Detailing Continuity in Building Enclosure Systems

Huber Engineered Woods

AIA Continuing Education Provider

This AIA Continuing Education Course is sponsored by Huber Engineered Woods, makers of:

ZIPsystem™ AdvanTech®

Building Envelope Solutions

Copyright

Course Description

This course emphasizes the importance of detailing continuity in maintaining the integrity of the four control layers of the building enclosure. We will explore methods for identifying areas where continuity can be disrupted and solutions for maintaining control layer continuity in these areas.

Course Objectives

- Explain the four primary, code-based control layers that make up a building enclosure system.
- Define the primary issues related to continuity of building enclosure control layers in wood-framed wall and roof assemblies.
- Review the common choices for products and materials for building enclosure control layers, including critical transitional areas.
- Compare different drawing details and solutions for their use in wood-framed wall and roof assemblies.

Course Outline

Part 1:
The Four Control Layers

→

Part 2:
Continuity of Control Layers

→

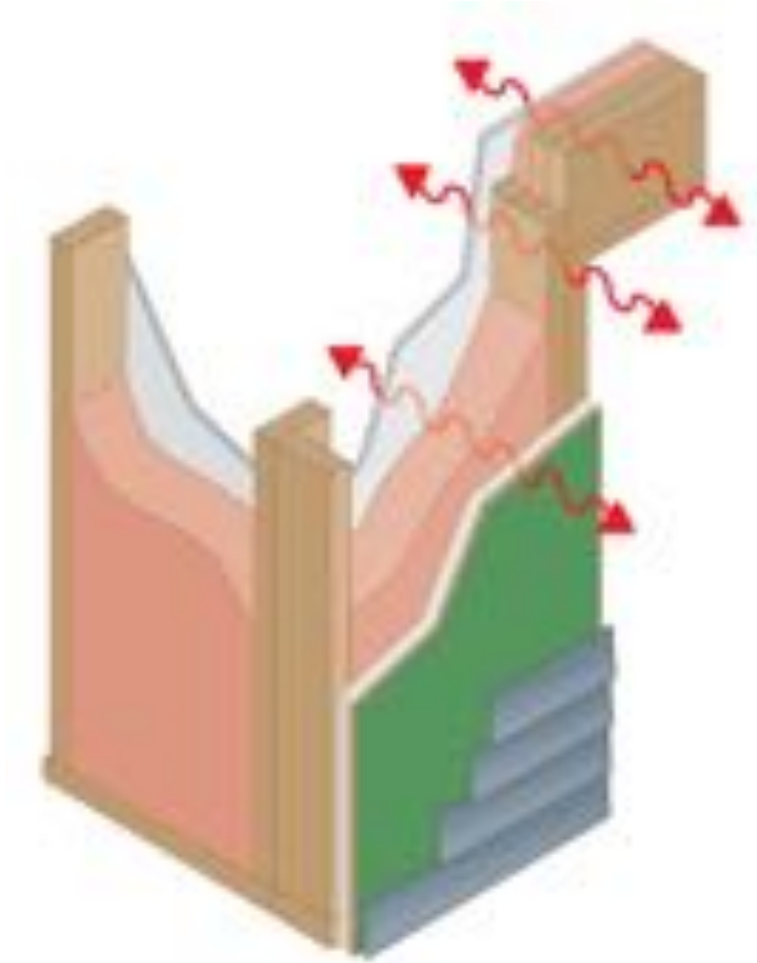
Part 3:
Choices in Systems

Part 4:
Detailing Solutions

→

Part 5:
Conclusion

Introduction



Building Enclosures

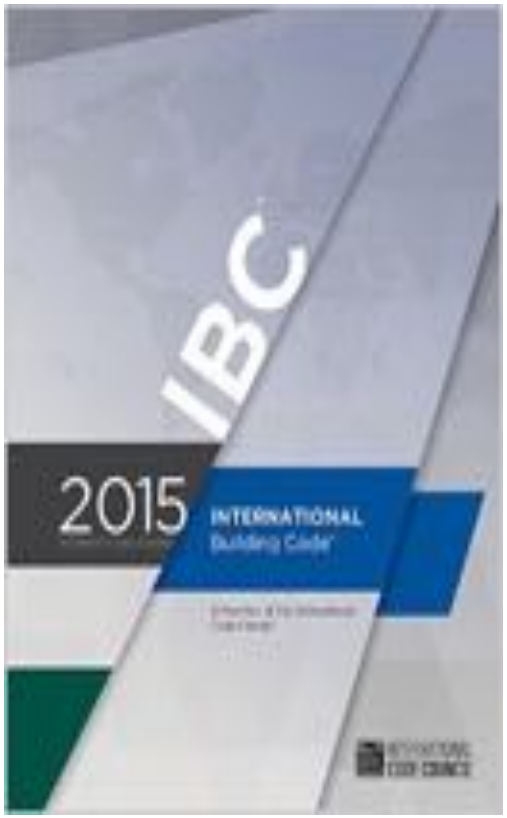
- Provide proper separation between the building interior and the exterior to control:
  - Water penetration
  - Airflow
  - Vapor transfer
  - Thermal transmission

Part 1: The Four Control Layers

Weather-Resistant Control Layer

2015 International Building Code (IBC) and International Residential Code (IRC) require:

- Weather Protection
  - Exterior walls shall provide the building with a weather-resistant exterior wall envelope.
- Flashing
  - Shall be installed at the perimeters of exterior **door and window assemblies**, **penetrations, and terminations** of exterior wall assemblies, exterior wall **intersections with roofs, chimneys, porches, decks, balconies**, and similar **projections**…and similar locations where moisture could enter the wall.



Air Control Layer

Air-Barrier Material Testing

- ASTM E2178: Air Permeance of Building Materials
- 1 m x 1 m specimen with no seams or transitions
- Must achieve less than 0.02 $L/(s*m^2)$ @ 75 Pa

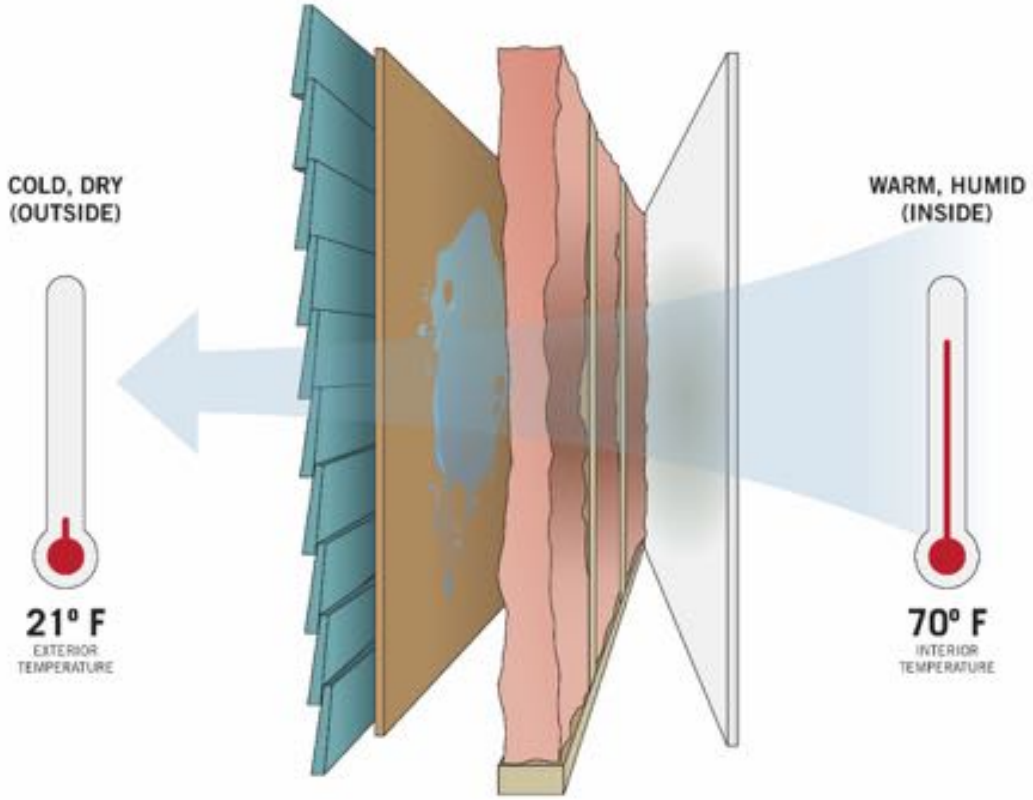
Air Control Layer

Air-Barrier Assembly Testing

- ASTM E2357: Air Leakage of Air Barrier Assemblies
- 8 ft x 8 ft wall with penetrations/transitions
- Includes wind cycling
- Measures infiltration and exfiltration
- Must achieve less than 0.2 $L/(s*m^2)$ @ 75 Pa

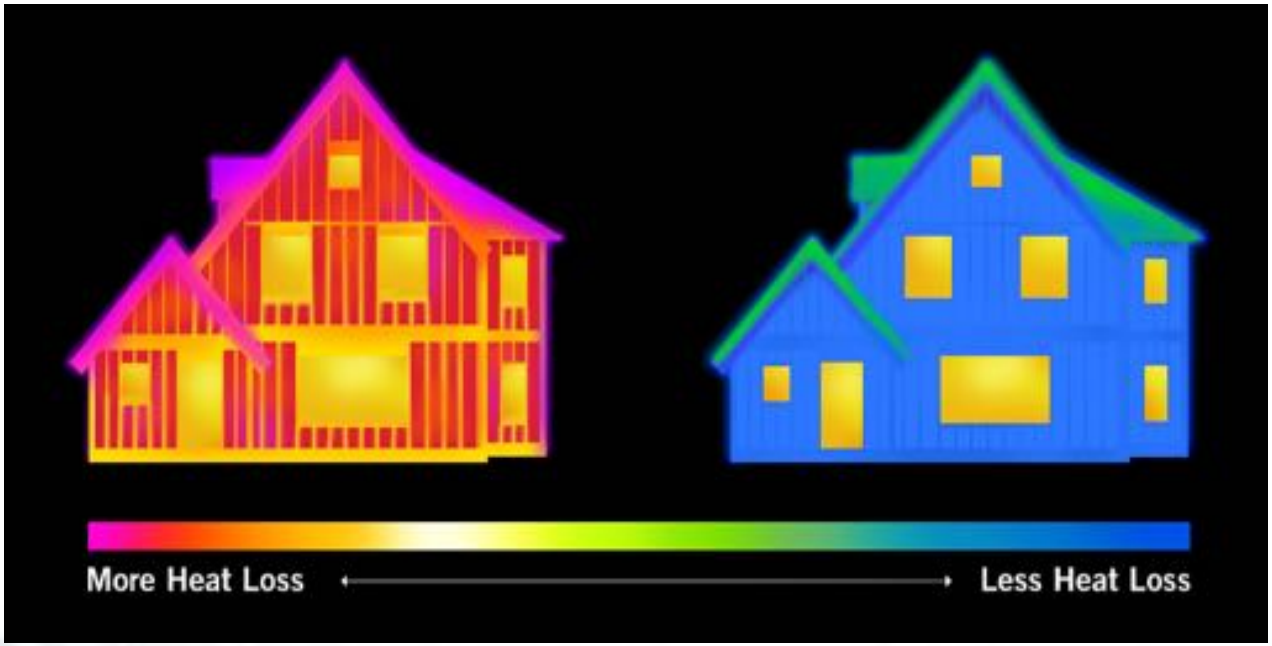
Vapor Control Layer

International Building Code and International Residential Code require vapor retarders for protection of construction assembly.



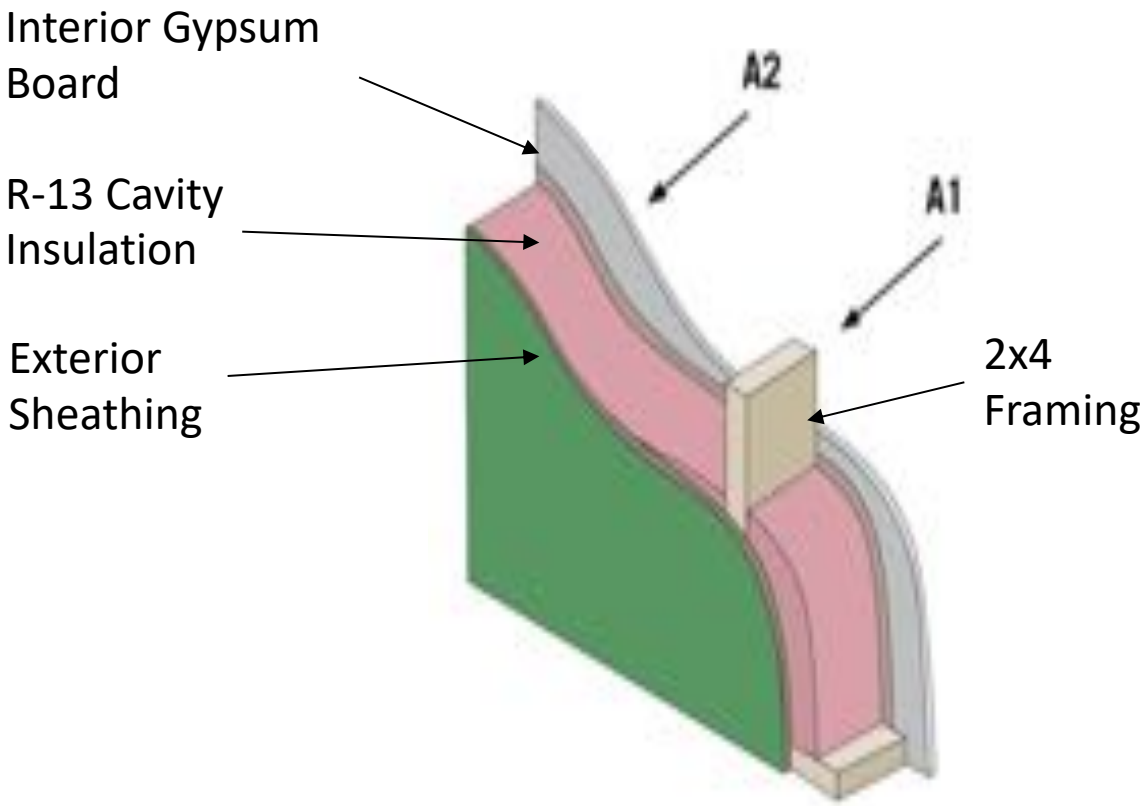
Thermal Control Layer

- IECC requires opaque building enclosures to be insulated based on climate zone.
- Insulation between studs not enough due to thermal bridging.
- Continuous insulation (ci) is required to minimize thermal bridging.



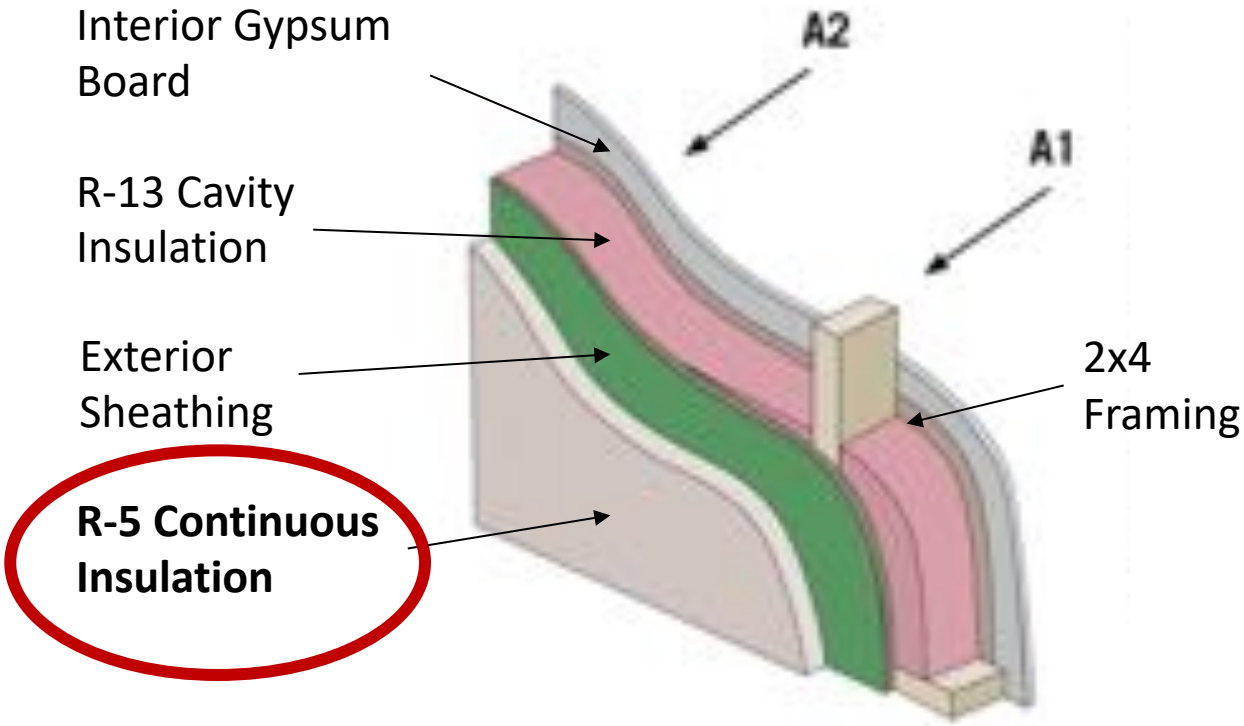
Thermal Control Layer

Typical Cavity Insulation Assembly



Thermal Control Layer

Cavity Insulation Plus Continuous Insulation



The amount of ci to use will be based on energy-performance goals. It can be a separate product or integrated with sheathing.

Part 2: Continuity of Control Layers

Continuity of Control Layers

Assuring Integrity

- Look at complete building.
- Understand that compromising one barrier may compromise others.
- Control layers can be single function/multiple product solutions or multifunction/ single-product solution.

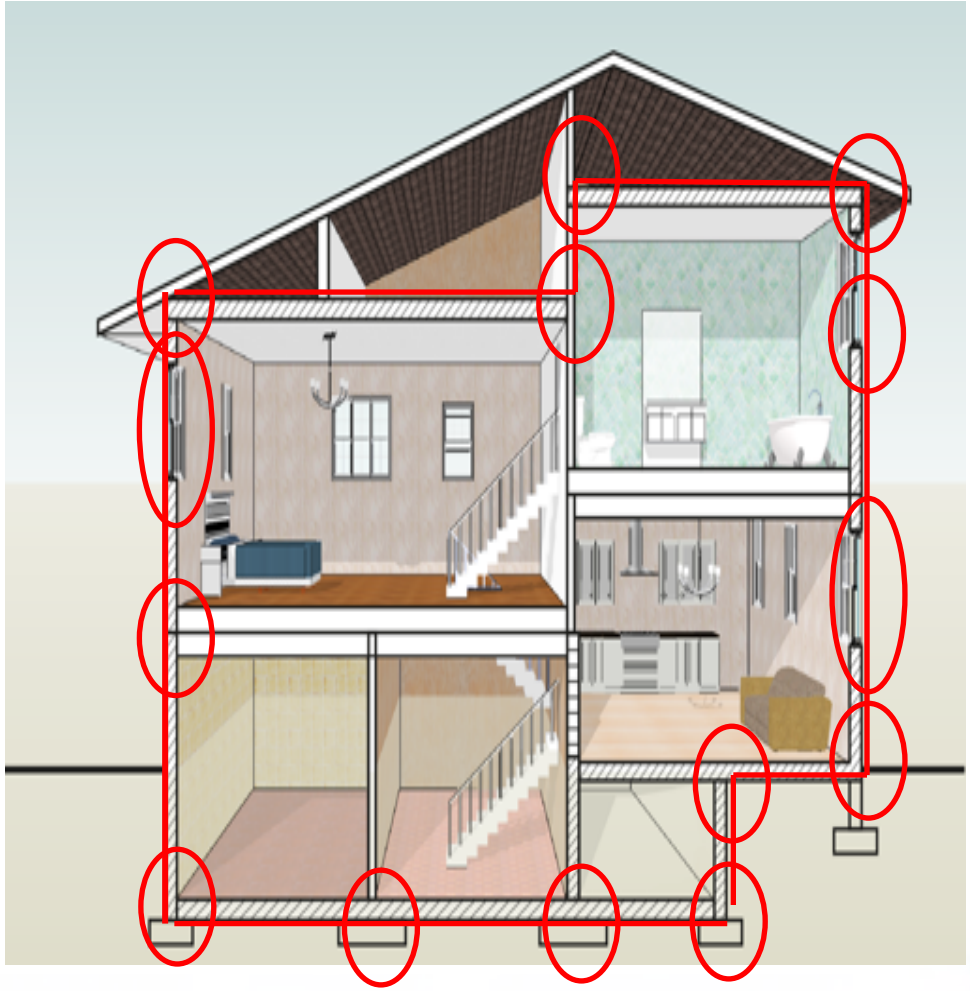
Continuity of Control Layers

Non-continuous Conditions Create Performance Risk

- Transition from one material to another
- Change in plane
- Penetrations/interruptions in the control layer

Identifying the Building Envelope

- Start at one corner of the building.
- Draw a continuous line around the building enclosure.
- Circle the changes in plane or potential discontinuity.



Construction Detailing

- Writing “continuous” on a design detail or specification is not quite enough.
- Buildings need to be designed and **detailed** to create continuity.
- Details are critical.

Part 3: Choices in Control Layer Systems: Impact on Continuity

Choices in Control Layer Systems

Multiple Products/Multiple layers

- Each of four control layers may be specified and installed separately.
- Each needs to be compatible with each other and the building structure.
- Each is tested separately.
- Each needs to be assured to be continuous across all conditions.
- Each needs to be durable.

Choices in Control Layer Systems

Single Product, Multifunction

- Structural sheathing panels with integrated:
  - WRB
  - Air barrier
  - Vapor permeability
  - Optional continuous insulation barrier
- Membrane fused to the structural panel during manufacturing
- Installation can be simpler and quicker
- Reduced labor time and skill required

Choices in Control Layer Systems

Assuring Continuity of Assembly

- Seams of integrated panels are sealed with self-adhering tape.
- Openings and penetrations can be addressed with sealants or liquid flashing.
- Flexibility of tapes and sealants allows for full conformity and continuity of control layers.
- Accomodates structural gaps while assuring control layers are intact.

Choices in Control Layer Systems

Assuring Continuity of Assembly

- Windows and door openings require special attention for continuity of control layers.

Fluid-applied flashing material

Flexible flashing tape

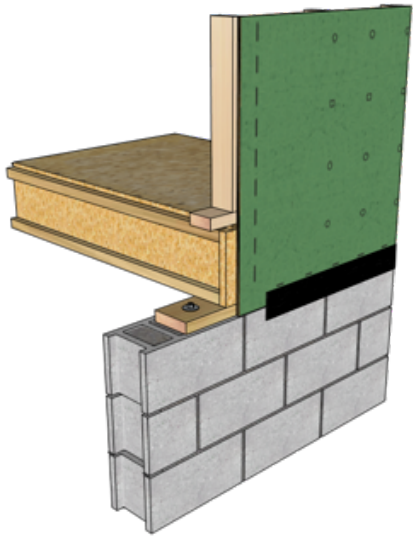
Part 4: Detailing Solutions

Detailing Solutions

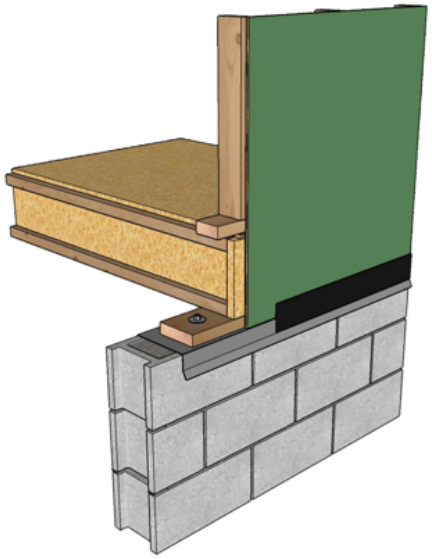
Sample Details

- Based on integrated product solution
- Focus on continuity of control layers
- Will look at seven typical conditions, generally following sequence of constructions

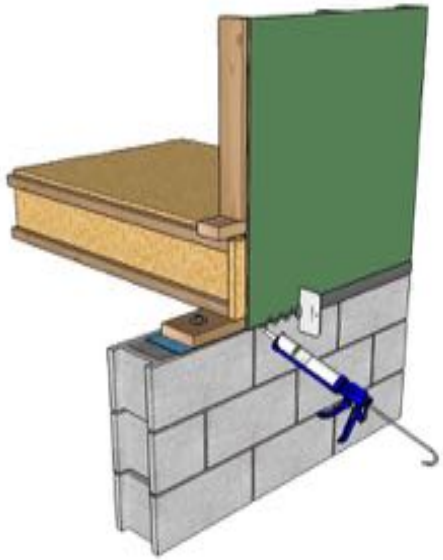
Transitions: Foundation to Framed Wall



Sealing tape across seal:
Not durable



Conventional flashing
and sealing tape:
May not achieve air/vapor
seal beneath metal



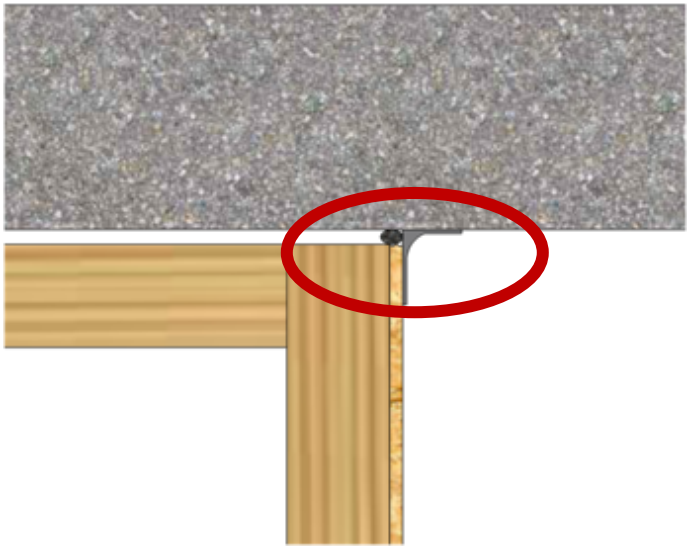
Liquid flashing across
sill joint

Control Layer Compatibility: Foundation to Framed Wall

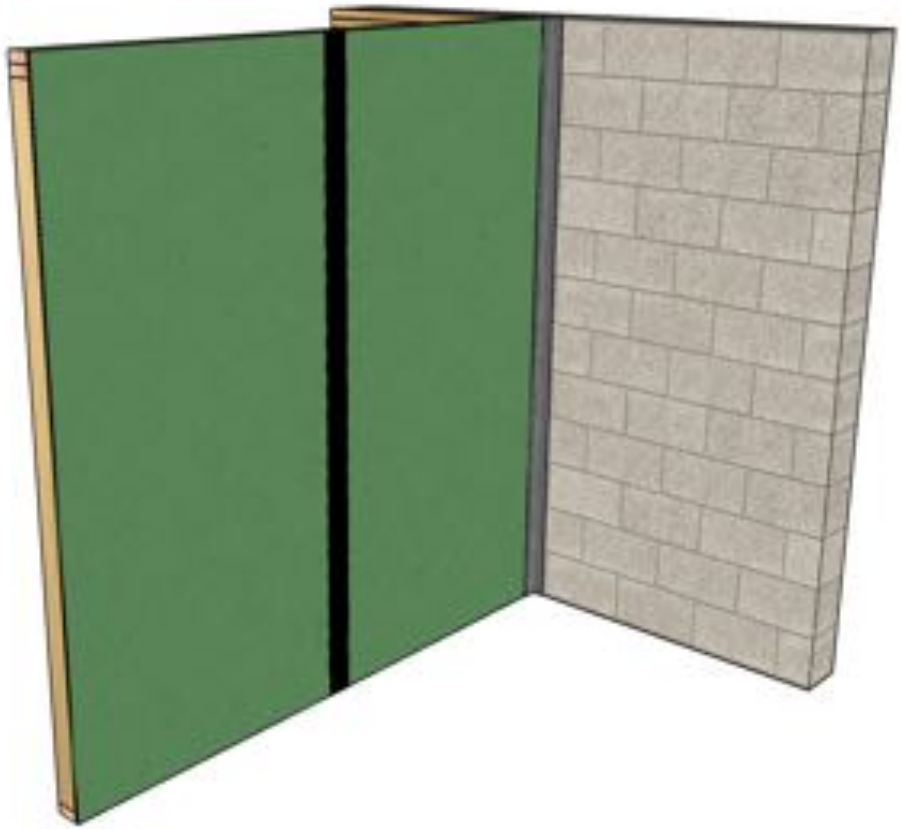
Compatability	Structure	WRB	Air Barrier	Vapor Permeable	Thermal Barrier
Metal Flashing	X	✓*	✓*	X	X
Acrylic Flashing Tape	X	✓	✓	X	X
Liquid Flashing	X	✓	✓	✓	X
Integrated Multifunction Panel	✓	✓	✓	✓	✓

*Only when integrated with the WRB using approved self-adhered flashing

Transitions: Framed Wall to Concrete/CMU Wall



Plan view



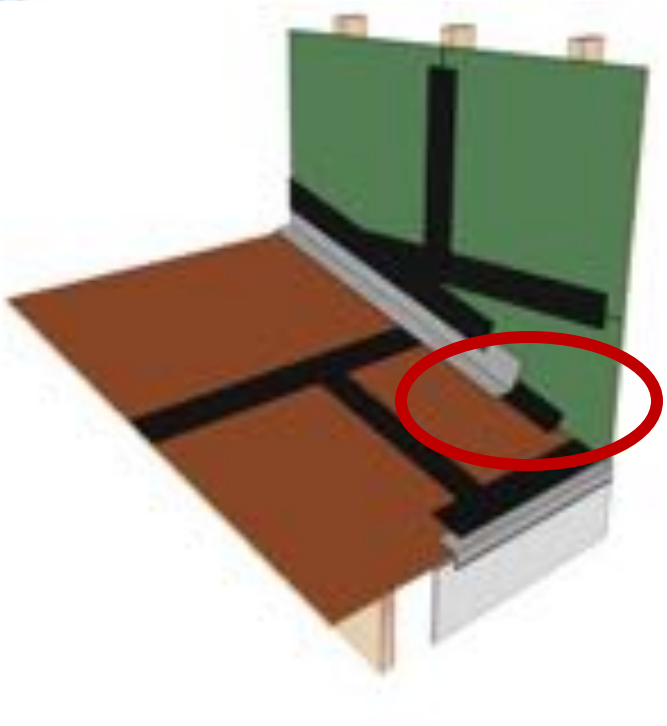
Perspective view into corner

Control Layer Compatibility: Framed Wall to Concrete/CMU

Compatability	Structure	WRB	Air Barrier	Vapor Permeable	Thermal Barrier
Metal Flashing	X	✓*	✓*	X	X
Acrylic Flashing Tape	X	✓*	✓*	X	X
Liquid Flashing	X	✓	✓	✓	X
Integrated Multifunction Panel	✓	✓	✓	✓	✓

*Only when integrated with the WRB using approved liquid flashing against CMU/concrete

Transitions: Wall to Roof Detail



Sealing tape over and under metal flashing

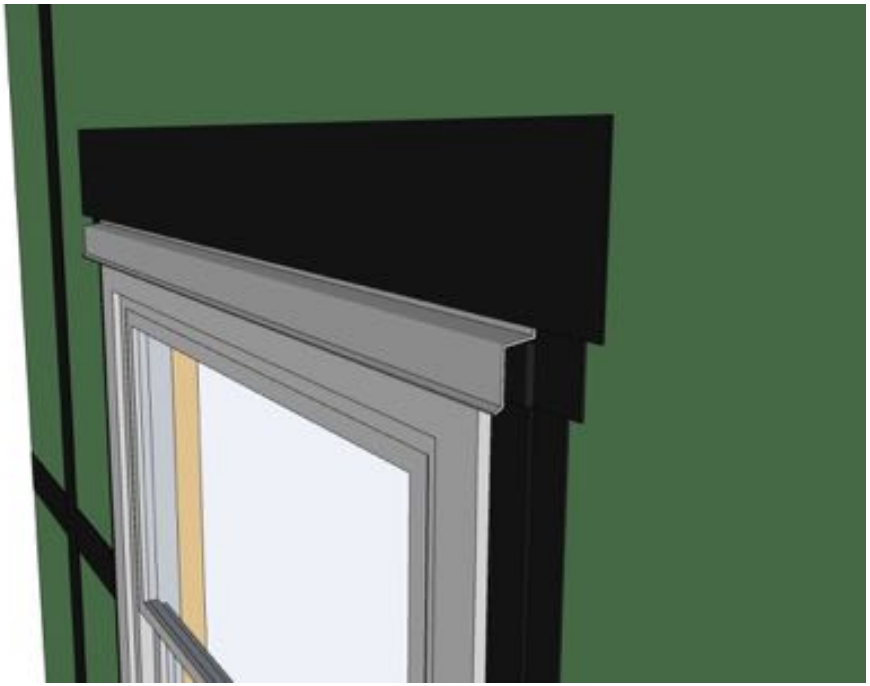
Control Layer Compatibility: Wall to Roof

Compatability	Structure	WRB	Air Barrier	Vapor Permeable	Thermal Barrier
Metal Flashing	X	✓*	X	X	X
Acrylic Flashing Tape	X	✓	✓	X	X
Liquid Flashing	X	✓	✓	✓	X
Integrated Multifunction Panel	✓	✓	✓	✓	✓

*Only when integrated with the WRB using approved self-adhered flashing

Penetrations: Window-Opening Detail

Typical Flashing



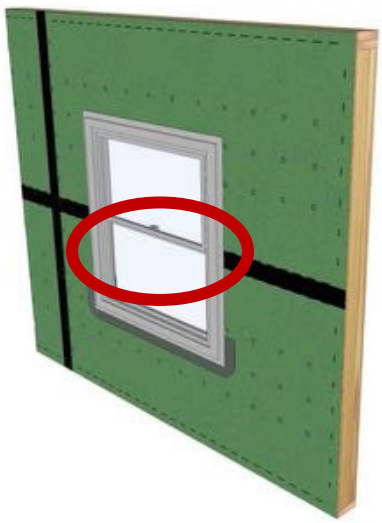
Penetrations: Window-Opening Detail

Types:

- Flanged window
- Flangeless/storefront aluminum
- Recessed

Penetrations: Window-Opening Detail – Flanged

1. Pan First

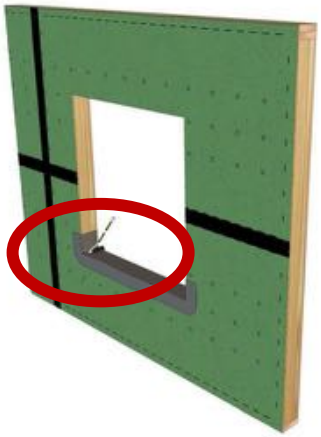


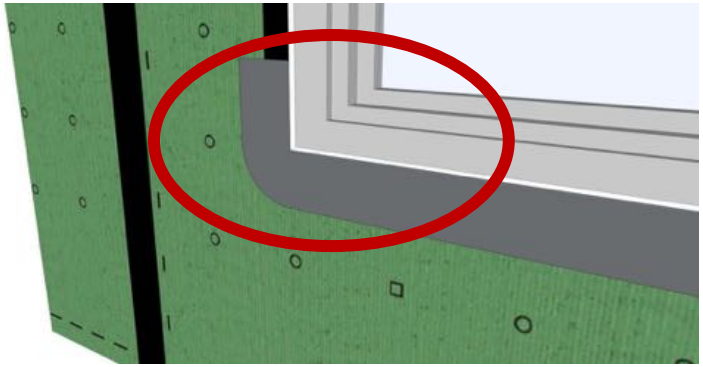
2. Window Next

3. Sealing Tape Last

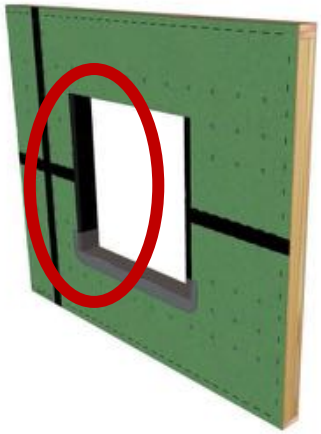
Penetrations: Window-Opening Detail – Storefront

1. Pan First

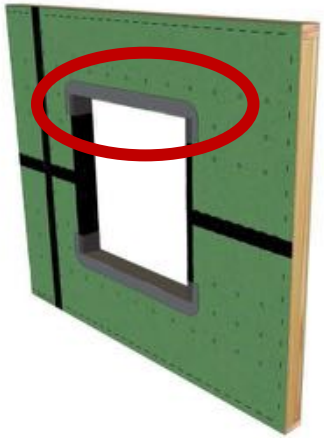




2. Side Jambs Next

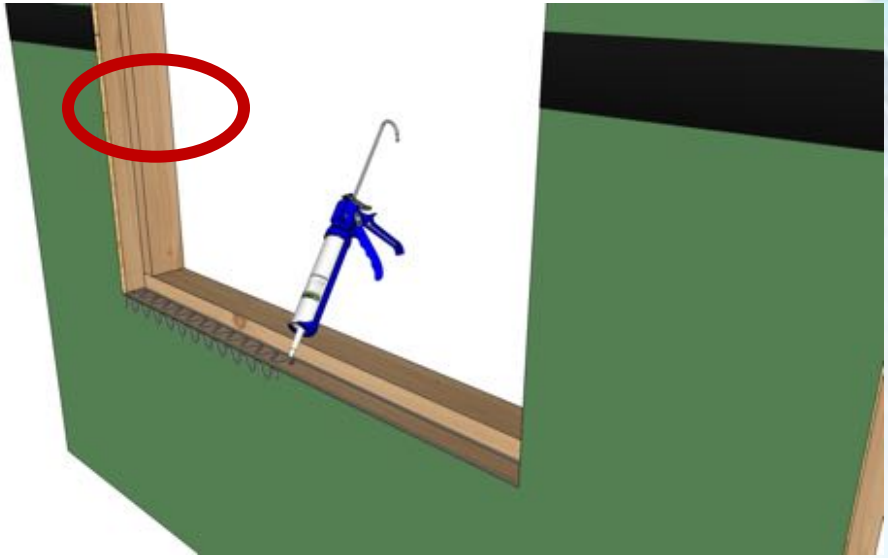


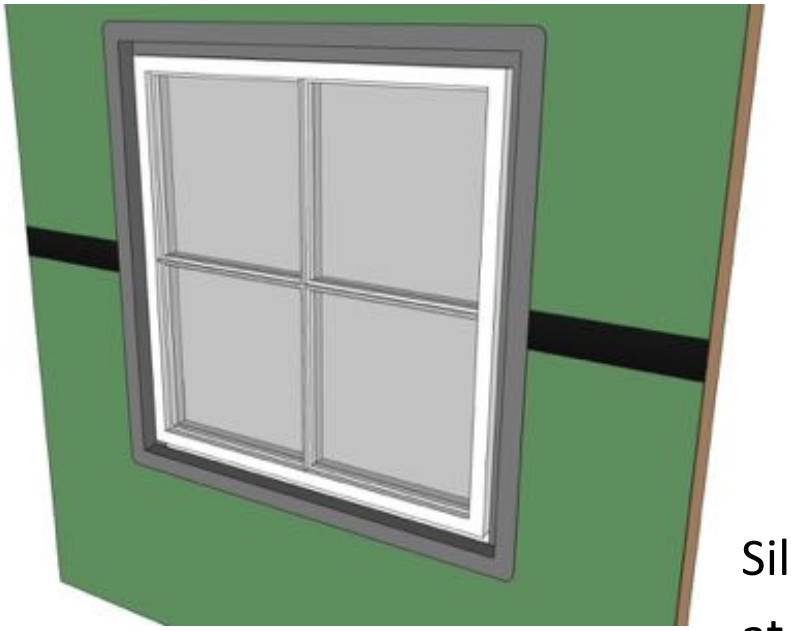
3. Head Jamb Last



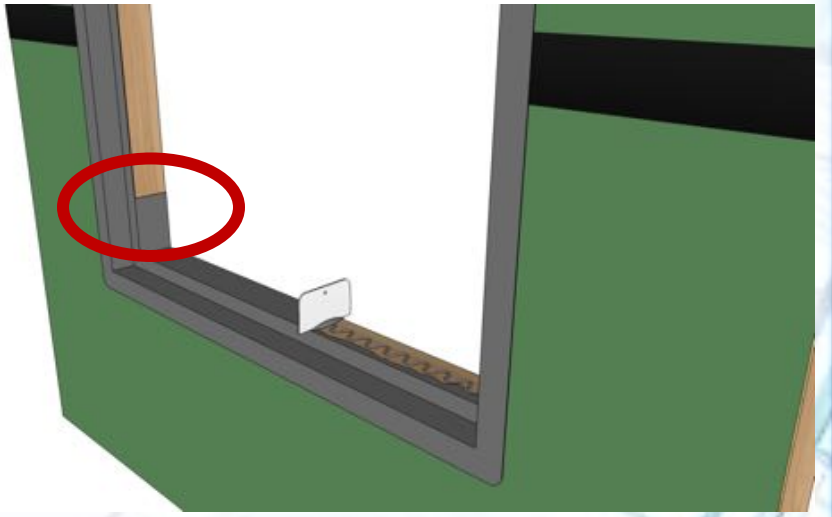
Penetrations: Window-Opening Detail - Recessed

Exposed Framing



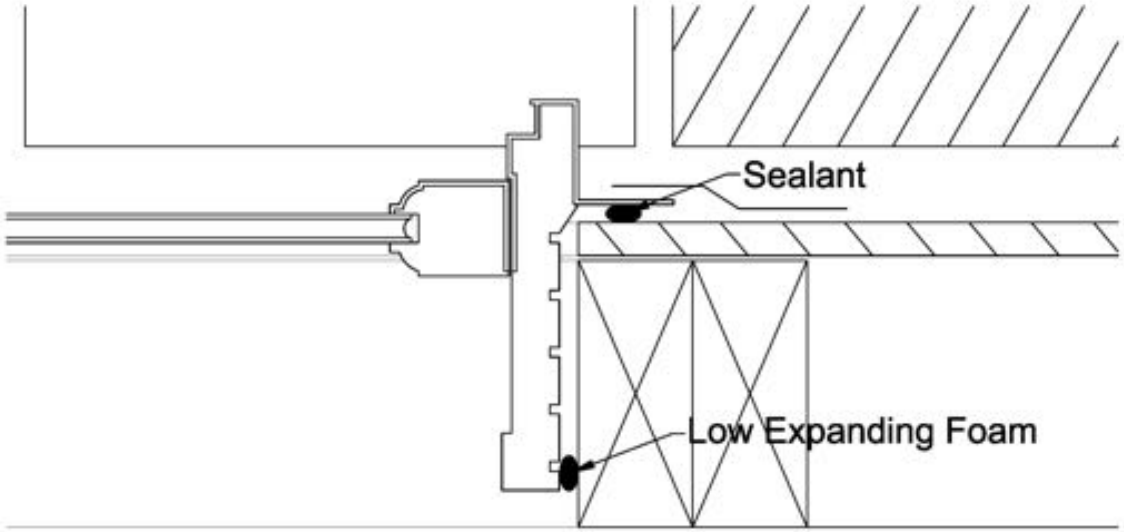


Sill Pan at Window



Penetrations: Window-Opening Detail

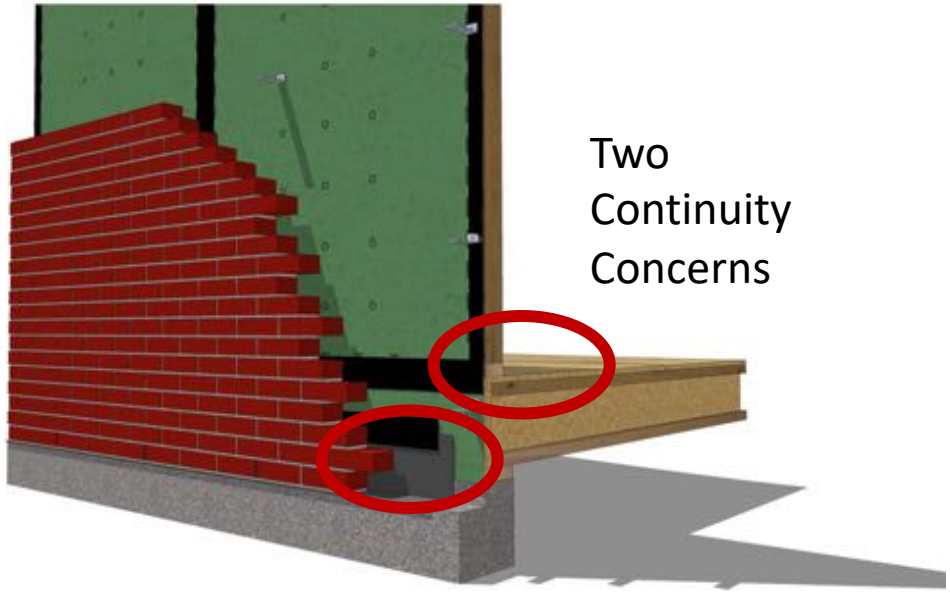
Interior Sealing for Continuity



Control Layer Compatibility: Windows

Compatability	Structure	WRB	Air Barrier	Vapor Permeable	Thermal Barrier
Metal Flashing	NA	NA	NA	NA	NA
Acrylic Flashing Tape	X	✓	✓	X	X
Liquid Flashing	X	✓	✓	✓	X
Integrated Multifunction Panel	✓	✓	✓	✓	✓

Penetrations: Masonry Veneer Detail

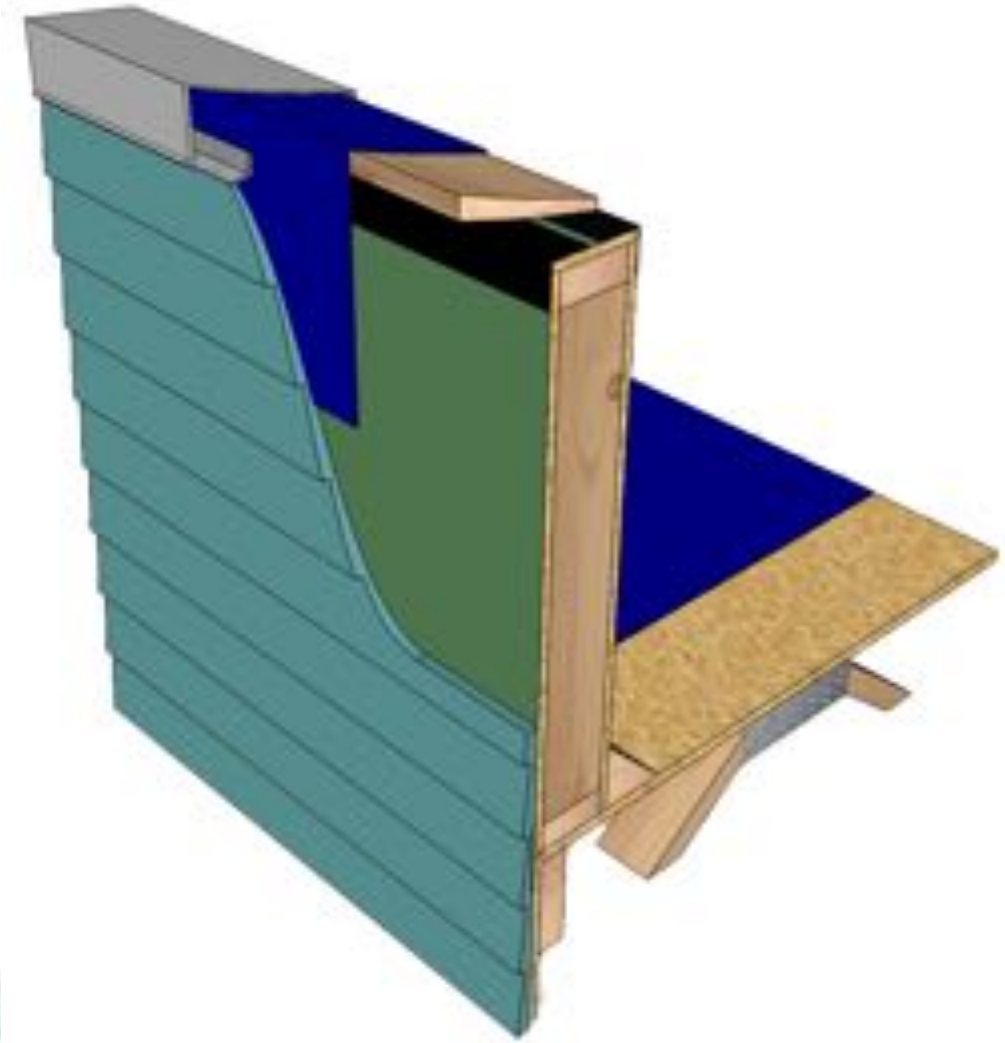


Control Layer Compatibility: Masonry Veneer

Compatability	Structure	WRB	Air Barrier	Vapor Permeable	Thermal Barrier
Metal Flashing	X	✓*	X	X	X
Acrylic Flashing Tape	X	✓	✓	X	X
Liquid Flashing	X	✓	✓	✓	X
Integrated Multifunction Panel	✓	✓	✓	✓	✓

*Only when integrated with the WRB using approved self-adhered flashing

Interruption: Parapet Walls

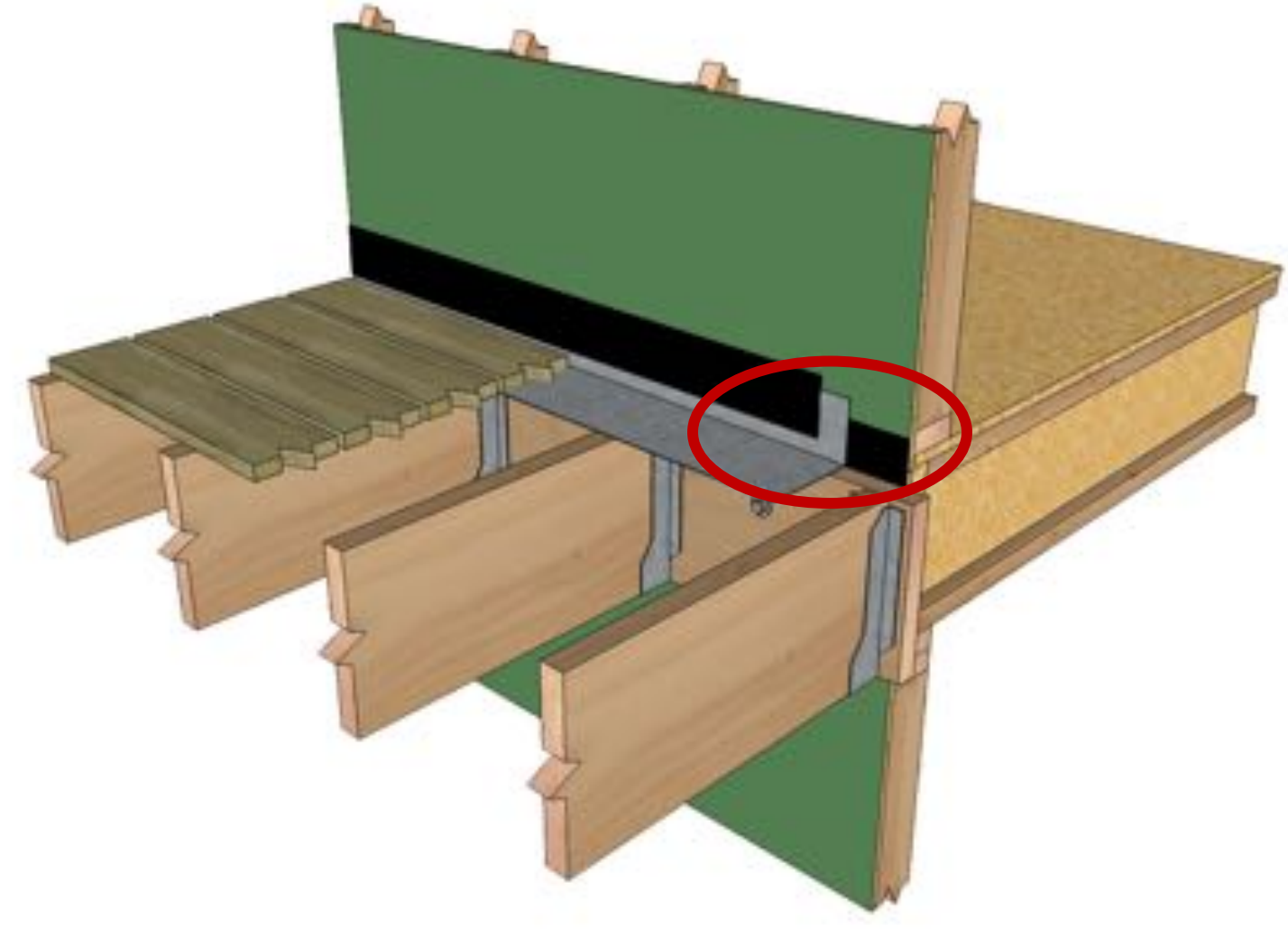


Control Layer Compatibility: Parapet Wall

Compatability	Structure	WRB	Air Barrier	Vapor Permeable	Thermal Barrier
Metal Flashing	X	✓*	X	X	X
Acrylic Flashing Tape	X	✓	✓	X	X
Liquid Flashing	X	✓	✓	✓	X
Integrated Multifunction Panel	✓	✓	✓	✓	✓

*Only when integrated with the WRB using approved self-adhered flashing

Interruption: Deck and Balcony Detail



Control Layer Compatibility: Deck and Balcony Ledger

Compatability	Structure	WRB	Air Barrier	Vapor Permeable	Thermal Barrier
Metal Flashing	X	✓*	X	X	X
Acrylic Flashing Tape	X	✓	✓	X	X
Liquid Flashing	X	✓	✓	✓	X
Integrated Multifunction Panel	✓	✓	✓	✓	✓

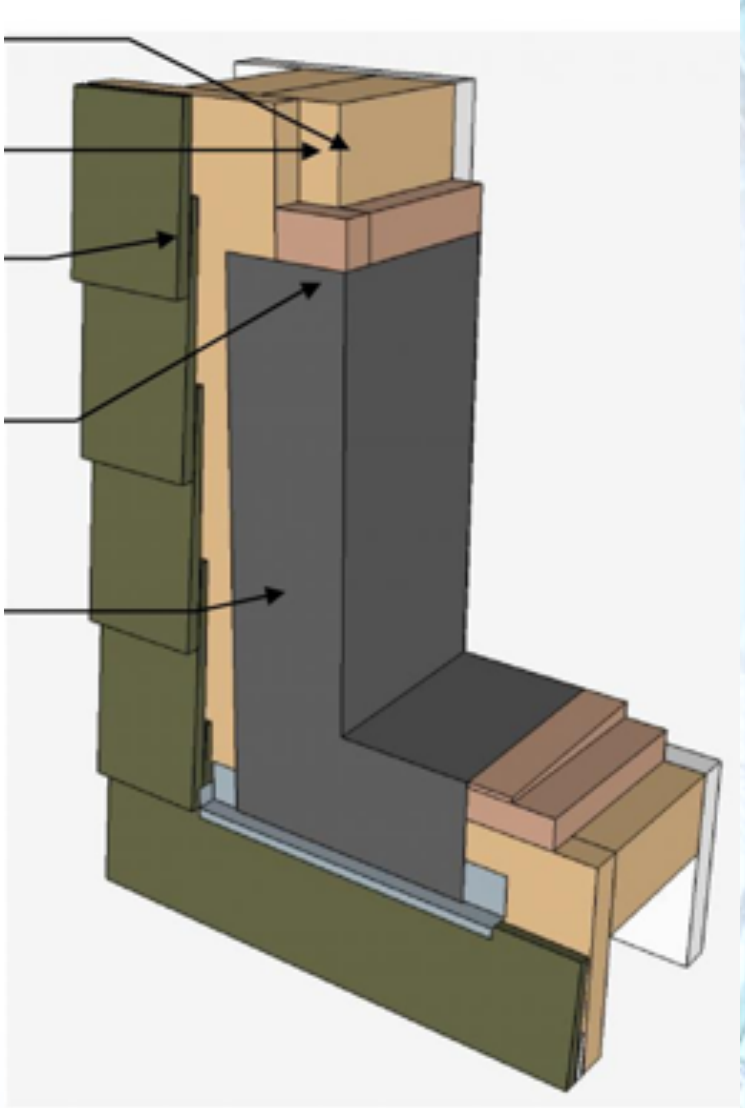
*Only when integrated with the WRB using approved self-adhered flashing

Part 5: Conclusions

Conclusions

The Key to Continuity Is Detailing

- All building conditions where there is a change of any type need to be addressed.
- All control layers must be detailed and constructed to be continuous.



Conclusions

Integrated Products can Simplify Continuity

- Single sheathing products can provide water-resistive, air, and thermal control layers.
- Coordinated tape, sealant, and liquid flashing assure a complete assembly solution.

Conclusions

Integrated Products can Mitigate risk

- Single source for field support
- Single manufacturer warranty

Thank you for participating.

For more information, contact:

For technical support, please contact:

techquestions@huber.com

ZIPRevolution.com | AdvanTechQuiet.com