

Technical Guide DELTA®-VENT SA



Air Barrier Systems for Low- and Mid-Rise
Wood Framed Buildings up to Six Stories
with Continuous Exterior Insulation.

Dörken Systems Inc. – Leading Through Technical Competence

Dörken delivers innovative, high-performance air and moisture barriers for commercial and residential construction sold under the DELTA® brand name. A North American manufacturer based out of Beamsville, Ontario, Dörken Systems Inc. is a subsidiary of Ewald Dörken AG, a leading European developer and manufacturer of waterproofing and drainage products sold worldwide. Dörken is known for delivering premium products while providing educational programs and full technical support. For more information, call +1 (888) 433-5824 or visit www.dorken.com.



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Introduction

What you will find in this guide

This technical guide provides an overview of the design and construction of complete air barrier systems using DELTA®-VENT SA with vapor permeable continuous exterior insulation for low- and mid-rise (up to six stories) wood framed buildings in continental North America.

An air barrier system (air control layer) is a critical component for high performance enclosures and is required in all climates to control airflow through the building enclosure. It also defines the location of the pressure boundary of the enclosure. An exterior air barrier system is preferred since fewer penetrations need to be accommodated and it is more easily inspected. An exterior air barrier system can be constructed using outer layers

of sheathing (such as gypsum, waferboard, or fiberboard) with a fully adhered membrane like DELTA®-VENT SA.

Continuous exterior insulation protects the membrane from failure at joints caused by thermal expansion and contraction. It also increases building durability and comfort by mitigating issues associated with thermal bridging and condensation in the interior wall cavity. Vapor permeable continuous exterior insulation is recommended in conjunction with the vapor permeable DELTA®-VENT SA to allow for drying of the wall assembly.

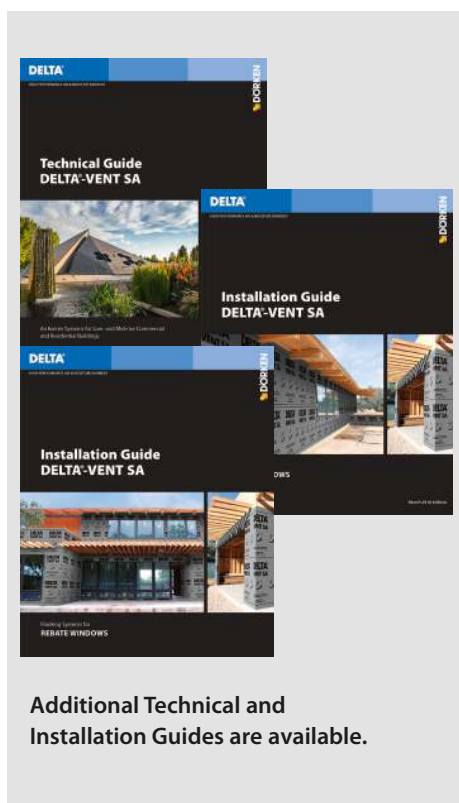
This guide uses the principles of building science to highlight the use of DELTA®-VENT SA

DELTA®-VENT SA is a self-adhered water-resistive membrane and air barrier component. DELTA®-VENT SA exceeds the most stringent requirements of the Air Barrier Association of America (ABAA D-115-010), the National Air Barrier Association (NABA), and of the National Building Code of Canada (NBC 2010) based on the results of ASTM E2357 - 11 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

and other DELTA® products with vapor permeable continuous exterior insulation to meet the needs of high performance buildings.



DELTA®-VENT SA with continuous exterior insulation: low-rise residential application. (Waterloo, ON)



Improved Heat Flow Control

Thermal Performance

Many concerns, including the rising cost of energy, climate change, and demands for increased comfort, have led to the desire for increased insulation levels in new and existing buildings. Building codes are changing to require higher levels of thermal performance than ever before. Besides increasing nominal thermal resistance requirement, codes are requiring more effective performance. The following sections explain why for continuous exterior insulation is a key strategy to enhancing thermal performance and how it can improve wall durability. Considerations for cladding attachment, assembly variations, and LEED credit opportunities are also provided.

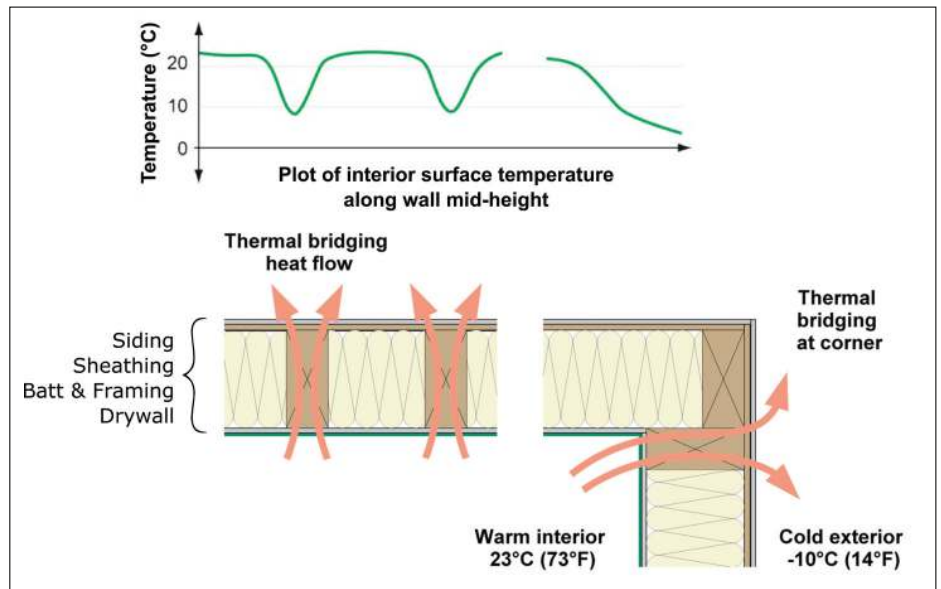


Figure 1: Thermal bridges can cause localized drops in temperature during cold weather, resulting in condensation, mold growth, and staining.

When large or intense (i.e., highly conductive), they can affect the total heat loss through the enclosure.

Thermal Bridging

Heat flow is often greater at corners, window frames, parapets, intersections between different assemblies, etc. This is a result of requiring additional structural elements, which are frequently more thermally conductive than insulation material. The term "thermal bridge" is used to reflect the fact that heat bypasses the thermal insulation (see Figure 1). Continuous exterior insulation limits thermal bridging through structural elements in the wall cavity. This reduces the accompanying excessive heat loss which leads to cold interior surfaces that can cause discomfort and surface condensation (Figure 2).

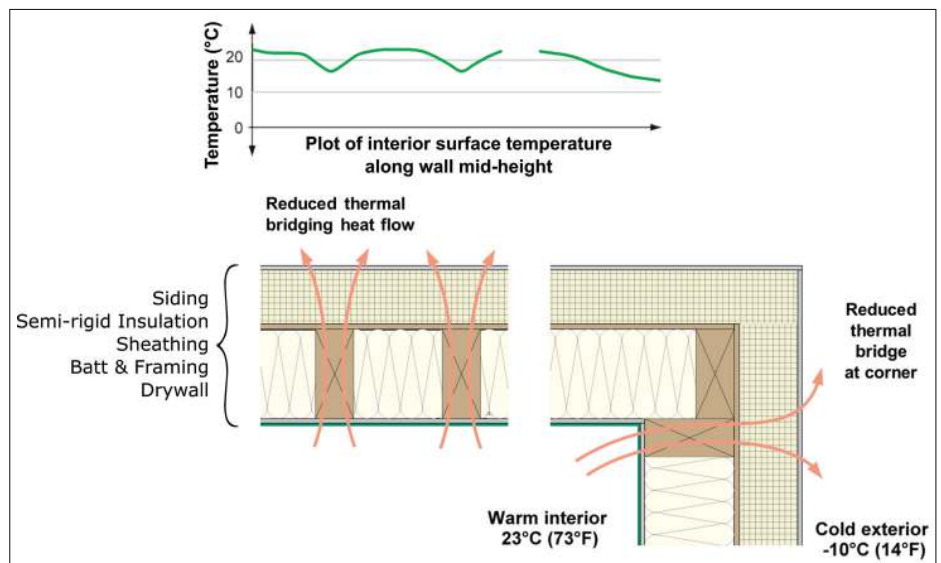


Figure 2: Illustration of reduction in localized drops in temperature from application of 2" continuous exterior insulation.

Improved Attachment Of Cladding

Attachment of Cladding

The use of thick continuous insulation (i.e., greater than 1.5") requires an additional mechanism for cladding attachment, the selection of which is an important consideration, since it can result in thermal bridging that influences the overall thermal performance of the enclosure. Several factors influence the cladding attachment design, including the cladding weight and wind loads, which affect attachment type and spacing.

For lightweight cladding, it is recommended that cladding be attached to furring strips, and that long screws be used to attach furring strips to the framing structure. This reduces thermal bridging and allows the continuous exterior insulation to retain its insulation value while also providing a drainage and ventilation gap to remove water penetrating and absorbed by the cladding. For heavier cladding, fiberglass clips are recommended.

Figure 3 provides the relative effectiveness of different cladding attachments for 2" to 8" of continuous exterior insulation.

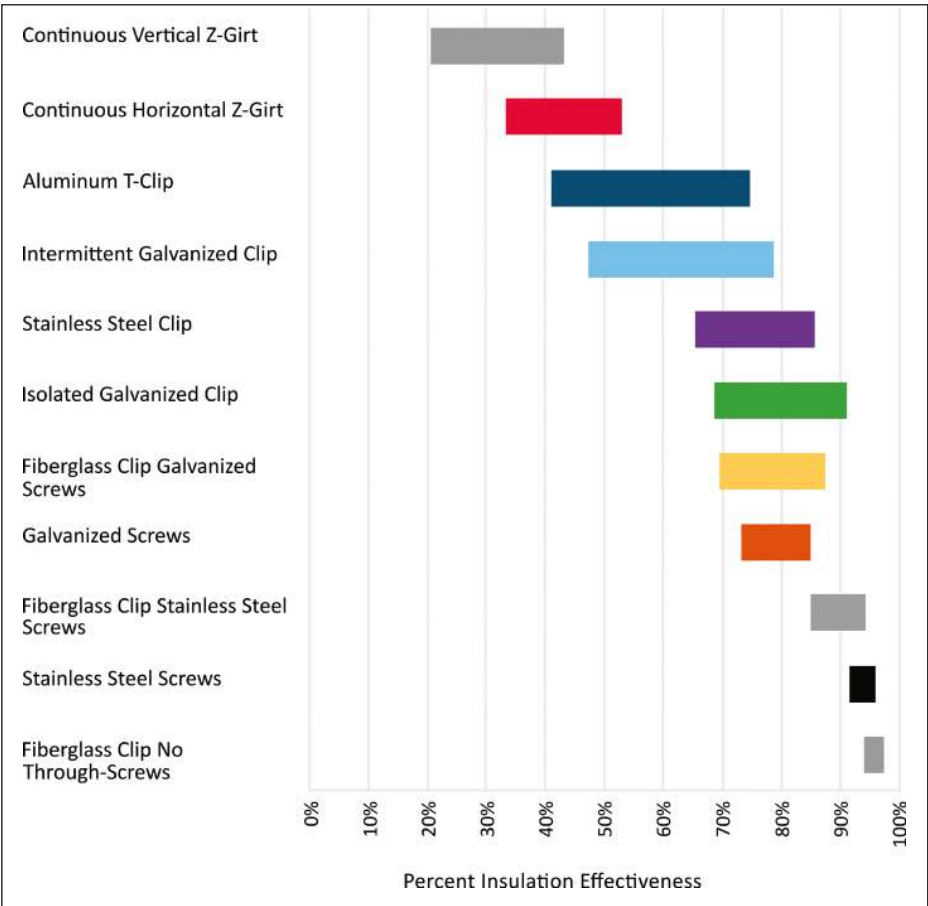


Figure 3: Cladding attachment influence on insulation Image credit: "RDH Technical Bulletin 011 Cladding Attachment Solutions for Exterior Insulated Commercial Walls"

Figure 4: (a) Wood furring strips installed with screws for attachment of cladding over DELTA®-VENT SA (Refer to Detail 04 and Detail 06) and (b) Cascadia Clips® installed over DELTA®-VENT SA.



Improved Heat Flow Control

Convective Loops and Wind Washing

Air barriers stop airflow moving across the enclosure and are key to ensuring indoor air quality, comfort, and resistance to condensation. However, convective loops can cause air movement within the enclosure, either through low-density insulation or in spaces around insulation, and can reduce the insulation's effectiveness (Figure 5). Wind-driven

flow of cold outdoor air through low-density insulation or air gaps in exterior continuous insulation (known as "wind washing") can also cool the interior side of the enclosure, resulting in condensation (Figure 6). Such condensation promotes mold growth which, in turn, affects indoor air quality and durability.

Continuous exterior insulation with adequate density keeps the sheathing warm, which reduces the risk of condensation caused by convective loops in cavity insulation. Recent research¹ has shown that wind washing effect can vary significantly depending on specific project circumstance for unprotected mineral wool exterior insulation behind cladding.

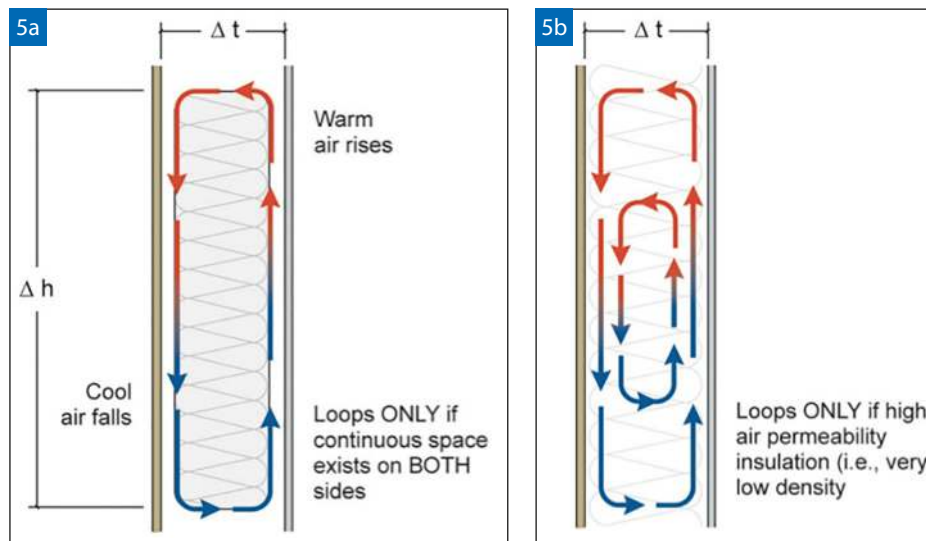


Figure 5: Convective loops around spaces in insulation (a) and convective loops through low-density insulation (b).

Image credit: John Straube, High Performance Enclosures, Building Science Press

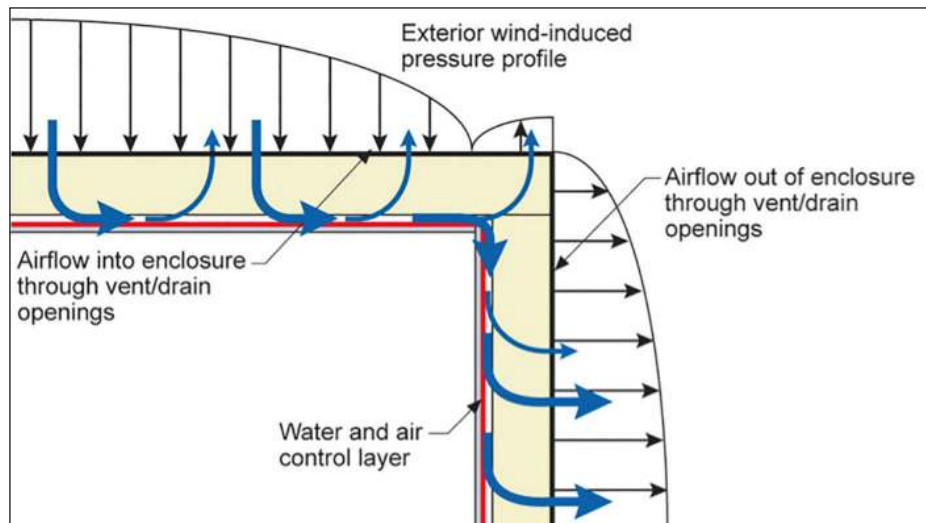


Figure 6: Wind-driven airflow around and behind exterior insulation.

Image credit: John Straube, High Performance Enclosures, Building Science Press

¹ Van Straaten, R., Straube, J., Trainor, T., and Habillion, A., (2014) "Wind Washing Effects on Mineral Wool Insulated Sheathing" Canadian Conference of Building Science and Technology, Toronto.

Improved Condensation Control

Condensation Control

Control of air leakage through the enclosure is important for avoiding condensation and the associated issues of enclosure durability and occupant health problems.

Use of continuous exterior insulation can be very effective in controlling condensation (see Figure 2). Outward air leaking may cause water and frost condensation on surfaces within the enclosure that are colder than the dew point of the exfiltrating indoor air. Sufficient exterior insulation, relative to the amount of interior insulation, will keep the sheathing and other surfaces above the dew point. Controlling the temperature and relative humidity within a building during cold weather is also critical. Interior temperatures often range 20-22 °C (68-72 °F), but relative humidity levels can vary significantly.

Table 1 provides the level of insulation (including sheathing, air space and cladding) that should be provided outside of an air permeable insulation (i.e., batt or blown fibrous insulation) filled stud space to prevent cold-weather condensation. Mild temperatures and dry interior air require less exterior insulation to control condensation, whereas a 50 %RH (a very high cold-weather interior humidity) in a cold climate should have virtually all the insulation on the exterior.

Vapor diffusion is a separate process that can also cause condensation. If the sheathing layers are highly vapor permeable (e.g., EPS, stone wool over fiberboard, gypsum sheathing, and vapor permeable air- and water-resistive membranes) then concerns of vapor diffusion are lessened, if not eliminated. Moisture flow due to air leakage tends to be much greater than moisture flow due to vapor diffusion. Hence, the airflow control and proper use and levels of insulation are still important for condensation control in such assemblies. If an assembly is safe against air leakage condensation based on insulation ratios, then it will also be safe from vapor diffusion condensation, regardless of the sheathing vapor control layer.

For important projects or situations in which the design team has little historical experience, investigation using widely available hygrothermal computer models would be prudent.



Figure 7: Using DELTA®-VENT SA membrane as an air barrier with mineral fiber insulation as vapor permeable continuous exterior insulation prevents condensation from air leakage and vapor diffusion, especially in cold climates.

Indoor	RH	20	25	30	35	40	50	60
Dew point	°C	-3.0	0.0	2.5	4.7	6.6	9.9	12.7
	°F	26.6	32.0	36.6	40.5	44.0	49.9	54.8
T _{outdoor}	°C	°F	Ratio of exterior to interior insulation					
	0	32	0.00	0.00	0.12	0.23	0.32	0.47
	-5	23	0.08	0.19	0.29	0.37	0.45	0.57
	-10	14	0.23	0.32	0.40	0.48	0.54	0.64
	-15	5	0.33	0.42	0.49	0.55	0.60	0.69
	-20	-4	0.41	0.49	0.55	0.60	0.65	0.73
	-25	-13	0.48	0.54	0.60	0.65	0.69	0.76
	-30	-22	0.53	0.59	0.64	0.68	0.72	0.78
	-35	-31	0.57	0.63	0.67	0.71	0.74	0.80
	-40	-40	0.61	0.66	0.70	0.73	0.76	0.82

Table 1: Ratio of exterior-interior insulation levels to control air leakage condensation
Data from Dr. John Straube, High Performance Enclosures, Building Science Press, Westford MA 2012.

Recommendations for Thermal Control by Climate

North American Climate Zones

The enclosure design must be adapted depending on the climate. Use Figure 8 below to determine the climate zone in which the project is located and refer to Table 2,

Table 3, and Table 4 in the following sections for details on climate-specific thermal control and selection of enclosure materials and components.

- Zone 1** Very Hot with $5000 < \text{CDD}_{10}^{\circ\text{C}} < 9000$ ($9000 < \text{CDD}_{50}^{\circ\text{F}}$)
- Zone 2** Hot with $3500 < \text{CDD}_{10}^{\circ\text{C}} \leq 5000$ ($6300 < \text{CDD}_{50}^{\circ\text{F}} \leq 9000$)
- Zone 3** Warm with $2500 < \text{CDD}_{10}^{\circ\text{C}} < 3500$ ($4500 < \text{CDD}_{50}^{\circ\text{F}} \leq 6300$)
- Zone 4** Mixed with $\text{CDD}_{10}^{\circ\text{C}} \leq 2500$ & $\text{HDD}_{18}^{\circ\text{C}} \leq 3000$ ($\text{CDD}_{50}^{\circ\text{F}} \leq 4500$ & $3600 < \text{HDD}_{65}^{\circ\text{F}} \leq 5400$)
- Zone 5** Cool with $3000 < \text{HDD}_{18}^{\circ\text{C}} \leq 4000$ ($5400 < \text{HDD}_{65}^{\circ\text{F}} \leq 7200$)
- Zone 6** Cold with $4000 < \text{HDD}_{18}^{\circ\text{C}} \leq 5000$ ($7200 < \text{HDD}_{65}^{\circ\text{F}} \leq 9000$)
- Zone 7** Very Cold with $5000 < \text{HDD}_{18}^{\circ\text{C}} \leq 7000$ ($9000 < \text{HDD}_{65}^{\circ\text{F}} \leq 12600$)
- Zone 8** Subarctic with $7000 < \text{HDD}_{18}^{\circ\text{C}}$ ($12600 < \text{HDD}_{65}^{\circ\text{F}}$)

HDD = Heating Degree Days, CDD = Cooling Degree Days

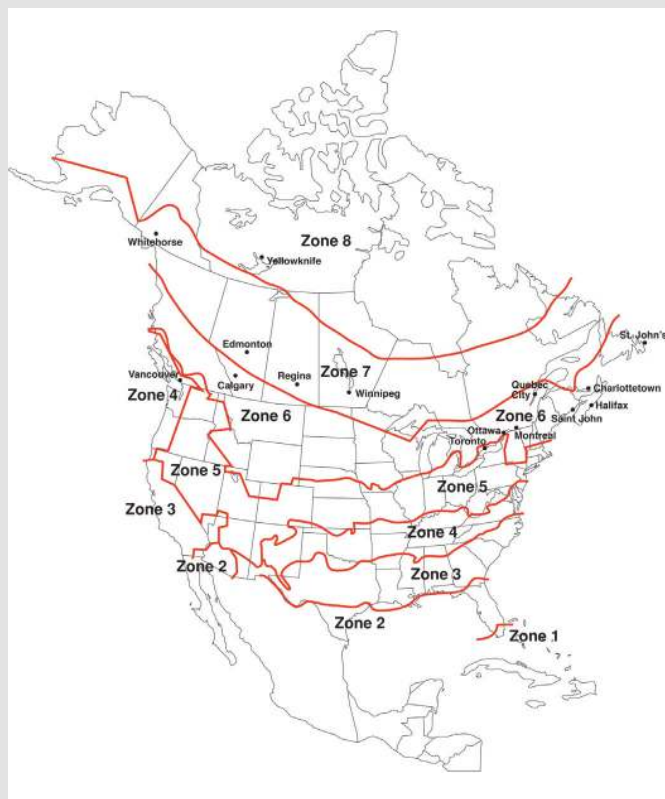


Figure 8: North American Climate Zone Map

Image credit: Dr. John Straube, High Performance Enclosures, Building Science Press. based on ASHRAE Standard 90.1-2010

Climate-Specific Recommendations for Insulation

The amount of thermal control required varies by climate. Table 2 summarizes the total effective R-value of various enclosure assemblies that are recommended for a low-energy, highly comfortable building. It is noted that these recommendations

are for buildings with relative low internal heat gains (e.g. residential buildings). These R-values can be provided entirely by exterior insulation, or, if a vapor permeable air- and water-resistive membrane is used, by some combination of framing cavity and exterior

insulation. Table 3 provides a guide for the thickness of exterior insulation by climate zone for the wall if framing cavity insulation is utilized.

Climate Zone	Wall	Vented Attic	Compact Roof	Basement Wall	Exposed Floor	Slab Edge	Windows (U/SHGC)	Sub-slab
1	10	40	35	5	10	none	yes	none
2	15	50	40	10	20	5	0.35 / < 0.25	none
3	20	50	45	10	20	7.5	0.30 / < 0.30	5
4	25	60	45	15	30	7.5	0.30 / < 0.35	7.5
5	30	65	50	15	30	10	0.24 / < 0.50	7.5
6	35	75	60	20	40	10	0.18 / --	10
7	40	90	65	25	45	15	0.15 / --	15
8	50	100	75	35	50	20	0.15 / --	20

Table 2: RDH Recommendations for Effective R-value by Climate Zone

Climate Zone	Wall	Inches of Exterior Semi-Rigid Stone Wool over Batt Filled 2x4 Framing	Inches of Exterior Semi-Rigid Stone Wool over Batt Filled 2x6 Cavity
1	10	none	none
2	15	1"	none
3	20	2.5"	1.25"
4	25	4"	2.5"
5	30	5"	4"
6	35	7"	5"
7	40	8"	7"
8	50	10"	9"

Table 3: Effective R-Values of Wood Framed Walls with Continuous Exterior Stone Wool Insulation

Recommendations for Vapor Control by Climate

Climate-Specific Material and Component Considerations

DELTA®-VENT SA can be used in all climate types; however, consideration must be given to the selection of wall assembly components to prevent condensation issues from vapor diffusion.

Consideration	Options	Examples	Recommendations / Cautions
Climate Zone	All	Zones 1-8	Recommendation: DELTA®-VENT SA can be used in all climates. See climate-specific guidance in the sections that follow.
Cladding Type	Non absorptive	metal panel, high density laminates, vinyl siding, etc.	Recommendation: In all climates (Zones 1-8), installation over a drained and ventilated space with DELTA®-VENT SA is recommended.
	Absorptive	fiber cement, brick, stucco, stone, tiles, terracotta, wood	Caution: In all climates (Zones 1-8), do not direct-apply absorptive claddings on DELTA®-VENT SA. These claddings must be installed over a drained and ventilated space.
Exterior Insulation	Vapor Permeable	semi-rigid glass fiber, stone wool	Recommendation: In all climates (Zones 1-8), DELTA®-VENT SA must be detailed as a drainage plane regardless of any other drainage plane that may be provided outboard of the exterior insulation.
Interior Vapor Control	Vapor Permeable	latex paint, kraft paper	Recommendation: In hot climates (Zones 1-4), vapor permeable interior control layers can and should be used.
			Caution: In cold climates (Zones 5-8) the vapor permeance of interior control layers should be selected to moderate outward vapor diffusion.
	Vapor Impermeable	vinyl wall coverings, polyethylene vapor retarder	Caution: In hot climates (Zones 1-4), do not install DELTA®-VENT SA on a wall that employs a low permeance interior vapor control layer, especially when using a moisture absorptive cladding.
			Recommendation: In cold climates (Zones 5-8), DELTA®-VENT SA can be used on walls that employ a low permeance interior vapor control layer (vapor barrier). Provided sufficient exterior insulation is provided, no interior vapor barrier is required.

Table 4: Selection Guide for DELTA®-VENT SA

Cladding should be installed over a drained and ventilated space, especially when using absorptive claddings. With DELTA®-VENT SA, vapor permeable exterior insulation is recommended and in all cases should be installed over a sheathing membrane that is detailed as a drainage plane/water-resistive barrier.

Vapor permeable latex paint and kraft paper should be used in hot climates (Zones 1-4) and not vinyl wall coverings or polyethylene

vapor retarders. To avoid issues with condensation from both inward and outward vapor drives, the vapor permeance of individual layers, and the amount of exterior continuous insulation should be balanced carefully in Zones 5-8. For instance, solar inward vapor drives caused by rain wetted cladding and solar energy can cause moisture accumulation inside the enclosure, particularly at low vapor permeance layers, potentially causing mold growth and other

durability issues. For absorptive claddings with high rain and solar exposure, alternative less permeable insulation or membrane products may be necessary to limit moisture transfer or use of interior smart vapor barriers.

Material Properties

Technical Data		
Product name	DELTA®-VENT SA	
Color	gray	
Material	3-ply polypropylene membrane with vapor permeable adhesive coating	
Adhesive coating	Full surface coating with vapor permeable pressure-sensitive adhesive	
Water vapor transmission	214 g/m²/24 h	ASTM E96-05, Proc. A (dry cup)
	343 g/m²/24 h	ASTM E96-05, Proc. B (wet cup)
Vapor permeance	31 perms [grains/h/ft²/in Hg]	ASTM E96-05, Proc. A (dry cup)
	50 perms [grains/h/ft²/in Hg]	ASTM E96-05, Proc. B (wet cup)
Air leakage of air barrier assemblies	< 0.2 L/(s · m²) @ 75 Pa (0.04 cfm/ft² @ 1.57 lb/ft²) as per ABAA and NBC 2010 requirements	
Breaking strength	Machine direction 71 lb	ASTM D5034-95
	Cross direction 65.4 lb	
Elongation at break	Machine direction 27.8 %	ASTM D5034-95
	Cross direction 60.1 %	
90° Peel adhesion	Pass	AAMA 711-5.3 (ASTM D3330)
Accelerated aging (U.V.)	Pass	AAMA 711-5.4
Elevated temperature	Pass (Level 3)	AAMA 711-5.5 (ASTM D3330)
Thermal cycling	Pass	AAMA 711-5.6
Adhesion after water immersion	Pass	AAMA 711-5.8
Bent test	Pass	AC-38 3.3.4
Nail sealability	Pass	ASTM D1970-01
Water resistance hydrostatic pressure	Pass (55 cm > 5 hours)	AATCC 127-1985
Linear dimensional change at elevated temperature (185 °F (85 °C))	Machine direction -1.4%	ASTM D1204-08
	Cross direction +0.1%	
Resistance to puncture	78.6 lbs (333.1N)	ASTM E154-99(10)
Low temperature flexibility	Pass	ASTM D1970-01
Crack bridging ability	Pass - 15 °F (- 26 °C)	ASTM C1305-06
Flame spread	14	ASTM E84-09
	NFPA Class A; IBC Class A	
Smoke developed	47	ASTM E84-09
	NFPA Class A; IBC Class A	
Air permeance	Pass (< 0.02 l/(s · m²) @ 75 Pa)	ASTM E2178
Application temperature	Minimum 40 °F (5 °C)	
Service temperature	- 40 °F to + 176 °F (- 40 °C to + 80 °C) W / Primer	
	- 13 °F to + 176 °F (- 25 °C to + 80 °C) W/O Primer	
Roll weight	approx. 40 lb (18 kg)	
Roll size	4' 11" (1.5 m) x 115' (35 m)	
Maximum UV (sunlight) exposure	Always cover as soon as possible. Maximum exposure 50 days.	
DELTA® Accessories	DELTA®-MULTI-BAND, DELTA®-FLEXX-BAND, DELTA®-FLASHING, DELTA®-TW FLASHING, DELTA®-FAS CORNER, DELTA®-THAN, DELTA®-HF PRIMER, DELTA®-ADHESIVE LVC	

LEEDv4

Leadership in Energy and Environmental Design Version 4

LEEDv4 has design-based green rating systems that include the building enclosure within their scope in terms of various environmental impacts. LEEDv4 includes the following rating systems for midrise buildings (USGBC.org).

Homes and Multifamily Lowrise: Designed for single family homes and multifamily buildings between one and three stories.

Multifamily Midrise: Designed for midrise multifamily buildings between four and eight stories.

The standards similarly define green building features in terms of prerequisite and point earning requirements. When all prerequisites are fulfilled and a minimum number of points are achieved, a project can receive a certified silver, gold, or platinum rating. Also,

it is important to note that the standards are evolving. Below is an overview of how **DELTA®-VENT SA** affects specific credit opportunities within the current LEEDv4 rating systems.

Credits	Points	Contribution
Building Product Disclosure and Optimization	3	<p>Environmental Product Declaration</p> <p>In LEED v4, up to 3 points can be achieved, each for using at least 20 different products with an approved Environmental Product Declaration, Corporate Sustainability Reports, and/or Material Ingredient Reporting certifications.</p> <p>Health Product Declarations</p> <p>Dörken is reviewing these certifications and DELTA® products can contribute to the minimum of 20 products.</p> <p>LEED v4 has also introduced up to 5 points for building life-cycle impact reduction. Within the life cycle assessment calculation for new buildings, the service life of components must be considered.</p>
Low Emitting Materials – Adhesives and Sealants	3	<p>Multifamily Midrise</p> <p>This credit does not apply to exterior products. The building exterior is defined as everything outside and inclusive of the primary and secondary weatherproofing system, such as waterproofing membranes and air- and water-resistive barrier materials.</p> <p>DELTA®-VENT SA is typically the waterproofing and air barrier membrane, so VOC documentation clearly does not need to be submitted. Guidance has not been provided in LEED v4 on whether or not VOC content documentation for primers is required.</p>
Enhanced Commissioning	2	<p>Multifamily Midrise</p> <p>An additional 2 points are available for including building enclosure with the scope of Enhanced Commissioning.</p> <p>Using DELTA®-VENT SA for air and moisture control is an effective part of meeting these building enclosure commissioning requirements.</p>

DELTA[®]-VENT SA and LEED[®] Building Design and Construction

Credits	Points	Contribution															
<div>Minimum Energy Performance</div> <div>Optimize Energy Performance</div>	<div>PR</div> <div>Up to 20</div>	<div>Multifamily Midrise</div> <div>Option 1 – Whole-building energy simulation</div> <div>Energy performance must be at least 10 % below baseline defined in and 90.1-2010. Credits are earned for surpassing this minimum threshold.</div> <div>DELTA®-VENT SA can be used to considerably improve building air tightness. To claim energy savings from air tightness, applicants must use the Exceptional Calculation Method defined in Appendix G2.5. See LEED interpretation 5060, 5691 and 5495 for guidance. ASHRAE 90.1-2010 (5.4.3.1) further requires that “the entire building envelope shall be designed and constructed with a continuous air barrier.” Using DELTA®-VENT SA, designers will help to ensure that air leakage rates are below the maximum allowed.</div> <div>Option 2 – Prescriptive compliance</div> <div>Projects must meet the prescriptive requirements of the ASHRAE Advanced Energy Design Guides (50 % savings required for LEED v4). These guides have similar air barrier requirements as ASHRAE 90.1-2010 under which DELTA®-VENT SA can serve as an effective continuous air barrier.</div> <div>Homes</div> <div>Homes must meet minimum Energy Star performance requirements that include blower door performance thresholds. Houses using DELTA® -VENT SA have been found to achieve exemplary air tightness performance. For projects following the Energy Star performance path, additional points are available for a more air tight house.</div> <div>Air tightness thresholds in ACH50(cfm50/sf) for IECC climate zones</div> <table><tr><th></th><th>Zones 1-2</th><th>Zones 3-4</th><th>Zones 5-7</th><th>Zone 8</th></tr><tr><td>1 pt</td><td>4.25 (0.195)</td><td>3.5 (0.16)</td><td>2.75 (0.125)</td><td>2.0 (0.0925)</td></tr><tr><td>2 pts</td><td>3.0 (0.1375)</td><td>2.5 (0.115)</td><td>2.0 (0.0925)</td><td>1.5 (0.0675)</td></tr></table>		Zones 1-2	Zones 3-4	Zones 5-7	Zone 8	1 pt	4.25 (0.195)	3.5 (0.16)	2.75 (0.125)	2.0 (0.0925)	2 pts	3.0 (0.1375)	2.5 (0.115)	2.0 (0.0925)	1.5 (0.0675)
	Zones 1-2	Zones 3-4	Zones 5-7	Zone 8													
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<div>Compartmentalization</div> <div>Enhanced Compartmentalization</div>	<div>PR</div> <div>3</div>	<div>Multifamily Midrise</div> <div>For multi-residential buildings 4-6 stories, the Multifamily Midrise requires all projects meet compartmentalization requirements for units, regardless of smoking policy. This is confirmed through unit blower door testing which captures interior separation between units and the exterior enclosure.</div> <div>This standard also provides additional point(s) for exceeding suite air tightness thresholds in the Enhanced Compartmentalization credit.</div> <div>Using DELTA®-VENT SA will ensure minimum air leakage contribution of the exterior enclosure.</div> <div>Suite air tightness thresholds for compartmentalization credits</div> <table><tr><th></th><th>Pts</th><th>Minimum</th></tr><tr><td>Prerequisite</td><td>PR</td><td>0.23 cfm50/sf</td></tr><tr><td>Enhanced Compartmentalization</td><td>3</td><td>0.15 cfm50/sf</td></tr></table>		Pts	Minimum	Prerequisite	PR	0.23 cfm50/sf	Enhanced Compartmentalization	3	0.15 cfm50/sf						
	Pts	Minimum															
Prerequisite	PR	0.23 cfm50/sf															
Enhanced Compartmentalization	3	0.15 cfm50/sf															

Table 5: Summary of How DELTA[®]-VENT SA Contributes to LEEDv4

Installation Details

Details List

The following drawings illustrate common construction details for low- mid-rise wood framed wall assemblies with continuous permeable exterior insulation. The drawings are not project-specific and are meant to be modified by the project architect to include selected cladding, structural components, and other construction materials. Each drawing, however, clearly labels assembly elements by function and includes a description of each detail and building science notes. The following details are included in this guide:

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Building Science Note

DELTA®-VENT SA with Continuous Exterior Insulation: Building Science Notes

1. General

- a. Detail is applicable to lightweight cladding systems (see 07.b below) using exterior insulation for low- and mid-rise residential or light commercial construction.

2. Structure

- a. A 2x4, 2x6 or 2x8 wood stud frame and exterior oriented strand board (OSB) or plywood sheathing infill structure with and without a plywood extension box is illustrated in design options A and B, respectively.

3. Rainwater control layer

- a. A drained-screen approach to rainwater control (as illustrated) is recommended.
- b. The continuous, fully adhered DELTA®-VENT SA membrane is the primary rainwater control layer in the wall assembly. It is applied to the exterior surface of the exterior OSB or plywood sheathing.

4. Air control layer

- a. The continuous, fully adhered DELTA®-VENT SA membrane is the primary air control layer. It is applied to the exterior surface of the exterior OSB or plywood sheathing. The membrane is fully supported by the exterior sheathing and continuous through the detail illustrated.

5. Thermal control layer

- a. 3" to 6" continuous exterior insulation is the primary thermal control layer (addressing thermal bridging). Insulation may also be included in the wall cavity.
- b. The recommended amounts of insulation vary by climate region (see Table 2 and Table 3).

6. Vapor control layer

- a. Depending on climate and insulation materials, the primary vapor control layer may be located at the wall interior (see Table 4).
- b. Design the assembly as a vapor-open assembly, if applicable, meaning that there is a single plane of vapor control and that drying can occur toward the interior or toward the exterior from this plane. Selection of vapor-open interior finishes should be considered.
- c. In hot climates (Zones 1-4), do not install a vapor permeable sheathing membrane on a wall that employs a low permeance interior vapor control layer, especially when using a moisture absorptive cladding.

7. Exterior cladding

- a. Lightweight cladding is illustrated,
- b. Material options for lightweight exterior cladding include:
 - I. Wood or wood panel
 - II. Fiber cement siding or panels
 - III. Vinyl siding
 - IV. Aluminum siding

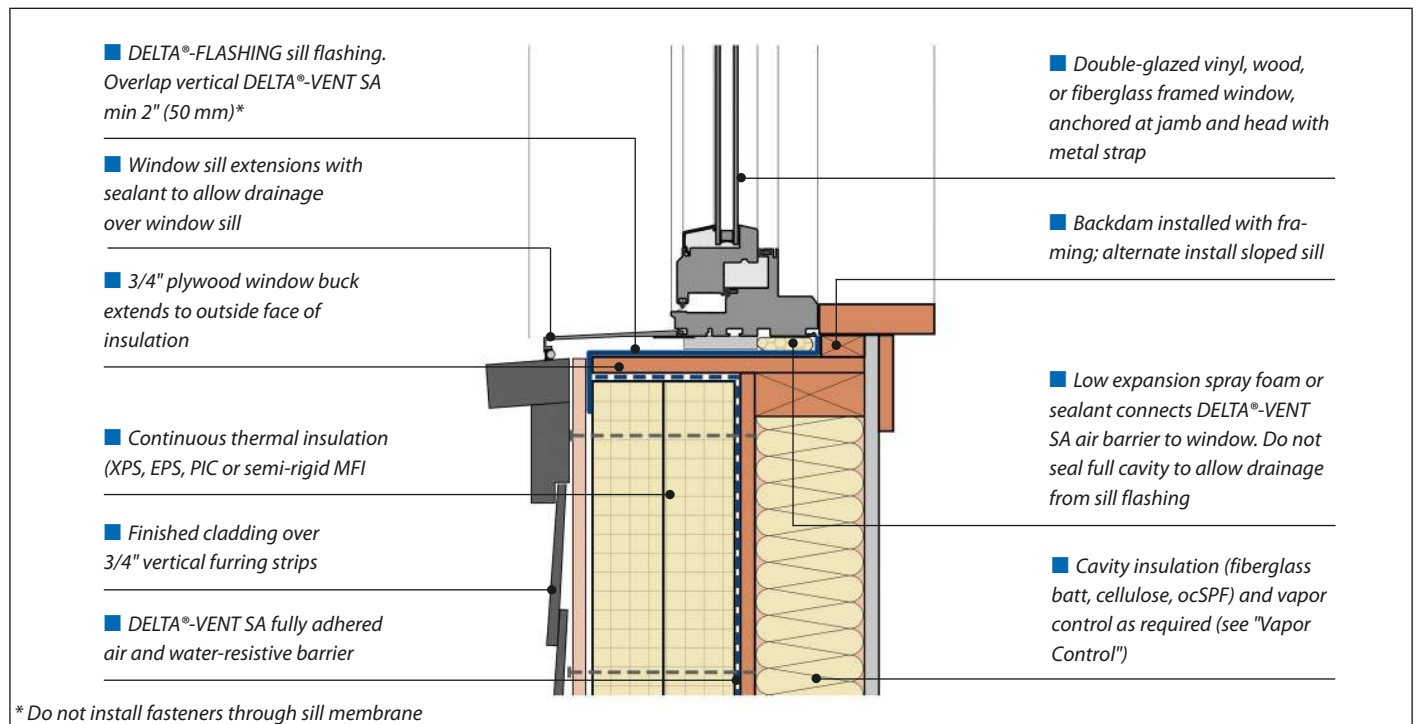
8. Quality control considerations

- a. Inspect the lapping of membrane pieces to ensure that pieces are installed in "shingle" fashion.
- b. Confirm installation of DELTA®-MULTI BAND tape at vertical edges of DELTA®-VENT SA membrane sheets.
- c. Ensure tight fit of continuous exterior insulation material at all penetrations.
- d. Ensure strapping is fastened through insulation into structural member.

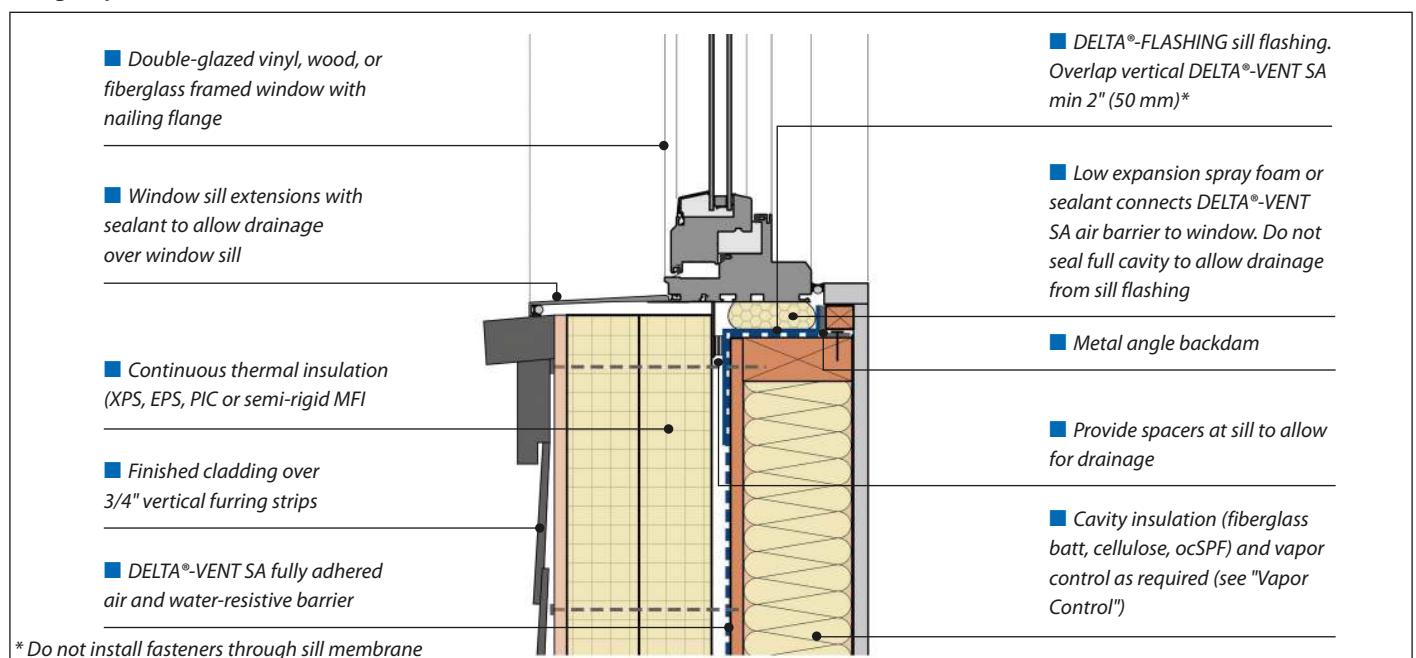
Installation Details

1. Punched Window Opening – Sill Detail

Design Option A

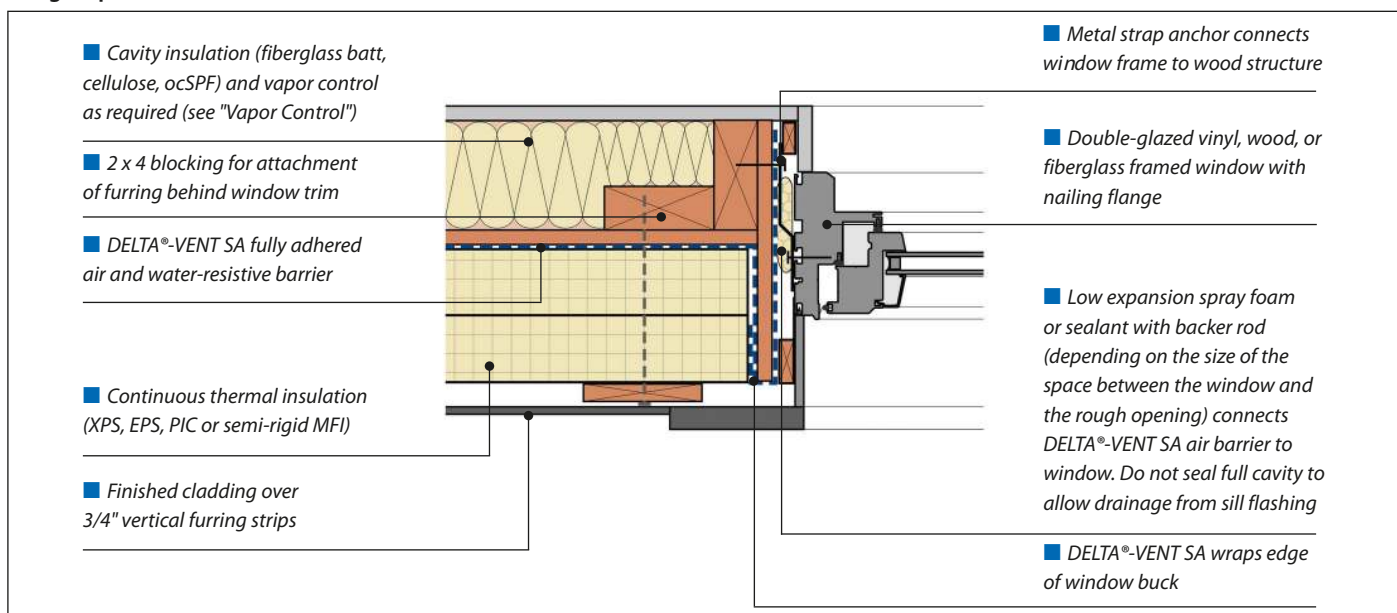


Design Option B

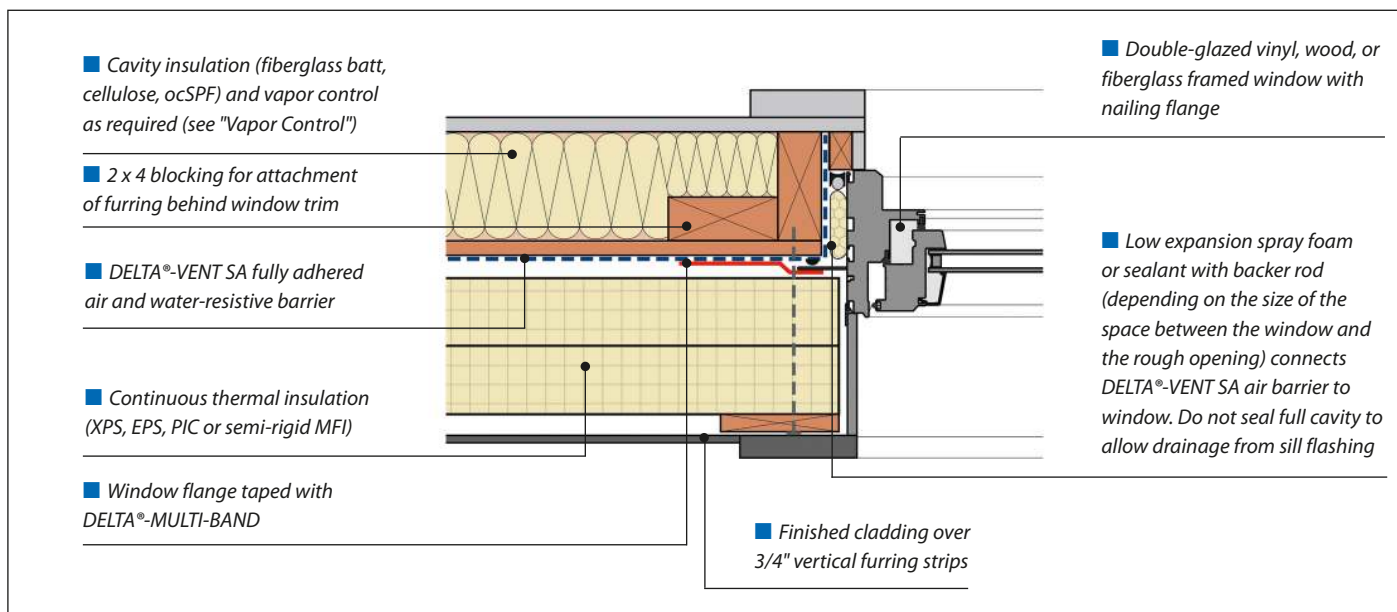


2. Punched Window Opening – Jamb Detail

Design Option A



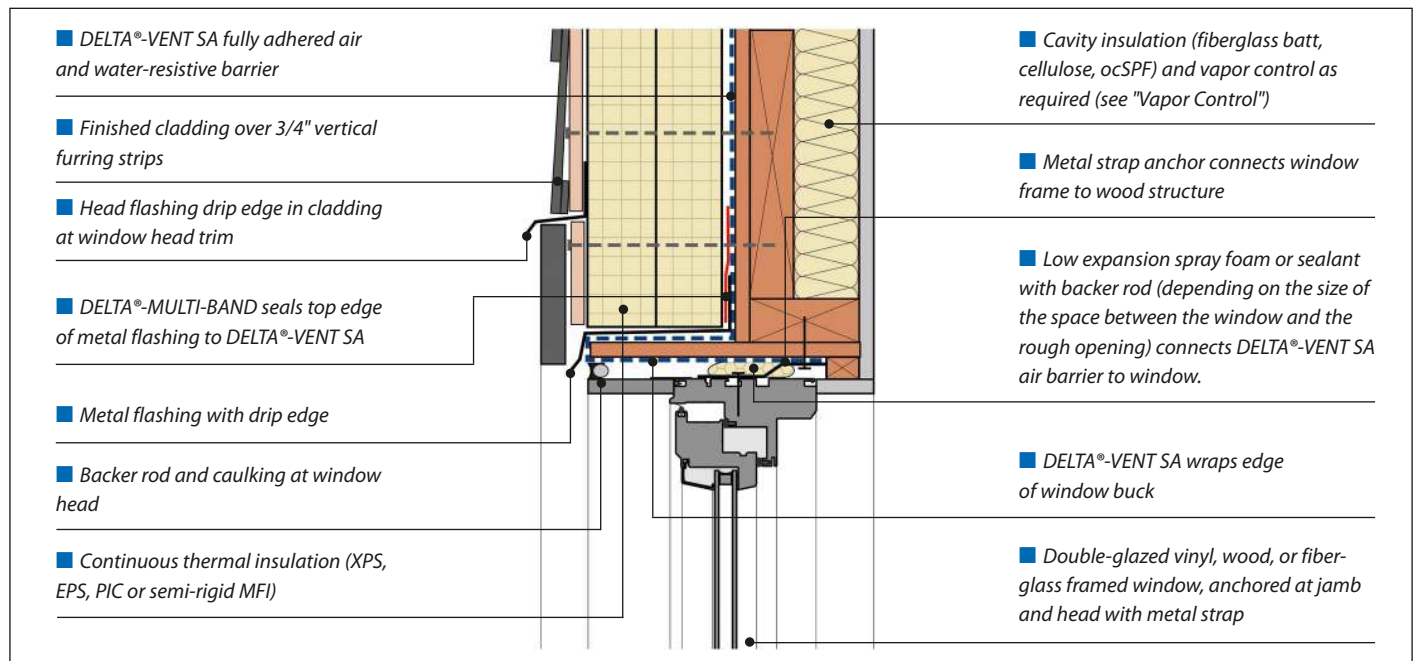
Design Option B



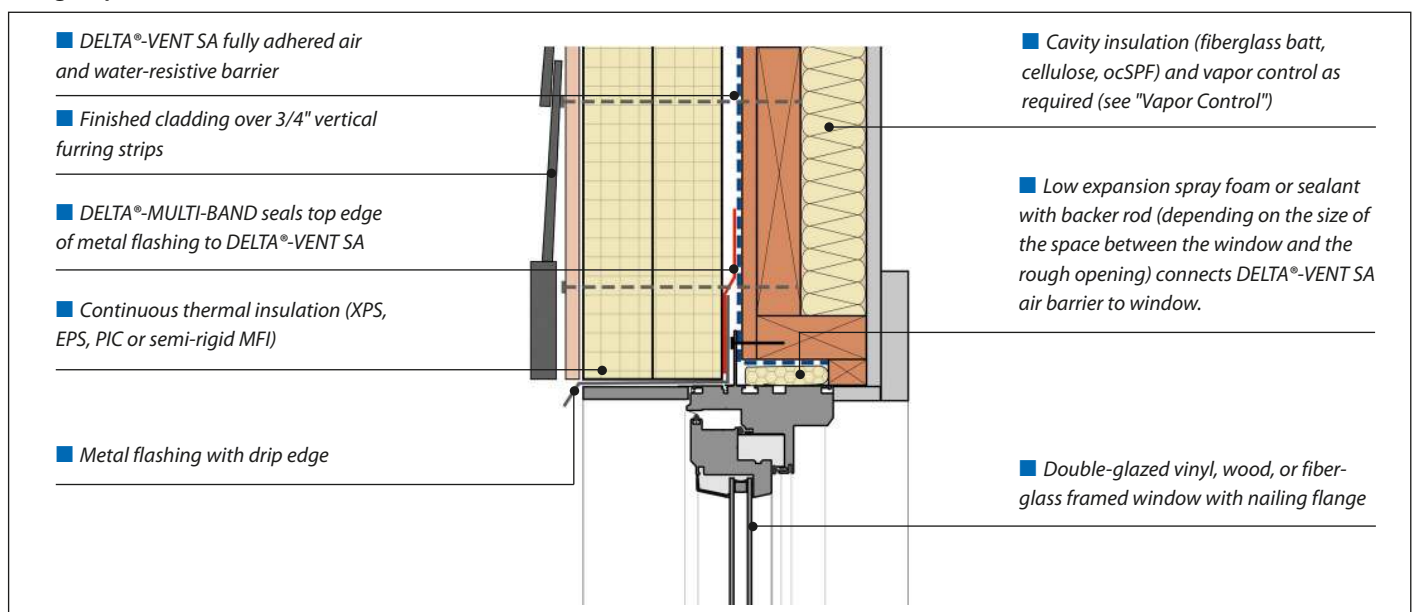
Installation Details

3. Punched Window Opening – Head Detail

Design Option A



Design Option B



4. Punched Window Opening Option A – Installation Sequence

Step 1



- Wood frame with OSB or plywood sheathing.

Step 2



- Install plywood/OSB window extension box inside rough opening to support window installation.

Step 3



- Prime sheathing with DELTA®-HF PRIMER before applying DELTA®-VENT SA*.
- Install DELTA®-VENT SA membrane below window and up over extension box.

Step 4



- Install DELTA®-VENT SA membrane to both sides of jamb, lapping minimum 4" (100 mm) over bottom sheet. Membrane should continue to cover interior sides of extension box.

*Use DELTA®-ADHESIVE LVC when temperatures are at 41 °F (5 °C) or below.

Installation Details

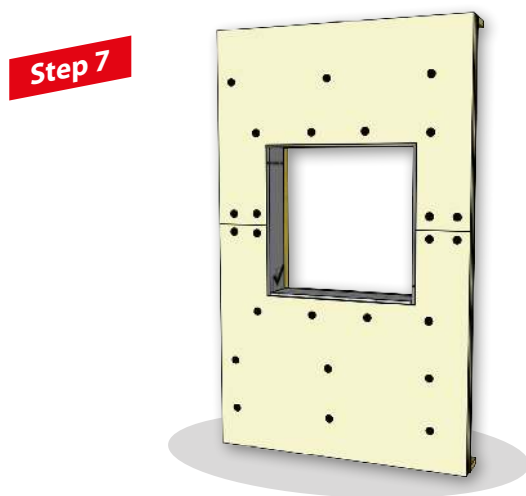
4. Punched Window Opening Option A – Installation Sequence



- Install DELTA®-VENT SA membrane at head of rough opening. Lap minimum 4" (100 mm) onto face of wall at head.



- Install DELTA®-MULTI-BAND tape at overlapped edges of DELTA®-VENT SA to ensure airtightness.
- Install DELTA®-FLASHING membrane to sill.



- Continuous vapor permeable thermal insulation (EPS, semi-rigid stonewool), installed in two layers, joints offset and staggered.



- Install window with metal strap anchors to interior of window extension box.

Step 9



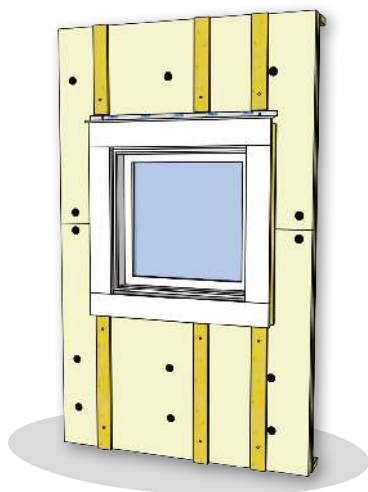
- Install 1x4 wood furring strips to support window trim and cladding.

Step 10



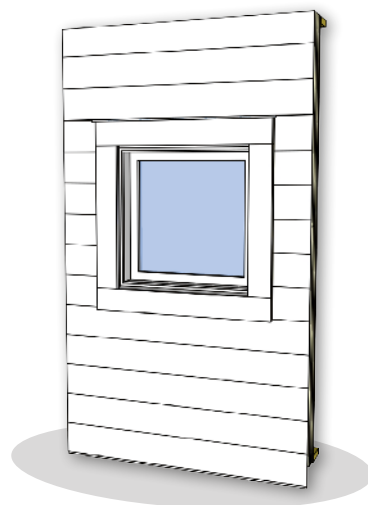
- Install window trim.

Step 11



- Install metal flashing to the strapping above the top trim board.

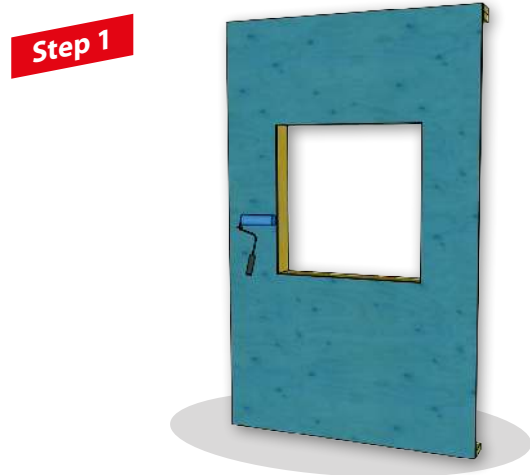
Step 12



- Install siding.

Installation Details

5. Punched Window Opening Option B – Installation Sequence



- Wood frame with OSB or plywood sheathing. Prime sheathing with DELTA®-HF PRIMER before applying DELTA®-VENT SA*.



- Install flexible plastic corner DELTA®-FAS CORNER to ensure reliable draught- and waterproof seals.

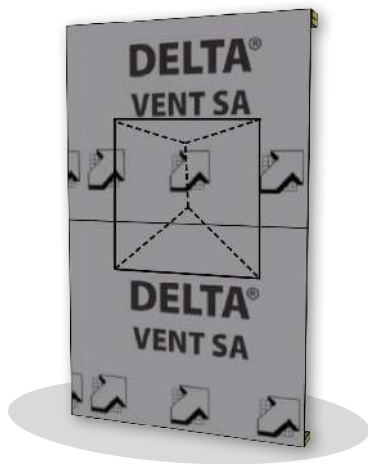


- Install DELTA®-VENT SA membrane to lower portion of wall.



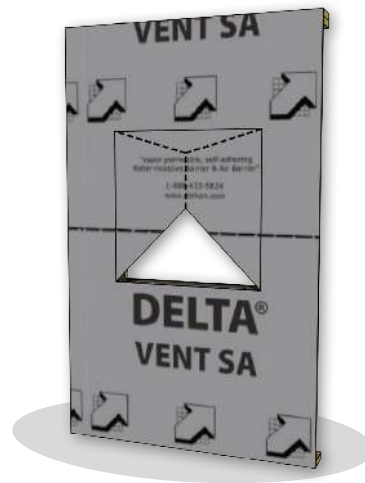
- Install DELTA®-VENT SA membrane to upper portion of wall, lapping minimum 4" (100 mm).

Step 5



- Use the "upside-down martini glass" method to cut into DELTA®-VENT SA membrane.

Step 6



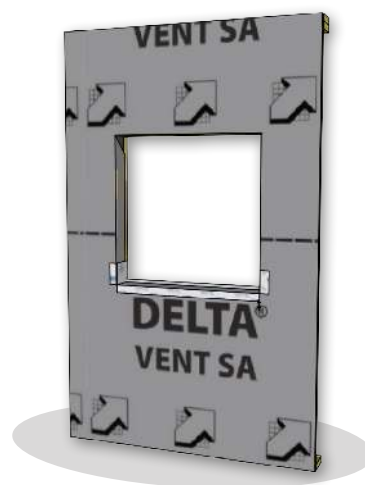
- Carefully fold back the sections of DELTA®-VENT SA towards the inside of the window opening.

Step 7



- Install DELTA®-FLASHING membrane to sill.

Step 8



- Install metal back dam back edge of window opening. Seal with DELTA®-THAN or DELTA®-TILAXX.

Installation Details

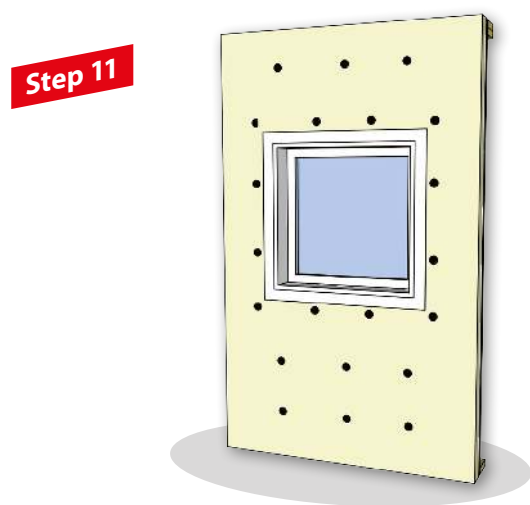
5. Punched Window Opening Option B – Installation Sequence



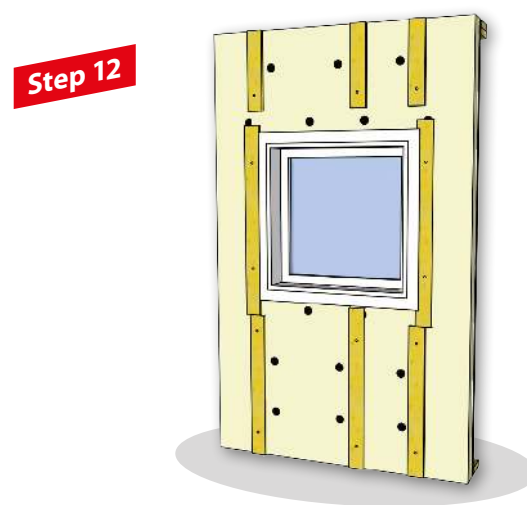
■ Install window.



■ Install DELTA®-MULTI-BAND tape at window edges starting with jamb to ensure proper lapping. Do not tape at window sill to allow for drainage.

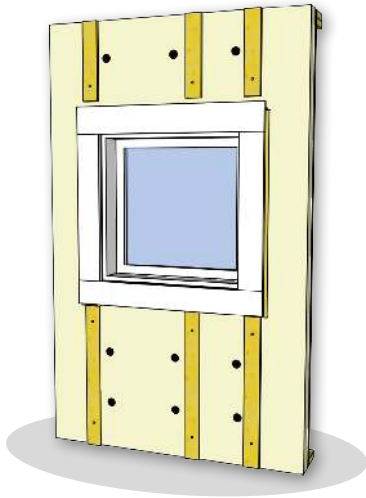


■ Install continuous insulation.



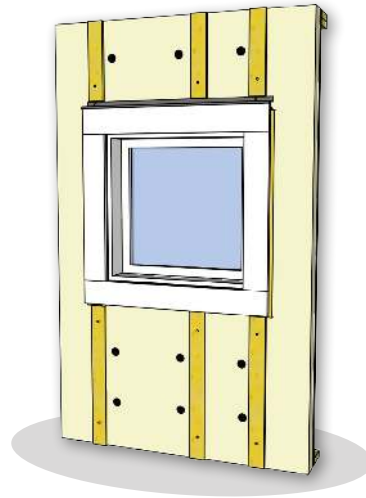
■ Install 1x4 wood strapping to support siding.

Step 13



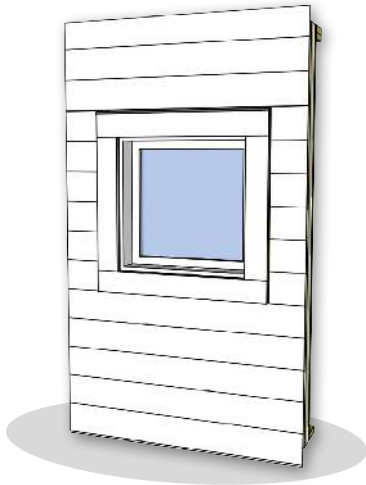
■ Install window trim.

Step 14



■ Install header flashing against insulation.

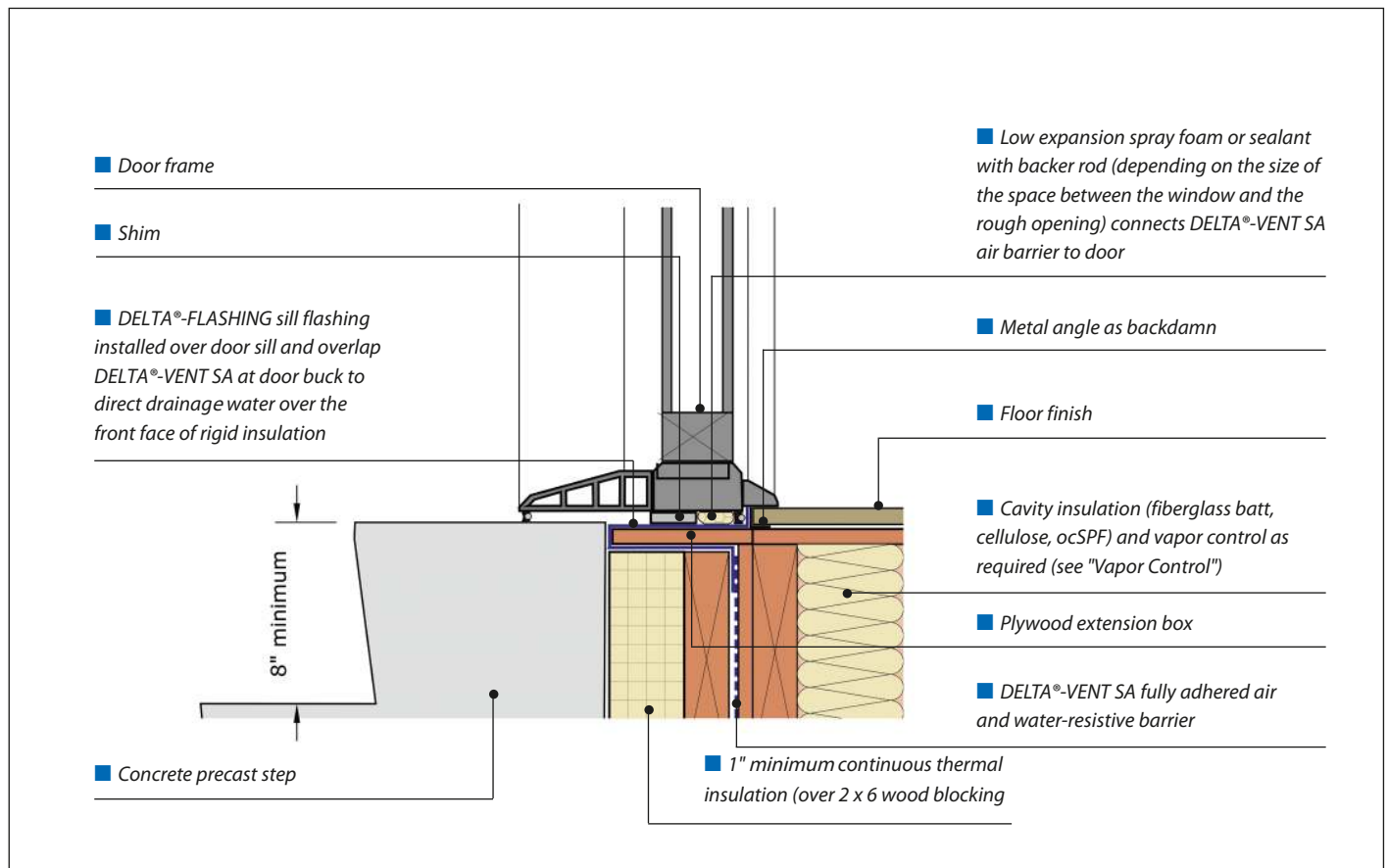
Step 15



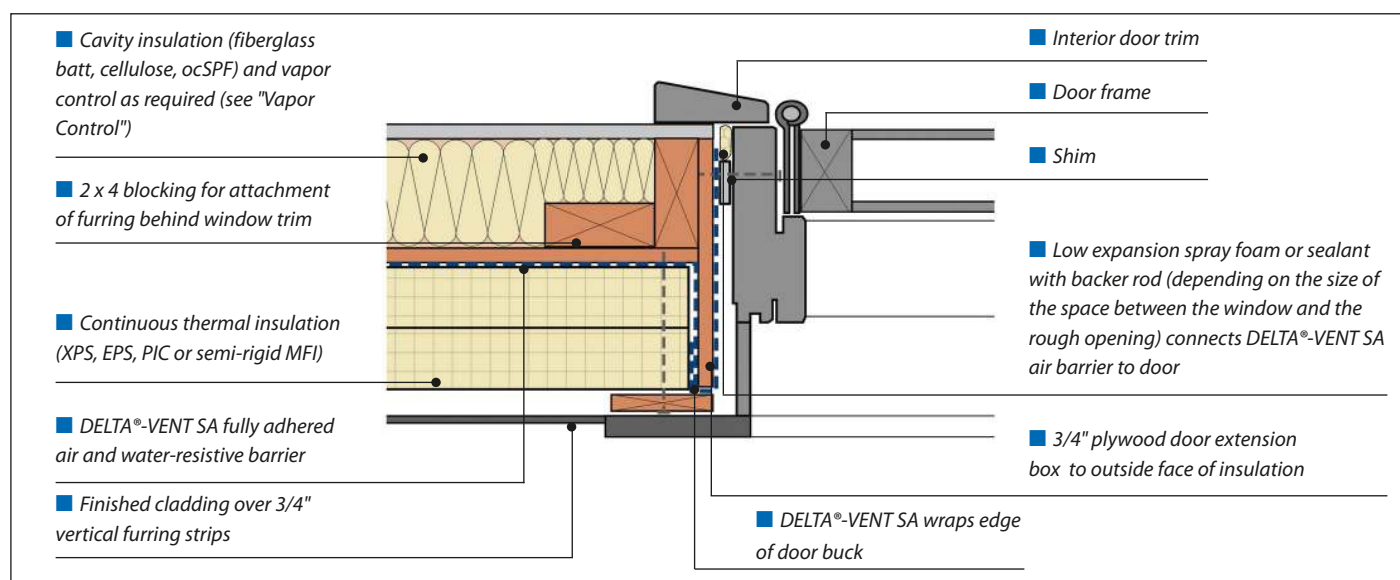
■ Install siding.

Installation Details

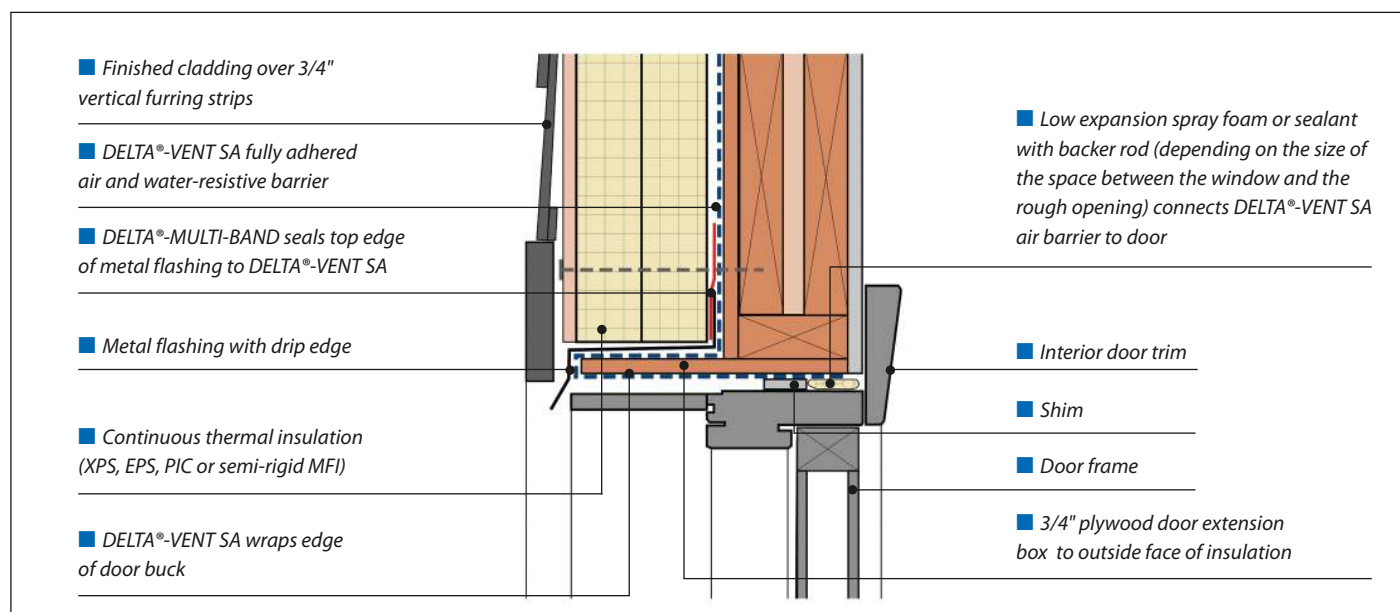
6. Field of Wall – Exterior Entry Door – Sill Detail



7. Field of Wall – Exterior Entry Door – Jamb Detail

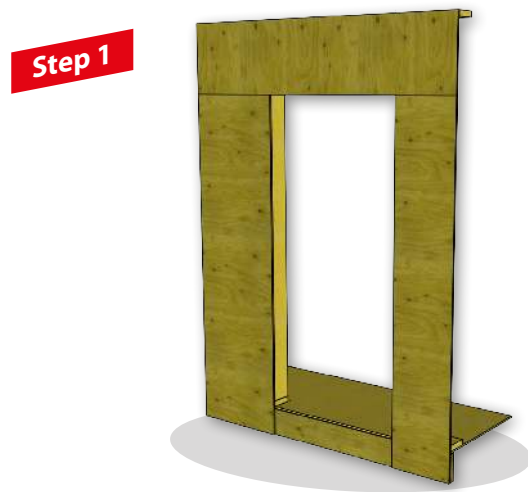


8. Field of Wall – Exterior Entry Door – Head Detail



Installation Details

9. Field of Wall – Exterior Entry Door – Sequence



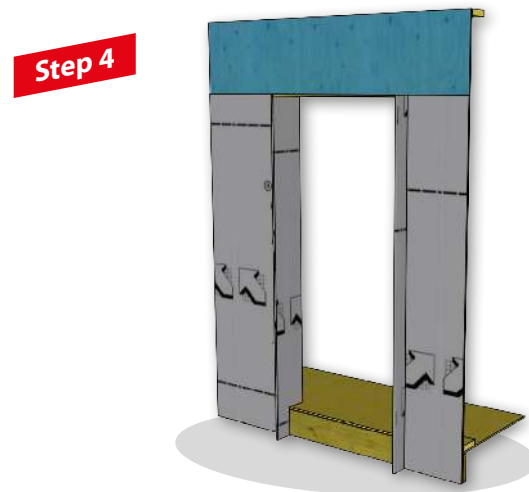
■ 2x4 wood frame with OSB or plywood sheathing .



■ Install plywood extension box.

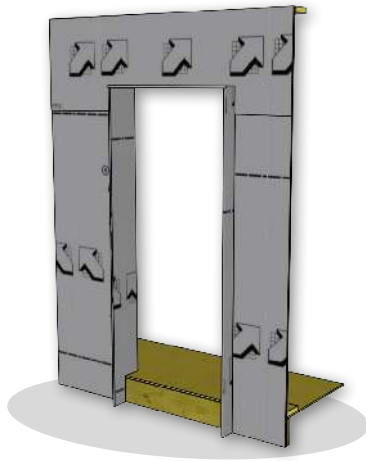


■ Prime sheathing with DELTA®-HF PRIMER before applying DELTA®-VENT SA.*



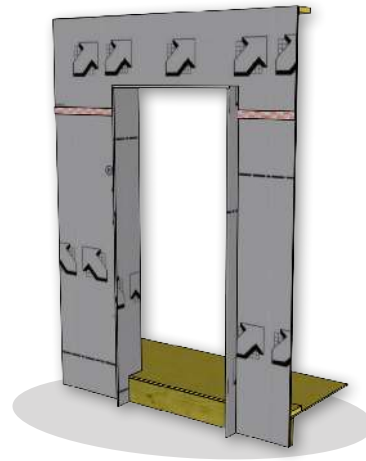
■ Install DELTA®-VENT SA membrane to both sides of jamb and wrap extension box.

Step 5



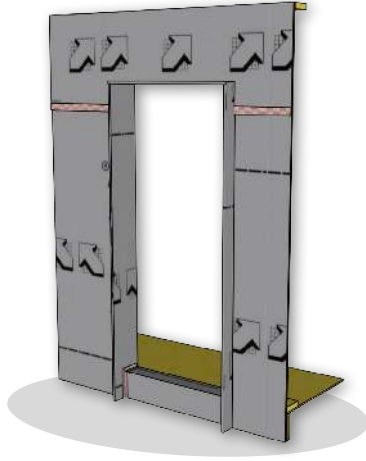
- Install DEL TA®-VENT SA membrane at head. Lap minimum 4" (100 mm) onto face of wall sheathing at head.

Step 6



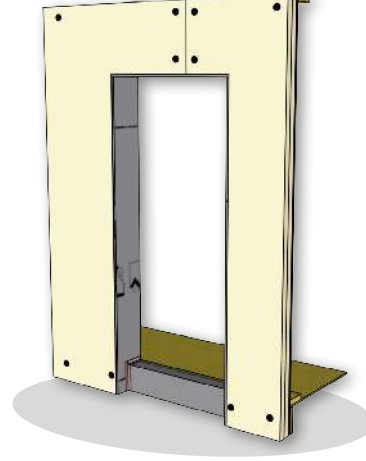
- Install DELTA®-MULTI-BAND tape at overlapped edges of DELTA®-VENT SA to ensure airtightness.

Step 7



- Install DELTA®-VENT SA membrane as sill flashing.

Step 8

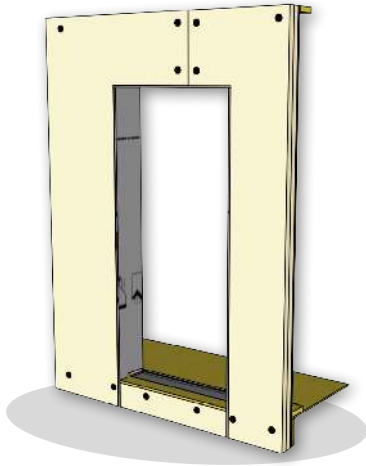


- Install 3"-6" continuous vapor permeable thermal insulation (EPS, semi-rigid stonewool), installed in two layers, joint offset and staggered.

Installation Details

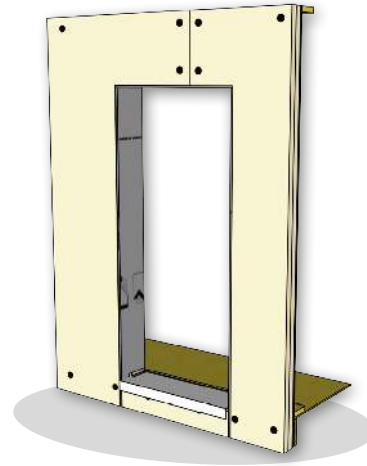
9. Field of Wall – Exterior Entry Door – Sequence

Step 9



- Install 2 2x8 wood filler to support door threshold. Cover with 1" continuous thermal insulation (EOS, semi-rigid stonewool).

Step 10



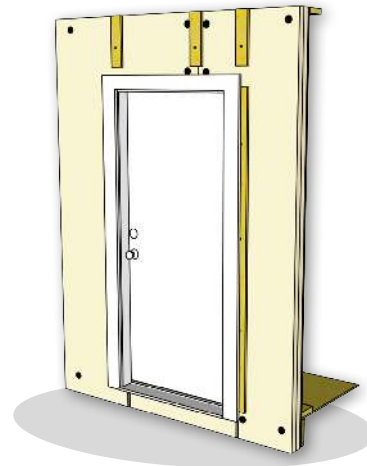
- Install 1/2" aluminum backdam support angle and 2nd layer of self-adhered membrane flashing.

Step 11



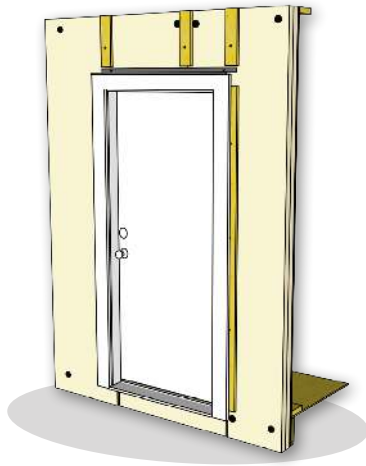
- Install door and back caulk around frame.

Step 12

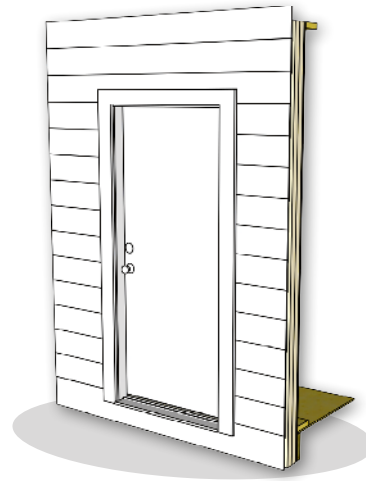


- Install door trim and trim extensions.

Step 13



Step 14

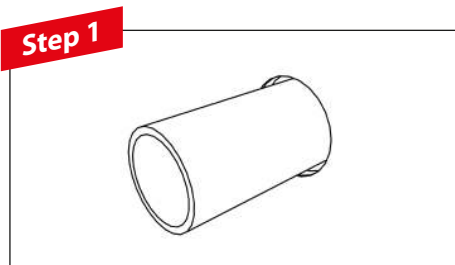
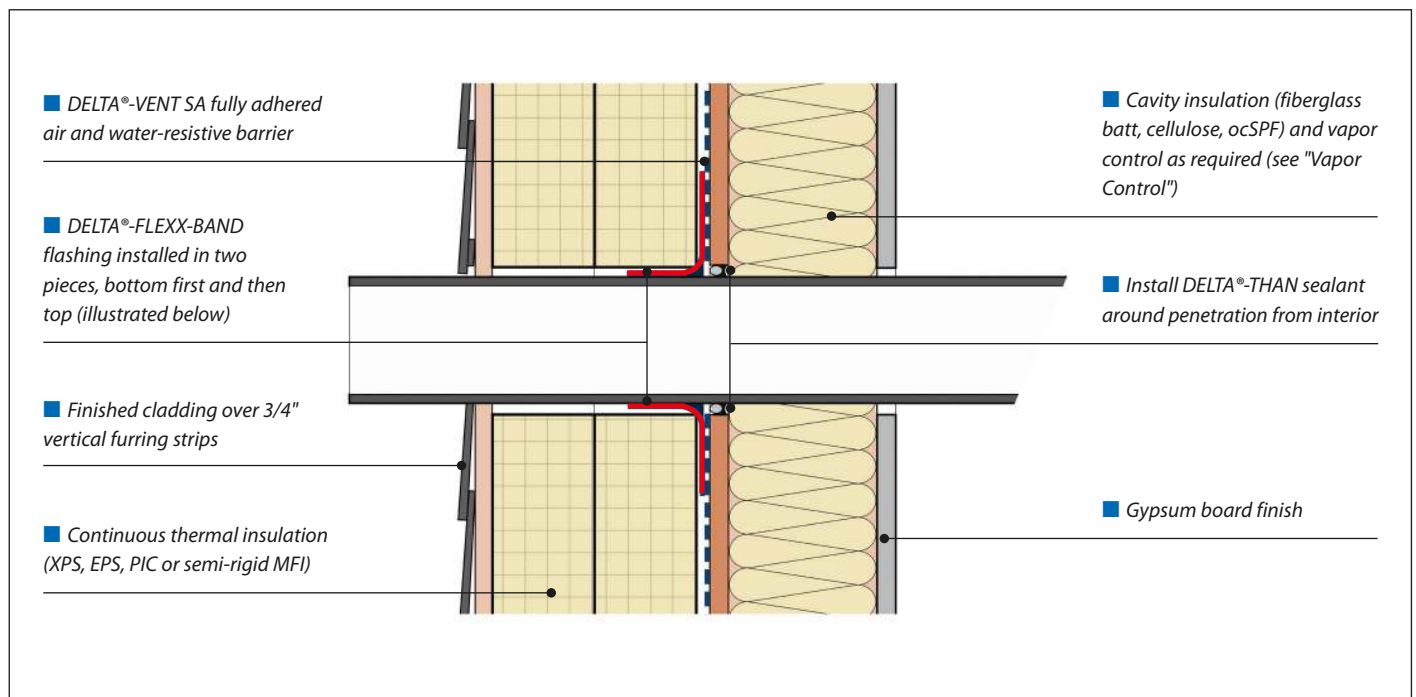


■ Install metal flashing to the face of insulation above trim board.

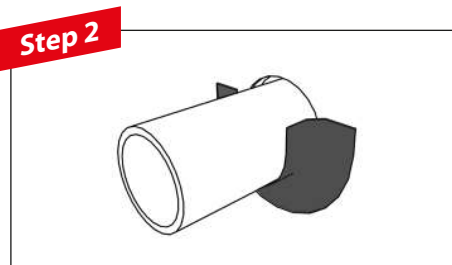
■ Install siding.

Installation Details

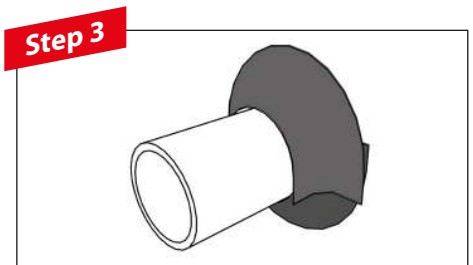
10. Field of Wall – Mechanical or Electrical Penetration



- Cut opening in exterior sheathing, ensuring that the penetration fits with a small gap on all sides.

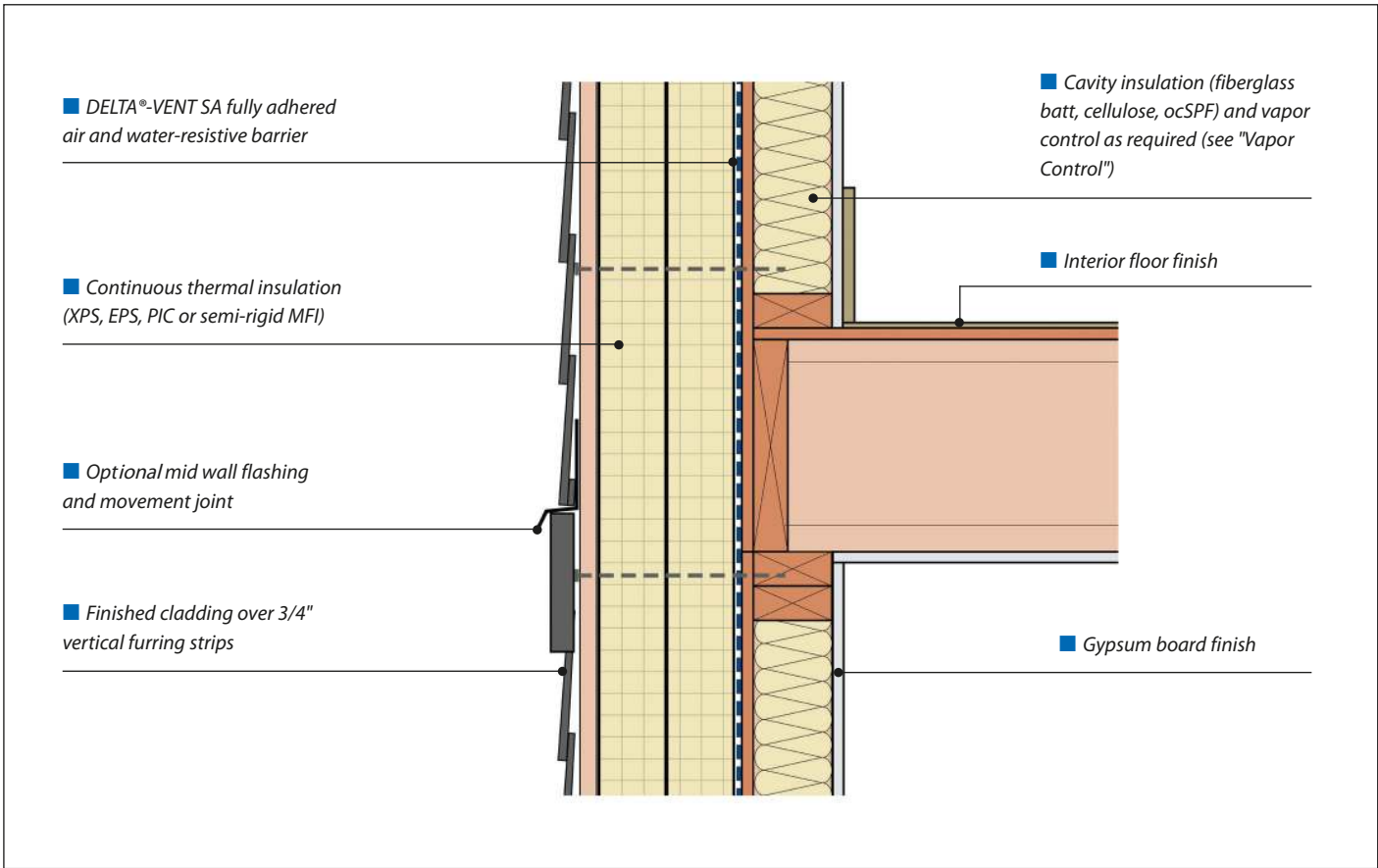


- Install DELTA®-FLEXX-BAND below penetration, forming the material tightly to the penetration.



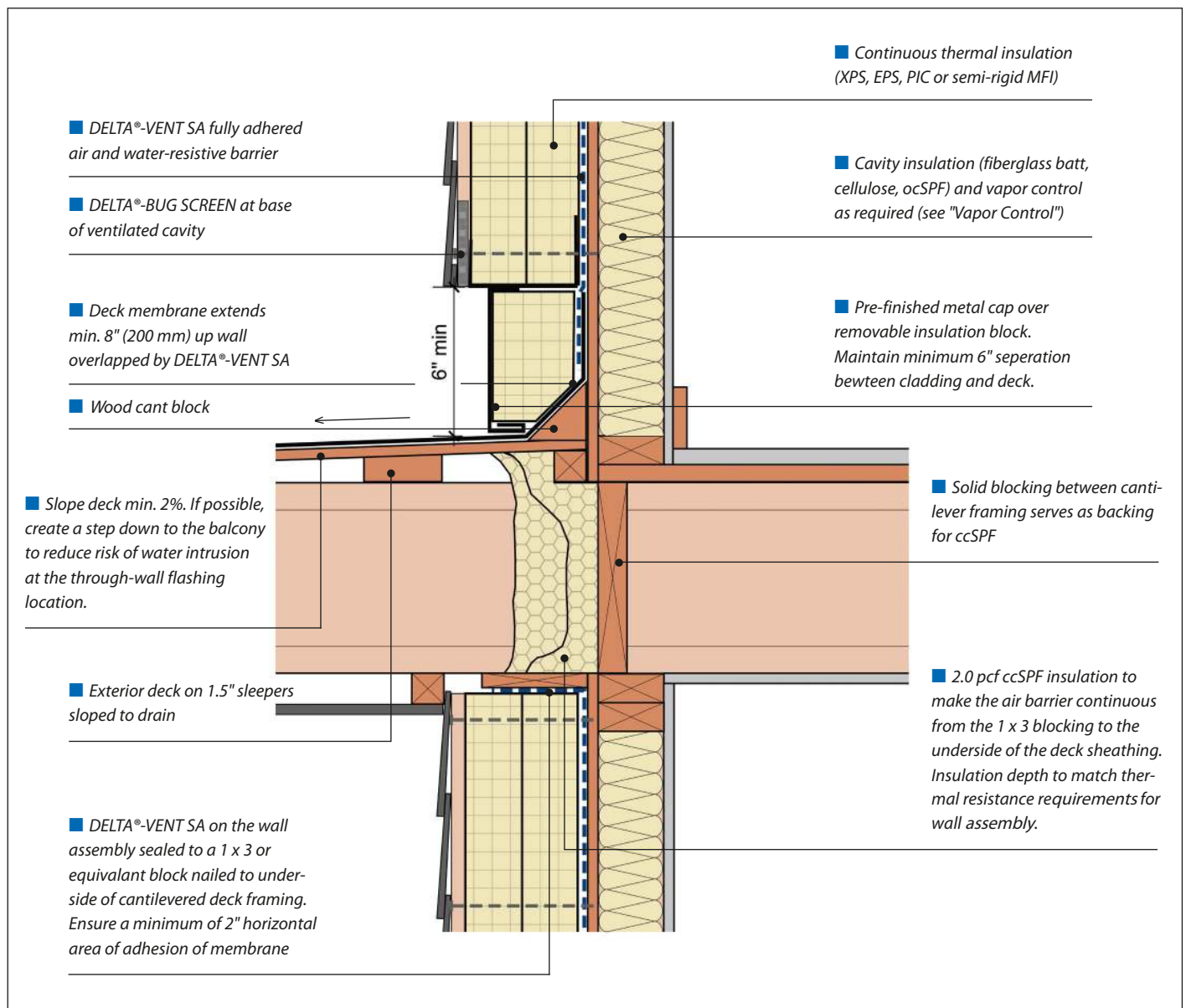
- Install a second piece of DELTA®-FLEXX-BAND above, overlapping the lower flashing and sealing tightly. Apply DELTA®-THAN sealant from interior.

11. Intersection of Wall to Second Floor

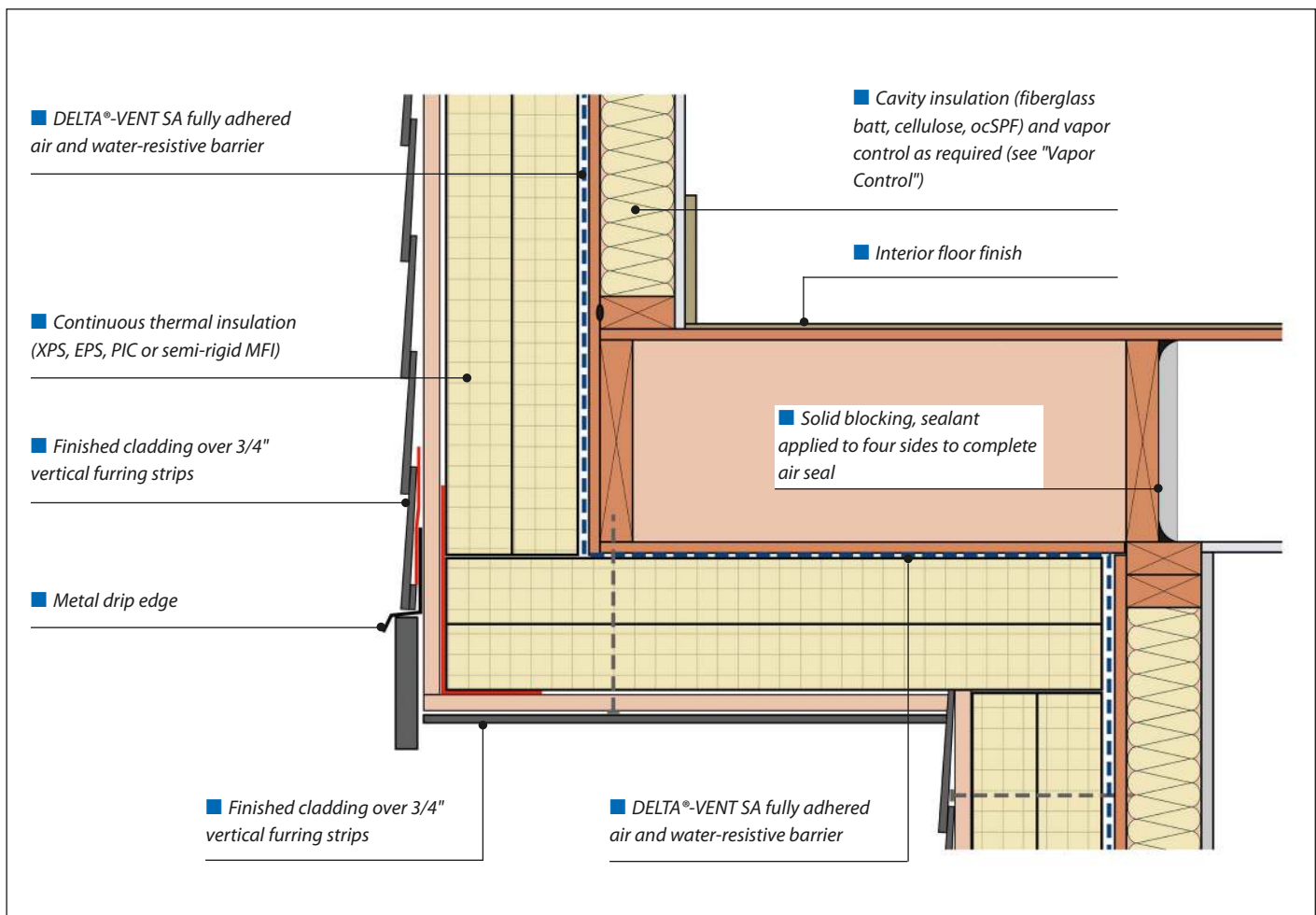


Installation Details

12. Intersection – Wall and Cantilevered Balcony

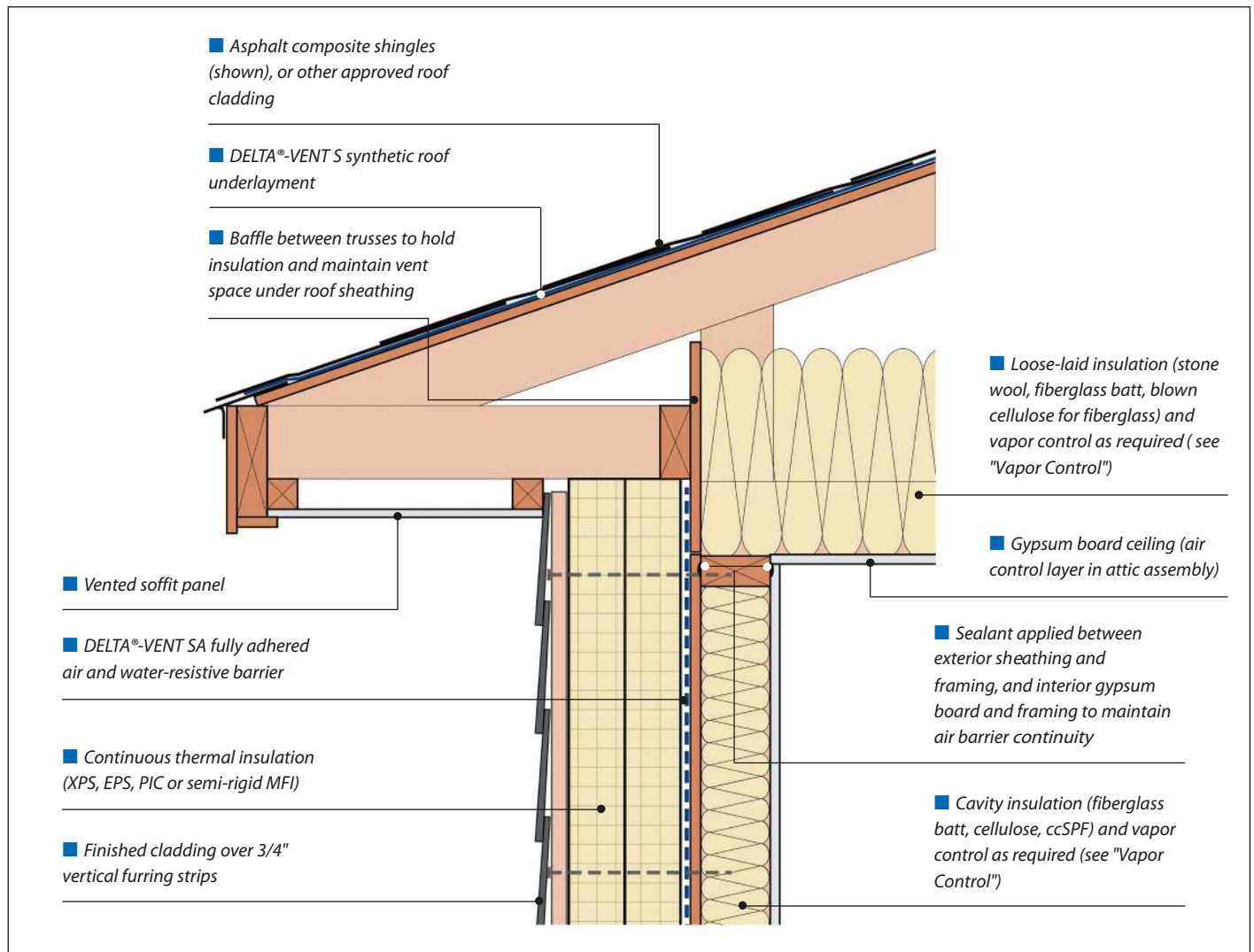


13. Intersection of Wall to Second Floor – Soffit Under Cantilevered Floor

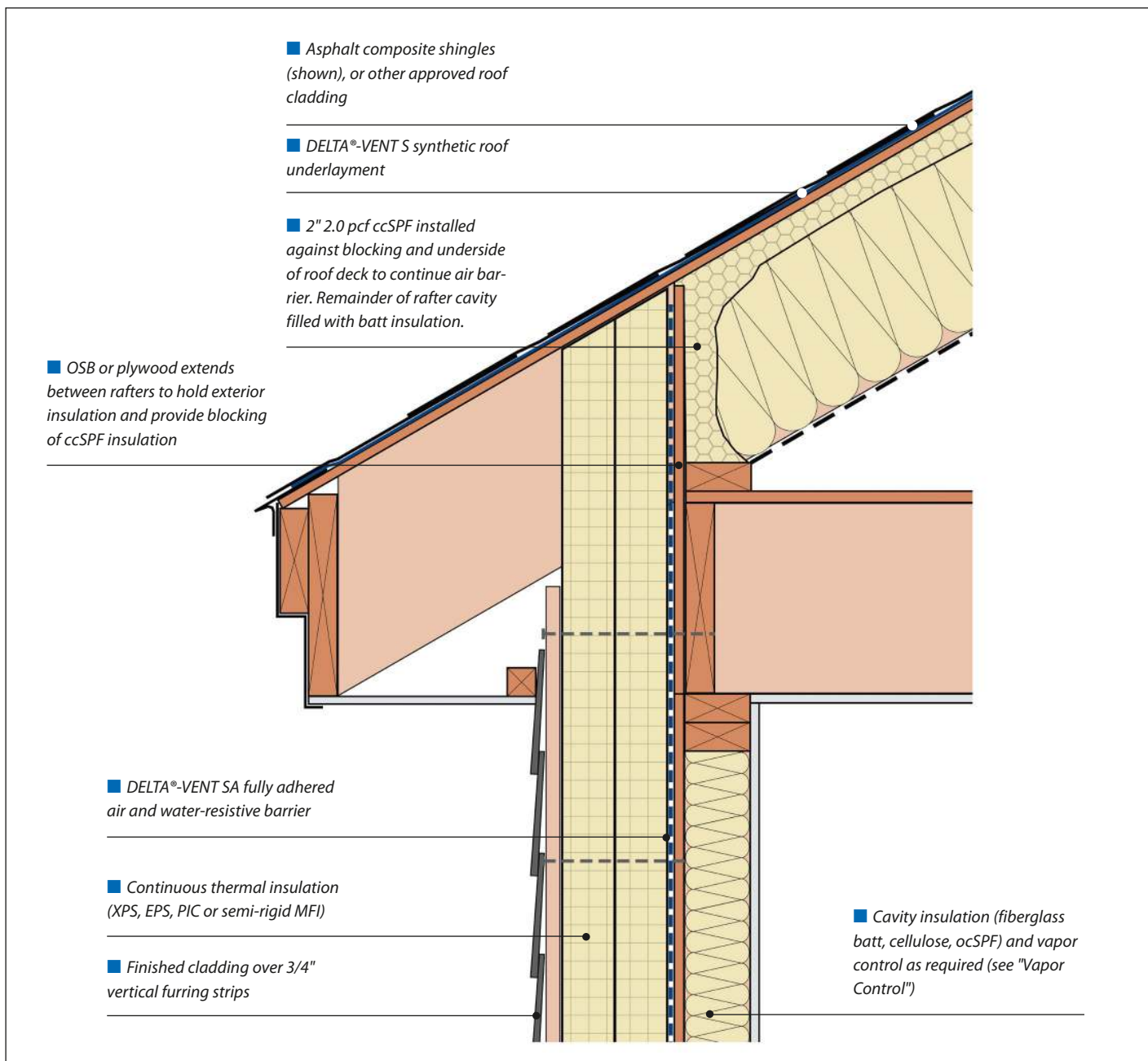


Installation Details

14. Intersection of Wall to Roof – Pitched Roof, Vented Assembly

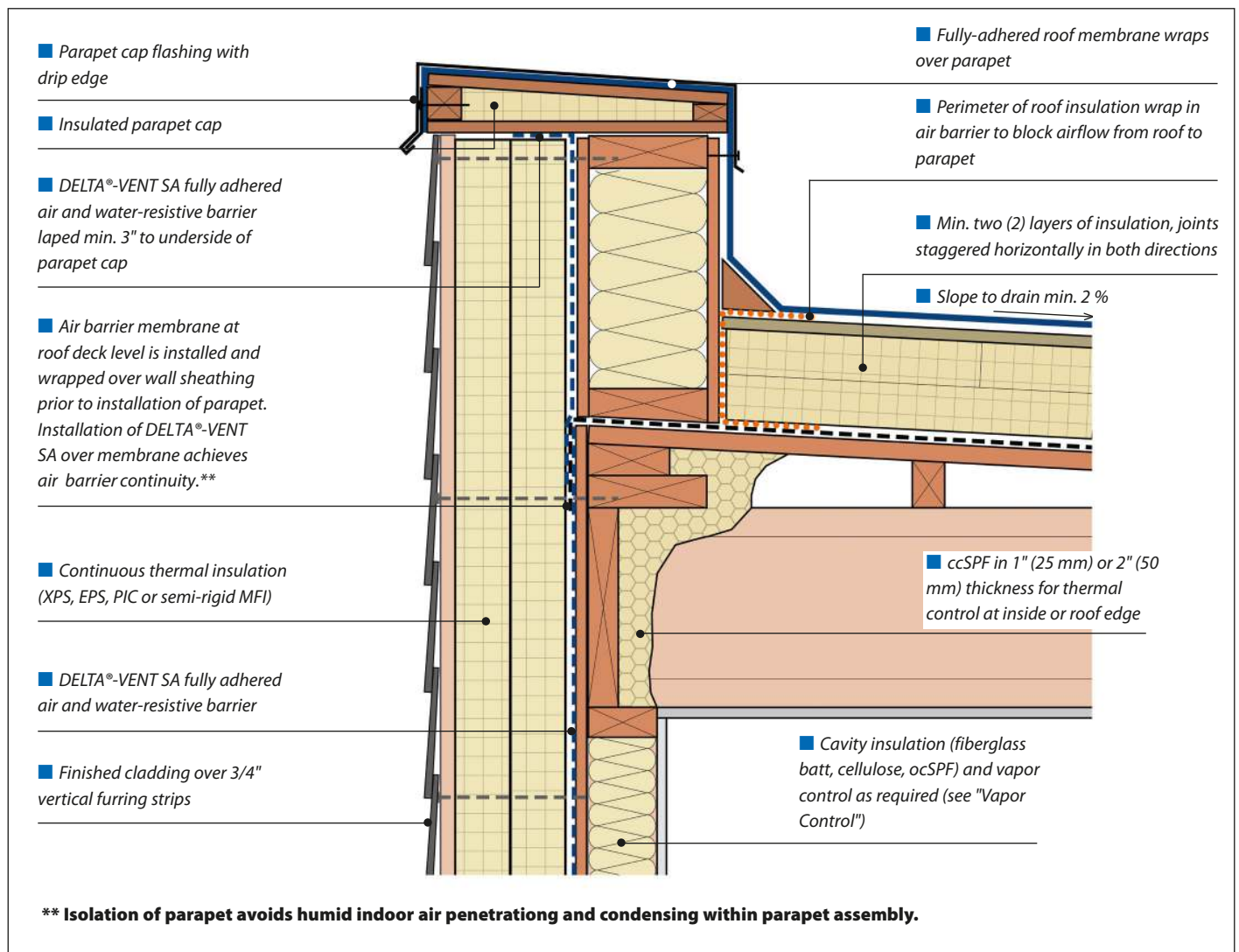


15. Intersection of Wall to Roof – Pitched Roof, Unvented Assembly

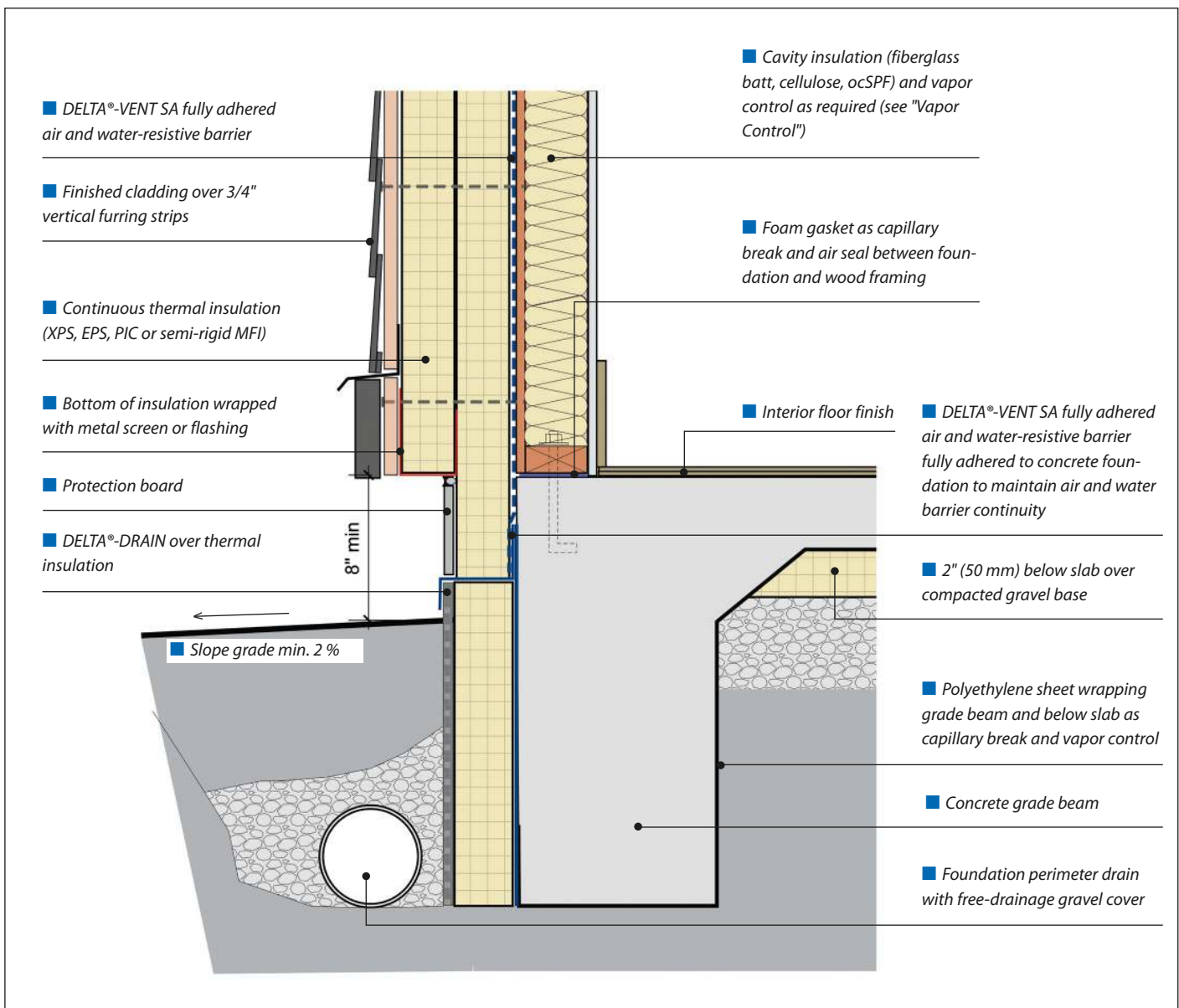


Installation Details

16. Intersection – Wall and Low-Slope Roof Parapet

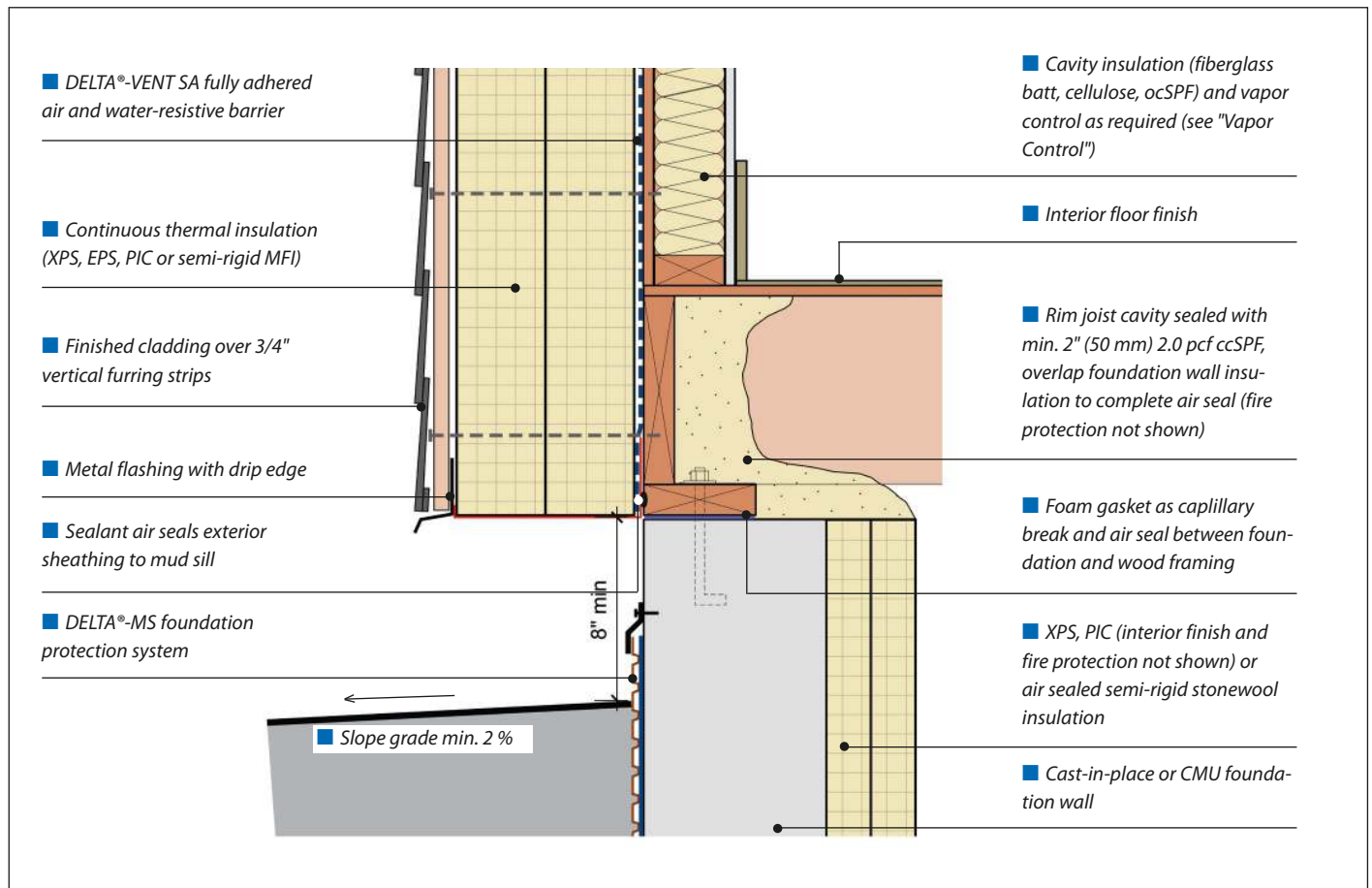


17. Intersection of Wall to Slab-on-Grade

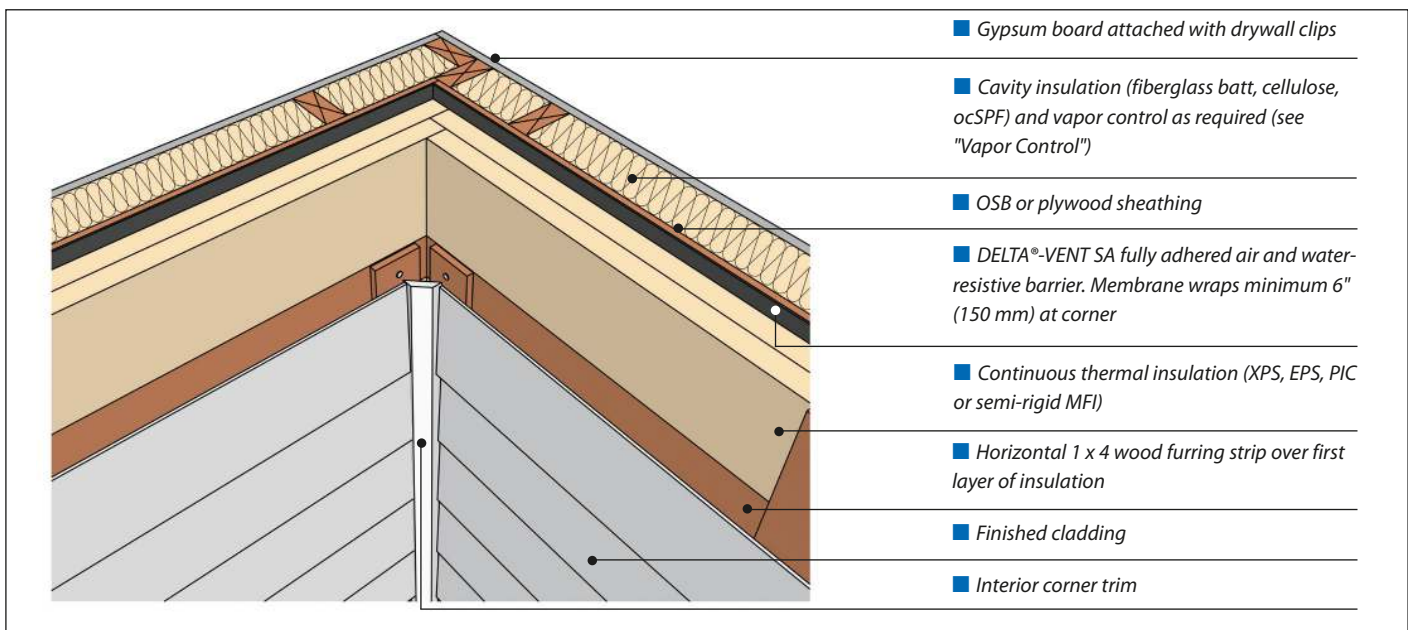


Installation Details

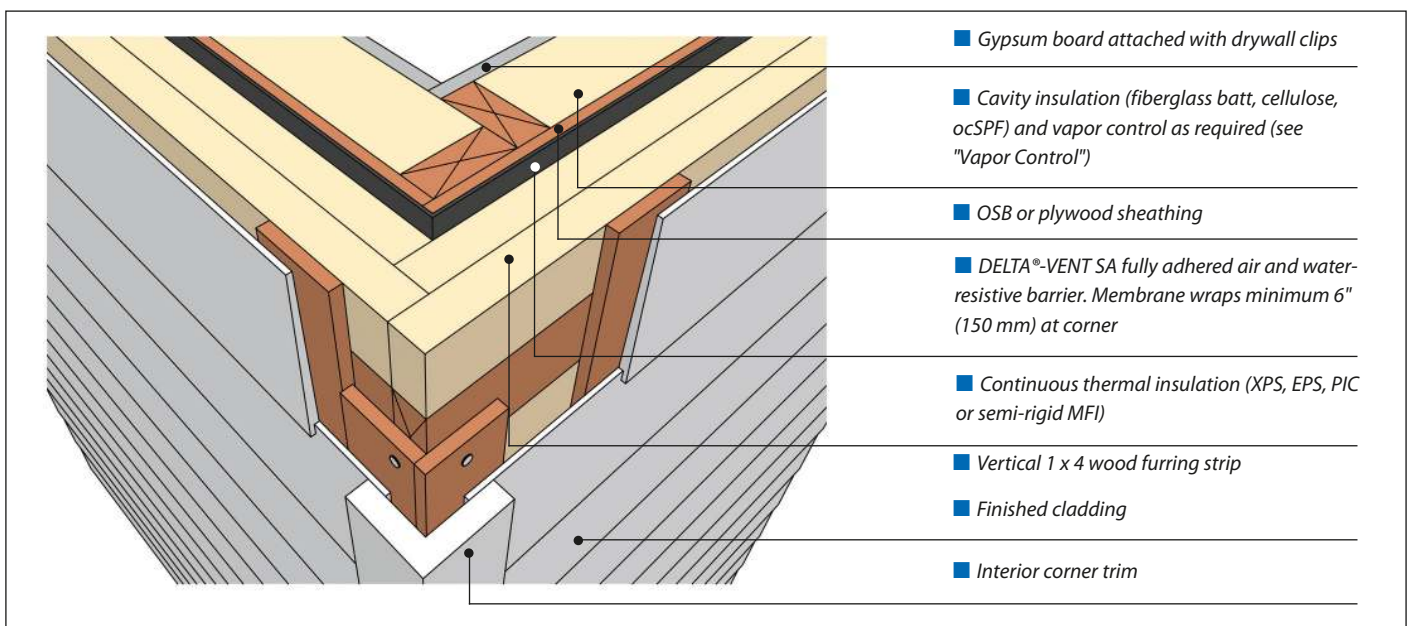
18. Intersection – Wall and Foundation with Exterior Insulation



19. Field of Wall – Cladding Attachment at Inside Corner



20. Field of Wall – Cladding Attachment at Outside Corner



DELTA®-Accessories

DELTA® Air Barrier System Components

Assuring an air-tight building enclosure

Using DELTA®-VENT SA to create an energy-efficient and air-tight building is a great choice. Choosing premium DELTA® Air Barrier System Components will help complete the job to meet the highest standards.

The secret to ensuring the overall effectiveness of an air barrier system is in the details, such as sealing windows, doors and penetrations. Proper attention to details is critically important to achieve an air-tight assembly. All components must be interconnected to successfully resist air and water infiltration, and turn individual materials, components and assemblies into a complete Air Barrier System.

DELTA®-Accessories are exhaustively tested for compatibility. Together they assure superior performance in air-tight building enclosures.

DELTA®-FLASHING is a best-in-class self-adhering membrane used to flash around window and door openings. Cut in practical and convenient widths, it provides superior long-term protection against air and water leaks.

DELTA®-MULTI-BAND is a very tough and durable seam tape with an aggressive pure acrylic adhesive. It is suitable for use at end and side laps or other detail areas. It sticks tenaciously to DELTA®-VENT SA as well as all other common construction substrates like OSB, plywood, metal, glass, etc.

DELTA®-FLEXX-BAND is a two-ply stretchable tape with a premium butyl rubber adhesive for use at penetrations such as service pipes, arched windows, window flanges, corners and joints. It is formed easily by

hand into irregularly-shaped areas, forming a tight bond to wood, vinyl, metal and other common building materials.

DELTA®-FAS CORNER is a unique preformed corner for sealing windows and doors in air- and water-tight construction. Both durable and UV resistant, it provides top performance in detailing energy-efficient enclosures. DELTA®-FAS CORNER is easy to use and saves both time and labor during installation.

DELTA®-THAN is a permanently elastic adhesive and sealant made with a special rubber compound. It is ideal for sealing around penetrations, terminations, etc.

DELTA®-TILAXX is a high quality permanently elastic adhesive and sealant for durable air-tight bonding to all common construction surfaces where moderate movement of components is expected.

DELTA®-ADHESIVE LVC is a low solvent surface conditioner. It consolidates surface dust on dirty construction site substrates, assuring reliable long-term air-tight adhesion for DELTA®-VENT SA.

DELTA®-HF PRIMER is a solvent-free primer suitable for most construction substrates. It is used to significantly improve the adhesion properties of surfaces such as plywood, OSB, masonry and concrete.

DELTA®-TW FLASHING is a premium, durable, self-adhering flashing designed for through-wall applications. It adheres tenaciously to seal the interface between common building substrates, including lintels and brick ledges, and to all DELTA® air- and water-resistive barrier membranes.

The comprehensive line of DELTA®-Accessories by Dörken delivers complete solutions for energy-efficient and durable building enclosures.



References and Resources

For more information on DELTA®-VENT SA, please visit

■ www.dorken.com

For more information on the design of air barrier systems for residential construction

- Building Science Insight 001: The Perfect Wall
- Building Science Digest 011: Thermal Control in Buildings
- Building Science Digest 013: Rain Control in Buildings
- Building Science Digest 014: Air Flow Control in Buildings
- Building Science Digest 163: Controlling Cold-Weather Condensation Using Insulation
- Canadian Building Digest 23: Air Leakage in Buildings
- RDH Technical Bulletin 011: Cladding Attachment Solutions for Exterior Insulated Commercial Walls

For general building science information

- Canadian Building Science Digests – <http://nparc.nrc-cnrc.gc.ca/eng/home/>
- www.buildingscience.com
- www.rdh.com/research-forensics/technical-bulletins-whitepapers/
- www.buildingsciencelabs.com/technical-library/
- www.brikbases.org
- BCIT Building Science Centre of Excellence research database – <https://www.bsce.ca/bsce-research-database/>
- National Institute of Building Science – www.nibs.org
- Local and regional building envelope councils – www.nbec.net

About Dörken Systems Inc.

Dörken delivers innovative, high-performance air and moisture barriers for commercial and residential construction sold under the DELTA® brand name. A North American manufacturer based out of Beamsville, Ontario, Dörken Systems Inc. is a subsidiary of Ewald Dörken AG, a leading European developer and manufacturer of waterproofing and drainage products sold worldwide. Dörken is known for delivering premium products while providing educational programs and full technical support.

For more information,
call 1-888-433-5824 or visit www.dorken.com

DELTA®-branded quality products
manufactured by Dörken.

DELTA®

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