abaa 2025 building enclosure conference

Basic Critical AVB Detailing

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Couse Description

The water, air, vapor, and insulation layers are needed in everyone's vocabulary, along with the importance of a system to facilitate a high-performance building. This presentation will identify the basic substrate conditions and critical transitions in any building. It will give you the tools to understand better the materials and sequencing needed to complete the installation to prevent constructability issues and potential rework in the field through construction photos of actual conditions and explanations of each condition.

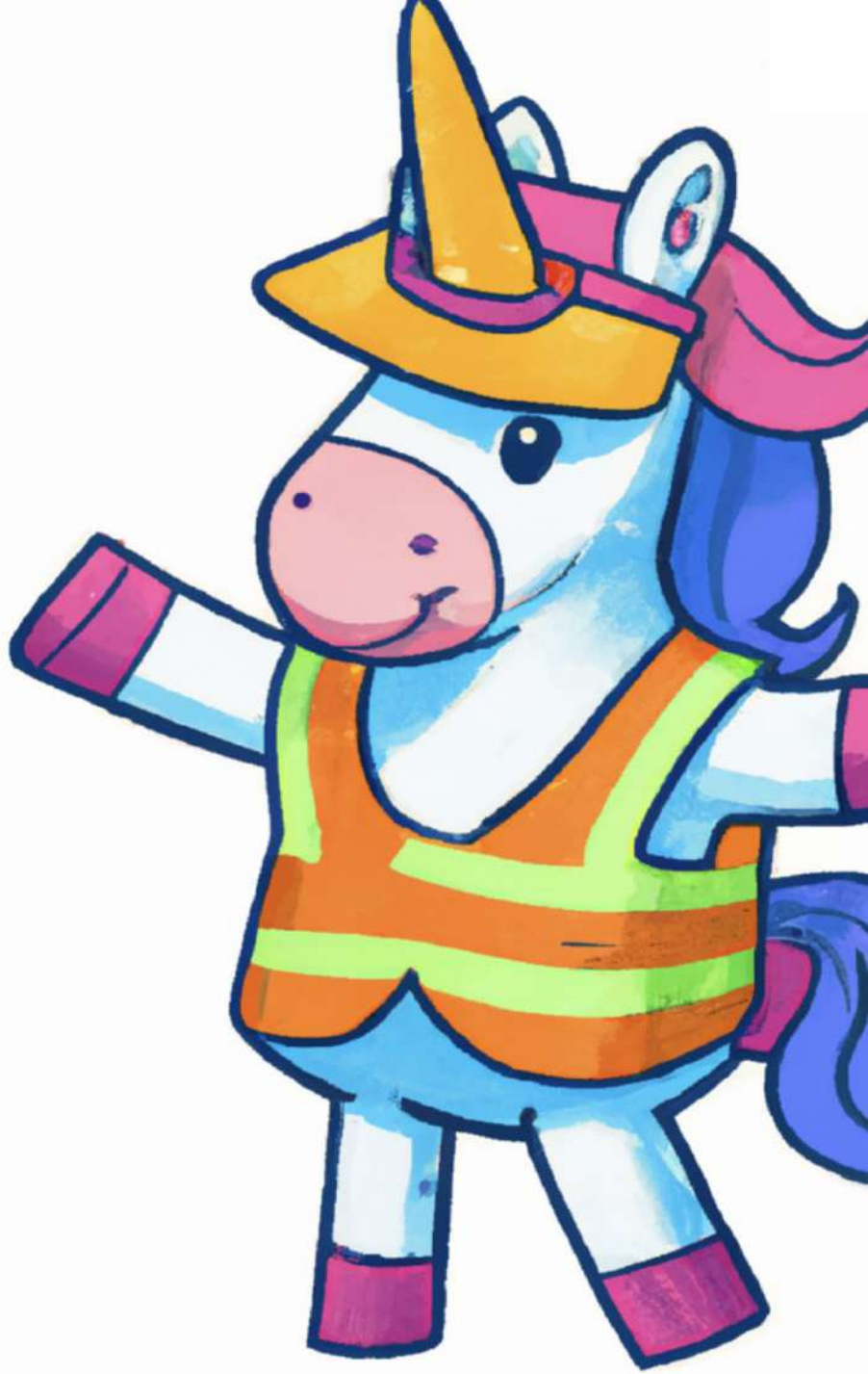
abaa building enclosure conference

Learning Objectives

1. *Understand the differences between an air, vapor, and moisture barrier and when to use them.*
2. *Identify and understand the locations of critical transitions regarding the installation of the water, air, vapor, and insulation layers through photos of correct and incorrect installations.*
3. *Learn how to prevent constructability issues during the CD phase and create an action plan for each condition for construction regarding the installation of the water, air, vapor, and insulation layers.*
4. *Apply the understanding of the installation of the water, air, vapor, and insulation layer concerns to the field during the site observation review.*

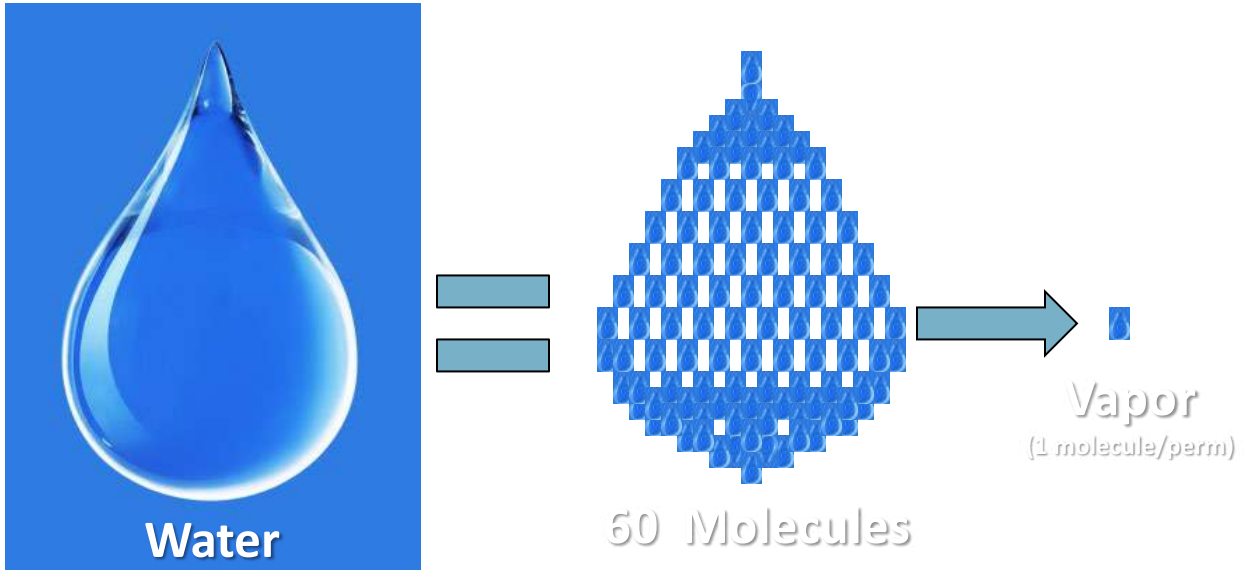
abaa EDUCATION

Among the most significant challenges for designers and installers today, is the use of unlike materials with questionable compatibility and lack of proper installation execution to form a continuous air barrier



Basics of Water

- 1 perm is one molecule of vapor that is able to pass through 1 ft^2 of material at static pressure at 1” of mercury in an hour.
- Perms = The amount of water vapor that passes through
- Vapor is one molecule…Water is 60 molecules
- 1 pound water = 7000 molecules (117 drops) = 0.12 gallons



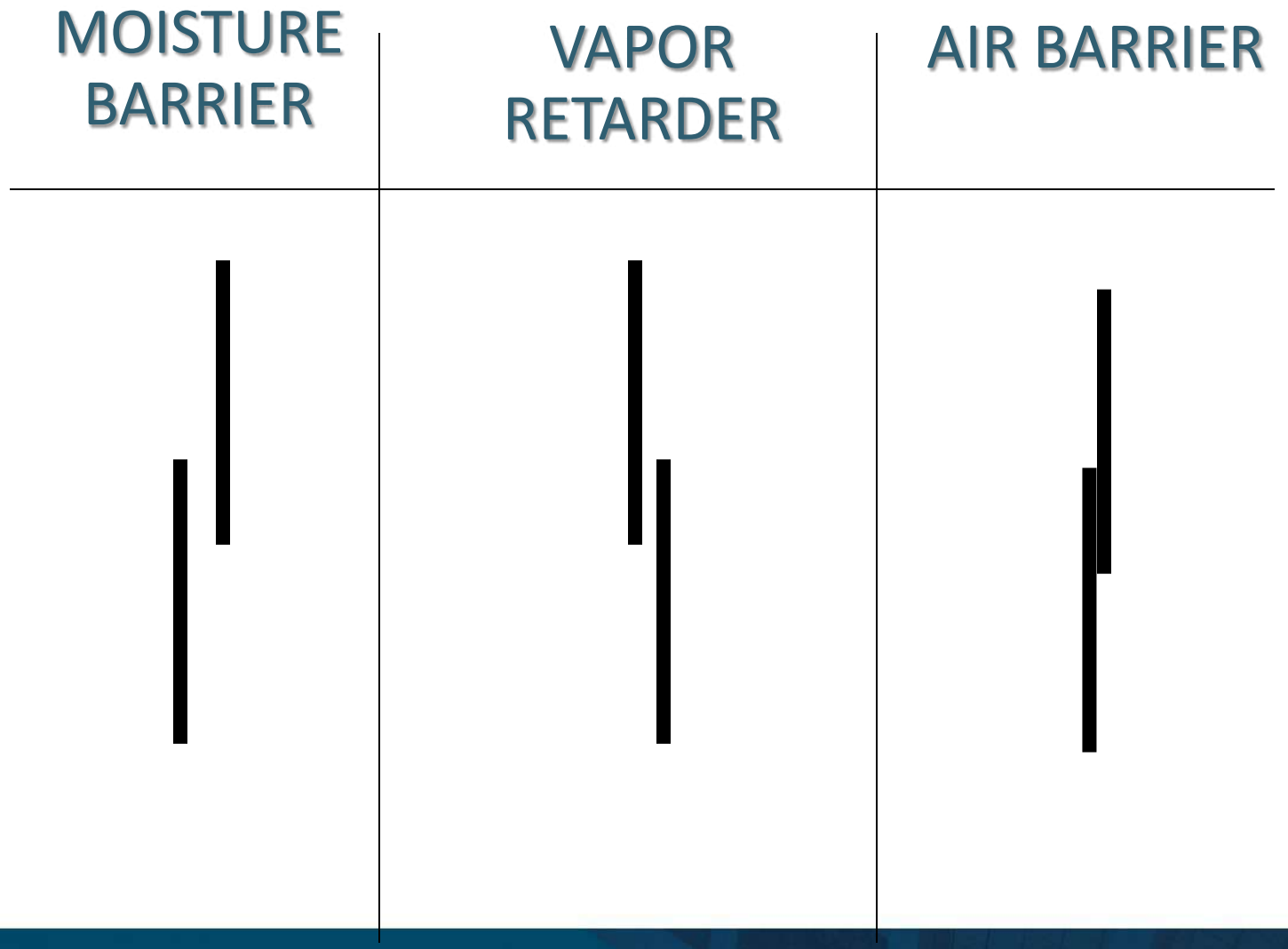
Air & Vapor Retarder

- Air Barriers allow vapor to pass freely
  - Air Barriers MUST be structurally sound
  - The higher the perm rating, the better the vapor flow
- Vapor Retarder stops air & a portion of vapor, depending on the “Perm Rating”
  - Steel & Glass – Practically Perfect AVB
  - Concrete is about 1perm @ 4.25”
- 0.1 perm or less is a Class I Vapor Retarder / Vapor impermeable
  - 1 – 0.1 = Class II (Kraft Faced Insulation)
  - 10 – 1 = Class III (Latex or Paint)

Key Qualities

- Durability
- Continual Structural Support
  - Prevents the vibration of the membrane, which will lead to failure.
  - ***Requirement of an Air Barrier***
- Continuity
- Six Sides of Installation
- Compatibility with adjacent materials
- A product that the manufacture declares and has installation instructions as an air and/or Vapor barrier

Difference Between Barriers



What are we Trying to Prevent?

What Are We Trying to Prevent

- Vapor Diffusion moves from warm ⇨ cold
  - Vapor will move through a material until saturation
- Air moves to equalize – from high ⇨ low
- Exfiltration
  - Conditioned interior air to the exterior
  - Cold climates – Prevent interior air getting exterior
  - Wind leeward side/roof
  - Stack Effect (warm air rises in a shaft, curtainwall, etc)
- Infiltration
  - Warm/Cold exterior air to the interior
  - Warm climates – Prevent exterior air getting into interior
  - Wind windward side of wall

What Are We Trying to Prevent

Common thought is that vapor transmission is the issue…however:

Vapor diffusion though materials accounts for about 10% of vapor concerns

Vapor diffusion or transport via air movement is not a problem until / unless the temperature on a surface in the cavity is at or below the dew point temperature

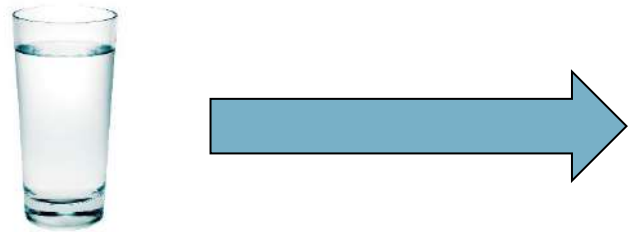
Condensation / Vapor

- Vapor moves very little…unless transported by air
- Dew Point…A temperature that no longer could support additional vapor

Ice Water Elevation

Vapor thru Air Transport

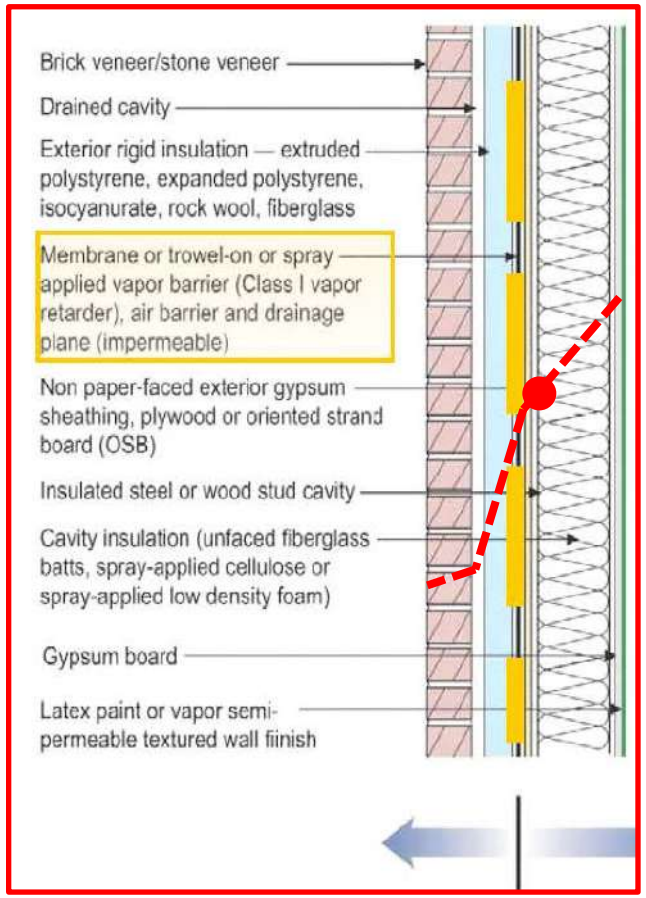
- Vapor diffusion with air movement (accounts for about 90%)
  - Air carries a large quantity of vapor through holes/gaps (100x more than diffusion alone)

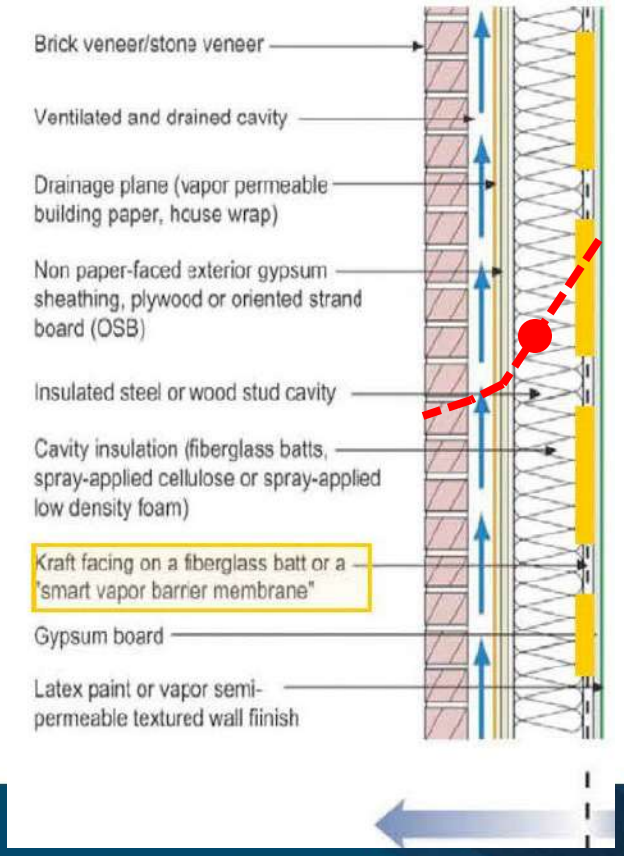


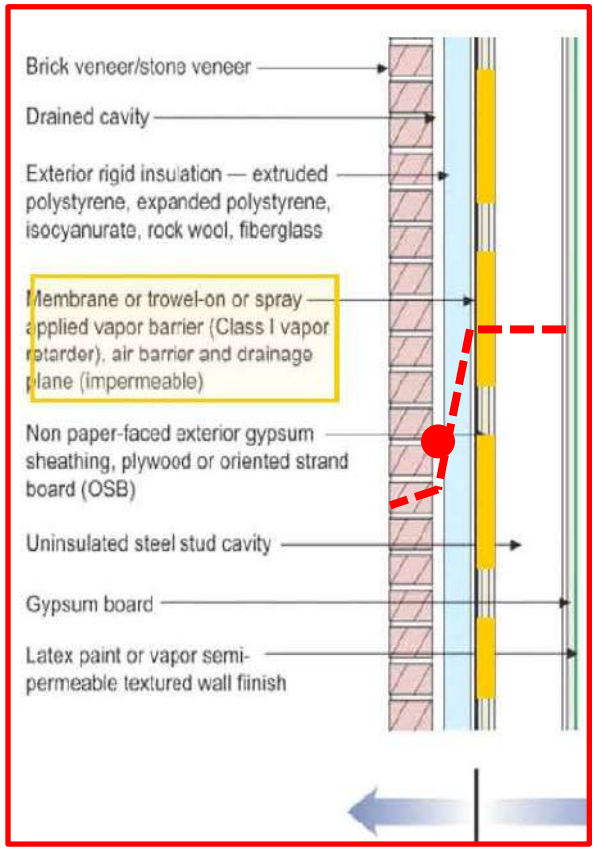
Diffusion Alone

1sq. In. hole
With
Air Movement

Heat Movement Within a Wall

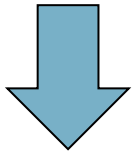






Thermal Break Location

- Location of Air barrier & Thermal Break is extremely important



- Wrong side of insulation could create condensation

In cold climates…Warm interior air bypasses the insulation and cools, condensing on the air barrier…leaving moisture on the interior side of the air barrier and potentially getting into the building

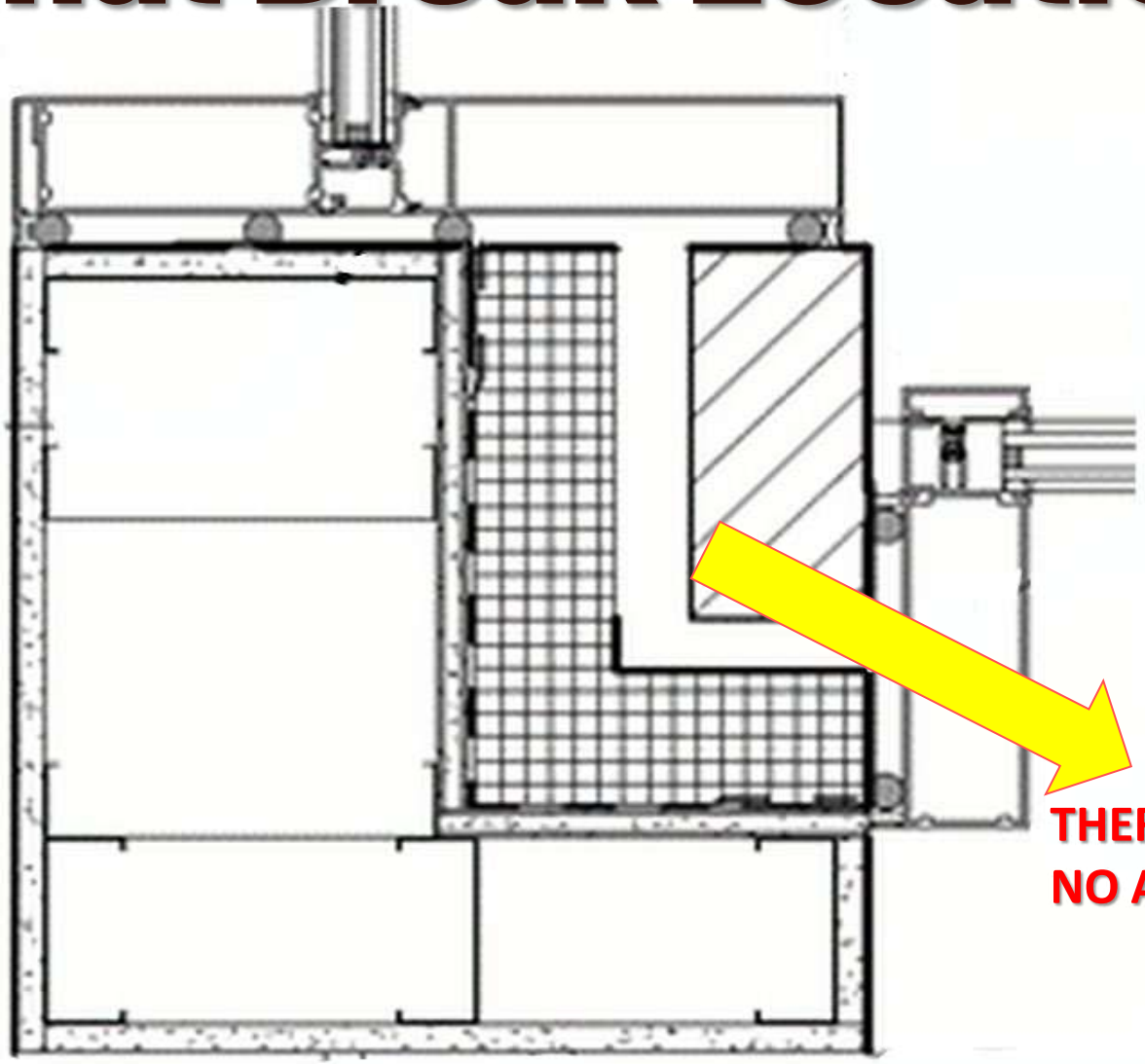
- Location of the thermal break must be with-in the warm side of the wall…if on the cold side, the aluminum will be cold on both sides of the thermal break.

Thermal Break Location

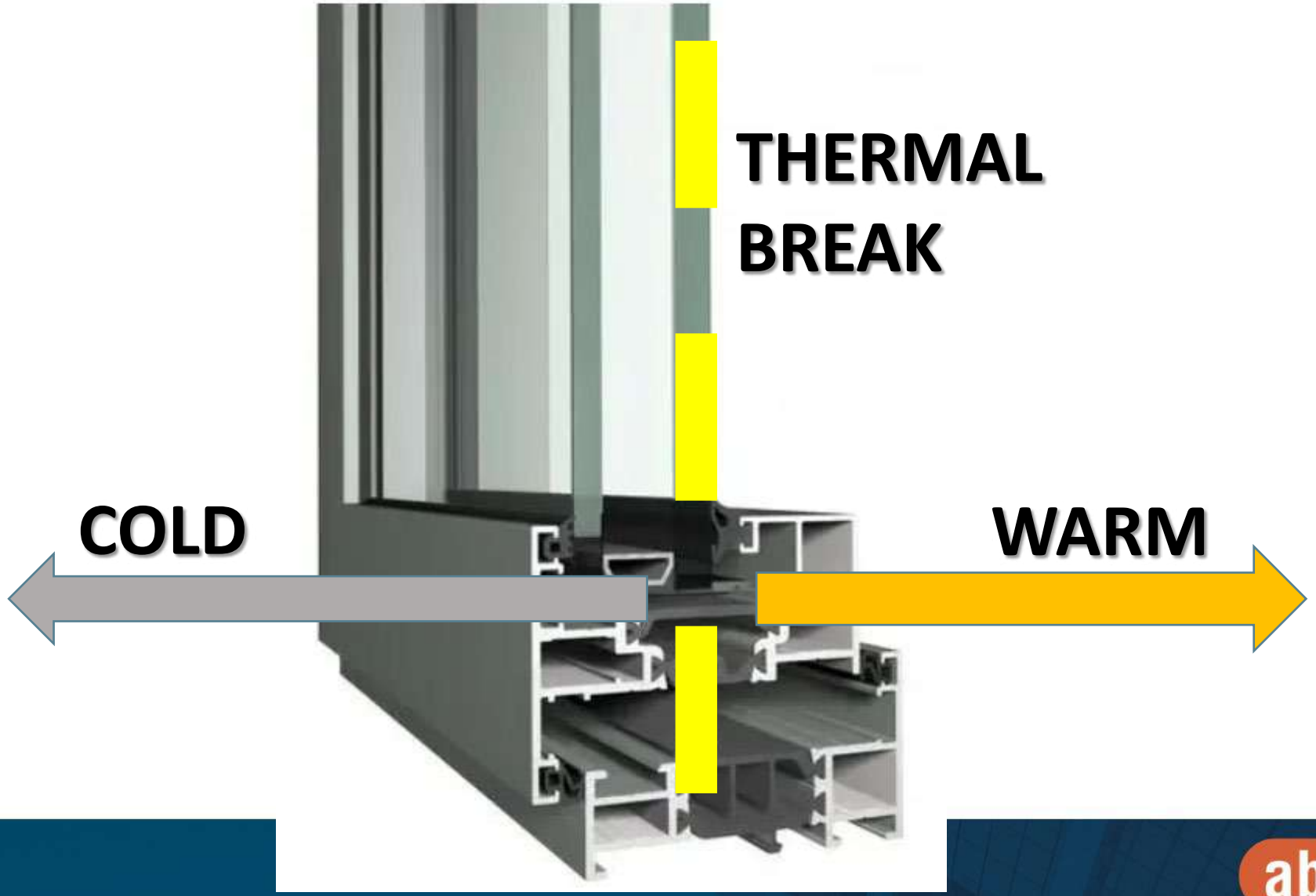
Alignment or Near Alignment is important

Per ASHRAE 90.1:

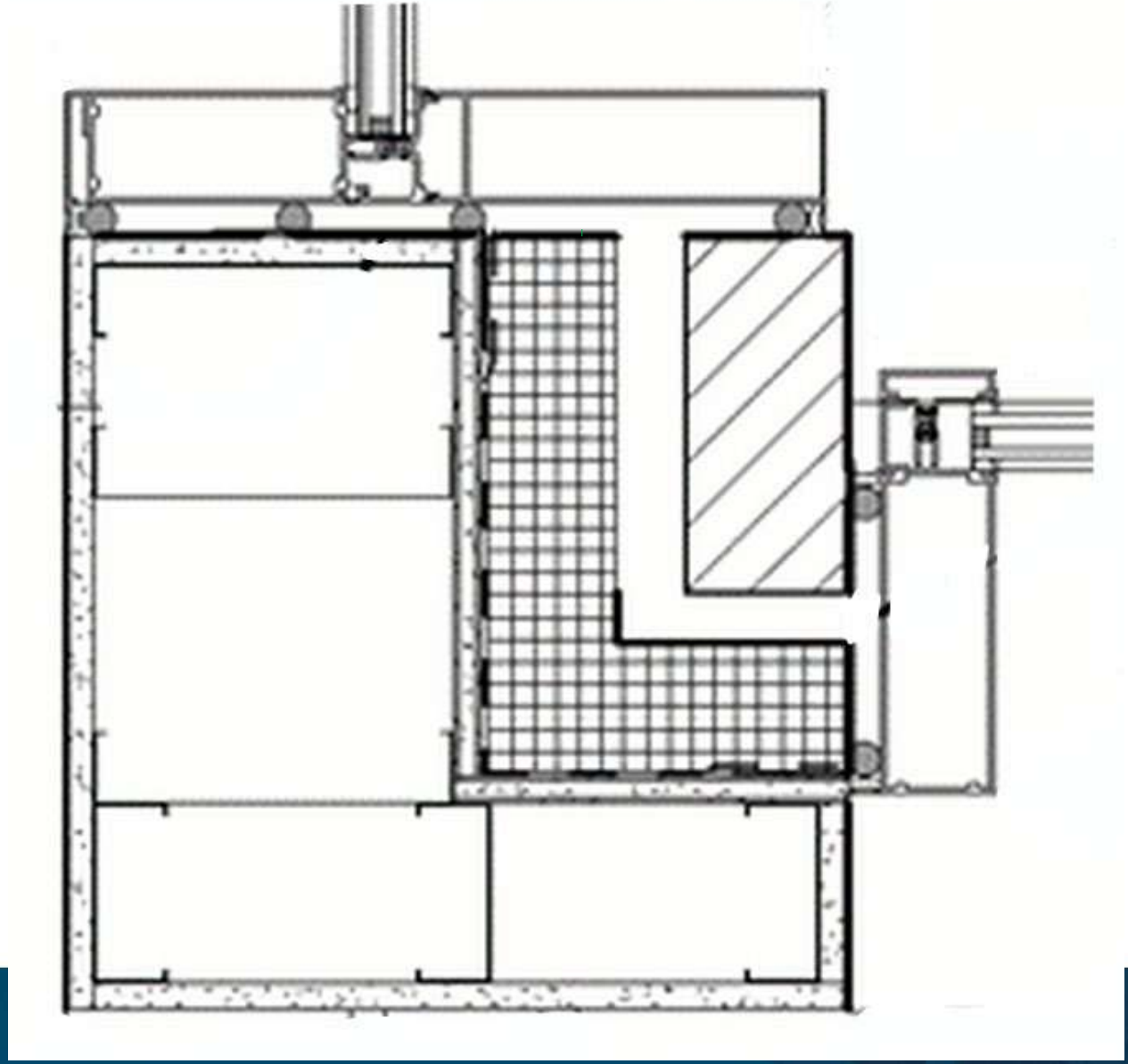
The primary requirement is to align the glazing layer within 2” of the wall’s continuous insulation (such as mineral wool or foam), or within 2” of the exterior side of the cavity insulation when there is no continuous insulation.



Thermal Break Location



Thermal Break Location



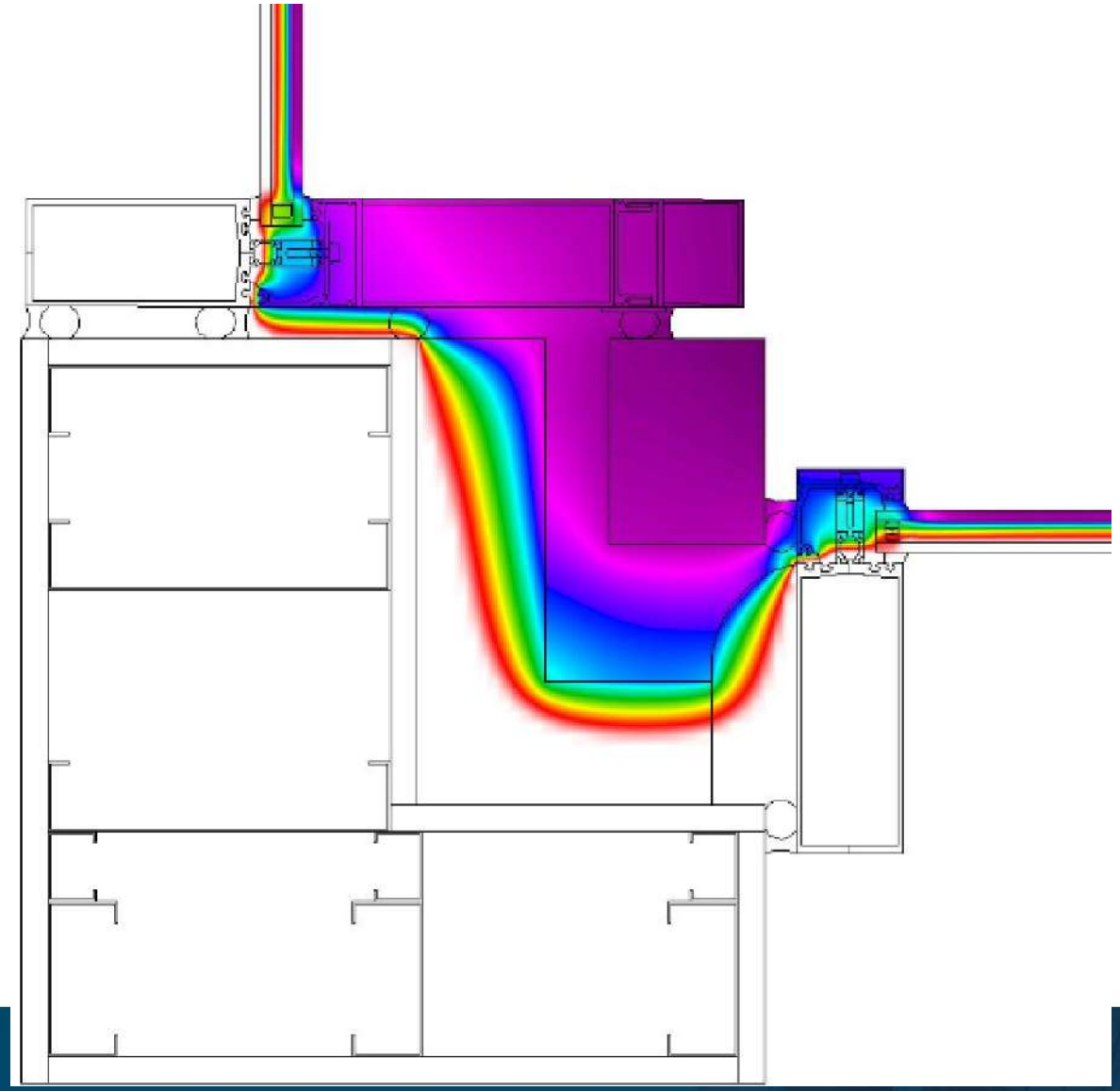
Precured Silicone

PRIMARY SEALANT

SPRAY POLYURETHANE FOAM

AVB MEMBRANE

Thermal Break Location



Different Types of Barriers

- Air Barrier
  - Mechanically Fastened
  - Self Adhering Sheets
  - Liquid Applied
- Vapor Retarder
  - Self Adhering Sheets
  - Liquid Applied
  - Insulation Board - Sealed
  - Spray Polyurethane Spray
- Air/Vapor Retarder
  - Self Adhering Sheets
  - Liquid Applied
  - Insulation Board - Sealed
  - Spray Polyurethane Spray
- Moisture Barrier
- Precured Silicone

Air Barrier - Mechanically Fastened

Air Barrier - Self-adhered Sheets

Air Barrier - Liquid applied

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Vapor Retarder- Self-adhered Sheets

Vapor Retarder- Liquid applied

Vapor Retarder - Insulation Board - Sealed

Vapor Retarder – Spray Polyurethane Foam

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Air/Vapor Retarder- Self-adhered Sheets

Air/Vapor Retarder- Liquid applied

Air/Vapor Retarder - Insulation Board - Sealed

Air/Vapor Retarder – Spray Polyurethane Foam

Different Types of Barriers

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  - Liquid Applied
  - Insulation Board - Sealed
  - Spray Polyurethane Spray
- Moisture Barrier
- Precured Silicone

MOISTURE BARRIERS

Different Types of Barriers

- Air Barrier
  - Mechanically Fastened
  - Self Adhering Sheets
  - Liquid Applied
- Vapor Retarder
  - Self Adhering Sheets
  - Liquid Applied
  - Insulation Board - Sealed
  - Spray Polyurethane Spray
- Air/Vapor Retarder
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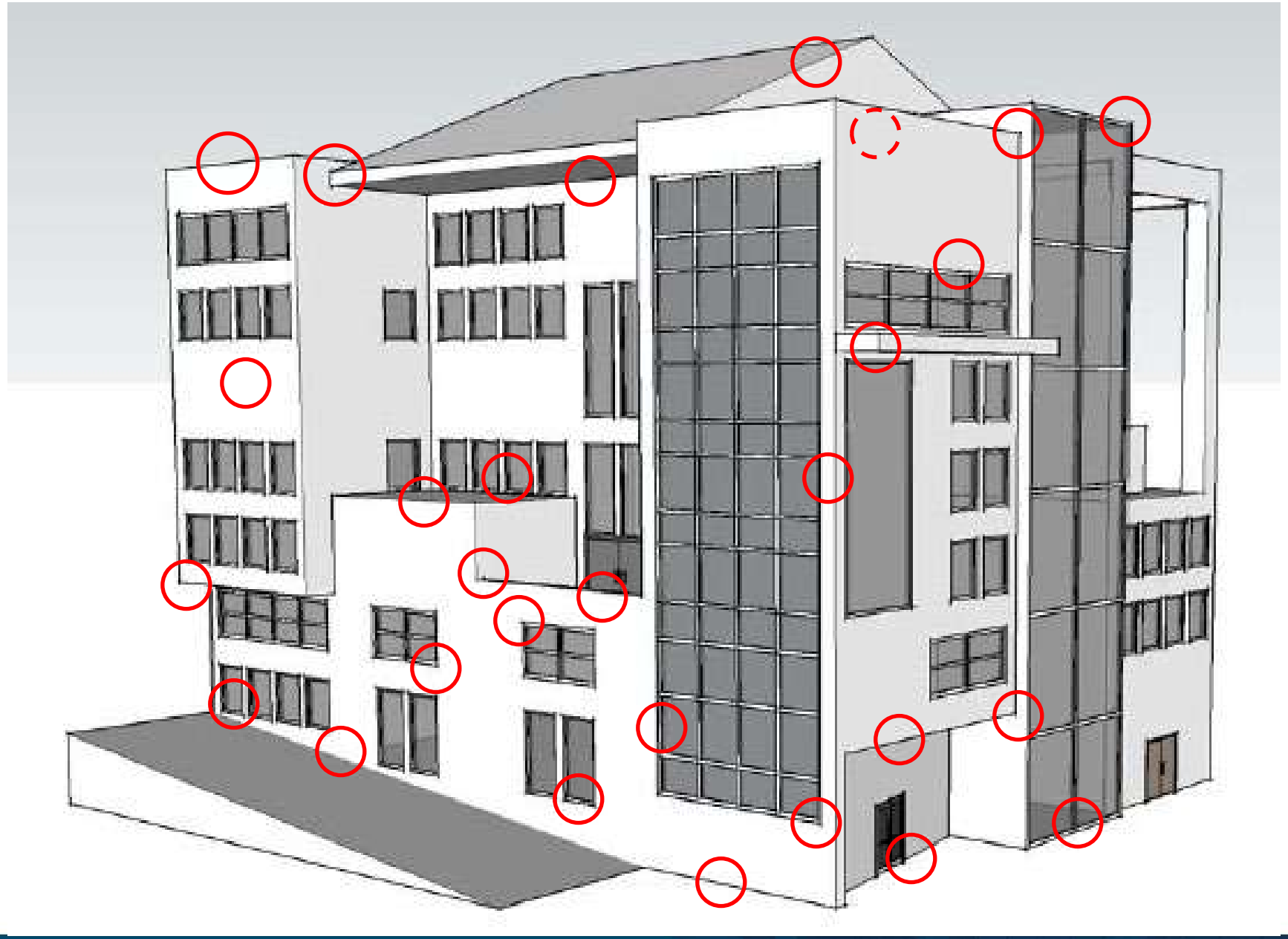
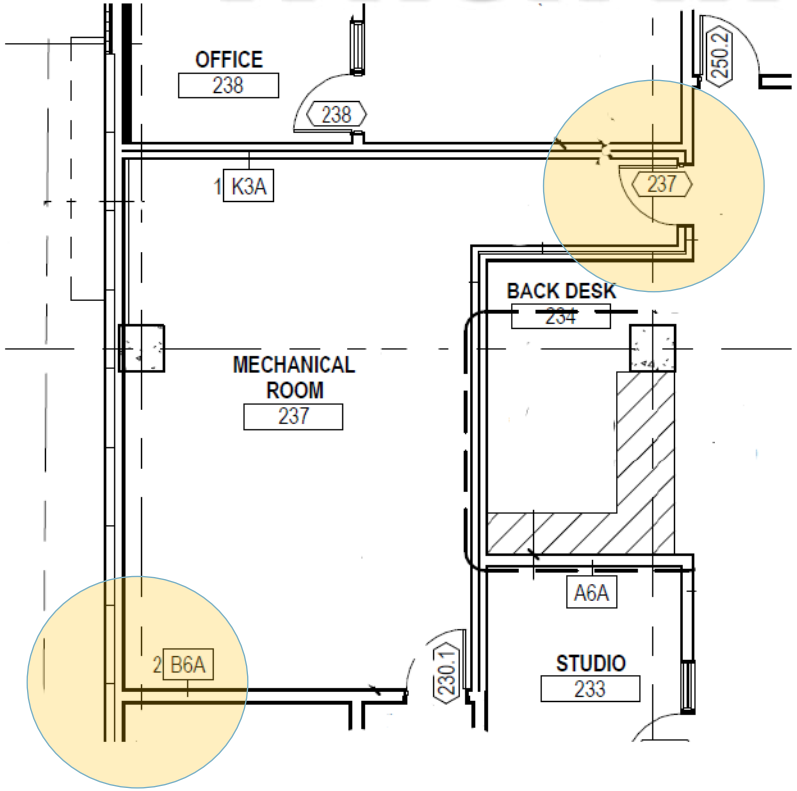
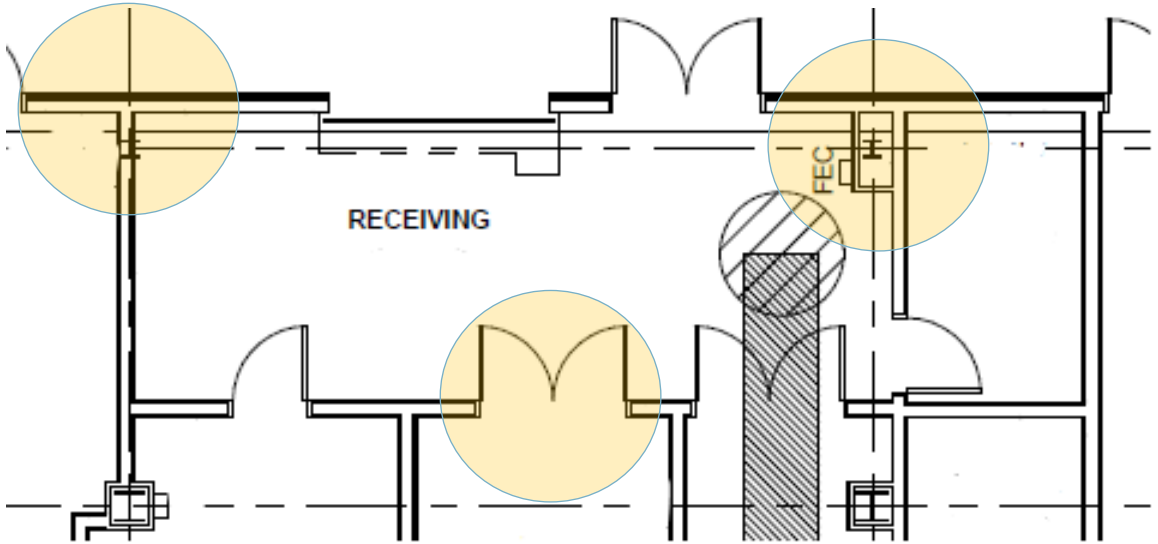
Precured Silicone



When Interior is Exterior





Sometimes, AVB is needed interior of the building and will separate the building into components…

Garage ▫ Loading Docks ▫ Mech Rooms ▫ Vented Spaces

Best Time to Address Issues

- Pre-Construction – Prior to Drawing Completion
  - Understand the schedule and any schedule changes…that might affect weather and material/product choices
  - Understand the market and market limitations.
  - The Designer should review these conditions and address as needed
    - The Designer might need to re-review Conditions may change before construction…permit timing, Owner decisions, etc.

Preconstruction Review

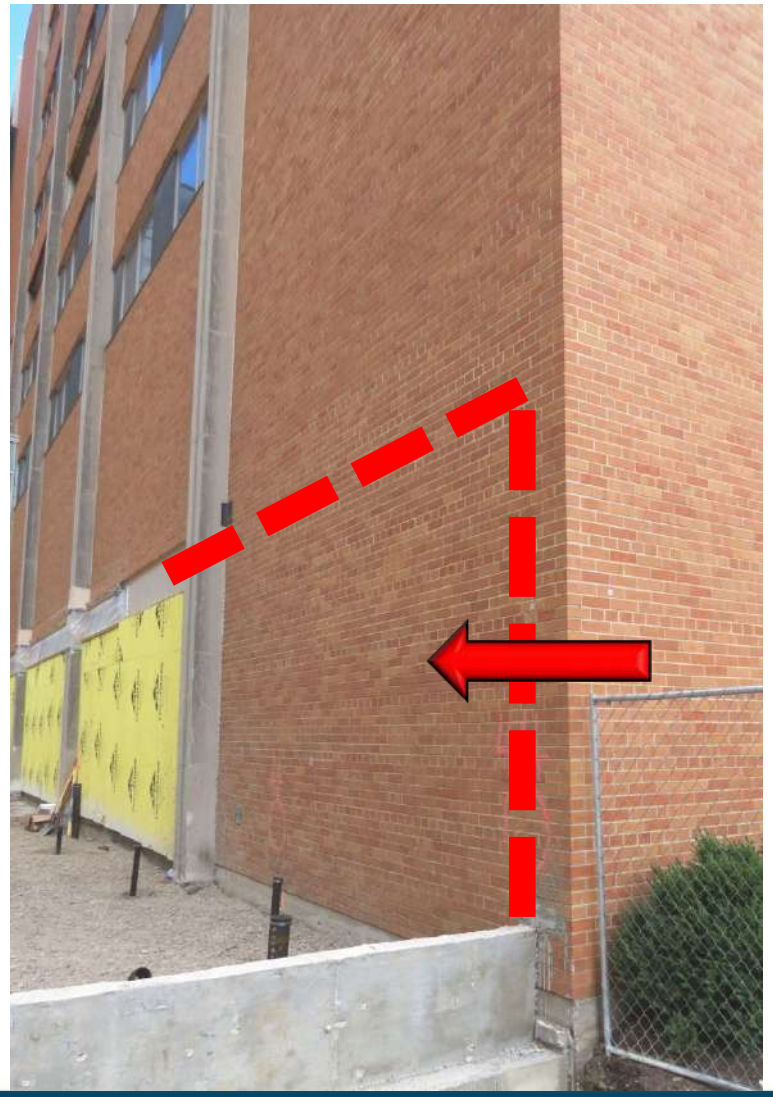
What is the detail at the parapet / Roofing?
Verify that the AVB membrane either goes under the roofing membrane or to a compatible material to extend the AVB envelope to the roofing system (vapor barrier or adhered roofing membrane).
Provide sketch…

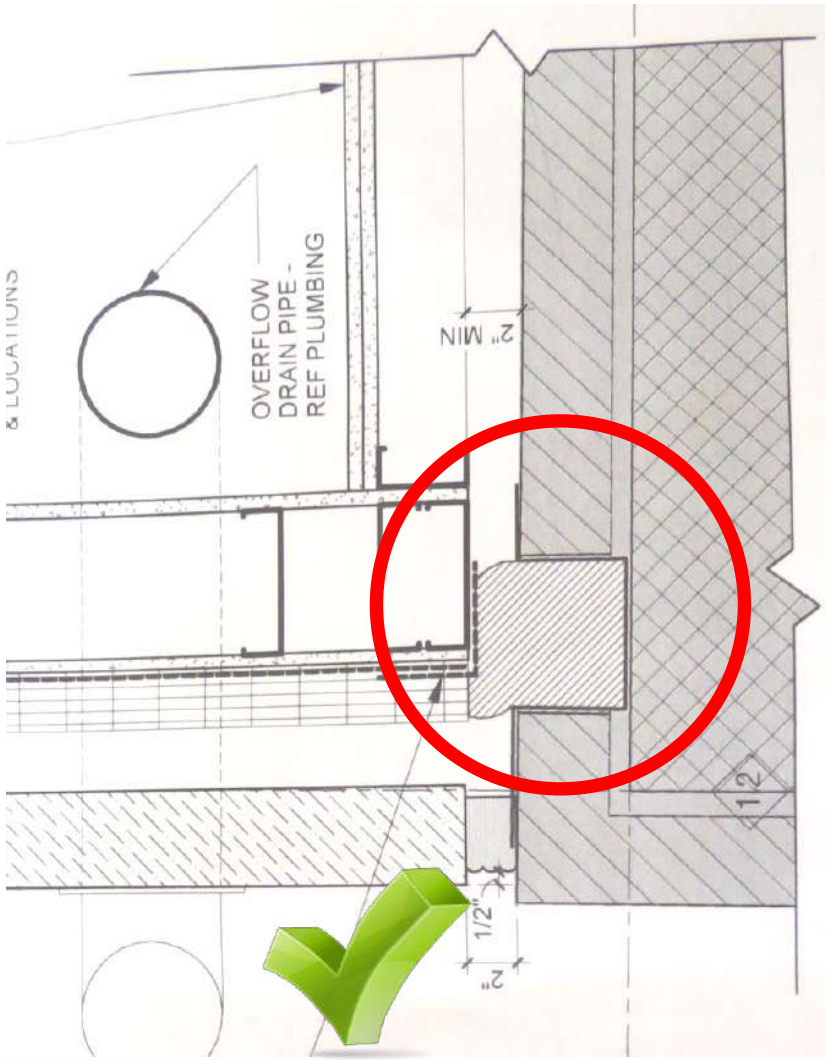
Example

Discuss peel and stick joints and covering them if a single ply roof is being installed (the joints are NOT compatible)

Clearance Challenges

Detail Challenges - Renovation



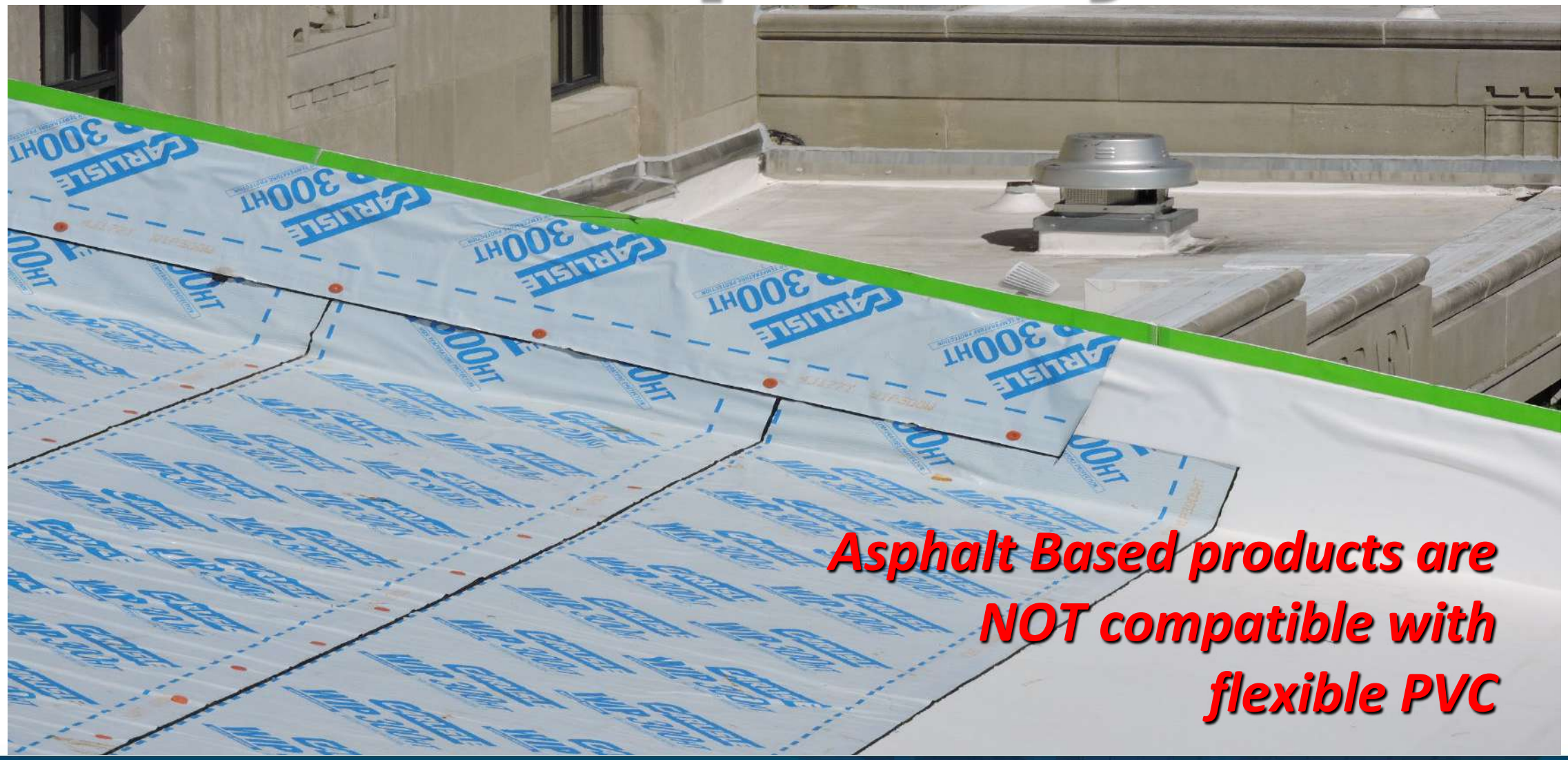


Detail Challenges - Renovation

Compatibility

Compatibility & Sequencing with air barrier components & other building materials

Compatibility



Flashing	Acrylic Liquid Air Barrier	Asphalt Liquid Air Barrier	Polyether Liquid Air Barrier	Silicone Liquid Air Barrier	Peel & Stick Asphalt Membrane	Peel & Stick Butyl Membrane	Spray Polyurethane Foam	Polystyrene Insulation	Polyiso Insulation
Copper Asphalt									
Copper Drainage									
Copper Fabric (Asphalt)									
Copper Fabric (Non-Asphaltic)									
Copper Sheet Metal									
EPDM									
EPDM Self-Adhered (Asphalt)									
PVC									
PVC Thermoplastic Vinyl									
PVC Thermoplastic Asphalt SA									
Rubberized Asphalt (Peel & Stick)									
Stainless Steel Drainage									
Stainless Steel Fabric									
Stainless Steel Self-Adhered									
Stainless Steel Sheet Metal									

Not Compatible
Caution
Compatible

From the ABAA's Flashings and Terminations Committee

General Requirements

Temperature

Type of material

(material/primer)

Weather

Dampness of substrate

Installation requirements/Rolling

Fish mouth

General Requirements

Thickness concerns

Overlap of material

Corner detailing

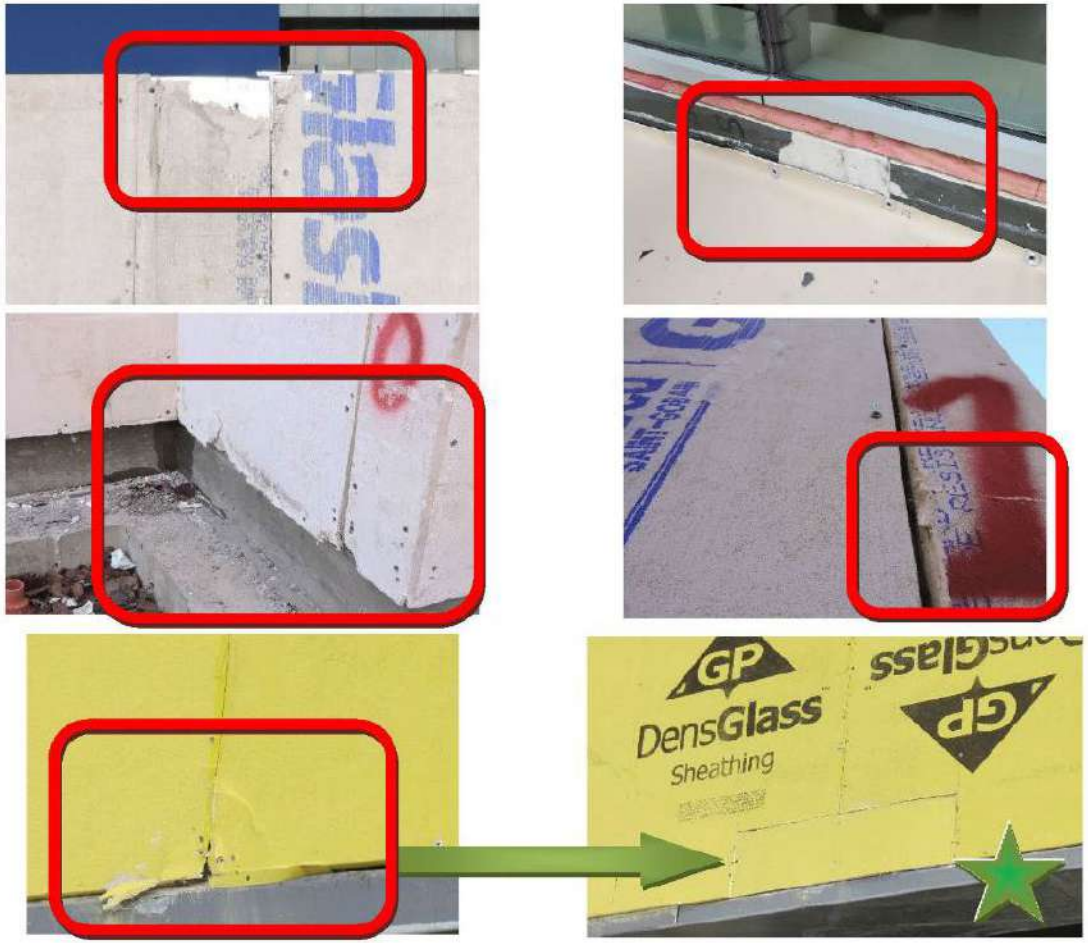
Transition detailing/material

Appropriateness of material

Patching procedures

End of day seal

Gypsum board sheathing damage MUST be repaired (replaced) <u>STUD to STUD</u> prior to any roofing or air /vapor barrier being installed:



When the paper face is torn off, the roof adhesive or the air/vapor barrier will get sucked into the gypsum and not properly adhere.

The roofing & air/vapor barrier needs to be fully supported. Damaged sheathing or sheathing that the face material has been torn off is not proper support for the roofing or air/vapor barrier – this will cause failure.

<u>Always review your sheathing prior to the installation of the roof or air/vapor barrier & always repair stud to stud.</u>

Substrate challenges

OTHER

I recommend performing a simple pull-off test on gypsum board sheathing to confirm a min. pull-off of the glass facer

Substrate challenges

Peel and Stick materials need backing.

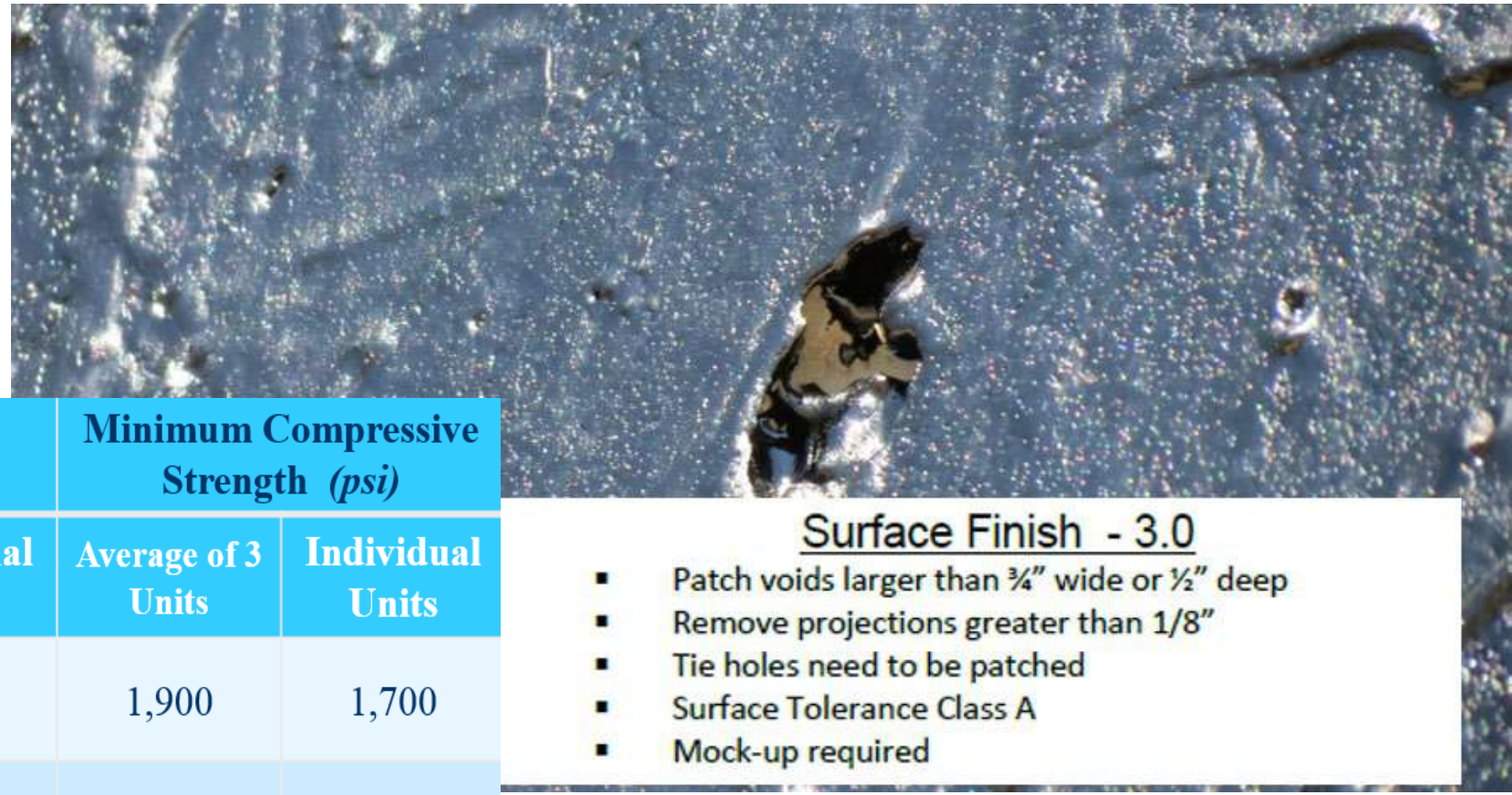
Generally, ¼” maximum gap is acceptable – but always review product installation instructions.

Substrate challenges

CMU

Weight Classification	Density (Ave of 3) (lb/ft^3)	Maximum Water Absorption (lb/ft^3)		Minimum Compressive Strength (psi)	
		Average of 3 Units	Individual Units	Average of 3 Units	Individual Units
Lightweight	Less than 105	18	20	1,900	1,700
Medium Weight	105 - 125	15	17	1,900	1,700
Normal Weight	Greater than 125	13	15	1,900	1,700

** Standard Specification for Loadbearing Concrete Masonry Units, ASTM C90-11b. ASTM International, 2011.*



Concrete

Substrate challenges

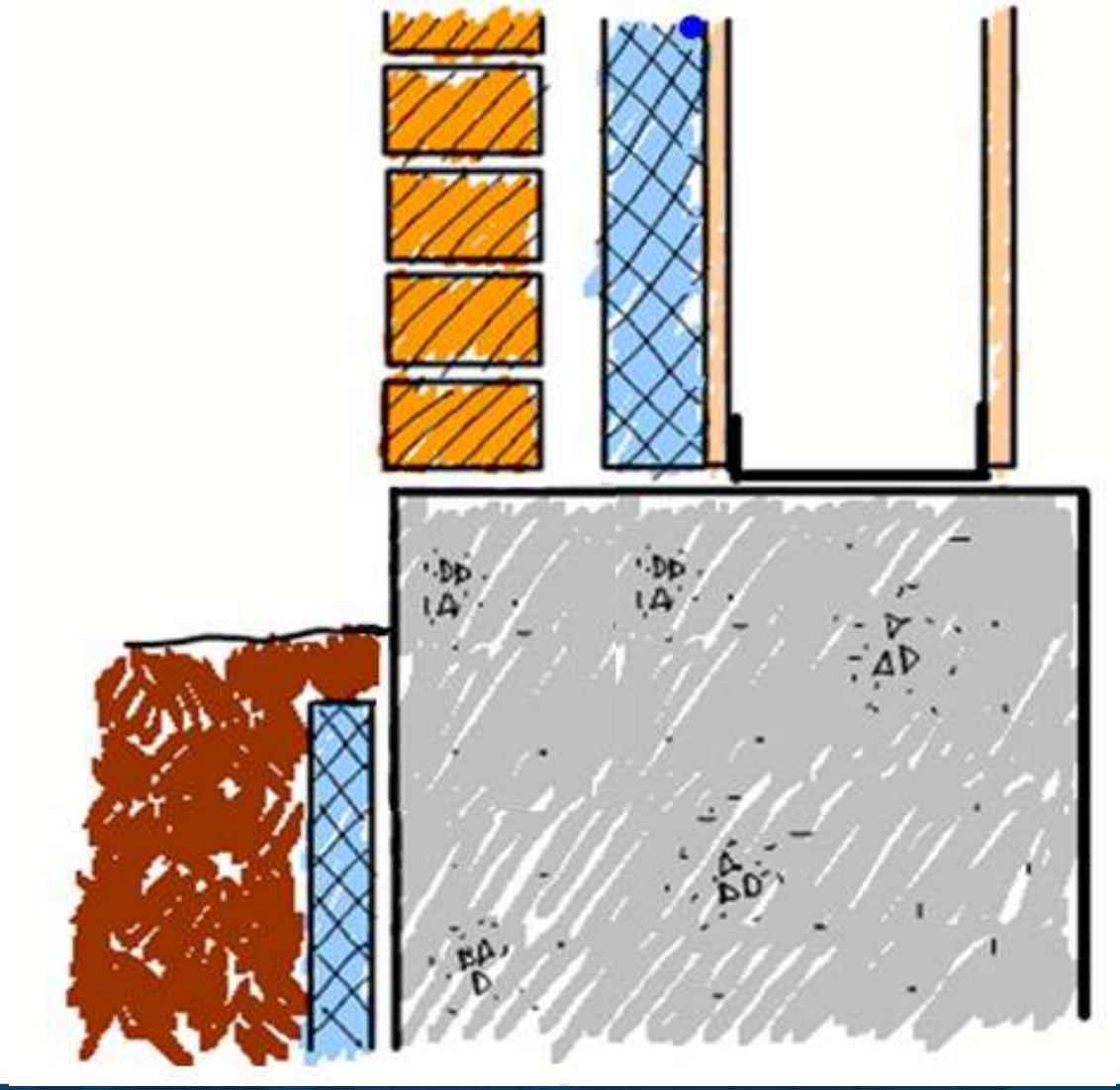
Wood

Foundation Detail

NO WATERPROOFING

MASONRY ABOVE GRADE

SOG



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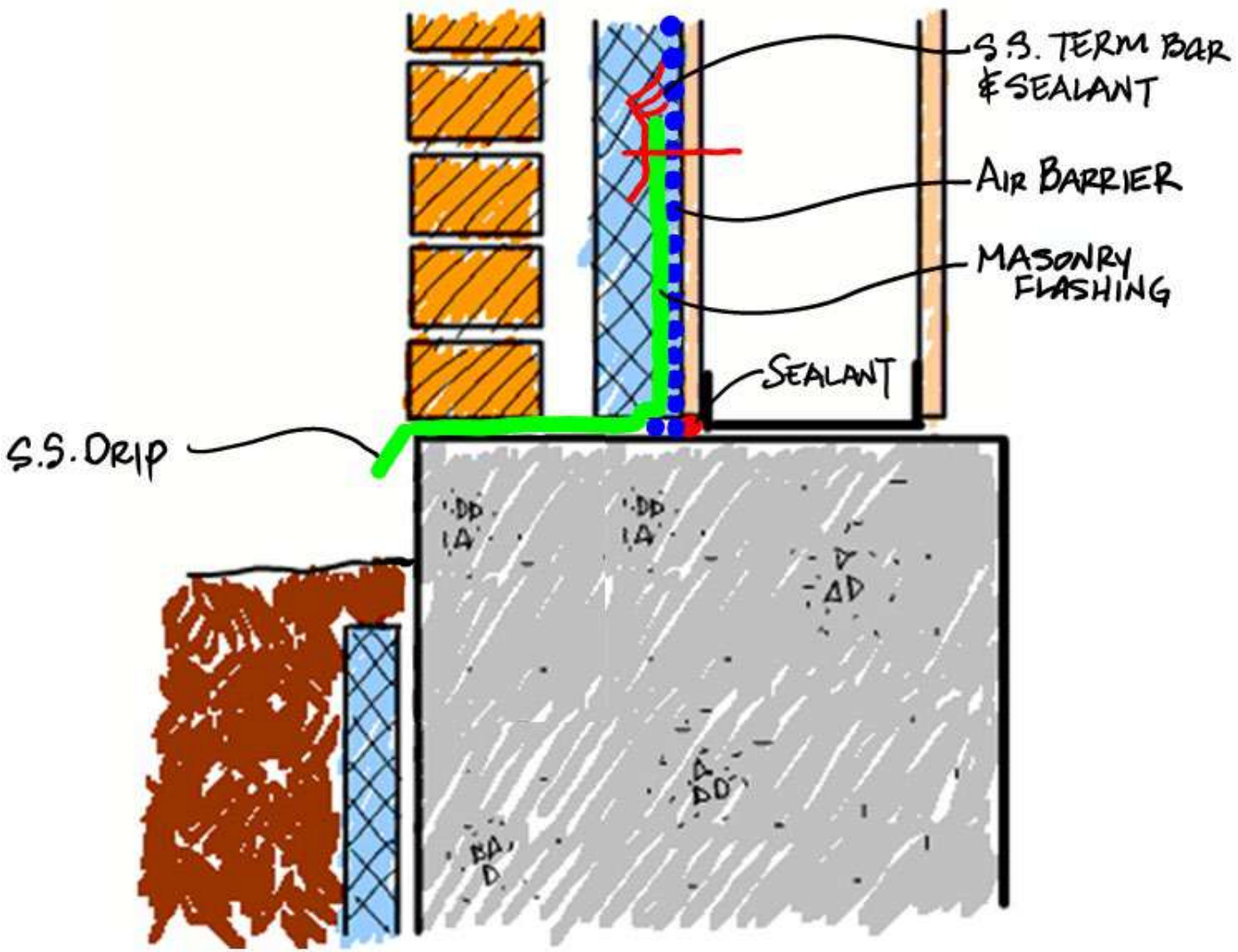
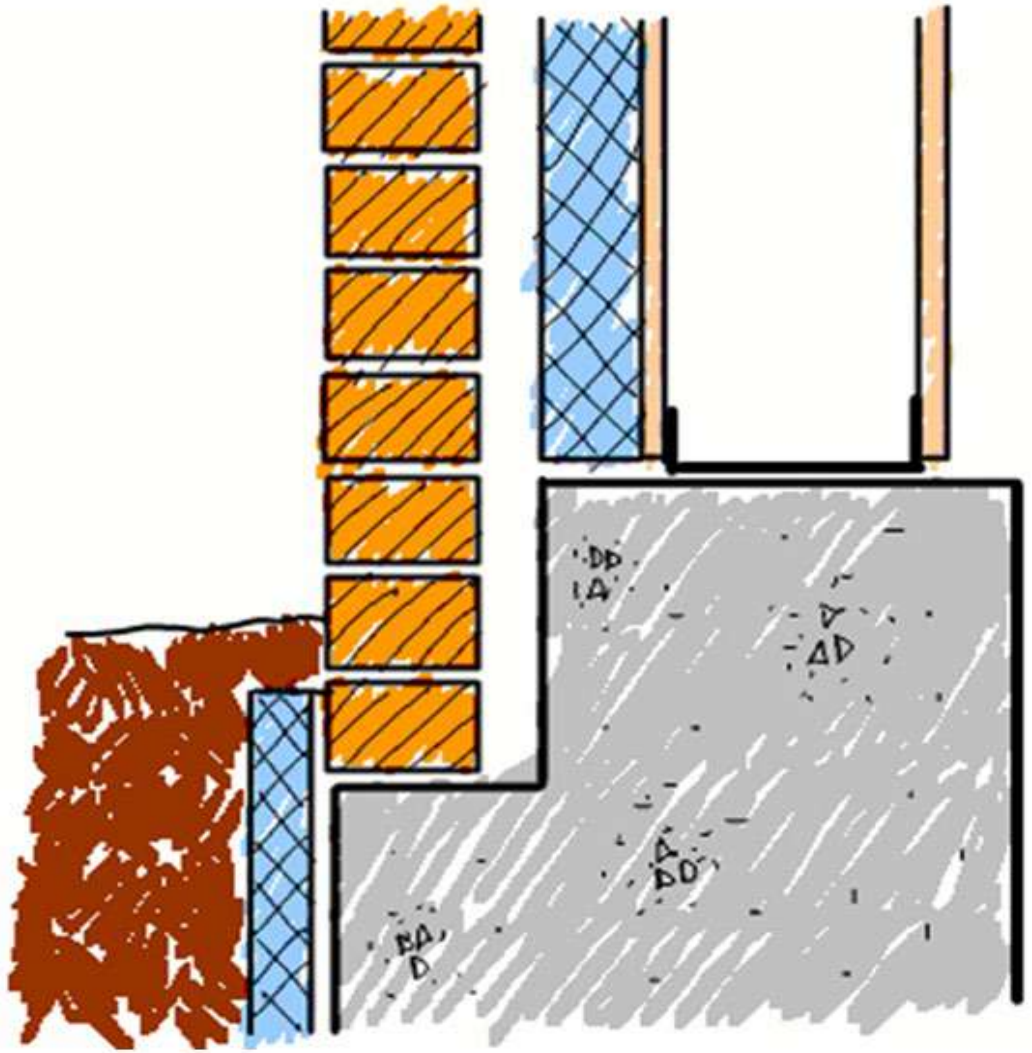
SOG



Foundation Detail

HOT OR LIQUID WATERPROOFING

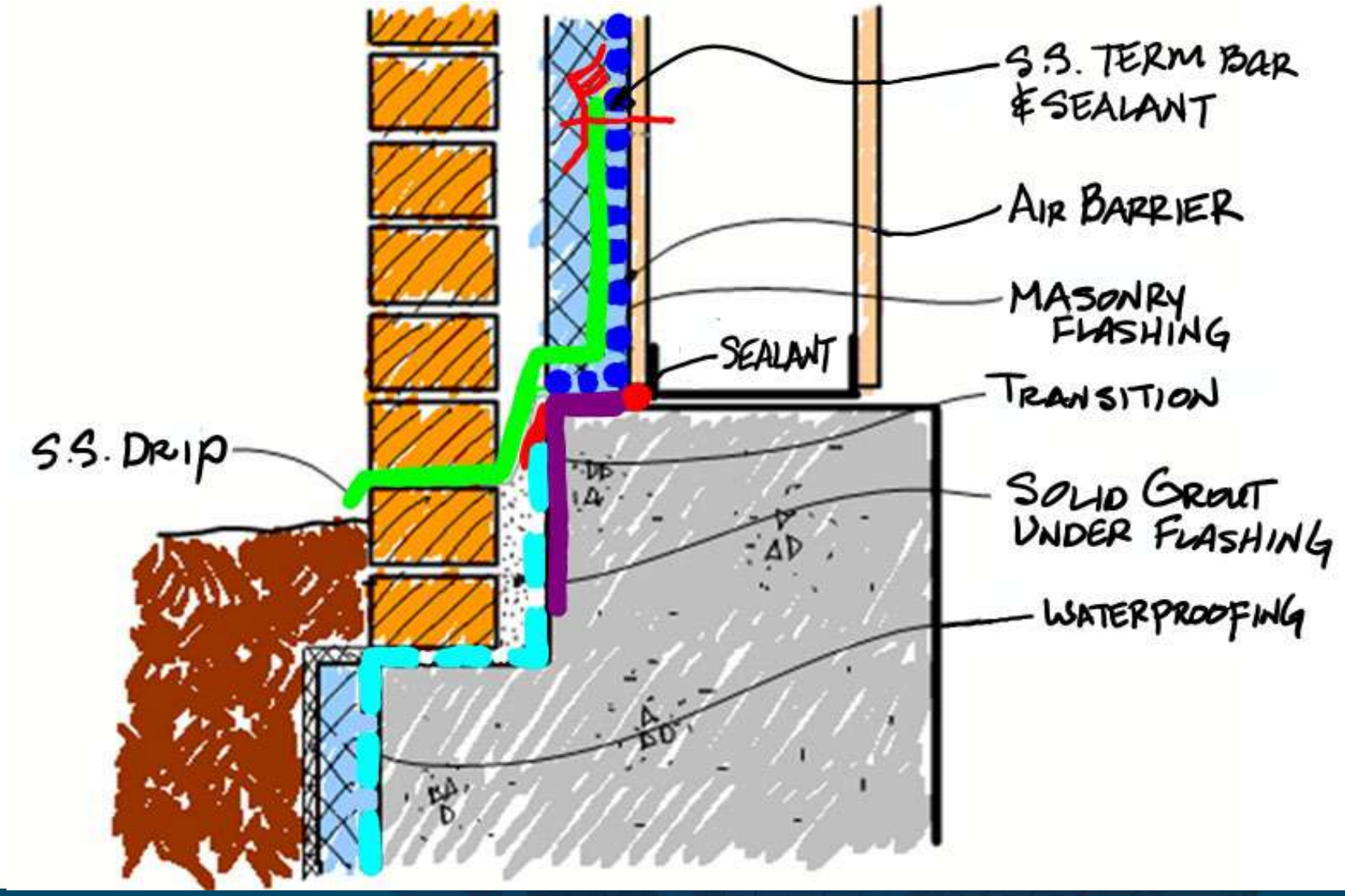
MASONRY BELOW GRADE



Foundation Detail

HOT OR LIQUID WATER-PROOFING

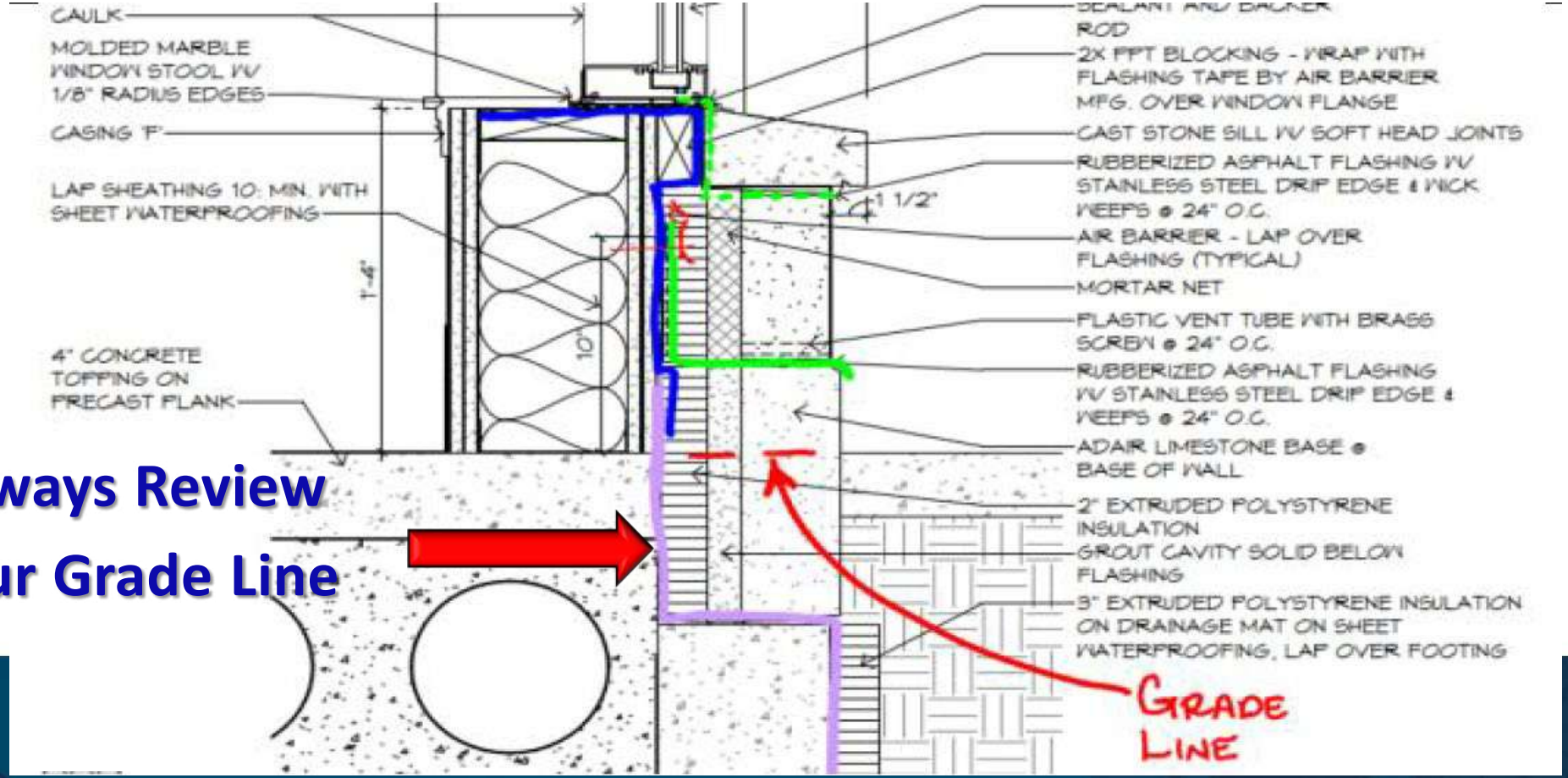
MASONRY BELOW GRADE



Base of wall flashing

Review if we have a portion of the air barrier going below grade

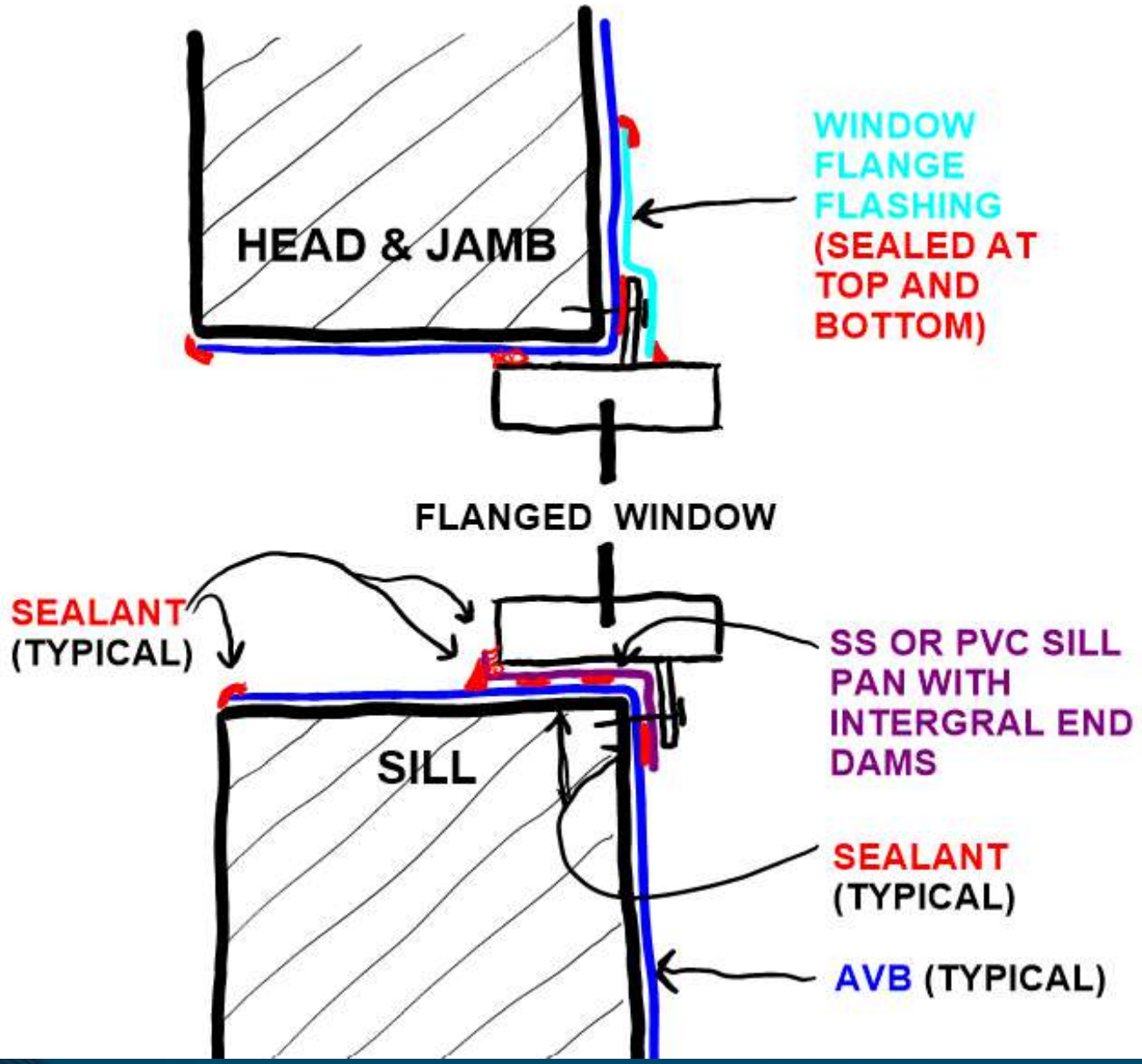
We need to install waterproofing, waterproof transition, or AVB that is waterproof and is designed to go below grade



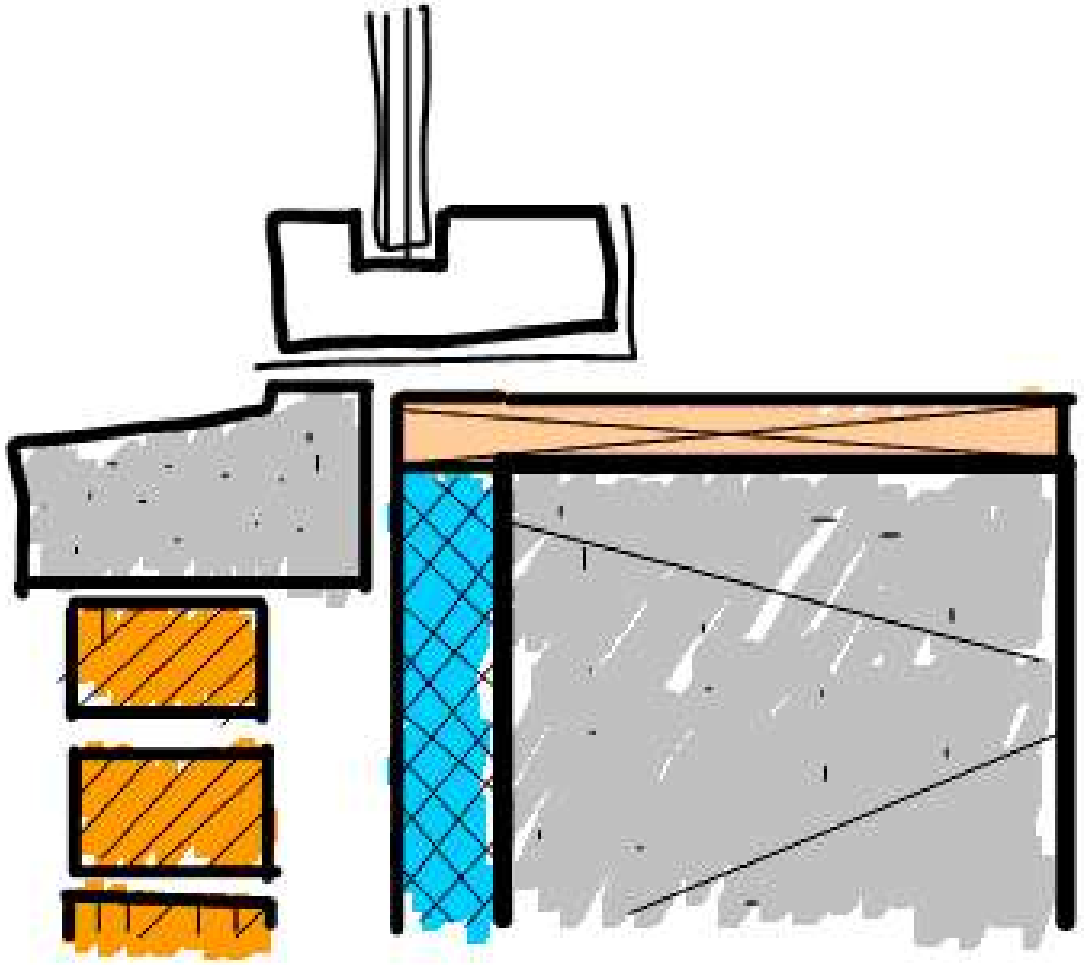
Always Review

Your Grade Line

Flanged Window Detailing



Storefront



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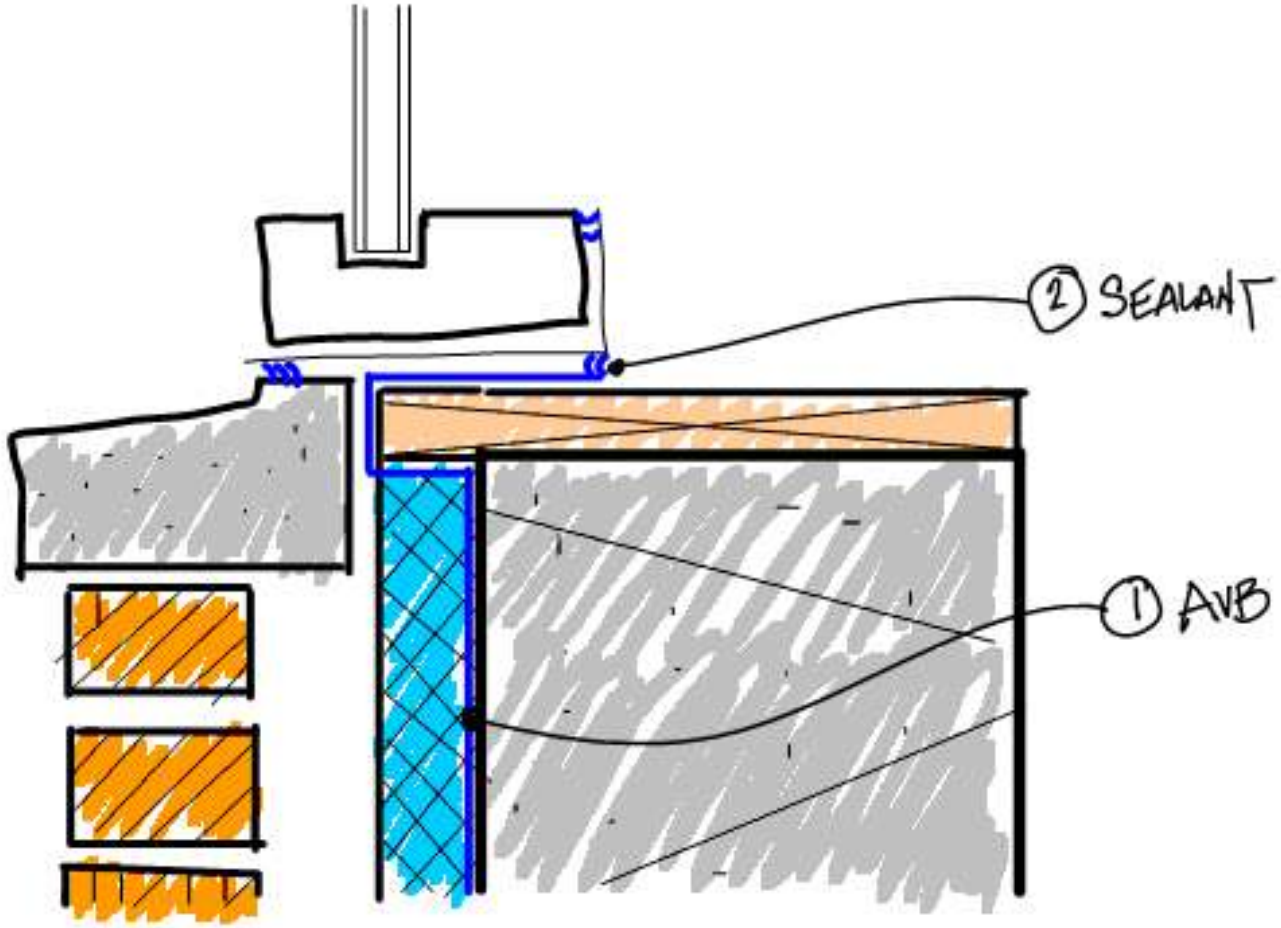
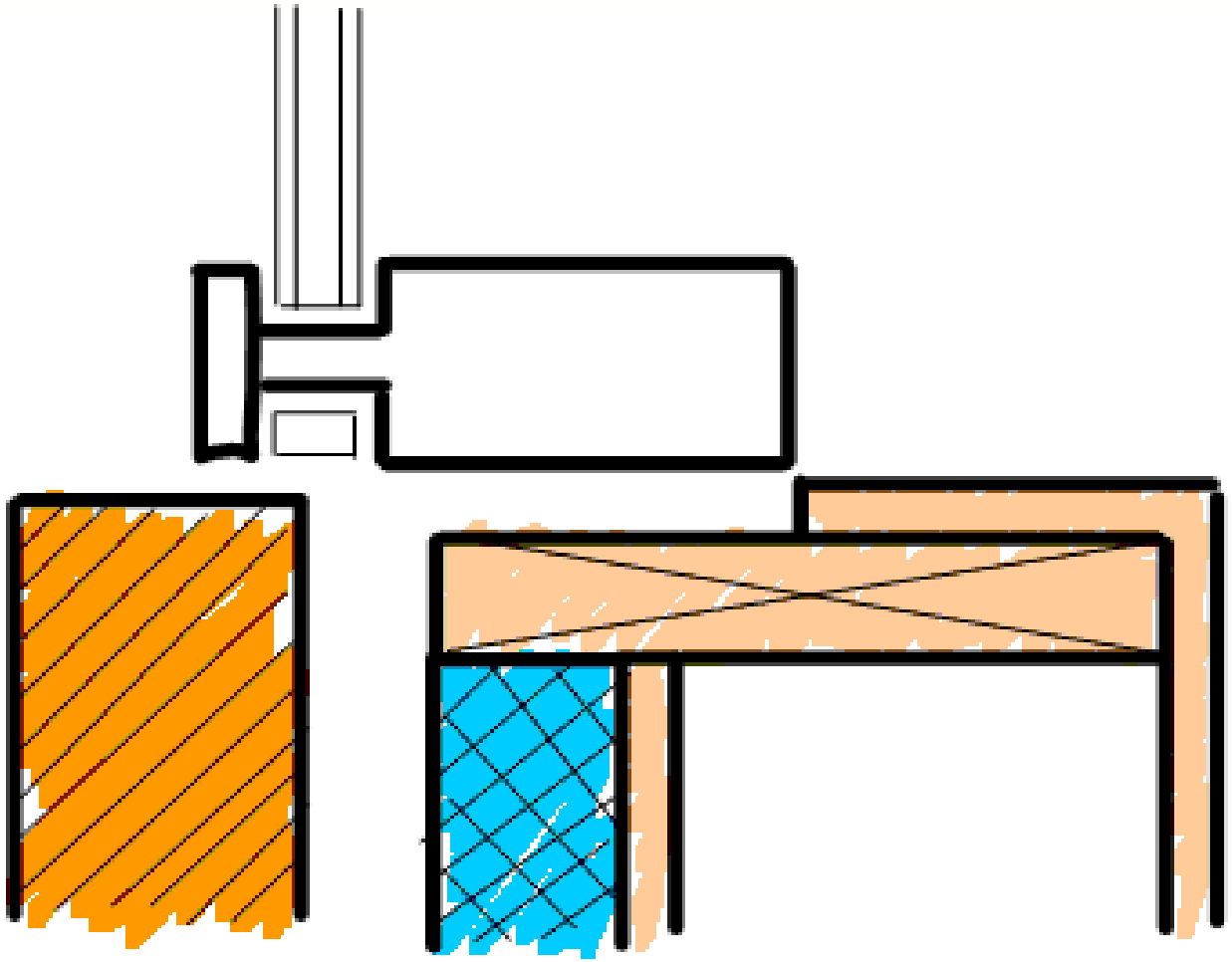
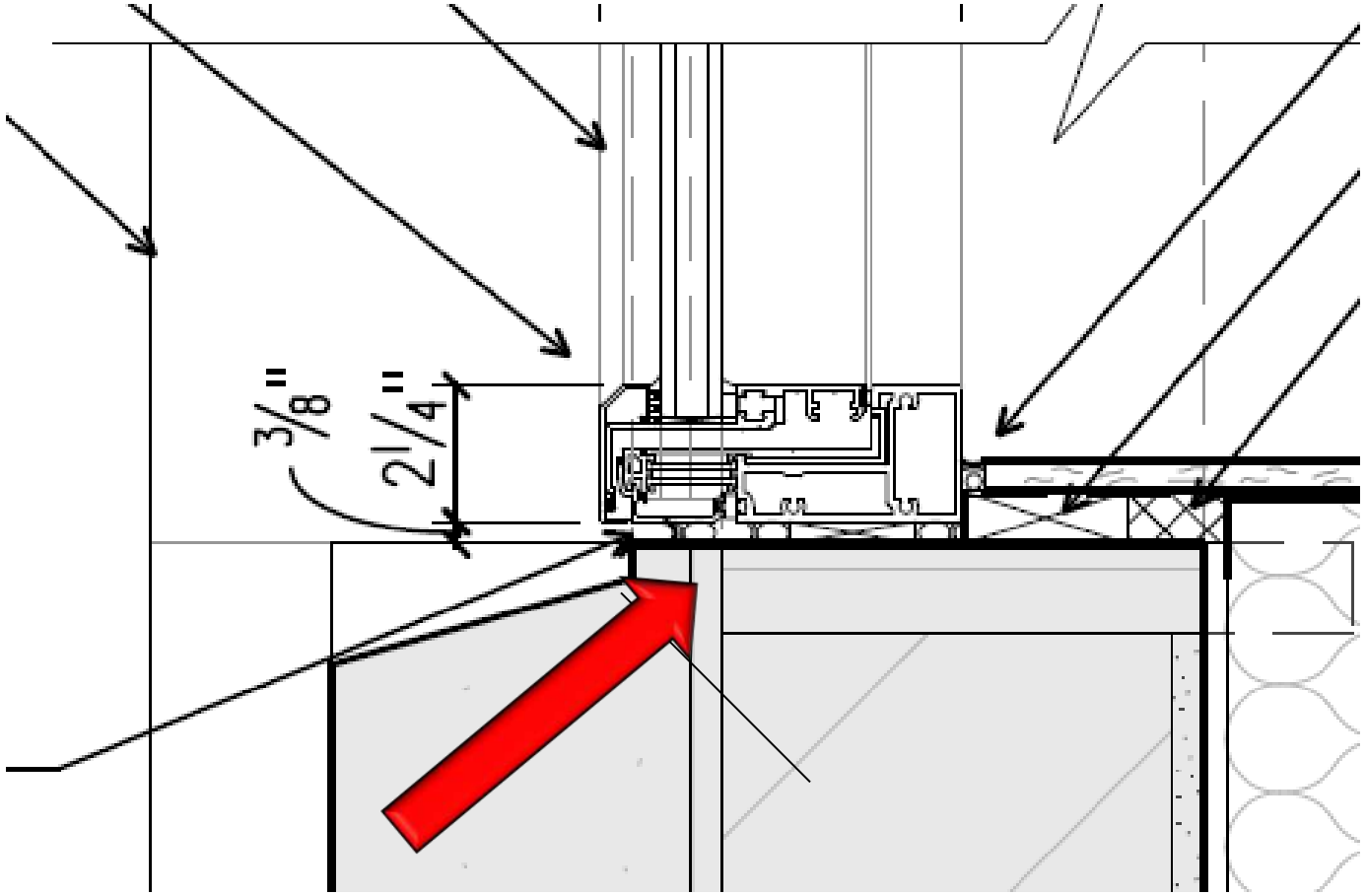


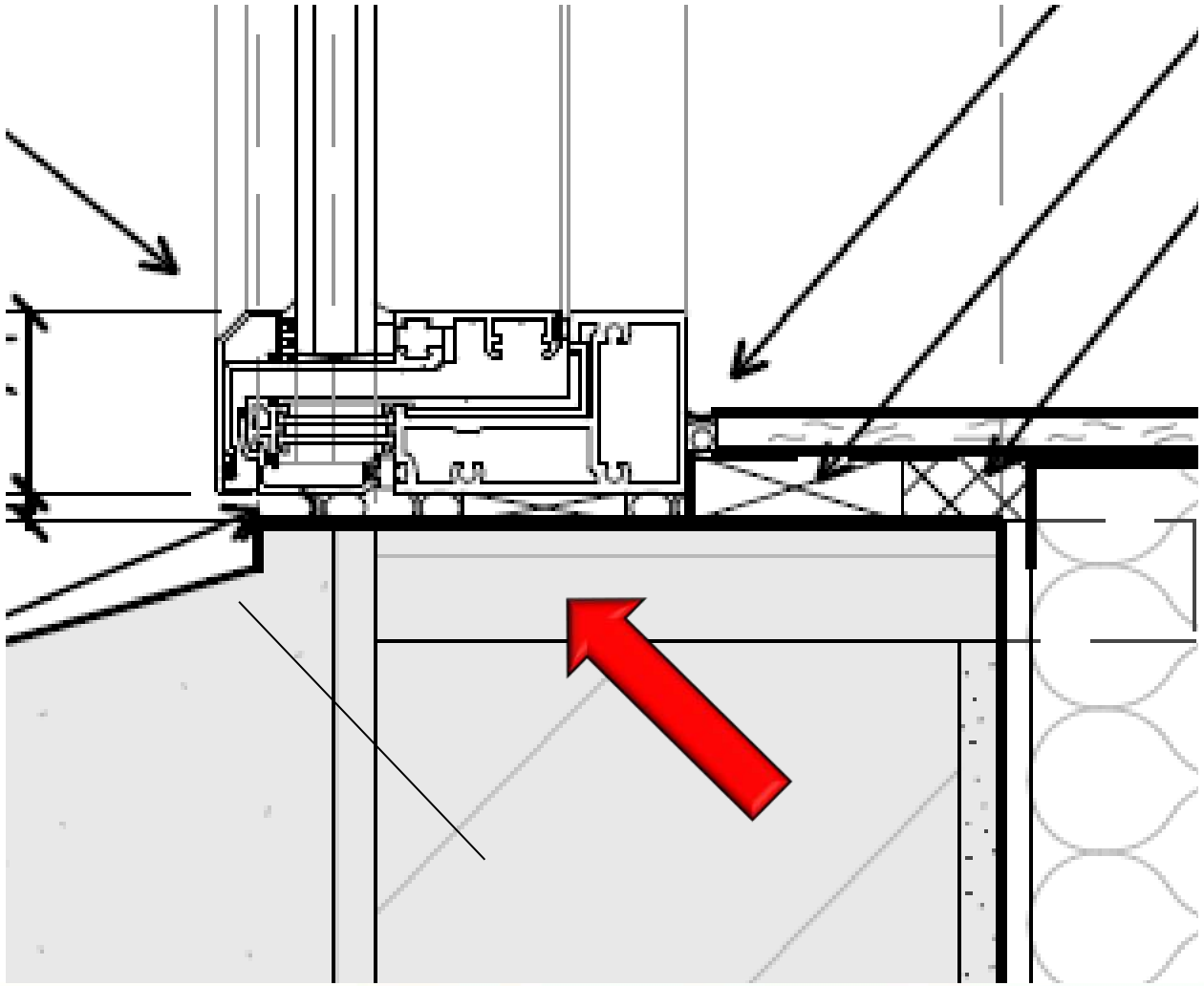
Curtainwall



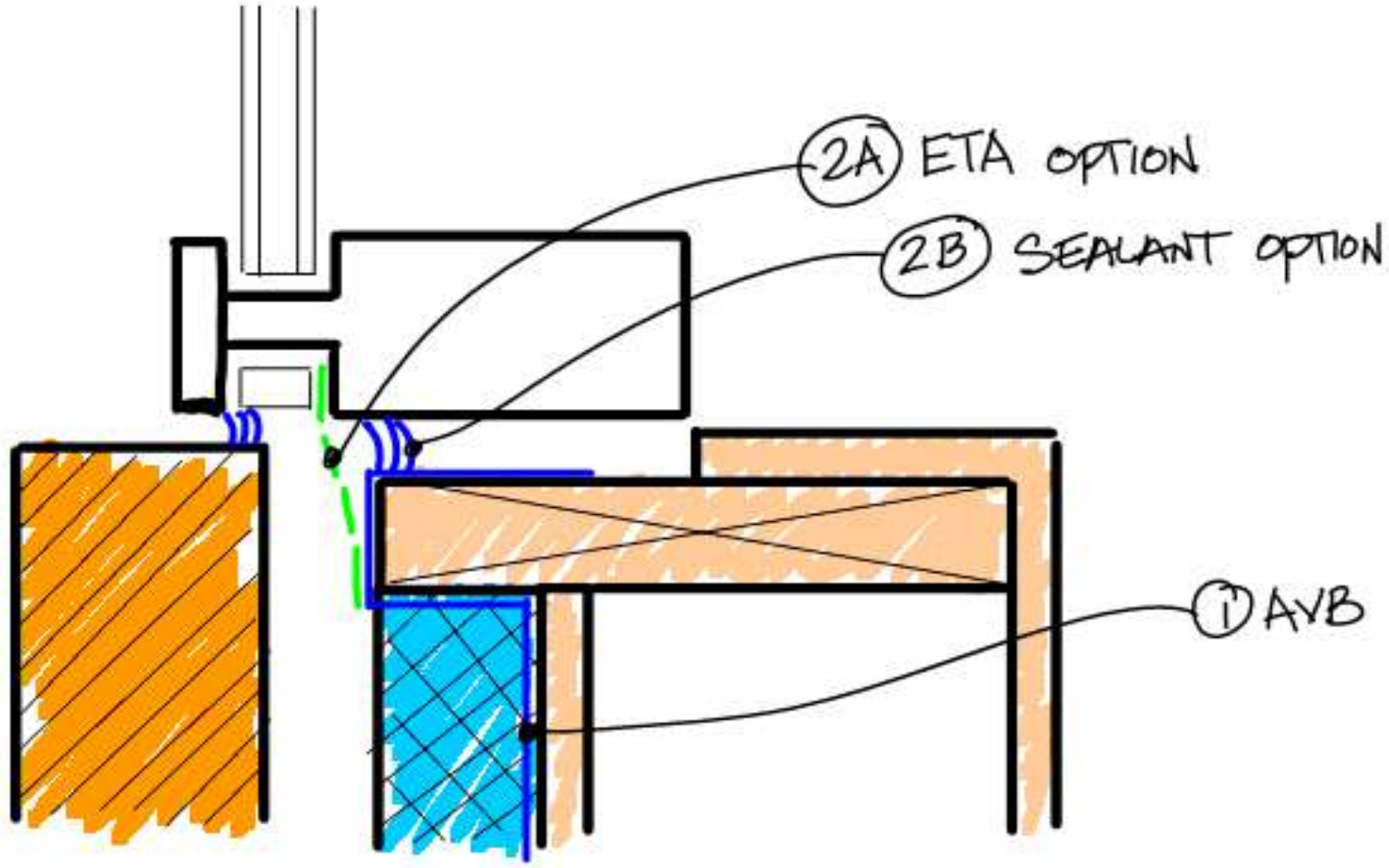
Curtainwall – No Sill



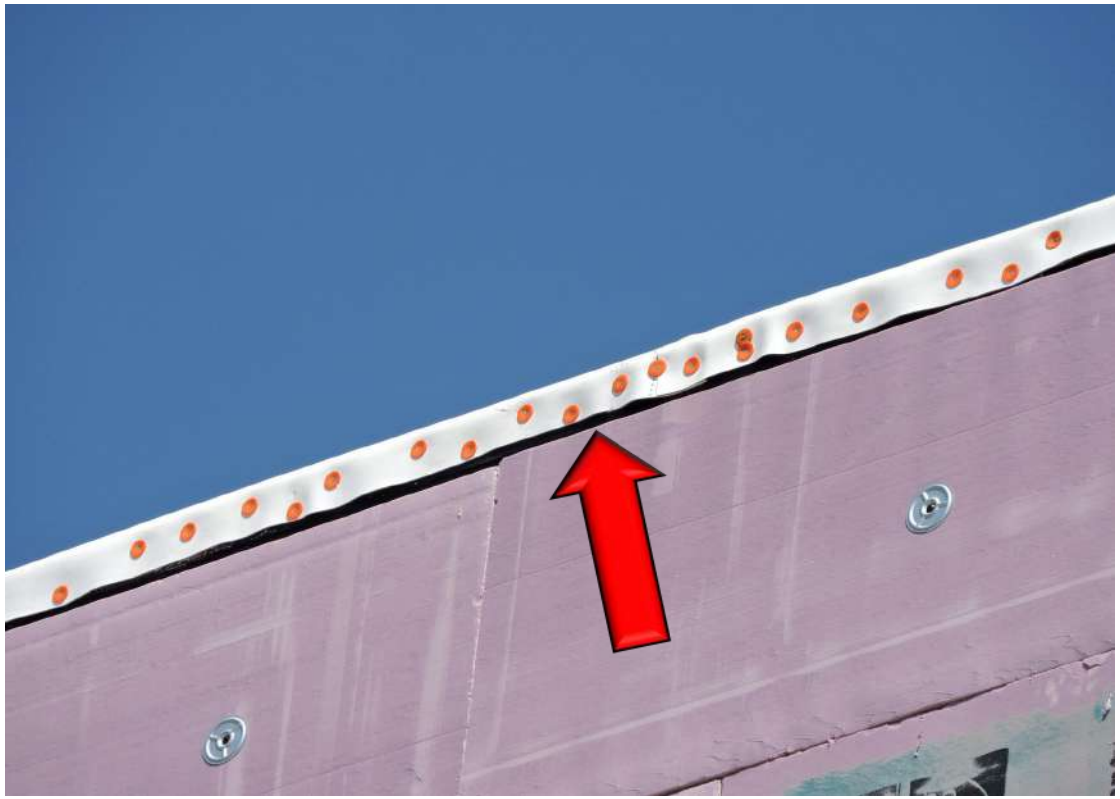
Curtainwall – No Sill

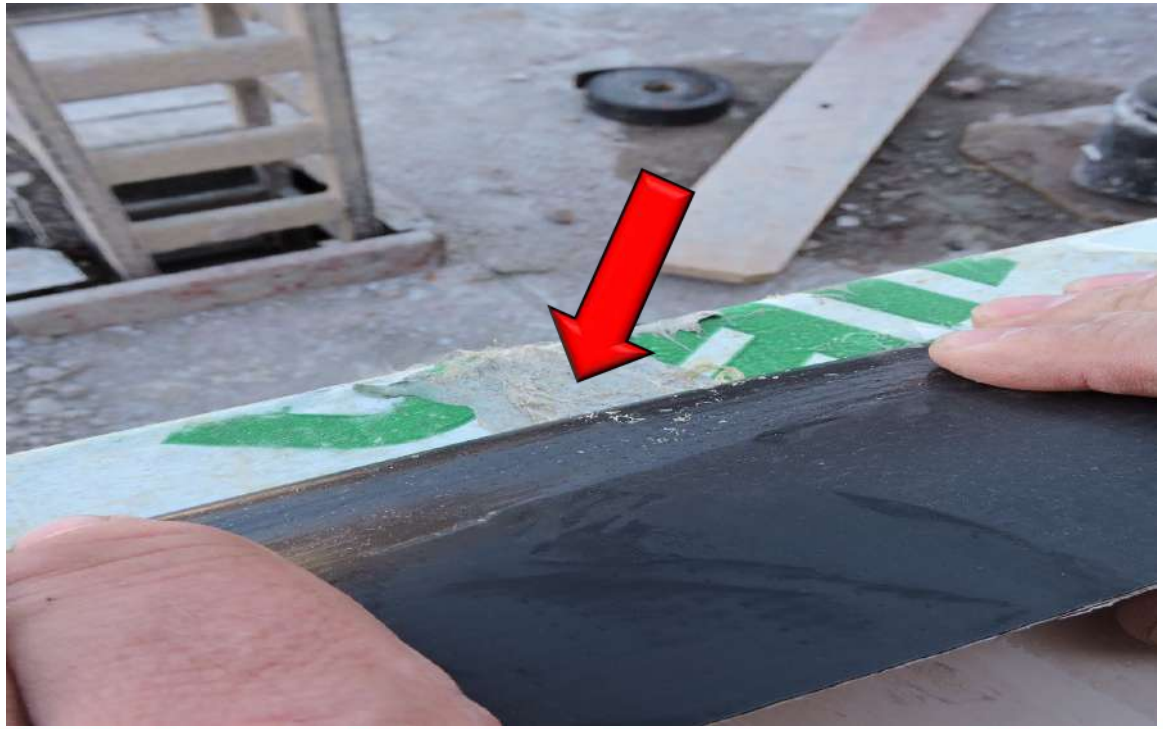


Curtainwall



Parapet

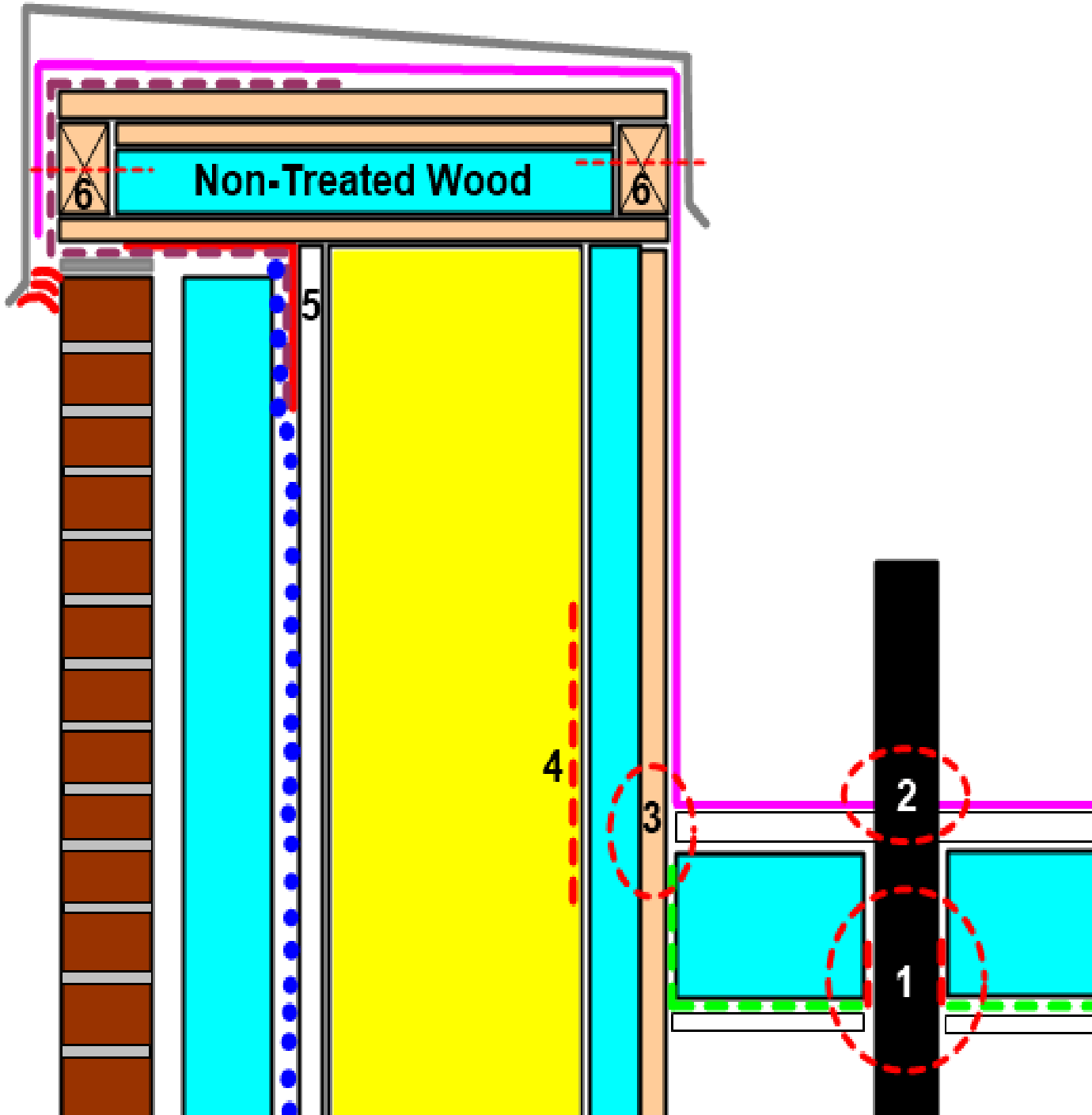




Parapet

1 – Detail at VR
2 – Detail at roofing
3 – VR not under roofing
4 – Potential 16ga strap
5 – 14 ga parapet support
6 – Must be solid 2x wood

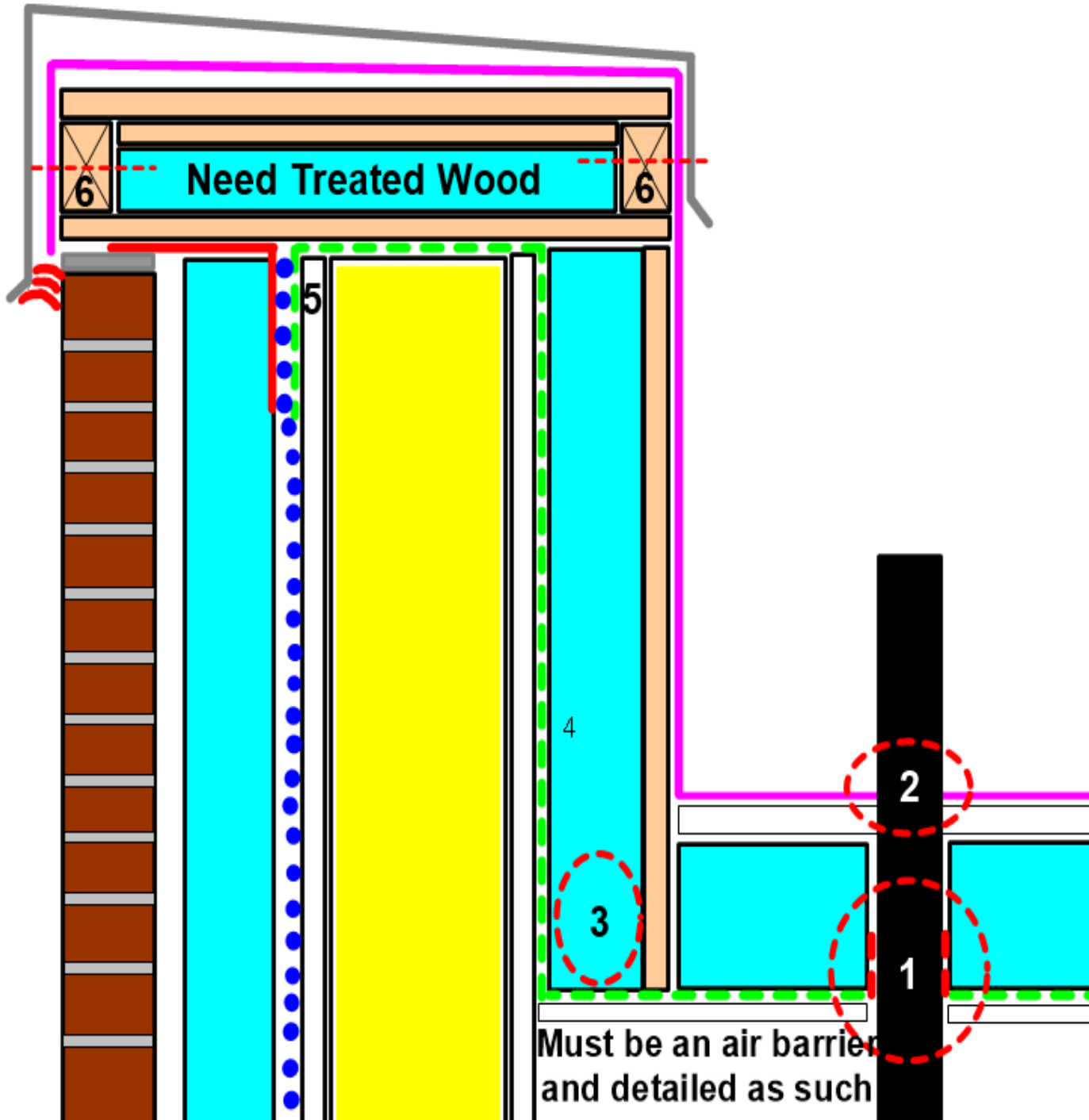
Wood should be non-treated



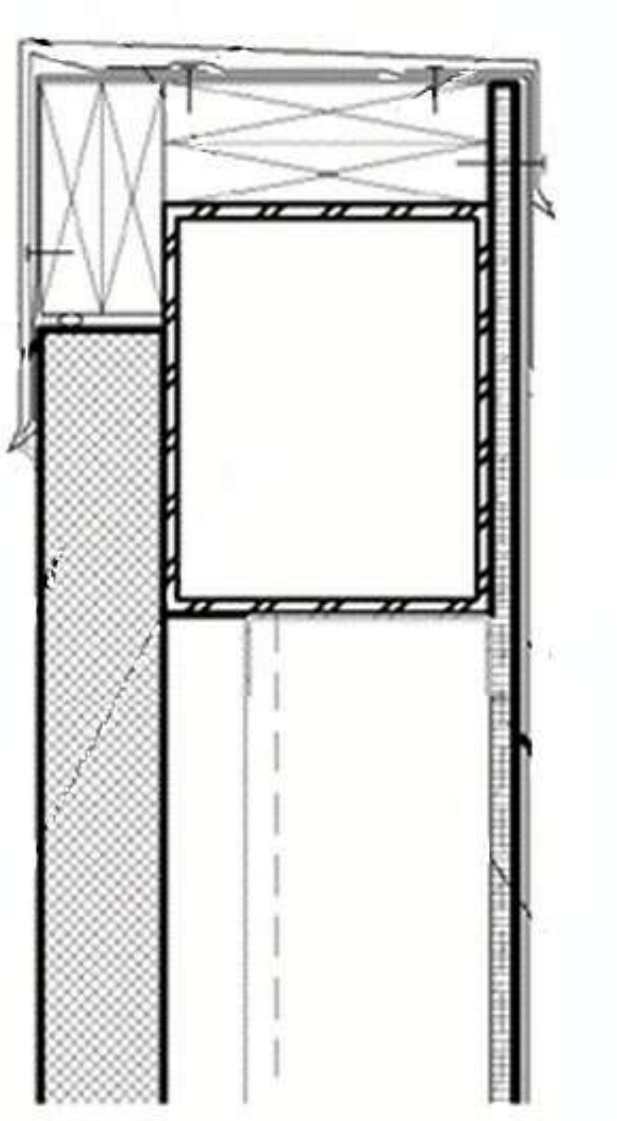
Parapet

1 – Detail at VR
2 – Detail at roofing
3 – VR seals interior
4 – VR up back of wall
5 – 14 ga parapet support
6 – must be solid 2x wood

Wood should be treated



Parapet



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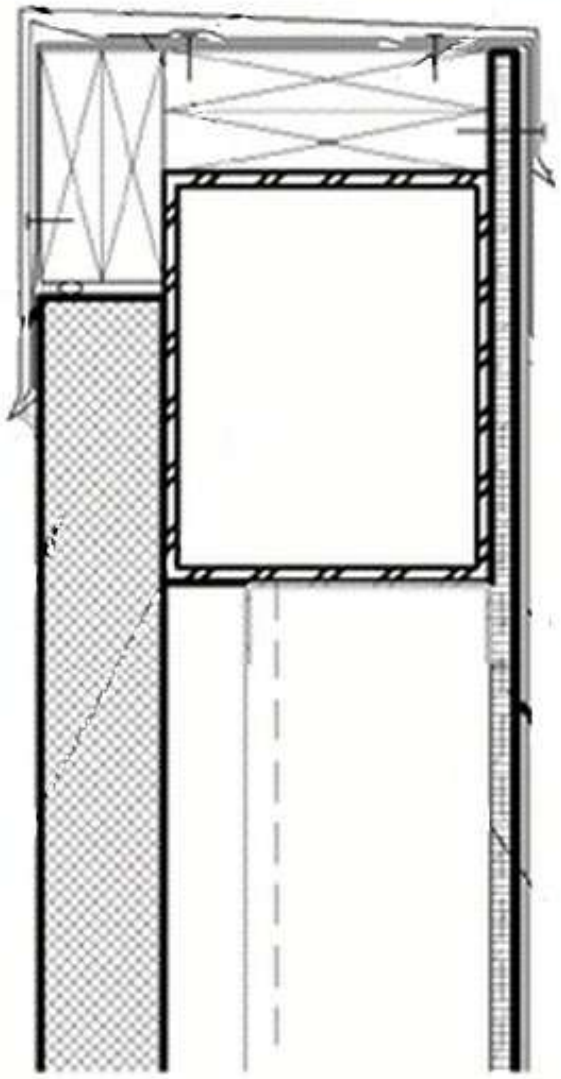
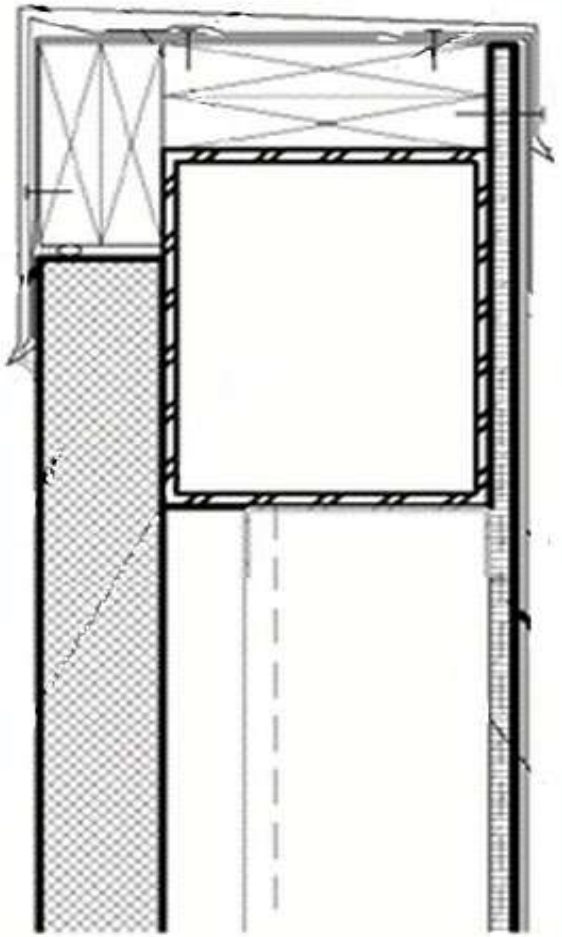


ROOFING

AVB TRANSITION MEMBRANE

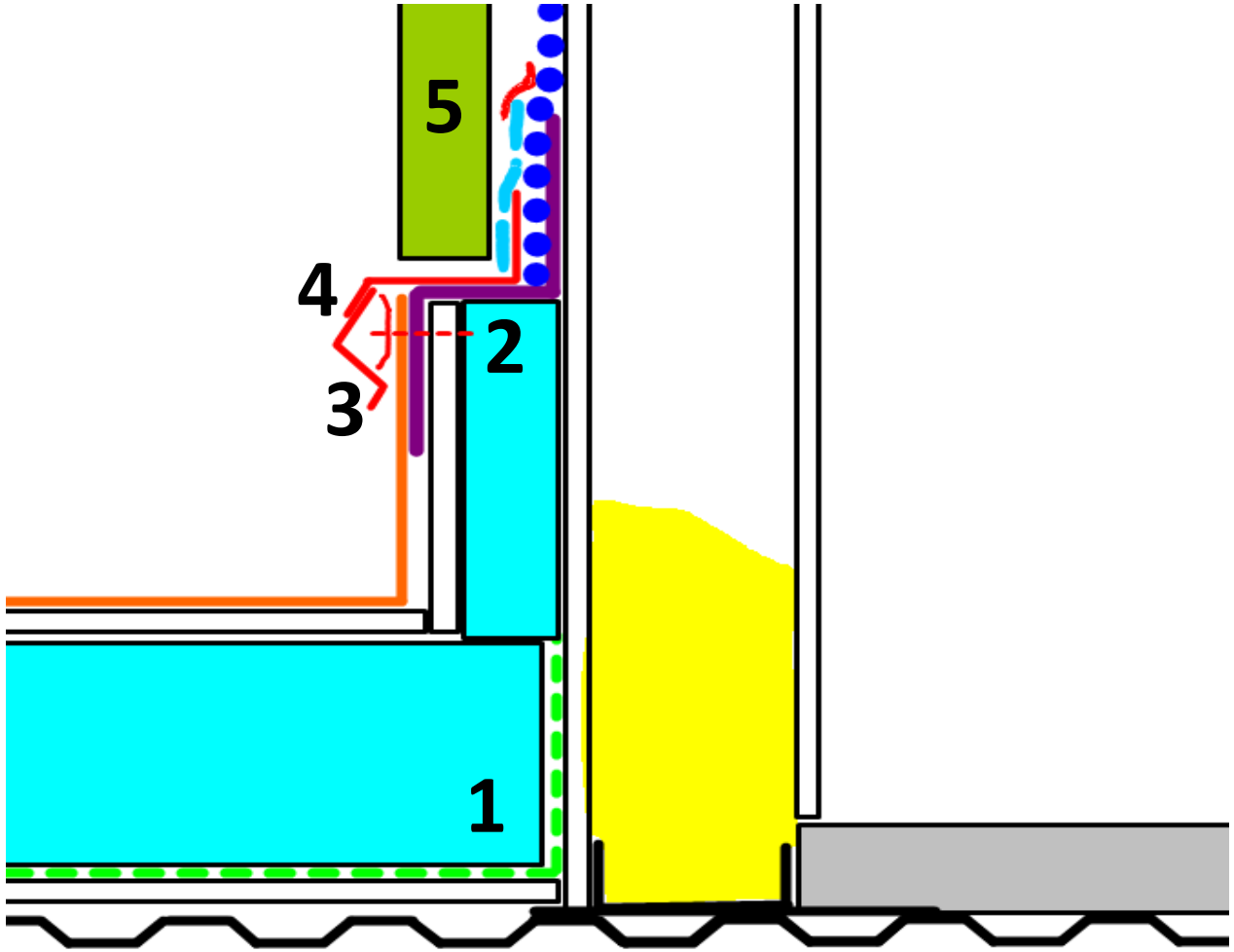
METAL PANEL FRONT FACE AVB PLANE

METAL PANEL BACK FACE AVB PLANE



Roof / Wall Detailing

1 – Roof VB
2 – Transition membrane – should overlap at least 4”-6”
3 – Term bar & Sealant
4 – 2-piece receiver flashing
5 – Flashing over receiver and sealed at the leading edge



Fireproofing & AVB

Unless allowable by the manufacturer and tested, SPF or AVB should not be on spray fireproofing

Fireproofing & AVB

Dear Subscribers,

UL has been asked to provide guidance for the condition where sprayed polyurethane foam would be applied over Sprayed Fire Resistive Materials (SFRM) or Intumescent Fire Resistive Materials (IFRM) Coatings as specified in a UL design. At this time we are prepared to place the following statement in the BXUV, CDWZ and CHPX Guide Information Page:

> *Unless otherwise noted in the individual design or certification published in UL's Online Certifications Directory, the application of sprayed polyurethane foam or other insulation over Sprayed Fire Resistive Materials (SFRM) or Intumescent Fire Resistive Materials (IFRM) coatings has not been investigated.*

In addition to this statement UL is considering the development of a certification program for thermal barriers to be used in conjunction with fire-resistance rated assemblies, to help satisfy conditions as that previously menti

If you have any q

When UL states it has not been investigated, it likely means that there is no data to prove that the assembly will perform under fire conditions.

Respectfully,

Frederick E. Hervey
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Luke C. Woods
Principal Engineer – Fire Resistance & Containment
UL LLC
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Fireproofing & AVB

Site Visits are a Must!

THANK YOU

Corey S Zussman

AIA, NCARB, ALA, RBEC, RRC, REWC, RWC, RRO, CDT, CQM,
CxA+BE, BECxP, CABS, LEED® AP BD+C
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