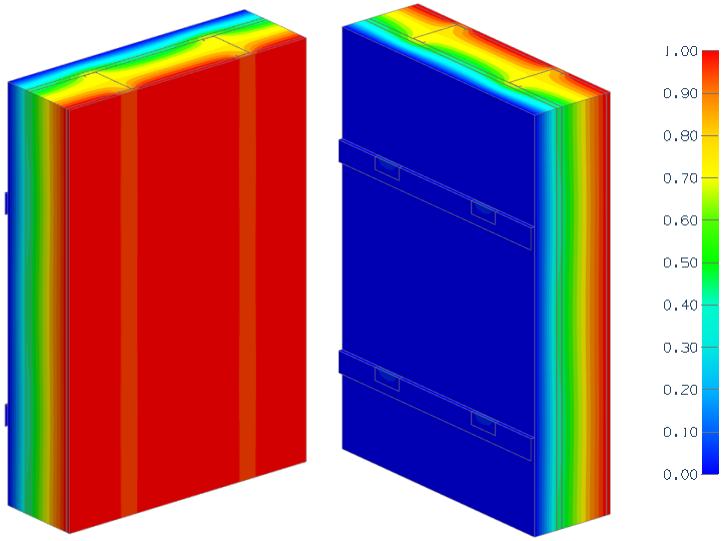


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	-	R-20 (3.52 RSI)	varies	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Horizontal Clips w/ 1 1/2" horizontal rail	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-6.3 to R-21.0 (1.11 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Panel Clip	14 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.96

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Galvanized Horizontal Intermittent Clips (24” o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.4 (3.94 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

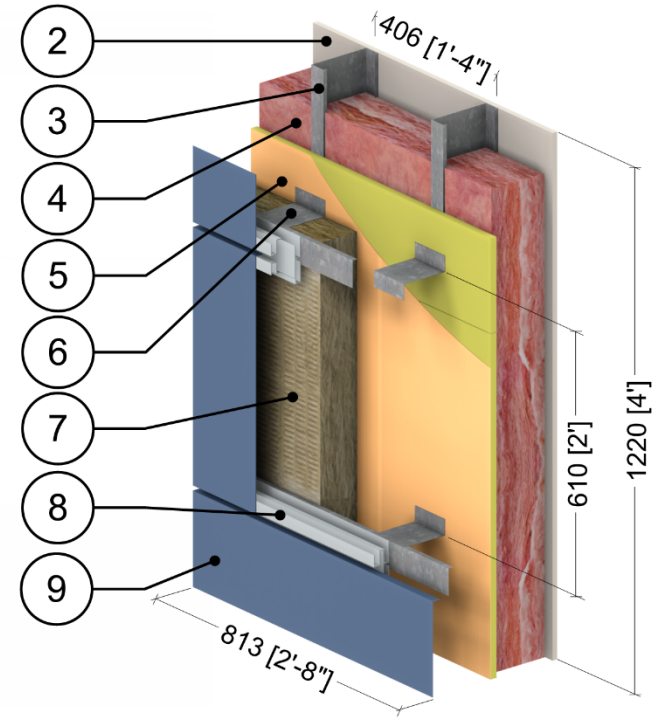
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-6.3 (1.11)	R-28.7 (5.05)	R-17.1 (3.02)	0.058 (0.33)
R-8.4 (1.48)	R-30.8 (5.42)	R-18.7 (3.29)	0.054 (0.30)
R-12.6 (2.22)	R-35.0 (6.16)	R-21.6 (3.80)	0.046 (0.26)
R-16.8 (2.96)	R-39.2 (6.90)	R-24.3 (4.27)	0.041 (0.23)
R-21.0 (3.70)	R-43.4 (7.64)	R-26.8 (4.72)	0.037 (0.21)

Detail 5.1.97

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Galvanized Horizontal Intermittent Clips (24” o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt Insulation in Stud Cavity – Clear Wall

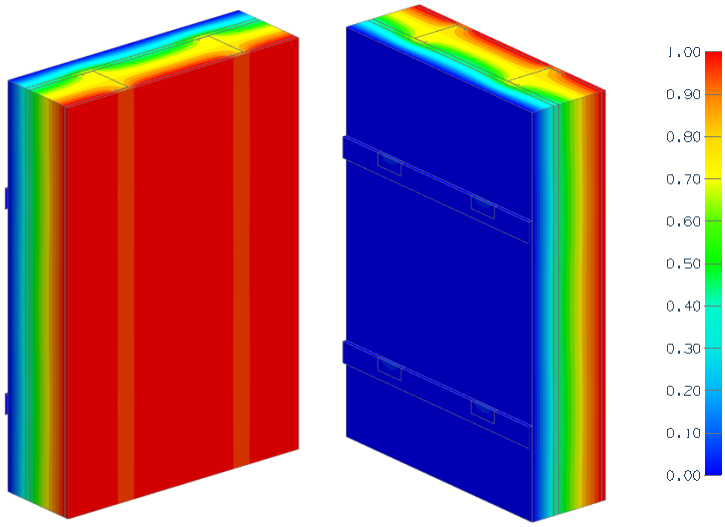


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.26 (0.038)	R-22.5 (4.0 RSI)	0.99 (15.9)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Horizontal Clips w/ 1 1/2" horizontal rail	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-6.3 to R-21.0 (1.11 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Panel Clip	14 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.97

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Galvanized Horizontal Intermittent Clips (24” o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.9 (4.38 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

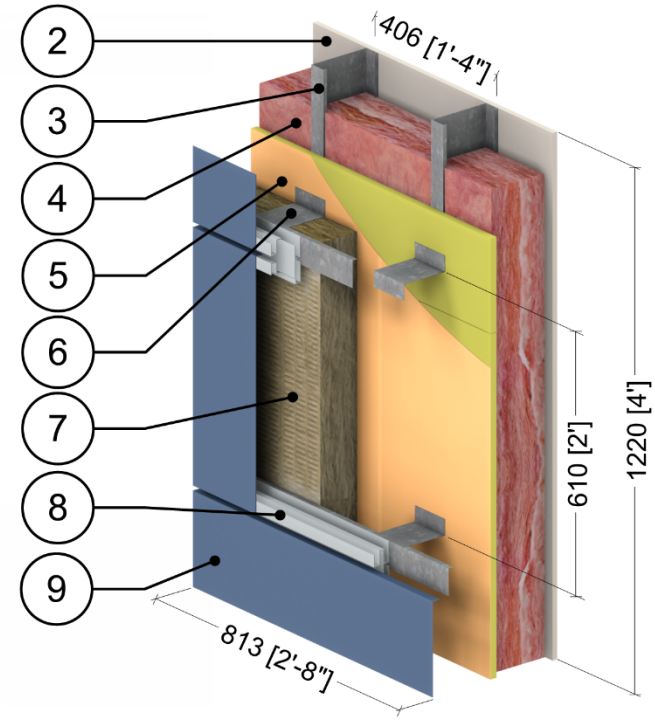
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-6.3 (1.11)	R-31.2 (5.49)	R-17.8 (3.13)	0.056 (0.32)
R-8.4 (1.48)	R-33.3 (5.86)	R-19.3 (3.40)	0.052 (0.29)
R-12.6 (2.22)	R-37.5 (6.60)	R-22.2 (3.91)	0.045 (0.26)
R-16.8 (2.96)	R-41.7 (7.34)	R-24.9 (4.38)	0.040 (0.23)
R-21.0 (3.70)	R-45.9 (8.08)	R-27.4 (4.83)	0.036 (0.21)

Detail 5.1.98

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Galvanized Horizontal Intermittent Clips (24” o.c.) Supporting Metal Cladding and Owens Corning R-24 Batt Insulation in Stud Cavity – Clear Wall

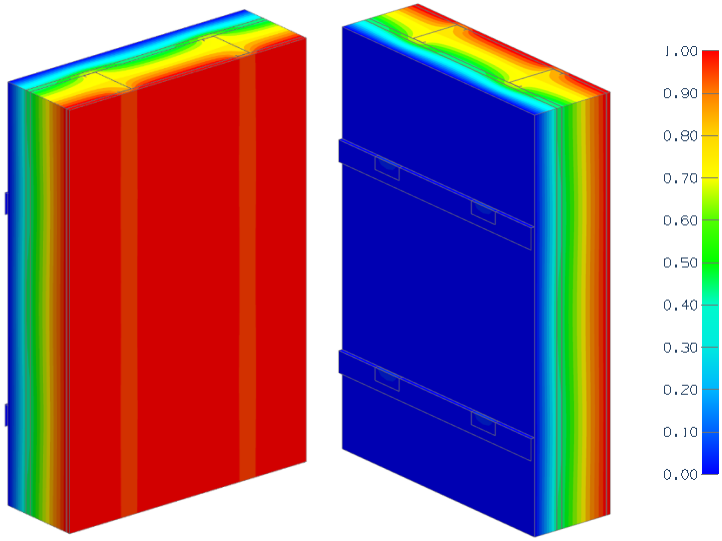


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.25 (0.036)	R-24 (4.2 RSI)	1.42 (22.7)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Horizontal Clips w/ 1 1/2" horizontal rail	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-6.3 to R-21.0 (1.11 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Panel Clip	14 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.98

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Galvanized Horizontal Intermittent Clips (24” o.c.) Supporting Metal Cladding and Owens Corning R-24 Batt Insulation in Stud Cavity – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-26.4 (4.65 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

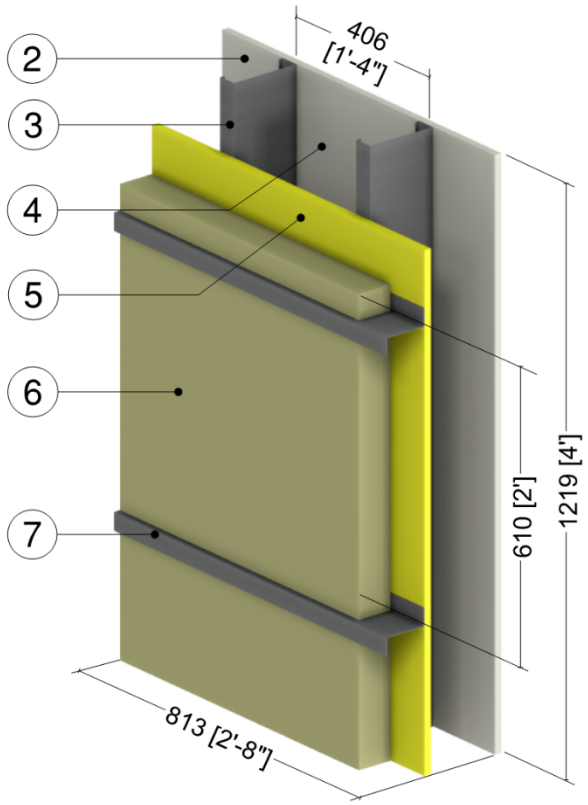
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-6.3 (1.11)	R-32.7 (5.76)	R-18.1 (3.19)	0.055 (0.31)
R-8.4 (1.48)	R-34.8 (6.13)	R-19.6 (3.46)	0.051 (0.29)
R-12.6 (2.22)	R-39.0 (6.87)	R-22.5 (3.97)	0.044 (0.25)
R-16.8 (2.96)	R-43.2 (7.61)	R-25.2 (4.44)	0.040 (0.23)
R-21.0 (3.70)	R-47.4 (8.34)	R-27.8 (4.89)	0.036 (0.20)

Detail 5.1.107

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Horizontal Z-Girts (24” o.c.) Supporting Cladding and Owens Corning ThermaFiber RainBarrier HC Max Insulation – Clear Wall

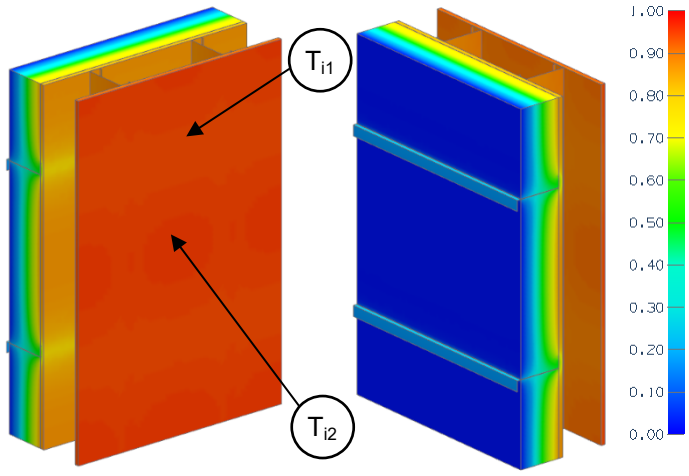


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6” (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Max Mineral Wool Semi Rigid Insulation	Varies	0.25 (0.036)	R-4 to R-24 (0.70 to 4.23 RSI)	11 (176)	0.20 (850)
7	Horizontal Z-Girts with 1-1/2” Flange	18 gauge	430 (62)	-	489 (7830)	0.12 (500)
8	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
9	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.107

Exterior Insulated 6” x 1 /58” Steel Stud (16” o.c.) Wall Assembly with Horizontal Z-Girts (24” o.c.) Supporting Cladding and Owens Corning ThermaFiber RainBarrier HC Max Insulation – Clear Wall



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.4 (0.60 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot ^oF$ / Btu (m^2 K / W)	R_o $ft^2 \cdot hr \cdot ^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 ·hr ·^oF (W/m^2 K)
R-4.0 (0.70)	R-7.4 (1.30)	R-6.5 (1.15)	0.153 (0.87)
R-8.0 (1.41)	R-11.4 (2.01)	R-8.6 (1.52)	0.116 (0.66)
R-12.0 (2.11)	R-15.4 (2.71)	R-10.7 (1.89)	0.093 (0.53)
R-16.0 (2.82)	R-19.4 (3.42)	R-12.2 (2.15)	0.082 (0.46)
R-20.0 (3.52)	R-23.4 (4.12)	R-13.7 (2.42)	0.073 (0.41)
R-24.0 (4.23)	R-27.4 (4.82)	R-15.0 (2.64)	0.067 (0.38)

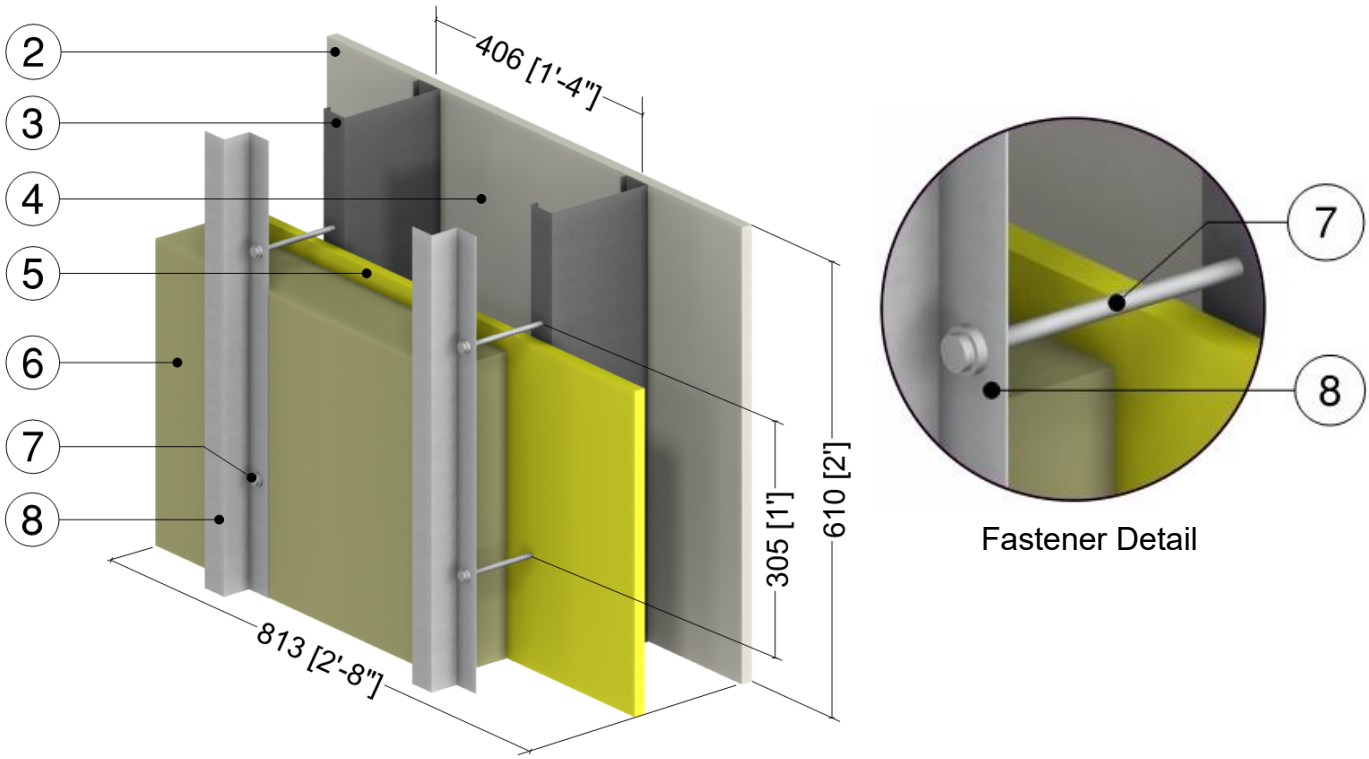
Temperature Indices

	R4	R12	R20	R24	
T_{i1}	0.62	0.73	0.77	0.79	Min T on sheathing, along girts between studs
T_{i2}	0.69	0.83	0.87	0.88	Max T on sheathing, between studs and girt

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.108

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation – Clear Wall



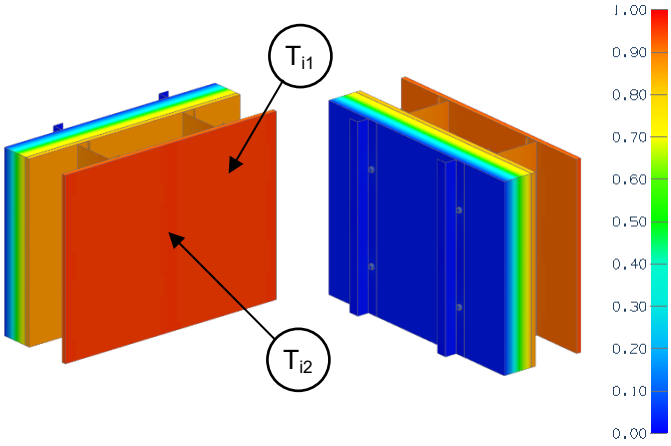
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6” (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Max Mineral Wool Semi Rigid Insulation	Varies	0.25 (0.036)	R-4.0 to R-16.0 (0.70 to 2.82 RSI)	11 (176)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.108

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.4 (0.60 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	R_o $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 ·hr ·^oF (W/m^2 K)
R-4.0 (0.70)	R-7.4 (1.30)	R-7.0 (1.24)	0.142 (0.81)
R-8.0 (1.41)	R-11.4 (2.01)	R-10.2 (1.79)	0.098 (0.56)
R-12.0 (2.11)	R-15.4 (2.71)	R-13.3 (2.35)	0.075 (0.43)
R-16.0 (2.82)	R-19.4 (3.42)	R-16.3 (2.87)	0.061 (0.35)

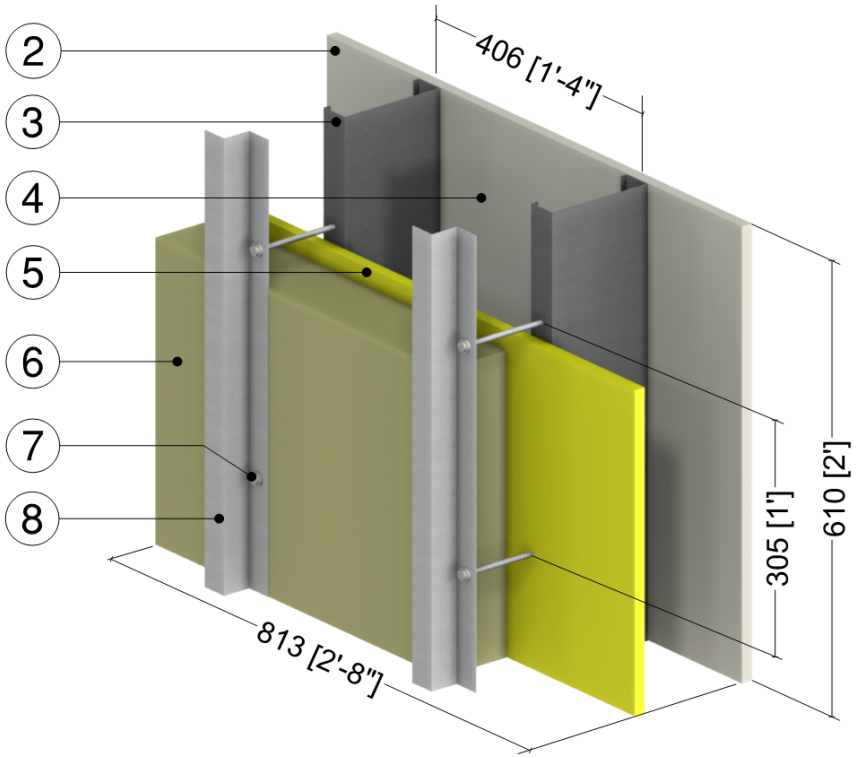
Temperature Indices

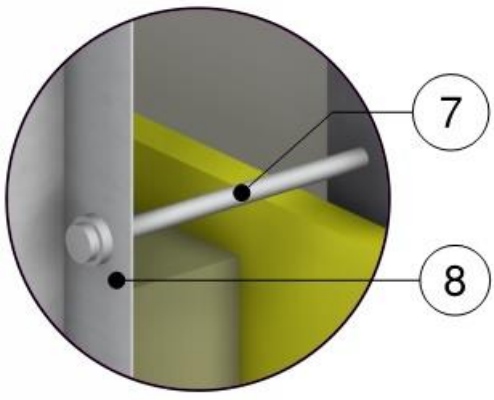
	R4	R12	R16	
T_{i1}	0.37	0.54	0.59	Min T on sheathing, at fastener along studs
T_{i2}	0.69	0.85	0.88	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.109

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation – Clear Wall





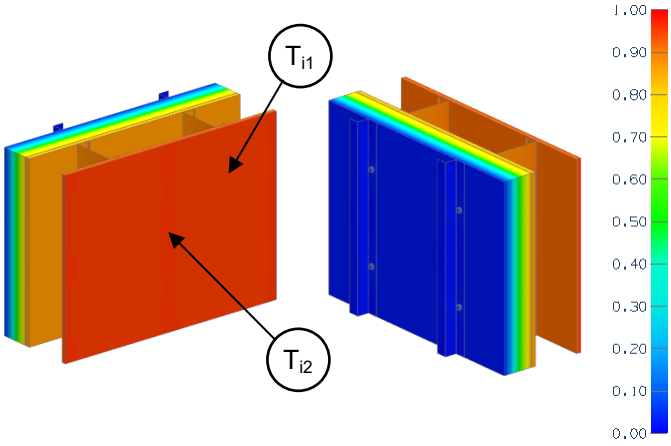
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6” (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC 80 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-16.8 (0.74 to 2.96 RSI)	4.5 (72)	0.20 (850)
7	#12 Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	430 (62)	-	489 (7830)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.109

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.4 (0.60 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-7.6 (1.34)	R-7.2 (1.27)	0.139 (0.79)
R-8.4 (1.48)	R-11.8 (2.08)	R-10.5 (1.85)	0.095 (0.54)
R-12.6 (2.22)	R-16.0 (2.82)	R-13.8 (2.42)	0.073 (0.41)
R-16.8 (2.96)	R-20.2 (3.56)	R-16.8 (2.96)	0.059 (0.34)

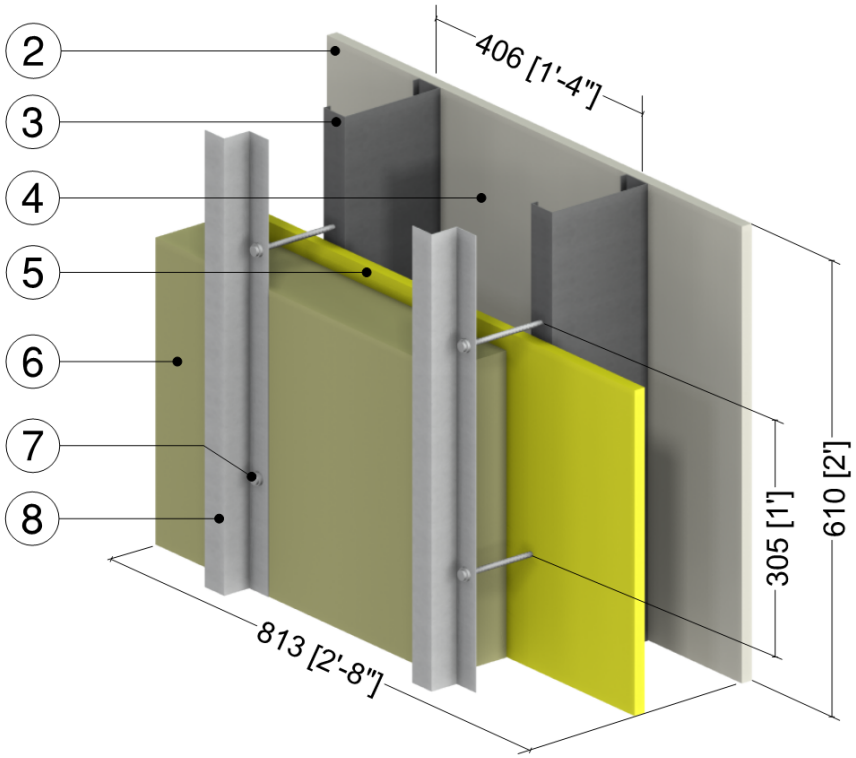
Temperature Indices

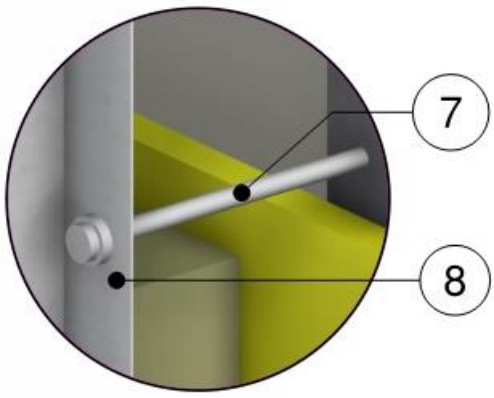
	R4	R12	R16	
T_{i1}	0.38	0.54	0.59	Min T on sheathing, at fastener along studs
T_{i2}	0.70	0.85	0.88	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.110

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Stainless Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation – Clear Wall





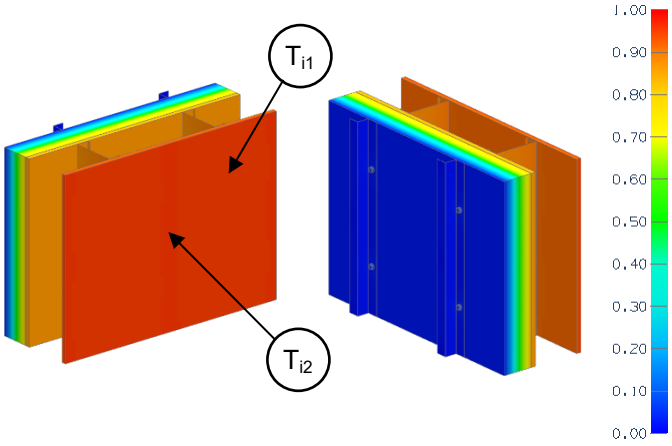
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6” (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Max Mineral Wool Semi Rigid Insulation	Varies	0.25 (0.036)	R-4.0 to R-16.0 (0.70 to 2.82 RSI)	11 (176)	0.20 (850)
7	#12 Stainless Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	118 (17)	-	500 (8000)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.110

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Stainless Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.4 (0.60 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.0 (0.70)	R-7.4 (1.30)	R-7.2 (1.27)	0.139 (0.79)
R-8.0 (1.41)	R-11.4 (2.01)	R-10.7 (1.89)	0.093 (0.53)
R-12.0 (2.11)	R-15.4 (2.71)	R-14.3 (2.52)	0.070 (0.40)
R-16.0 (2.82)	R-19.4 (3.42)	R-17.8 (3.14)	0.056 (0.32)

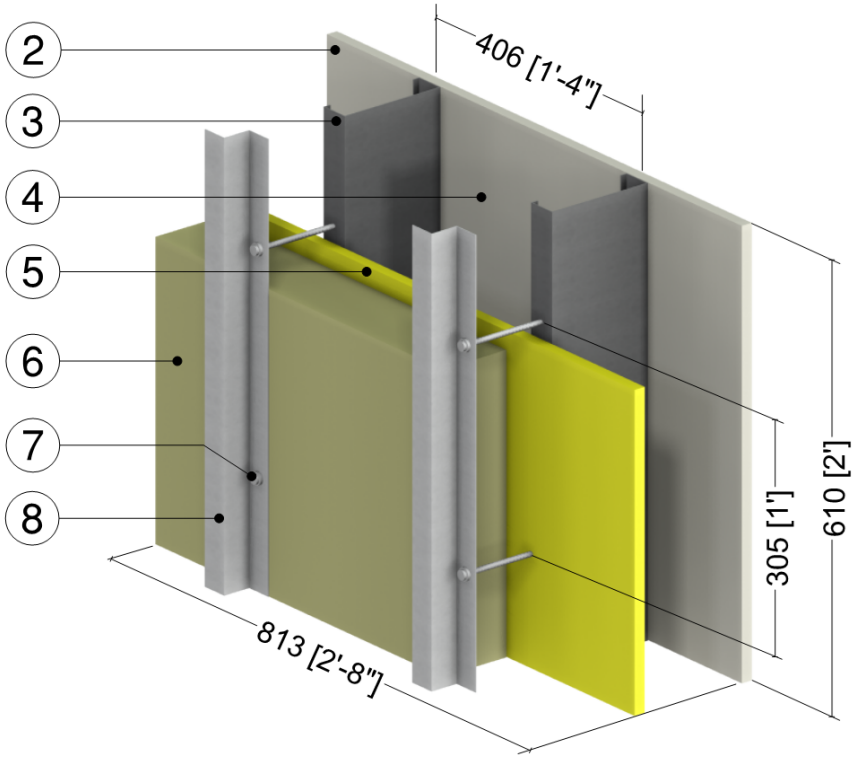
Temperature Indices

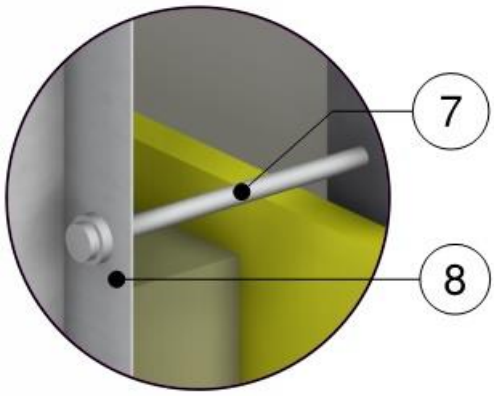
	R4	R12	R16	
T_{i1}	0.51	0.71	0.76	Min T on sheathing, at fastener along studs
T_{i2}	0.70	0.85	0.88	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.111

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Stainless Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation – Clear Wall





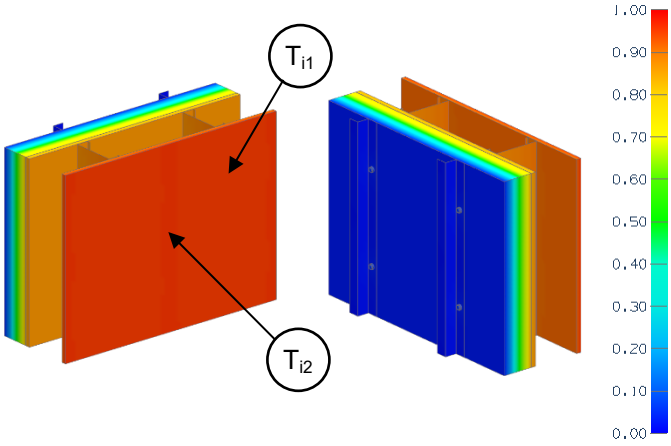
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6” (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC 80 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-16.8 (0.74 to 2.96 RSI)	4.5 (72)	0.20 (850)
7	#12 Stainless Steel Fasteners (12” o.c.)	0.21” (5.3) Ø	118 (17)	-	500 (8000)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.111

Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Stainless Steel Fasteners (12” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.4 (0.60 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-7.6 (1.34)	R-7.4 (1.30)	0.136 (0.77)
R-8.4 (1.48)	R-11.8 (2.08)	R-11.1 (1.95)	0.090 (0.51)
R-12.6 (2.22)	R-16.0 (2.82)	R-14.8 (2.61)	0.068 (0.38)
R-16.8 (2.96)	R-20.2 (3.56)	R-18.5 (3.26)	0.054 (0.31)

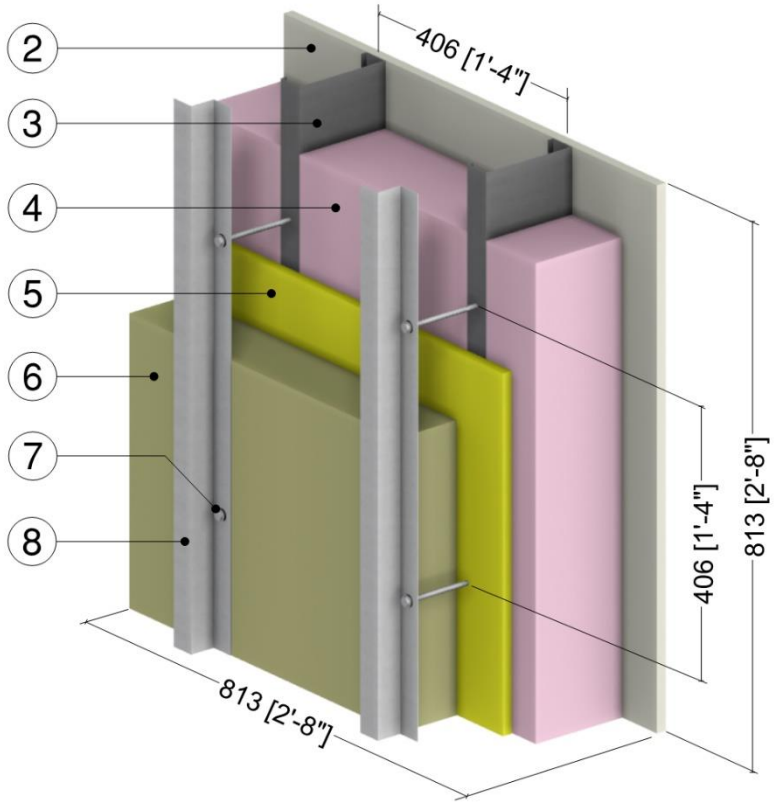
Temperature Indices

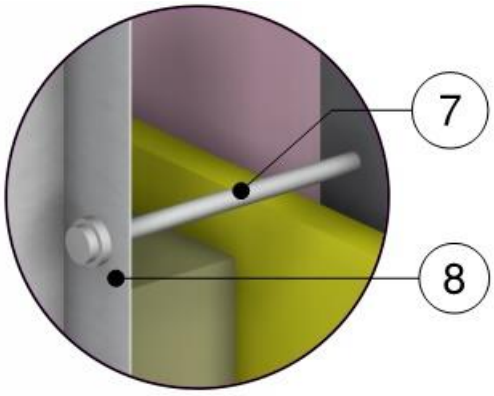
	R4	R12	R16	
T_{i1}	0.51	0.72	0.76	Min T on sheathing, at fastener along studs
T_{i2}	0.70	0.86	0.89	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.112

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Stainless Steel Fasteners (16” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall





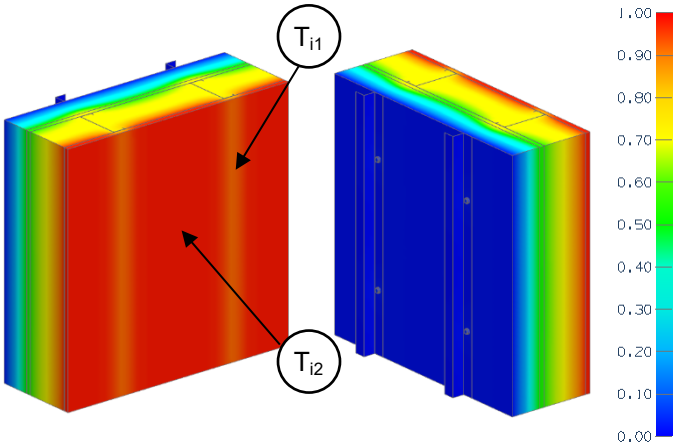
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.28 (0.041)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC Max Mineral Wool Semi Rigid Insulation	Varies	0.25 (0.036)	R-4.0 to R-16.0 (0.70 to 2.82 RSI)	11 (176)	0.20 (850)
7	#12 Stainless Steel Fasteners (16” o.c.)	0.21” (5.3) Ø	118 (17)	-	500 (8000)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.112

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Stainless Steel Fasteners (16” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC Max Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.5 (3.96 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.0 (0.70)	R-26.5 (4.67)	R-16.0 (2.82)	0.062 (0.35)
R-8.0 (1.41)	R-30.5 (5.37)	R-19.7 (3.48)	0.051 (0.29)
R-12.0 (2.11)	R-34.5 (6.08)	R-23.4 (4.13)	0.043 (0.24)
R-16.0 (2.82)	R-38.5 (6.78)	R-27.1 (4.77)	0.037 (0.21)

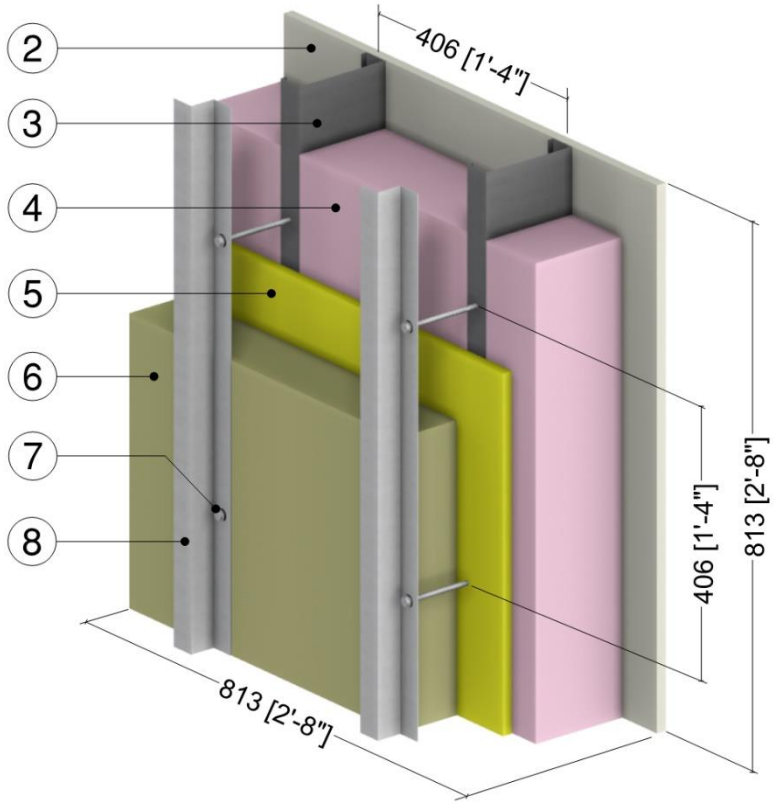
Temperature Indices

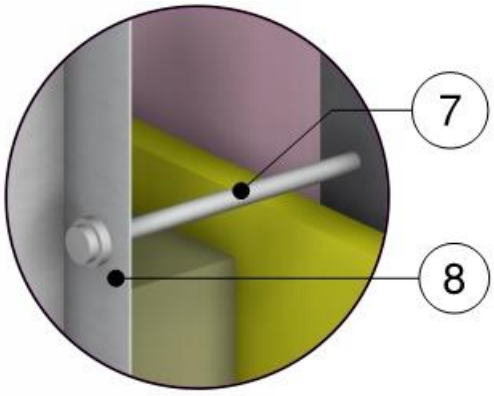
	R4.2	R12.6	R16.8	
T_{i1}	0.39	0.56	0.62	Min T on sheathing, at fastener along studs
T_{i2}	0.23	0.46	0.53	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.1.113

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Stainless Steel Fasteners (16” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall





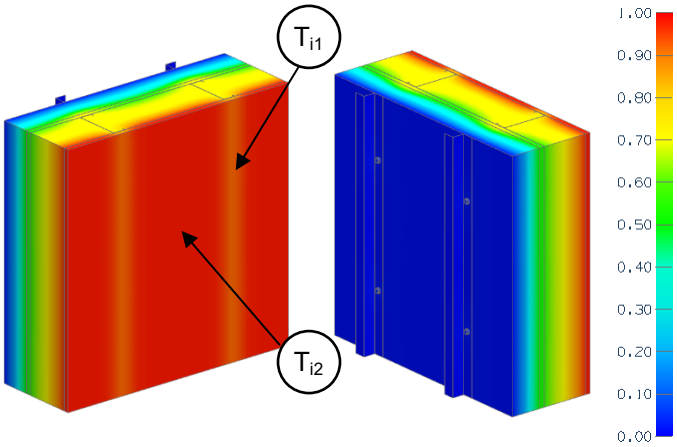
Fastener Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-
2	Gypsum Board	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.28 (0.041)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	ThermaFiber RainBarrier HC 80 Mineral Wool Semi Rigid Insulation	Varies	0.24 (0.034)	R-4.2 to R-16.8 (0.74 to 2.96 RSI)	4.5 (72)	0.20 (850)
7	#12 Stainless Steel Fasteners (16” o.c.)	0.21” (5.3) Ø	118 (17)	-	500 (8000)	0.12 (500)
8	Vertical Z-Girts	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
9	Metal Cladding with 1/2” (13 mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.1.113

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with High Compression Insulation and Through Insulation Stainless Steel Fasteners (16” o.c.) Supporting Cladding, Owens Corning ThermaFiber RainBarrier HC 80 Insulation and R-20 Batt Insulation in Stud Cavity – Clear Wall



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.5 (3.96 RSI) + exterior insulation
Transmittance / Resistance	U_o, R_o	“clear wall” U- and R-value
Surface Temperature Index	T_i	0 = exterior temperature 1 = interior temperature

View from Interior View from Exterior

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-4.2 (0.74)	R-26.7 (4.70)	R-16.2 (2.85)	0.062 (0.35)
R-8.4 (1.48)	R-30.9 (5.44)	R-20.1 (3.54)	0.050 (0.28)
R-12.6 (2.22)	R-35.1 (6.18)	R-24.0 (4.22)	0.042 (0.24)
R-16.8 (2.96)	R-39.3 (6.92)	R-27.8 (4.89)	0.036 (0.20)

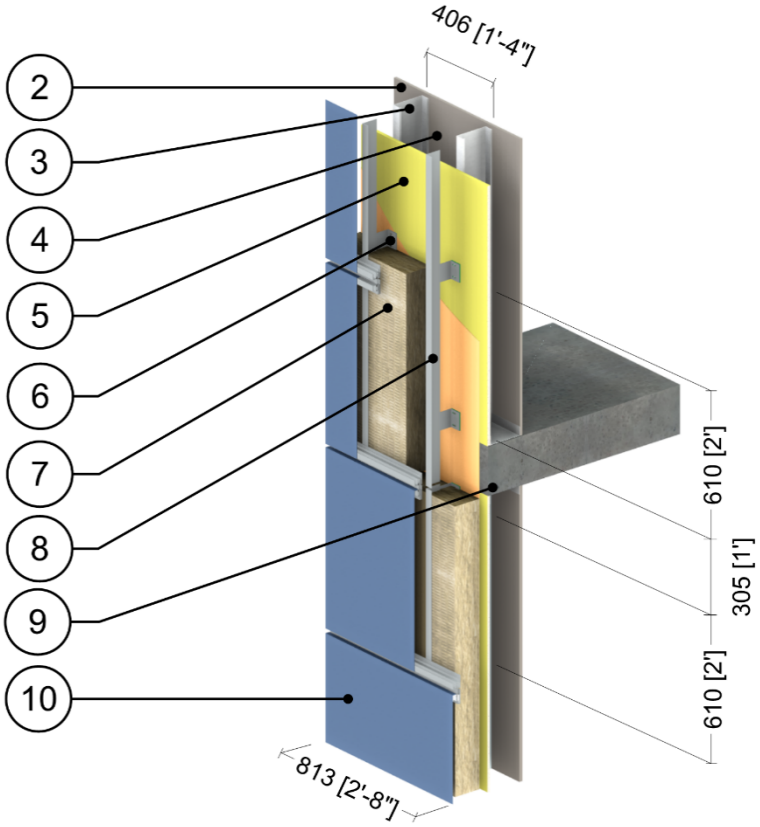
Temperature Indices

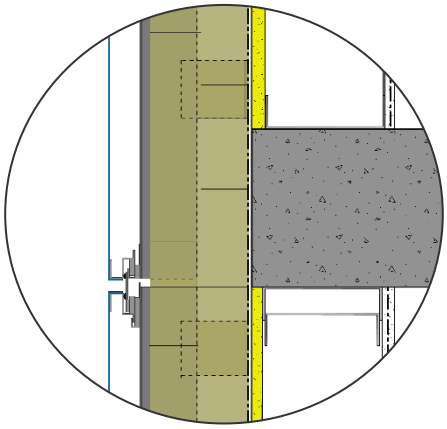
	R4.2	R12.6	R16.8	
T_{i1}	0.39	0.57	0.62	Min T on sheathing, at fastener along studs
T_{i2}	0.24	0.47	0.54	Min T on sheathing, between studs and fasteners

Temperature indices listed for selected scenarios. All other scenarios to be interpolated.

Detail 5.2.34

Owens Corning Exterior Insulated 6'' x 1 5/8" Steel Stud (16'' o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding – Intermediate Floor Intersection





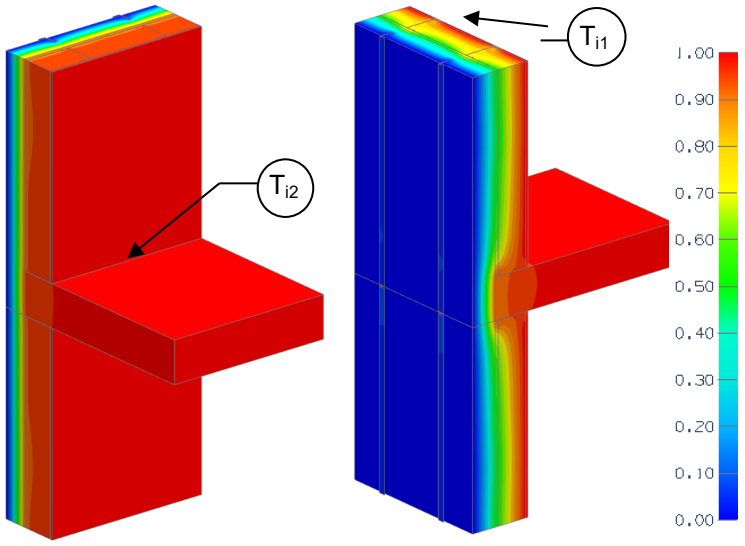
Intermediate Floor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.9 (0.16 to (0.11 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6" (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
10	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
11	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.2.34

Owens Corning Exterior Insulated 6'' x 1 5/8" Steel Stud (16'' o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding – Intermediate Floor Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.3 (0.58 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab and shelf angle
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of slab

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

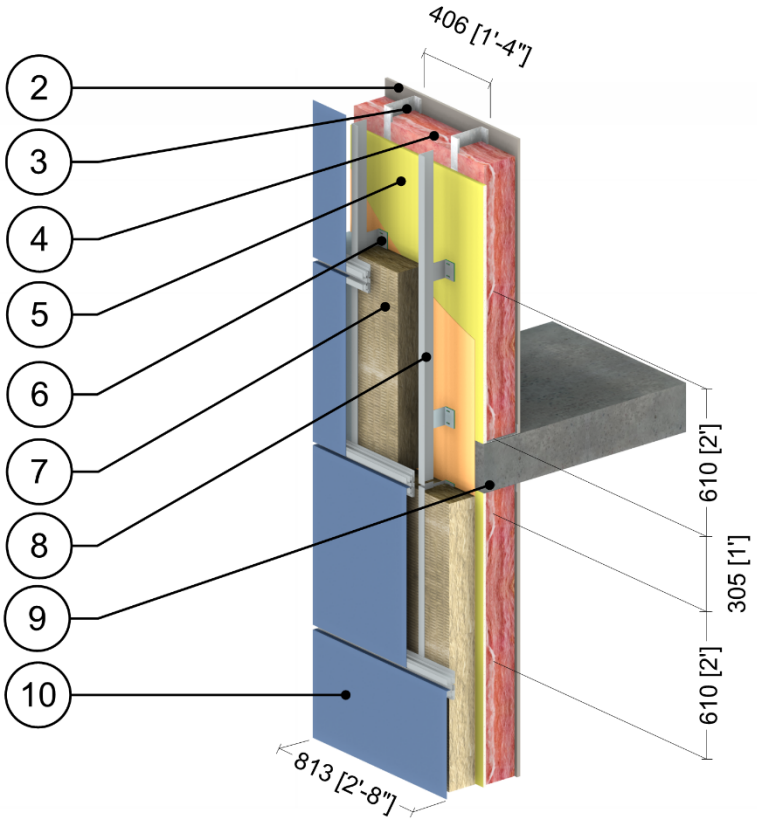
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	R_o $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 ·hr ·^oF (W/m^2 K)	R $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U Btu/ft^2 ·hr ·^oF (W/m^2 K)	ψ Btu/ft hr ^oF (W/m K)
R-8.4 (1.48)	R-11.7 (2.06)	R-10.0 (1.77)	0.100 (0.57)	R-9.7 (1.72)	0.103 (0.58)	0.020 (0.034)
R-21.0 (3.70)	R-24.3 (4.28)	R-17.6 (3.10)	0.057 (0.32)	R-17.0 (3.00)	0.059 (0.33)	0.013 (0.023)

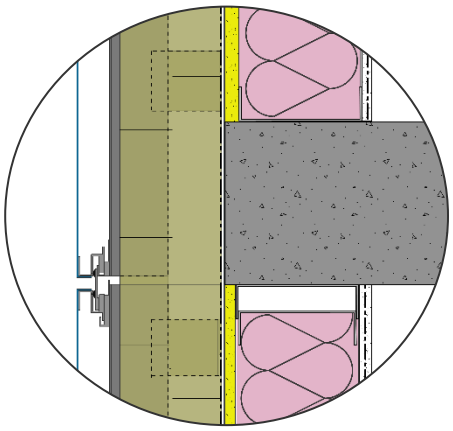
Temperature Indices

	R8.4	R21	
T_{i1}	0.80	0.89	Min T on sheathing cavity centre, away from slab
T_{i2}	0.84	0.91	Max T on sheathing, at slab, between steel studs

Detail 5.2.35

Exterior and Interior Insulated 6'' x 1 5/8" Steel Stud (16'' o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Intermediate Floor Intersection





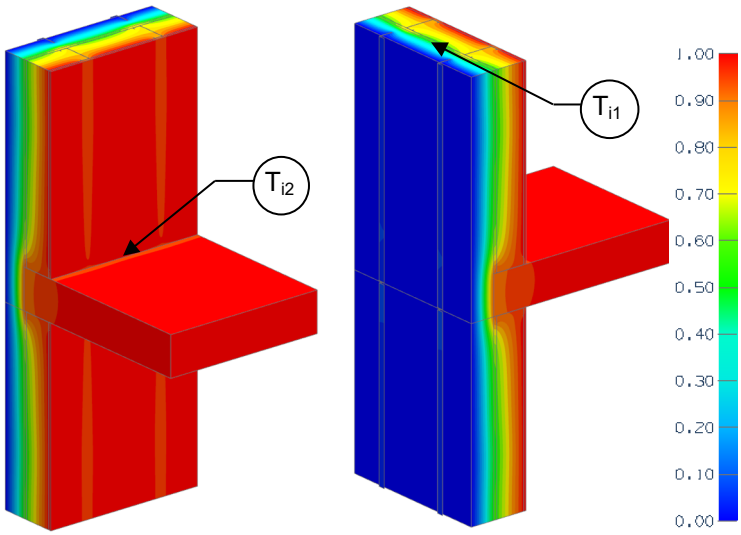
Intermediate Floor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.9 (0.16 to (0.11 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
10	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
11	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.2.35

Exterior and Interior Insulated 6'' x 1 5/8" Steel Stud (16'' o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Intermediate Floor Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.4 (3.94 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab and shelf angle
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of slab

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

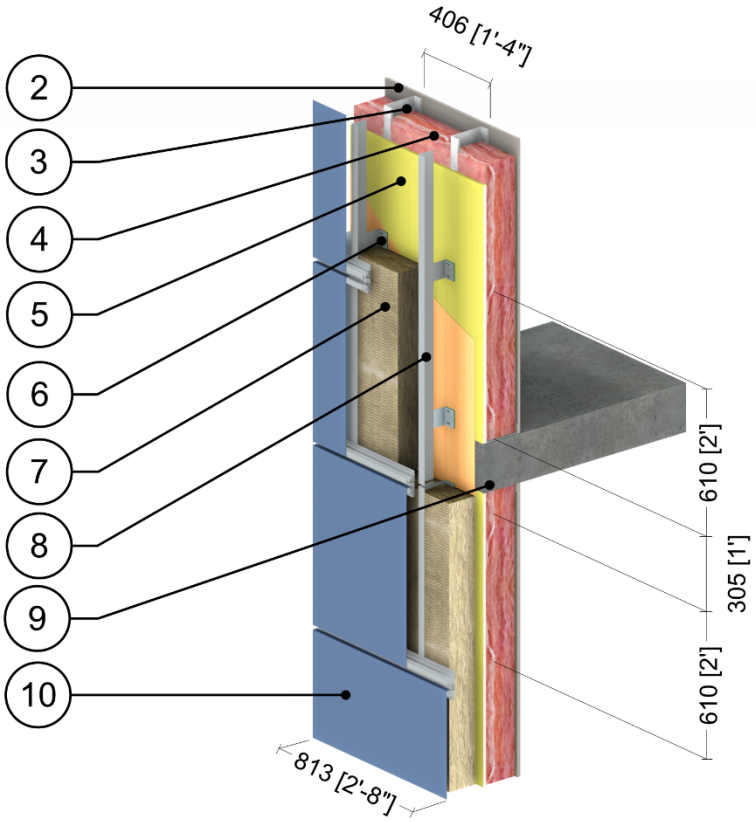
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	R_o $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 ·hr ·^oF (W/m^2 K)	R $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U Btu/ft^2 ·hr ·^oF (W/m^2 K)	ψ Btu/ft hr ^oF (W/m K)
R-8.4 (1.48)	R-30.8 (5.42)	R-18.3 (3.23)	0.055 (0.31)	R-15.3 (2.69)	0.065 (0.37)	0.076 (0.132)
R-21.0 (3.70)	R-43.4 (7.64)	R-25.8 (4.54)	0.039 (0.22)	R-22.5 (3.96)	0.045 (0.25)	0.040 (0.069)

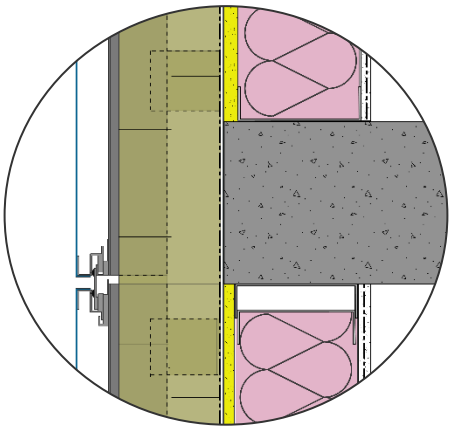
Temperature Indices

	R8.4	R21	
T_{i1}	0.35	0.55	Min T on sheathing cavity centre, away from slab
T_{i2}	0.80	0.88	Max T on sheathing, at slab, between steel studs

Detail 5.2.36

Exterior and Interior Insulated 6'' x 1 5/8" Steel Stud (16'' o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Intermediate Floor Intersection





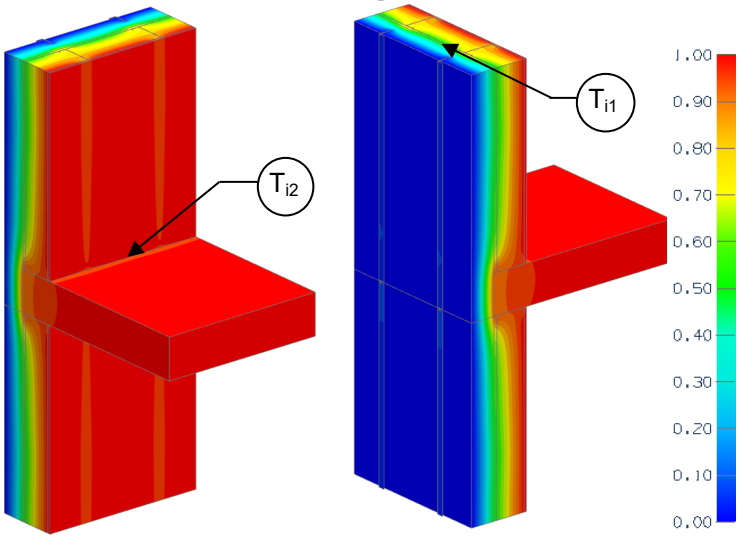
Intermediate Floor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.9 (0.16 to (0.11 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.26 (0.038)	R-22.5 (3.96 RSI)	0.99 (15.9)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
10	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
11	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.2.36

Exterior and Interior Insulated 6'' x 1 5/8" Steel Stud (16'' o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Intermediate Floor Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.9 (4.38 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab and shelf angle
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of slab

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

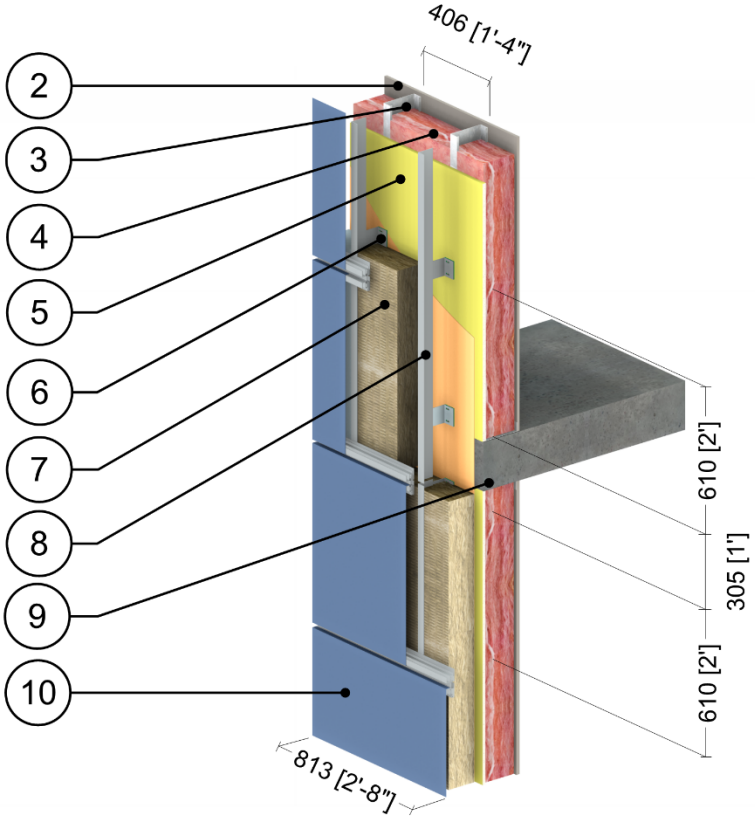
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	R_o $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U_o Btu/ft^2 ·hr ·°F (W/m^2 K)	R $ft^2 \cdot hr \cdot °F$ / Btu (m^2 K / W)	U Btu/ft^2 ·hr ·°F (W/m^2 K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-33.3 (5.86)	R-19.0 (3.34)	0.053 (0.30)	R-15.6 (2.75)	0.064 (0.36)	0.079 (0.136)
R-21.0 (3.70)	R-45.9 (8.08)	R-26.4 (4.64)	0.038 (0.22)	R-22.8 (4.02)	0.044 (0.25)	0.041 (0.071)

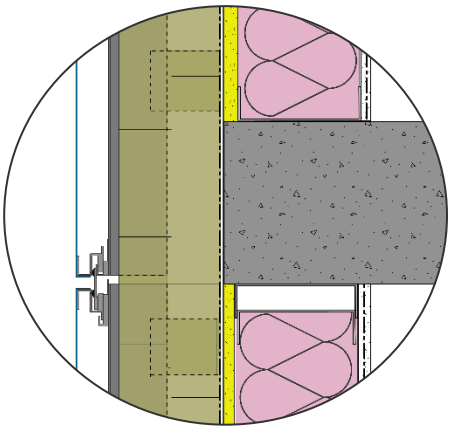
Temperature Indices

	R8.4	R21	
T_{i1}	0.33	0.53	Min T on sheathing cavity centre, away from slab
T_{i2}	0.80	0.87	Max T on sheathing, at slab, between steel studs

Detail 5.2.37

Exterior and Interior Insulated 6'' x 1 5/8" Steel Stud (16'' o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-24 Batt in Stud Cavity – Intermediate Floor Intersection





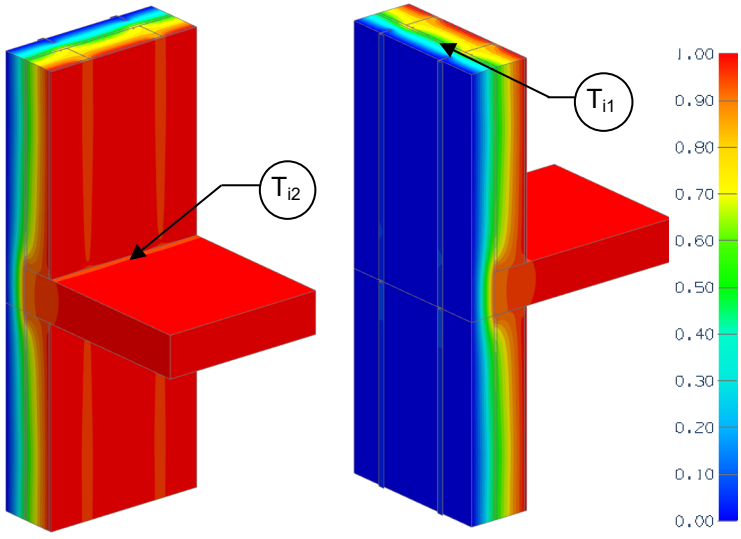
Intermediate Floor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.9 (0.16 to (0.11 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.25 (0.036)	R-24 (4.23 RSI)	1.42 (22.7)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
10	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
11	Exterior Film[1]	-	-	R-0.7 (0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.2.37

Exterior and Interior Insulated 6'' x 1 5/8" Steel Stud (16'' o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-24 Batt in Stud Cavity – Intermediate Floor Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-26.4 (4.65 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab and shelf angle
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of slab

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

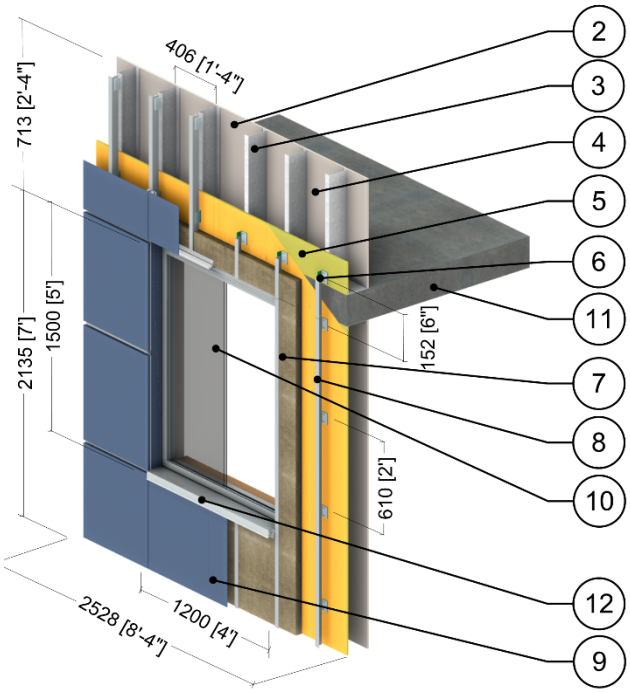
Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot ^oF$ / Btu (m^2 K / W)	R_o $ft^2 \cdot hr \cdot ^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 $\cdot hr \cdot ^oF$ (W/m^2 K)	R $ft^2 \cdot hr \cdot ^oF$ / Btu (m^2 K / W)	U Btu/ft^2 $\cdot hr \cdot ^oF$ (W/m^2 K)	ψ Btu/ft hr ^oF (W/m K)
R-8.4 (1.48)	R-34.8 (6.13)	R-19.3 (3.40)	0.052 (0.29)	R-15.8 (2.78)	0.063 (0.36)	0.080 (0.139)
R-21.0 (3.70)	R-47.4 (8.34)	R-26.7 (4.71)	0.037 (0.21)	R-23.0 (4.05)	0.043 (0.25)	0.042 (0.073)

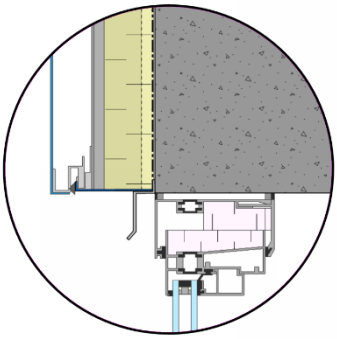
Temperature Indices

	R8.4	R21	
T_{i1}	0.32	0.52	Min T on sheathing cavity centre, away from slab
T_{i2}	0.80	0.87	Max T on sheathing, at slab, between steel studs

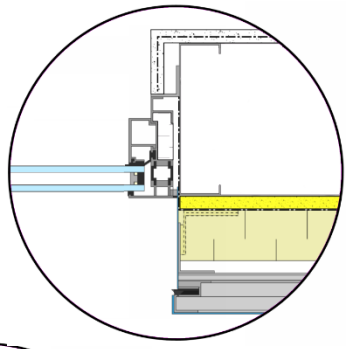
Detail 5.3.14

Owens Corning Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding – Double Glazed Aluminum Window and Intermediate Floor Intersection

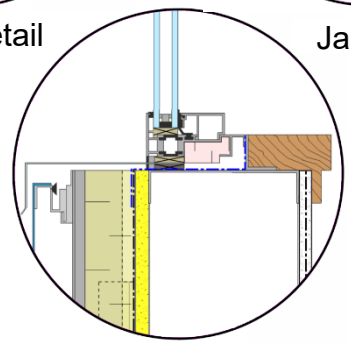




Head Detail



Jamb Detail



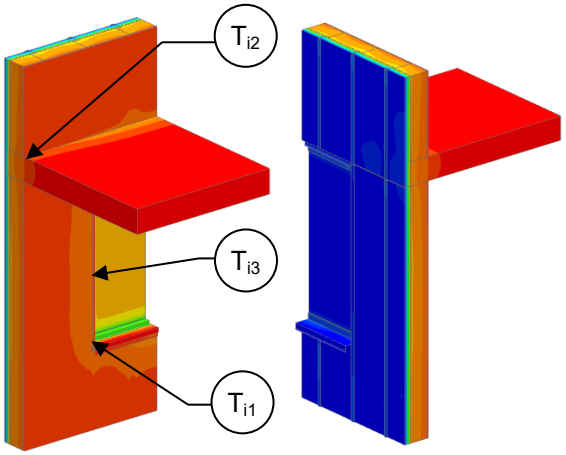
Sill Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-1.1 (0.11 to 0.20 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6” (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	5’ (1.5m) x 4’ (1.2m) Aluminum window: thermally broken, double glazed IGU[2] U_{IGU} = 0.32 BTU/hr.ft².°F (1.82 W/m²K)					
11	Concrete Slab	8” (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
12	Aluminum Flashing	18 gauge	1110 (160)	-	171 (2739)	0.22 (900)
13	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.3.14

Owens Corning Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding – Double Glazed Aluminum Window and Intermediate Floor Intersection



View from Interior

View from Exterior

Base Assembly – Glazing

$U_{centre\ of\ glass}$ Btu/ft² ·hr ·ºF (W/m² K)	U_g Btu/ft² ·hr ·ºF (W/m² K)
0.321 (1.82)	0.396 (2.25)

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.3 (0.58 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_w, R_w, U_g,	“clear wall” U- and R-value: w = wall without intermediate floor g = glazing
Transmittance / Resistance	U_{floor}, R_{floor}, U_t, R_t	U and R-values for: floor = wall + intermediate floor t = combined wall + floor + window
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Steel Stud Clear Wall

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·ºF / Btu (m² K / W)	R_w ft²·hr·ºF / Btu (m² K / W)	U_w Btu/ft² ·hr ·ºF (W/m² K)
R-8.4 (1.48)	R-11.7 (2.06)	R-10.0 (1.77)	0.100 (0.57)
R-21.0 (3.70)	R-24.3 (4.28)	R-17.6 (3.10)	0.057 (0.32)

Intermediate Floor Linear Transmittance

R_{floor} ft²·hr·ºF / Btu (m² K / W)	U_{floor} Btu/ft² ·hr ·ºF (W/m² K)	ψ_{floor} Btu/ft² ·hr ·ºF (W/m² K)
R-9.7 (1.72)	0.103 (0.58)	0.020 (0.034)
R-17.0 (3.00)	0.059 (0.33)	0.013 (0.023)

Window Transition Transmittance

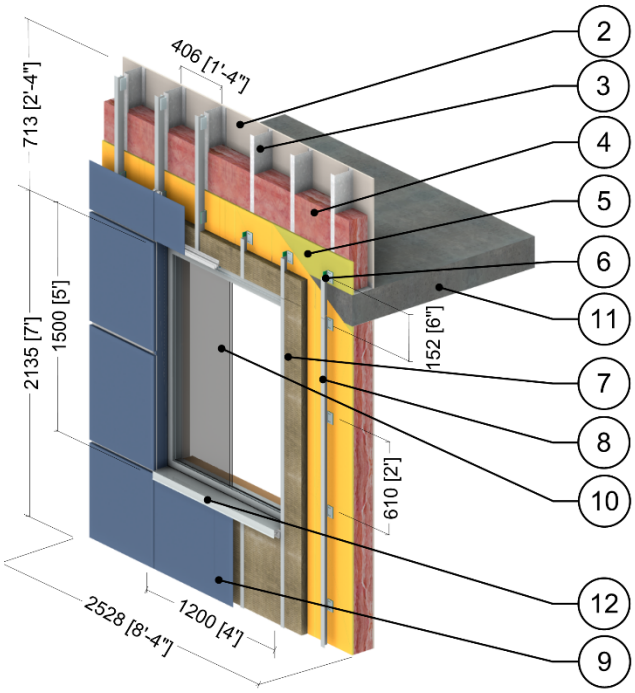
Exterior Insulation 1D R-Value (RSI)	R_t ft²·hr·ºF / Btu (m² K / W)	U_t Btu/ft² ·hr ·ºF (W/m² K)	ψ_{Head} Btu/ft ·hr ·ºF (W/m K)	ψ_{Sill} Btu/ft ·hr ·ºF (W/m K)	ψ_{Jamb} Btu/ft ·hr ·ºF (W/m K)	ψ_{Total} Btu/ft ·hr ·ºF (W/m K)
R-8.4 (1.48)	R-4.8 (0.84)	0.210 (1.19)	0.276 (0.478)	0.215 (0.373)	0.124 (0.214)	0.182 (0.315)
R-21.0 (3.70)	R-5.4 (0.96)	0.184 (1.04)	0.298 (0.516)	0.248 (0.429)	0.143 (0.248)	0.216 (0.374)

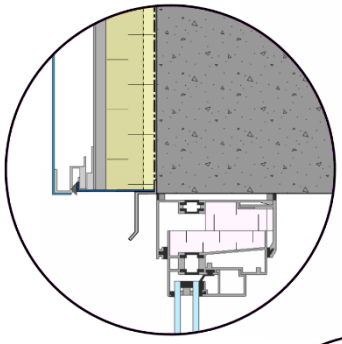
Temperature Indices

	R8.4	R21	
T_{i1}	0.54	0.57	Min T on window frame, at bottom corner at edge of glass
T_{i2}	0.83	0.89	Max T on interior surface of sheathing, along bottom track
T_{i3}	0.37	0.38	Min T on interior surface of sheathing, at bracket along jamb

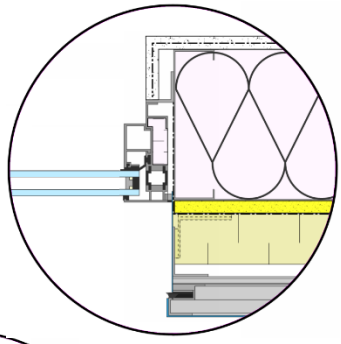
Detail 5.3.15

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Double Glazed Aluminum Window and Intermediate Floor Intersection

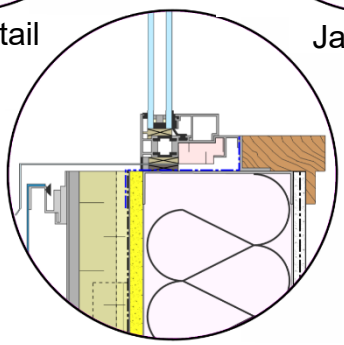




Head Detail



Jamb Detail



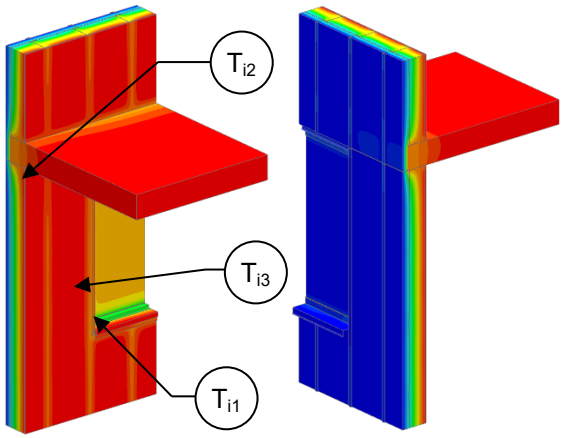
Sill Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-1.1 (0.11 to 0.20 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	5’ (1.5m) x 4’ (1.2m) Aluminum window: thermally broken, double glazed IGU[2] U_{IGU} = 0.32 BTU/hr.ft².°F (1.82 W/m²K)					
11	Concrete Slab	8” (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
12	Aluminum Flashing	18 gauge	1110 (160)	-	171 (2739)	0.22 (900)
13	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.3.15

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Double Glazed Aluminum Window and Intermediate Floor Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.4 (3.94 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	$U_{w,}$ $R_{w,}$ $U_{g,}$	“clear wall” U- and R-value: w = wall without intermediate floor g = glazing
Transmittance / Resistance	$U_{floor,}$ $R_{floor,}$ $U_{t,}$ R_{t}	U and R-values for: floor = wall + intermediate floor t = combined wall + floor + window
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	Ψ	Incremental increase in transmittance per linear length

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Base Assembly – Glazing

$U_{centre\ of\ glass}$ Btu/ft² ·hr ·°F (W/m² K)	U_g Btu/ft² ·hr ·°F (W/m² K)
0.321 (1.82)	0.396 (2.25)

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Steel Stud Clear Wall

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-30.8 (5.42)	R-18.3 (3.23)	0.055 (0.31)
R-21.0 (3.70)	R-43.4 (7.64)	R-25.8 (4.54)	0.039 (0.22)

Intermediate Floor Linear Transmittance

R_{floor} ft²·hr·°F / Btu (m² K / W)	U_{floor} Btu/ft² ·hr ·°F (W/m² K)	Ψ_{floor} Btu/ft² ·hr ·°F (W/m² K)
R-15.3 (2.69)	0.065 (0.37)	0.076 (0.132)
R-22.5 (3.96)	0.045 (0.25)	0.040 (0.069)

Window Transition Transmittance

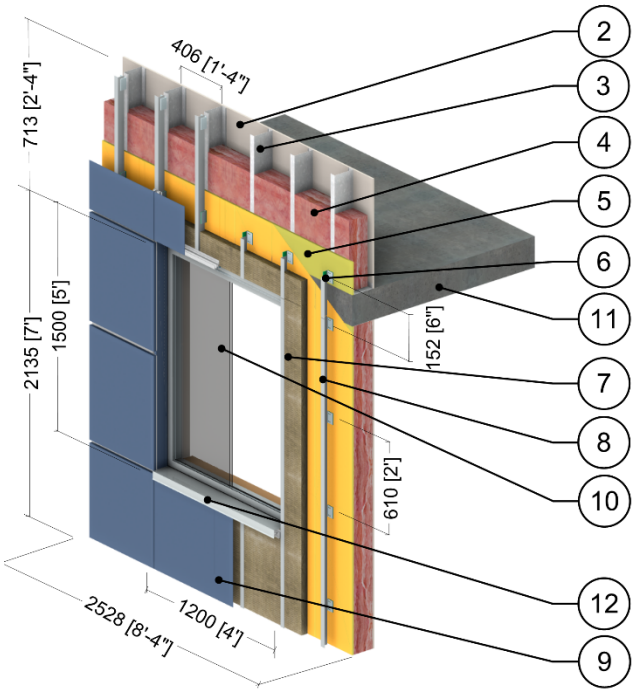
Exterior Insulation 1D R-Value (RSI)	R_t ft²·hr·°F / Btu (m² K / W)	U_t Btu/ft² ·hr ·°F (W/m² K)	Ψ_{Head} Btu/ft ·hr ·°F (W/m K)	Ψ_{Sill} Btu/ft ·hr ·°F (W/m K)	Ψ_{Jamb} Btu/ft ·hr ·°F (W/m K)	Ψ_{Total} Btu/ft ·hr ·°F (W/m K)
R-8.4 (1.48)	R-5.8 (1.02)	0.173 (0.99)	0.308 (0.533)	0.146 (0.253)	0.094 (0.163)	0.159 (0.274)
R-21.0 (3.70)	R-6.2 (1.10)	0.161 (0.91)	0.303 (0.525)	0.158 (0.273)	0.102 (0.176)	0.164 (0.283)

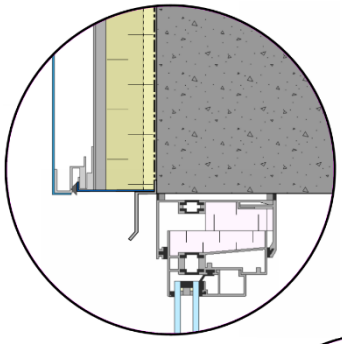
Temperature Indices

	R8.4	R21	
T_{i1}	0.50	0.50	Min T on window frame, at bottom corner at edge of glass
T_{i2}	0.80	0.86	Max T on interior surface of sheathing, along bottom track
T_{i3}	0.28	0.28	Min T on interior surface of sheathing, at bracket along jamb

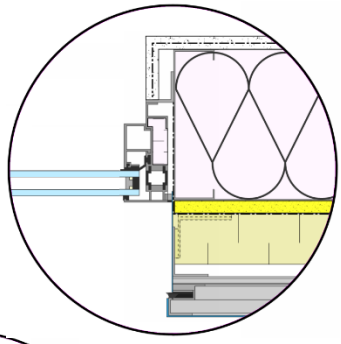
Detail 5.3.16

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Double Glazed Aluminum Window and Intermediate Floor Intersection

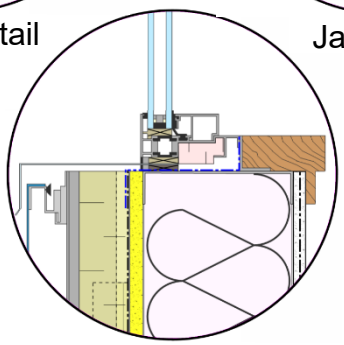




Head Detail



Jamb Detail



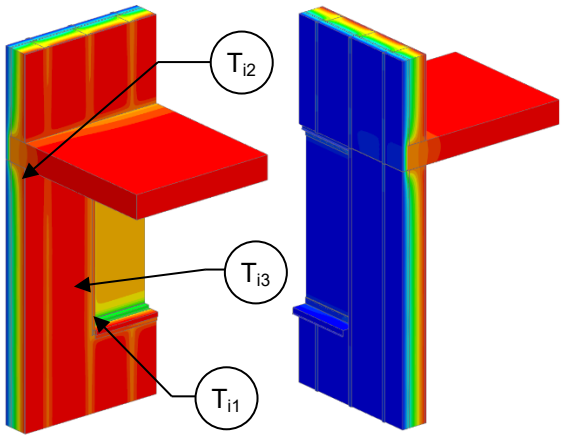
Sill Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-1.1 (0.11 to 0.20 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.26 (0.038)	R-22.5 (3.96 RSI)	0.99 (15.9)	0.17 (710)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	5’ (1.5m) x 4’ (1.2m) Aluminum window: thermally broken, double glazed IGU[2] U_{IGU} = 0.32 BTU/hr.ft².°F (1.82 W/m²K)					
11	Concrete Slab	8” (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
12	Aluminum Flashing	18 gauge	1110 (160)	-	171 (2739)	0.22 (900)
13	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.3.16

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Double Glazed Aluminum Window and Intermediate Floor Intersection



View from Interior View from Exterior



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.9 (4.38 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	$U_{w,}$ $R_{w,}$ $U_{g,}$	“clear wall” U- and R-value: w = wall without intermediate floor g = glazing
Transmittance / Resistance	$U_{floor,}$ $R_{floor,}$ $U_{t,}$ R_t	U and R-values for: floor = wall + intermediate floor t = combined wall + floor + window
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	Ψ	Incremental increase in transmittance per linear length

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Base Assembly – Glazing

$U_{centre\ of\ glass}$ Btu/ft² ·hr ·°F (W/m² K)	U_g Btu/ft² ·hr ·°F (W/m² K)
0.321 (1.82)	0.396 (2.25)

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Steel Stud Clear Wall

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-33.3 (5.86)	R-19.0 (3.34)	0.053 (0.30)
R-21.0 (3.70)	R-45.9 (8.08)	R-26.4 (4.64)	0.038 (0.22)

Intermediate Floor Linear Transmittance

R_{floor} ft²·hr·°F / Btu (m² K / W)	U_{floor} Btu/ft² ·hr ·°F (W/m² K)	Ψ_{floor} Btu/ft² ·hr ·°F (W/m² K)
R-15.6 (2.75)	0.064 (0.36)	0.079 (0.136)
R-22.8 (4.02)	0.044 (0.25)	0.041 (0.071)

Window Transition Transmittance

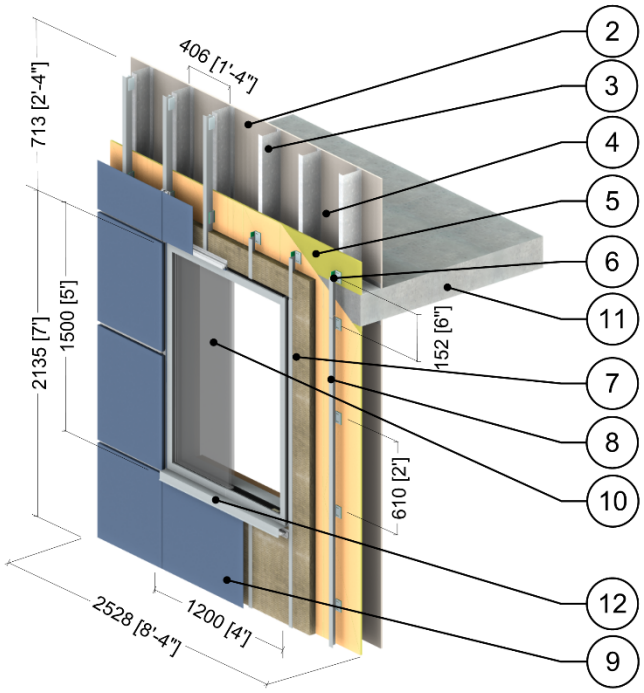
Exterior Insulation 1D R-Value (RSI)	R_t ft²·hr·°F / Btu (m² K / W)	U_t Btu/ft² ·hr ·°F (W/m² K)	Ψ_{Head} Btu/ft ·hr ·°F (W/m K)	Ψ_{Sill} Btu/ft ·hr ·°F (W/m K)	Ψ_{Jamb} Btu/ft ·hr ·°F (W/m K)	Ψ_{Total} Btu/ft ·hr ·°F (W/m K)
R-8.4 (1.48)	R-5.8 (1.02)	0.172 (0.98)	0.310 (0.536)	0.146 (0.252)	0.094 (0.163)	0.159 (0.275)
R-21.0 (3.70)	R-6.3 (1.10)	0.160 (0.91)	0.304 (0.526)	0.157 (0.271)	0.101 (0.175)	0.163 (0.282)

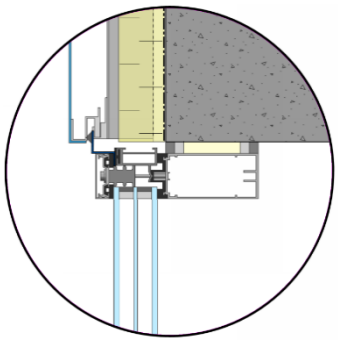
Temperature Indices

	R8.4	R21	
T_{i1}	0.50	0.50	Min T on window frame, at bottom corner at edge of glass
T_{i2}	0.79	0.86	Max T on interior surface of sheathing, along bottom track
T_{i3}	0.27	0.28	Min T on interior surface of sheathing, at bracket along jamb

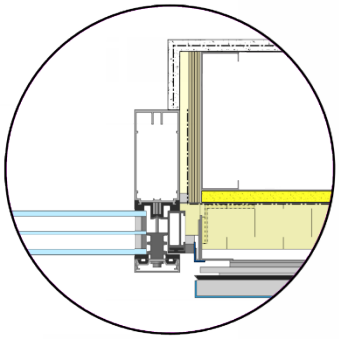
Detail 5.3.17

Owens Corning Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding – Triple Glazed Aluminum Window and Intermediate Floor Intersection

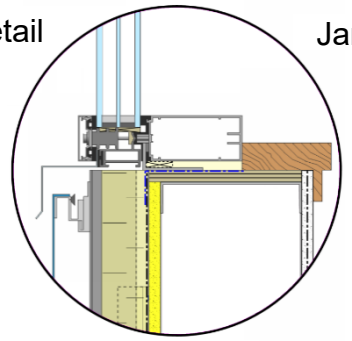




Head Detail



Jamb Detail



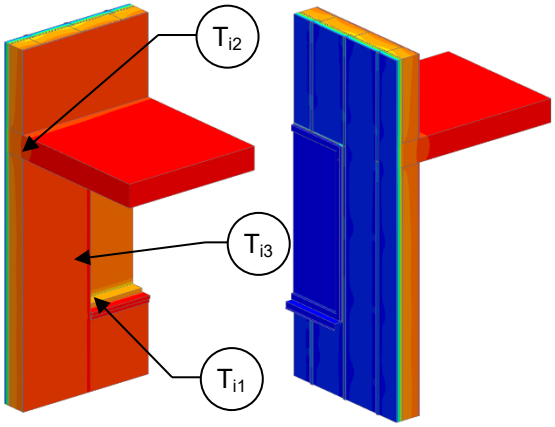
Sill Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-1.1 (0.11 to 0.20 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6” (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	5’ (1.5m) x 4’ (1.2m) Aluminum window: thermally broken, triple glazed IGU[2] U_{IGU} = 0.220 BTU/hr.ft².°F (1.25 W/m²K)					
11	Concrete Slab	8” (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
12	Aluminum Flashing	18 gauge	1110 (160)	-	171 (2739)	0.22 (900)
13	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.3.17

Owens Corning Exterior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding – Triple Glazed Aluminum Window and Intermediate Floor Intersection



View from Interior View from Exterior



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.3 (0.58 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	$U_{w,}$ $R_{w,}$ $U_{g,}$	“clear wall” U- and R-value: w = wall without intermediate floor g = glazing
Transmittance / Resistance	$U_{floor,}$ $R_{floor,}$ $U_{t,}$ R_{t}	U and R-values for: floor = wall + intermediate floor t = combined wall + floor + window
Linear Transmittance	Ψ	Incremental increase in transmittance per linear length

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Base Assembly – Glazing

$U_{centre\ of\ glass}$ Btu/ft² ·hr ·°F (W/m² K)	U_g Btu/ft² ·hr ·°F (W/m² K)
0.220 (1.25)	0.208 (1.18)

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Steel Stud Clear Wall

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-11.7 (2.06)	R-10.0 (1.77)	0.100 (0.57)
R-21.0 (3.70)	R-24.3 (4.28)	R-17.6 (3.10)	0.057 (0.32)

Intermediate Floor Linear Transmittance

R_{floor} ft²·hr·°F / Btu (m² K / W)	U_{floor} Btu/ft² ·hr ·°F (W/m² K)	Ψ_{floor} Btu/ft ·hr ·°F (W/m K)
R-9.7 (1.72)	0.103 (0.58)	0.020 (0.034)
R-17.0 (3.00)	0.059 (0.33)	0.013 (0.023)

Window Transition Transmittance

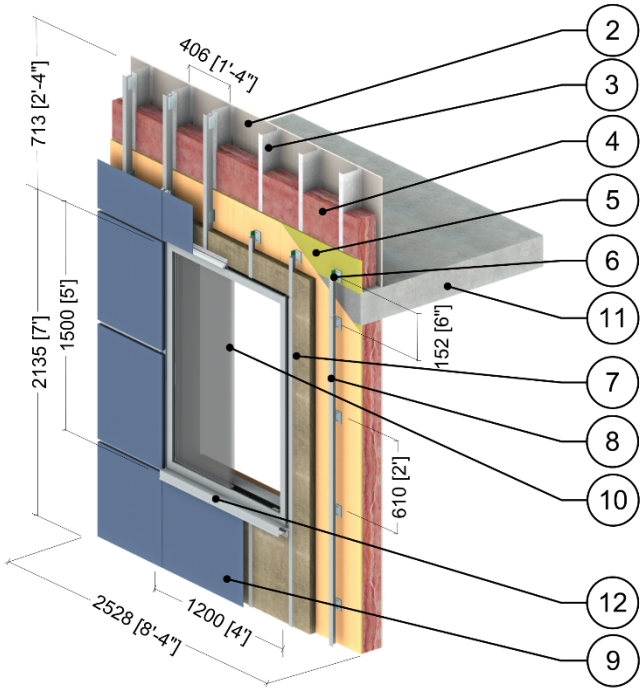
Exterior Insulation 1D R-Value (RSI)	R_t ft²·hr·°F / Btu (m² K / W)	U_t Btu/ft² ·hr ·°F (W/m² K)	Ψ_{Head} Btu/ft ·hr ·°F (W/m K)	Ψ_{Sill} Btu/ft ·hr ·°F (W/m K)	Ψ_{Jamb} Btu/ft ·hr ·°F (W/m K)	Ψ_{Total} Btu/ft ·hr ·°F (W/m K)
R-8.4 (1.48)	R-7.5 (1.32)	0.133 (0.76)	0.050 (0.086)	0.033 (0.057)	0.043 (0.075)	0.033 (0.056)
R-21.0 (3.70)	R-9.4 (1.65)	0.107 (0.61)	0.045 (0.078)	0.052 (0.090)	0.047 (0.082)	0.062 (0.107)

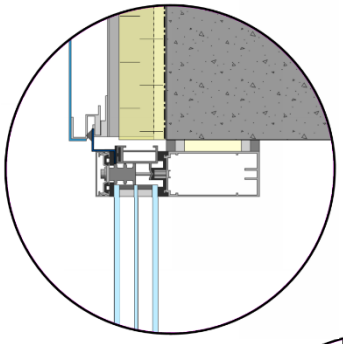
Temperature Indices

	R8.4	R21	
T_{i1}	0.71	0.71	Min T on window frame, at bottom corner at edge of glass
T_{i2}	0.86	0.91	Max T on interior surface of sheathing, along bottom track
T_{i3}	0.69	0.66	Min T on interior surface of sheathing, at bracket along jamb

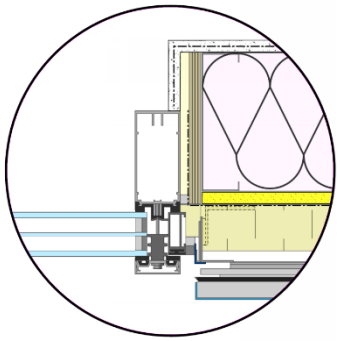
Detail 5.3.18

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Triple Glazed Aluminum Window and Intermediate Floor Intersection

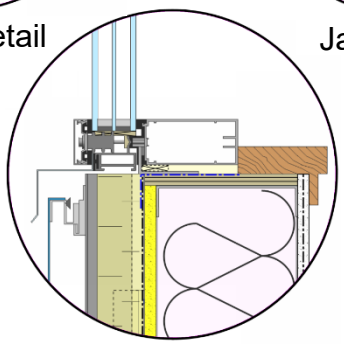




Head Detail



Jamb Detail



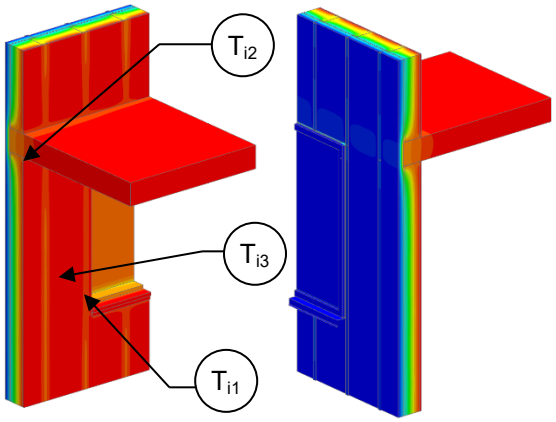
Sill Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-1.1 (0.11 to 0.20 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	5’ (1.5m) x 4’ (1.2m) Aluminum window: thermally broken, double glazed IGU[2] U_{IGU} = 0.220 BTU/hr.ft².°F (1.25 W/m²K)					
11	Concrete Slab	8” (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
12	Aluminum Flashing	18 gauge	1110 (160)	-	171 (2739)	0.22 (900)
13	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 to 0.12 RSI)	-	-

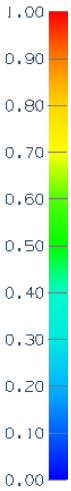
[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.3.18

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Triple Glazed Aluminum Window and Intermediate Floor Intersection



View from Interior View from Exterior



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.4 (3.94 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	$U_{w,}$ $R_{w,}$ $U_{g,}$	“clear wall” U- and R-value: w = wall without intermediate floor g = glazing
Transmittance / Resistance	$U_{floor,}$ $R_{floor,}$ $U_{t,}$ R_{t}	U and R-values for: floor = wall + intermediate floor t = combined wall + floor + window
Linear Transmittance	Ψ	Incremental increase in transmittance per linear length

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Base Assembly – Glazing

$U_{centre\ of\ glass}$ Btu/ft² ·hr ·°F (W/m² K)	U_g Btu/ft² ·hr ·°F (W/m² K)
0.220 (1.25)	0.208 (1.18)

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Steel Stud Clear Wall

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-30.8 (5.42)	R-18.3 (3.23)	0.055 (0.31)
R-21.0 (3.70)	R-43.4 (7.64)	R-25.8 (4.54)	0.039 (0.22)

Intermediate Floor Linear Transmittance

R_{floor} ft²·hr·°F / Btu (m² K / W)	U_{floor} Btu/ft² ·hr ·°F (W/m² K)	Ψ_{floor} Btu/ft² ·hr ·°F (W/m² K)
R-15.3 (2.69)	0.065 (0.37)	0.076 (0.132)
R-22.5 (3.96)	0.045 (0.25)	0.040 (0.069)

Window Transition Transmittance

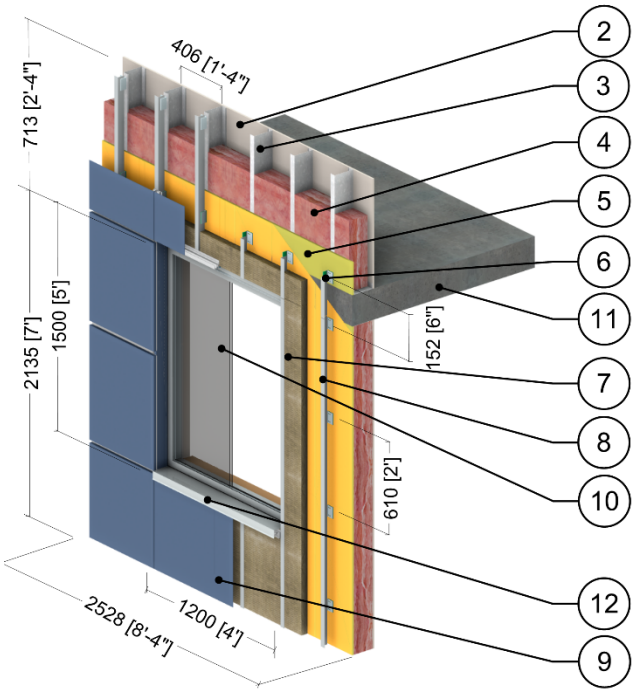
Exterior Insulation 1D R-Value (RSI)	R_t ft²·hr·°F / Btu (m² K / W)	U_t Btu/ft² ·hr ·°F (W/m² K)	Ψ_{Head} Btu/ft ·hr ·°F (W/m K)	Ψ_{Sill} Btu/ft ·hr ·°F (W/m K)	Ψ_{Jamb} Btu/ft ·hr ·°F (W/m K)	Ψ_{Total} Btu/ft ·hr ·°F (W/m K)
R-8.4 (1.48)	R-9.7 (1.70)	0.103 (0.59)	0.093 (0.162)	0.033 (0.057)	0.045 (0.078)	0.044 (0.077)
R-21.0 (3.70)	R-10.9 (1.92)	0.092 (0.52)	0.063 (0.109)	0.043 (0.075)	0.043 (0.075)	0.052 (0.091)

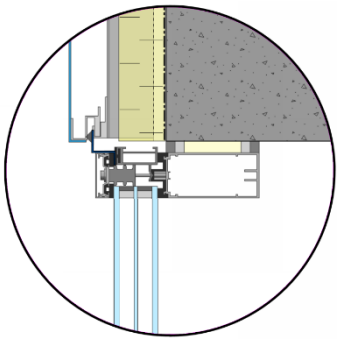
Temperature Indices

	R8.4	R21	
T_{i1}	0.70	0.70	Min T on window frame, at bottom corner at edge of glass
T_{i2}	0.84	0.89	Max T on interior surface of sheathing, along bottom track
T_{i3}	0.36	0.47	Min T on interior surface of sheathing, between studs

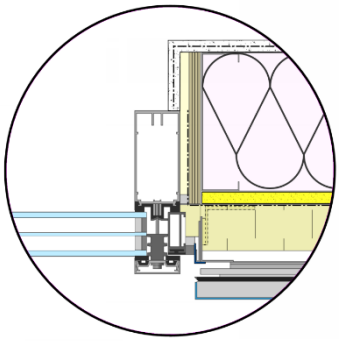
Detail 5.3.19

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Triple Glazed Aluminum Window and Intermediate Floor Intersection

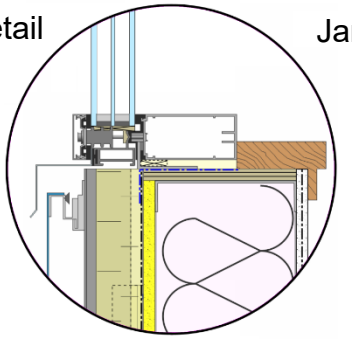




Head Detail



Jamb Detail



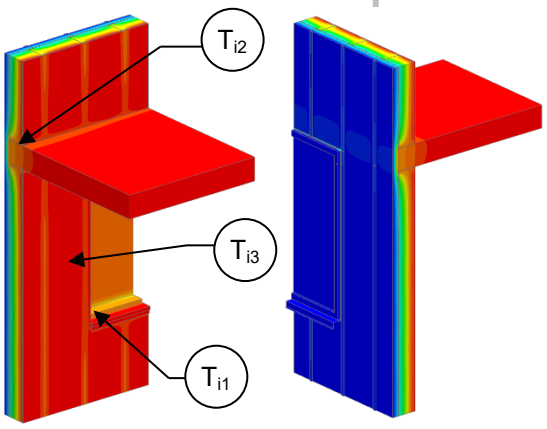
Sill Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-1.1 (0.11 to 0.20 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6” x 1 5/8” Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6” (152)	0.26 (0.038)	R-22.5 (3.96 RSI)	0.99 (15.9)	0.17 (710)
5	Exterior Sheathing	5/8” (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09” (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Metal Cladding with 1/2” vented airspace incorporated into exterior heat transfer coefficient					
10	5’ (1.5m) x 4’ (1.2m) Aluminum window: thermally broken, double glazed IGU[2] U_{IGU} = 0.220 BTU/hr.ft².°F (1.25 W/m²K)					
11	Concrete Slab	8” (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
12	Aluminum Flashing	18 gauge	1110 (160)	-	171 (2739)	0.22 (900)
13	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 5.3.19

Exterior and Interior Insulated 6” x 1 5/8” Steel Stud (16” o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24” o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Triple Glazed Aluminum Window and Intermediate Floor Intersection



View from Interior View from Exterior



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.9 (4.38 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	$U_{w,}$ $R_{w,}$ $U_{g,}$	“clear wall” U- and R-value: w = wall without intermediate floor g = glazing
Transmittance / Resistance	$U_{floor,}$ $R_{floor,}$ $U_{t,}$ R_{t}	U and R-values for: floor = wall + intermediate floor t = combined wall + floor + window
Linear Transmittance	ψ	Incremental increase in transmittance per linear length

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Base Assembly – Glazing

$U_{centre\ of\ glass}$ Btu/ft² ·hr ·°F (W/m² K)	U_g Btu/ft² ·hr ·°F (W/m² K)
0.220 (1.25)	0.208 (1.18)

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Steel Stud Clear Wall

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-33.3 (5.86)	R-19.0 (3.34)	0.053 (0.30)
R-21.0 (3.70)	R-45.9 (8.08)	R-26.4 (4.64)	0.038 (0.22)

Intermediate Floor Linear Transmittance

R_{floor} ft²·hr·°F / Btu (m² K / W)	U_{floor} Btu/ft² ·hr ·°F (W/m² K)	ψ_{floor} Btu/ft² ·hr ·°F (W/m² K)
R-15.6 (2.75)	0.064 (0.36)	0.079 (0.136)
R-22.8 (4.02)	0.044 (0.25)	0.041 (0.071)

Window Transition Transmittance

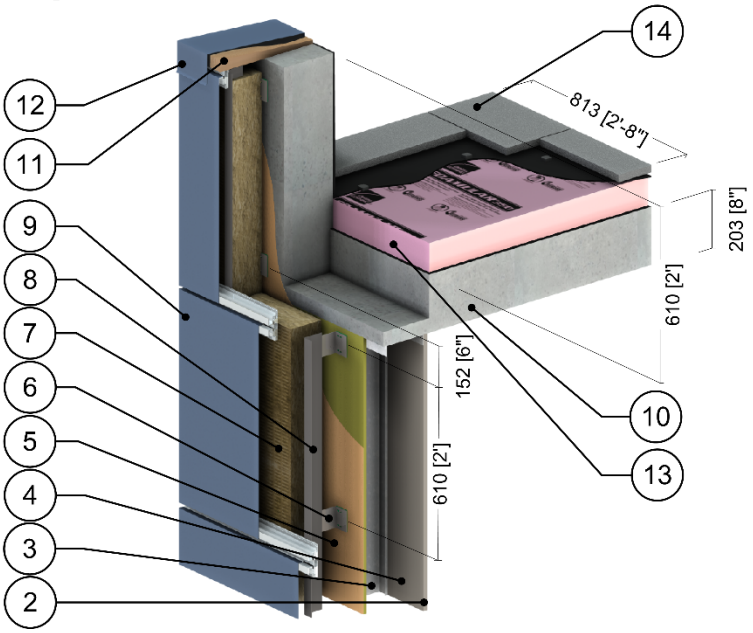
Exterior Insulation 1D R-Value (RSI)	R_t ft²·hr·°F / Btu (m² K / W)	U_t Btu/ft² ·hr ·°F (W/m² K)	ψ_{Head} Btu/ft ·hr ·°F (W/m K)	ψ_{Sill} Btu/ft ·hr ·°F (W/m K)	ψ_{Jamb} Btu/ft ·hr ·°F (W/m K)	ψ_{Total} Btu/ft ·hr ·°F (W/m K)
R-8.4 (1.48)	R-9.7 (1.70)	0.103 (0.59)	0.095 (0.165)	0.033 (0.057)	0.045 (0.079)	0.045 (0.078)
R-21.0 (3.70)	R-10.9 (1.92)	0.092 (0.52)	0.064 (0.111)	0.045 (0.078)	0.043 (0.075)	0.053 (0.091)

Temperature Indices

	R8.4	R21	
T_{i1}	0.70	0.70	Min T on window frame, at bottom corner at edge of glass
T_{i2}	0.84	0.89	Max T on interior surface of sheathing, along bottom track
T_{i3}	0.34	0.46	Min T on interior surface of sheathing, between studs

Detail 5.5.12

Owens Corning Exterior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding – Concrete Parapet and Roof Intersection

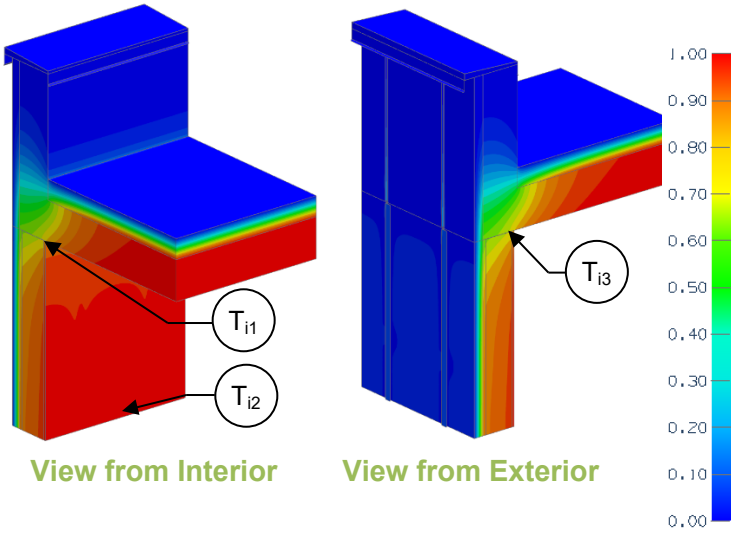


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6" (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
12	Cap Flashing	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
13	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
14	Flashing & roof finish material are incorporated into exterior heat transfer coefficient					
15	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.5.12

Owens Corning Exterior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding – Concrete Parapet and Roof Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.3 (0.58 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	"clear field" U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-11.7 (2.06)	R-10.0 (1.77)	0.100 (0.57)
R-21.0 (3.70)	R-24.3 (4.28)	R-17.6 (3.10)	0.057 (0.32)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

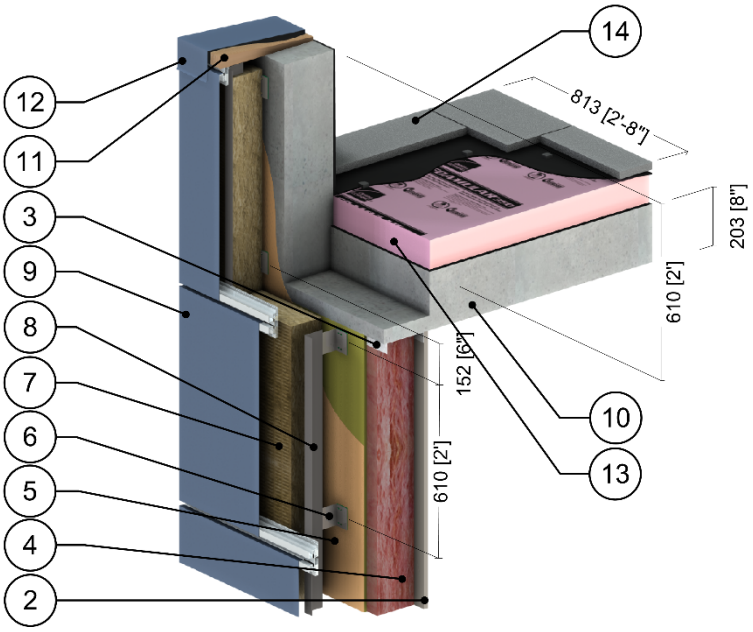
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-7.2 (1.28)	0.138 (0.78)	0.405 (0.701)
R-21.0 (3.70)	R-8.6 (1.51)	0.117 (0.66)	0.407 (0.704)

Temperature Indices

	R8.4	R21	
T_{i1}	0.58	0.62	Min T on sheathing at roof slab, at clip
T_{i2}	0.80	0.89	Max T on sheathing away from roof slab, between studs
T_{i3}	0.72	0.74	Min T on roof slab exposed to interior air, at gypsum between studs

Detail 5.5.13

Exterior and Interior Insulated 6" x 1 5/8"Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Concrete Parapet and Roof Intersection

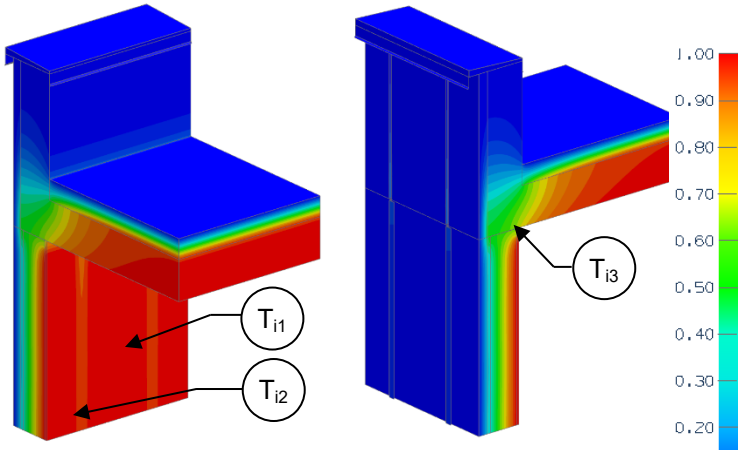


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
12	Cap Flashing	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
13	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
14	Flashing & roof finish material are incorporated into exterior heat transfer coefficient					
15	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.5.13

Exterior and Interior Insulated 6″ x 1 5/8″ Steel Stud (16″ o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24″ o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Concrete Parapet and Roof Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.4 (3.94 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	“clear field” U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-30.8 (5.42)	R-18.3 (3.23)	0.055 (0.31)
R-21.0 (3.70)	R-43.4 (7.64)	R-25.8 (4.54)	0.039 (0.22)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

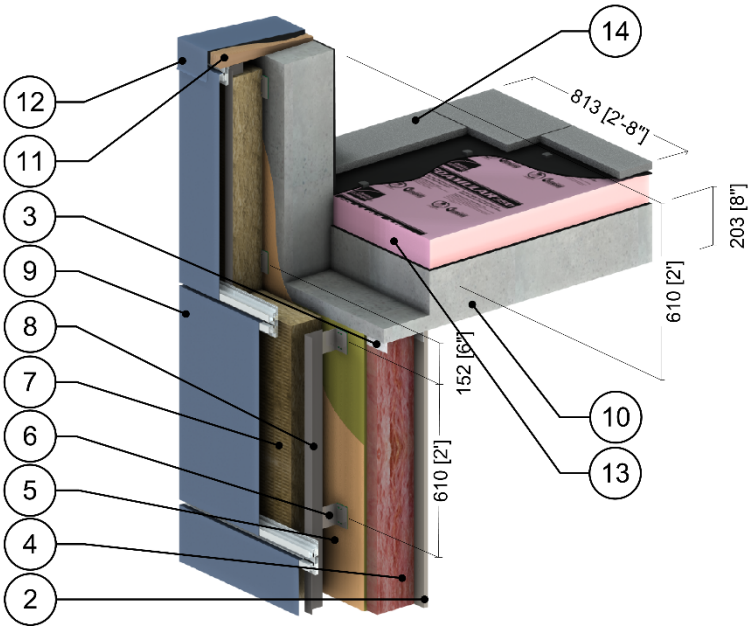
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-8.9 (1.57)	0.112 (0.64)	0.388 (0.671)
R-21.0 (3.70)	R-9.7 (1.71)	0.103 (0.59)	0.379 (0.657)

Temperature Indices

	R8.4	R21	
T_{i1}	0.35	0.54	Min T on sheathing at roof slab, away from roof slab, between studs at clip
T_{i2}	0.60	0.73	Max T on sheathing away from roof slab, at studs
T_{i3}	0.67	0.69	Min T on roof slab exposed to interior air, at gypsum between studs

Detail 5.5.14

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Concrete Parapet and Roof Intersection

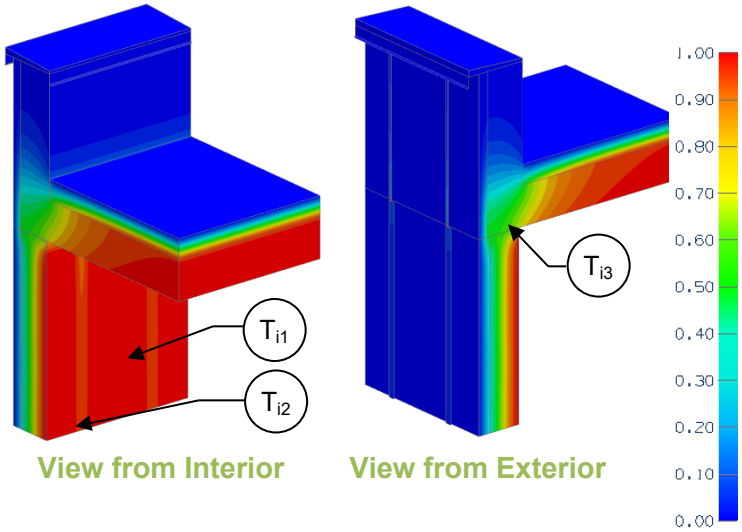


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.26 (0.038)	R-22.5 (3.96 RSI)	0.99 (15.9)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
12	Cap Flashing	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
13	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
14	Flashing & roof finish material are incorporated into exterior heat transfer coefficient					
15	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.5.14

Exterior and Interior Insulated 6″ x 1 5/8″ Steel Stud (16″ o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24″ o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Concrete Parapet and Roof Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.9 (4.38 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	“clear field” U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-33.3 (5.86)	R-19.0 (3.34)	0.053 (0.30)
R-21.0 (3.70)	R-45.9 (8.08)	R-26.4 (4.64)	0.038 (0.22)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

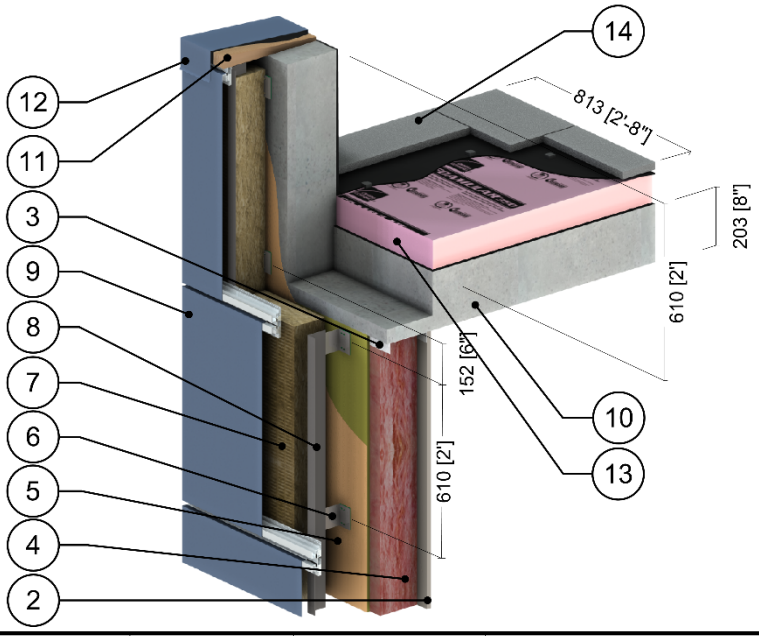
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-9.0 (1.58)	0.111 (0.63)	0.388 (0.671)
R-21.0 (3.70)	R-9.7 (1.72)	0.103 (0.58)	0.379 (0.656)

Temperature Indices

	R8.4	R21	
T_{i1}	0.33	0.52	Min T on sheathing at roof slab, away from roof slab, between studs at clip
T_{i2}	0.60	0.72	Max T on sheathing away from roof slab, at studs
T_{i3}	0.67	0.69	Min T on roof slab exposed to interior air, at gypsum between studs

Detail 5.5.15

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-24 Batt in Stud Cavity – Concrete Parapet and Roof Intersection

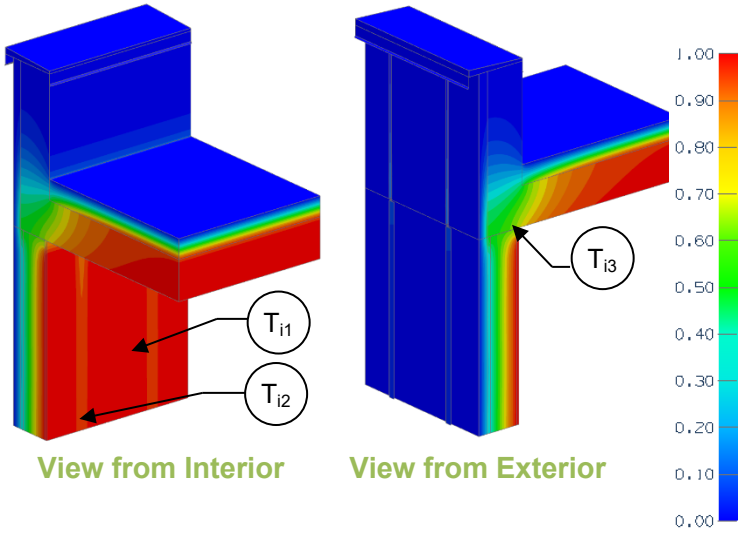


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.25 (0.036)	R-24 (4.23 RSI)	1.42 (22.7)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
12	Cap Flashing	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
13	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
14	Flashing & roof finish material are incorporated into exterior heat transfer coefficient					
15	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.5.15

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-24 Batt in Stud Cavity – Concrete Parapet and Roof Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-26.4 (4.65 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	"clear field" U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-34.8 (6.13)	R-19.3 (3.40)	0.052 (0.29)
R-21.0 (3.70)	R-47.4 (8.34)	R-26.7 (4.71)	0.037 (0.21)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

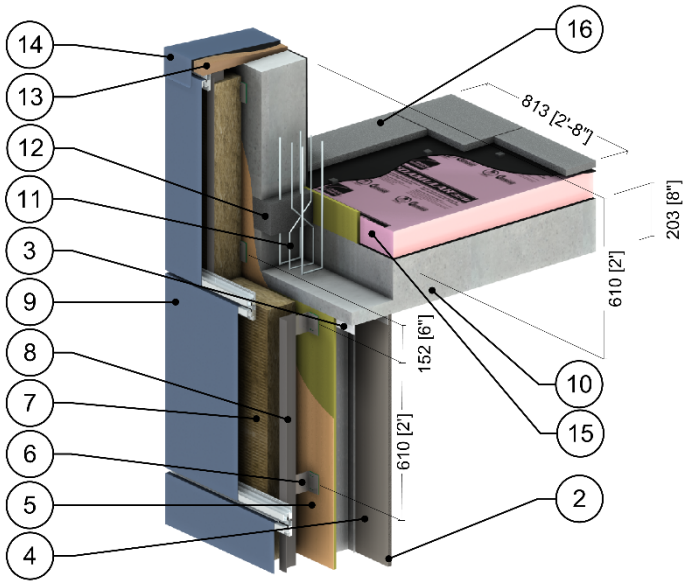
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-9.0 (1.59)	0.111 (0.63)	0.388 (0.672)
R-21.0 (3.70)	R-9.8 (1.72)	0.102 (0.58)	0.379 (0.657)

Temperature Indices

	R8.4	R21	
T_{i1}	0.32	0.50	Min T on sheathing at roof slab, away from roof slab, between studs at clip
T_{i2}	0.59	0.71	Max T on sheathing away from roof slab, at studs
T_{i3}	0.67	0.69	Min T on roof slab exposed to interior air, at gypsum between studs

Detail 5.5.16

Owens Corning Exterior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding – Concrete Roof Deck at Isokorb AXTI Thermal Broken Concrete Parapet

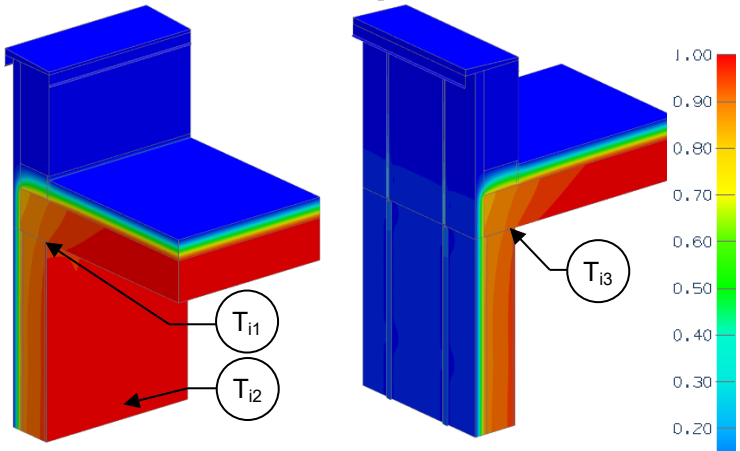


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	6" (152)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Stainless Steel Rebar	-	118 (17)	-	500 (8000)	0.12 (500)
12	Polystyrene Rigid Foam Insulation	4 3/4" (120)	0.217 (0.031)	R-22.0 (3.87 RSI)	66 (1060)	0.35 (1500)
13	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
14	Cap Flashing	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
15	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
16	Flashing & roof finish material are incorporated into exterior heat transfer coefficient					
17	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.5.16

Owens Corning Exterior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding – Concrete Roof Deck at Isokorb AXTI Thermal Broken Concrete Parapet



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-3.3 (0.58 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	"clear field" U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-11.7 (2.06)	R-10.0 (1.77)	0.100 (0.57)
R-21.0 (3.70)	R-24.3 (4.28)	R-17.6 (3.10)	0.057 (0.32)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

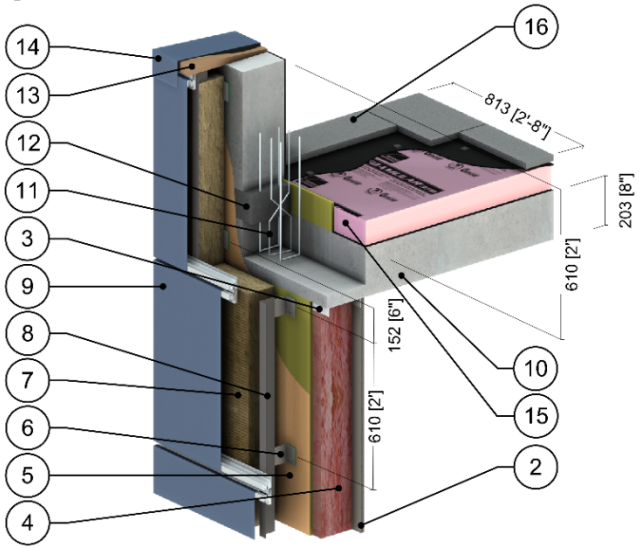
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-10.6 (1.87)	0.094 (0.53)	0.130 (0.225)
R-21.0 (3.70)	R-14.4 (2.54)	0.069 (0.39)	0.112 (0.194)

Temperature Indices

	R8.4	R21	
T_{i1}	0.71	0.76	Min T on sheathing at roof slab, at clip
T_{i2}	0.81	0.90	Max T on sheathing away from roof slab, between studs
T_{i3}	0.86	0.89	Min T on roof slab exposed to interior air, at gypsum between studs

Detail 5.5.17

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Concrete Roof Deck at Isokorb AXTI Thermal Broken Concrete Parapet

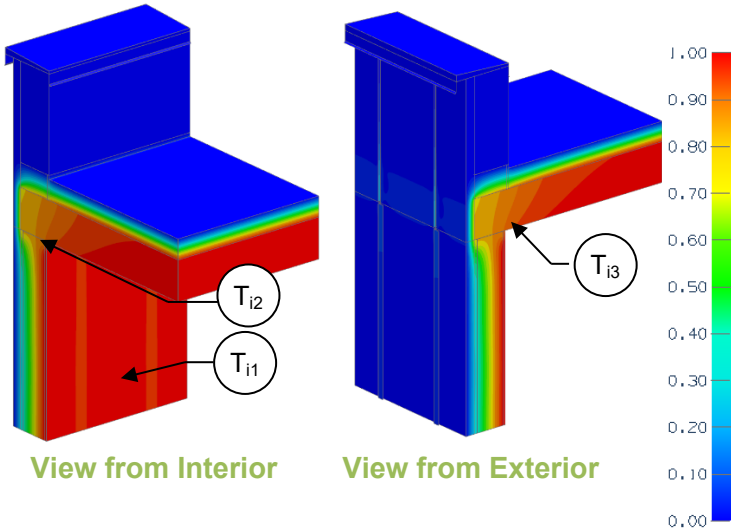


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.30 (0.043)	R-20 (3.52 RSI)	0.55 (8.8)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Stainless Steel Rebar	-	118 (17)	-	500 (8000)	0.12 (500)
12	Polystyrene Rigid Foam Insulation	4 3/4" (120)	0.217 (0.031)	R-22.0 (3.87 RSI)	66 (1060)	0.35 (1500)
13	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
14	Cap Flashing	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
15	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
16	Flashing & roof finish material are incorporated into exterior heat transfer coefficient					
17	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.5.17

Exterior and Interior Insulated 6″ x 1 5/8″ Steel Stud (16″ o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24″ o.c.) Supporting Metal Cladding and Owens Corning R-20 Batt in Stud Cavity – Concrete Roof Deck at Isokorb AXTI Thermal Broken Concrete Parapet



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.4 (3.94 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	“clear field” U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-30.8 (5.42)	R-18.3 (3.23)	0.055 (0.31)
R-21.0 (3.70)	R-43.4 (7.64)	R-25.8 (4.54)	0.039 (0.22)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

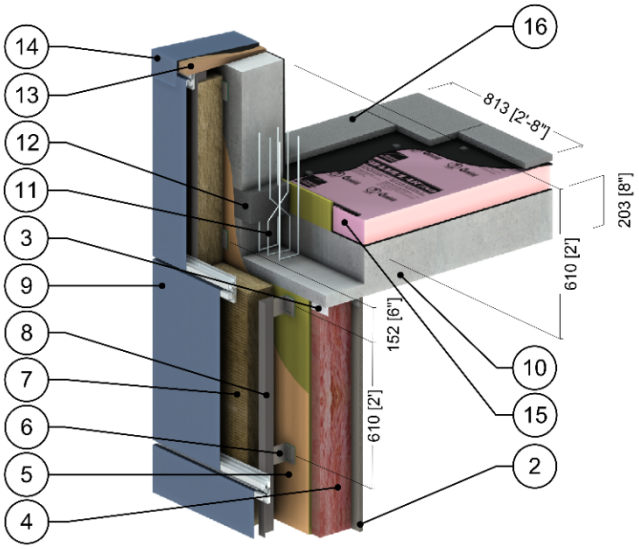
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-13.8 (2.43)	0.073 (0.41)	0.139 (0.241)
R-21.0 (3.70)	R-16.6 (2.92)	0.060 (0.34)	0.113 (0.196)

Temperature Indices

	R8.4	R21	
T_{i1}	0.35	0.53	Min T on sheathing away from roof slab, between studs at clip
T_{i2}	0.72	0.78	Max T on sheathing at roof slab, between studs
T_{i3}	0.84	0.87	Min T on roof slab exposed to interior air, at gypsum between studs

Detail 5.5.18

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Concrete Roof Deck at Isokorb AXTI Thermal Broken Concrete Parapet

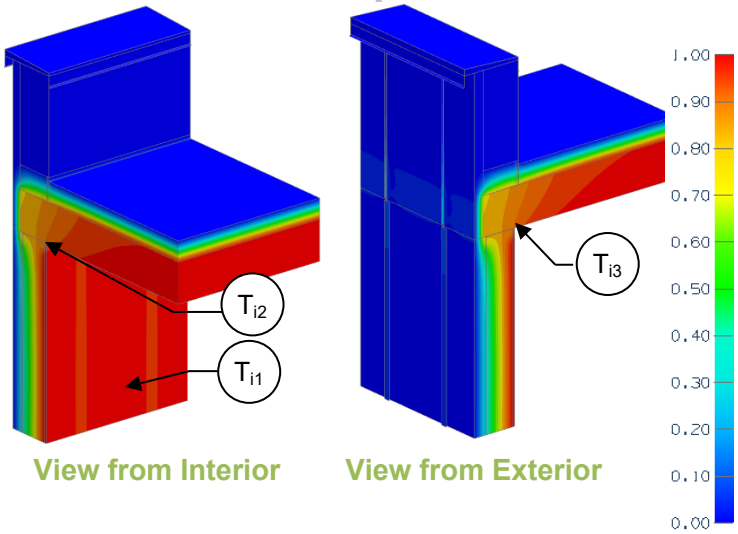


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.26 (0.038)	R-22.5 (3.96 RSI)	0.99 (15.9)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Stainless Steel Rebar	-	118 (17)	-	500 (8000)	0.12 (500)
12	Polystyrene Rigid Foam Insulation	4 3/4" (120)	0.217 (0.031)	R-22.0 (3.87 RSI)	66 (1060)	0.35 (1500)
13	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
14	Cap Flashing	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
15	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
16	Flashing & roof finish material are incorporated into exterior heat transfer coefficient					
17	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.5.18

Exterior and Interior Insulated 6″ x 1 5/8″ Steel Stud (16″ o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24″ o.c.) Supporting Metal Cladding and Owens Corning R-22.5 Batt in Stud Cavity – Concrete Roof Deck at Isokorb AXTI Thermal Broken Concrete Parapet



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-24.9 (4.38 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	“clear field” U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-33.3 (5.86)	R-19.0 (3.34)	0.053 (0.30)
R-21.0 (3.70)	R-45.9 (8.08)	R-26.4 (4.64)	0.038 (0.22)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

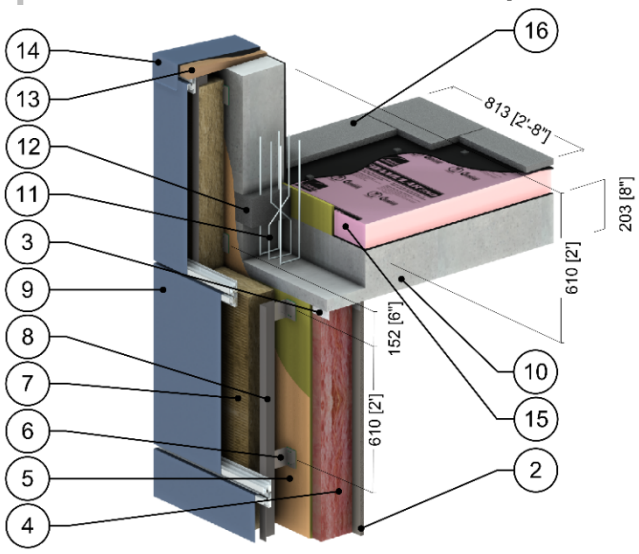
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-13.9 (2.46)	0.072 (0.41)	0.140 (0.242)
R-21.0 (3.70)	R-16.7 (2.94)	0.060 (0.34)	0.113 (0.196)

Temperature Indices

	R8.4	R21	
T_{i1}	0.33	0.51	Min T on sheathing away from roof slab, between studs at clip
T_{i2}	0.72	0.78	Max T on sheathing at roof slab, between studs
T_{i3}	0.84	0.87	Min T on roof slab exposed to interior air, at gypsum between studs

Detail 5.5.19

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24" o.c.) Supporting Metal Cladding and Owens Corning R-24 Batt in Stud Cavity – Concrete Roof Deck at Isokorb AXTI Thermal Broken Concrete Parapet

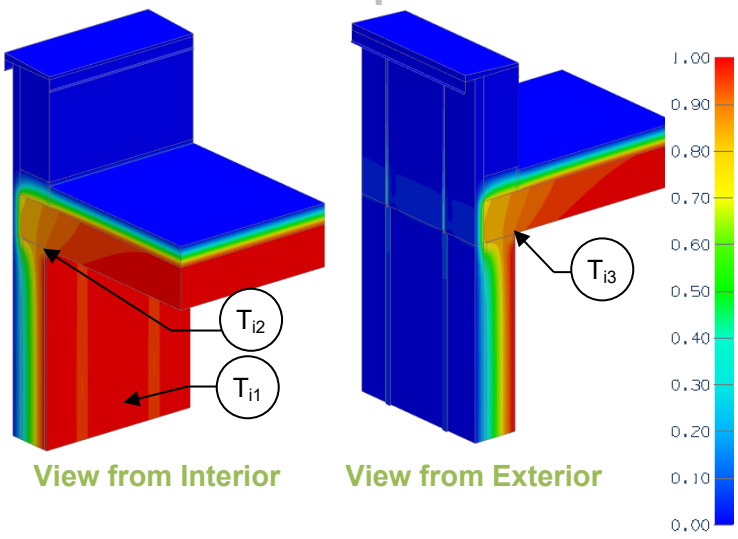


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	6" x 1 5/8" Steel Studs with Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Ecotouch Pink Fiberglass Batt	6" (152)	0.25 (0.036)	R-24 (4.23 RSI)	1.42 (22.7)	0.17 (710)
5	Exterior Sheathing	5/8" (16)	1.1 (0.16)	R-0.6 (0.10 RSI)	50 (800)	0.26 (1090)
6	Thermally Isolated Aluminum Bracket	varies	-	-	-	-
7	Thermafiber RainBarrier 45 Mineral Wool Semi Rigid Insulation	varies	0.24 (0.034)	R-8.4 to R-21.0 (1.48 to 3.70 RSI)	4.5 (72)	0.20 (850)
8	Vertical Aluminum L-girt	0.09" (2.2)	1110 (160)	-	171 (2739)	0.22 (900)
9	Cladding with 1/2" (13mm) vented airspace incorporated into exterior heat transfer coefficient					
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Stainless Steel Rebar	-	118 (17)	-	500 (8000)	0.12 (500)
12	Polystyrene Rigid Foam Insulation	4 3/4" (120)	0.217 (0.031)	R-22.0 (3.87 RSI)	66 (1060)	0.35 (1500)
13	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
14	Cap Flashing	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
15	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
16	Flashing & roof finish material are incorporated into exterior heat transfer coefficient					
17	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 5.5.19

Exterior and Interior Insulated 6″ x 1 5/8″ Steel Stud (16″ o.c.) Wall Assembly with Thermally Isolated Vertical Brackets and Rail System (24″ o.c.) Supporting Metal Cladding and Owens Corning R-24 Batt in Stud Cavity – Concrete Roof Deck at Isokorb AXTI Thermal Broken Concrete Parapet



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-26.4 (4.65 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	"clear field" U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-8.4 (1.48)	R-34.8 (6.13)	R-19.3 (3.40)	0.052 (0.29)
R-21.0 (3.70)	R-47.4 (8.34)	R-26.7 (4.71)	0.037 (0.21)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

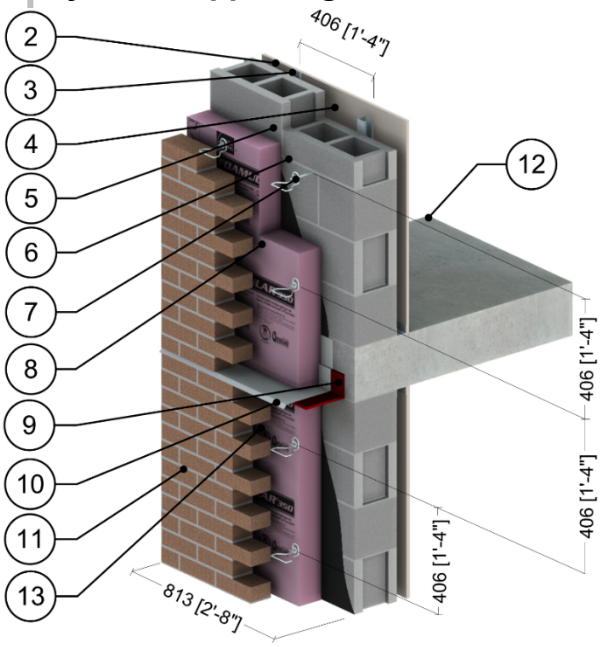
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-8.4 (1.48)	R-14.0 (2.47)	0.071 (0.41)	0.141 (0.244)
R-21.0 (3.70)	R-16.7 (2.94)	0.060 (0.34)	0.115 (0.199)

Temperature Indices

	R8.4	R21	
T_{i1}	0.32	0.51	Min T on sheathing away from roof slab, between studs at clip
T_{i2}	0.72	0.78	Max T on sheathing at roof slab, between studs
T_{i3}	0.84	0.87	Min T on roof slab exposed to interior air, at gypsum between studs

Detail 7.2.22

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Shelf Angle and Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer – Intermediate Floor Intersection

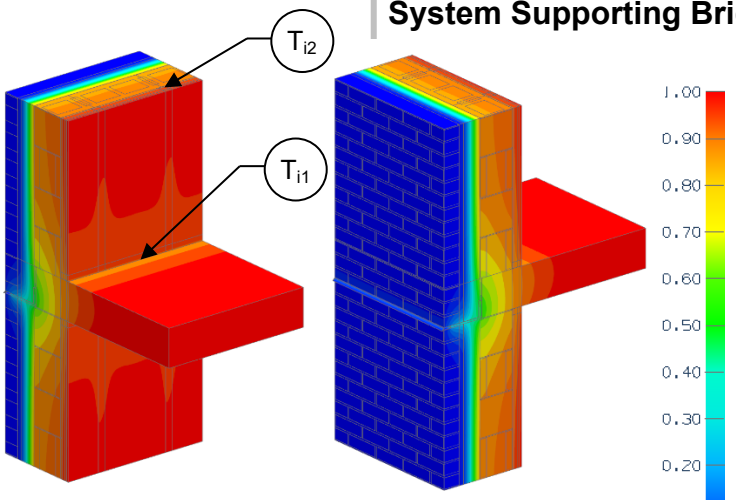


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.9 (0.11 to 0.16 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	1 5/8" Steel Studs with Metal Tracks	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Standard Concrete Block	7 5/8" (190)	3.5 (0.5)	-	119 (1900)	0.19 (800)
6	Cement Mortar	-	3.5 (0.5)	-	113 (1800)	0.12 (500)
7	Heckmann Pos-I-Tie Masonry Tie @ 16" (406) o.c.	varies	-	-	-	-
8	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
9	Steel Shelf Angle	3/8" (10)	347 (50)	-	489 (7830)	0.12 (500)
10	Metal Flashing	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
11	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
12	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
13	Vented Air Gap[2]	1" (25)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
14	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 7.2.22

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Shelf Angle and Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer – Intermediate Floor Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-5.6 (0.99 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab and shelf angle
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of shelf angle and slab

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

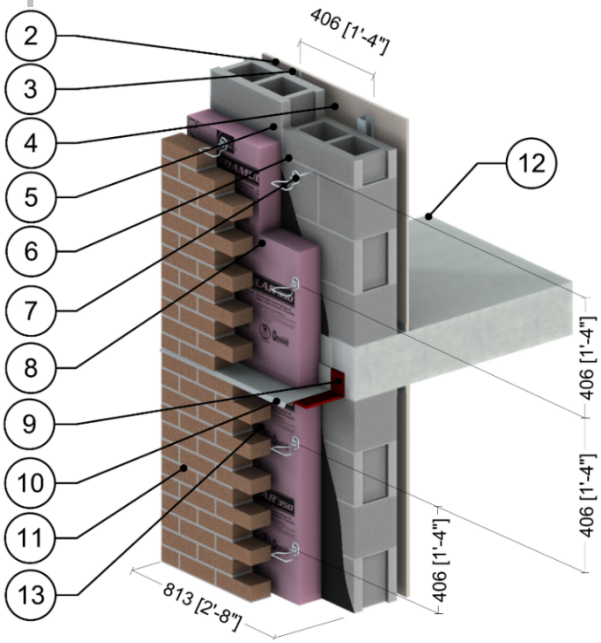
Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-10.0 (1.76)	R-15.6 (2.75)	R-13.4 (2.36)	0.075 (0.42)	R-8.3 (1.46)	0.121 (0.69)	0.277 (0.480)
R-20.0 (3.52)	R-25.6 (4.51)	R-20.0 (3.52)	0.050 (0.28)	R-10.1 (1.78)	0.099 (0.56)	0.292 (0.506)

Temperature Indices

	R10	R20	
T_{i1}	0.77	0.80	Min T on slab exposed to interior air, between studs
T_{i2}	0.85	0.86	Max T on concrete block away from slab, at studs

Detail 7.2.23

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Stainless Steel Stand-off Shelf Angle and Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer – Intermediate Floor Intersection

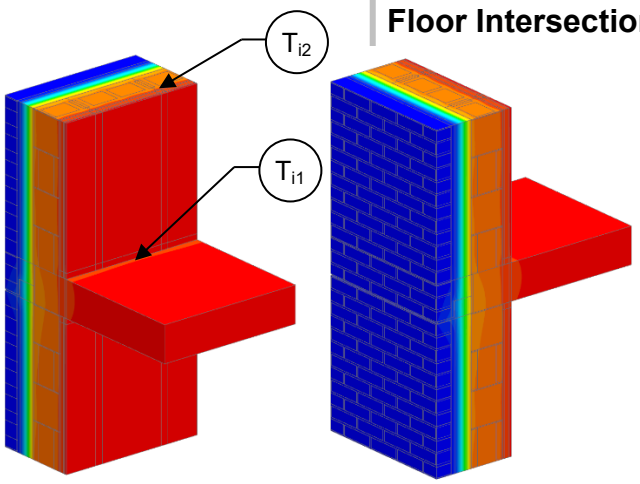


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.9 (0.11 to 0.16 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	1 5/8" Steel Studs with Metal Tracks	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Standard Concrete Block	7 5/8" (190)	3.5 (0.5)	-	119 (1900)	0.19 (800)
6	Cement Mortar	-	3.5 (0.5)	-	113 (1800)	0.12 (500)
7	Heckmann Pos-I-Tie Masonry Tie @ 16" (406) o.c.	varies	-	-	-	-
8	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
9	Stainless Steel Stand-off Shelf Angle	3/8" (10)	118 (17)	-	503 (8060)	0.12 (500)
10	Flashing	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
11	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
12	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
13	Vented Air Gap[2]	1" (25)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
14	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 7.2.23

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Stainless Steel Stand-off Shelf Angle and Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer – Intermediate Floor Intersection



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-5.6 (0.99 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab and shelf angle
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of shelf angle and slab

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

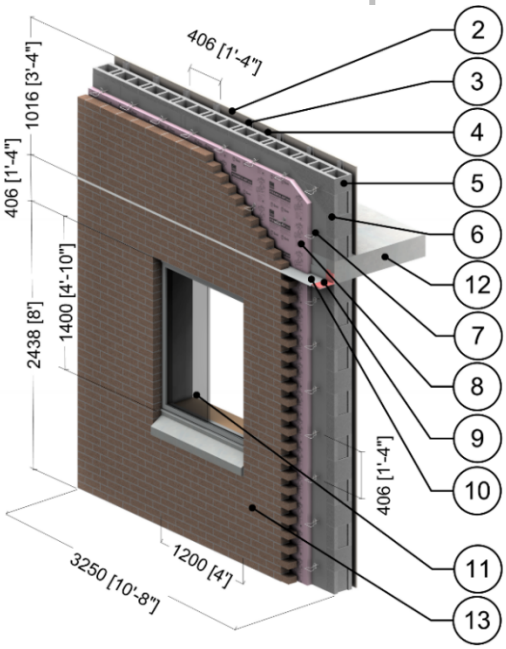
Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-10.0 (1.76)	R-15.6 (2.75)	R-13.4 (2.36)	0.075 (0.42)	R-11.7 (2.06)	0.085 (0.49)	0.064 (0.112)
R-20.0 (3.52)	R-25.6 (4.51)	R-20.0 (3.52)	0.050 (0.28)	R-16.9 (2.98)	0.059 (0.34)	0.054 (0.093)

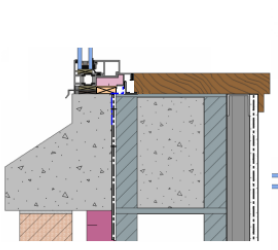
Temperature Indices

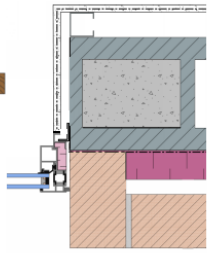
	R10	R20	
T_{i1}	0.85	0.90	Min T on slab exposed to interior air, between studs
T_{i2}	0.88	0.92	Max T on concrete block away from slab, at studs

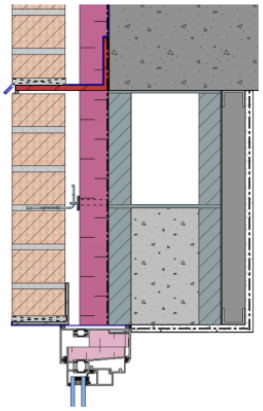
Detail 7.3.14

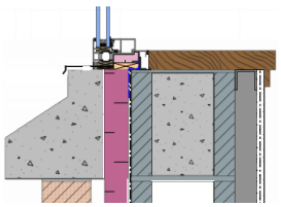
Owens Corning Exterior Insulated Concrete Block Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer with Insulation Interrupted at Window Perimeter – Double Glazed Aluminum Window and Intermediate Floor Intersection

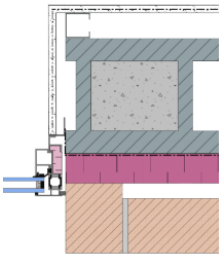



R-10 Sill


R-10 Jamb


Head


R-20 Sill

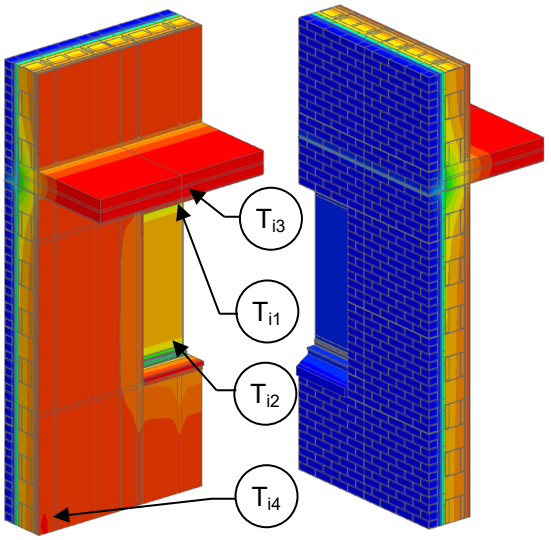

R-20 Jamb

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.6 to R-1.1 (0.11 to 0.20 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	1 5/8" x 1 5/8" Steel Studs (16"o.c.) with Top and Bottom Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Standard Concrete Block	7 5/8" (190)	3.5 (0.5)	-	119 (1900)	0.19 (800)
6	Cement Mortar	-	3.5 (0.5)	-	119 (1900)	0.12 (500)
7	Heckmann Pos-I-Tie Masonry Tie @ 16" (406) o.c.	varies	-	-	-	-
8	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
9	Steel Shelf Angle	3/8" (10)	347 (50)	-	489 (7830)	0.12 (500)
10	Steel Lintel	1/4" (6)	347 (50)	-	489 (7830)	0.12 (500)
11	4'8 (1.4m) x 4' (1.2m) Aluminum window: thermally broken, double glazed IGU[2] U_{IGU} = 0.321 BTU/hr.ft².°F (1.82 W/m²K)					
12	Concrete Slab	8" (203)	12 (1.8)	-	140 (2250)	0.20 (850)
13	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
14	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 7.3.14

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer with Insulation Interrupted at Window Perimeter – Double Glazed Aluminum Window and Intermediate Floor Intersection





View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-5.6 (0.99 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	$U_{w,}$ $R_{w,}$ $U_{g,}$	"clear wall" U- and R-value: w = wall without intermediate floor g = glazing
Transmittance / Resistance	$U_{floor,}$ $R_{floor,}$ $U_{t,}$ R_{t}	U and R-values for: floor = wall + intermediate floor t = combined wall + floor + window
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	Ψ	Incremental increase in transmittance per linear length

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Base Assembly – Glazing

$U_{centre\ of\ glass}$ Btu/ft² ·hr ·°F (W/m² K)	U_g Btu/ft² ·hr ·°F (W/m² K)
0.321 (1.82)	0.408 (2.32)

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Steel Stud Clear Wall

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-10.0 (1.76)	R-15.6 (2.75)	R-13.4 (2.36)	0.075 (0.42)
R-20.0 (3.52)	R-25.6 (4.51)	R-20.0 (3.52)	0.050 (0.28)

Intermediate Floor Linear Transmittance

R_{floor} ft²·hr·°F / Btu (m² K / W)	U_{floor} Btu/ft² ·hr ·°F (W/m² K)	Ψ_{floor} Btu/ft² ·hr ·°F (W/m² K)
R-8.3 (1.46)	0.121 (0.69)	0.277 (0.480)
R-10.1 (1.78)	0.099 (0.56)	0.292 (0.506)

Window Transition Transmittance

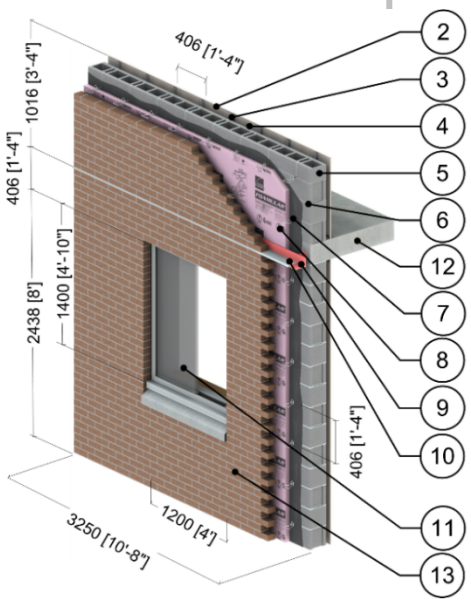
Exterior Insulation 1D R-Value (RSI)	R_t ft²·hr·°F / Btu (m² K / W)	U_t Btu/ft² ·hr ·°F (W/m² K)	Ψ_{Head} Btu/ft ·hr ·°F (W/m K)	Ψ_{Sill} Btu/ft ·hr ·°F (W/m K)	Ψ_{Jamb} Btu/ft ·hr ·°F (W/m K)	Ψ_{Total} Btu/ft ·hr ·°F (W/m K)
R-10.0 (1.76)	R-5.7 (1.00)	0.177 (0.28)	0.141 (0.24)	0.395 (0.68)	0.244 (0.42)	0.431 (0.746)
R-20.0 (3.52)	R-7.1 (1.24)	0.142 (0.28)	0.362 (0.63)	0.131 (0.23)	0.076 (0.13)	0.148 (0.257)

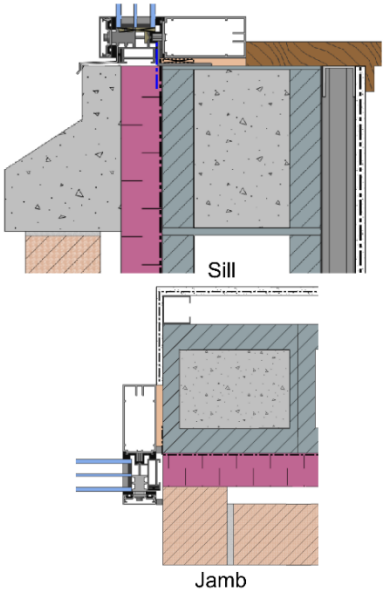
Temperature Indices

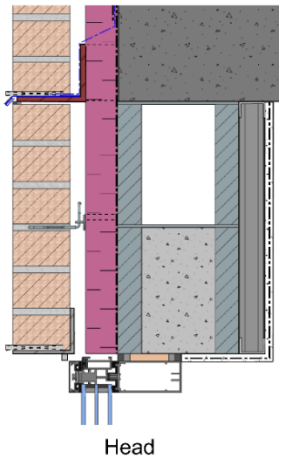
	R10	R20	
T_{i1}	0.53	0.43	Min T at centre of window head
T_{i2}	0.47	0.62	Min T at centre of window sill
T_{i3}	0.74	0.75	Min T on interior surface of CMU at ceiling
T_{i4}	0.85	0.90	Max T on interior surface of CMU at steel studs, away from floor

Detail 7.3.15

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer with Reduced Insulation at Jambs – Triple Glazed Aluminum High Performance Window and Intermediate Floor Intersection





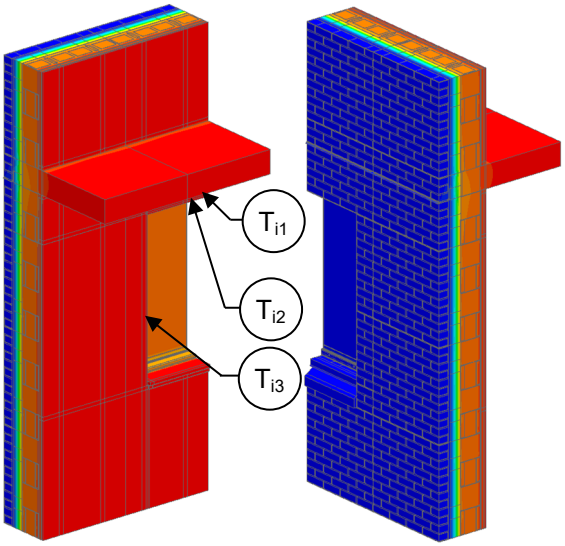


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.6 to R-1.1 (0.11 to 0.20 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	1 5/8" x 1 5/8" Steel Studs (16"o.c.) with Top and Bottom Tracks	18 Gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Standard Concrete Block	7 5/8" (190)	3.5 (0.5)	-	119 (1900)	0.19 (800)
6	Cement Mortar	-	3.5 (0.5)	-	119 (1900)	0.12 (500)
7	Heckmann Pos-I-Tie Masonry Tie @ 16" (406) o.c.	varies	-	-	-	-
8	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
9	Stainless Steel Shelf Angle	3/8" (10)	118 (17)	-	503 (8060)	0.12 (500)
10	Steel Lintel	1/4" (6)	347 (50)	-	489 (7830)	0.12 (500)
11	4'8 (1.5m) x 4' (1.2m) Aluminum window: thermally broken, triple glazed IGU[2] U_{IGU} = 0.22 BTU/hr.ft².°F (1.25 W/m²K)					
12	Concrete Slab	8" (203)	12 (1.8)	-	140 (2250)	0.20 (850)
13	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
14	Spray Foam Insulation	3/8" (10)	0.17 (0.024)	-	2.8 (39)	0.35 (1470)
15	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 7.3.15

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer with Reduced Insulation at Jambs – Triple Glazed Aluminum High Performance Window and Intermediate Floor Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-5.6 (0.99 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_w, R_w, U_g,	"clear wall" U- and R-value: w = wall without intermediate floor g = glazing
Transmittance / Resistance	U_{floor}, R_{floor}, U_t, R_t	U and R-values for: floor = wall + intermediate floor t = combined wall + floor + window
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Base Assembly – Glazing

$U_{centre\ of\ glass}$ Btu/ft² ·hr ·ºF (W/m² K)	U_g Btu/ft² ·hr ·ºF (W/m² K)
0.220 (1.25)	0.204 (1.16)

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Steel Stud Clear Wall

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·ºF / Btu (m² K / W)	R_w ft²·hr·ºF / Btu (m² K / W)	U_w Btu/ft² ·hr ·ºF (W/m² K)
R-10.0 (1.76)	R-15.6 (2.75)	R-13.4 (2.36)	0.075 (0.42)
R-20.0 (3.52)	R-25.6 (4.51)	R-20.0 (3.52)	0.050 (0.28)

Intermediate Floor Linear Transmittance

R_{floor} ft²·hr·ºF / Btu (m² K / W)	U_{floor} Btu/ft² ·hr ·ºF (W/m² K)	ψ_{floor} Btu/ft² ·hr ·ºF (W/m² K)
R-11.7 (2.06)	0.085 (0.48)	0.064 (0.112)
R-16.9 (2.98)	0.059 (0.34)	0.054 (0.093)

Window Transition Transmittance

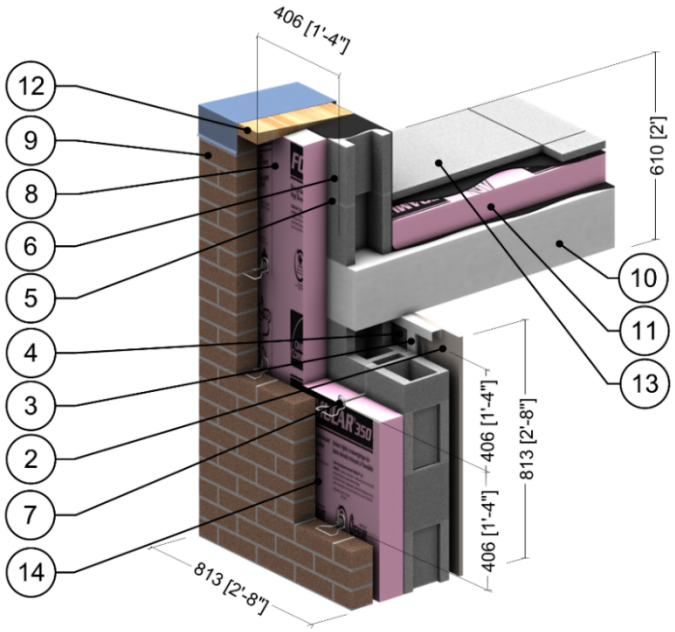
Exterior Insulation 1D R-Value (RSI)	R_t ft²·hr·ºF / Btu (m² K / W)	U_t Btu/ft² ·hr ·ºF (W/m² K)	ψ_{Head} Btu/ft ·hr ·ºF (W/m K)	ψ_{Sill} Btu/ft ·hr ·ºF (W/m K)	ψ_{Jamb} Btu/ft ·hr ·ºF (W/m K)	ψ_{Total} Btu/ft ·hr ·ºF (W/m K)
R-10.0 (1.76)	R-9.6 (1.69)	0.104 (0.42)	0.053 (0.09)	0.020 (0.03)	0.082 (0.14)	0.051 (0.088)
R-20.0 (3.52)	R-12.1 (2.12)	0.083 (0.28)	0.142 (0.25)	0.015 (0.03)	0.058 (0.10)	0.058 (0.101)

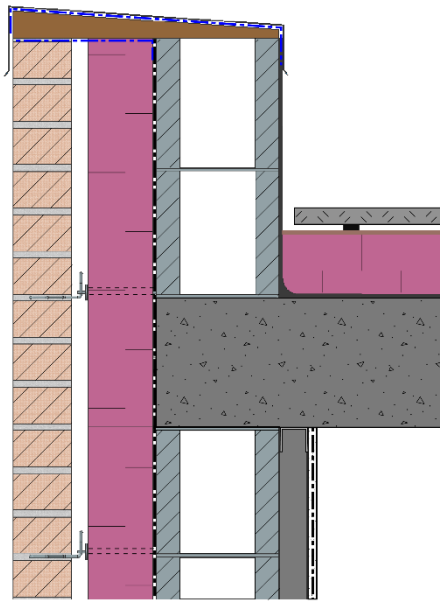
Temperature Indices

	R10	R20	
T_{i1}	0.81	0.77	Min T on window frame, at centre of window head
T_{i3}	0.86	0.90	Min T on interior surface of CMU at ceiling
T_{i4}	0.91	0.92	Max T on interior surface of CMU, at Jamb

Detail 7.5.11

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer – Parapet & Roof Intersection with Uninsulated Parapet



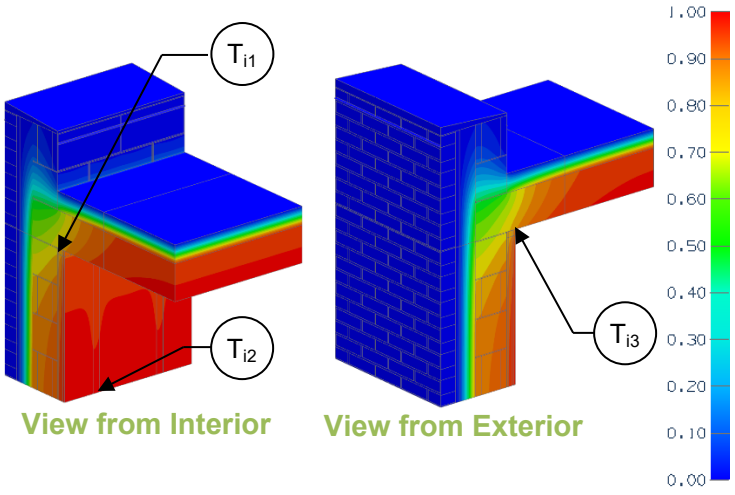


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	1 5/8" Steel Studs with Metal Tracks	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Standard Concrete Block	7 5/8" (190)	3.5 (0.5)	-	119 (1900)	0.19 (800)
6	Cement Mortar	-	3.5 (0.5)	-	113 (1800)	0.12 (500)
7	Heckmann Pos-I-Tie Masonry Tie @ 16" (406) o.c.	varies	-	-	-	-
8	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
9	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
12	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
13	Flashing & roof finish materials are incorporated into exterior heat transfer coefficient					
14	Air Gap	1" (25)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
15	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 7.5.11

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer – Roof to Wall Intersection with Uninsulated Parapet



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-5.6 (0.99 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	"clear field" U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-10.0 (1.76)	R-15.6 (2.75)	R-13.4 (2.36)	0.075 (0.42)
R-20.0 (3.52)	R-25.6 (4.51)	R-20.0 (3.52)	0.050 (0.28)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

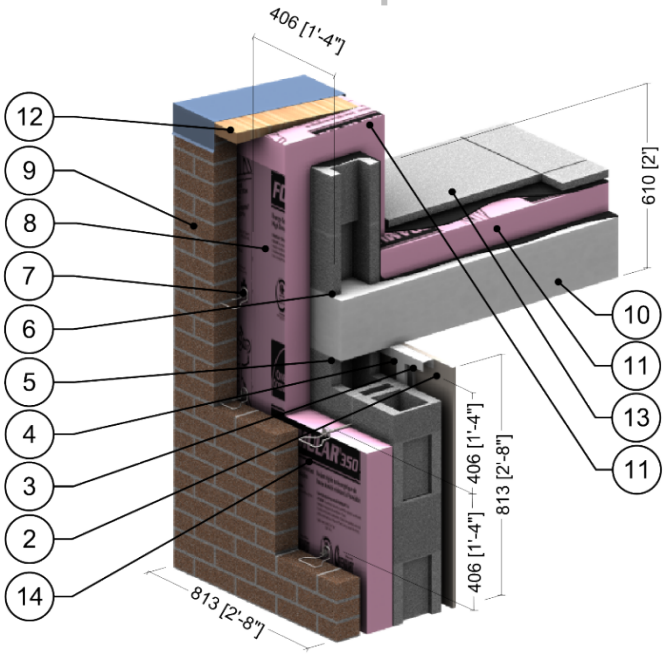
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-10.0 (1.76)	R-8.9 (1.56)	0.113 (0.64)	0.292 (0.505)
R-20.0 (3.52)	R-10.0 (1.75)	0.100 (0.57)	0.290 (0.502)

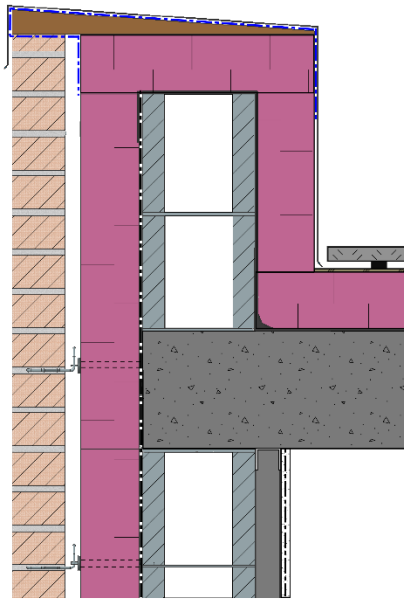
Temperature Indices

	R10	R20	
T_{i1}	0.72	0.74	Min T on interior CMU surface, at concrete roof slab intersection
T_{i2}	0.85	0.89	Max T on interior CMU surface, at studs and away from concrete roof slab intersection
T_{i3}	0.78	0.79	Min T on concrete ceiling, at drywall intersection, exposed to interior air

Detail 7.5.12

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer – Parapet & Roof Intersection with Insulation Wrapped Around Parapet



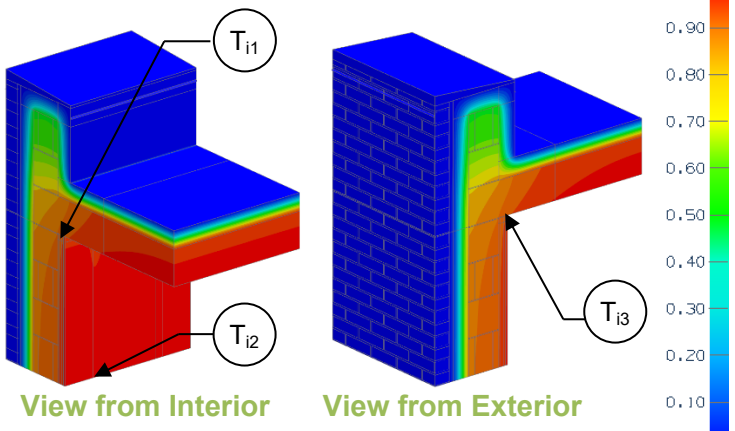


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.6 to R-0.7 (0.11 RSI to 0.12 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	1 5/8" Steel Studs with Metal Tracks	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Standard Concrete Block	7 5/8" (190)	3.5 (0.5)	-	119 (1900)	0.19 (800)
6	Cement Mortar	-	3.5 (0.5)	-	113 (1800)	0.12 (500)
7	Heckmann Pos-I-Tie Masonry Tie @ 16" (406) o.c.	varies	-	-	-	-
8	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
9	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
10	Concrete Slab	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
11	Foamular XPS Rigid Insulation	4" (102)	0.20 (0.029)	R-20 (3.52 RSI)	1.8 (28)	0.29 (1220)
12	Wood Blocking	5/8" (16)	0.69 (0.10)	R-1.0 (0.18 RSI)	31 (500)	0.45 (1880)
13	Flashing & roof finish materials are incorporated into exterior heat transfer coefficient					
14	Air Gap	1" (25)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
15	Exterior Film[1]	-	-	R-0.2 to R-0.7 (0.03 RSI to 0.12 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 7.5.12

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer – Roof to Wall Intersection with Insulation Wrapped Around Parapet



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-5.6 (0.99 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_r, R_r, U_w, R_w	"clear field" U- and R-values for: r = roof w = wall
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per length of parapet

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 1D R-Value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_w ft²·hr·°F / Btu (m² K / W)	U_w Btu/ft² ·hr ·°F (W/m² K)
R-10.0 (1.76)	R-15.6 (2.75)	R-13.4 (2.36)	0.075 (0.42)
R-20.0 (3.52)	R-25.6 (4.51)	R-20.0 (3.52)	0.050 (0.28)

Base Assembly - Roof

Roof Insulation 1DR-Value (RSI)	R_r ft² hr °F / Btu (m² K / W)	U_r Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	0.046 (0.26)

Parapet Linear Transmittance

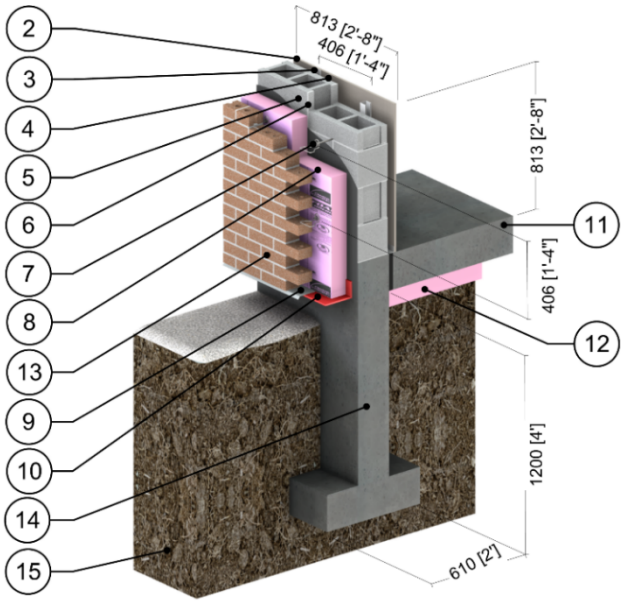
Exterior Insulation 1D R-Value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft hr °F (W/m K)
R-10.0 (1.76)	R-11.5 (2.03)	0.087 (0.49)	0.150 (0.260)
R-20.0 (3.52)	R-14.4 (2.53)	0.070 (0.40)	0.121 (0.209)

Temperature Indices

	R10	R20	
T_{i1}	0.81	0.85	Min T on interior CMU surface, at concrete roof slab intersection
T_{i2}	0.86	0.90	Max T on interior CMU surface, at studs and away from concrete roof slab intersection
T_{i3}	0.85	0.88	Min T on concrete ceiling, at drywall intersection, exposed to interior air

Detail 7.7.9

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Steel Shelf Angle and Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Insulation Below Floor – Slab on Grade and Foundation Intersection

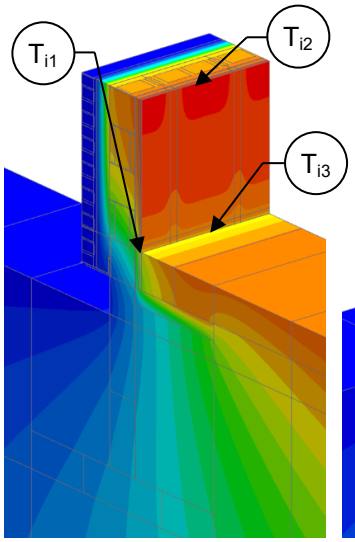


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 to R-0.9 (0.12 to 0.16 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	1 5/8" Steel Studs with Bottom Track	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Standard Concrete Block	7 5/8" (190)	3.5 (0.5)	-	119 (1900)	0.19 (800)
6	Cement Mortar	-	3.5 (0.5)	-	113 (1800)	0.12 (500)
7	Heckmann Pos-I-Tie Masonry Tie @ 16" (406) o.c.	varies	-	-	-	-
8	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
9	Steel Shelf Angle	3/8" (10)	347 (50)	-	489 (7830)	0.12 (500)
10	Metal Flashing	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
11	Concrete Slab on Grade	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
12	Foamular XPS Insulation	3 1/2" (89)	0.20 (0.029)	R-17.5 (3.08 RSI)	1.8 (28)	0.29 (1220)
13	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
14	Concrete Footing	24" (610)	12.5 (1.8)	-	140 (2250)	0.20 (850)
15	Soil	-	15.6 (2.25)	-	-	-
16	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

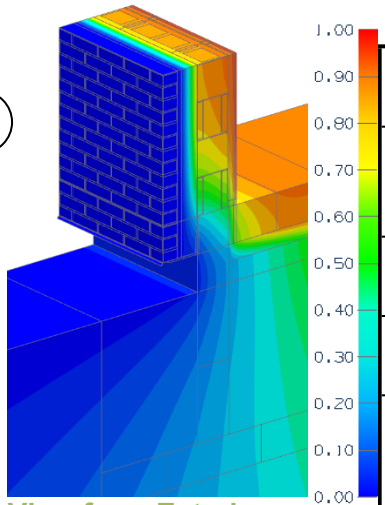
[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 7.7.9

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Steel Shelf Angle and Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Insulation Below Floor – Slab on Grade and Foundation Intersection



View from Interior



View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-5.6 (0.99 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab and shelf angle
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Foundation Transmittance[2]	L_{2Df}, L_{2Dt}	Heat loss of slab on grade per unit width of slab: f = floor t = floor + wall + foundation
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of foundation

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

[2]Calculation method follows ISO 10211:2007, 10.4.3

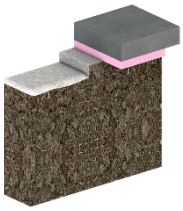
Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

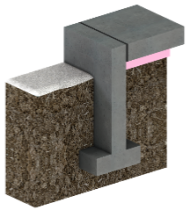
Sandwich Panel Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-10.0 (1.76)	R-15.6 (2.75)	R-13.4 (2.36)	0.075 (0.42)
R-20.0 (3.52)	R-25.6 (4.51)	R-20.0 (3.52)	0.050 (0.28)

Foundation Linear Transmittance

Foundation Insulation 1D R-Value (RSI)	Insulation Length in (mm)	L_{2Df} Btu/ft ·hr·°F (W/m K)	L_{2Dt} Btu/ft ·hr·°F (W/m K)	ψ Btu/ft ·hr·°F (W/m K)
R-17.5 (3.08)	24 (610)	1.25 (2.16)	1.75 (3.02)	0.301 (0.521)
R-17.5 (3.08)	24 (610)	1.25 (2.16)	1.70 (2.95)	0.322 (0.557)



L_{2Df}



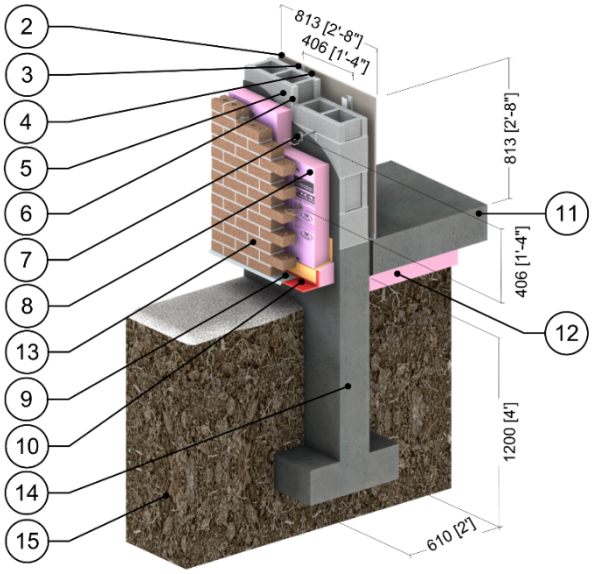
L_{2Dt}

Temperature Indices

	R10	R20	
T_{i1}	0.55	0.56	Min T on interior CMU surface, at slab intersection
T_{i2}	0.82	0.86	Max T on interior CMU surface, between studs and away from slab
T_{i3}	0.69	0.70	Min T on floor, at drywall intersection

Detail 7.7.10

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Stainless Steel Stand-off Shelf Angle and Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Insulation Below Floor – Slab on Grade and Foundation Intersection

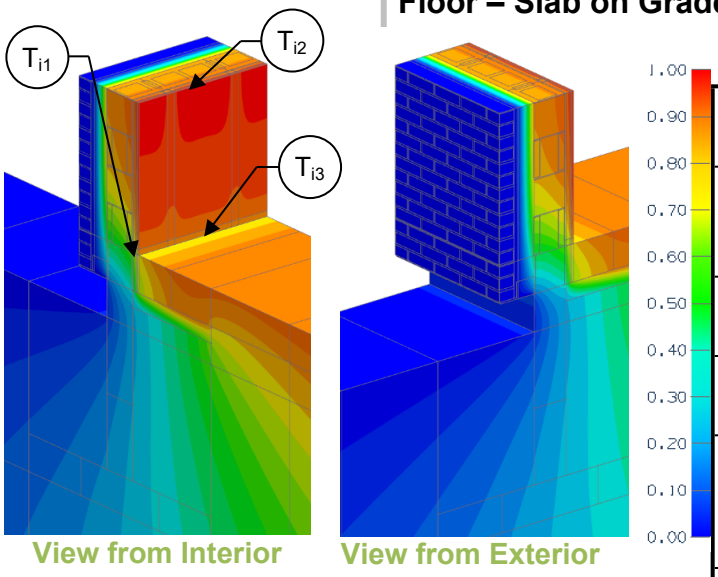


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 to R-0.9 (0.12 to 0.16 RSI)	-	-
2	Gypsum Board	1/2" (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	1 5/8" Steel Studs with Bottom Track	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
4	Air in Stud Cavity	1 5/8" (41)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
5	Standard Concrete Block	7 5/8" (190)	3.5 (0.5)	-	119 (1900)	0.19 (800)
6	Cement Mortar	-	3.5 (0.5)	-	113 (1800)	0.12 (500)
7	Heckmann Pos-I-Tie Masonry Tie @ 16" (406) o.c.	varies	-	-	-	-
8	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
9	Stainless Steel Stand-off Shelf Angle	3/8" (10)	118 (17)	-	503 (8060)	0.12 (500)
10	Metal Flashing	20 gauge	430 (62)	-	489 (7830)	0.12 (500)
11	Concrete Slab on Grade	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
12	Foamular XPS Insulation	3 1/2" (89)	0.20 (0.029)	R-17.5 (3.08 RSI)	1.8 (28)	0.29 (1220)
13	Brick Veneer	3 5/8" (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
14	Concrete Footing	24" (610)	12.5 (1.8)	-	140 (2250)	0.20 (850)
15	Soil	-	15.6 (2.25)	-	-	-
16	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 7.7.10

Owens Corning Exterior Insulated Concrete Block Wall Assembly with Stainless Steel Shelf Angle and Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Insulation Below Floor – Slab on Grade and Foundation Intersection



View from Interior View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-5.6 (0.99 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab and shelf angle
Transmittance / Resistance	U, R	U- and R-values for overall assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Foundation Transmittance[2]	L_{2Df}, L_{2Dt}	Heat loss of slab on grade per unit width of slab: f = floor t = floor + wall + foundation
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of foundation

[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

[2]Calculation method follows ISO 10211:2007, 10.4.3

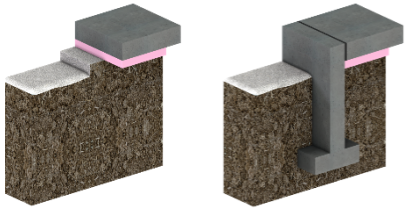
Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Sandwich Panel Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-10.0 (1.76)	R-15.6 (2.75)	R-13.4 (2.36)	0.075 (0.42)
R-20.0 (3.52)	R-25.6 (4.51)	R-20.0 (3.52)	0.050 (0.28)

Foundation Linear Transmittance

Foundation Insulation 1D R-Value (RSI)	Insulation Length in (mm)	L_{2Df} Btu/ft ·hr·°F (W/m K)	L_{2Dt} Btu/ft ·hr·°F (W/m K)	ψ Btu/ft ·hr·°F (W/m K)
R-17.5 (3.08)	24 (610)	1.25 (2.16)	1.68 (2.90)	0.230 (0.399)
R-17.5 (3.08)	24 (610)	1.25 (2.16)	1.62 (2.81)	0.241 (0.418)



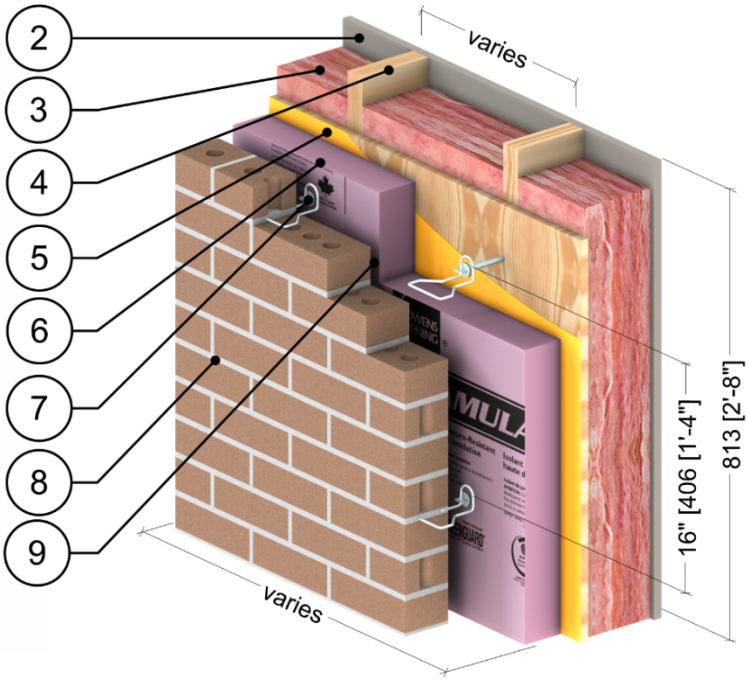
L_{2Df} L_{2Dt}

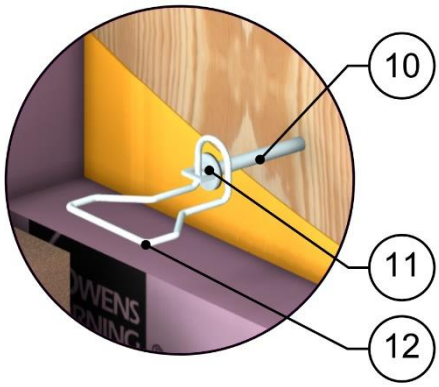
Temperature Indices

	R10	R20	
T_{i1}	0.61	0.63	Min T on interior CMU surface, at slab intersection
T_{i2}	0.83	0.87	Max T on interior CMU surface, between studs and away from slab
T_{i3}	0.73	0.74	Min T on floor, at drywall intersection

Detail 8.1.14

Exterior and Interior Insulated 2”x6” Wood Stud (16” o.c. and 24” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-19 Batt Insulation in Stud Cavity – Clear Wall





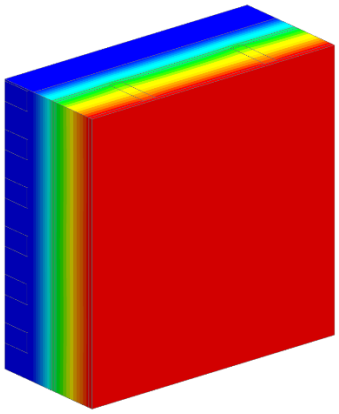
Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	
2	Gypsum Board	1/2” (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	5 1/2” (140)	-	R-19 (3.35 RSI)	0.9 (14)	0.17 (710)
4	2x6 Wood Stud (16” o.c. and 24” o.c.)	5 1/2” (140)	0.69 (0.10)	-	31 (500)	0.45 (1880)
5	Exterior Wood Sheathing	1/2” (16)	0.69 (0.10)	R-0.7 (0.12 RSI)	31 (500)	0.45 (1880)
6	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
7	Heckmann Pos-I-Tie Masonry Tie @ 16” (406) o.c.	varies	-	-	-	-
8	Brick Veneer	3 5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
9	Vented Air Cavity[2]	1” (25)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
10	Zinc Barrel	-	726 (105)	-	412 (6600)	-
11	Rubber Washer (EPDM)	1/16” (1.59)	1.7 (0.25)	-	62 (997)	-
12	Galvanized Steel Wire Pintle	3/16” (5) Ø	645 (93)	-	489 (7830)	0.12 (500)
13	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

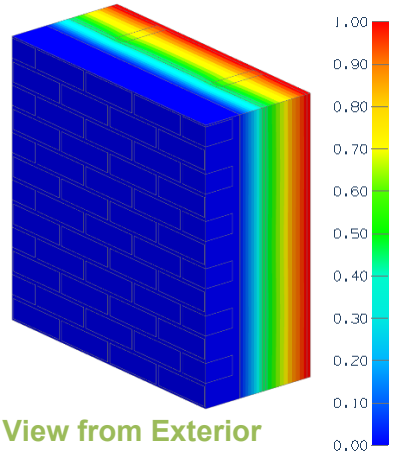
[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 8.1.14

Exterior and Interior Insulated 2”x6” Wood Stud (16” o.c. and 24” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-19 Batt Insulation in Stud Cavity – Clear Wall



View from Interior



View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.6 (3.98 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

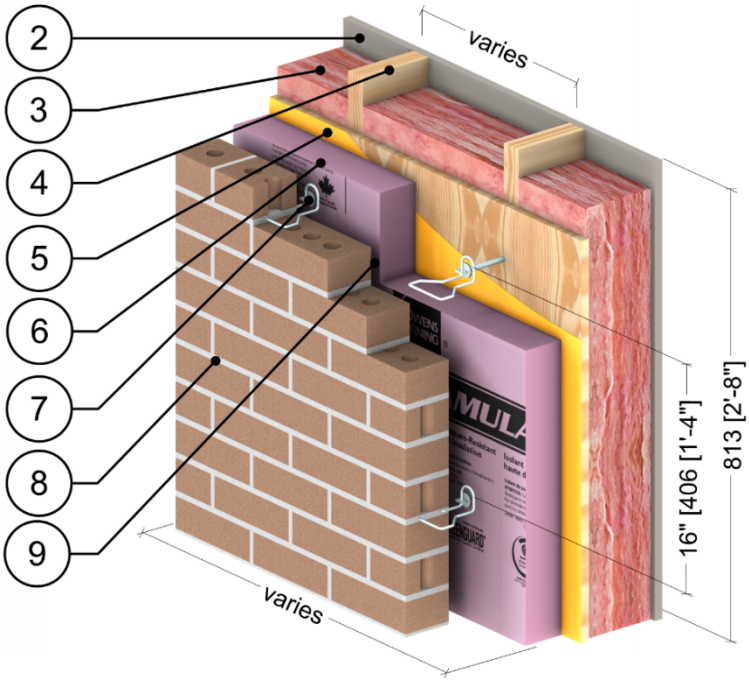
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

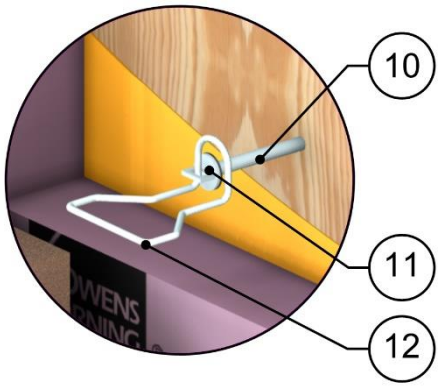
Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	16” o.c. Stud Spacing		24” o.c. Stud Spacing	
		R_o ft²·hr·`°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-10.0 (1.76)	R-32.6 (5.74)	R-29.6 (5.21)	0.034 (0.19)	R-30.6 (5.39)	0.033 (0.19)
R-15.0 (2.64)	R-37.6 (6.62)	R-33.6 (5.92)	0.030 (0.17)	R-35.0 (6.16)	0.029 (0.16)
R-20.0 (3.52)	R-42.6 (7.50)	R-37.4 (6.59)	0.027 (0.15)	R-39.1 (6.89)	0.026 (0.15)

Detail 8.1.15

Exterior and Interior Insulated 2”x6” Wood Stud (16” o.c. and 24” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-22 Batt Insulation in Stud Cavity – Clear Wall





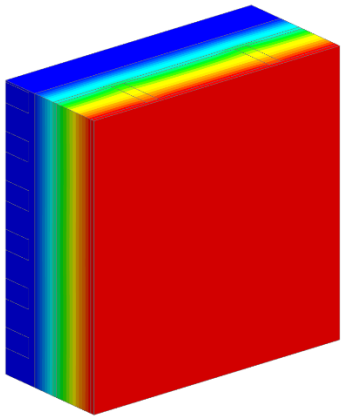
Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	
2	Gypsum Board	1/2” (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	5 1/2” (140)	-	R-22 (3.87 RSI)	0.9 (14)	0.17 (710)
4	2x6 Wood Stud (16” o.c. and 24” o.c.)	5 1/2” (140)	0.69 (0.10)	-	31 (500)	0.45 (1880)
5	Exterior Wood Sheathing	1/2” (16)	0.69 (0.10)	R-0.7 (0.12 RSI)	31 (500)	0.45 (1880)
6	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
7	Heckmann Pos-I-Tie Masonry Tie @ 16” (406) o.c.	varies	-	-	-	-
8	Brick Veneer	3 5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
9	Vented Air Cavity[2]	1” (25)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
10	Zinc Barrel	-	726 (105)	-	412 (6600)	-
11	Rubber Washer (EPDM)	1/16” (1.59)	1.7 (0.25)	-	62 (997)	-
12	Galvanized Steel Wire Pintle	3/16” (5) Ø	645 (93)	-	489 (7830)	0.12 (500)
13	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

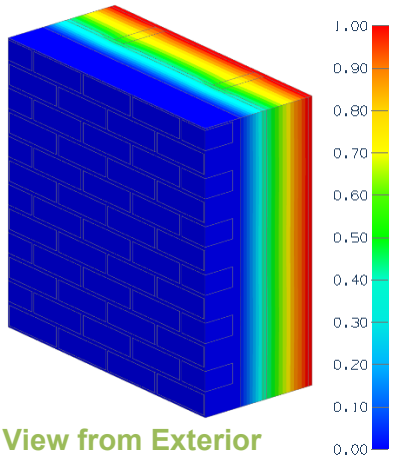
[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 8.1.15

Exterior and Interior Insulated 2”x6” Wood Stud (16” o.c. and 24” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-22 Batt Insulation in Stud Cavity – Clear Wall



View from Interior



View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-25.6 (4.51 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

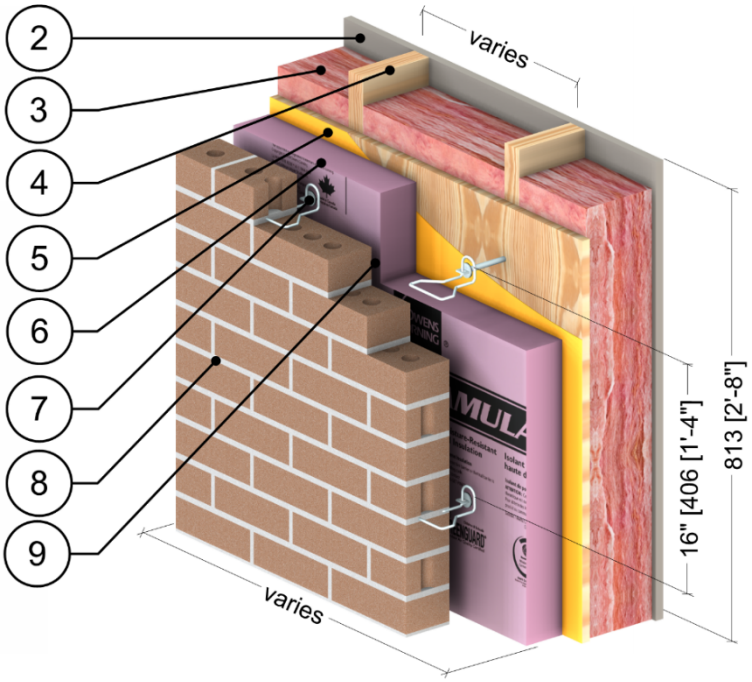
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

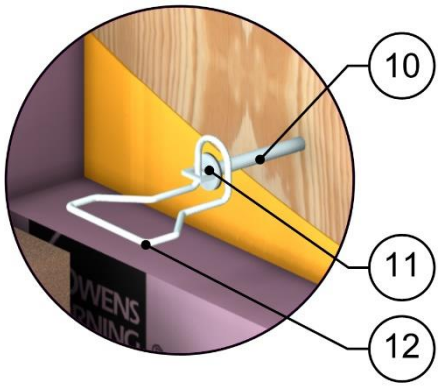
Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	16” o.c. Stud Spacing		24” o.c. Stud Spacing	
		R_o $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 ·hr ·^oF (W/m^2 K)	R_o $ft^2 \cdot hr \cdot {}^oF$ / Btu (m^2 K / W)	U_o Btu/ft^2 ·hr ·^oF (W/m^2 K)
R-10.0 (1.76)	R-35.6 (6.27)	R-31.7 (5.58)	0.032 (0.18)	R-33.0 (5.82)	0.030 (0.17)
R-15.0 (2.64)	R-40.6 (7.15)	R-35.8 (6.30)	0.028 (0.16)	R-37.3 (6.58)	0.027 (0.15)
R-20.0 (3.52)	R-45.6 (8.03)	R-39.6 (6.97)	0.025 (0.14)	R-41.3 (7.28)	0.024 (0.14)

Detail 8.1.16

Exterior and Interior Insulated 2”x6” Wood Stud (16” o.c. and 24” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-24 Batt Insulation in Stud Cavity – Clear Wall





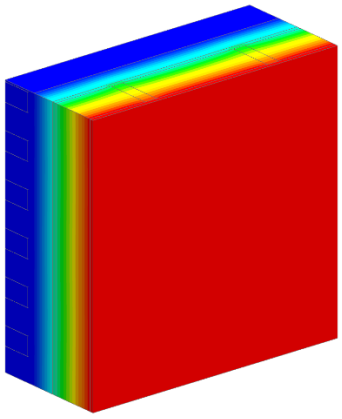
Anchor Detail

ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Film[1]	-	-	R-0.7 (0.12 RSI)	-	
2	Gypsum Board	1/2” (13)	1.1 (0.16)	R-0.5 (0.08 RSI)	50 (800)	0.26 (1090)
3	Ecotouch Pink Fiberglass Batt	5 1/2” (140)	-	R-24 (4.23 RSI)	0.9 (14)	0.17 (710)
4	2x6 Wood Stud (16” o.c. and 24” o.c.)	5 1/2” (140)	0.69 (0.10)	-	31 (500)	0.45 (1880)
5	Exterior Wood Sheathing	1/2” (16)	0.69 (0.10)	R-0.7 (0.12 RSI)	31 (500)	0.45 (1880)
6	Foamular CodeBord/C-200 Extruded Polystyrene (XPS) Rigid Insulation Type 3	varies	0.20 (0.029)	R-10 to R-20 (1.76 to 3.52 RSI)	1.8 (28)	0.29 (1220)
7	Heckmann Pos-I-Tie Masonry Tie @ 16” (406) o.c.	varies	-	-	-	-
8	Brick Veneer	3 5/8” (92)	5.4 (0.78)	-	120 (1920)	0.19 (720)
9	Vented Air Cavity[2]	1” (25)	-	R-0.9 (0.16 RSI)	0.075 (1.2)	0.24 (1000)
10	Zinc Barrel	-	726 (105)	-	412 (6600)	-
11	Rubber Washer (EPDM)	1/16” (1.59)	1.7 (0.25)	-	62 (997)	-
12	Galvanized Steel Wire Pintle	3/16” (5) Ø	645 (93)	-	489 (7830)	0.12 (500)
13	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

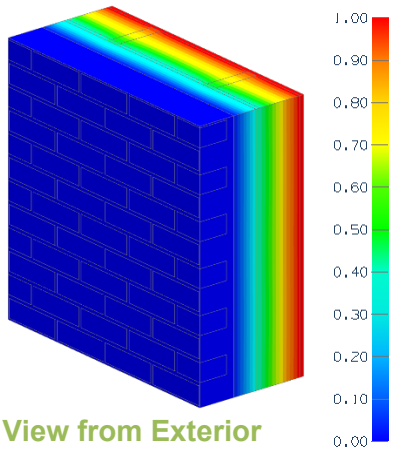
[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation
[2] The thermal conductivity of air spaces was found using ISO 100077-2

Detail 8.1.16

Exterior and Interior Insulated 2”x6” Wood Stud (16” o.c. and 24” o.c.) Wall Assembly with Heckmann Pos-I-Tie Veneer Anchoring System Supporting Brick Veneer and Owens Corning R-24 Batt Insulation in Stud Cavity – Clear Wall



View from Interior



View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-27.6 (4.86 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	“clear wall” U- and R-value

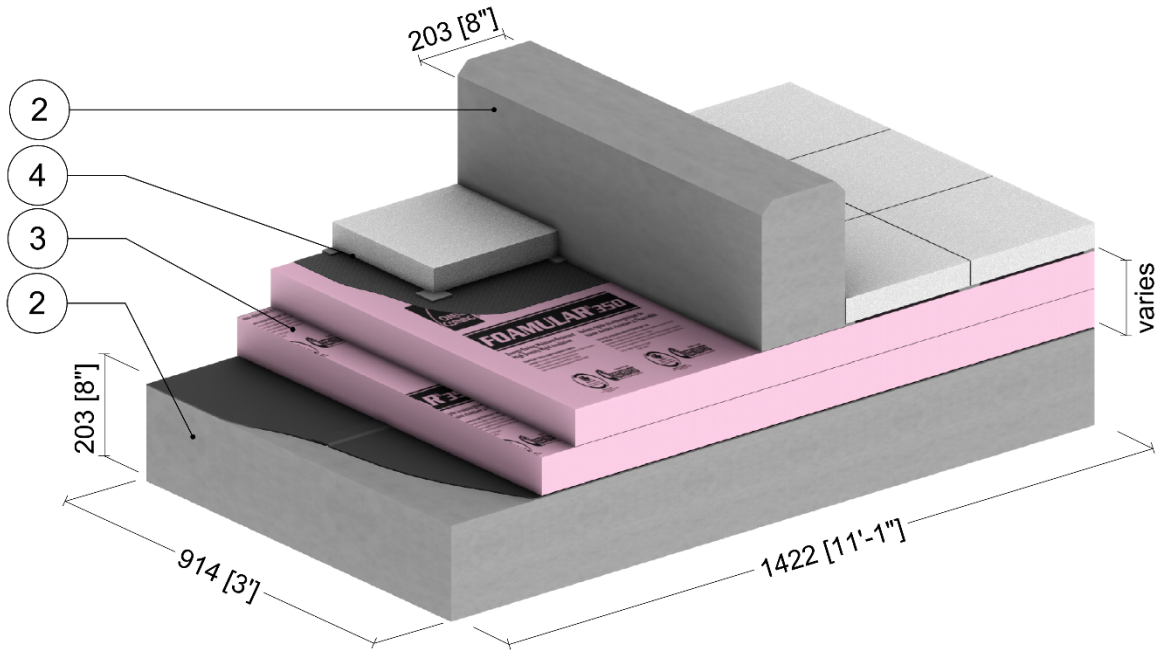
[1]Assumptions and limitations for surface temperatures identified in ASHRAE 1365-RP

Nominal (1D) vs. Assembly Performance Indicators

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	16” o.c. Stud Spacing		24” o.c. Stud Spacing	
		R_o ft²·hr·`°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-10.0 (1.76)	R-37.6 (6.62)	R-33.2 (5.84)	0.030 (0.17)	R-34.7 (6.11)	0.029 (0.16)
R-15.0 (2.64)	R-42.6 (7.50)	R-37.1 (6.53)	0.027 (0.15)	R-39.0 (6.86)	0.026 (0.15)
R-20.0 (3.52)	R-47.6 (8.38)	R-41.0 (7.22)	0.024 (0.14)	R-42.9 (7.56)	0.023 (0.13)

Detail 10.2.3

Owens Corning Insulated Projected Membrane Roof – Floating Concrete Wall Intersection

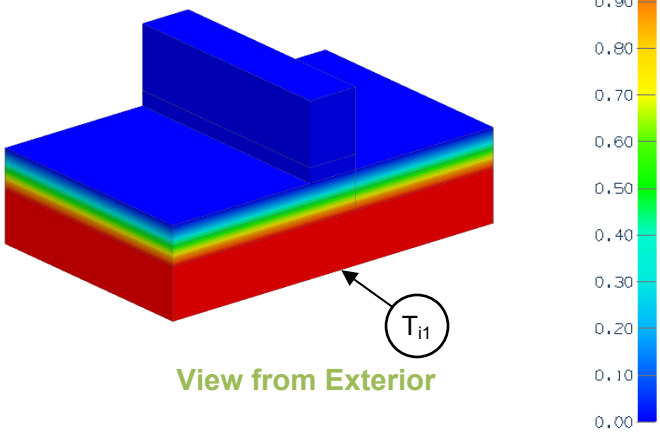


ID	Component	Thickness Inches (mm)	Conductivity Btu·in / ft²·hr·°F (W/m K)	Nominal Resistance hr·ft²·°F/Btu (m²K/W)	Density lb/ft³ (kg/m³)	Specific Heat Btu/lb·°F (J/kg K)
1	Interior Films[1]	-	-	R-0.6 (0.11 RSI)	-	-
2	Concrete	8" (203)	12.5 (1.8)	-	140 (2250)	0.20 (850)
3	Fomular 350 Extruded Polystyrene Rigid Insulation Type 4	Varies	-	R-20 to R-40 (3.52 RSI to 7.04 RSI)	varies	-
4	Finish roof material is incorporated into exterior heat transfer coefficient					
5	Exterior Film[1]	-	-	R-0.2 (0.03 RSI)	-	-

[1] Value selected from table 1, p. 26.1 of 2009 ASHRAE Handbook – Fundamentals depending on surface orientation

Detail 10.2.3

Owens Corning Insulated Projected Membrane Roof – Floating Concrete Wall Intersection



View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-1.9 (0.33 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value, without concrete anomaly
Transmittance / Resistance	U, R	U and R-values for the assembly
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	ψ	Incremental increase in transmittance per linear length of concrete anomaly

[1]Surface temperatures are a result of steady-state conductive heat flow with constant heat transfer coefficients. Limitations are identified in final report.

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly - Roof

Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)
R-20 (3.52)	R-21.9 (3.86)	R-21.9 (3.86)	0.046 (0.26)
R-30 (5.28)	R-31.9 (5.62)	R-31.9 (5.62)	0.031 (0.18)
R-40 (7.04)	R-41.9 (7.39)	R-41.9 (7.38)	0.024 (0.14)

Concrete Anomaly Linear Transmittance

R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	Ψ Btu/ft ·hr ·°F (W/m K)
R-21.9 (3.86)	0.046 (0.26)	0 (0)
R-31.9 (5.62)	0.031 (0.18)	0 (0)
R-41.9 (7.38)	0.024 (0.14)	0 (0)

Temperature Indices

T_{i1}	0.97	Min T on concrete, at center of anomaly