MULTI UNIT RESIDENTIAL BUILDING

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INTRODUCTION

This design proposal offers an airtight and high thermally efficient building envelope optimized for Manitoba's cold climate. The design utilizes an insulated concrete form (ICF) wall construction with additional exterior insulation, combined with steel cladding and high-performance fibreglass windows and doors.

DESIGN CONCEPT

The main design feature is an ICF wall system with a double layer of exterior rigid insulation, providing continuous control layers with minimal thermal bridging using Z-Girts and thermal clips. This system allows structural support for the cladding without compromising the continuity of the thermal layer. The double layer of rigid insulation increases the R-value to surpass the requirements.

Careful thought went into the design of the balcony because it could potentially be the largest thermal bridge in the building. The balcony uses the Simpson Strong Tie ICF-VL connection system, which significantly reduces conductive heat loss by reducing the number of penetrations through the thermal layer. The balcony uses timber construction to reduce weight and thermal transmittance.

Window to wall ratios were optimized to balance natural light with energy performance. We chose fibreglass windows manufactured locally by Duxton Windows and Doors. Fibreglass windows offer the highest resistance to warping, cracking and rotting, ensuring they will last through Manitoba's intense freeze and thaw cycles. All windows are

designed to be triple pane with 2 Cardinal LoĒ-366 coatings, offering the highest performance values and lowest solar heat gain without compromising visibility.

The roof is constructed using specially engineered wood trusses. The thermal component of our roof uses blown in cellulose, with the wall continuing past the ceiling to keep the control layers continuous across the wall and roof assemblies.

INSPIRATIONS AND GOALS

The above design concept reflects our goals of creating an energy efficient building envelope with minimal thermal bridges, as well as using locally sourced materials that can handle evolving environmental challenges.

The materials and color choices for our design were inspired by the modern farmhouse architectural style focusing on contemporary design. This choice was inspired by local Winnipeg residential designs.

FEASIBILITY & CONSTRUCTIBILITY

To make our design feasible, the ICF for this project should be constructed in sections going from floor to floor for ease of construction. Every floor should have the ICF-VL systems installed before pouring the concrete layer.

ICF construction is highly feasible and constructible because it combines energy efficiency, structural strength and all control systems in a single wall system. ICF is modular and stackable, reducing installation time and is also commonly used in Manitoba, so most crews are generally comfortable working with ICF walls.

THERMAL BRIDGING CALCULATIONS

Figures 1 and 2 below include the wall and roof R-value and linear transmittance calculations.

Figure 1. Roof Calculations

BC hydro powersmart FORTIS BC

Scenario Description: BEDC

Enhanced Thermal Performance Spread Sheet **IP Units**

Clear Field Area Method

Select Area Calculation (Choose One)	Area	Units
☐ Sum of Active Clear Field Areas (Default)	973.06	ft²
☐ User Defined Area		ft²

Overall Opaque Wall Thermal Performance Values

Base Building		Proposed Building		% Below Baseline
Opaque U-Value (BTU/hr ft² °F)	0.021	Opaque U-Value (BTU/hr ft² °F)	0.017	✓ -17.5%
Effective R-Value (hr ft² °F/BTU)	48.0	Effective R-Value (hr ft² °F/BTU)	58.2	

Proposed Building Entries

Add/Remove Detail	Transmittance Type	Include	Transmittance Description	Area, Length or Amount Takeoff	Units	Transmittance Value	Units	Source Reference	Totals 16.7 Heat Flow (BTU/hr°F)	100% %Total Heat Flow
Add Clear Field	Clear Field	☑	Roof	973.06	ft²	0.014	BTU/ hr ft² °F		13.5	81%
Add Linear Interface Detail	Linear Interface Detail	☑	Wall to Roof	67.88	ft	0.047	BTU/ hr ft °F		3.2	19%
Add Point Interface Detail	Point Interface Detail	☑			#	0.000	BTU/ hr °F		0.0	0%

Figure 2. Wall Calculations

BC hydro powersmart FORTIS BC

Scenario Description: BEDC

Enhanced Thermal Performance Spread Sheet **IP Units**

Clear Field Area Method

Select Area Calculation (Choose One)	Area	Units
☐ Sum of Active Clear Field Areas (Default)	731.13	ft²
☐ User Defined Area	Enter User Defined Opaque Area	ft²

Overall Opaque Wall Thermal Performance Values

Base Building		Proposed Building		% Below Baseline
Opaque U-Value (BTU/hr ft² °F)	0.048	Opaque U-Value (BTU/hr ft² °F)	0.041	✔ -13.7%
Effective R-Value (hr ft² °F/BTU)	21.0	Effective R-Value (hr ft² °F/BTU)	24.3	

Proposed Building Entries

								Totals	30.0	100%
Add/Remove Detail	Transmittance Type	Include	Transmittance Description	Area, Length or Amount Takeoff	Units	Transmittance Value	Units	Source Reference	Heat Flow (BTU/hr°F)	%Total Heat Flow
Add Clear Field	Clear Field	☑	Wall	653.80	ft²	0.015	BTU/ hr ft² °F	Enter Source Here	9.8	33%
1	Clear Field	☑	Window - Living Room	20.00	ft²	0.170	BTU/ hr ft² °F	Enter Source Here	3.4	11%
1	Clear Field	☑	Door	20.83	ft²	0.201	BTU/ hr ft² °F	Enter Source Here	4.2	14%
1	Clear Field	☑	Window - Bedroom	16.00	ft²	0.170	BTU/ hr ft² °F	Enter Source Here	2.7	9%
1	Clear Field	☑	Window-Laundry fixed	4.50	ft²	0.140	BTU/ hr ft² °F	Enter Source Here	0.6	2%
1	Clear Field	☑	Window Bedroom 2	16.00	ft²	0.170	BTU/ hr ft² °F	Enter Source Here	2.7	9%
Add Linear Interface Detail	Linear Interface Detail	☑	Wall to Window	60.00	ft	0.028	BTU/ hr ft °F	Enter Source Here	1.7	6%
	Linear Interface Detail	☑	Wall to Wall s/s Corner	24.60	ft	0.005	BTU/ hr ft °F	Enter Source Here	0.1	0%
	Linear Interface Detail	☑	Wall to Door	20.00	ft	0.143	BTU/ hr ft °F	Enter Source Here	2.9	10%
	Linear Interface Detail	☑	Wall to Floor	68.24	ft	0.021	BTU/ hr ft °F	Enter Source Here	1.5	5%
Add Point Interface Detail	Point Interface Detail	☑	Balcony Connections	5	#	0.090	BTU/ hr °F	Enter Source Here	0.5	1%

Note: Transmittance values obtained from thermalenvelope.ca were based on the closest comparable assembly configuration available. Since the referenced assemblies were not an exact match to our design, slight adjustments were made to accurately reflect our specific assembly. Additionally, the most conservative values were always chosen.

BILL OF MATERIALS

Bill of Materials

Floor			
Materials	Sizes	Supplier/ Manufacturer	Description
Top			
Vinyl Flooring	229mm x 1524mm	Ken's Carpets	Luxury Vinyl plank Flooring in Dynamix Premiere Napa
Underlayment	1.4mm	MP Global	QuietWalk LV Universal Acoustical Underlayment
OSB Plywood	1219mm x 2457mm	Star Building Materials	HIGH PERFORMANCE T&G OSB
Engineered Trusses	304.8mm	Truss Fab inc.	N.A.
Gypsum board Type	1219mm x 2451mm	Certainteed	Type C Drywall
Gypsum board Type	1219mm x 2451mm	Certainteed	Type C Drywall
Bottom			
Accessories/ Connection Systems			
Materials	Sizes	Supplier/ Manufacturer	Description
ICF Strong Tie	203mm	Simpson Strong Tie	ICFVL 1219mm o.c. Ledger to Wall
Ledger Connector	N.A.	Simpson Strong Tie	ICFVL-W 1219mm o.c. Ledger to ICFVL
Joist Hangers	538mm x 286mm	Simpson Strong Tie	HUS210-2 1219mm o.c Joist to Ledger

Wall			
Materials	Sizes	Supplier/ Manufacturer	Description
Outside			
Metal Cladding	304.8mm	Westman Steel	24 Ga WS279 Vertical Steel Cladding in Cambridge White
Z-Girts	25mm	Westman Steel	N.A.
Rigid Insulation	102mm	Soprema	Sopra-IOS V Plus
Rigid Insulation	76mm	Soprema	Sopra-IOS V Plus
Thermel Clip	178mm	Soprema	ACS-S Clip at 406mm O/C. Horizontally,
Air/Vapor Barrier	N.A.	Soprema	Sopra Seal Stick 1100T C/W Elastocol Stick H2O Primer
ICF Block	343mm	Element ICF	203mm ICF Blocks
Gypsum board Type	12.7mm	Certainteed	Type C Drywall
Inside			
Accessories/ Connection Systems			
Materials	Sizes	Supplier/ Manufacturer	Description
Primer	N.A.	Soprema	Elastocol Stick H2O needed because it is a water based primer

Balcony

Materials	Sizes	Supplier/ Manufacturer	Description
Top			
Vinyl Decking Mat	1.5mm	Duradek	Vinyl Deck Membrane in Cotton wood
OSB Plywood	1219mm x 2457mm	Star Building Materials	HIGH PERFORMANCE T&G OSB
Wood Joist	38mm x 184mm	Star Building Materials	N.A.
Soffit	N.A.	Gentek Building Materials	Aluminum Black
Bottom			
Accessories/ Connection Systems			
Materials	Sizes	Supplier/ Manufacturer	Description
ICF Stronge Tie	203mm	Simpson Strong Tie	ICFVL 1219mm o.c. Ledger to Wall
Ledger Connector	N.A.	Simpson Strong Tie	ICFVL-W 1219mm o.c. Ledger to ICFVL
Joist Hangers	28mm x 184mm	Simpson Strong Tie	HUS210-2 1219mm o.c Joist to Ledger

Roof

Materials	Sizes	Suplier/ Manufacter	Description
Outside			
Asphalt Shingle	1/2"	IKO North America	Fiberglass-Reinforced Asphalt Shingles
Substrate	1.5mm	IKO North America	StormShield Apply at bottom of roof & Stormtite Apply to the upper section UnderLayments
OSB Plywood	1219mm x 2457mm	Star Building Materials	HIGH PERFORMANCE T&G OSB
Engineered Trusses	N.A.	Truss Fab inc.	N.A.
Gypsum board Type	1219mm x 2451mm	Certainteed	Type C Drywall
Inside			
Accessories/ Connection Systems			
Materials	Sizes	Supplier/ Manufacturer	Description
Soffit	N.A.	Gentek Building Materials	Aluminum Black
Fascia	14mm x 288mm	Gentek Building Materials	Aluminum Black

Windows & Doors

Materials	Sizes	Supplier/ Manufacturer	Description
Fiberglass	1219mm x 1219mm	Duxton Windows & Doors	Series 328- FiberWall Casement, Triple Pane, Cardinal 2 LoE coating-366 (Argon)
Fiberglass	1524mm x 1219mm	Duxton Windows & Doors	Series 328- FiberWall Casement, Triple Pane, Cardinal 2 LoE coating-366 (Argon)
Fiberglass	457mm x 914mm	Duxton Windows & Doors	Series 328- FiberWall Casement, Triple Pane, Cardinal 2 LoE coating-366 (Argon)
Fiberglass	1010mm x 2110mm	Duxton Windows & Doors	Series 458- FiberWall, Outswing Door, Full Lite -Duxton Sandwich Frame,Triple Pane, Cardinal 2 LoE coating-366 (Argon)
Accessories/ Connection Systems			
Materials	Sizes	Supplier/ Manufacturer	Description
Trim	N.A.	Gentek Building Materials	Aluminum Black
Drip Edge	N.A.	Gentek Building Materials	Aluminum Black
Trim board	19mm x 286mm	Star Building Materials	Wood White
Trim board	19mm x 64mm	Star Building Materials	Wood White
Panning parameter	N.A.	Duxton Windows & Doors	Connection Clip

APPENDIX A: OVERALL ROOF AND WALL R-VALUE CALCULATIONS

ROOF R VALUE CALCULATION

Assembly Material	Thickness (in.)	k-value	R_{value}			$R_{cumulative}$	ASHRAE CH. 26 TABLE #	Material Details (product, Material Density)
Inside Air Film			0.68			0.68	10	
Gypsum Wall Board	5/8	1.1	0.57			1.25	1	Gypsum or plaster board
6mil Polyethelene sheet			Negligible			1.25	1	Vapour: Seal, plastic film
Blown Celulous & wood			$R_{F\ Value}$	$R_{I\ Value}$	R_{value}			
2 x 4 SPF Wood Studs @ 24" o/c	3.5		2.59			10.63	1	
Celulous	3 1/2			12.00	12.00		1	Sopra-cellulose
			R_{Value}					
Celulous	20 1/3		61.00			71.63	1	Sopra-cellulose
Outside Air Film			0.17			71.80	10	
Air Gap	1/2					71.80	1	TPD
Trusses	3 1/2		2 3/5		0.52	72.32	1	hem, doug, spruce
Sheathing	5/8		0.85			73.17	1	Doug fir
Roof Felt	1	8.32	0.12			73.29	3	Roof Felt
Ashpalt shingles	1/2	2.98	0.17			73.45	1	Ashpalt shingles
Outside Air Film			0.17			73.62	10	
			Total R Value			71.80	h*ft.^{2}*F/Btu	
			U Value = 1/R			0.014	Btuh h/ft^2/F	

Note: The greyed-out portion of the table does not contribute to the overall R-value calculation.

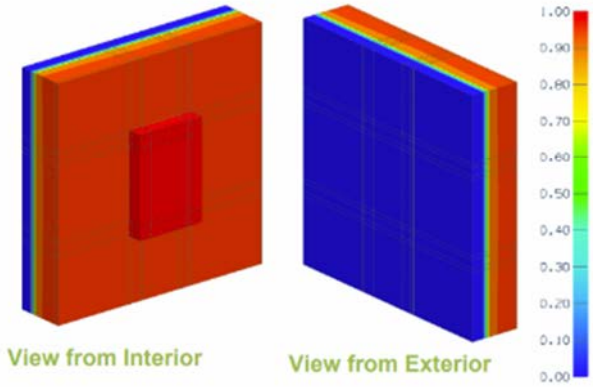
ICF Exterior Wall - Building Competition

Assembly Material	Thickness (in.)	K-value	R-Value	R-Cumulative	U-value	Material Details (Product, Material Density)
Interior Film			0.7	0.7	1.43	
EPS foam	2.75	0.2	13.75	14.45	0.07	
Concrete	8	15	0.53	14.98	0.07	
EPS foam	2.75	0.2	13.75	28.73	0.03	
SOPREMA SOPRASEAL STICK				28.73	0.03	
RA-ISO V ALU Exterior Insulation (I	3		18.5	47.23	0.02	
RA-ISO V ALU Exterior Insulation (I	4		25.0	72.23	0.01	
Cladding			0.6	72.85	0.01	
Exterior Film			0.7	73.55	0.01	
		Total R-Value		66.87	h*ft.^{2}*°F/Btu	
		U-Value=1/R		0.0150	Btuh/ft^2/°F	

APPENDIX B: THERMAL DATA SHEETS

Detail 7.8.1

Precast Sandwich Panel Wall Assembly – Emloc Thermally Broken Embedment Detail



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-1.8 (0.32 RSI) + sandwich panel insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear field" U- and R-values, without embedment
Transmittance / Resistance	U, R	U- and R-values for the assembly
Surface Temperature Index[1]	T_I	0 = exterior temperature 1 = interior temperature
Point Transmittance	χ	Incremental increase in transmittance for embedment

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

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

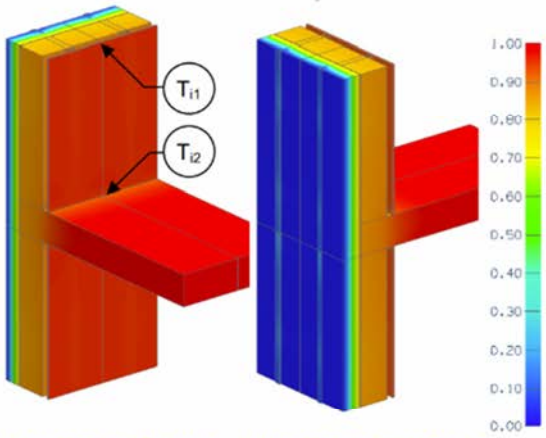
Sandwich Panel Insulation 1D R-value (RSI)	R_{1Dw} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft²·hr·°F (W/m² K)
R-10 (1.76)	R-11.8 (2.08)	R-11.8 (2.06)	0.085 (0.48)
R-15 (2.64)	R-16.8 (2.96)	R-16.7 (2.94)	0.060 (0.34)
R-20 (3.52)	R-21.8 (3.84)	R-21.7 (3.82)	0.046 (0.26)

Embedment Point Transmittance

Sandwich Panel Insulation 1D R-value (RSI)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft²·hr·°F (W/m² K)	χ Btu/·hr·°F (W/K)
R-10 (1.76)	R-11.4 (2.00)	0.088 (0.50)	0.053 (0.028)
R-15 (2.64)	R-15.5 (2.73)	0.065 (0.367)	0.094 (0.050)
R-20 (3.52)	R-19.8 (3.48)	0.051 (0.287)	0.090 (0.048)

Detail 7.2.24

Exterior Insulated Concrete Mass Wall with 1 5/8" x 1 5/8" Steel Stud (16" o.c.) and 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-3.4 (0.59 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o, R_o	"clear wall" U- and R-value without slab
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

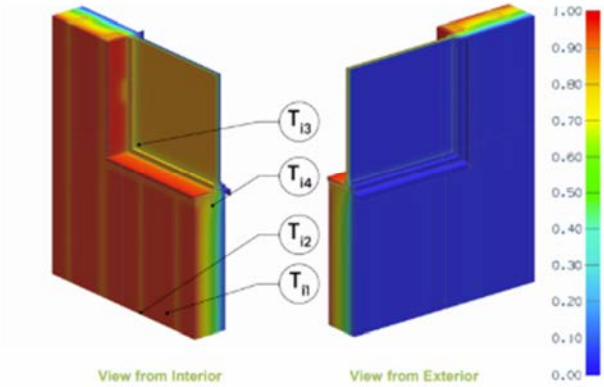
Exterior Insulation 1D R-Value (RSI)	R_{1D} ft²·hr·°F / Btu (m² K / W)	R_o ft²·hr·°F / Btu (m² K / W)	U_o Btu/ft² ·hr ·°F (W/m² K)	R ft²·hr·°F / Btu (m² K / W)	U Btu/ft² ·hr ·°F (W/m² K)	ψ Btu/ft² ·hr ·°F (W/m² K)
R-10 (1.76)	R-13.4 (2.35)	R-10.9 (1.92)	0.092 (0.52)	R-10.4 (1.84)	0.096 (0.55)	0.030 (0.052)
R-15 (2.64)	R-18.4 (3.23)	R-13.3 (2.34)	0.075 (0.43)	R-12.6 (2.22)	0.079 (0.45)	0.030 (0.051)
R-20 (3.52)	R-23.4 (4.11)	R-15.9 (2.80)	0.063 (0.36)	R-15.0 (2.65)	0.066 (0.38)	0.026 (0.045)
R-25 (4.40)	R-28.4 (4.99)	R-18.3 (3.22)	0.055 (0.31)	R-17.3 (3.05)	0.058 (0.33)	0.022 (0.037)

Temperature Indices

	R10	R15	R20	R25	
T_{i1}	0.82	0.85	0.88	0.90	Min T on concrete away from slab, between studs
T_{i2}	0.87	0.89	0.91	0.92	Min T on slab exposed to interior air, at concrete, at studs

Detail 5.3.24

Exterior and Interior Insulated 6" x 1 5/8" Steel Stud (16" o.c.) Wall Assembly with R-20 Batt Insulation in Stud Cavity - Triple Glazed Fiberglass Window Sill and Jamb Intersection with Aluminum Angle Support



Thermal Performance Indicators

Assembly 1D (Nominal) R-Value	R_{1D}	R-22.3 (3.92 RSI) + exterior insulation
Transmittance / Resistance without Anomaly	U_o R_o	"clear field" U- and R value of wall assembly
Transmittance / Resistance	R_t U_t U_g	U and R-value for: t = total g = glazing
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature
Linear Transmittance	Ψ	Incremental increase in transmittance per linear length of window interface

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

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Wall

Exterior Insulation 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)
12.6 (2.22)	34.9 (6.15)	25.9 (4.56)	0.039 (0.219)
16.8 (2.96)	39.1 (6.89)	30.2 (5.31)	0.033 (0.188)
25.2 (4.44)	47.5 (8.36)	38.7 (6.81)	0.026 (0.147)
33.6 (5.92)	55.9 (9.84)	47.2 (8.31)	0.021 (0.120)
42.0 (7.40)	64.3 (11.32)	55.7 (9.80)	0.018 (0.102)

Base Assembly – Glazing

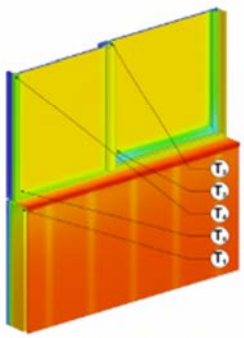
$U_{centre\ of\ glazing}$ Btu/ft²·hr·°F (W/m² K)	U_g Btu/ft²·hr·°F (W/m² K)
0.14 (0.81)	0.132 (0.749)

Window Sill and Jamb Linear Transmittance

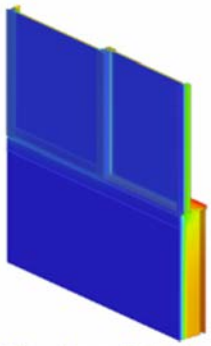
Insulation in Cavity Between Window and Wall	Exterior Insulation R-Value (RSI)	R_t ft²·hr·°F/Btu (m² K / W)	U_t Btu/ft²·hr·°F (W/m² K)	Ψ_{Sill} Btu/ft·hr·°F (W/m K)	Ψ_{Jamb} Btu/ft·hr·°F (W/m K)
No	12.6 (2.22)	R-13.9 (2.44)	0.072 (0.409)	0.060 (0.104)	0.032 (0.056)
	16.8 (2.96)	R-15.0 (2.64)	0.067 (0.379)	0.052 (0.090)	0.027 (0.047)
	25.2 (4.44)	R-16.3 (2.87)	0.061 (0.348)	0.051 (0.088)	0.026 (0.044)
	33.6 (5.92)	R-17.2 (3.04)	0.058 (0.330)	0.052 (0.089)	0.026 (0.046)
	42.0 (7.40)	R-17.9 (3.15)	0.056 (0.318)	0.053 (0.092)	0.028 (0.048)
Yes	12.6 (2.22)	R-14.1 (2.48)	0.071 (0.403)	0.060 (0.104)	0.019 (0.034)
	16.8 (2.96)	R-15.2 (2.68)	0.066 (0.373)	0.052 (0.090)	0.015 (0.026)
	25.2 (4.44)	R-16.6 (2.93)	0.060 (0.342)	0.051 (0.088)	0.013 (0.022)
	33.6 (5.92)	R-17.6 (3.10)	0.057 (0.323)	0.052 (0.089)	0.013 (0.023)
	42.0 (7.40)	R-18.3 (3.22)	0.055 (0.311)	0.053 (0.092)	0.014 (0.025)

Detail 9.3.1

Starline 4504 Series Sliding Door with Exterior Insulated Concrete – Door Sill Interface



View from Interior



View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-value	R_{1D}	R-2.6 (0.46 RSI) to R-2.7 (0.48 RSI) + exterior insulation, depending on concrete thickness
Transmittance / Resistance	U_g	U-value and R-value for sliding door, including framing
	U_t R_t	U-value and R-value for overall assembly
	R_w U_w	Clear field U-value and R-value for opaque wall
Linear Transmittance[2]	Ψ	Incremental increase in transmittance per linear length of door sill
Surface Temperature Index[1]	T_i	0 = exterior temperature 1 = interior temperature

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

[2]See help page on thermalenvelope.ca and technical bulletin called "Determining Thermal Transmittances at Balconies and Doors" for more information

Nominal (1D) vs. Assembly Performance Indicators

Base Assembly – Opaque Wall

Exterior Insulation 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-12.6 (2.22)	R-15.2 (2.68)	R-15.1 (2.66)	0.066 (0.375)
R-6.3 (1.11)	R-9.0 (1.59)	R-8.8 (1.55)	0.114 (0.646)

Base Assembly – Glazing

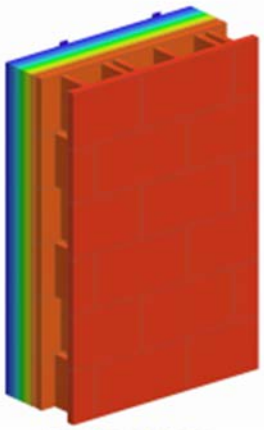
$U_{centre\ of\ glazing}$ Btu/ft²·hr·°F (W/m² K)	U_g Btu/ft²·hr·°F (W/m² K)
0.238 (1.35)	0.334 (1.89)

Door Sill Transmittance

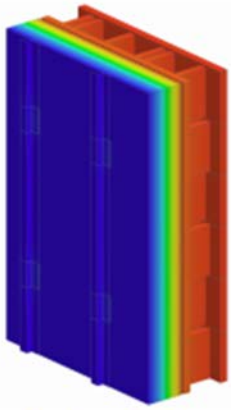
Scenario	Exterior Insulation R-Value (RSI)	R_t ft²·hr·°F/Btu (m² K / W)	U_t Btu/ft²·hr·°F (W/m² K)	Ψ Btu/ft·hr·°F (W/m K)
Steel Angle	R-12.6 (2.22)	R-4.5 (0.79)	0.223 (1.267)	0.143 (0.247)
Fiberglass Angle	R-12.6 (2.22)	R-4.7 (0.83)	0.211 (1.199)	0.062 (0.108)
Extended Curb	R-6.3 (1.11)	R-4.2 (0.74)	0.240 (1.361)	0.096 (0.167)

Detail 7.1.25

Exterior Insulated Concrete Block Wall Assembly with Protected SOPREMA SOPRA-ISO V ALU and ACS-S Thermal Clip (16" o.c. Horizontal) Supporting Metal Cladding - Clear Wall



View from Interior



View from Exterior

Thermal Performance Indicators

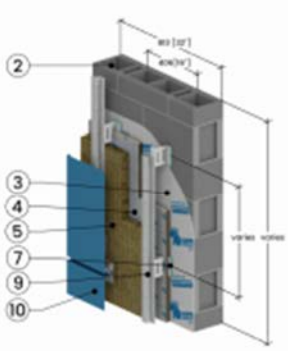
Assembly 1D (Nominal) R-value	R_{1D}	R-2.9 (0.51 RSI) + exterior insulation
Transmittance / Resistance	U_o R_o	"Clear wall" U- and R-value

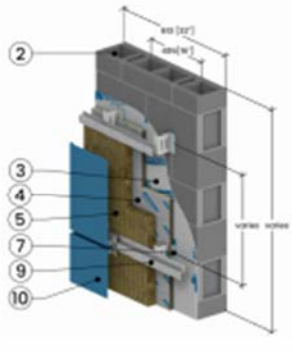
Nominal (1D) vs. Assembly Performance Indicators

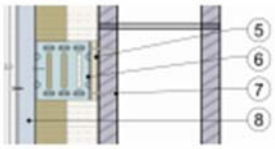
Thickness of Exterior Insulation	Exterior Insulation 1D R-value (RSI)	16x24 Clip Spacing		16x36 Clip Spacing		16x48 Clip Spacing	
		R_o ft²·hr·°F/Btu (m² K / W)	U_o Btu/ft²·hr·°F (W/m² K)	R_o ft²·hr·°F/Btu (m² K / W)	U_o Btu/ft²·hr·°F (W/m² K)	R_o ft²·hr·°F/Btu (m² K / W)	U_o Btu/ft²·hr·°F (W/m² K)
2" Mineral Wool + 2" SOPRA-ISO V ALU	21.0 (3.70)	21.0 (3.70)	0.048 (0.270)	21.9 (3.86)	0.046 (0.259)	22.3 (3.92)	0.045 (0.255)
2" Mineral Wool + 4" SOPRA-ISO V ALU	33.3 (5.86)	31.4 (5.52)	0.032 (0.181)	33.0 (5.81)	0.030 (0.172)	33.8 (5.95)	0.030 (0.168)
2" Mineral Wool + 6" SOPRA-ISO V ALU	45.7 (8.05)	41.8 (7.35)	0.024 (0.136)	44.0 (7.75)	0.023 (0.129)	45.1 (7.94)	0.022 (0.126)
2" Mineral Wool + 8" SOPRA-ISO V ALU	58.1 (10.23)	52.6 (9.26)	0.019 (0.108)	54.6 (9.62)	0.018 (0.104)	56.2 (9.90)	0.018 (0.101)

Detail 7.1.25

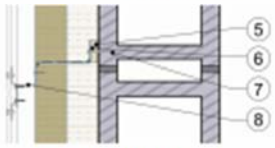
Exterior Insulated Concrete Block Wall Assembly with Protected SOPREMA SOPRA-ISO V ALU and ACS-S Thermal Clip (16" o.c. Horizontal) Supporting Metal Cladding - Clear Wall







Vertical Section at ACS Clip



Plan Detail at ACS Clip

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	Standard Concrete Block	8" (203)	10.4 (1.50)	-	119 (900)	0.19 (800)
3	SOPREMA SOPRASEAL STICK 1100T membrane installed with SOPRASEAL STICK PRIMER	-	-	-	-	-
4	SOPRA-ISO V ALU Exterior Insulation (LTTR)	Varies	0.16 (0.023)	R-12.4 to R-49.5 (2.18 RSI to 8.71 RSI)	1.9 (30)	0.36 (1500)
5	ACS Thermal Pad	1/2" (13)	0.20 (0.0288)	R-2.5 (0.44 RSI)	4.2 (68)	0.36 (1500)
6	Exterior Mineral Wool Insulation	2" (50)	0.23 (0.0335)	R-8.6 (1.51 RSI)	4.3 (69)	0.2 (850)
7	ACS-S Thermal Clip	16 Gauge	118 (17)	-	500 (8000)	0.13 (530)
8	Fasteners	1/4" (6.4) Ø	430 (62)	-	489 (7830)	0.12 (500)
9	Girt	18 Guage	430 (62)	-	489 (7830)	0.12 (500)
10	Cladding with 1/2" 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

APPENDIX C: SPECIFICATION SHEETS

PRODUCT DATA SHEET

SUNDECKS | ROOF DECKS | BALCONIES | PATIOS | STAIRS | POOL DECKS | WALKWAYS

DURADEK™ ULTRA PVC SHEET MEMBRANE

Duradek is an outdoor vinyl flooring system that provides an attractive, finished walking surface and roof-grade waterproofing in a single-ply, single product solution.

Since 1974 over 175 million square feet of Duradek outdoor vinyl flooring has been successfully waterproofing sun decks, balconies, roof decks and more.

The Duradek system is easily integrated into the building envelope to assist in managing water away from the structure, thus protecting the building and extending its life.

Duradek™ Ultra Product Features

- 60 mil thickness
- 15 year waterproofing warranty
- 5 year appearance warranty
- Textured for slip resistance - meets ADA requirements
- UV and mold inhibitors for extended life
- Useable immediately after installation (no curing time)
- Only maintenance is occasional cleaning (no re-coating needed)
- ICC listed as a Thermoplastic Roofing Membrane (AC 75) and a Pedestrian Traffic Coating (AC 39)
- Class A & C Fire rated assemblies
- Expands and contracts with substrate without cracking (tested to -40 $\pm$ 1°C)
- Installed only by authorized and trained contractors using sound roofing details
- Specially formulated adhesives and color coordinated trim pieces
- Over 20 color/pattern options available

Duradek Vinyl Membranes Stand the Test of Time

Since 1974, over a 175 million square feet of decks protected all over North America.

PHYSICAL PROPERTIES

- Calendared polyvinyl chloride (PVC) film laminated to a woven, heat-set polyester fabric
- Surface is factory printed and top-coated with a PVC/acrylic finish
- Weight: 55 oz. per sq. yd. (1864 g/m2)
- Thickness: nominally 0.060 inch [60 mils (1.5 mm)]
- Width: 72 inch (182.88 cm)
- Length: master rolls 25 yards (22.86 m) /or cut to order

TESTS & EVALUATIONS

Code Compliance	ICC-ES No. 2151	Thermal and Moisture Protection Evaluation Report Compliance with 2012, 2015 and 2018 IBC & IRC - Section 07 18 13 Pedestrian Traffic Coatings - Section 07 54 00 Thermoplastic Roofing Membrane - Section 07 54 19 Polyvinyl Chloride Roofing
	ICC-ES CBC & CRC Supplement	Compliance with 2019 California Building Code and Residential Building Code
	ASTM D4434, Type II	Compliance with Standard Specification for Polyvinyl Chloride Sheet Roofing (section 3.2.1 of ICC-ESR-2151)
	FBC Report No. FL12407	Compliance with 2020 Florida Building Code
	TDI Report No. RC-477	Meets Texas Department of Insurance Requirements
	CGSB QAI Report No. RJ0449P-1R1	Compliance with CAN/CGSB 37.54-95 - Polyvinyl Chloride Roofing & Waterproofing Membrane Type 3, Class B
	CCMC Report No. 13134-R	Compliance with 2020 NBC - Traffic Coating and Walkable Roofing Membrane over Habitable or Rated Space
Independent Quality Control	QAI Listing No. B1023-2	Quality Auditing Institute - an accredited third party product certification body to ensure consistent product quality
Fire Classification	QAI Engineering Evaluation RJ0720F-1 & RJ5052F-1	ASTM E108-08 Fire test of roof covering methods. - Class A and Class C fire rated assemblies
	QAI Engineering Evaluation T731-2 & T731-8	CAN/ULC S107-3 Methods of fire tests of roof coverings. - Class A and Class C fire rated assemblies
Wind Uplift	QAI Test Report No. RJ0913P-1R2	Passed ANSI/FM 4474 (2004) - to evaluate the wind uplift resistance of roof assemblies
Edge Flashing Pulloff Resistance	Farabaugh Test Report No. T128-11	Passed ANSI/SPRI ES-1 wind design standard - for edge systems used with low slope roof systems
Chemical Resistance of Walking Decks	QAI Test Report RJ2822P-2	ASTM D2299-68 Chemical Resistance - Meets requirements of AC39

For Test Report details, Detail Drawings or MSDS please visit duradek.com/architectural-resources/vinyl-decking-resources

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North Kansas City, MO, USA, 64116
duradekus@duradek.com
T 816 421 5830 | TF 1 800 338 3568

Duradek Canada Ltd.
8288 - 129 Street
Surrey, BC, Canada V3W 0A6
duradek@duradek.com
T 604 591 5594 | TF 1 866 591 5594

Job Name _____

Contractor _____

Date _____

Products Specified _____

CertainTeed Type C

Fire-Resistant Drywall Panel

CertainTeed Type C Drywall Panel is an interior drywall panel consisting of an enhanced fire-resistant, non-combustible gypsum core enclosed in 100% recycled face and back paper. CertainTeed Type C Drywall Panels provide superior fire performance when used in specific fire-rated Type C assemblies. Long edges are slightly tapered, allowing joints to be reinforced and concealed with joint tape and joint compound. CertainTeed Type C Drywall Panel is available in a variety of lengths and widths.

BASIC USES

CertainTeed Type C Drywall Panel is used for interior walls and ceilings in residential and commercial applications requiring extended fire ratings. It can be used for installations over wood or steel framing. They are typically nailed or screwed to studs spaced 16″ (406 mm) or 24″ (610 mm) o.c.

ADVANTAGES

- UL / cUL / ULC fire rated assemblies up to four hours.
- Consistently high quality.
- Uniformly flat, attractive appearance.
- High edge hardness.
- No wavy edges, warps, bows or deformities.
- Uniform high-strength cores eliminate crumbling, cracking.
- Edge tapers consistent to form perfect joints.
- Excellent thermal barrier and sound attenuation qualities.
- GREENGUARD Gold Certified

INSTALLATION

LIMITATIONS

- Exposure to continuous moisture or extreme temperatures should be avoided. Not recommended for continuous exposure to temperatures exceeding 125° F (52° C).
- Framing spacing should not exceed 24″ (610 mm) o.c.
- Store indoors and off ground surface. Storage should be in accordance with the Gypsum Association GA-801, *Handling and Storage of Gypsum Panel Products*.
- Panels should be stacked flat with care taken to prevent sagging or damage to edges, ends and surfaces.
- Storing panel lengthwise leaning against the framing is not recommended.
- Panels should be carried, not dragged, to place of installation to prevent damaging finished edges.

PRODUCT DATA

PROPERTIES	
Thickness	1/2″ (12.7 mm), 5/8″ (15.9 mm)
Width	4′ (1220 mm)
Length	8′ to 12′ (2440 mm to 3660 mm)
Weight	1/2″ (12.7 mm) - 1.9 lb/ft² (9.3 kg/m²), 5/8″ (15.9 mm) - 2.3 lb/ft² (11.2 kg/m²)
Edges	Tapered
Packaging	Two pieces per bundle, face-to-face and end-taped

Custom lengths may be available on special order. Consult your CertainTeed sales representative.

TECHNICAL DATA

APPLICABLE STANDARDS AND REFERENCE	
Product Standard	ASTM C1396
Installation Guidelines	ASTM C840 / GA-216
Finishing Guidelines	ASTM C840 / GA-214
Code References	International Building Code (IBC)
Code References	International Residential Code (IRC)
Code References	National Building Code of Canada (NBCC)
UL/ULC Designation	Type C

certainteed
SAINT-GOBAIN

PHYSICAL PROPERTIES	1/2″ (12.7 mm) TYPE C	5/8″ (15.9 mm) TYPE C	TEST METHOD
Nominal Width	4′ (1220 mm)	4′ (1220 mm)	-
Standard Lengths	8′ to 12′ (2440 mm to 3660 mm)	8′ to 12′ (2440 to 3660 mm)	-
Face Surface	Paper	Paper	-
Weight - lb/ft² (kg/m²)	1.9 lb/ft² (9.3 kg/m²)	2.3 lb/ft² (11.2 kg/m²)	-
Edge Profile	Tapered	Tapered	
Surface Burning Characteristics - Flame Spread	15 (0)	15 (0)	ASTM E84 / UL 723 (CAN/ULC-S102)
Surface Burning Characteristics - Smoke Developed	0 (0)	0 (0)	ASTM E84 / UL 723 (CAN/ULC-S102)
Surface Burning Characteristics	Class A	Class A	ASTM E84 / UL 723 (CAN/ULC-S102)
Combustibility	Non-Combustible	Non-Combustible	ASTM E136 (CAN/ULC-S114)
Nail Pull	≥ 77 lbf (343 N)	≥ 87 lbf (387 N)	ASTM C473 (Method B)
Core Hardness - End	≥ 11 lbf (49 N)	≥ 11 lbf (49 N)	ASTM C473 (Method B)
Core Hardness - Edge	≥ 11 lbf (49 N)	≥ 11 lbf (49 N)	ASTM C473 (Method B)
Flexural Strength - Parallel	≥ 36 lbf (160 N)	≥ 46 lbf (205 N)	ASTM C473 (Method B)
Flexural Strength - Perpendicular	≥ 107 lbf (476 N)	≥ 147 lbf (654 N)	ASTM C473 (Method B)
Humidified Deflection	≤ 1-1/4″ (32 mm)	≤ 5/8″ (16 mm)	ASTM C473

INSTALLATION *continued*

- Cutting and scoring should be done from the face side.
- In cold weather or during joint finishing, temperatures within the enclosure should stay within the range of 50° to 95° F (10° to 35° C) and with sufficient ventilation to carry off excess moisture.
- CertainTeed Type C can be substituted in an equivalent thickness in any fire resistance rated assembly specifying Type X.
- Where CertainTeed Type C is specified to attain a fire resistance rating, CertainTeed Type X of equivalent thickness cannot be substituted.

RECOMMENDATIONS

Installation of CertainTeed® Type C Drywall Panels should be consistent with methods described in the standards and references noted. Cutting should be from the face side of the panels for best results.

DECORATION

CertainTeed Type C Drywall Panel accepts most types of paints, texture and wall covering materials. The surface shall be primed with a full-bodied latex primer before applying a final decorative material. This will equalize the suction between the joint compounds and the paper surface.

For best painting results, all surfaces, including joint compound, should be clean, dust-free and not glossy. If glossy paints are used, a thin skim coat of compound over the entire surface, Level 5 finish, is recommended to reduce highlighting or joint photographing. This method is also recommended for areas of critical sidelighting of natural or artificial light sources.

A sealer application under wallpaper or other wall covering is also recommended so the panel surface will not be damaged if the covering is subsequently removed during redecorating. Joint treatment must be thoroughly dry before proceeding with primer-sealer application and final decoration.

BIM/CAD INFORMATION

The BIM and CAD UL fire rated assemblies and sound assemblies can be found on CertainTeed's BIM and CAD Design Studio at bimlibrary.saint-gobain.com/certainteed. CertainTeed's BIM and CAD Design Studio provides BIM and CAD details to many UL fire rated assemblies and sound assemblies in easy to view experience. Plus, downloadable Revit and DWG and PDF CAD Details are available.

SUSTAINABILITY

Sustainable documentation, including recycled content, EPDs, HPDs, VOC Certifications, can be found at saintgobain.ecomedes.com.

NOTICE

The information in this document is subject to change without notice. CertainTeed assumes no responsibility for any errors that may inadvertently appear in this document.

For Fire Resistance, no warranty is made other than conformance to the standard under which the assembly was tested. Minor discrepancies may exist in the values of ratings, attributable to changes in materials and standards, as well as differences between testing facilities. Assemblies are listed as “combustible” (wood framing) and “noncombustible” (concrete and/or steel construction).

SAINT-GOBAIN

CertainTeed Canada

CEILINGS • GYPSUM • INSULATION • ROOFING • SIDING • TRIM

2424 Lakeshore Rd. West, Mississauga, ON L5J 1K4 800-233-8990 certainteed.ca

QUIETWALK LV®

MULTIPURPOSE UNDERLAYMENT

Delta△IIC 28
IIC 70
STC 62
*With ceiling assembly

For Use Under
- Rigid Core Vinyl
- WPC/ SPC
- LVT/LVP
- Laminate
- Hardwood

Installation Methods
- Floating
- Glue Down (4mm+)
- Mechanically Fastened


MULTILAYER FLOORING UNDERLAYMENT


SUPERIOR SOUND CONTROL


EXCLUSIVE MOISTURE PROTECTION


ADDING INSULATION VALUE


MADE FROM RECYCLED CONTENT

INSTALLATION METHODS

FLOATING FLOORS
1. Roll out underlayment and flip over so vapor barrier side is facing up and butt seams together
2. Apply moisture barrier seam tape, and ensure underlayment seams run perpendicular to the floor covering seams
3. Click & lock floating floors over the top according to manufacturer

DOUBLE GLUED DOWN FLOORS
1. Double Glue Down installations are approved with flooring that is a minimum thickness of 4mm.
2. Roll out underlayment and flip over so vapor barrier side is facing up and butt seams together, ensure seams run perpendicular to the flooring seams
3. Adhere to subfloor using pressure sensitive adhesive and recommended trowel size and install method
4. Roll over the underlayment with a 75 or 100 pound roller
5. Adhere flooring over the top using floor manufacturer's recommended adhesive and trowel size. Follow all adhesive manufacturer's instructions for appropriate bonding

MECHANICALLY FASTENED HARDWOOD FLOORS
1. Unroll the underlayment and ensure vapor side is up and fibers are to the subfloor.
2. Install underlayment in opposite direction to the flooring material. You can

tape the seams but it is not necessary.

3. Install the hardwood per manufactures written instructions, using their recommended fastening materials.

*ENSURE TO READ THE COMPLETE INSTALLATION INSTRUCTIONS BEFORE INSTALLATION

APPROVED SUBSTRATES
- Dry, completely cured concrete (at least 28 days old)
- Concrete and masonry blocks
- Cement backer units (CBU)
- Cementitious screeds, leveling coats and mortar beds
- Waterproofing and crack-isolation membranes
- Wood, plywood, or OSB subfloors that meet NWFA Subfloor Guidelines and Specifications, and meet applicable building codes
- Cement terrazzo floors
- Suitable with Radiant Heat Systems

SPECIFICATIONS
- **Physical Properties:** Blended synthetic fibers and polyethylene film. Inert hot-melt adhesive.
- Weight ..... 9lbs/100sf roll : 30lbs/360sf roll
- Thickness 1.4mm
- Density ..... 18.28 lbs / ft^3
- R-Value(@1.4mm) ..... 0.528 hr-ft2-degF/Btu (9.58/ inch)
- Compression Resistance @ 50% (ASTM D1667) 64.58psi
- Compression Set @ 25% (ASTM D1668) 8.8%
- Break Strength ..... Length 28.3 lbs. Width 31.4 lbs.
- Antimicrobial Protection ..... Yes
- WVTR ..... 0.12lbs/1000ft^2 /24hrs
- Moisture Emissions Allowance ..... 6lbs/1000ft^2 /24hrs

SOUND PROPERTIES

IMPACT SOUND TRANSMISSION
The method is designed to measure the impact sound transmission performance of a floor-ceiling assembly in a controlled laboratory environment.

IIC	Flooring	Sub-floor
70	5mm Vinyl Plank	over a 6" concrete subfloor with a suspended ceiling assembly
55	5mm WPC	over a 6" concrete slab
63	3.5mm Vinyl Plank w/ attached pad	over a 8" concrete slab
62	5.5mm Vinyl Plank	over a 8" concrete slab

SOUND TRANSMISSION LOSS
The sound-insulating property of a partition element is expressed in terms of the sound transmission loss.

STC	Flooring	Sub-floor
62	5mm Vinyl Plank	over a 6" concrete subfloor with a suspended ceiling
54	3.5mm Vinyl Plank w/ attached pad	over a 8" concrete slab
52	5.5mm Vinyl Plank	over a 8" concrete slab

DELTA TEST
Tests the impact insulation difference between a bare concrete subfloor with no flooring materials and the same concrete subfloor with flooring and underlayment.

Delta IIC	Flooring
28	QWLV under 5mm Vinyl Plank

LIMITATIONS
QuietWalk LV is not suitable for use as underlayment for:
- Ceramic tile
- Carpet
- Sheet-vinyl
- VCT

*Commercial applications require minimum floor thickness of 4mm

Installations over concrete in high moisture areas (vapor emission rate above 6 lbs/ 1000 sq ft/ 24 hrs) will require additional protection such as a concrete sealant or polyethylene vapor barrier.

SUSTAINABILITY AND LEED
- QuietWalk LV contains post industrial/pre-consumer fibers.
- QuietWalk LV is LEED ™ compliant and will contribute to:
  - -MRc4.1-4.2 recycled content credit
  - -EQ 4.3 low-emitting materials credit
- QuietWalk LV is GreenGuard Gold certified

Volatile Organic Compounds (VOC)
Meets low emissions standards with zero offgassing.

PACKAGING
Roll Sizes: **3' x 33.4' (100 sq ft)** do-it-yourself size rolls
6' x 60' (360 sq ft) contractor sized rolls

100 SF ROLLS: QW100LV
54 rolls per pallet, 1 box per pallet
3456 rolls per truck, 64 pallets per truck

360 SF ROLLS: QW360LV
24 rolls per pallet, 32 pallets per truck
768 rolls per truck

REV: 0825

Type IV Glass Ply Sheet

ASPHALT SATURATED FIBERGLASS MAT

STOCK# **0640092**

QUANTITY PER PALLET: **24**

PALLET SIZE: **112 cm x 112 cm (44 in. x 44 in.)**

LENGTH: **50.2 m (164.6 ft.)**

WIDTH: **1000 mm (39 3/8 in.)**

AREA: **50 m² (540 ft.²)**

Note: All reported values are nominal.

- MINIMIZES MOISTURE
- MULTI-USE

IKO COMMERCIAL®

Specify *with* Confidence.

Specially designed to alleviate moisture build up and easy to install, let IKO Type IV Glass Ply Sheet go to work for your next commercial roofing project.

Type IV Glass Ply Sheet

ASPHALT SATURATED FIBERGLASS MAT

Asphalt Permeated

IKO Type IV Glass Ply Sheet is composed of a high-strength, inorganic mat of non-woven glass fibers, which has been thoroughly permeated with premium asphalt.

Minimizes Moisture Build Up

Offers greater moisture resistance, enabling a four-ply application to provide substantially greater performance characteristics than a conventional four-ply organic felt built-up roofing system.

Non-Stick

This product's surface is sprayed with a water-based soap solution to prevent sticking in the roll.

Superior Strength

IKO Type IV Glass Ply Sheets provide superior "breaking strength" characteristics in both longitudinal and transverse directions.

Type IV Glass Ply Sheet

ASPHALT SATURATED FIBERGLASS MAT

IKO COMMERCIAL®
Specify *with* Confidence.

This sheet complies with all CSA A123.17 and ASTM D2178 Type IV specifications.

Please contact your IKO Technical Representative for specific slope requirements.

CHARACTERISTICS	UNITS	NOMINAL VALUE	TEST METHOD	STANDARD LIMITS
Cold Flex:	° C (° F)	✓	ASTM D146	MIN: 10 (50)
Tensile Strength MD: XD:	kN/m (lbf/in.)	✓ ✓	ASTM D146	MIN: 7.7 (44) MIN: 7.7 (44)

NORDIC™

Nordic is a laminated two-piece, polymer-modified-asphalt shingle, manufactured on a robust fiberglass reinforcement.

Fiberglass-Reinforced Asphalt Shingles

IKO Nordic performance shingles are among the top-performing asphalt shingles currently available. They're engineered for superior wind and impact resistance, and offer a Class 4 Impact Resistance rating[1]. Their fiberglass mat has an extra-thick coating of polymer-modified asphalt, embedded with algae-resistant granules. Available in a wide range of enhanced color blends, these shingles are made in IKO's special "Advantage" size for full square coverage.

Click here or scan this QR code for product literature, color swatches and color availability.

1 Features and Benefits

- Polymer-Modified Asphalt
- Full Square Coverage
- Blue-Green Algae Resistant
- ArmourZone Reinforcement
- Class 4 Impact Resistance[3]

2 General Information

Shingles/Bundle	20
Coverage/Bundle	33.3 ft.^{2} (3.1 m^2)
Coverage/Three Bundles	100 ft.^{2} (9.29 m^2)
Bundles/Pallet	56
Pallet Size	40 x 53 1/2 in. (102 x 136 cm)
Product Stock No. (U.S.)	4608XXX
Product Stock No. (Canada)	4609XXX

NOTE: *XXX refers to numerical product color code. Product color availability varies by region.*

3 Product Dimentions

Length	40 7/8 in. (1,038 mm)
Width	13 3/4 in. (349 mm)
Exposure	5 7/8 in. (149 mm)

Product dimensions shown are subject to normal manufacturing tolerances of +/- 1/4 in. (6 mm) on the shingle's length and +/- 1/8 in. (3 mm) width.

NORDIC™

4 Applicable Standards[1]

ASTM D3462 Product Standard

ASTM D3018 Product Standard

ASTM D3161 Class F Wind Resistance

ASTM D7158 Class H Wind Resistance

ASTM E108 / UL 790 Class A Fire Resistance[2]

CAN / ULC S107 Class A Fire Resistance (Canada)[2]

CSA A123.5 Product Standard (Canada)

FM 4473 / UL 2218 Class 4 Impact Resistance[3] **here**

Miami-Dade County Product Approval[4] **here**

Florida Building Code High-Velocity Hurricane Zone (HVHZ) Approval[4] **here**

Texas Department of Insurance Details **here**

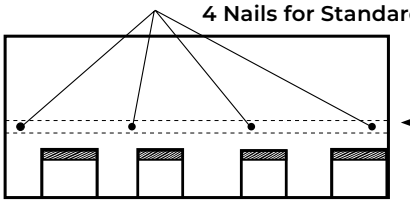
NOTE: *IKO Nordic asphalt shingles meet or exceed the requirements in the product standards referenced at the time of manufacture.*

5 Safety Information

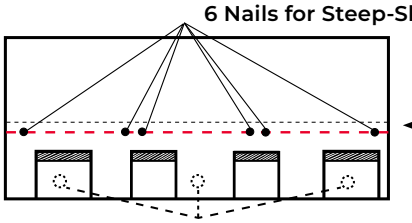
CAUTION: Working at heights on sloped-roof surfaces can be dangerous. Do not install until all appropriate safety precautions are followed. Always wear appropriate personal protective equipment (PPE), including appropriate fall protection equipment.

6 Shingle Installation

4 Nails for Standard Application



6 Nails for Steep-Slope Applications



Apply Roofing Cement CAUTION: Excessive Use of Roofing Cement Can Cause Shingles to Blister.

Shingles must be installed according to all of IKO's application instructions. Some select installation requirements are highlighted here.

1. The space beneath the roof deck (e.g., attic) should be thoroughly ventilated to minimum local building code requirements.
2. Shingles should be installed with 5 7/8-inch shingle exposure to the weather.
3. Offsets between courses are recommended to be 10 inches.
4. Open metal valleys are recommended for best roof system performance.
5. Never apply asphalt shingles to roof slopes less than 2:12. For slopes 2:12 to less than 4:12 (low slope), see special underlayment requirements outlined in the IKO application instructions.

This product's Safety Data Sheet (SDS) is available **here.**

Complete product installation details can be found **here.**

[1]Compliance with listed product standards is based on sampling and testing of products as manufactured. [2]When shingles are installed over an approved underlayment. [3]The Impact Resistance rating is solely for the purpose of enabling residential property owners to obtain a reduction in their residential insurance premium, if available. It is not to be construed as any type of express or implied warranty or guarantee of the impact performance of this shingle by the manufacturer, supplier or installer, and damage from hail is not covered under the Limited Warranty. For further details concerning the FM 4473 standard, visit the FM Approvals website. For the UL 2218 standard, visit the UL Solutions website. [4]M-D and FBC HVHZ approvals apply only to shingles available in the southeast U.S. market. For more information, please contact IKO at: 1-888-IKO-ROOF (1-888-456-7663).

INSTALLATION GUIDE

NOTE

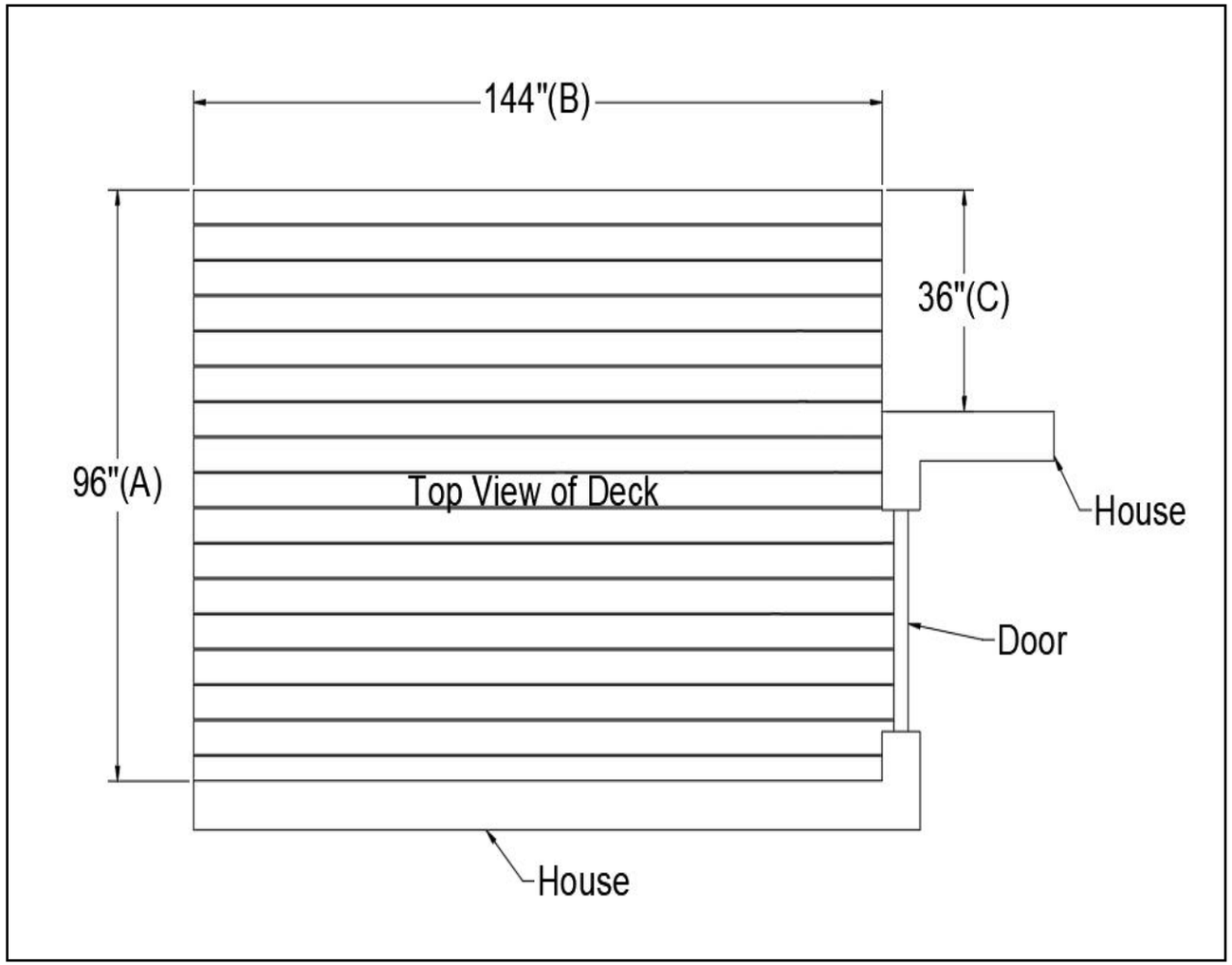
- When attaching to vinyl siding with wall attachments and vinyl decks.
- Pre-drill holes
- Fill holes in plate with silicone then drive screw in

MAINTENANCE

- Silicone around screws need to be checked every two years
- Reapplied as necessary

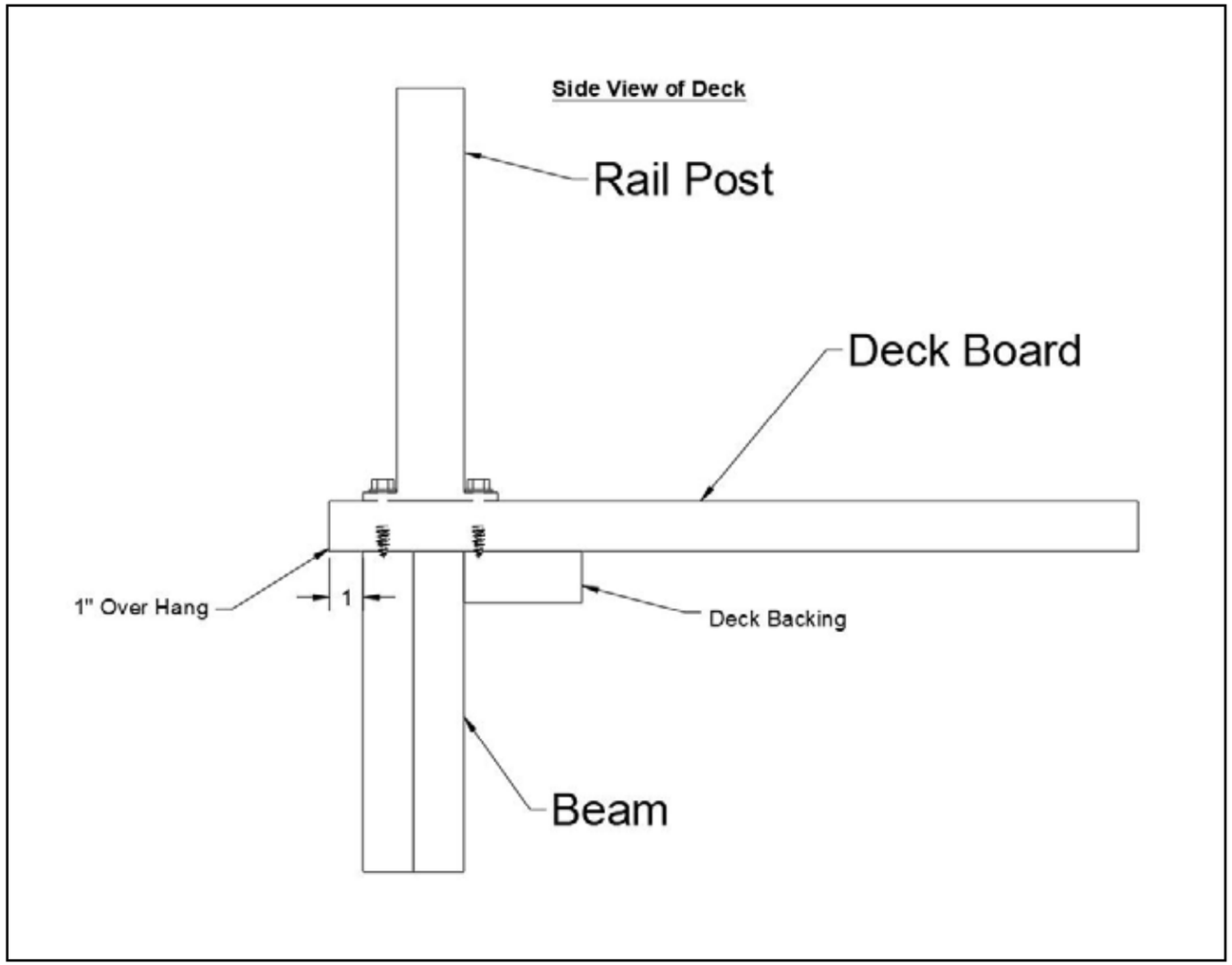
INSTALLATION GUIDE

STANDARD PICKET RAILING



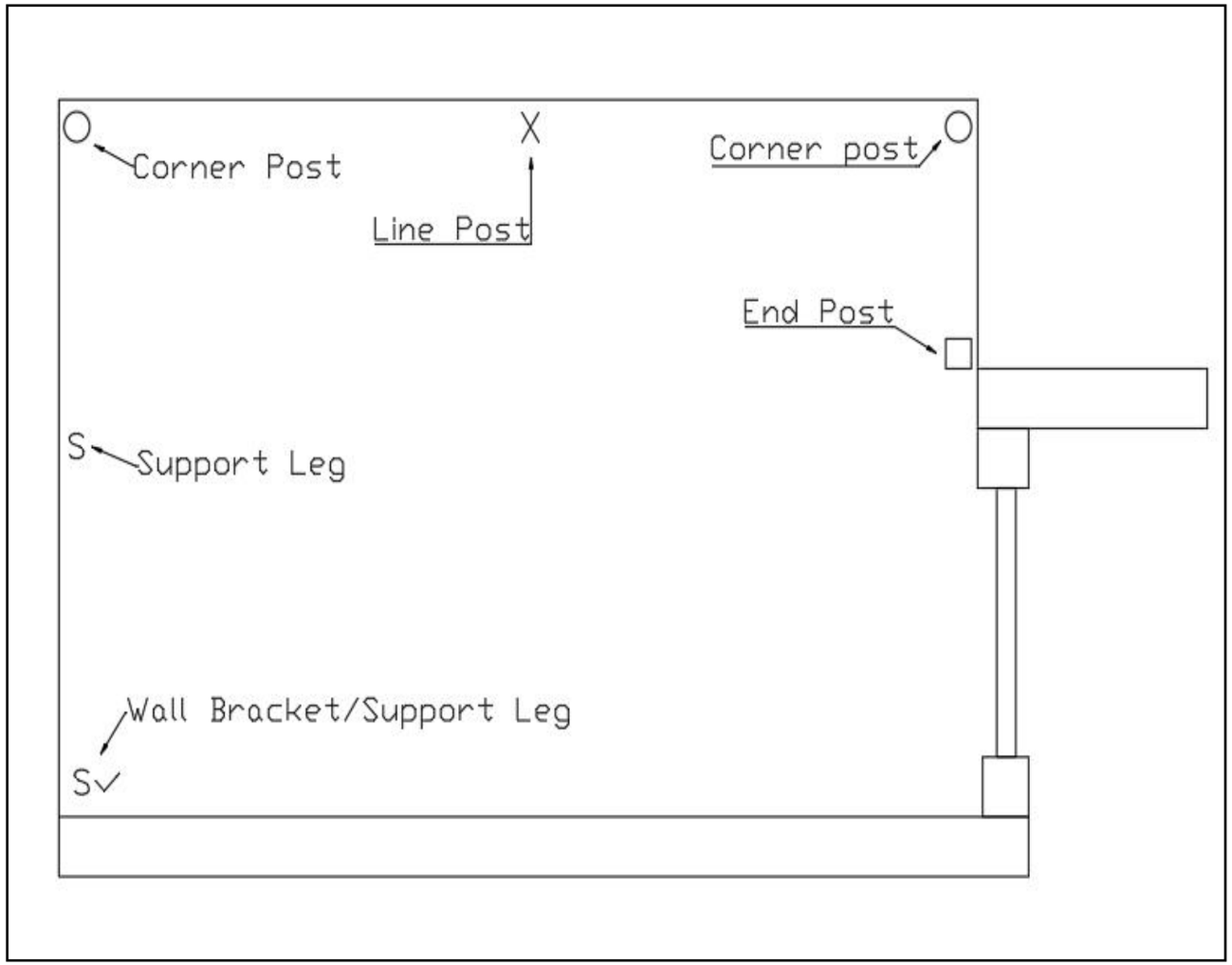
1 MEASURING THE DECK

- Measure overall length of deck
- This will be used to develop the cut sheet
- Recommend using inches



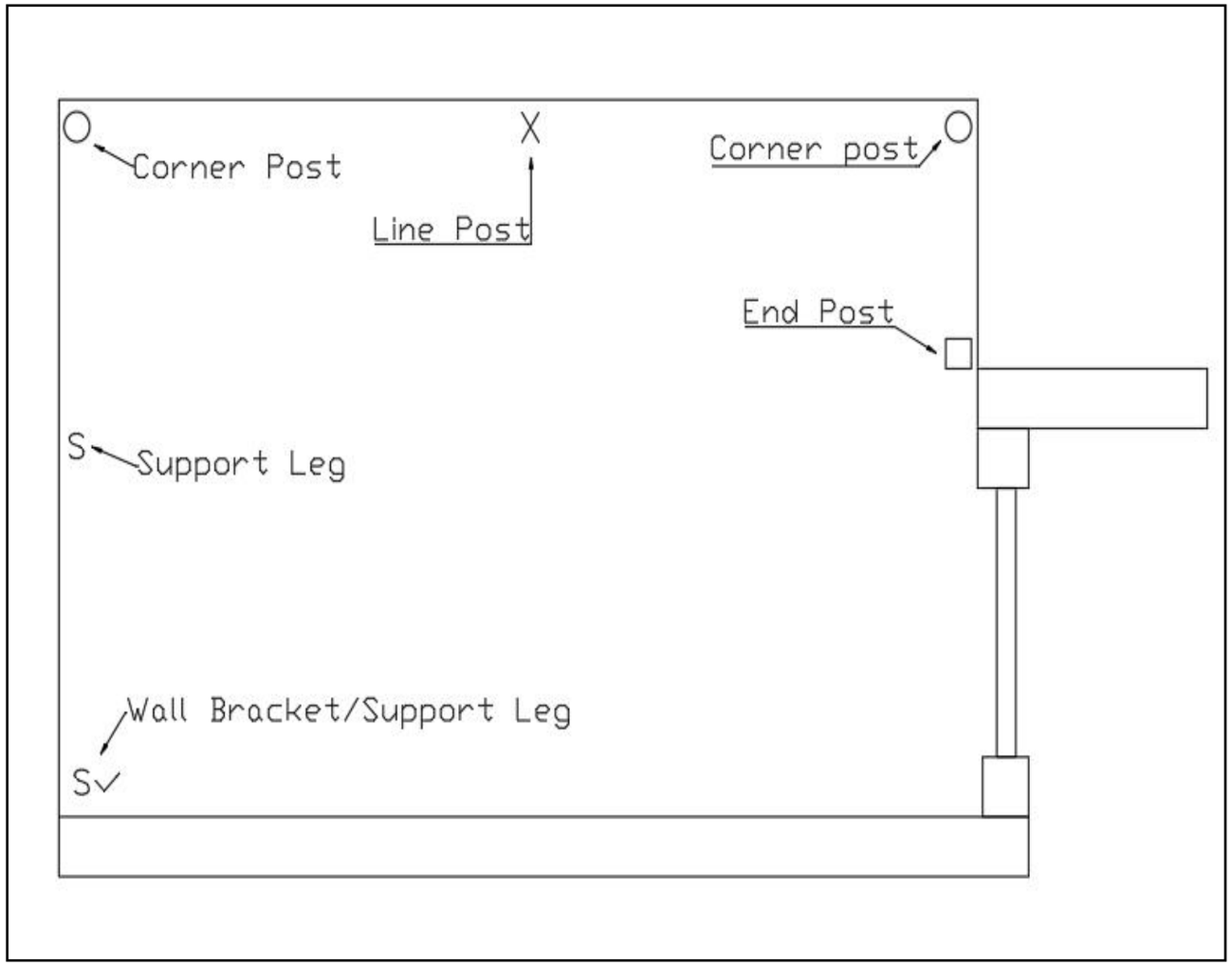
2 CHECK OVER HANG OF DECK BOARDS

- Railing post to be mounted over framing, not the over hang of deck boards
- Measure over hang
- This will be used to develop cut sheet



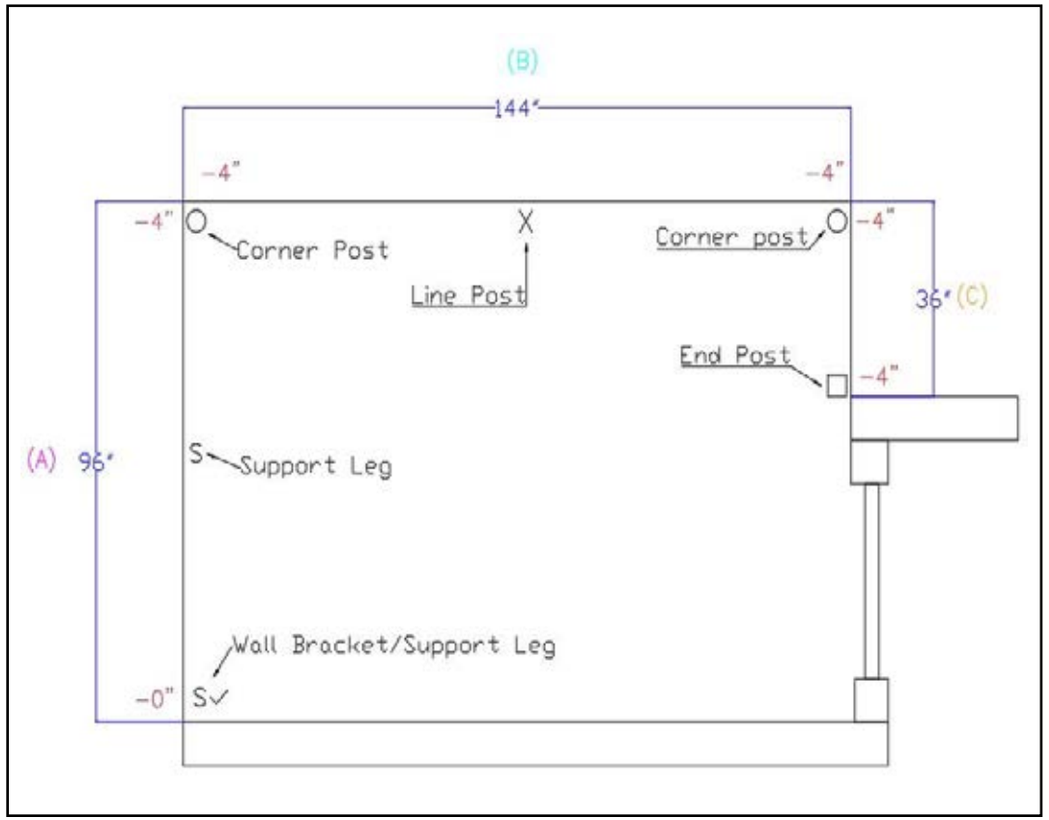
3 POST LAYOUT

- Know what posts go where
- Posts will effect the cut sheet



4 POST DIMENSIONS

- Post dimensions effects cut sheet
- McLean posts are 2”x2” square posts
- McLean corner posts are 4”x4” base plate
- McLean End and Line posts have 4”x6” base plate
- Bottom rail is cut to the inside of each stated post
- Bottom rail cut is 3” less for every post. Plus whatever the over hang is on the deck boards



Note: Measurement for cut sheet is for <u>bottom rail</u> cut sheet

(A) 92" (B) 136" (C) 28"

5 CUT SHEET

- Using steps 1 to 4 you can now generate your cut sheet

  1) Take the overall measurement

  2) Deduct deck board over hang

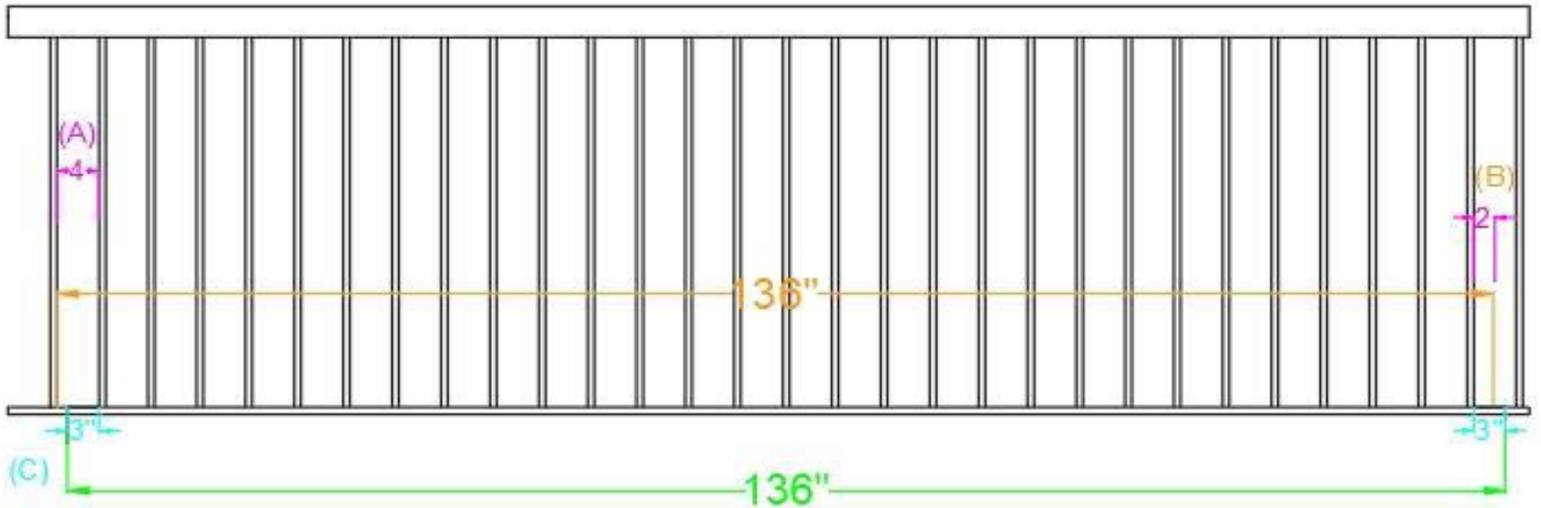
  3) Know what posts are being used for the piece you are cutting

  4) Account for deck board over hang

- If there is no over hang, base plate should be 1" away from the edge of deck

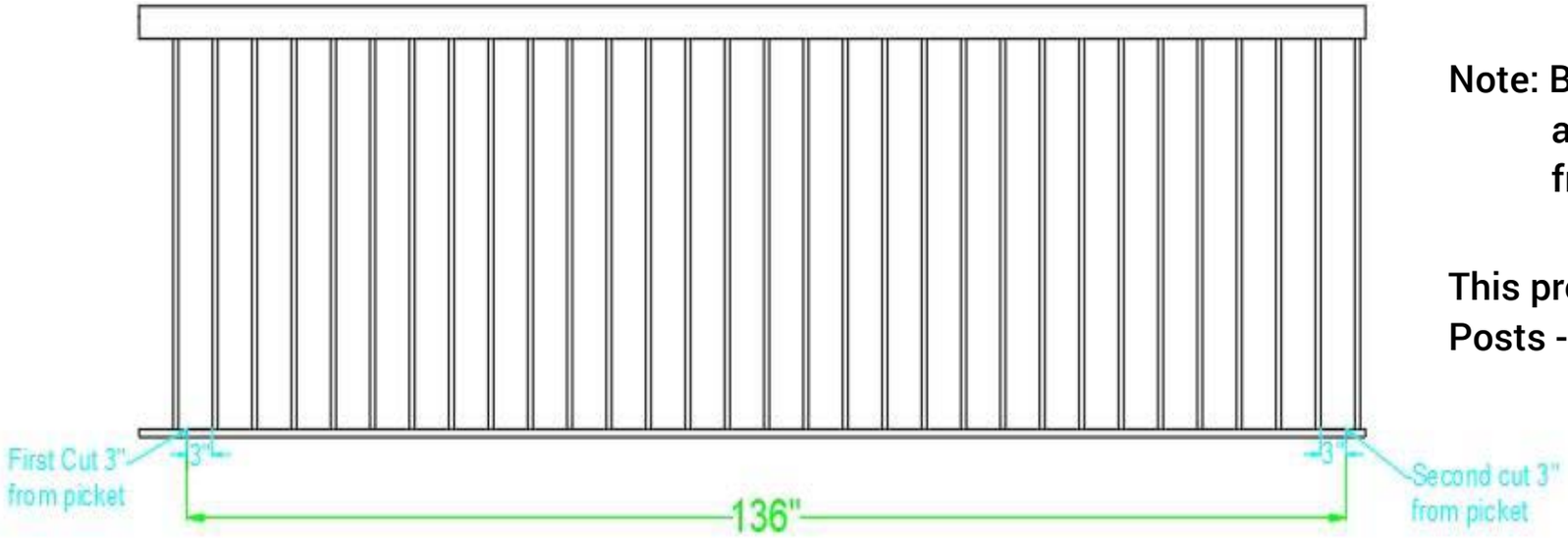
6 PICKET SPACING

- Taking the measurements generated from the cut sheet
- Determine picket spacing (corner to corner)
- Picket spacing is 4” (between each picket)
- Goal is to have the same space between post and picket on each side of a single piece of rail
- (A) Always start at a full picket space 4”
- (B) Measure the rail from the start of a picket to the measurement from your cut sheet
- Divide by 2 -> divide the sum of (A+B/2=C)
- Now determine (C) is 3” picket space from post to picket on each side of the rail
- Add (A) 4” and (B) 2” together=6



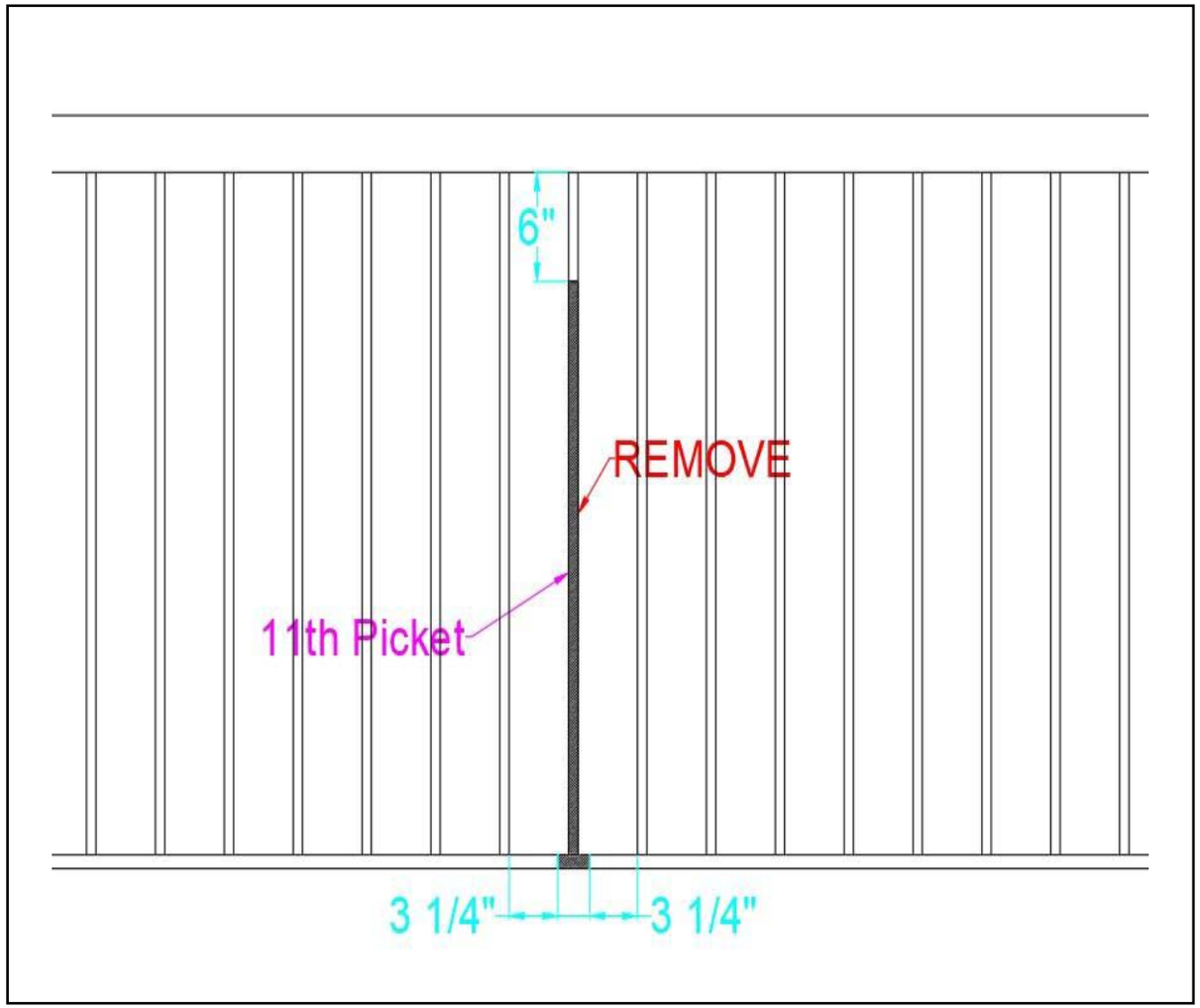
7 CUTTING THE BOTTOM RAIL

- Cut bottom rail first
- Use number from picket spacing formula (C) 3”
- Make first cut
- Measure length of rail from cut sheet and make second cut



Note: Bottom rail cut cannot exceed 4” past a picket and must be no less than 1” from a picket

This process works the same for
Posts - Wall Brackets - End Post - Corner Post



8 CUTTING RAIL FOR LINE POST

- Count the number of pickets in said piece of rail (21)
- Find the middle picket (11) This is the picket line post will replace
- Make one cut 6” from top rail (Cut #1)
- Measure 3¼” from each picket on either side of the picket being removed
- Install line post
- Line post has an open slot in the top to slip over the 6” picket you left in the top rail

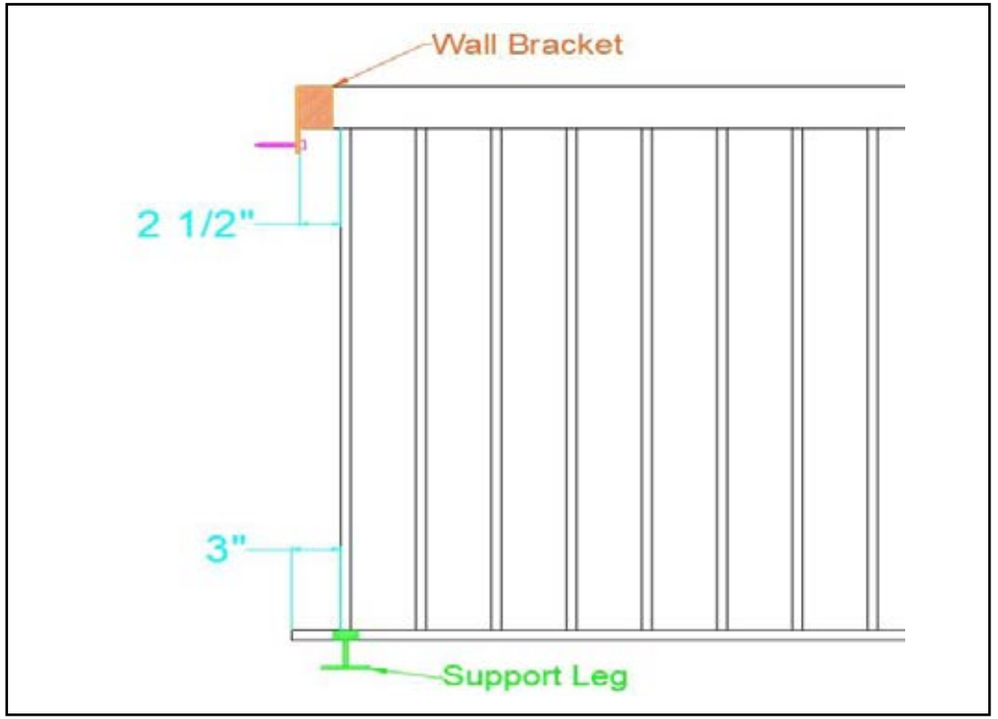
9 CUTTING TOP RAIL WALL BRACKETS

- All rail being cut to go into wall brackets the top rail will be ½" less than the bottom rail
- This is not the overall measurement but ½" less from the picket

Note:

- **Bottom rail is to be cut square and tight to wall**
- **Top wall bracket to be screwed flat to surface (not rock)**
- **Bottom rail is an exposed cut**

- Bottom rail to first picket 3" (example)
- Top rail cut to first 2 ½" (example)



10 CUTTING TOP RAIL END POST

- For all Rail being cut to go into an end post the top cut will be 3” more than the bottom rail cut
- This is not the overall measurement but 3” more from the first picket
- Bottom rail to first picket 3” (example)
- Top rail cut to first picket 6” (example)

Note:

- **Never use a factory end when cutting the rail for an end post**
- **Factory end of rail: top and bottom equal distance from first picket**
- **End post requiers top rail to be 3” longer than the bottom rail**

11 CUTTING TOP RAIL FOR CORNER POST

- For all rail being cut to go into corner post the top cut always be 1” less than the bottom rail cut
- This is not the overall measurement but 1” more from the first picket
- Bottom rail to first picket 3” (example)
- Top rail cut to be 2” first picket (example)

Note:

The top rail cut will always be generated after the bottom rail has been cut and picket spacing has been determined.

INSTALLATION GUIDE

GLASS RAILING

- Follow all the same steps for measuring for picket rail
- For Glass Rail the overall idea is the same as picket

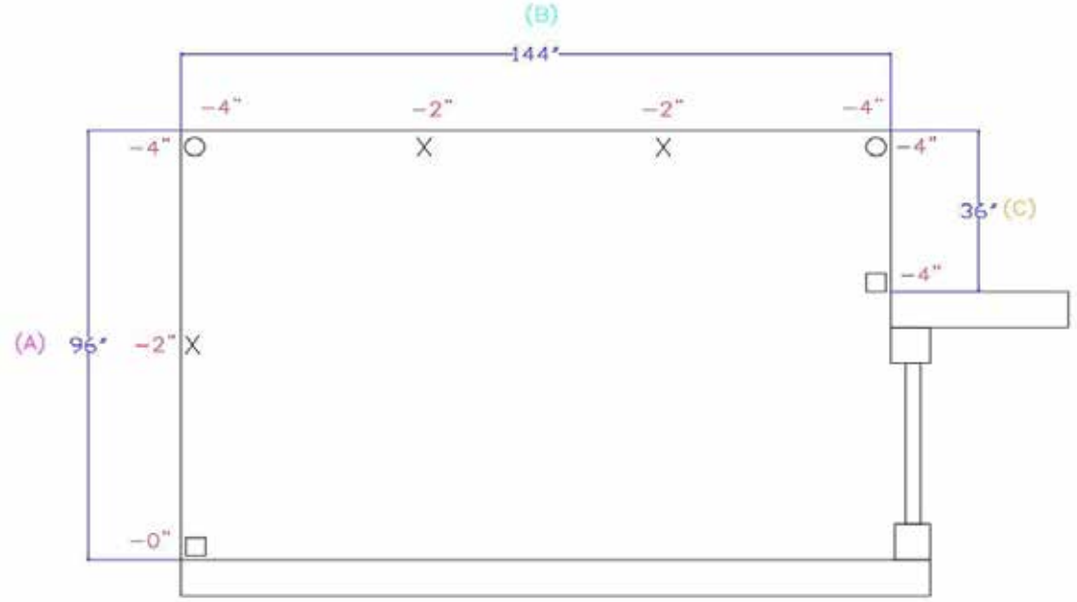
  1) Measure the Deck

  2) Know what posts go where

  3) Develop a cut sheet

  4) Build the rail in a full square piece

  5) Install on Deck
- Where Glass Rail differs is developing your cut sheet
- You still are getting the bottom rail cut first but the bottom rail will be cut to the R.O. (rough opening) pieces
- Then pieced together create the full length of railing



Example: Length 144”

-4” for each corner post

-2” for each line post =12”

Divide by how many openings

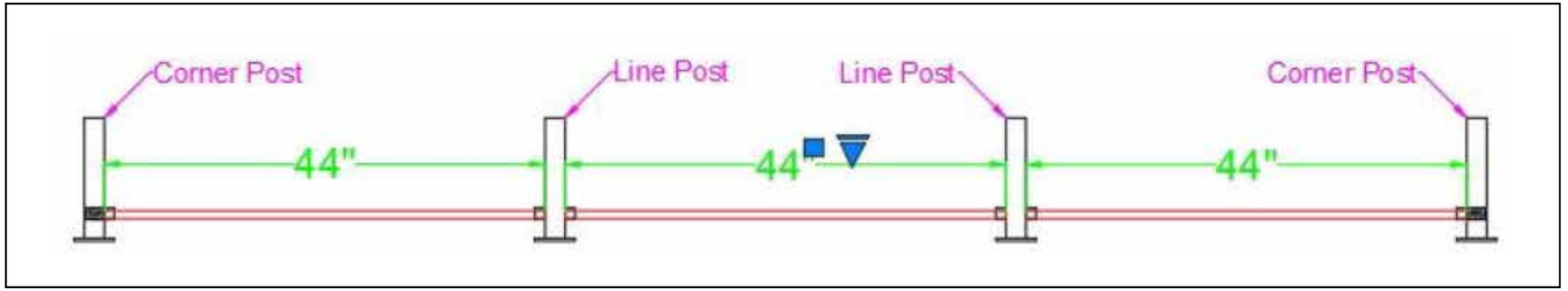
144”-12”=132”

132” / 3 = 44”

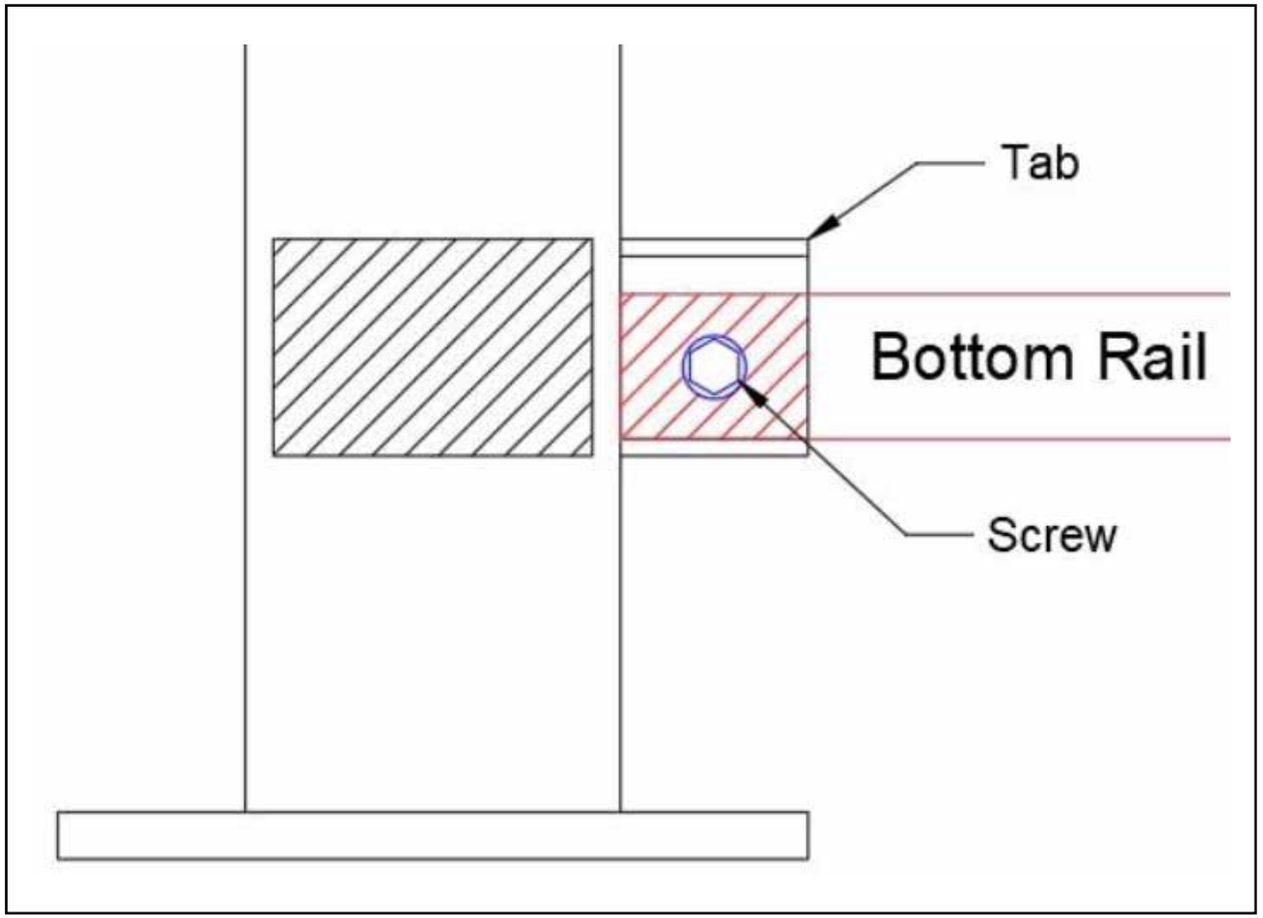
Bottom Rail Cut

(R.O.) 44” x 3 pieces

- Cut the bottom rail pieces at 44”
- On a flat level surface slide each bottom rail into the posts
- Make sure the bottom rail is all the way into the tab slot on the post (If it’s not it will effect the overall length on the rail)
- Screw in all the bottom rail
- Ensure the bottom rail is resting on the bottom of the Tab

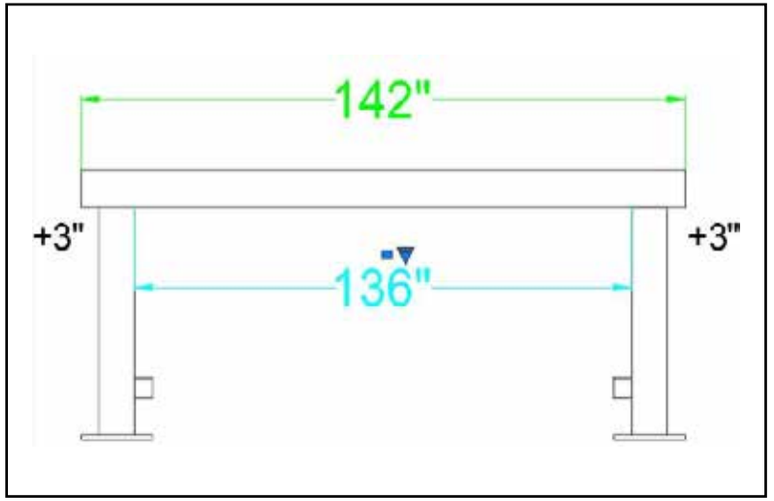


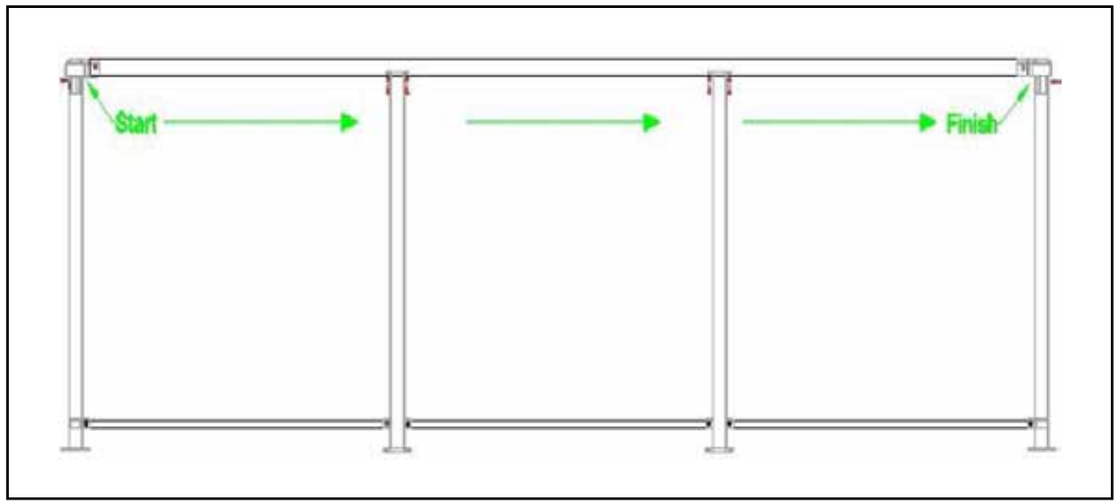
- Once the bottom rail has been fully screwed in, you can measure the top of the rail
- Measure from the inside corner post to the inside of the other corner post (132″-2″=134′)
- Minus 1″ for each corner top
- Top rail cut will be 134″
- This method five about 5/8″ of play inside the top corner sleeve



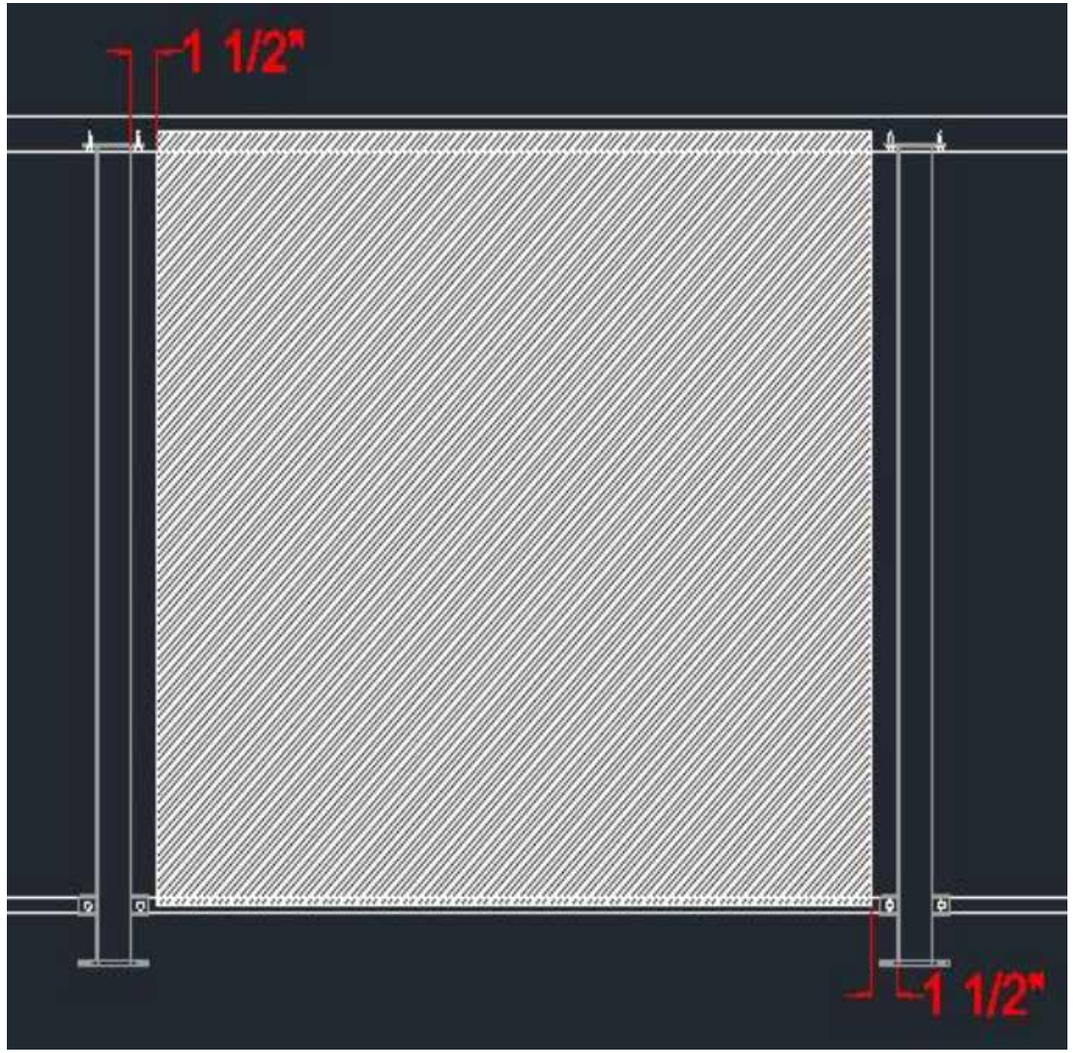
Note

- For end posts the top rail should be cut 3” past the inside of the post 136”+6” = 142”
- Install the top rail on your posts
- Start at one side and work your way to the other
- Slide top rail into top corner sleeve (leave 5/8” of play in sleeve)
- Screw rail to corner sleeve
- Screw corner sleeve to post
- Measure post to post at the bottom of posts (44”)





- Measure from corner post to next line post and and make it match the bottom measurement 44” (Square the Rail)
- Screw the four screws in the line post
- Repeat this process moving left to right
- Now you will have a perfectly square piece of rail
- Ready to install on the deck



GLASS SIZE

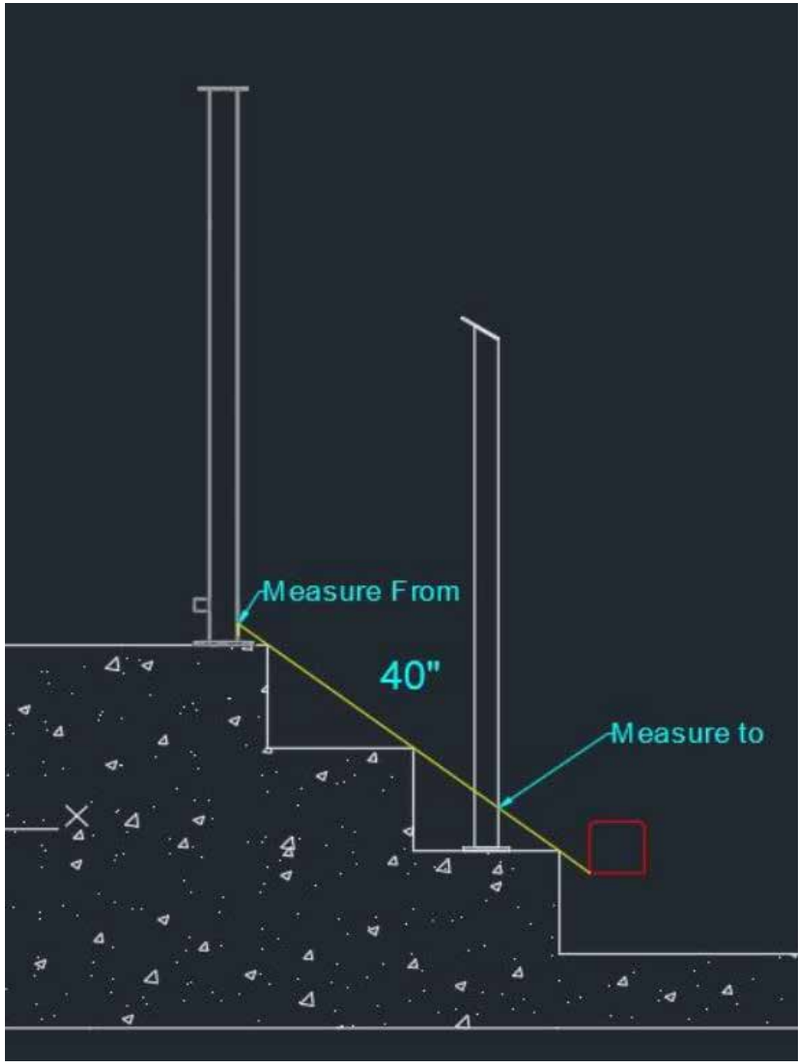
- Your glass panel will be 3" less in width than your R.O. inside of post to inside of post measurement

  44" R.O. 41" Glass Size

- Glass panel height is set at a consisten height of 38 ¼" tall
- This gives a ½ glass reveal from post to glass on each side of the piece
- To install the glass simply push the panel all the way into the top rail
- Then pull down the glass to rest in the bottom channel

INSTALLATION GUIDE

STAIR RAILING



1 MEASUREMENT

- McLean stair rails comes from the factoryas a per built piece of rail. It features a pivoting picket system that will pivot to the degree you need for your stairs
- The rail only pivots in one direction

1) First install top 2" stair post where you want it and level this post front to back and side to side

2) Install bottom stair post in the middle of the last step level this post front to back and side to side

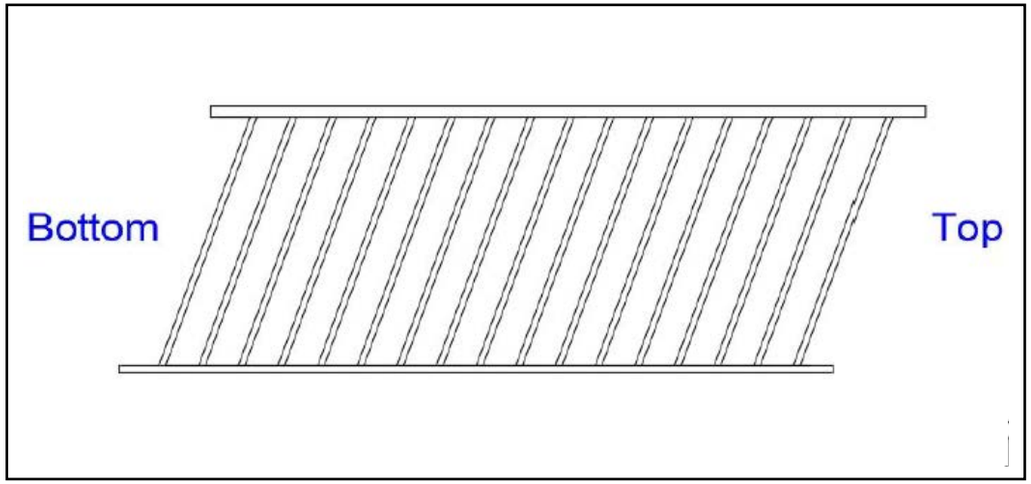
3) Measure from the front of the top stair post to the back of the bottom stair post (40")

Note: Your tape measure must be touching the stair treads all the way along the steps not lifted up in spot as this will affect your measurement

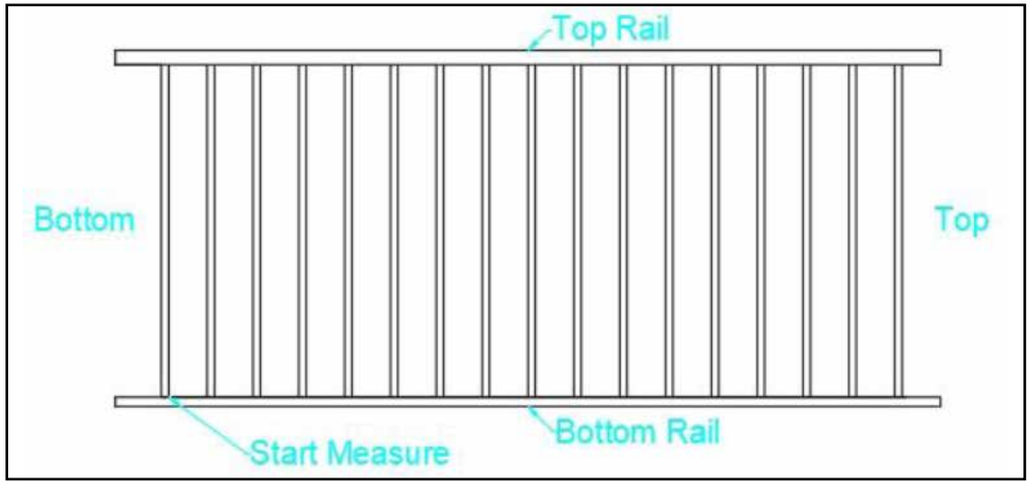
This 40" is the bottom rail measurement

2 STAIR RAIL (CUTTING)

- Check which way the stair rail pivots. This determines the top of the stair (2" post) and the bottom of the stair (Bottom Stair Post)



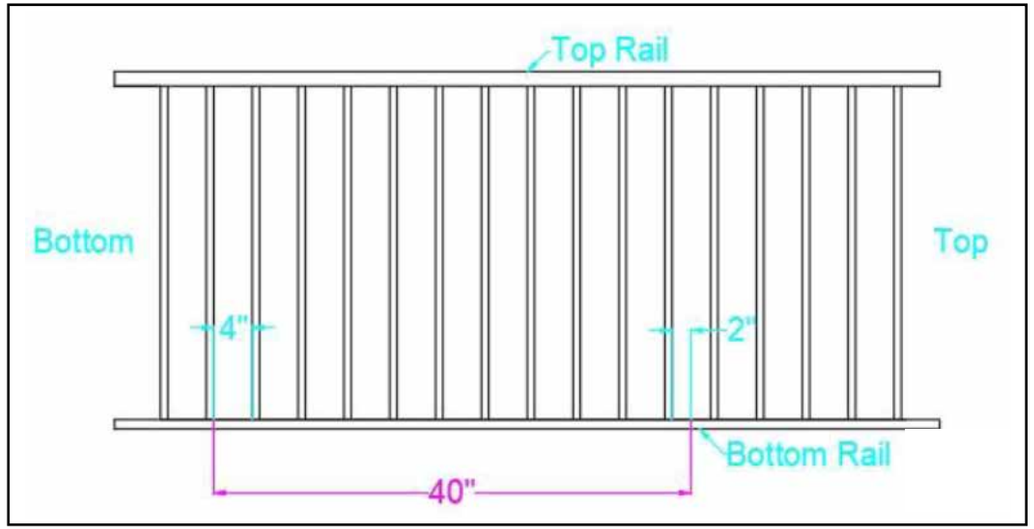
- Always measuring the from the bottom of the rail start one picket space in from the factory end



- **Determine Picket Spacing**

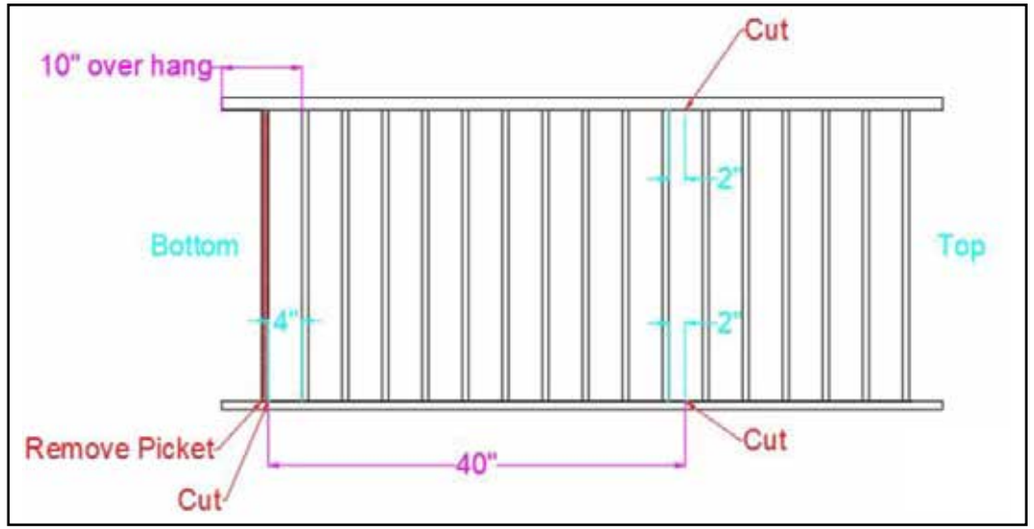
  Note: The bottom stair post will deduct 2″ from picket spacing

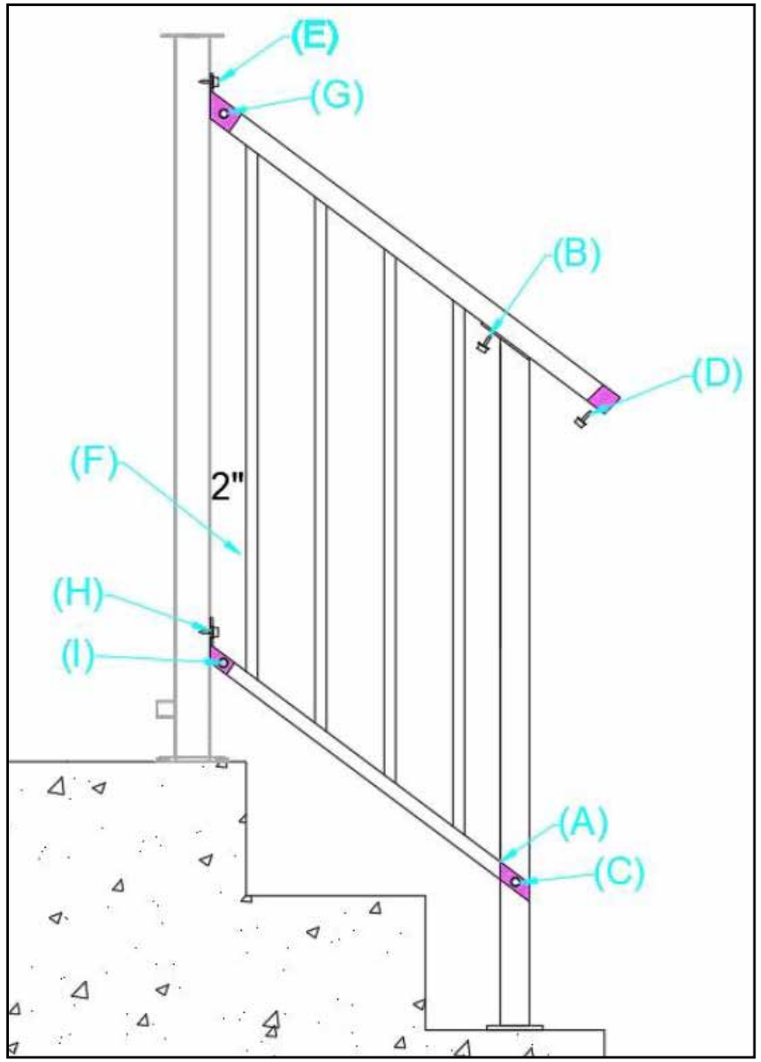
  The goal is to have 2″ more from the picket at the bottom stair post then at the top stair post



- **Stair rail can now be cut**

  - Make first cut on the bottom rail
  - Remove the jacket
  - Now measure from the cut line 40″ on the bottom rail and cut
  - Measure from the picket to the end of the bottom rail should be 2″
  - From the same picket measure 2″ on the top of the rail and cut





3 INSTALL

- Slide the top and bottom stair bracket on rail (don't screw in)
- Slide stair rail into bottom stair post

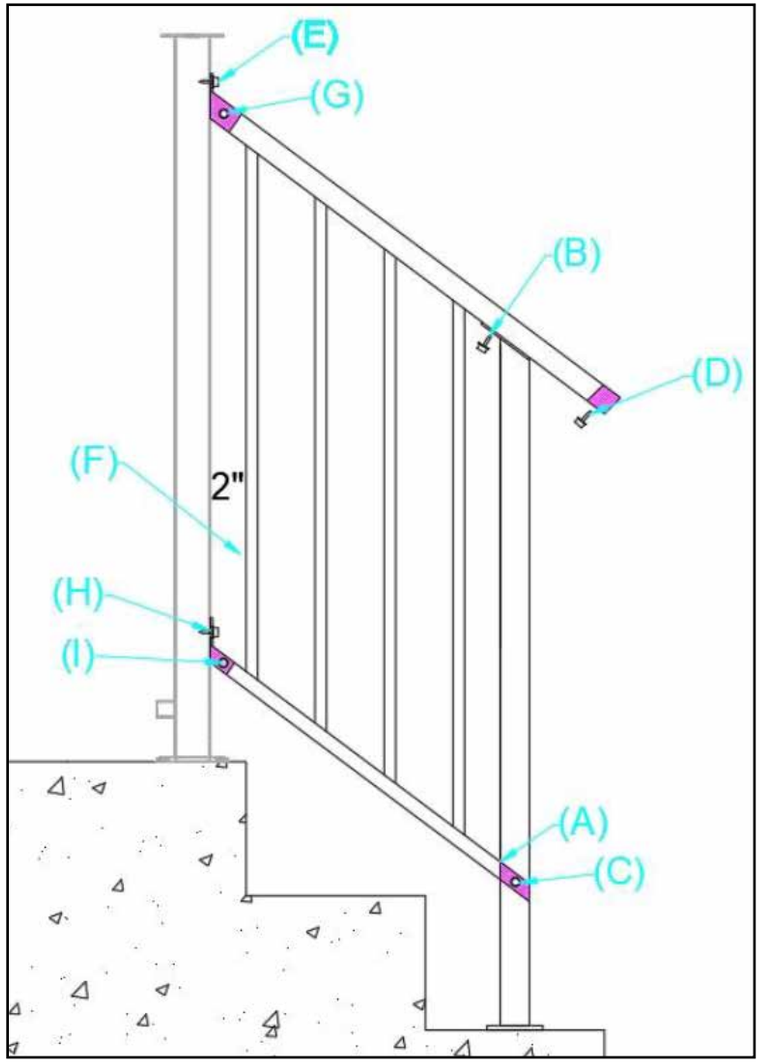
1) Pull up on bottom rail until the rail touches the top of the milled hole in the bottom stair post. This will square the picket and the post at the bottom stair post

2) Screw the top rail to the bottom stair post

3) Screw the bottom rail to the bottom stair post

4) Screw on end cap

5) Screw the top stair bracket to the top stair post



6) Make sure you have the same 2" from the picket to the post at the bottom and the top rail

7) Screw rail to top stair bracket

8) Screw bottom stair bracket to top stair post

9) Screw rail to bottom stair bracket

Note: Stair rail must be in between 865mm (34") and 965mm (38") off the nosing of stair to top of stair rail

SOPRA-CELLULOSE

INSULATION
SOUNDPROOFING

APPLICATIONS
WALLS
INDOOR APPLICATIONS

TECHNICAL DATA SHEET 250611SCANE (supersedes 250609SCANE)

DESCRIPTION

SOPRA-CELLULOSE is a blown or injected insulation made of paper, glassine and cardboard. It consists of small loose grey fibres, smooth to touch. SOPRA-CELLULOSE is also odourless and has a low VOC content.

It acts as a protective shield to reduce the transmission of heat and sound. SOPRA-CELLULOSE will reduce energy consumption and improve comfort for a wide range of climatic conditions.

INSTALLATION

BLOWN (ATTIC)

The SOPRA-CELLULOSE is an excellent insulation for attics of new homes and can also be applied as a complement to other existing insulation in attics. The SOPRA-CELLULOSE must be blown with special pneumatic blowing equipment to a minimum density of 25.6 kg/m^3 (1.6 lb/ft^3) and can be manually applied in restricted spaces.

Secure SOPRA-CELLULOSE RULERS to the roof trusses in the attic, with numbering facing the access hatch, to indicate the insulation application thickness. The bottom of the ruler must be installed at the same level as the bottom of the SOPRA-CELLULOSE insulation. Use one ruler every 20 m^2 (200 ft^2).

Attach the *Coverage Chart for Attics* (available on the product page of the SOPREMA website) to a roof truss next to the access hatch, duly signed by the thermal insulation work supervisor. Provide an identical copy to the property owner. The installer also keeps a copy in his records, as required by the SOPREMA certification program.

CAUTION: Maintain building, electrical, gas and oil safety code clearances between the insulation and heat emitting devices, such as fuel-burning appliances, chimney pipes, ducts and vents to these appliances and recessed light fixtures (at least 75 mm (3 in)) unless approved for insulation contact. Check with local building or fire officials for guidance on installation and barrier requirements.

INJECTED (WALL AND FLOOR)

This system uses a retaining membrane that is secured to the studs using SOPRA-CELLULOSE STRIP and staples. Openings are then made to inject dry SOPRA-CELLULOSE with mandatory nozzle (for dense packed system) preapproved by SOPREMA.

For wall injection, SOPRA-CELLULOSE must be injected to a minimum density of 56 kg/m^3 (3.5 lb/ft^3) for wall thickness up to 150 mm (6 inches) and to a minimum density of 64 kg/m^3 (4 lb/ft^3) for wall thickness greater than 150 mm (6 inches).

For ceiling and floor injection, SOPRA-CELLULOSE must be injected at a density of 28.8 kg/m^3 (1.8 lb/ft^3) to 48 kg/m^3 (3 lb/ft^3).

Note the number of bags used on the Estimation Guide for Cellulose Wall Insulation. Provide a signed copy to the property owner. The installer also keeps a copy in his records, as required by the SOPREMA certification program.

Service temperature: < 90 °C (< 194 °F)

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

SOPRA-CELLULOSE

INSULATION
SOUNDPROOFING

APPLICATIONS
WALLS
INDOOR APPLICATIONS

TECHNICAL DATA SHEET 250611SCANE (supersedes 250609SCANE)

GENERAL INFORMATION

Specifications	SOPRA-CELLULOSE
Colour	Grey
Density, *Attics* *Wall, thickness up to 150 mm (6 inches)* *Wall, thickness greater than 150 mm (6 inches)* *Floors*	25.6 kg/m³ (1.6 lb/ft³) 56 kg/m³ (3.5 lb/ft³) 64 kg/m³ (4.0 lb/ft³) 28.8 kg/m³ (1.8 lb/ft³) to 48 kg/m³ (3.0 lb/ft³)
Packaging	11.3 kg (25 lb) Bag

INSTALLATION CHART (ATTIC)

COVERAGE CHART (ATTICS)
Settled density : 25.6 kg/m³ (1.6 lb/ft³)

Thermal resistivity		Minimum installed thickness		Minimum settled thickness		Mass per unit area		Coverage per bag		Minimum number of bags per unit area	
RSI	R	mm	in	mm	in	kg/m²	lb/ft²	m²	ft²	100 m²	1000 ft²
2.1	12	94	3.7	84	3.3	2.1	0.4	5.3	56.9	19.0	17.6
2.3	13	103	4.0	92	3.6	2.3	0.5	4.8	52.0	20.8	19.2
3.4	19	152	6.0	136	5.3	3.5	0.7	3.3	35.1	30.7	28.5
3.5	20	156	6.2	139	5.5	3.6	0.7	3.2	34.1	31.6	29.3
3.9	22	174	6.9	155	6.1	4.0	0.8	2.8	30.6	35.3	32.6
5.3	30	237	9.3	211	8.3	5.4	1.1	2.1	22.5	47.9	44.4
5.6	32	250	9.8	223	8.8	5.7	1.2	2.0	21.3	50.6	46.9
6.7	38	299	11.8	267	10.5	6.8	1.4	1.7	17.8	60.6	56.1
7.0	40	312	12.3	279	11.0	7.2	1.5	1.6	17.1	63.3	58.6
8.6	49	394	15.5	343	13.5	9.0	1.8	1.3	13.5	79.8	73.9
8.8	50	403	15.9	351	13.8	9.2	1.9	1.2	13.2	81.7	75.6
10.8	61	517	20.3	430	16.9	11.8	2.4	1.0	10.3	104.6	96.8

This chart indicates the minimum number of bags to use. The final result will vary according to the application technique, the equipment and the hose used. The thermal resistances presented in this chart are measured after settlement, according to ASTM C518 standard and ASTM C687 conditioning method. A 15% settlement rate for RSI 8,6 (R-49) and RSI 8,8 (R-50) and a 20% settlement for RSI 10,8 (R-61) was added. For the most up-to-date information, please refer to our website at www.soprema.ca.

SOPRA-CELLULOSE

INSULATION
SOUNDPROOFING

APPLICATIONS
WALLS
INDOOR APPLICATIONS

TECHNICAL DATA SHEET 250611SCANE (supersedes 250609SCANE)

INSTALLATION CHART (WALL)

COVERAGE CHART (WALLS) Wall density : 56 kg/m³ (3.5 lb/ft³) or 64 kg/m³ (4 lb/ft³)									
Thermal resistance		Insulation thickness		Mass per unit area		Coverage per bag		Minimum number of bags per unit area	
RSI	R	mm	in	kg/m²	lb/ft²	m²	ft²	100 m²	1000 ft²
2.3	13	89	3.5	4.5	0.9	2.5	27.2	40	37
3.6	21	140	5.5	7.0	1.4	1.6	17.3	62	58
6.6	37	254	10	15.0	3.1	0.8	8.2	132	123
7.9	45	305	12	18.2	3.7	0.6	6.7	160	149
9.2	52	356	14	21.4	4.4	0.5	5.7	189	176
10.5	60	406	16	24.7	5.1	0.5	4.9	218	202
11.8	67	457	18	27.9	5.7	0.4	4.4	246	229
13.1	75	508	20	31.2	6.4	0.4	3.9	275	255

This chart indicates the minimum number of bags to use. The final result will vary according to the application technique, the equipment and the hose used. The minimum number of bags required takes into account the volume of the wood structure. For walls with metal structure, additional bags may be required. Check with your representative for more information. For the most up-to-date information, please refer to our website at www.soprema.ca or your SOPREMA representative.

SOPRA-CELLULOSE

INSULATION
SOUNDPROOFING

APPLICATIONS
WALLS
INDOOR APPLICATIONS

TECHNICAL DATA SHEET 250611SCANE (supersedes 250609SCANE)

PROPERTIES

Properties	Standards	SOPRA-CELLULOSE
Thermal resistance	CAN / ULC-S703	RSI = 0.65 per 25.4 mm (R = 3.7 per inch)
Flame spread rating	CAN / ULC-S102.2 CAN / ULC-S102	< 150 < 25
Smoke developed classification	CAN / ULC-S102.2	< 45
Open-flammability	CAN / ULC-S703	Min. 0.12 W/cm²
Open-flammability permanency	CAN / ULC-S703	Min. 0.12 W/cm²
Smoulder resistance, *mass loss after being exposed to a high temperature*	CAN / ULC-S703 CAN / ULC-S130	Max. 15% of mass loss
Moisture vapour sorption	CAN / ULC-S703	Less than 20% in mass gain
Corrosiveness, *Exposed at 50 °C (120 °F) for 28 days* *# 3003 bare aluminum, soft temper* *# 110 CABRA type ETP, soft copper* *Cold-rolled low carbon steel, commercial quality*	CAN / ULC-S703 ASTM G1-90	No perforation No perforation No perforation No perforation
Fungi resistance, *in a culture medium containing fungous spores (95% RH and 28 °C (82 °F)) after 28 days*	CAN / ULC-S703 ASTM C1338	No growth
Separation of chemicals, *after agitating at 275 cycles/min for 30 minutes*	CAN / ULC-S703	Max. 1.5% by mass
Recycled content	ISO 14020 ISO 14021	Made from pre-consumer and post-consumer recycled content. See the Recycled Content Certificate (RCC) on the product page for more details.

(All values are nominal)

For CCMC product evaluation see CCMC Evaluation listing 09232-L (for the product) and 12307-R (for SOPRA-CELLULOSE WALL SYSTEMS).

STORAGE AND HANDLING

Bags must be stored indoor, in a dry area in their original packaging. On a work site, store in their original, non-perforated packaging and cover the bags with an opaque protective tarp.

TESTS, CERTIFICATIONS AND EVALUATIONS

CCMC ÉVALUATION 09232-L

CCMC ÉVALUATION 12307-R

FOR MORE INFORMATION, REFER TO THE INSTRUCTIONS ON THE CONTAINER LABEL AND RELEVANT SAFETY DATA SHEET(SDS).

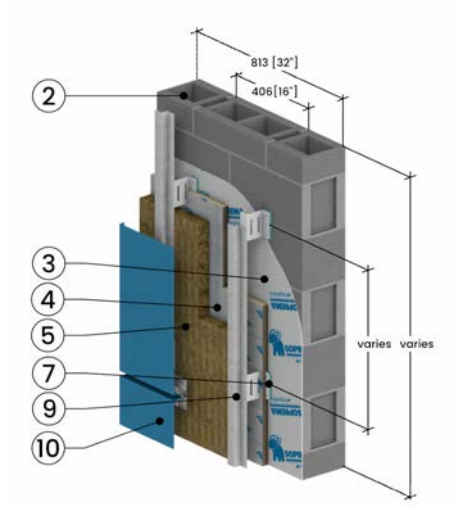
SOPREMA®

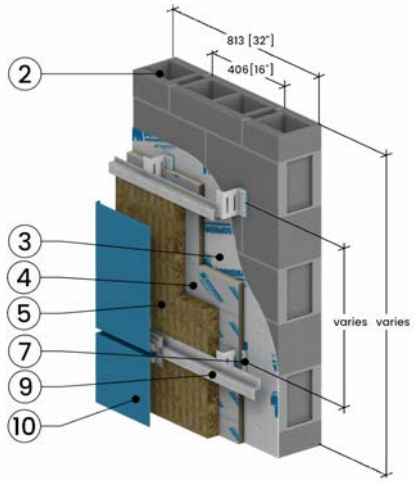
SYSTÈME QUALITÉ ISO 9001 QUALITY SYSTEM

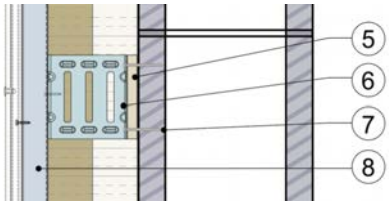
SYSTÈME ENVIRONNEMENT ISO 14001 ENVIRONMENT SYSTEM

Detail 7.1.25

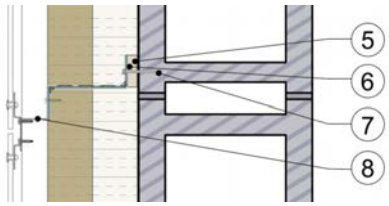
Exterior Insulated Concrete Block Wall Assembly with Protected SOPREMA SOPRA-ISO V ALU and ACS-S Thermal Clip (16” o.c. Horizontal) Supporting Metal Cladding - Clear Wall







Vertical Section at ACS Clip



Plan Detail at ACS Clip

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	Standard Concrete Block	8" (203)	10.4 (1.50)	-	119 (900)	0.19 (800)
3	SOPREMA SOPRASEAL STICK 1100T membrane installed with SOPRASEAL STICK PRIMER	-	-	-	-	-
4	SOPRA-ISO V ALU Exterior Insulation (LTTR)	Varies	0.16 (0.023)	R-12.4 to R-49.5 (2.18 RSI to 8.71 RSI)	1.9 (30)	0.36 (1500)
5	ACS Thermal Pad	1/2" (13)	0.20 (0.0288)	R-2.5 (0.44 RSI)	4.2 (68)	0.36 (1500)
6	Exterior Mineral Wool Insulation	2" (50)	0.23 (0.0335)	R-8.6 (1.51 RSI)	4.3 (69)	0.2 (850)
7	ACS-S Thermal Clip	16 Gauge	118 (17)	-	500 (8000)	0.13 (530)
8	Fasteners	1/4" (6.4) Ø	430 (62)	-	489 (7830)	0.12 (500)
9	Girt	18 Guage	430 (62)	-	489 (7830)	0.12 (500)
10	Cladding with 1/2” 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

ICFVL™

Ledger Connector System

The ICFVL ledger connector system is engineered to solve the challenges of mounting wood or steel ledgers to insulated concrete form (ICF) walls up to 4½" in thickness as specified by the designer. The ICFVL6 maximum ICF foam wall thickness is 3¼", the ICFVL8 maximum ICF foam wall thickness is 4½". The ICFVL is designed to provide both vertical and lateral in-plane performance. The system offers many benefits over traditional anchor bolting, including better on-center spacing in most cases, faster installation and no protrusions.

The embedded legs of the ICFVL (ICFVL6 = 6", ICFVL8 = 8") are embossed for additional stiffness and the hole enables concrete to flow through and around the connector. The exposed flange on the face of the ICF provides a structural surface for mounting wood ledger. Note: For wood ledger applications, the ICFVL-W or ICFVL-CW is required (sold separately).

Features:

- Two size options to accommodate up to 4½" thick ICF foam walls.
- Embossments on the embedded legs for additional stiffness.
- Two diamond-shaped holes in the center of the connector allow screw installation to hold it in place during concrete pour and to aid in proper alignment during installation. (Remove center screws prior to ledger installation.)

Material: ICFVL — 14 gauge; ICFVL-CW and ICFVL-W — 16 gauge

Finish: Galvanized (G90)

Installation:

ICFVL in ICF

- For use with a minimum 4" thick core
- Snap a chalk line for the bottom of the ledger
- Mark required on-center spacing
- Use ICFVL to mark kerfs locations
- Cut kerfs as marked
- Insert ICFVL flush to the face of the ICF
- Pour concrete

Warning: Industry studies show that hardened fasteners can experience performance problems in wet environments. Accordingly, use this product in dry environments only.

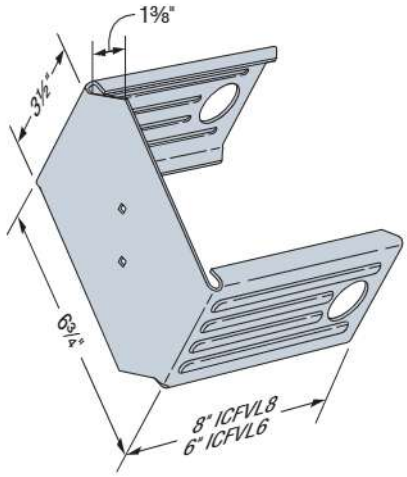
Wood Ledger Attachment — ICFVL-W or ICFVL-CW

- Slip appropriate ledger connector underneath the ledger.
- Install the eight ICF-D3.25 screws partially into the ledger. ICF-D3.25 installs best using a low-speed drill with ⅜" hex-head driver.
- For denser wood species (specific gravity ≥ 0.50), predrilling may be necessary. Predrill ledger only with 5⁄32" drill bit.
- Position bottom of the ledger level to the chalk line and drive the screws through the wood and into the ICFVL.

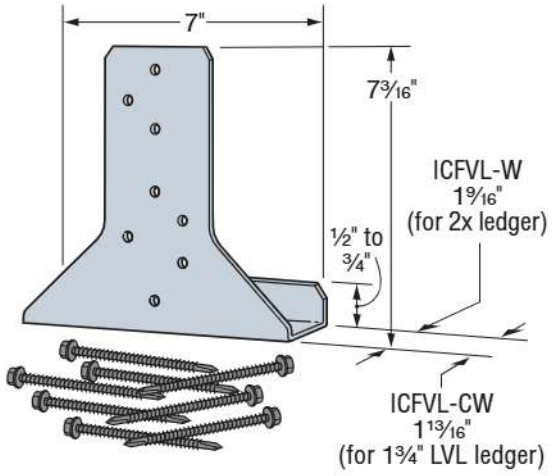
Steel Ledger Attachment

- Position bottom of the ledger level to the chalk line and against the ICFVL
- Attach with four #14 x ¾", #3 drill point screws (not provided)
- All screws should be located at least ½" from the edge of the ICFVL
- Space screws evenly

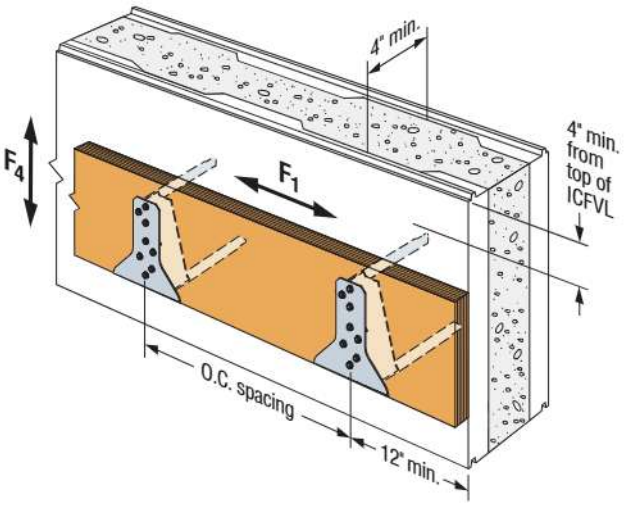
Codes: See p. 12 for Code Reference Key Chart



ICFVL



ICFVL-W and ICFVL-CW



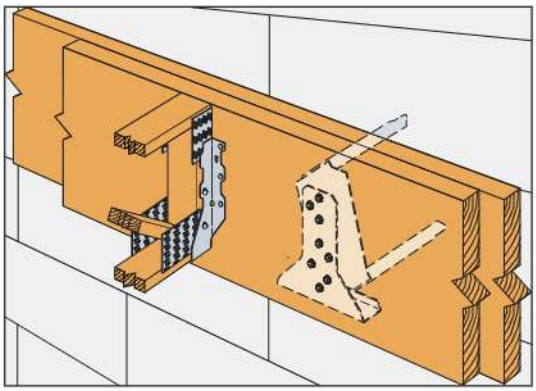
Typical Wood Ledger Installation with ICFVL8

ICFVL™

Ledger Connector System (cont.)

Ledger Type	Fasteners	Allowable Loads (lb.)	
		Vertical (F_4)	Lateral (F_1)
Wood	(8) ICF-D3.25	2,280	1,265

1. Use (8) ICF-D3.25 screws (provided).
2. Loads apply to ICF with 4½" maximum foam thickness with the ICFVL8 and 3¼" maximum foam thickness with the ICFVL6.
3. Loads assume a minimum spruce-pine-fir ledger.
4. Loads may not be increased for short-term loading.
5. The top of the ICFVL must be installed 4" minimum below the top of the wall. For installations where the ICFVL is installed less than 4" from the top of the wall (including flush), multiply the allowable loads by 0.80.

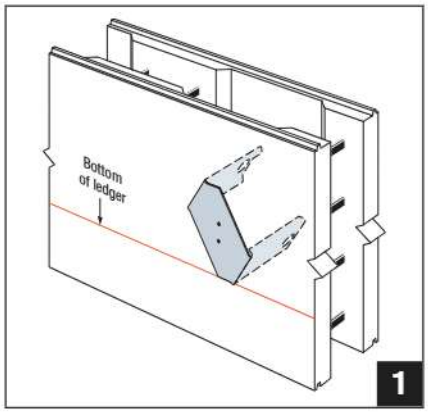


Typical 2-Ply Wood Ledger Installation with ICFVL8

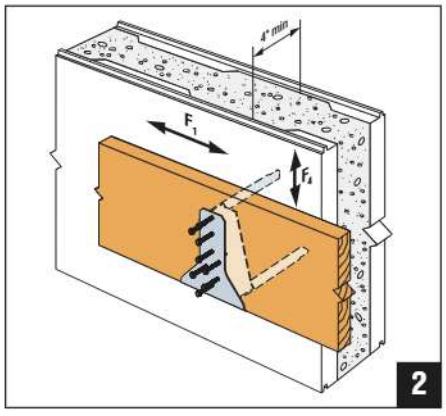
This table address vertical load applications only.

Ledger Type	Connector Type	ICFVL Spacing To Replace Anchor Bolts (in.)[1,2,3]																Code Ref.
		½"-Diameter Anchors at				⅝"-Diameter Anchors at				(2) ⅝"-Diameter Anchors at				¾"-Diameter Anchors at				
		12" o.c.	24" o.c.	36" o.c.	48" o.c.	12" o.c.	24" o.c.	36" o.c.	48" o.c.	12" o.c.	24" o.c.	36" o.c.	48" o.c.	12" o.c.	24" o.c.	36" o.c.	48" o.c.	
Wood Ledgers																		
DF/SP/SPF	ICFVL w/ ICFVL-W	48	48	48	48	48	48	48	48	24	48	48	48	42	48	48	48	—
LVL	ICFVL w/ ICFVL-CW	48	48	48	48	48	48	48	48	24	48	48	48	42	48	48	48	
Steel Ledgers																		
68 mil (0.068")	ICFVL	11	22	33	44	9	18	27	36	—	—	—	—	—	—	—	—	—
54 mil (0.054")	ICFVL	15	30	45	48	12	24	36	48	—	—	—	—	—	—	—	—	

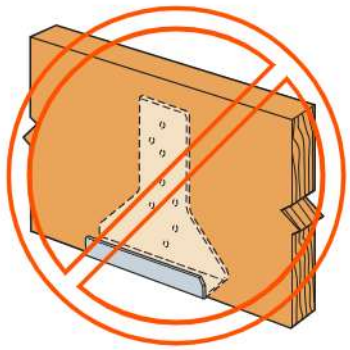
1. The designer may specify different spacing based on the load requirements.
2. Spacings are based on the perpendicular-to-grain capacity of the bolt in the wood ledger compared to the tested value of the ICFVL. Additional connectors are required for out-of-plane loads.
3. See flier F-C-ICFVL at **strongtie.com** for additional connection details.
4. For steel ledgers, the 68 mil ledger spacing is closer than the 54 mil ledger because the calculated load of a bolt is higher in a thicker piece of steel.
5. Steel ledger values are based on steel. F_u = 60 ksi.
6. Values shown apply to ICF foam thicknesses up to 3¼" for ICFVL6 and 4½" for ICFVL8.



ICFVL



Typical Wood Ledger Installation with ICFVL and ICFVL-W



Misinstallation

SOPRA-ISO V INSTALLATION GUIDE

INTRODUCTION, PRODUCTS, APPLICATION, RESTRICTIONS, INSPECTION AND PREPARATION, INSTALLATION, STORAGE AND HANDLING

SOPREMA®

- AVERAGE THERMAL RESISTANCE R-VALUE PER INCH HIGHER THAN ANY OTHER TYPE OF INSULATION
- CONTINUOUS INSULATION
- REDUCTION OF THERMAL BRIDGES
- REDUCE THE POTENTIEL FOR CONDENSATION

1688 Jean-Berchmans-Michaud, Drummondville (Qc), J2C 8E9

SOPRA-ISO V

INTRODUCTION

Insulation boards enable reduction of heat and cold transfers between a building's interior and exterior. To perform properly, walls must be designed such that they offer high thermal resistance (R-value), and insulation must be continuous. It has been clearly demonstrated that continuous insulation is the most efficient method of building insulation for achieving energy savings. It eliminates thermal bridging through steel, wood and concrete structures. Polyisocyanurate is the material of choice for increasing the R-value of walls with boards of minimal thickness.

SOPRA-ISO V boards feature an excellent R-value and low water absorption, delivering unparalleled versatility for wall insulation applications. Their R-value per inch of continuous insulation is one of the highest among of all types of rigid insulation: the result is thinner walls and reduction of thermal bridges.

(CREDIT PHOTO: STÉPHANE GROLEAU)

PRODUCTS

SOPRA-ISO V PLUS is a closed-cell polyisocyanurate foam insulation board laminated with non-reflective glass-mat facer on both sides.

Boards are available in 1.2 m (4 ft.) x 2.4 m (8 ft.) and in multiple thicknesses ranging from 13 to 102 mm (0.5 to 4.0 in.).

SOPRA-ISO V PLUS THERMAL RESISTANCE		
BOARD THICKNESS	RSI	R-VALUE*
12.7 mm (0.5 in/po)	0.53	3.00
19.1 mm (0.75 in/po)	0.79	4.50
25 mm (1.0 in/po)	1.05	6.00
38.1 mm (1.5 in/po)	1.58	9.00
50 mm (2.0 in/po)	2.13	12.10
63.5 mm (2.5 in/po)	2.69	15.30
75 mm (3.0 in/po)	3.26	18.50
88.9 mm (3.5 in/po)	3.82	21.70
101.6 mm (4.0 in/po)	4.40	25.00
* Conditioned thermal values were determined by ASTM Test Method C518 at 23.9 °C (75 °F) mean temperature.		

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

Boards are available in 1.2 m (4 ft.) x 2.4 m (8 ft.) and in multiple thicknesses ranging from 13 to 102 mm (0.5 to 4.0 in.).

SOPRA-ISO V ALU THERMAL RESISTANCE		
BOARD THICKNESS	RSI	R-VALUE*
12.7 mm (0.5 in)	0.58	3.30
19.1 mm (0.75 in)	0.86	4.90
25 mm (1.0 in)	1.14	6.50
38.1 mm (1.5 in)	1.73	9.80
50 mm (2.0 in)	2.31	13.10
63.5 mm (2.5 in)	2.89	16.40
75 mm (3.0 in)	3.49	19.80
88.9 mm (3.5 in)	4.10	23.30
101.6 mm (4.0 in)	4.72	26.80
* Conditioned thermal values were determined by ASTM Test Method C518 at 23.9 °C (75 °F) mean temperature.		

APPLICATIONS

SOPRA-ISO V PLUS and **SOPRA-ISO V ALU** insulation boards are designed for all types of construction—commercial, institutional and residential. They can be used on most surfaces using fasteners or adhesive, including concrete, wood, wood studs, steel studs, exterior grade gypsum, and air barrier / vapour barrier membranes.

ATTACHING BOARDS

Wood or metal studding

Boards must be attached using fasteners at 305 mm (12 in.) on centre at board perimeter, and at 406 mm (16 in.) on centre onto the vertical studs.

Boards are lightweight and easily installed on wood or metal studs using fasteners such as 50 mm (2 in.) or larger washers with the fasteners, Wind Devil 2 by Wind-Lock, Insulfast System by Ramset or equivalent.

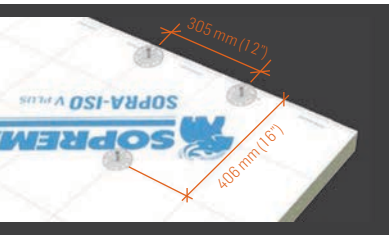
Concrete or cinderblock walls

With masonry :
Boards must be installed using Sopraseal LM 200 T adhesive and supported with masonry anchors.

With exterior cladding:
Boards must be attached using fasteners spaced at 305 mm (12 in.) o.c. at board perimeter, and at 406 mm (16 in.) o.c. elsewhere.

For concrete walls, use Insulfast System by Ramset, X-IE by Hilti or equivalent fasteners. Use 50 mm (2 in.) or larger washers with the fasteners.

Mechanical fastening (minimum penetration by substrate type)
- Wood stud screws : 19 mm (3/4 in.)
- Metal stud screws: 6.5 mm (1/4 in.)
- Concrete screws: 19 mm to 32 mm (3/4 to 1 1/4 in.)



Sopraseal LM 200 T


Fasteners on concrete walls


Fasteners on wood or metal studs

RESTRICTIONS

- SOPRA-ISO V insulation boards cannot be used as structural elements.
- SOPRA-ISO V insulation boards must not be exposed for more than 60 days.
- SOPRA-ISO V insulation boards cannot be used as a nailing base, regardless of the type of cladding.
- SOPRA-ISO V insulation boards are designed solely for above-grade wall applications.

INSPECTION AND PREPARATION PRIOR TO INSTALLATION

- Before installation, inspect Sopra-Iso V insulation boards to ensure none has been damaged during shipping or handling. Damaged boards must not be installed.
- Discard any damaged boards.
- Keep Sopra-Iso V boards away from any flame at all times.
- If installing Sopra-Iso V boards in windy conditions, take necessary measures to ensure boards are not damaged.
- If installing Sopra-Iso V boards directly on wood or metal studding, studs must be spaced no wider than 610 mm (24 in.) o.c.
- All boards must be dry before installation; do not install any board that is wet or has been damaged by moisture.

INSTALLATION

INSTALLATION ON SUPPORT PANELS

1. Before installing **SOPRA-ISO V ALU** or **SOPRA-ISO V PLUS** insulation boards, ensure underlying air barrier membrane has been properly installed per manufacturer recommendations and is undamaged.

2. Install **SOPRA-ISO V ALU** or **SOPRA-ISO V PLUS** boards horizontally or vertically, and with printed side facing outward. Use boards at full length to minimize number of joints required.

3. Install first row of **SOPRA-ISO V ALU** or **SOPRA-ISO V PLUS** boards at bottom of wall, at same height as support panel.

4. Stagger **SOPRA-ISO V ALU** or **SOPRA-ISO V PLUS** board joints compared with those of support panels. Butt boards against one another perfectly without applying excessive pressure.

5. Adjust all boards so as to leave no space between board joints or around penetrations.

6. Cut boards as needed at penetrations and openings, and to accommodate exterior cladding fasteners. Seal around penetrations using a sealant product.

7. Attach boards using fasteners at intervals of 305 mm (12 in.) o.c. at board perimeter, and at 406 mm (16 in.) o.c. onto the vertical studs. Adjust fastener length to insulation thickness.

8. Ensure insulating board edges overlap at inside and outside wall corners. Fasten each board to nearest stud.

9. At tops of walls, install last row of **SOPRA-ISO V ALU** or **SOPRA-ISO V PLUS** insulation boards flush with tops of support panels.

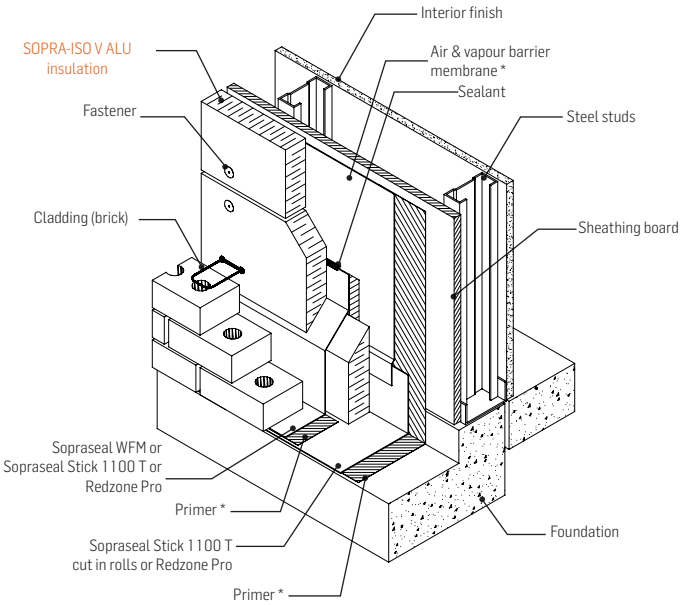
10. If necessary, seal all **SOPRA-ISO V ALU** or **SOPRA-ISO V PLUS** joints and fastener points.

    Membrane for tape at joints and fasteners:
    SOPRA-ISO V PLUS: Use **SOPRASEAL STICK FLASHPRO** without primer or RESISTO **REDZONE 25** previously primed with **SOPRASEAL STICK PRIMER** or RESISTO **EXTERIOR PRIMER,** centered over the joints.
    SOPRA-ISO V ALU: Use **SOPRASEAL STICK FLASHPRO** or RESISTO **REDZONE 25** (don't require primer before the installation of the membrane), or use the RESISTO **METALIZED ADHESIVE TAPE** when the temperature is above 10˚C and use the RESISTO **ALL-WEATHER FLASHING TAPE** for the temperature in between -15˚C to 10˚C, centered over the joints.

DETAIL

STUD WALL FOUNDATION JUNCTION ON SUPPORT PANELS - SOPRA-ISO V ALU

(ISOV_03) Air & vapour barrier

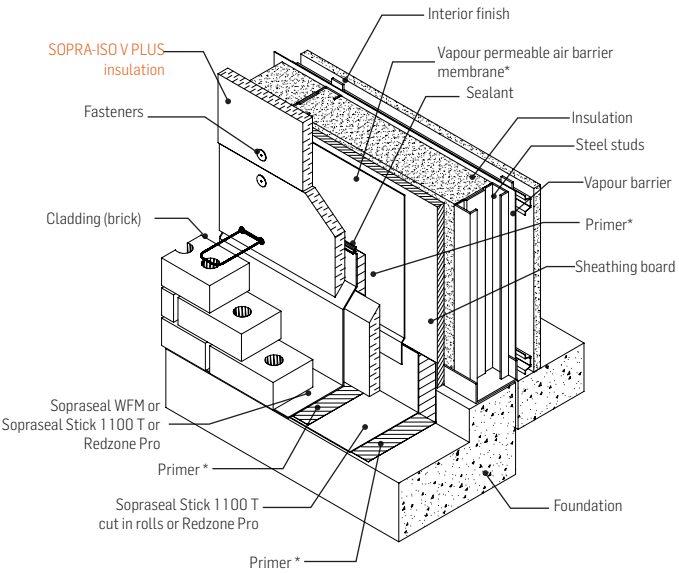


* See reference table of SOPREMA and RESISTO membranes and primers.

DETAIL

STUD WALL FOUNDATION JUNCTION ON SUPPORT PANELS - SOPRA-ISO V PLUS

(ISOV_06) Vapour permeable air barrier

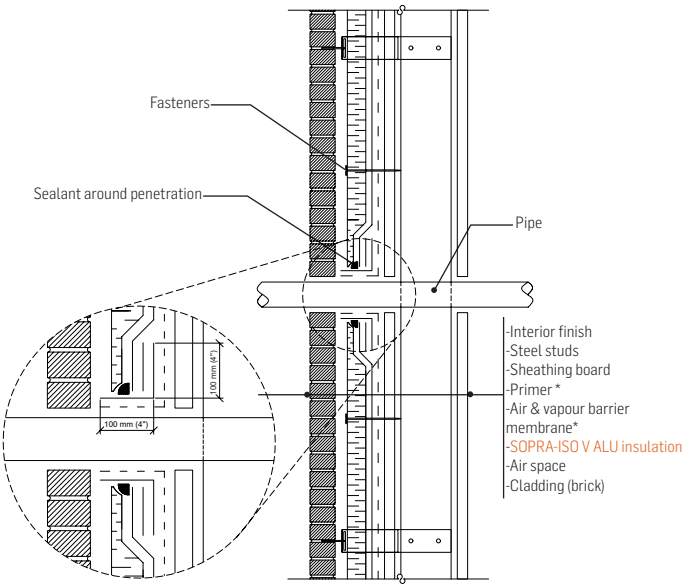


* See reference table of SOPREMA and RESISTO membranes and primers.

DETAIL

PIPE PENETRATION - SOPRA-ISO V ALU

(ISOV_04) Air & vapour barrier

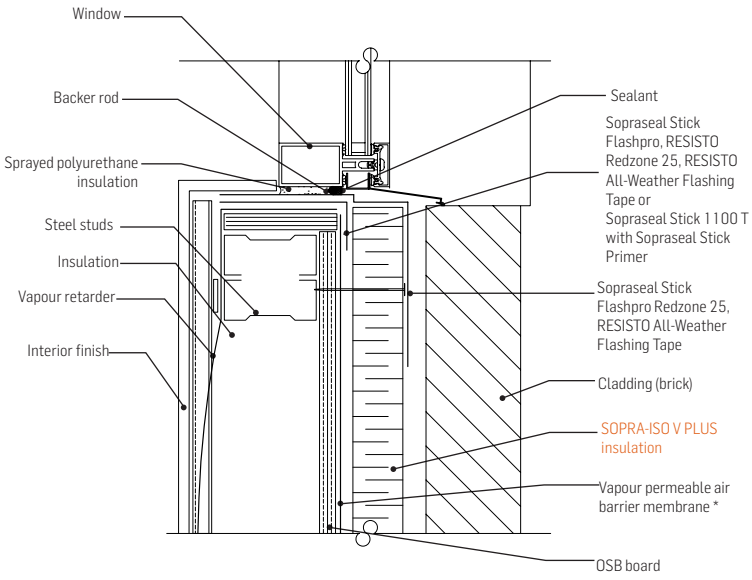


* See reference table of SOPREMA and RESISTO membranes and primers.

DETAIL

SEALING OF WINDOWS - SOPRA-ISO V PLUS

(ISOV_09) Vapour permeable air barrier



* See reference table of SOPREMA and RESISTO membranes and primers.

INSTALLATION

INSTALLATION ON WOOD OR METAL STUDDING

1. Before installing **SOPRA-ISO V PLUS** insulation boards, ensure studs are spaced no wider than 610 mm (24 in.) o.c.

2. Install **SOPRA-ISO V PLUS** boards horizontally or vertically, and with printed side facing outward. Use boards at full length to minimize number of joints required.

3. Install first row of **SOPRA-ISO V PLUS** boards at bottom of wall, at the same height as the sole or sill plate.

4. Stagger **SOPRA-ISO V PLUS** board joints by at least 406 mm (16 in.). Butt boards against one another perfectly without applying excessive pressure.

5. Adjust all boards so as to leave no space between board joints or around penetrations.

6. Cut boards as needed at penetrations and openings, and to accommodate exterior cladding fasteners. Seal around penetrations using a sealant product.

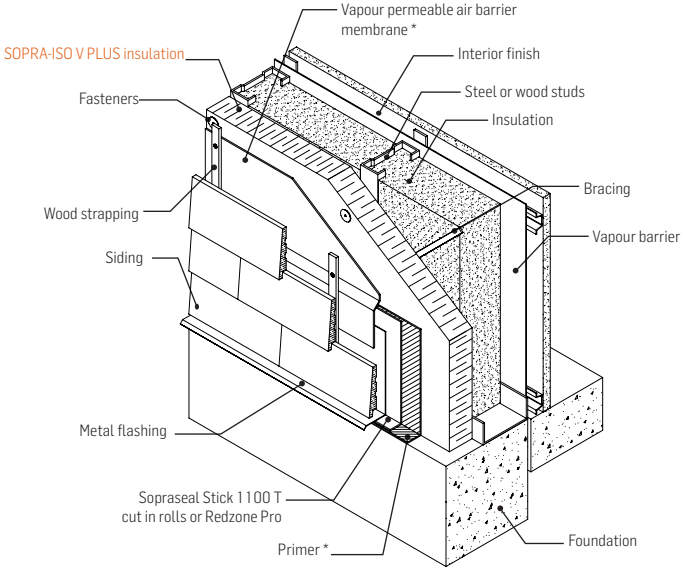
7. Attach boards using fasteners aligned with the vertical studs. Adjust fastener length to insulation thickness.

8. Ensure insulation board edges overlap at inside and outside wall corners. Fasten each board to nearest stud.

DETAIL

STUD WALL FOUNDATION JUNCTION ON WOOD OR METAL STUDDING - SOPRA-ISO V PLUS

(ISOV_08) Vapour permeable air barrier



* See reference table of SOPREMA and RESISTO membranes and primers.

INSTALLATION

INSTALLATION ON CONCRETE WALL

1. Before installing **SOPRA-ISO V ALU** insulation boards, ensure underlying air barrier membrane has been properly installed per manufacturer recommendations and is undamaged.

2. Install **SOPRA-ISO V ALU** boards horizontally or vertically, and with printed side facing outward. Use boards at full length to minimize number of joints required.

3. Stagger **SOPRA-ISO V ALU** horizontal and vertical joints by at least 150 mm (6 in.). Butt boards against one another perfectly without applying excessive pressure.

4. Adjust all boards so as to leave no space between board joints or around penetrations.

5. Cut boards as needed at penetrations and openings, and to accommodate exterior cladding fasteners. Seal around penetrations using a sealant product.

6. Attaching boards:

   For masonry: Attach boards using Sopraseal LM 200 T adhesive. Boards will also be supported with masonry anchors.

   OR

   For cladding : Attach boards using fasteners at intervals of 305 mm (12 in.) o.c. at board perimeter, and at 406 mm (16 in.) o.c. onto the vertical studs. Adjust fastener length to insulation thickness.

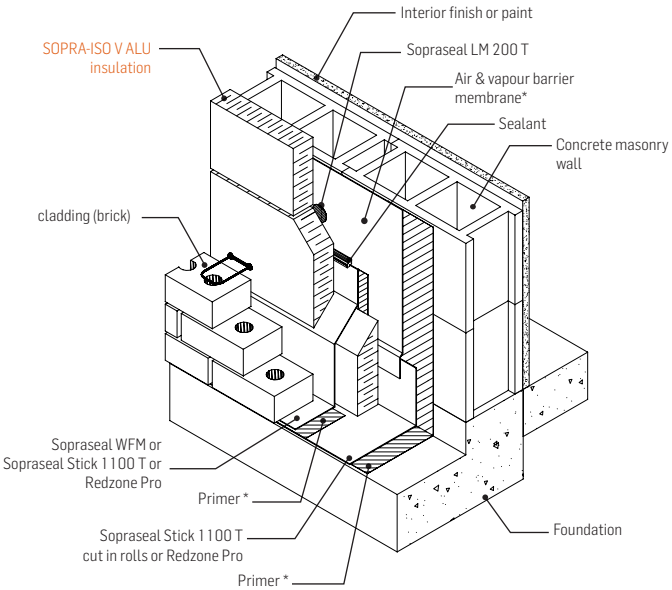
7. Ensure insulating board edges overlap at inside and outside wall corners.

8. If necessary, seal all **SOPRA-ISO V ALU** joints and fastener points. Use **SOPRASEAL STICK FLASHPRO** or RESISTO **REDZONE 25** (don't require primer before the installation of the membrane), or use the RESISTO **METALIZED ADHESIVE TAPE** when the temperature is above 10°C and use the RESISTO **ALL-WEATHER FLASHING TAPE** for the temperature in between -15°C to 10°C, centered over the joints.

DETAIL

FOUNDATION JUNCTION - CMU WALL - SOPRA-ISO V ALU

(ISOV_02) Air & vapour barrier



* See reference table of SOPREMA and RESISTO membranes and primers.

INSTALLATION

INSTALLATION OF SOPRA-ISO V ALU ON CONCRETE WALL (AIR/ VAPOUR BARRIER)

1. Before installing **SOPRA-ISO V ALU** insulation boards, ensure surface is clean, dry, and free of debris and dust.

2. Install **SOPRA-ISO V ALU** boards horizontally or vertically, and with printed side facing outward. Use boards at full length to minimize number of joints required.

3. Stagger **SOPRA-ISO V ALU** board horizontal and vertical joints by at least 150 mm (6 in.). Butt boards against one another perfectly without applying excessive pressure.

4. Adjust all boards so as to leave no space between board joints or around penetrations.

5. Cut boards as needed at penetrations and openings, and to accommodate exterior cladding fasteners. Seal around penetrations using a sealant product.

6. Attaching boards :

   For masonry: Attach boards using Sopraseal LM 200 T adhesive. Boards will also be supported with masonry anchors.

   OR

   For cladding : Attach boards using fasteners at intervals of 305 mm (12 in.) o.c. at board perimeter, and at 406 mm (16 in.) o.c. onto the vertical studs. Adjust fastener length to insulation thickness.

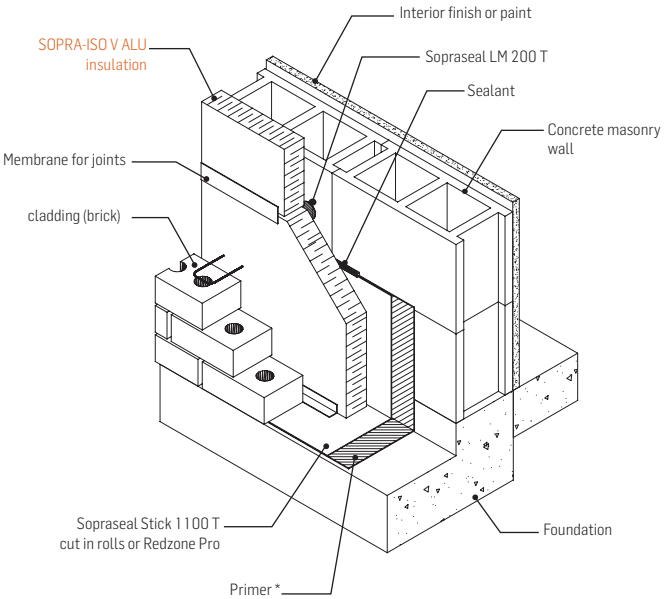
7. Ensure insulation board edges overlap at inside and outside wall corners.

8. Seal all **SOPRA-ISO V ALU** joints and fastener points. Use **SOPRASEAL STICK FLASHPRO** or RESISTO **REDZONE 25** (don't require primer before the installation of the membrane), or use the RESISTO **METALIZED ADHESIVE TAPE** when the temperature is above 10°C and use the RESISTO **ALL-WEATHER FLASHING TAPE** for the temperature in between -15°C to 10°C, centered over the joints.

DETAIL

FOUNDATION JUNCTION - CMU WALL (AIR/ VAPOUR BARRIER) - SOPRA-ISO V ALU

(ISOV_01) Air & vapour barrier



* See reference table of SOPREMA and RESISTO membranes and primers.

INSTALLATION

INSTALLATION WITH Z BARS

1. Before installing **SOPRA-ISO V ALU** insulation boards, ensure underlying air barrier membrane has been properly installed per manufacturer recommendations and is undamaged.

2. Install **SOPRA-ISO V ALU** boards by sliding them along Z bars.

3. Stagger **SOPRA-ISO V ALU** vertical board joints by at least 150 mm (6 in.). Butt boards against one another perfectly without applying excessive pressure.

4. Adjust all boards so as to leave no space between board joints or around penetrations.

5. Cut boards as needed at penetrations and openings, and to accommodate exterior cladding fasteners. Seal around penetrations using a sealant product.

6. Attach boards using fasteners aligned with the vertical studs only at the bottom of the insulation board. Adjust fastener length to insulation thickness.

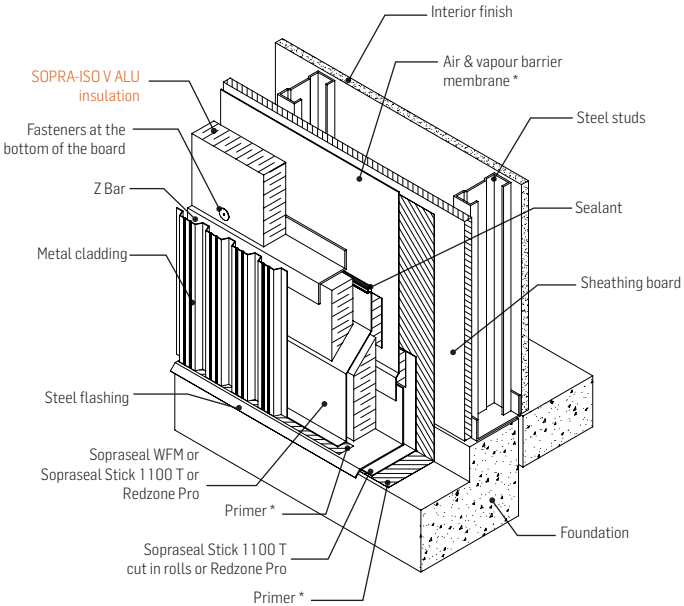
7. Ensure insulation board edges overlap at inside and outside wall corners. Fasten each board to nearest stud.

8. If necessary, seal all **SOPRA-ISO V ALU** joints and fastener points. Use **SOPRASEAL STICK FLASHPRO** or RESISTO **REDZONE 25** (don't require primer before the installation of the membrane), or use the RESISTO **METALIZED ADHESIVE TAPE** when the temperature is above 10°C and use the RESISTO **ALL-WEATHER FLASHING TAPE** for the temperature in between -15°C to 10°C, centered over the joints.

DETAIL

STUDS WALL FOUNDATION JUNCTION - WITH Z BARS - SOPRA-ISO V ALU

(ISOV_05) Air & vapour barrier



* See reference table of SOPREMA and RESISTO membranes and primers.

STORAGE AND HANDLING

SOPRA-ISO V boards are completely covered in a waterproof packaging designed to protect the boards during handling in factory and shipping only.

SOPRA-ISO V boards must be stacked and protected from inclement weather. When short-term outdoor storage is required, they must be stacked flat on pallets at least 100 mm (4 in.) above ground level, and covered with a waterproof covering. Do not allow water to pool on top of covering or beneath boards. Remove temporary **SOPREMA** packaging to prevent condensation from accumulating.

REFERENCE TABLE OF SOPREMA AND RESISTO MEMBRANES AND PRIMERS

	PRODUCTS	PRIMERS
NO- PERMEABLE AIR & VAPOUR BARRIERS	Self-adhesive membranes	
	Sopraseal Stick 1100 T Sopraseal Stick 130 & 130 S Redzone Pro	Sopraseal Stick PRIMER Elastocol Stick H_2O Elatocol Stick Zero RESISTO Exterior Primer RESISTO Exterior Low V.O.C. Primer RESISTO H_2O Primer
	Heat-welded membranes	
	Sopraseal 60 & 60 FF Sopraseal 180 HD & 180 HD FF	Elastocol 500
	Liquid applied	
	Sopraseal LM 200S Sopraseal LM 203	N/A
	Mechanically fastened	
	Sopraseal Xpress G	N/A
PERMEABLE AIR BARRIER	Self-adhesive membrane	
	Sopraseal Stick VP Redzone Stick VP	N/A
	Liquid applied	
	Sopraseal LM 200S	N/A

(CREDIT PHOTO: STÉPHANE GROLEAU)

INNOVATION SINCE 1908

SOPREMA has developed around the idea that the quality, durability and reliability of materials must match builders' ambitions and expectations. For more than 100 years, SOPREMA has been using its expertise to develop a variety of high-end products that meet or exceed all the requirements of the construction field.

ROOFS WALLS FOUNDATIONS PARKING DECKS BRIDGES ADDITIONAL EXPERTISE


WATERPROOFING


INSULATION


VEGETATIVE SOLUTIONS


SOUNDPROOFING


COMPLEMENTARY PRODUCTS

SOPREMA is an international manufacturer specializing in the production of waterproofing and insulation products, as well as vegetative and soundproofing solutions, for the building and civil engineering sectors.

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THERMAL CLIPS
ACS

TECHNICAL DATA SHEET 240305SCANE (Supersedes 230307SCANE)

ACCESSORY PRODUCTS

APPLICATIONS

WALLS

DESCRIPTION

ACS THERMAL CLIPS are available in two configurations, solid and adjustable. Both types of clips are composed of stainless steel and include a high-density polyisocyanurate thermal break pad at the back. Both clips also include cut-outs that represent 15% to 20% of the clip volume in order to reduce the quantity of conductive material and further enhance its purpose of reducing the effects of thermal bridging in wall systems.

Solid Clips

ACS-S CLIPS are shaped similarly to a Z-girt. They are available in various sizes in order to accommodate different insulation thicknesses, but they are not adjustable. The solid ACS-S CLIP is ideal when a high-performance, cost-effective solution is required and the back-up structure and cladding materials do not require on-site adjustments of the support system.

Adjustable Clips

ACS-A CLIPS are a two-piece design. Each stainless steel piece is “L” shaped. The inner piece of the clip fits inside the outer piece, allowing the exact depth of the clip to be adjusted on-site by the installers. The adjustable ACS-A CLIP is very useful for cladding systems that require very tight tolerances on uneven substrates, such as masonry or concrete walls, and/or systems that are installed over steel stud walls that are not on the same vertical plane as the slab beams.

INSTALLATION

Clip length, spacing and attachment to the substructure are determined based on the combination of thermal and structural requirements of the assembly.

The *Structural Design Guide* will provide assistance with properly specifying the attachment and spacing of the ACS THERMAL CLIP in order to support exterior cladding assemblies. The *BUILD BETTER Guide* can be referenced to comply with energy-related objectives in building codes.

1. Precise measurements are required for the installation of ACS THERMAL CLIPS. Use a laser level or chalk line to draw a grid on the substrate so as to ensure all lines are level and plumb.

2. Fasten the ACS-S CLIP or the ACS-A CLIP (male) to the substrate using the fasteners specified for the project by following the reference lines.

3. When the ACS-A CLIP (male) is used, insert the ACS-A CLIP (female) into it. Adjust depth to achieve the desired positioning and hold the two pieces in place using one or two long-nose locking pliers.

4. Use an impact driver to screw the parts together. Constant pressure and high RPM are required.

RESTRICTIONS

Due to the number of variables inherent in the design of exterior cladding, structural review of cladding installations is required on any project. These variables include, but are not limited to, building height, building exposure, design wind pressure, cladding weight, cladding flexibility/brittleness, cladding fastening requirements, cladding assembly depth, substructure construction tolerances, and substructure material type.

As a result of the large number of variables involved in cladding design, a project structural engineer is required to review and provide the necessary design/assurance that the overall system is structurally acceptable.

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

THERMAL CLIPS
ACS

TECHNICAL DATA SHEET 240305SCANE (Supersedes 230307SCANE)

ACCESSORY PRODUCTS

APPLICATIONS

WALLS

GENERAL INFORMATION

Specifications	ACS THERMAL CLIPS	
	ACS-S CLIP	ACS-A CLIP
Available clip sizes (1)	1.5 in 2 in 2.5 in 3 in 3.5 in 4 in 4.5 in 5 in 5.5 in 6 in 7 in 8 in 9 in 10 in 11 in	3-4 in 4-5 in 5-6 in 6-7 in 7-8 in 8-9 in 9-10 in 10-11 in

(1) Customized clips can also be created to accommodate various insulation thicknesses upon special order if needed.

PROPERTIES [Thermal break pad]

Properties	Standards	ACS THERMAL CLIPS *(Thermal break pad)*
Color	-	Cream
Thickness	-	12.7 mm (1/2 in)
Thermal resistance (RSI (R-value) / 12,7 mm [1/2 in] @ 24 °C [75 °F])	ASTM C 518	0.44 RSI (R – 2.5)
Compressive strength	ASTM D 1621	550 to 759 kPa (80 to 110 psi)
Density	ASTM D 1622	68 kg/m³ (4.2 lb/pi³)
Linear dimensional stability	ASTM D 2126	< 0.5 % linear change
Water absorption	ASTM C 209	< 3 %
Flame spread*	ASTM E 84	40 - 60
Tensile strength	ASTM D 1623	> 35 kPa (> 730 lb/ft²)
Mold growth resistance	ASTM D 3273	Pass

(All values are nominal)

* The results determined in accordance with the ASTM E 84 Standard are not intended to indicate the hazards generated by this material, nor any other, in real fire conditions.

THERMAL CLIPS
ACS

TECHNICAL DATA SHEET 240305SCANE (Supersedes 230307SCANE)

ACCESSORY PRODUCTS

APPLICATIONS

WALLS

PROPERTIES [Stainless steel]

Properties	Standards	ACS THERMAL CLIPS *(Stainless Steel)*
Stainless steel gauge	-	16 gauge
Grade	ASTM A240/A480	304/304L
Stainless steel finish	ASTM A240/A480	Finish 2B
Recycled content	-	approx. 70 %

(All values are nominal)

SOPRASEAL
STICK 1100 T

TECHNICAL DATA SHEET 260126SCANE (supersedes 250730SCANE)

WATERPROOFING

APPLICATIONS

WALLS

DESCRIPTION

SOPRASEAL STICK 1100 T is a self-adhesive membrane composed of SBS modified bitumen and a tri-laminated woven polyethylene facer. The tri-laminated woven polyethylene is compatible for the use of sprayed polyurethane foam insulation. The underface is covered with a silicone release paper or film.

SOPRASEAL STICK 1100 T is an air/vapour barrier, therefore functions as an above-grade waterproofing membrane within exterior wall assemblies.

SOPRASEAL STICK 1100 T is also used as a masonry and through wall flashing membrane as well as a waterproofing membrane at openings and transitions.

RECOMMENDED SUBSTRATES

This product can be used on most substrates, such as masonry, concrete, wood, gypsum and metal.

SURFACE PREPARATION

The use of SOPRASEAL STICK PRIMER, ELASTOCOL STICK ZERO or ELASTOCOL STICK H_2O is required before the installation of SOPRASEAL STICK 1100 T membrane. The substrate should be clean, sound, dry and free of loose materials, grease and any contaminants, which may compromise the performance of the product.

INSTALLATION

SELF-ADHESIVE

1. Install the SOPRASEAL STICK 1100 T or SOPRASEAL STICK FLASHPRO membrane on angle changes, details and penetrations by removing the detachable silicone release paper or film from the self-adhesive underside.
2. Adhere the SOPRASEAL STICK 1100 T membrane to the substrate, making sure all overlaps are at least 50 mm (2 in).
3. To ensure proper adhesion, apply uniform pressure to the entire membrane using a hard roller.
4. To complete the installation, use the SOPRASEAL SEALANT with SOPRASEAL STICK 1100 T or SOPRASEAL STICK FLASHPRO to seal details, reverse laps, and critical areas.

Application temperatures (winter grade): - 10 to 10 °C (14 to 50 °F)
Application temperatures (summer grade): 10 to 50 °C (50 to 122 °F)

Service temperatures (winter grade): - 45 to 90 °C (- 49 to 194 °F)
Service temperatures (summer grade): - 45 to 90 °C (- 49 to 194 °F)

UV exposure: up to 90 days.

WARNING

When sprayed insulation is to be applied on the SOPRASEAL STICK 1100 T membrane, additional protection measures are recommended to prevent a possible delamination of the membrane caused by the curing of the insulation. Metal bars shall be mechanically fastened at the building perimeter, at membrane transitions, and around door and window frames, as well as all other openings.

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

SOPREMA®

SYSTÈME QUALITÉ ISO 9001 QUALITY SYSTEM

SYSTÈME ENVIRONNEMENT ISO 14001 ENVIRONMENT SYSTEM

SOPRASEAL
STICK 1100 T

WATERPROOFING

APPLICATIONS

WALLS

TECHNICAL DATA SHEET 260126SCANE (supersedes 250730SCANE)

GENERAL INFORMATION

Specifications	SOPRASEAL STICK 1100 T	
	Complete roll	Pre-cut roll
Thickness	1.0 mm (40 mils)	
Dimensions	0.91 x 22.9 m (3 x 75 ft)	100 mm x 22.9 m (4 in x 75 ft) 150 mm x 22.9 m (6 in x 75 ft) 225 mm x 22.9 m (9 in x 75 ft) 300 mm x 22.9 m (12 in x 75 ft) 350 mm x 22.9 m (14 in x 75 ft) 400 mm x 22.9 m (16 in x 75 ft) 450 mm x 22.9 m (18 in x 75 ft) 600 mm x 22.9 m (24 in x 75 ft)
Gross / Net area per roll	20.8 / 19.7 m^2 (224 / 212 ft^2)	-
Weight	1.0 kg/m^2 (0.2 lb/ft^2)	
Selvedge width	50 mm (2 in)	-
Surface	Tri-laminated woven polyethylene	
Underface	Silicone release paper	Silicone release film
Qty/pal	36	Varies depending of the width

PROPERTIES

SOPRASEAL STICK 1100 T meets the CSA A440.4 standard for windows and doors installation.

Properties	Standards	SOPRASEAL STICK 1100 T	
		MD	XD
Tensile strength	ASTM D5147	13.1 kN/m (74 lb/in)	9.6 kN/m (55 lb/in)
Ultimate elongation	ASTM D5147	40%	25%
Ultimate elongation (bitumen)	ASTM D5147	> 1000%	
Flexibility at low temperature	ASTM D5147	-35 °C (-31 °F)	
Dynamic puncture	ASTM E154	575 N (129 lbf)	
Tear resistance	ASTM D5147	535 N (120 lbf)	245 N (55 lbf)
Flow, *at 110 °C (230 °F)*	ASTM D5147	Pass	
Lap adhesion	ASTM D1876	2100 N/m (12 lbf/in)	
Peel resistance on primed gypsum	ASTM D903	1180 N/m (7 lbf/in)	

(All values are nominal)

SOPREMA®

SYSTÈME QUALITÉ ISO 9001 QUALITY SYSTEM

SYSTÈME ENVIRONNEMENT ISO 14001 ENVIRONMENT SYSTEM

SOPRASEAL
STICK 1100 T

TECHNICAL DATA SHEET 260126SCANE (supersedes 250730SCANE)

WATERPROOFING

APPLICATIONS

WALLS

PROPERTIES (*continued*)

Properties	Standards	SOPRASEAL STICK 1100 T	
		MD	XD
Water vapour permeance	ASTM E96 *(Procedure A and B)*	< 2.5 ng/Pa•s•m² (< 0.04 perm)	
Air permeability, *at 75 Pa*	ASTM E2178	< 0.0005 L/s•m² (< 0.00001 cfm/ft²)	
Air leakage resistance	ASTM E2357	< 0.002 L/s•m²	
Air permeance of membrane	CAN/ULC S741	< 0.001 L/s•m²	
Fire resistance	Component of an assembly tested in conformity with NFPA 285	Pass	
Nail sealability	ASTM D1970 modified	Pass	

(All values are nominal)
Note: SOPRASEAL STICK 1100 T is part of a wall system tested according to the ULC-S742 standard.

STORAGE AND HANDLING

Rolls must be stored upright, with the selvedge side on top. If the product is stored outdoors, cover them with an opaque protective cover after removal of the delivery packaging.

TESTS, CERTIFICATIONS AND EVALUATIONS

air barrier association of america abaa EVALUATED

FOR MORE INFORMATION, REFER TO THE INSTRUCTIONS ON THE LABEL AND RELEVANT SAFETY DATA SHEET (SDS).

ACS THERMAL PAD

TECHNICAL DATA SHEET

DESCRIPTION

The ACS THERMAL PAD is a high-density polyisocyanurate thermal insulation pad. It is composed of a closed-cell core structure placed between two polymer coated glass fibre facings.

The pad is utilized as a component of the ACS THERMAL CLIP: **ACS A-Clip® | ACS S-Clip® | ACS U-Clip™**

PROPERTIES

The ACS THERMAL PAD meets the requirements of ASTM C 1289, Type II, Class 4, Grade 1 and CAN/ULC S704.1 Type 4, Class 3.

Properties	Standards	Performance
Thermal Resistance RSI (R-Value) / 12.7mm [1/2″] @ 24°C [75°F]	ASTM C 518	0.44 RSI (R-2.5)
Compressive Strength	ASTM D 1621	693 kPa (100 psi)
Density	ASTM D 1622	68kg/m^3 (4.2lb/pi^3)
Linear Dimensional Stability	ASTM D 2126	< 0.5% linear change
Water Absorption	ASTM C 209	< 3%
Flame Spread[1]	ASTM E 84	40 - 60
Tensile Strength	ASTM D 1623	> 35kPA (> 730 lb/ft^2)
Mold Growth Resistance	ASTM D 3273	Pass

[1] Results determined in accordance with the ASTM E 84 Standard are not intended to indicate the hazards generated by this material, nor any other, in real fire conditions. All values are nominal.

PACKAGING

Specifications		ACS Thermal Pad
Dimensions	Thickness	12.7mm [1/2″]
	Width/Length	38.1mm x 101.6mm [1 ½″ x 4″]
Surface		Polymer coated glass fibres

INSTALLATION

Adhere the ACS THERMAL PAD to the **ACS A-Clip®, ACS S-Clip®** or **ACS U-Clip™** using the adhesive tape provided.

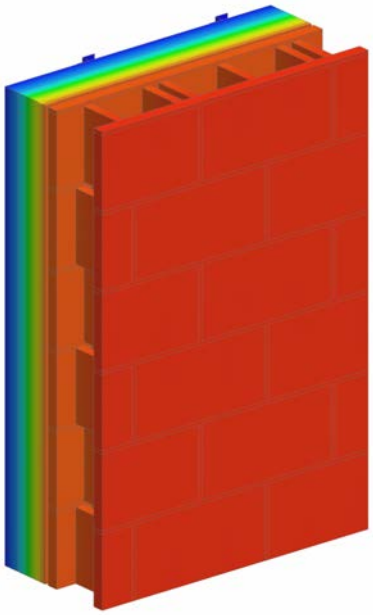
STORAGE AND HANDLING

To ensure performance of the adhesive tape, it is recommended that storage temperatures remain at: -30°C to 40°C [-22°F to 104°F]

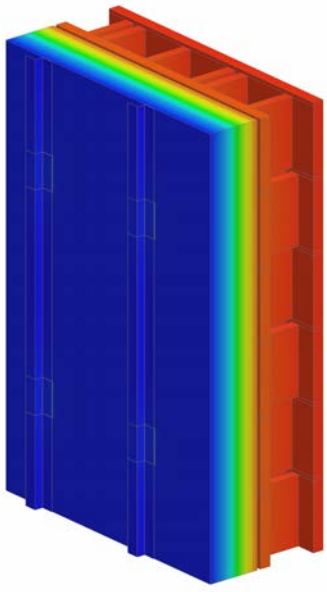
ACS Composite Systems Inc.
+1 (778) 352-1015
www.acscompositesystems.com

Detail 7.1.25

Exterior Insulated Concrete Block Wall Assembly with Protected SOPREMA SOPRA-ISO V ALU and ACS-S Thermal Clip (16” o.c. Horizontal) Supporting Metal Cladding - Clear Wall



View from Interior



View from Exterior

Thermal Performance Indicators

Assembly 1D (Nominal) R-value	R_{1D}	R-2.9 (0.51 RSI) + exterior insulation
Transmittance / Resistance	U_o R_o	“Clear wall” U- and R-value

Nominal (1D) vs. Assembly Performance Indicators

Thickness of Exterior Insulation	**Exterior Insulation 1D** R-value (RSI)	16x24 Clip Spacing		16x36 Clip Spacing		16x48 Clip Spacing	
		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_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_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)
2" Mineral Wool + 2” SOPRA-ISO V ALU	21.0 (3.70)	21.0 (3.70)	0.048 (0.270)	21.9 (3.86)	0.046 (0.259)	22.3 (3.92)	0.045 (0.255)
2" Mineral Wool + 4” SOPRA-ISO V ALU	33.3 (5.86)	31.4 (5.52)	0.032 (0.181)	33.0 (5.81)	0.030 (0.172)	33.8 (5.95)	0.030 (0.168)
2" Mineral Wool + 6” SOPRA-ISO V ALU	45.7 (8.05)	41.8 (7.35)	0.024 (0.136)	44.0 (7.75)	0.023 (0.129)	45.1 (7.94)	0.022 (0.126)
2" Mineral Wool + 8” SOPRA-ISO V ALU	58.1 (10.23)	52.6 (9.26)	0.019 (0.108)	54.6 (9.62)	0.018 (0.104)	56.2 (9.90)	0.018 (0.101)

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Thermal Performance

SERIES 328 - FiberWall™ Casement

				Centre-of-Glass				Overall Window				Energy Star	
Glass type	**Application**	**LoĒ Surface**	**Gas**	**R-Value**	**U-Value**	**Heat Gain**	**Visible Light**	**U-Value** *(imperial)*	**U-Value** *(metric)*	**Heat Gain**	**Visible Light**	**Energy Rating (ER)**	**Energy Star Efficiency**
Dual Pane													
Cardinal LoĒ-180	High Solar Gain	3	Argon	3.85	0.26	0.68	79%	0.27	1.53	0.44	50%	-	○
Cardinal LoĒ-272	Mid-Range	2	Argon	4.00	0.25	0.41	72%	0.26	1.48	0.27	46%	-	○
Cardinal LoĒ-366	Low Solar Gain	2	Argon	4.17	0.24	0.27	65%	0.26	1.48	0.18	41%	-	○
Triple Pane - 1 LoĒ Coating - High Performance													
Cardinal LoĒ-180	High Solar Gain	5	Argon	5.56	0.18	0.61	73%	0.21	1.19	0.40	46%	37	●
Cardinal LoĒ-272	Mid-Range	2	Argon	5.26	0.19	0.38	66%	0.21	1.19	0.25	42%	28	●
Cardinal LoĒ-366	Low Solar Gain	2	Argon	5.56	0.18	0.25	59%	0.21	1.19	0.16	37%	23	●
Triple Pane - 2 LoĒ Coatings - Ultra High Performance													
Cardinal LoĒ-180 and 180	High Solar Gain	2 and 5	Argon	7.69	0.13	0.56	70%	0.18	1.02	0.36	44%	38	●●
Cardinal LoĒ-272 and 180	Mid-Range	2 and 5	Argon	7.69	0.13	0.37	63%	0.17	0.97	0.24	40%	33	●●
Cardinal LoĒ-272 and 272	Mid-Range	2 and 5	Argon	7.69	0.13	0.35	58%	0.17	0.97	0.23	36%	32	●●
Cardinal LoĒ-366 and 180	Low Solar Gain	2 and 5	Argon	7.69	0.13	0.24	57%	0.17	0.97	0.16	36%	28	●●
Cardinal LoĒ-366 and 366	Low Solar Gain	2 and 5	Argon	8.33	0.12	0.24	47%	0.17	0.97	0.16	30%	28	●●

Performance Values are calcuated by certified, 3rd party test labs. Information is gleaned from best available industry sources. The reader is cautioned that test results should be used for comparison purposes only. Results are size and installation dependent. In-service performance can be significantly different from those shown. Product tested indicates design potential. Model size was 600 mm x 1500 mm.

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Thermal Performance

SERIES 328 - FiberWall™ Casement

Notes

(1) 2-Pane Cardinal IG unit calculations based on 2 lites of 1/8" (3 mm) glass and 1/2" (13 mm) airspace.
(2) 3-Pane Cardinal IG unit calculations based on 3 lites of 1/8" (3 mm) glass and two 1/2" (13 mm) airspaces.
(3) Calculations for argon filled unit made with 90% Argon/ 10% air.
(4) NFRC Environmental Conditions used for all values.
(5) Cardinal Endur warm edge stainless steel spacer used for all values.
(6) Thicker glass options available, up to 6 mm in dual pane or 5 mm in triple pane.
(7) Chart indicating Energy Star Canada efficiency designation:

- ●● ENERGY STAR Most Efficient 2023
- ● ENERGY STAR
- ○ Not Applicable

Values updated August 2023.

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Thermal Performance

SERIES 458 - Swinging Door - Outswing

				Centre-of-Glass				Overall Door		Energy Star	
Slab / Glass Type	**LoĒ Type**	**LoĒ Surface**	**Gas Fill**	**R-Value**	**U-Value** *(imperial)*	**Heat Gain**	**Visible Light**	**U-Value** *(imperial)*	**U-Value** *(metric)*	**Energy Rating**	**Energy Star Efficiency**
Opaque											
Opaque	None	N/A	N/A	-	-	0.01	0%	0.14	0.79	23	●
Half Lite											
Dual	Cardinal LoĒ-180	3	Argon	3.85	0.26	0.68	79%	0.23	1.31	-	○
Dual	Cardinal LoĒ-272	3	Argon	4.00	0.25	0.41	72%	0.23	1.31	-	○
Dual	Cardinal LoĒ-366	3	Argon	4.17	0.24	0.27	65%	0.23	1.31	-	○
Triple 1 Coating	Cardinal LoĒ-180	5	Argon	5.56	0.18	0.61	73%	0.21	1.19	22	●
Triple 1 Coating	Cardinal LoĒ-272	2	Argon	5.26	0.19	0.38	66%	0.21	1.19	19	●
Triple 1 Coating	Cardinal LoĒ-366	2	Argon	5.56	0.18	0.25	59%	0.20	1.14	18	●
Triple 2 Coatings	Cardinal LoĒ-180 / 180	2 and 5	Argon	7.69	0.13	0.56	70%	0.20	1.14	22	●
Triple 2 Coatings	Cardinal LoĒ-272 / 180	2 and 5	Argon	7.69	0.13	0.37	63%	0.20	1.14	20	●
Triple 2 Coatings	Cardinal LoĒ-272 / 272	2 and 5	Argon	7.69	0.13	0.35	58%	0.19	1.08	21	●
Triple 2 Coatings	Cardinal LoĒ-366 / 180	2 and 5	Argon	7.69	0.13	0.24	57%	0.19	1.08	20	●
Triple 2 Coatings	Cardinal LoĒ-366 / 366	2 and 5	Argon	8.33	0.12	0.24	47%	0.19	1.08	20	●

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Thermal Performance

SERIES 458 - Swinging Door - Outswing

				Centre-of-Glass				Overall Door		Energy Star	
Slab / Glass Type	**LoĒ Type**	**LoĒ Surface**	**Gas Fill**	**R-Value**	**U-Value** *(imperial)*	**Heat Gain**	**Visible Light**	**U-Value** *(imperial)*	**U-Value** *(metric)*	**Energy Rating**	**Energy Star Efficiency**
Full Lite - Flush Glaze											
Dual	Cardinal LoĒ-180	3	Argon	3.85	0.26	0.68	79%	0.25	1.42	-	o
Dual	Cardinal LoĒ-272	3	Argon	4.00	0.25	0.41	72%	0.25	1.42	-	o
Dual	Cardinal LoĒ-366	3	Argon	4.17	0.24	0.27	65%	0.24	1.36	-	o
Triple 1 Coating	Cardinal LoĒ-180	5	Argon	5.56	0.18	0.61	73%	0.25	1.42	-	o
Triple 1 Coating	Cardinal LoĒ-272	2	Argon	5.26	0.19	0.38	66%	0.25	1.42	-	o
Triple 1 Coating	Cardinal LoĒ-366	2	Argon	5.56	0.18	0.25	59%	0.25	1.42	-	o
Triple 2 Coatings	Cardinal LoĒ-180 / 180	2 and 5	Argon	7.69	0.13	0.56	70%	0.23	1.31	-	o
Triple 2 Coatings	Cardinal LoĒ-272 / 180	2 and 5	Argon	7.69	0.13	0.37	63%	0.23	1.31	-	o
Triple 2 Coatings	Cardinal LoĒ-272 / 272	2 and 5	Argon	7.69	0.13	0.35	58%	0.23	1.31	-	o
Triple 2 Coatings	Cardinal LoĒ-366 / 180	2 and 5	Argon	7.69	0.13	0.24	57%	0.23	1.31	-	o
Triple 2 Coatings	Cardinal LoĒ-366 / 366	2 and 5	Argon	8.33	0.12	0.24	47%	0.23	1.31	-	o

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Thermal Performance

SERIES 458 - Swinging Door - Outswing

				Centre-of-Glass				Overall Door		Energy Star	
Slab / Glass Type	**LoĒ Type**	**LoĒ Surface**	**Gas Fill**	**R-Value**	**U-Value** *(imperial)*	**Heat Gain**	**Visible Light**	**U-Value** *(imperial)*	**U-Value** *(metric)*	**Energy Rating**	**Energy Star Efficiency**
Full Lite - Duxton Sandwich Frame											
Triple 1 Coating	Cardinal LoĒ-180	5	Argon	5.56	0.18	0.61	73%	0.23	1.31	-	○
Triple 1 Coating	Cardinal LoĒ-272	2	Argon	5.26	0.19	0.38	66%	0.23	1.31	-	○
Triple 1 Coating	Cardinal LoĒ-366	2	Argon	5.56	0.18	0.25	59%	0.23	1.31	-	○
Triple 2 Coatings	Cardinal LoĒ-180 / 180	2 and 5	Argon	7.69	0.13	0.56	70%	0.21	1.19	28	●
Triple 2 Coatings	Cardinal LoĒ-272 / 180	2 and 5	Argon	7.69	0.13	0.37	63%	0.21	1.19	24	●
Triple 2 Coatings	Cardinal LoĒ-272 / 272	2 and 5	Argon	7.69	0.13	0.35	58%	0.21	1.19	23	●
Triple 2 Coatings	Cardinal LoĒ-366 / 180	2 and 5	Argon	7.69	0.13	0.24	57%	0.21	1.19	20	●
Triple 2 Coatings	Cardinal LoĒ-366 / 366	2 and 5	Argon	8.33	0.12	0.24	47%	0.20	1.14	21	●

Information is gleaned from best available industry sources. The reader is cautioned that values should be used for comparison purposes only. Results are size and installation dependent. In-service performance can be significantly different from those shown. Product tested indicates design potential.

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Thermal Performance

SERIES 458 - Swinging Door - Outswing

				Centre-of-Glass				Overall Door		Energy Star	
Slab / Glass Type	**LoĒ Type**	**LoĒ Surface**	**Gas Fill**	**R-Value**	**U-Value** *(imperial)*	**Heat Gain**	**Visible Light**	**U-Value** *(imperial)*	**U-Value** *(metric)*	**Energy Rating**	**Energy Star Efficiency**

Notes

(1) 2-Pane Cardinal IG unit calculations based on 2 lites of 1/8" (3 mm) glass and 1/2" (13 mm) airspace.

(2) 3-Pane Cardinal IG unit calculations based on:

Half Lite / Full Lite Flush Glaze: 3 lites of 1/8" (3 mm) glass and two 1/4" (8 mm) airspaces.

Full Lite Duxton Sandwich Frame: 3 lites of 1/8" (3mm) glass and two 5/8" (16 mm) airspaces.

(3) Calculations for argon filled unit made with 90% Argon/ 10% air.

(4) NFRC Environmental Conditions used for all values.

(5) Chart indicating Energy Star Canada efficiency designation:

- ● ENERGY STAR
- ○ Not Applicable

Note: Energy Star does not have a "Most Efficient" category for swinging doors.

Values updated August 2023.

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Thermal Performance

SERIES 658 - FiberWall™ Fixed

				Centre-of-Glass				Overall Window				Energy Star	
Glass type	**Application**	**LoĒ Surface #**	**Gas**	**R-Value**	**U-Value**	**Heat Gain**	**Visible Light**	**U-Value *(imperial)***	**U-Value *(metric)***	**Heat Gain**	**Visible Light**	**Energy Rating (ER)**	**Energy Star Efficiency**
Dual Pane													
Cardinal LoĒ-180	High Solar Gain	3	Argon	3.85	0.26	0.68	79%	0.28	1.59	0.61	70%	40	●●
Cardinal LoĒ-272	Mid-Range	2	Argon	4.00	0.25	0.41	72%	0.27	1.53	0.36	63%	-	○
Cardinal LoĒ-366	Low Solar Gain	2	Argon	4.17	0.24	0.27	65%	0.26	1.48	0.24	57%	-	○
Triple Pane - 1 LoĒ Coating - High Performance													
Cardinal LoĒ-180	High Solar Gain	5	Argon	5.56	0.18	0.61	73%	0.20	1.14	0.54	64%	46	●●
Cardinal LoĒ-272	Mid-Range	2	Argon	5.26	0.19	0.38	66%	0.20	1.14	0.34	58%	34	●
Cardinal LoĒ-366	Low Solar Gain	2	Argon	5.56	0.18	0.25	59%	0.20	1.14	0.22	52%	28	●
Triple Pane - 2 LoĒ Coatings - Ultra High Performance													
Cardinal LoĒ-180 and 180	High Solar Gain	2 and 5	Argon	7.69	0.13	0.56	70%	0.16	0.91	0.50	61%	49	●●
Cardinal LoĒ-272 and 180	Mid-Range	2 and 5	Argon	7.69	0.13	0.37	63%	0.15	0.85	0.33	56%	40	●●
Cardinal LoĒ-272 and 272	Mid-Range	2 and 5	Argon	7.69	0.13	0.35	58%	0.15	0.85	0.31	51%	39	●●
Cardinal LoĒ-366 and 180	Low Solar Gain	2 and 5	Argon	7.69	0.13	0.24	57%	0.15	0.85	0.22	50%	34	●●
Cardinal LoĒ-366 and 366	Low Solar Gain	2 and 5	Argon	8.33	0.12	0.24	47%	0.14	0.79	0.21	41%	35	●●

Performance Values are calcuated by certified, 3rd party test labs. Information is gleaned from best available industry sources. The reader is cautioned that test results should be used for comparison purposes only. Results are size and installation dependent. In-service performance can be significantly different from those shown. Product tested indicates design potential. Model size was 1200 mm x 1500 mm.

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Thermal Performance

SERIES 658 - FiberWall™ Fixed

Notes

(1) 2-Pane Cardinal IG unit calculations based on 2 lites of 1/8" (3 mm) glass and 1/2" (13 mm) airspace.
(2) 3-Pane Cardinal IG unit calculations based on 3 lites of 1/8" (3 mm) glass and two 1/2" (13 mm) airspaces.
(3) Calculations for argon filled unit made with 90% Argon/ 10% air.
(4) NFRC Environmental Conditions used for all values.
(5) Cardinal Endur warm edge stainless steel spacer used for all values.
(6) Thicker glass options available, up to 6 or 8 mm.
(7) Chart indicating Energy Star Canada efficiency designation:

- ●● ENERGY STAR Most Efficient 2023
- ● ENERGY STAR
- ○ Not Applicable

Values updated August 2023.