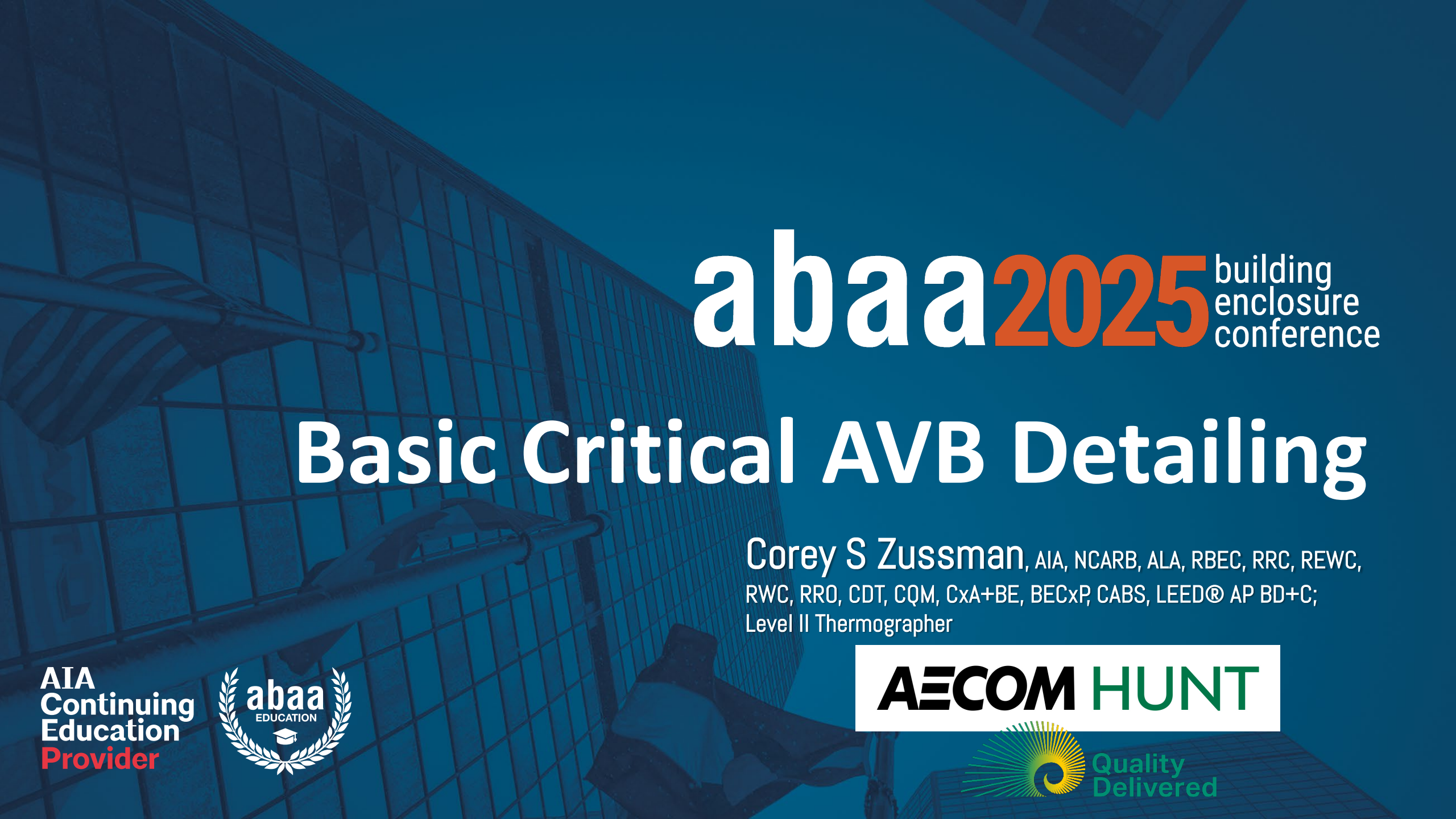


abaa 2025 building enclosure conference

# Basic Critical AVB Detailing

Corey S Zussman, AIA, NCARB, ALA, RBEC, RRC, REWC, RWC, RRO, CDT, CQM, CxA+BE, BECxP, CABS, LEED® AP BD+C; Level II Thermographer

AECOM HUNT

AIA Continuing Education Provider

abaa EDUCATION

Quality Delivered

# 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

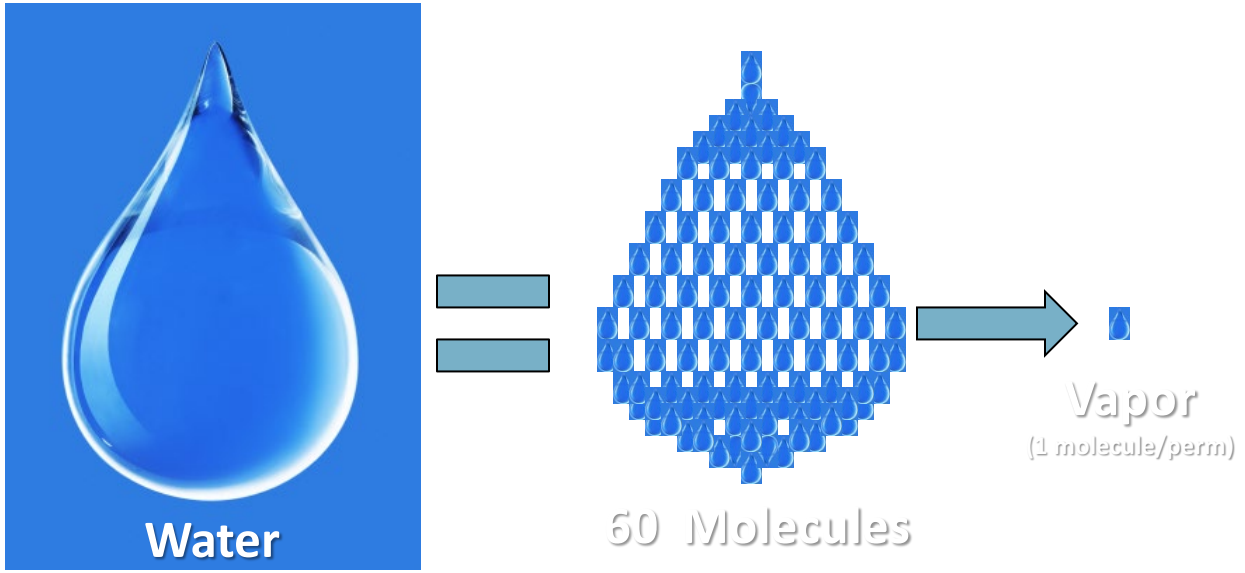
1. *Understand the differences between an air, vapor, and moisture barrier and when to use them.*
2. *Identify and understand the locations of critical transitions regarding the installation of the water, air, vapor, and insulation layers through photos of correct and incorrect installations.*
3. *Learn 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

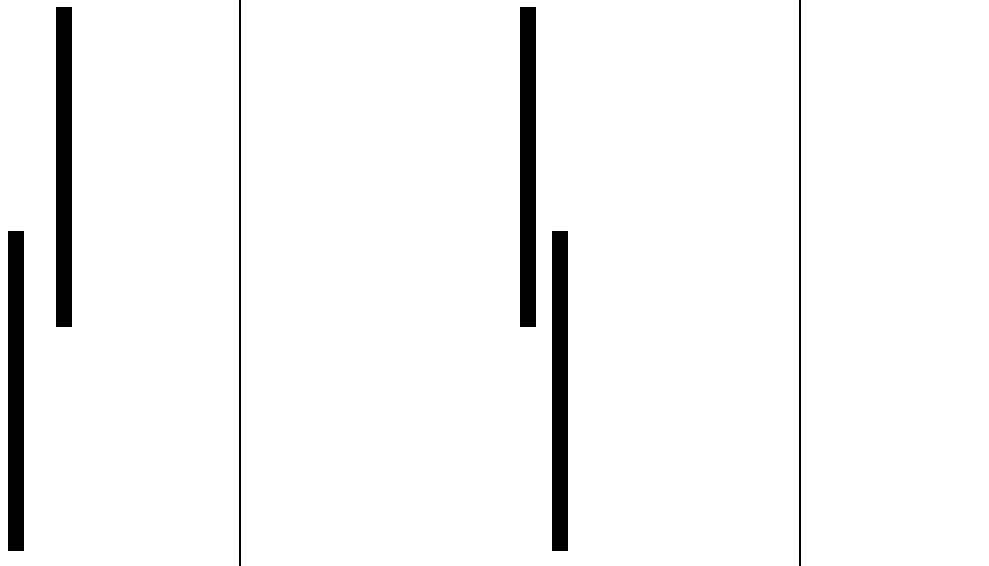
- Durability
- Continual Structural Support
  - Prevents the vibration of the membrane, which will lead to failure.
  - ***Requirement of an Air Barrier***
- Continuity
- Six Sides of Installation
- Compatibility with adjacent materials
- A product that the manufacture declares and has installation instructions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

# Difference Between Barriers

MOISTURE BARRIER

VAPOR RETARDER

AIR BARRIER




# 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***

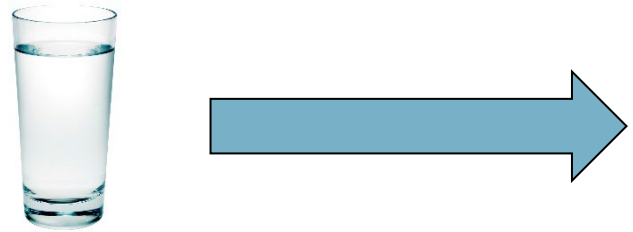
# Condensation / Vapor

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

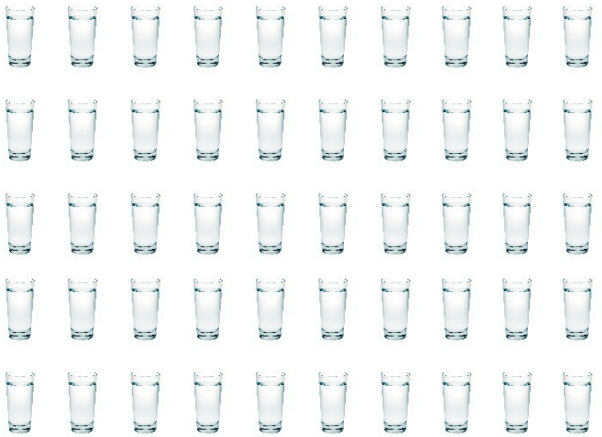
Ice Water Elevation

# 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)

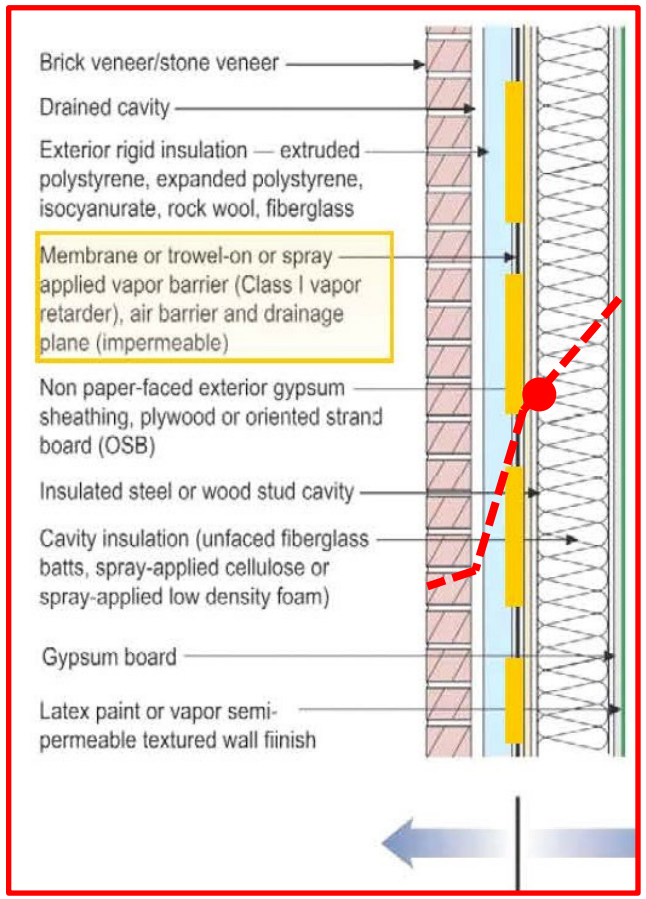


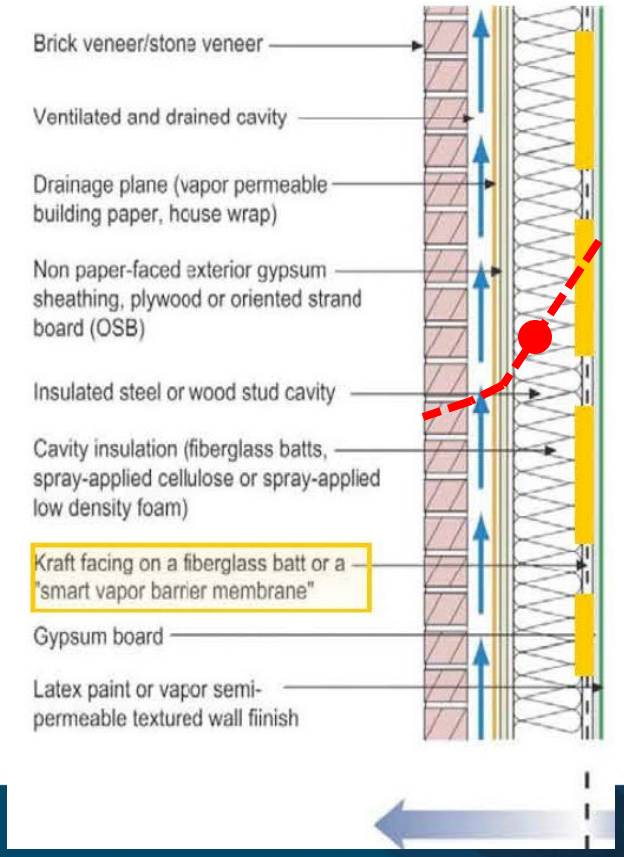
Diffusion Alone

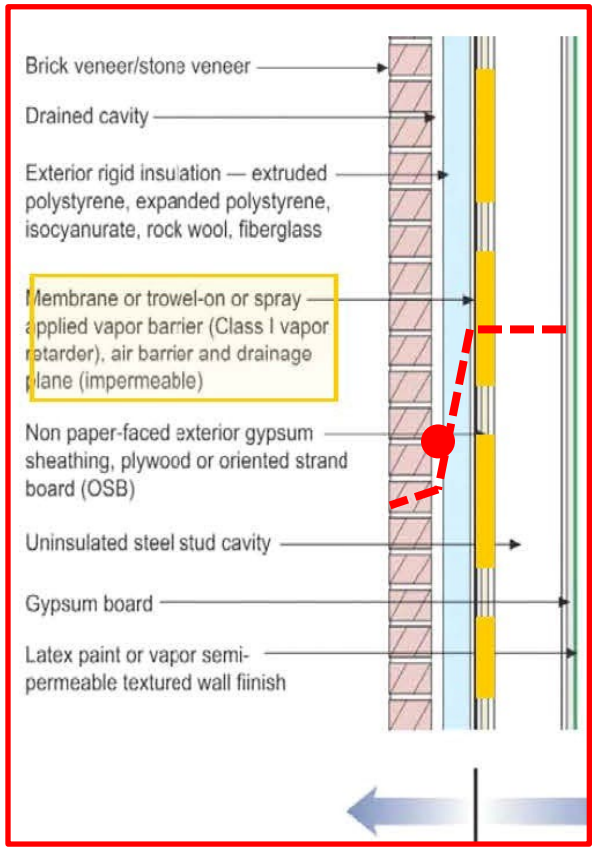


1sq. In. hole
With
Air Movement

# Heat Movement Within a Wall

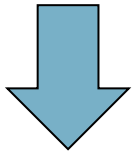


# Thermal Break Location

- 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

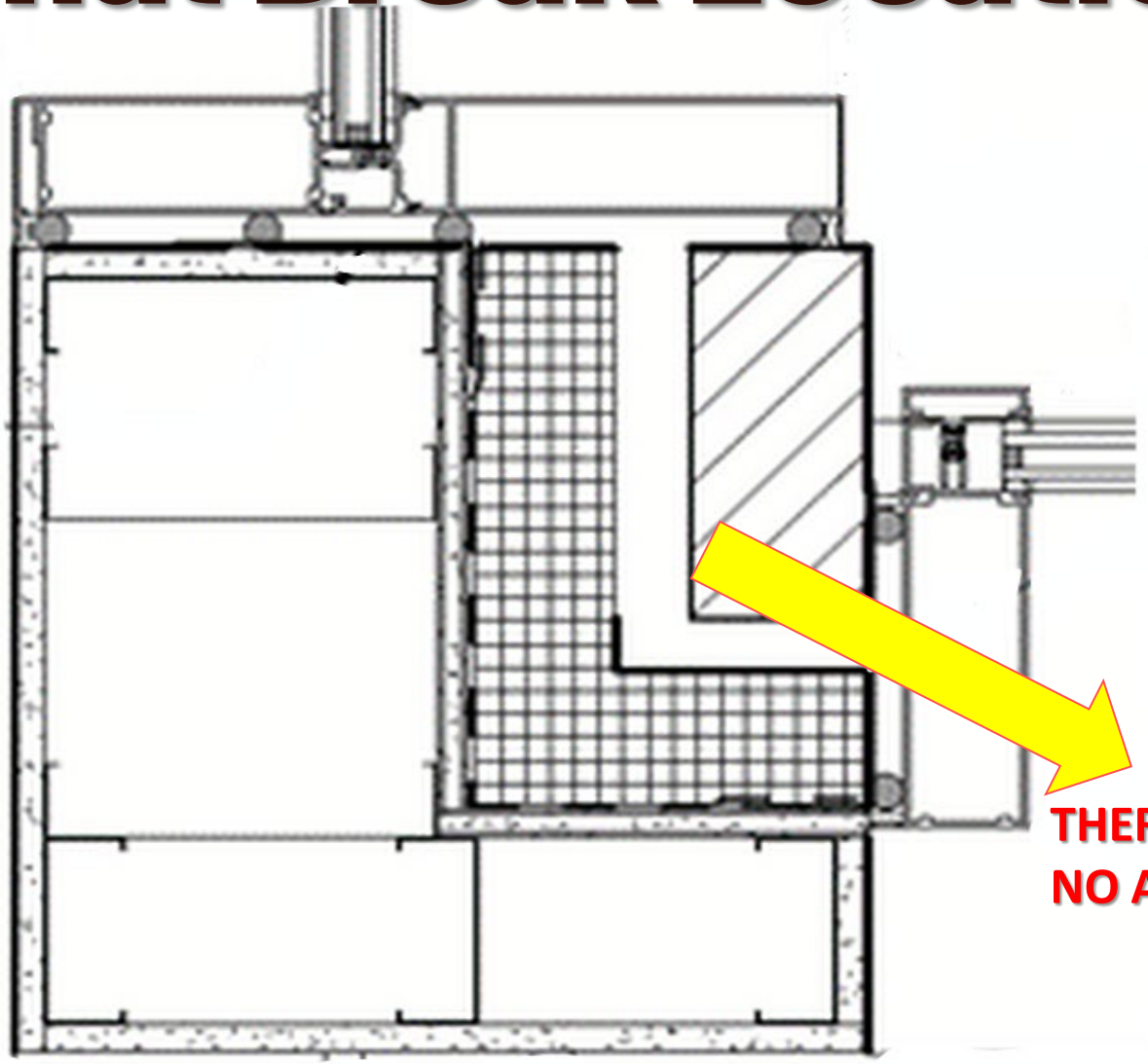
- Location of the thermal break must be with-in the warm side of the wall…if on the cold side, the aluminum will be cold on both sides of the thermal break.

# Thermal Break Location

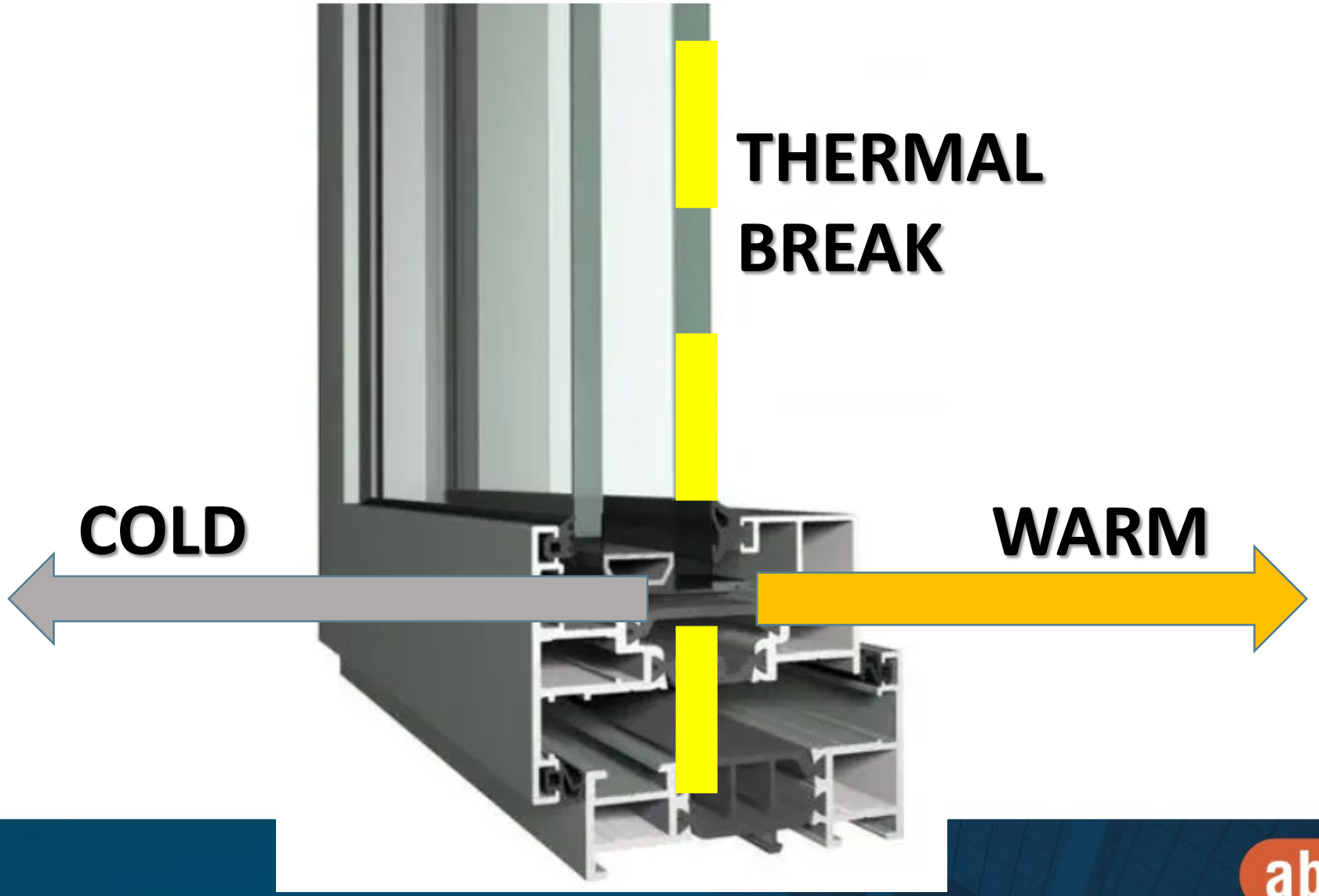
## Alignment or Near Alignment is important

***Per ASHRAE 90.1:***

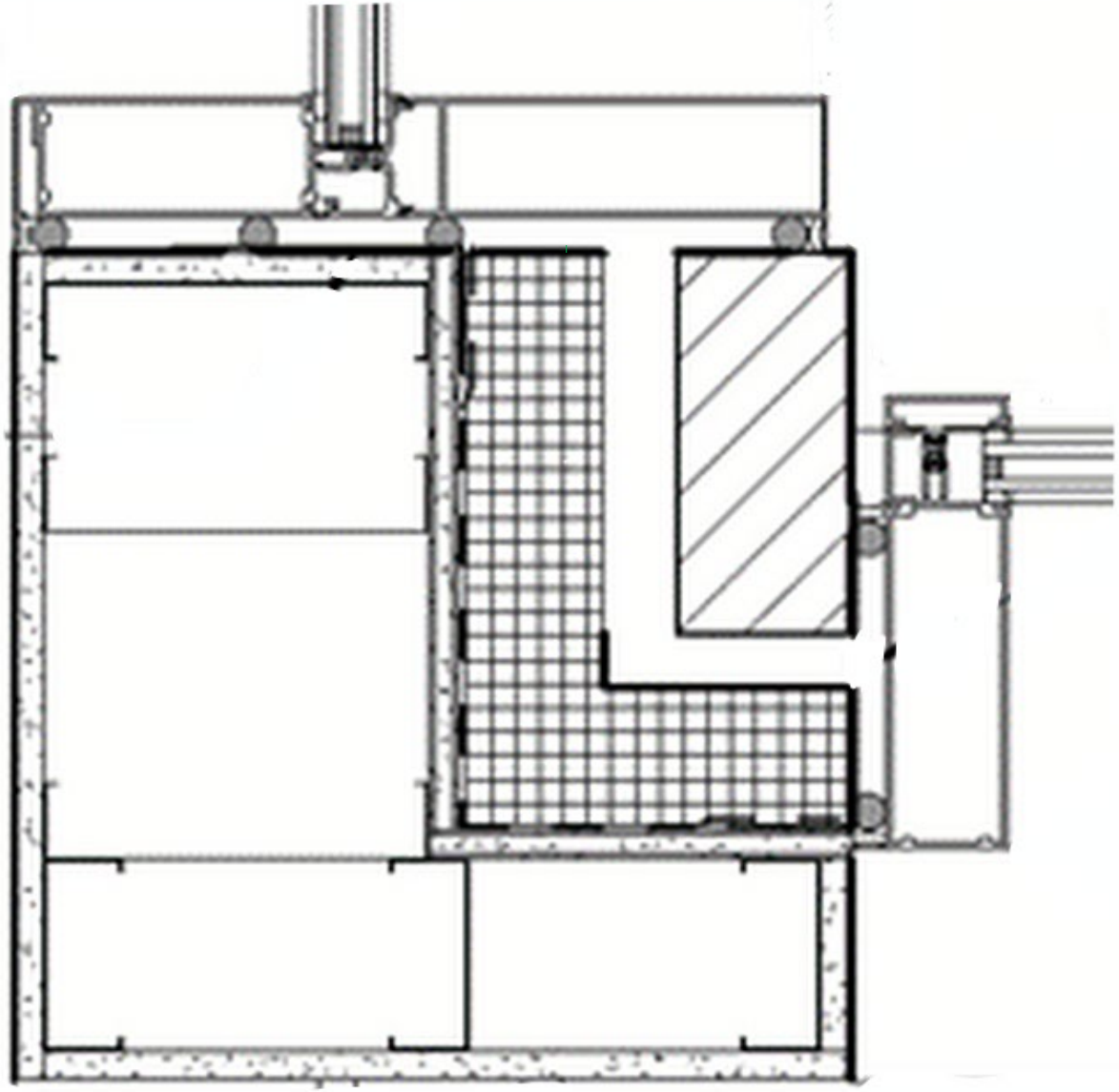
***The primary requirement is to align the glazing layer within 2” of the wall’s continuous insulation (such as mineral wool or foam), or within 2” of the exterior side of the cavity insulation when there is no continuous insulation.***



# Thermal Break Location



# Thermal Break Location



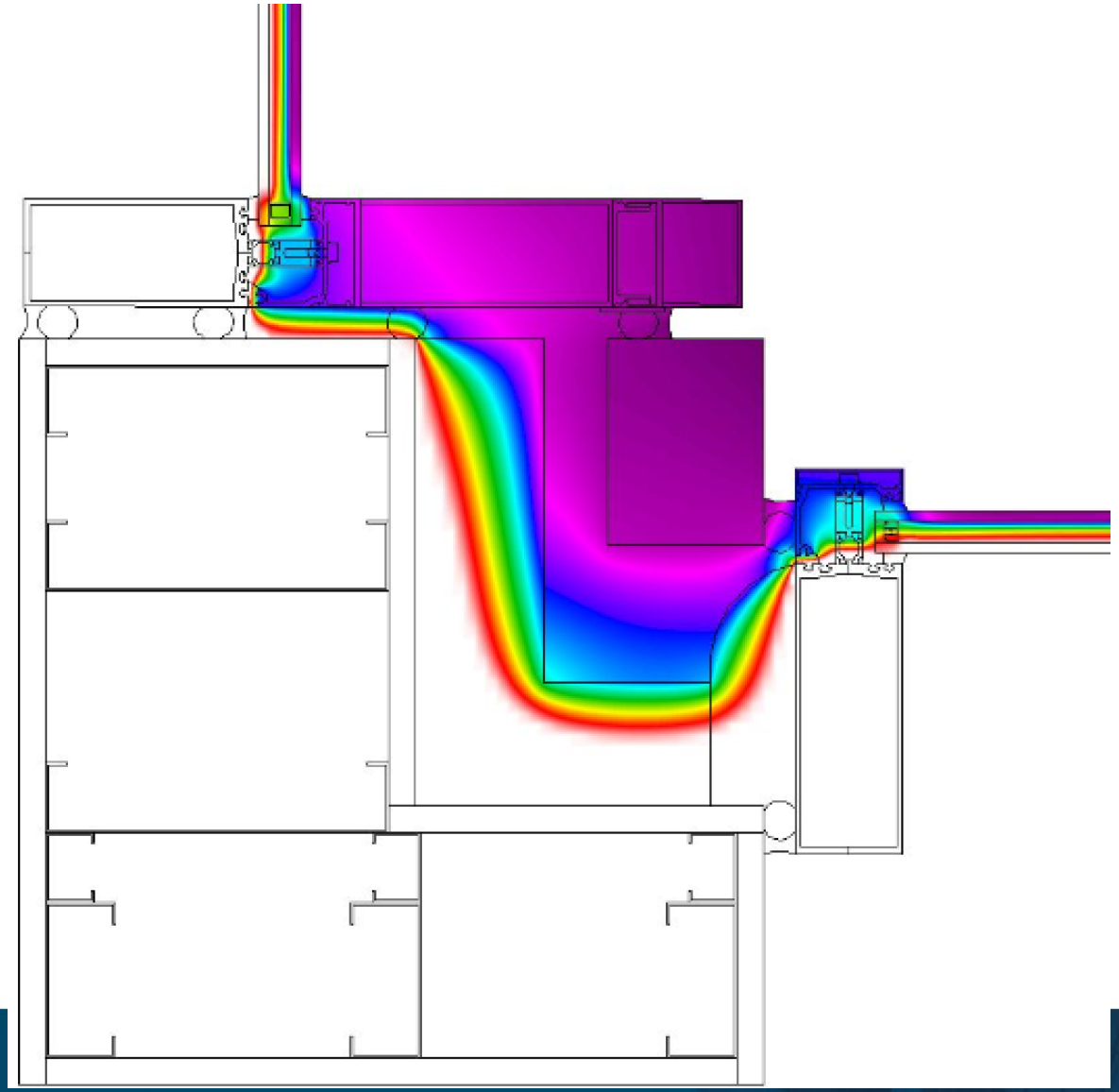
Precured Silicone

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

# 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

# Vapor Retarder- Self-adhered Sheets

# Vapor Retarder- Liquid applied


# Vapor Retarder - Insulation Board - Sealed

# Vapor Retarder – Spray Polyurethane Foam

# 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/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

- 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

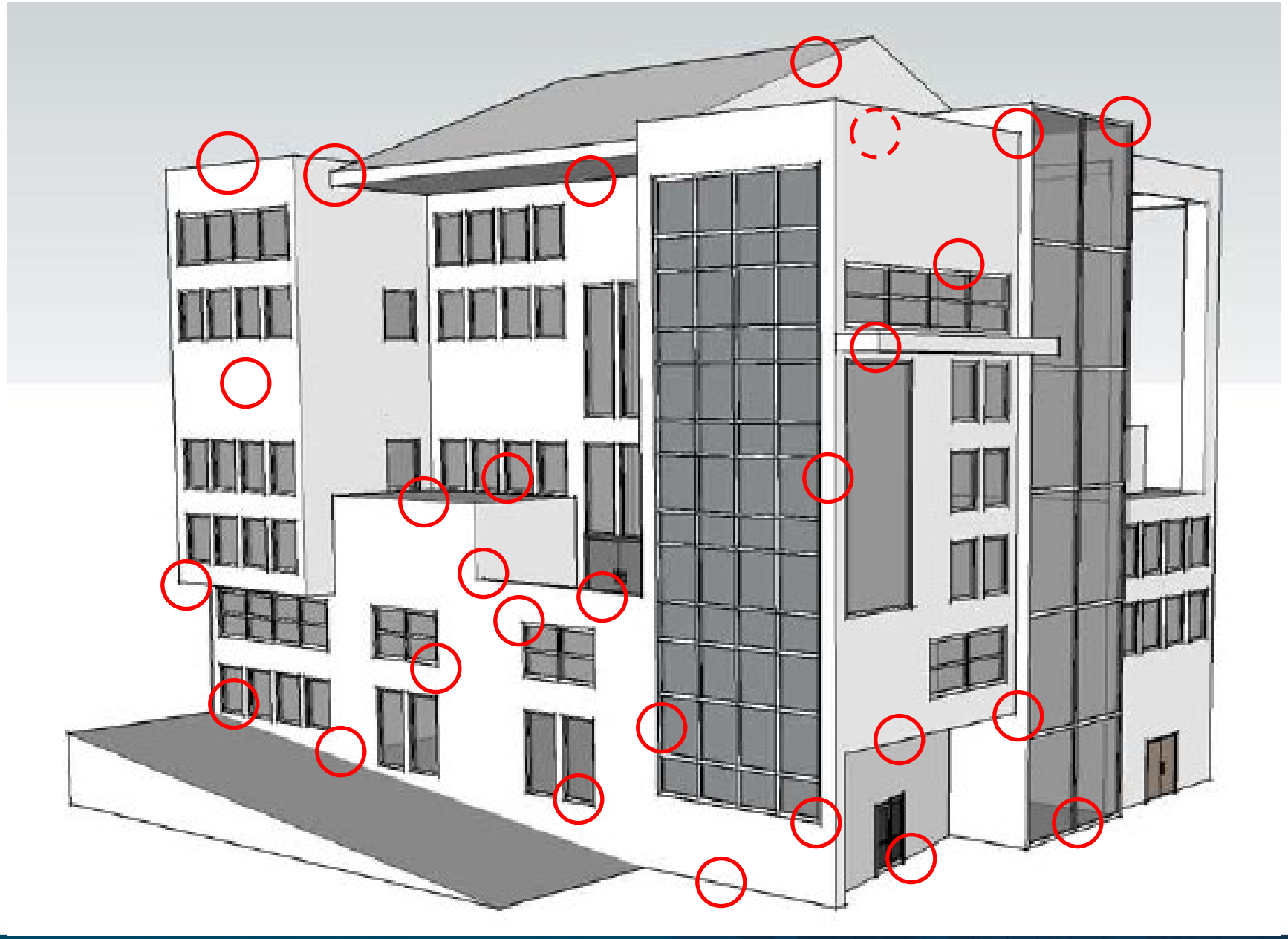
# MOISTURE BARRIERS



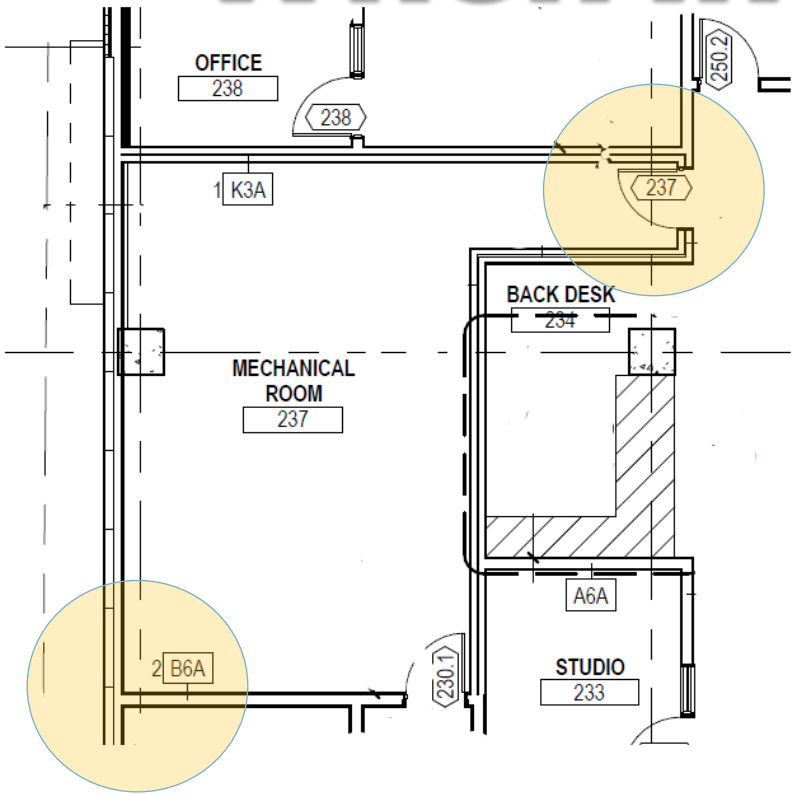
# Different Types of Barriers

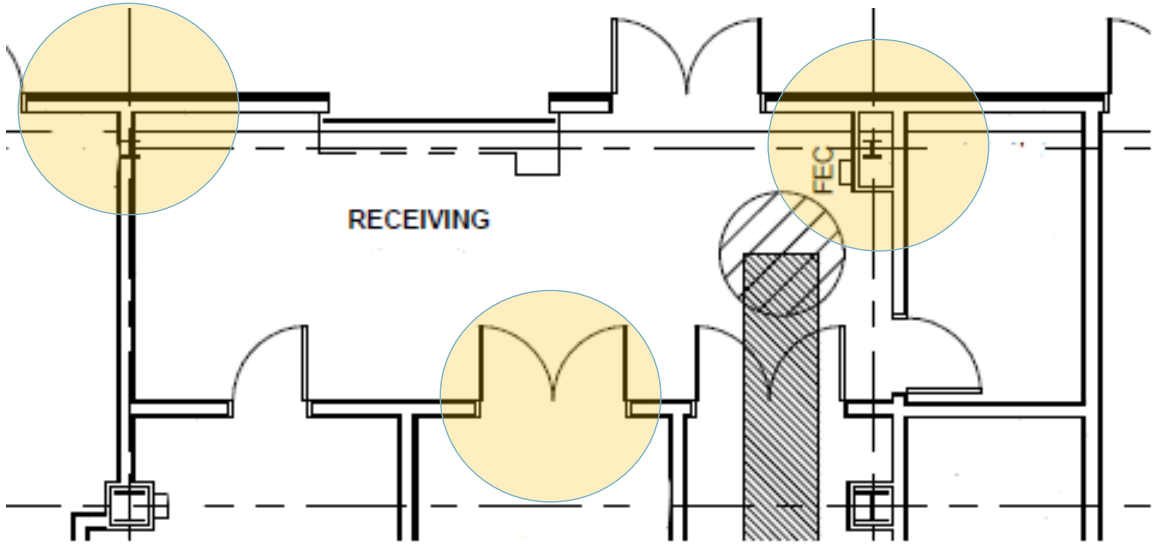
- Air Barrier
  - Mechanically Fastened
  - Self Adhering Sheets
  - Liquid Applied
- Vapor Retarder
  - Self Adhering Sheets
  - Liquid Applied
  - Insulation Board - Sealed
  - Spray Polyurethane Spray
- Air/Vapor Retarder
  - Self Adhering Sheets
  - Liquid Applied
  - Insulation Board - Sealed
 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

# Precured Silicone



# When Interior is Exterior




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

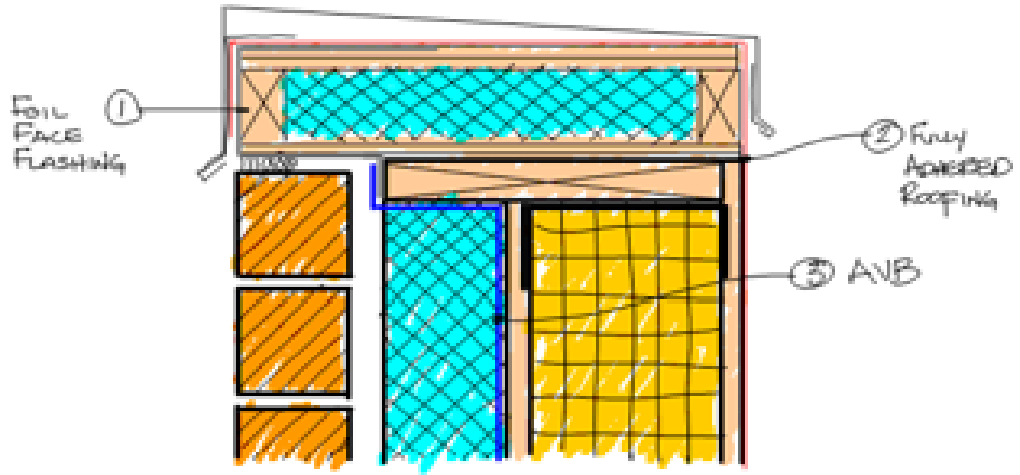
Garage ▫ Loading Docks ▫ Mech Rooms ▫ Vented Spaces

# 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

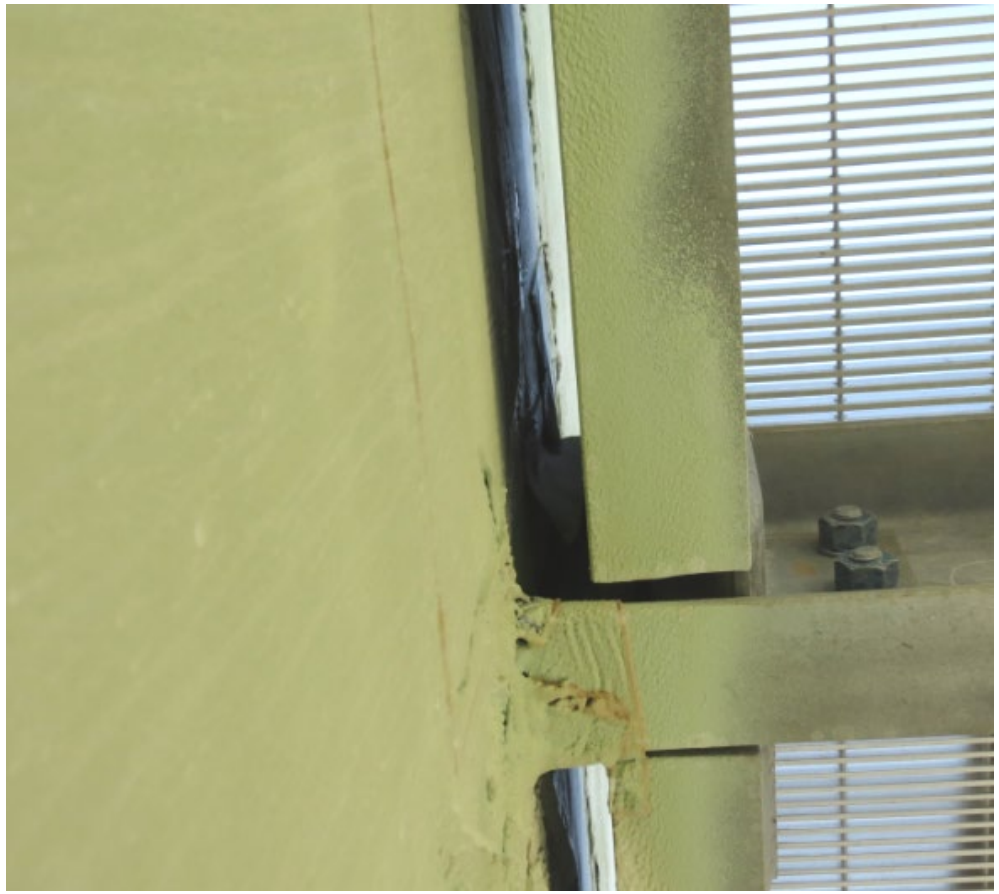
What is the detail at the parapet / Roofing?
Verify that the AVB membrane either goes under the roofing membrane or to a compatible material to extend the AVB envelope to the roofing system (vapor barrier or adhered roofing membrane).
***Provide sketch…***



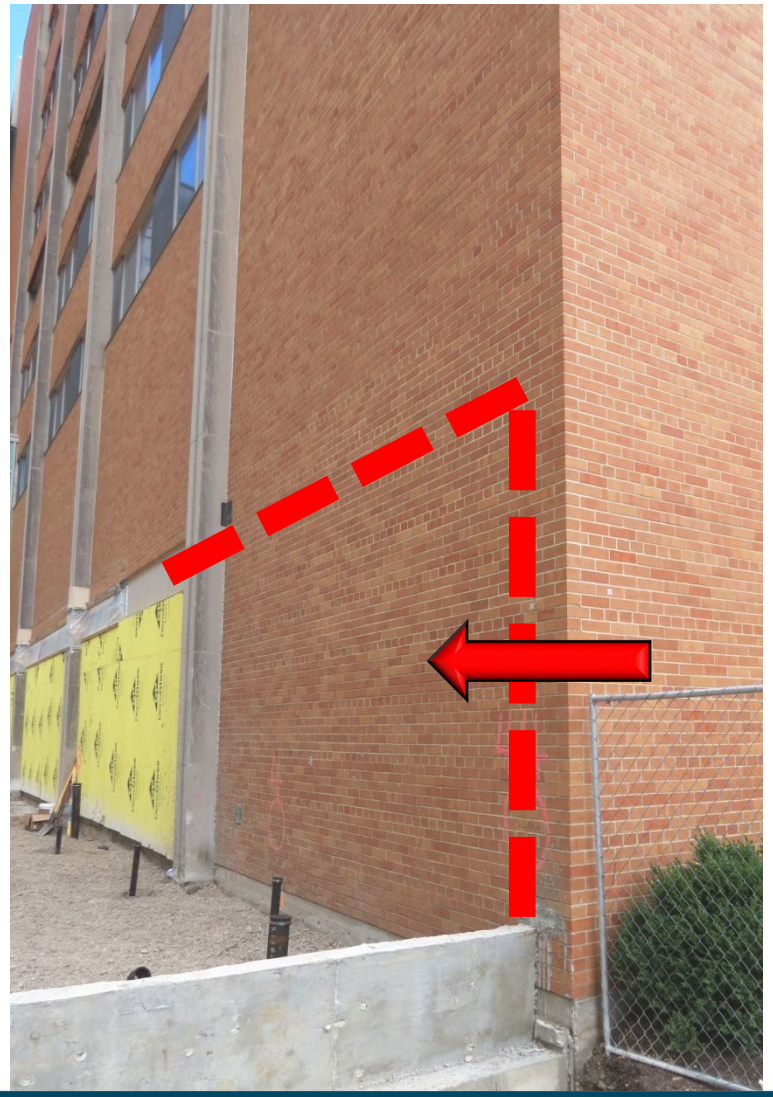

*Example*

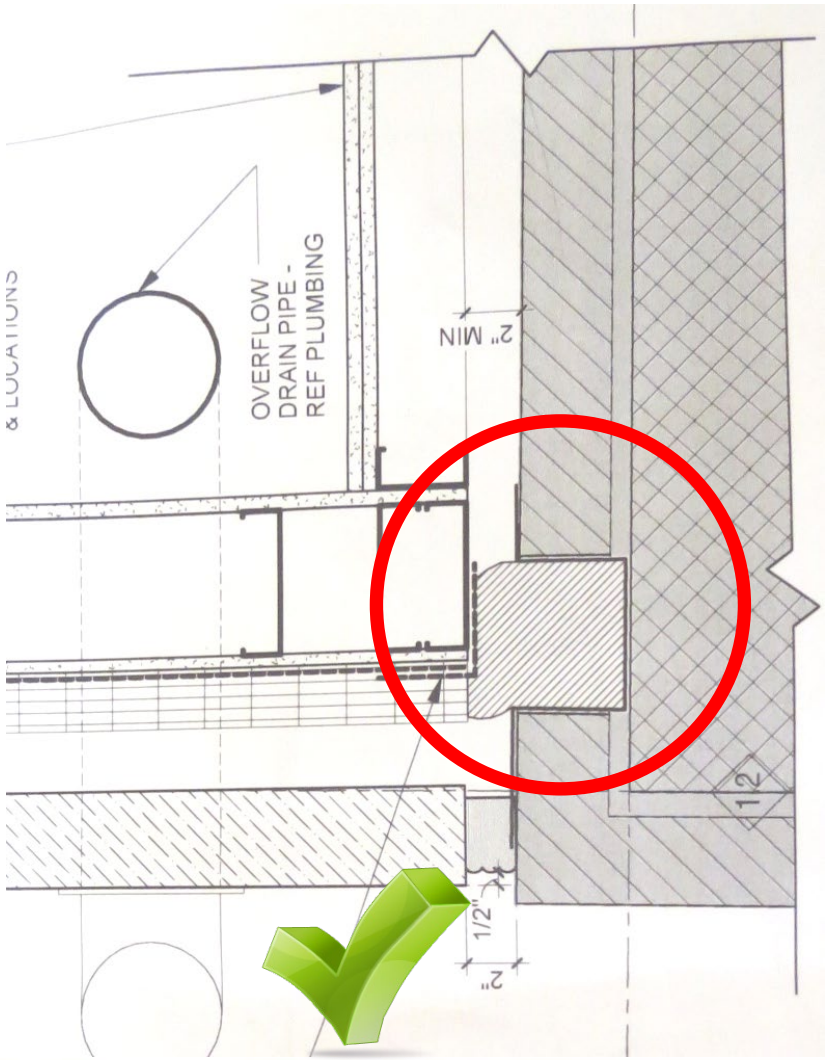
*Discuss peel and stick joints and covering them if a single ply roof is being installed (the joints are NOT compatible)*

# Clearance Challenges



# Detail Challenges - Renovation



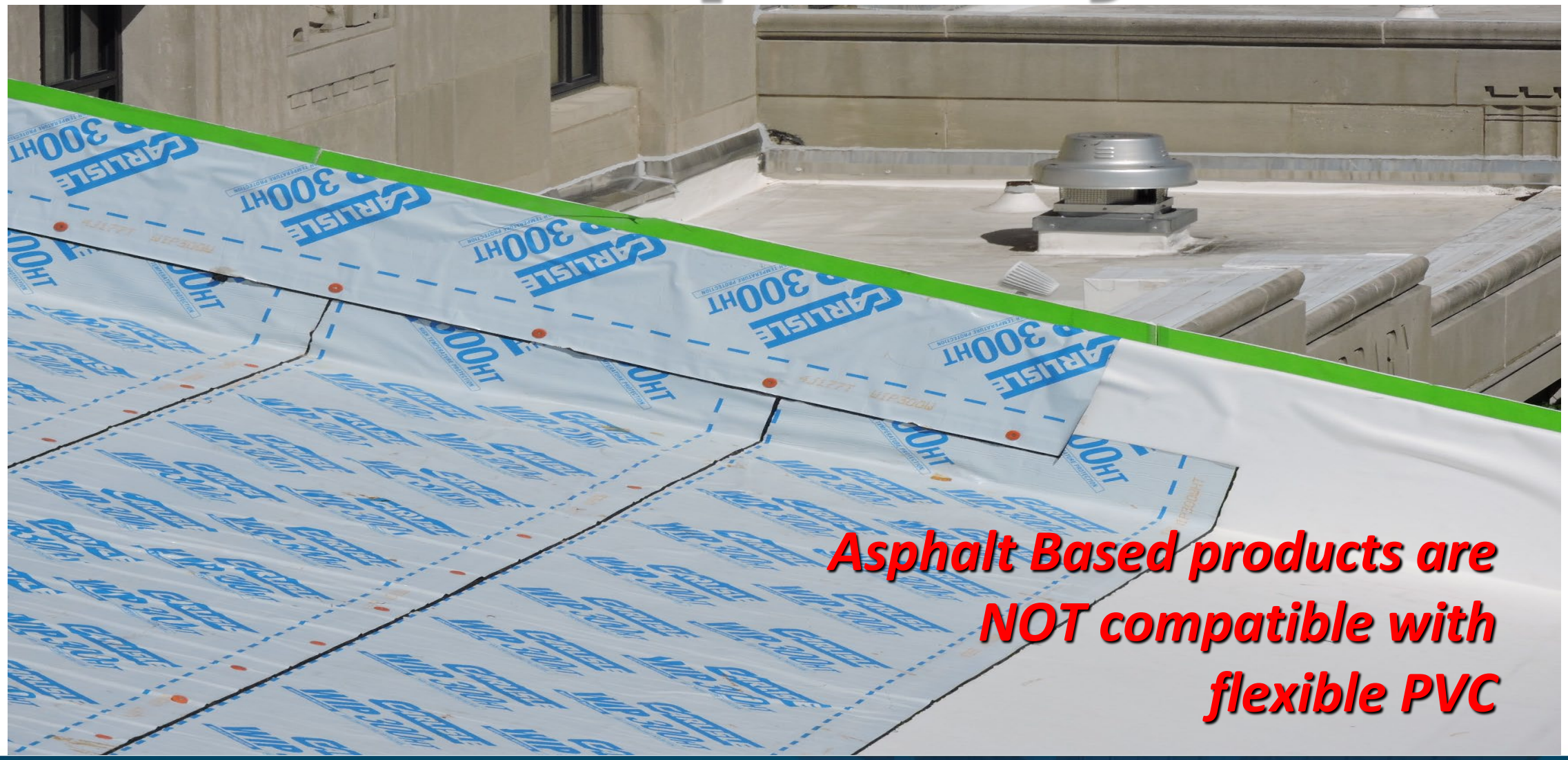


# Detail Challenges - Renovation

# 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

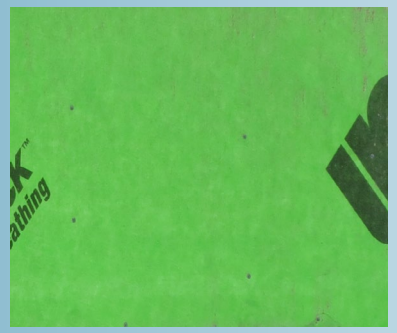
***Gypsum board sheathing damage MUST be repaired (replaced) <u>STUD to STUD</u> prior to any roofing or air /vapor barrier being installed:***

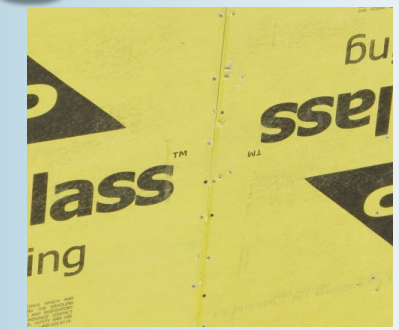

*When the paper face is torn off, the roof adhesive or the air/vapor barrier will get sucked into the gypsum and not properly adhere.*

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.**

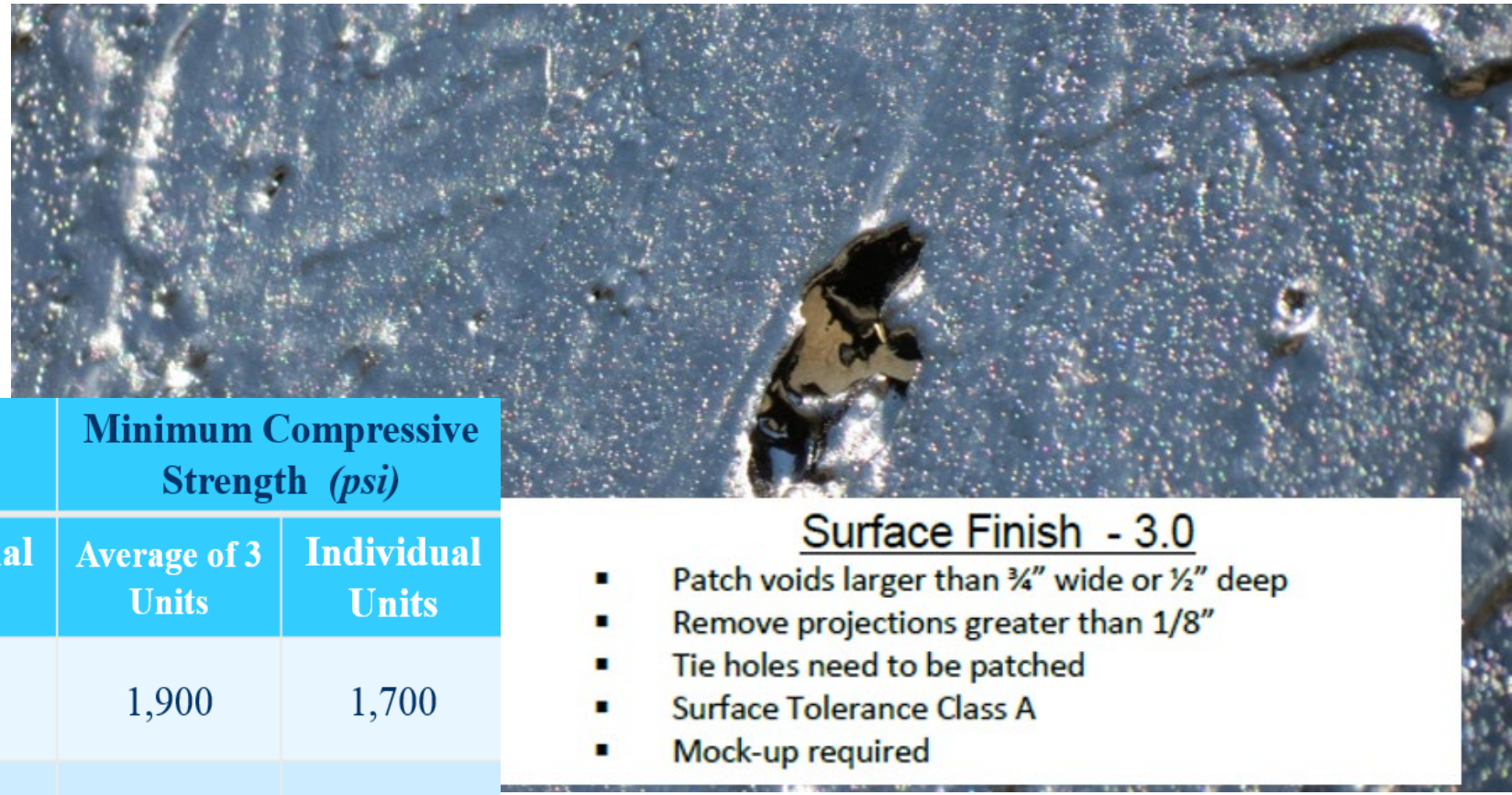
**Generally, ¼” maximum gap is acceptable – but always review product installation instructions.**

# 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.*



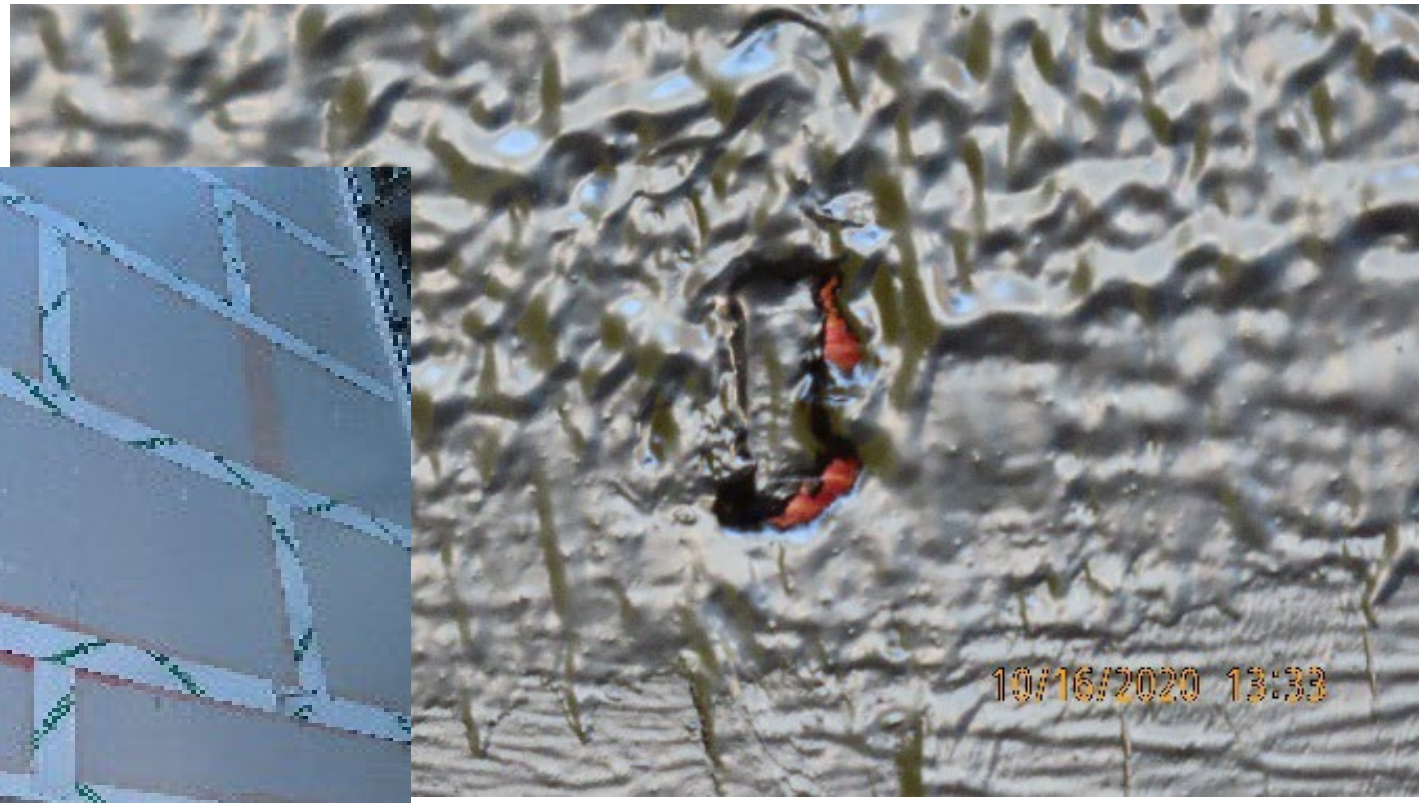
Surface Finish - 3.0

- Patch voids larger than ¾" wide or ½" deep
- Remove projections greater than 1/8"
- Tie holes need to be patched
- Surface Tolerance Class A
- Mock-up required

## Concrete

# Substrate challenges

## Wood

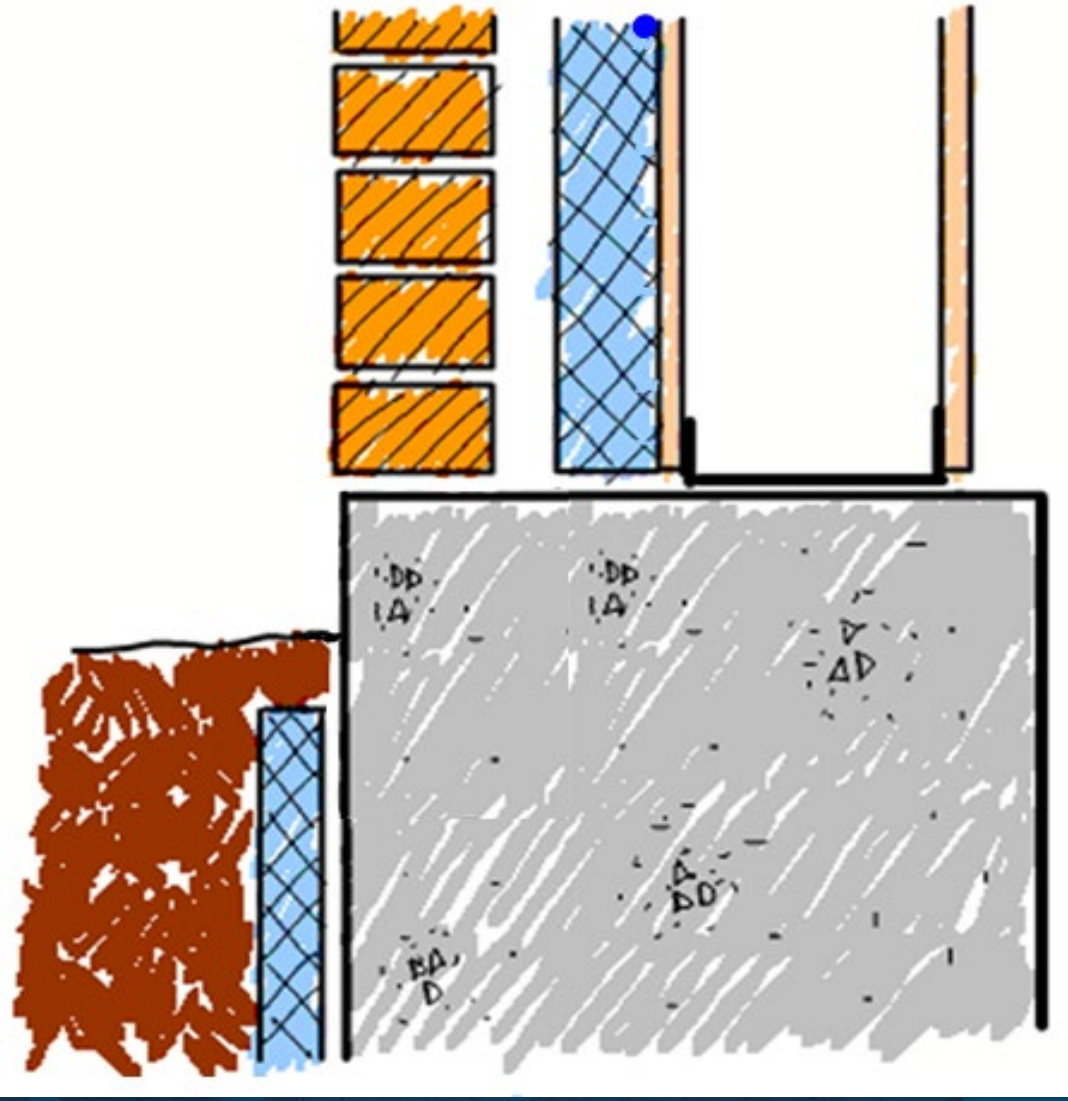


# Foundation Detail

NO WATERPROOFING

MASONRY ABOVE GRADE

SOG

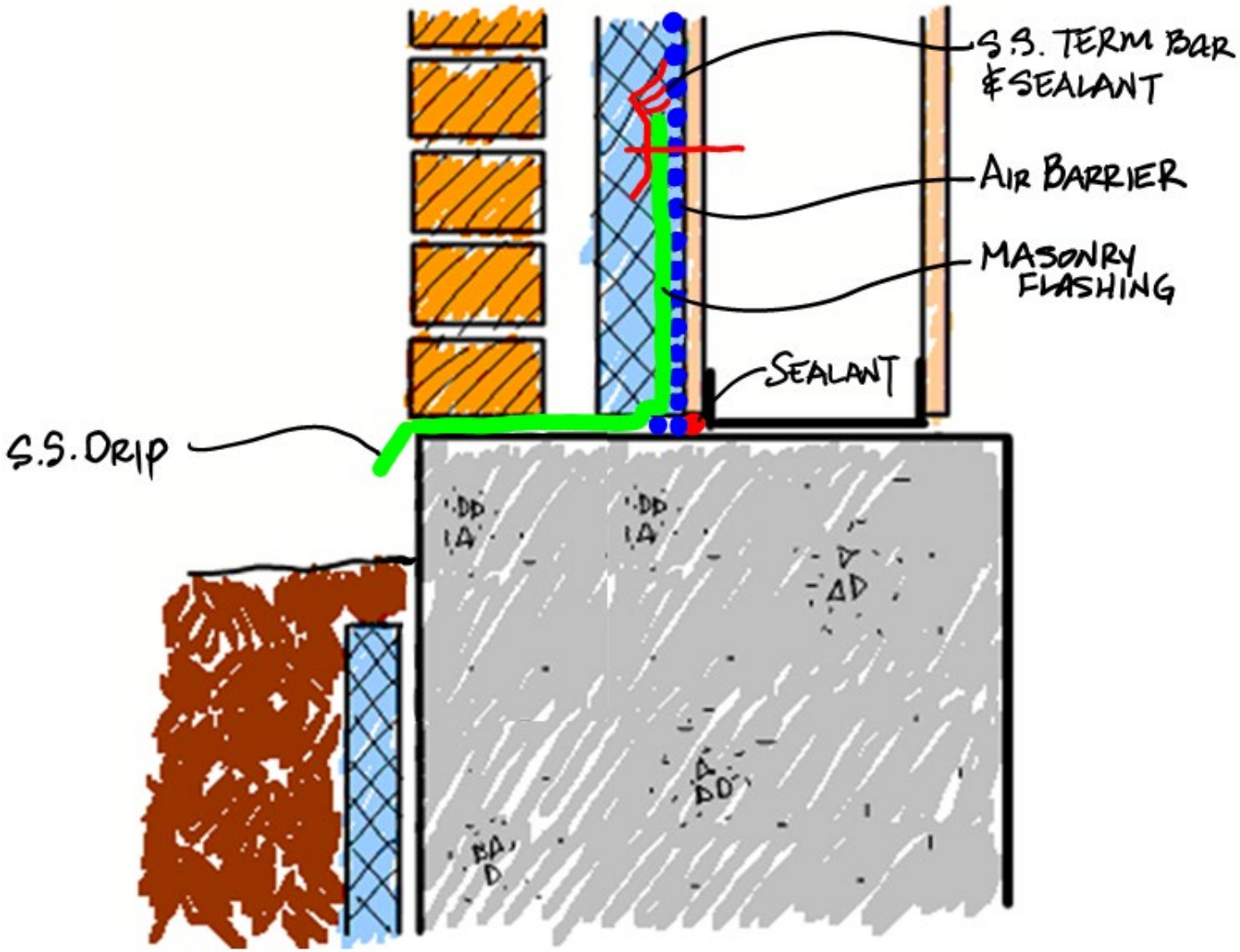


# Foundation Detail

NO WATERPROOFING

MASONRY ABOVE GRADE

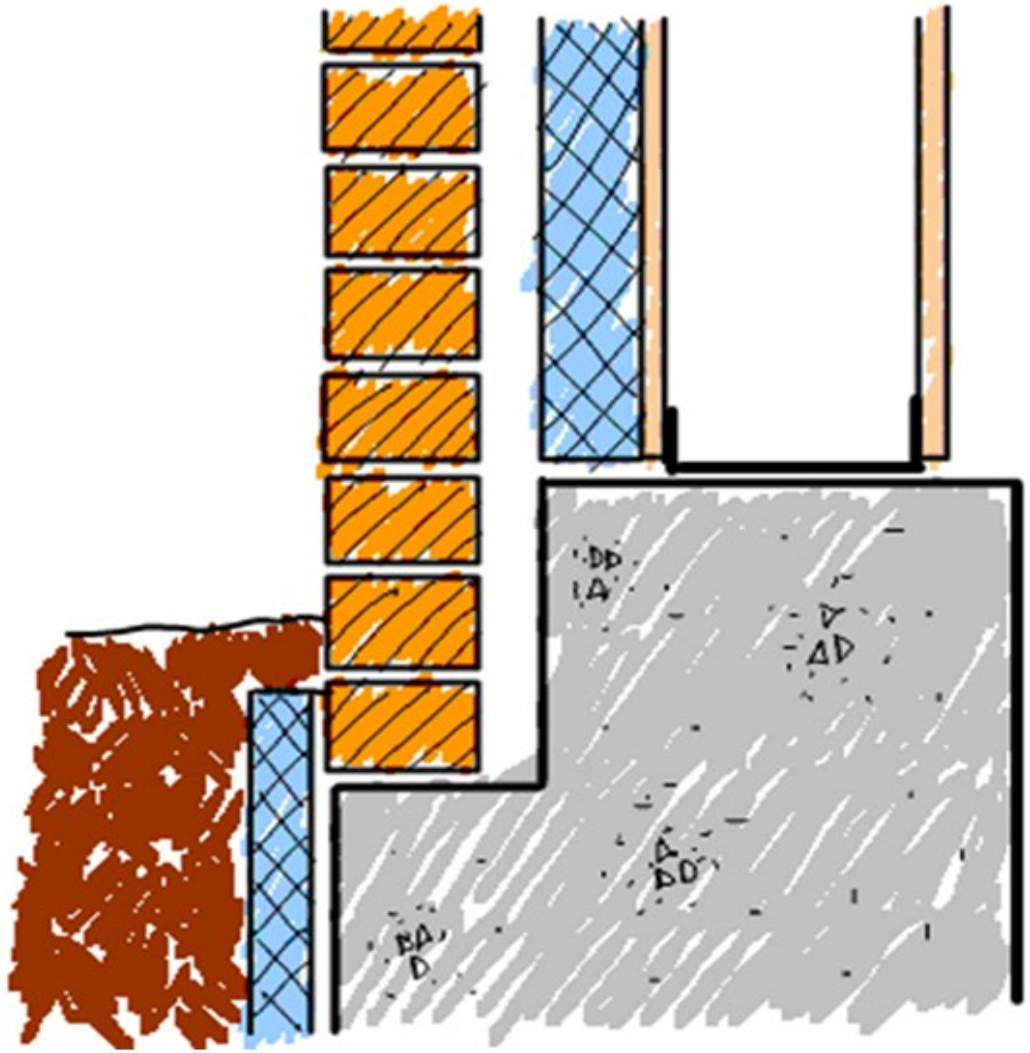
SOG



# Foundation Detail

HOT OR LIQUID WATERPROOFING

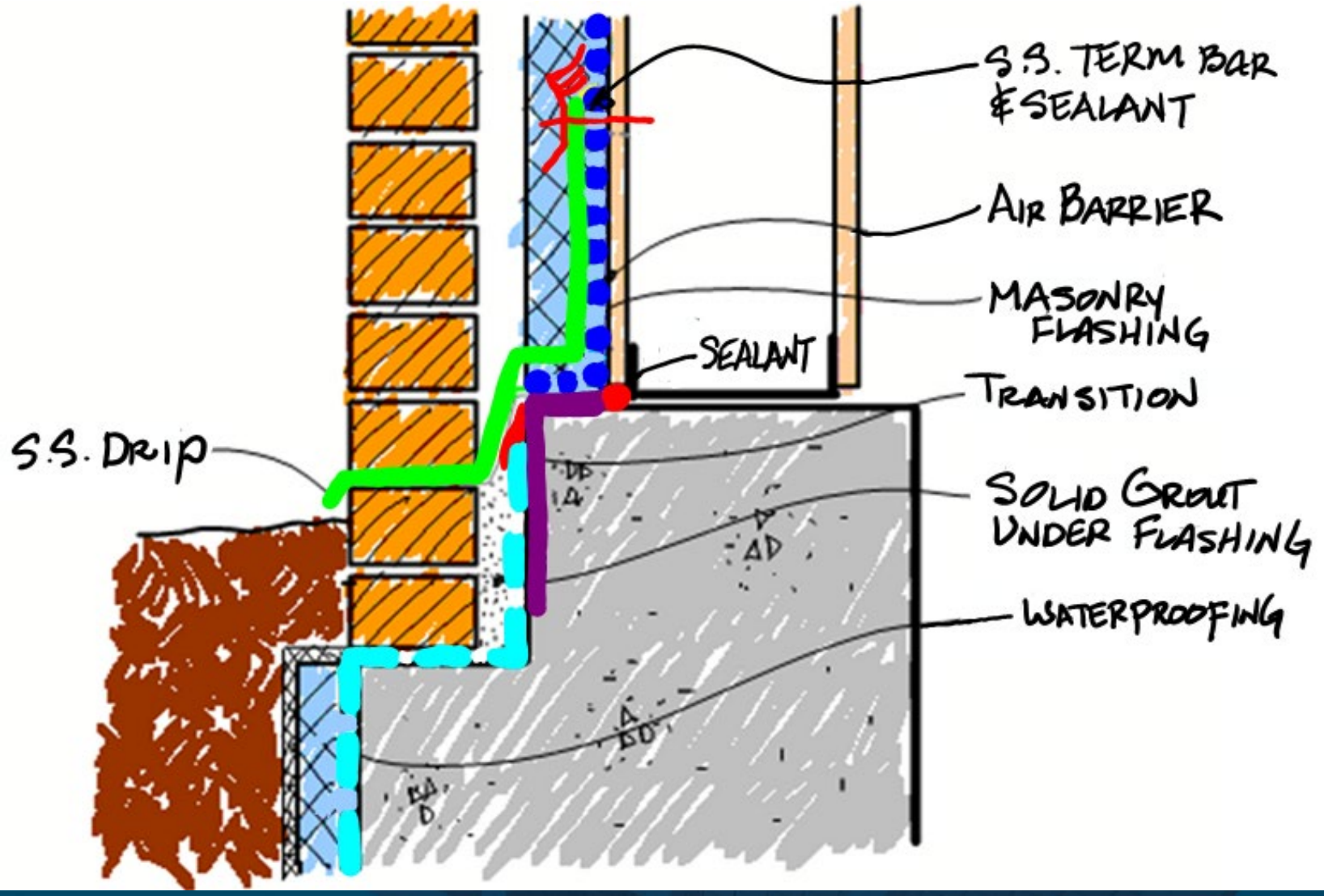
MASONRY BELOW GRADE



# Foundation Detail

**HOT OR LIQUID WATER-PROOFING**

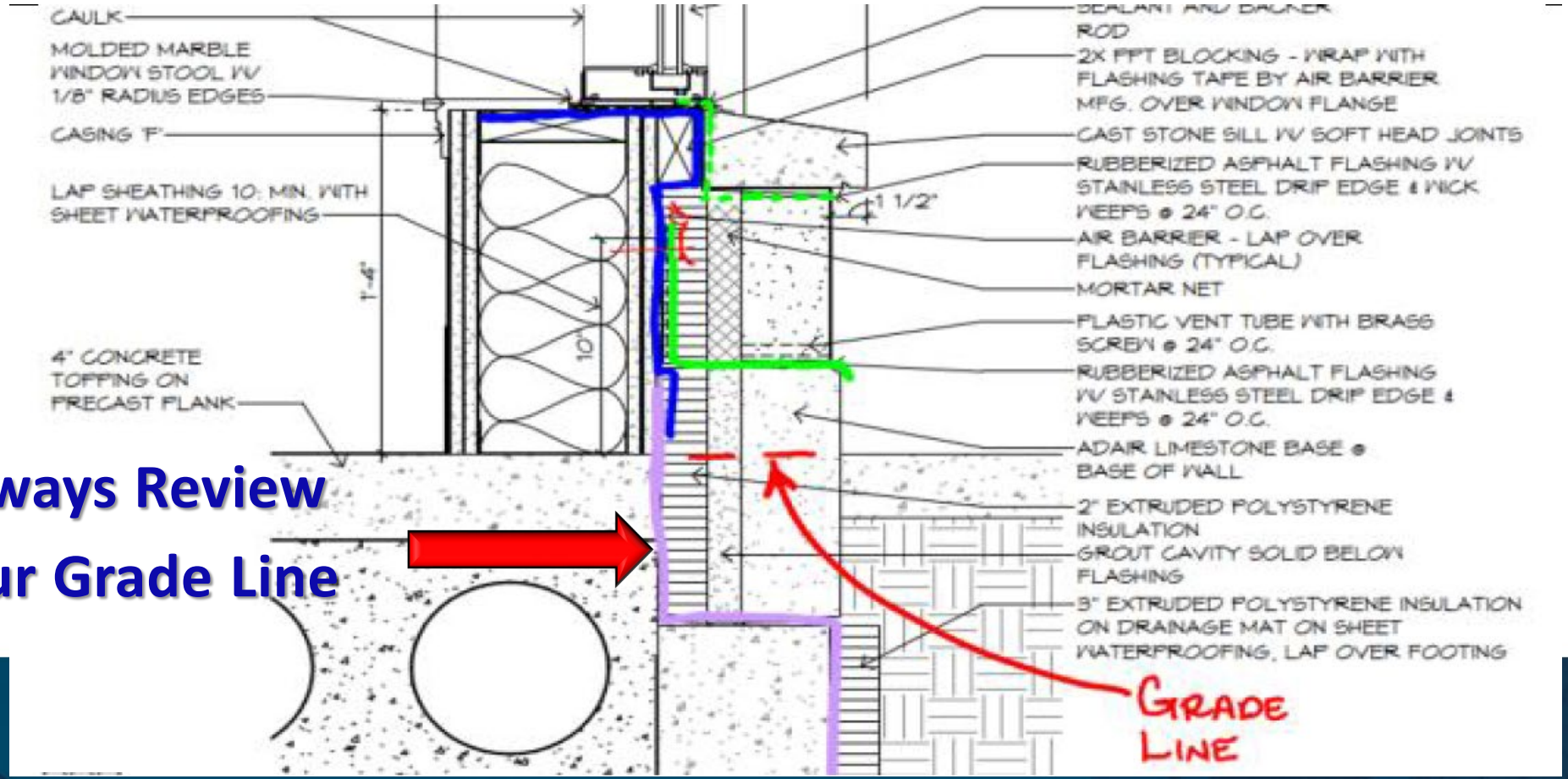
**MASONRY BELOW GRADE**



# Base of wall flashing

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

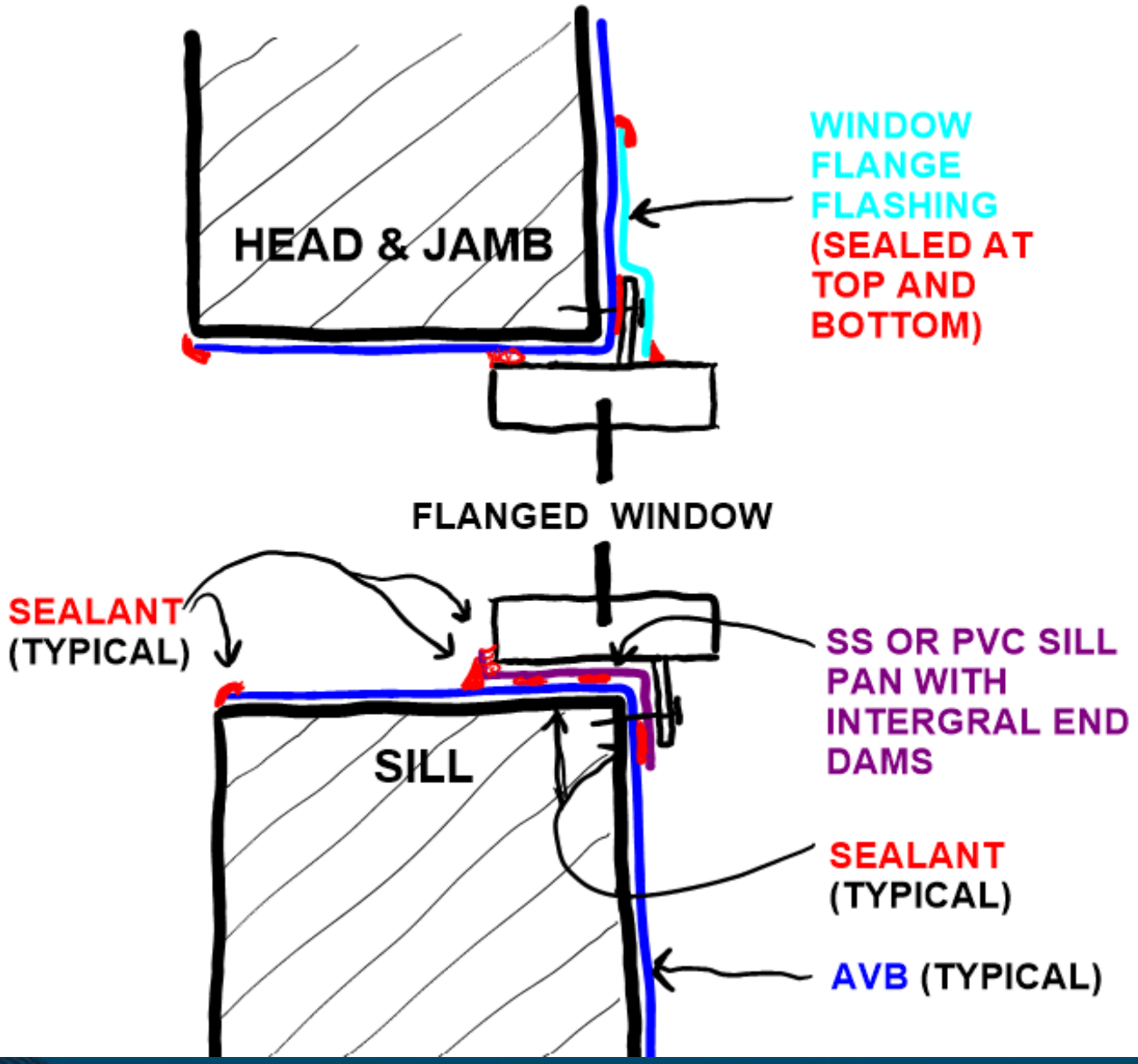
**We need to install waterproofing, waterproof transition, or AVB that is waterproof and is designed to go below grade**



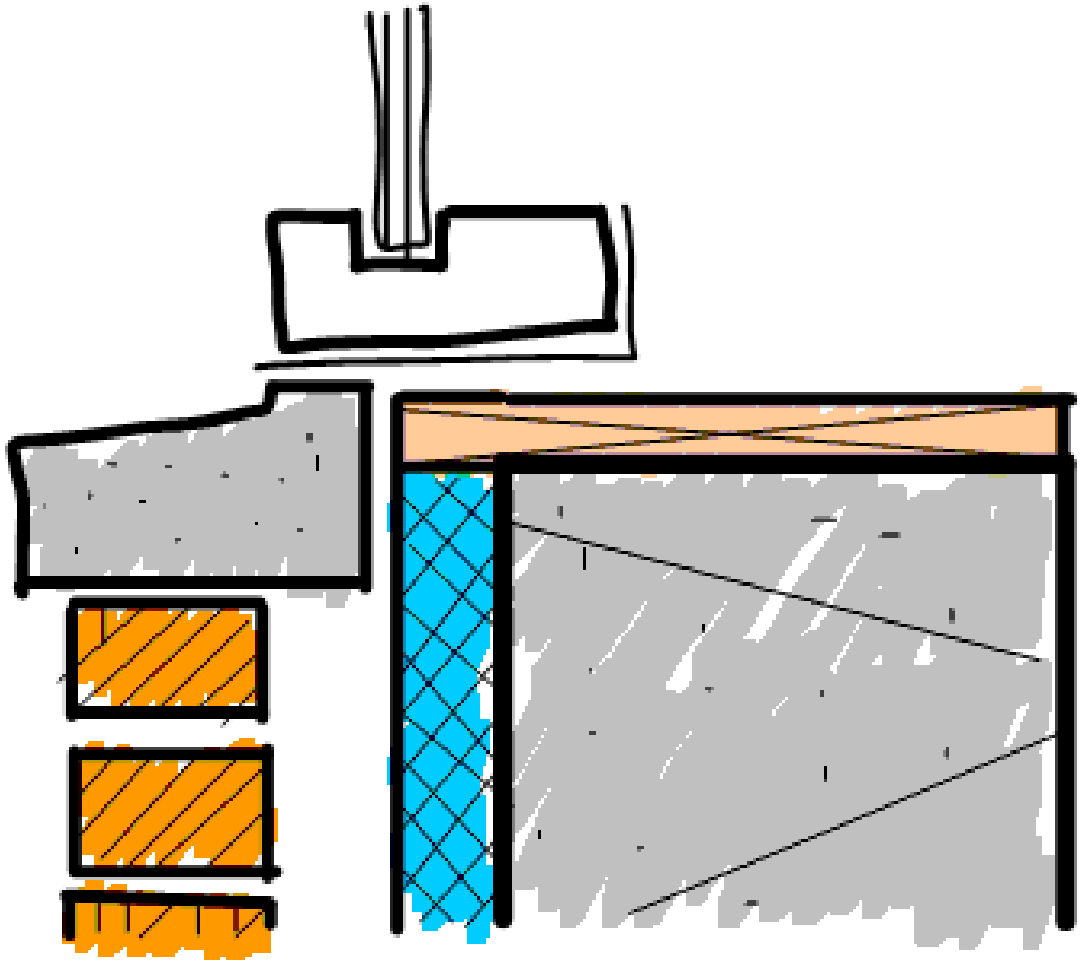

**Always Review**

**Your Grade Line**

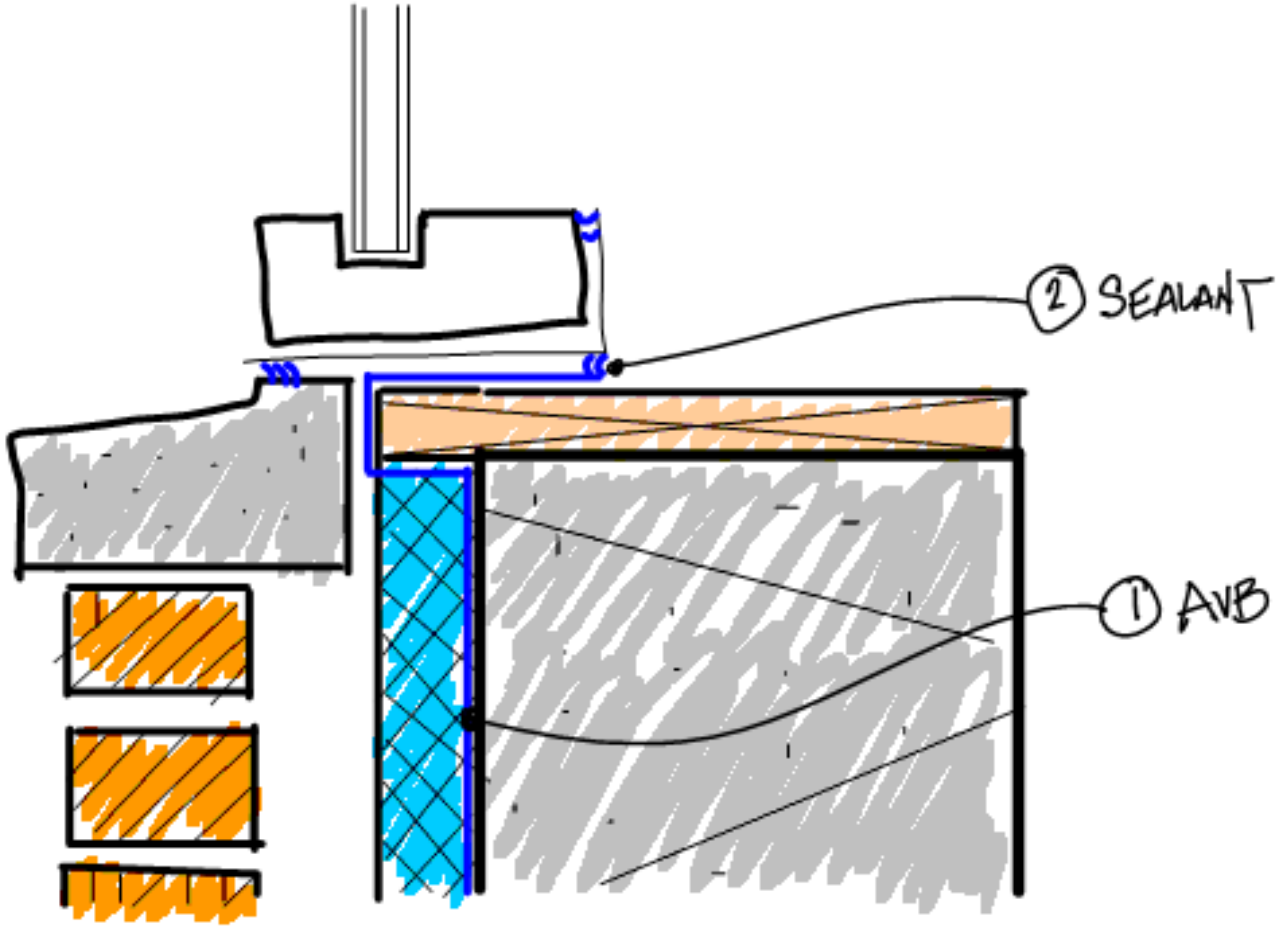
# Flanged Window Detailing



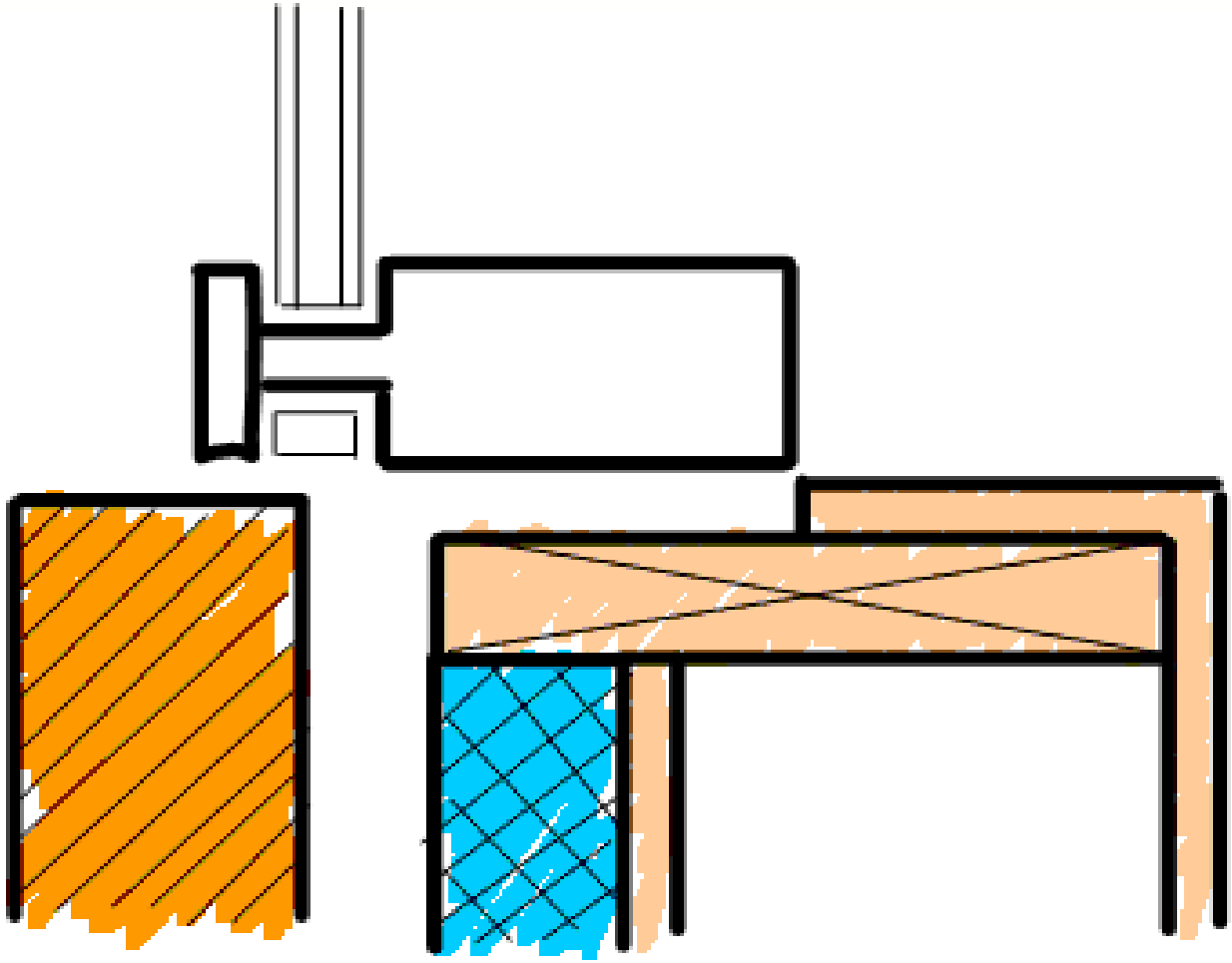

# Storefront



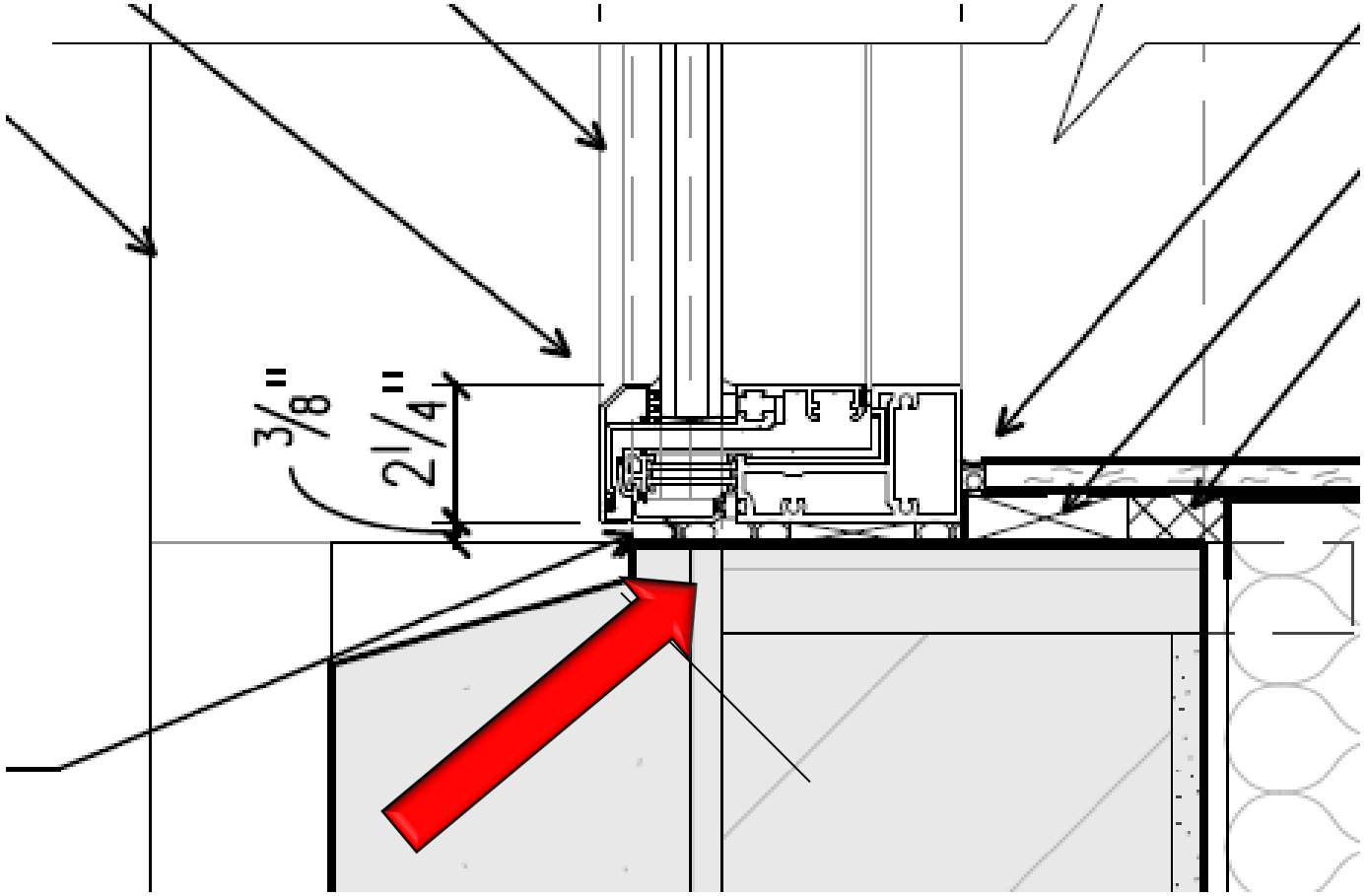
# Storefront



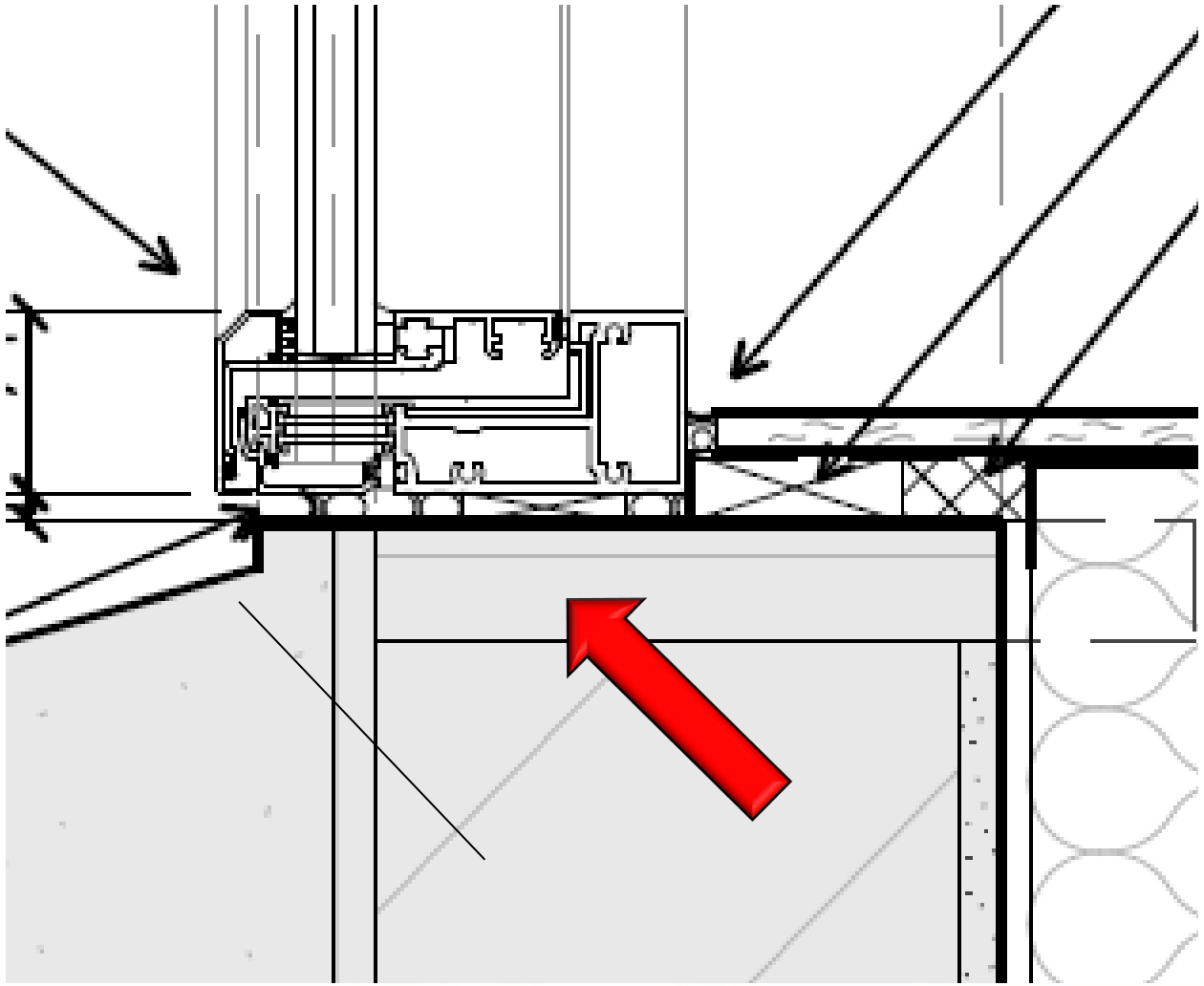
# Curtainwall



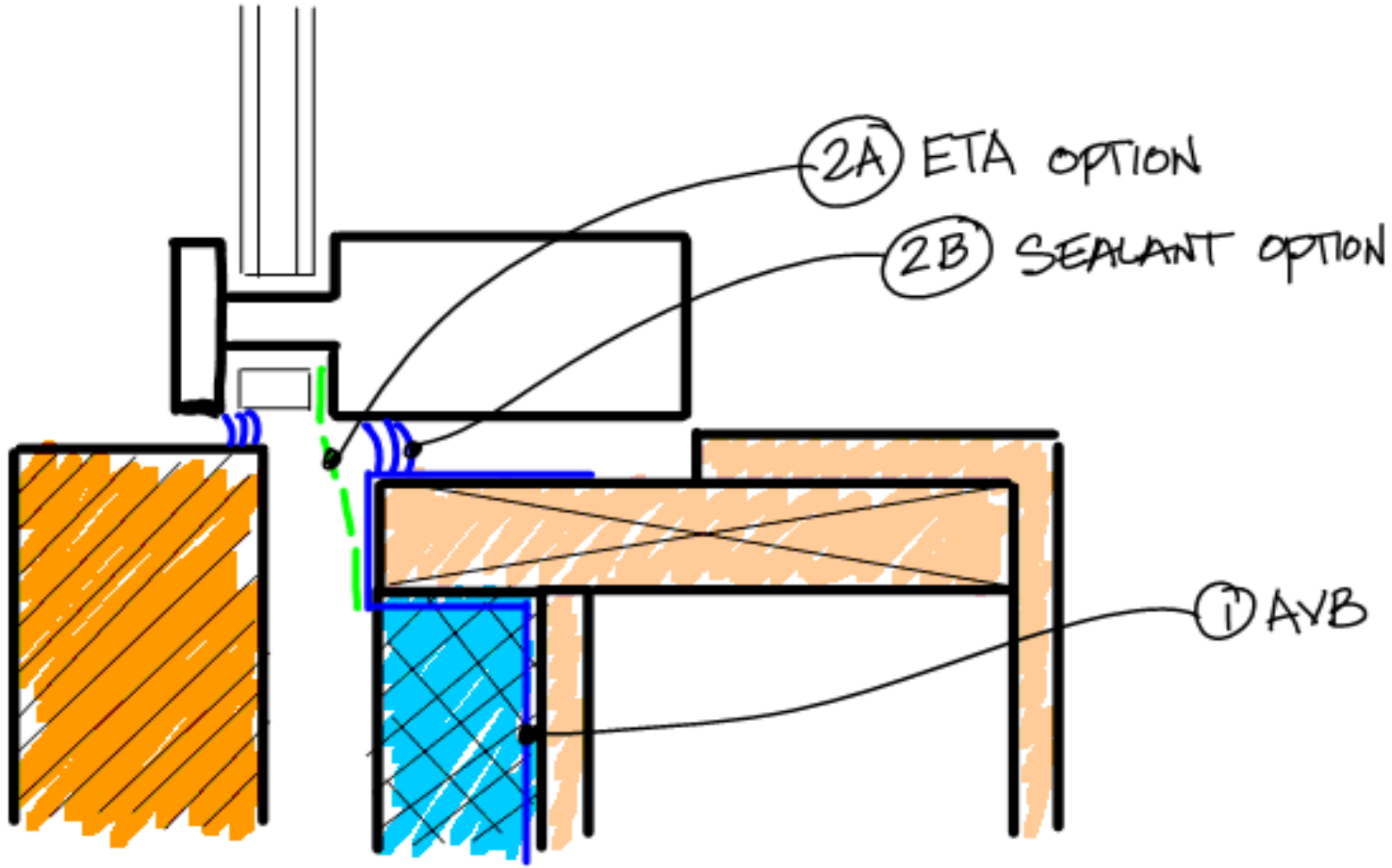
# Curtainwall – No Sill



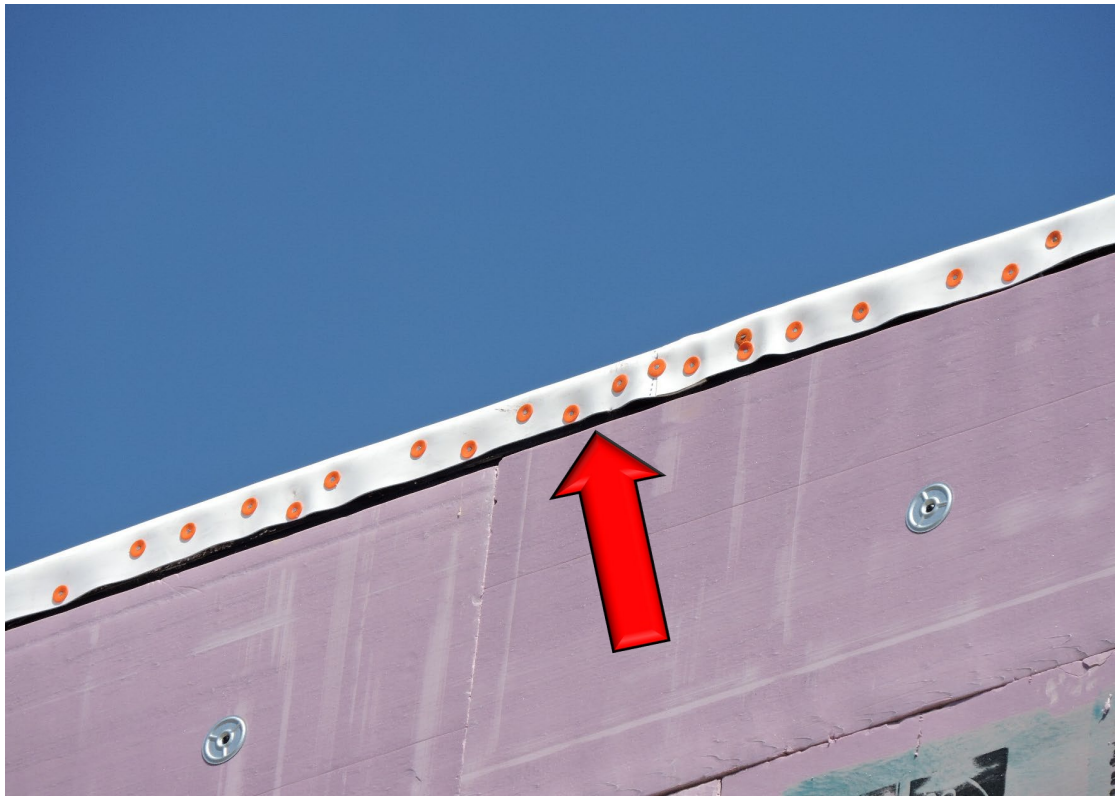

# Curtainwall – No Sill

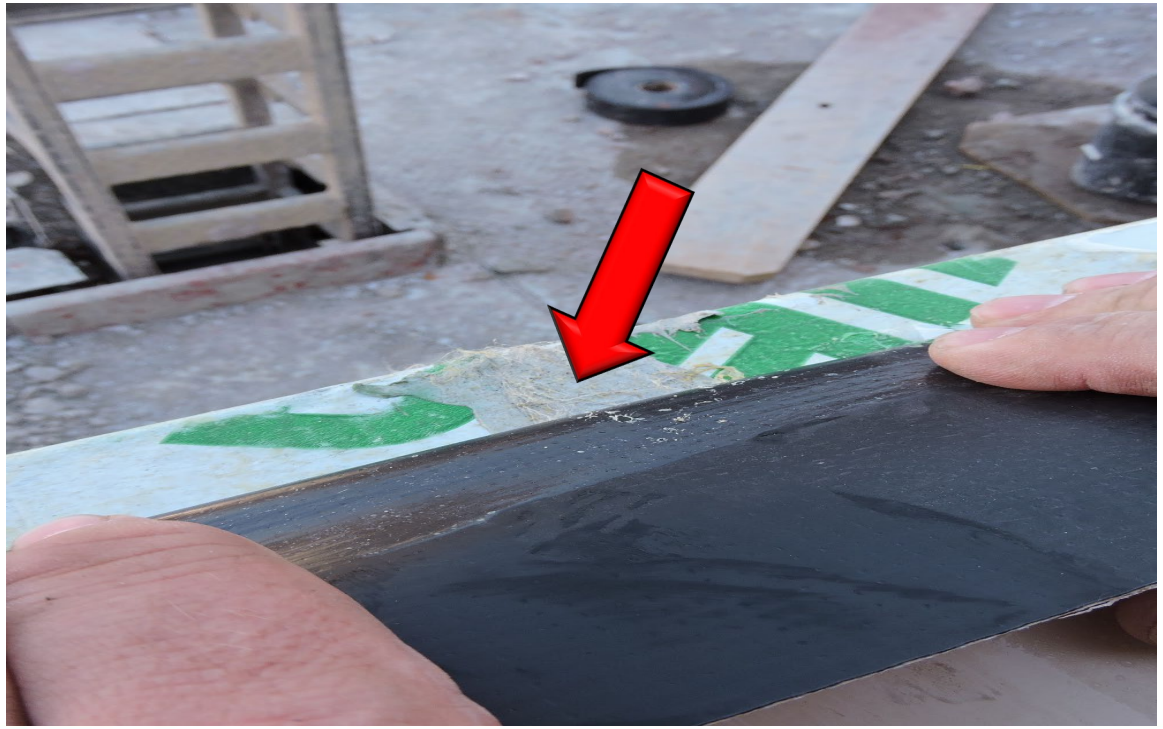


# Curtainwall



# Parapet

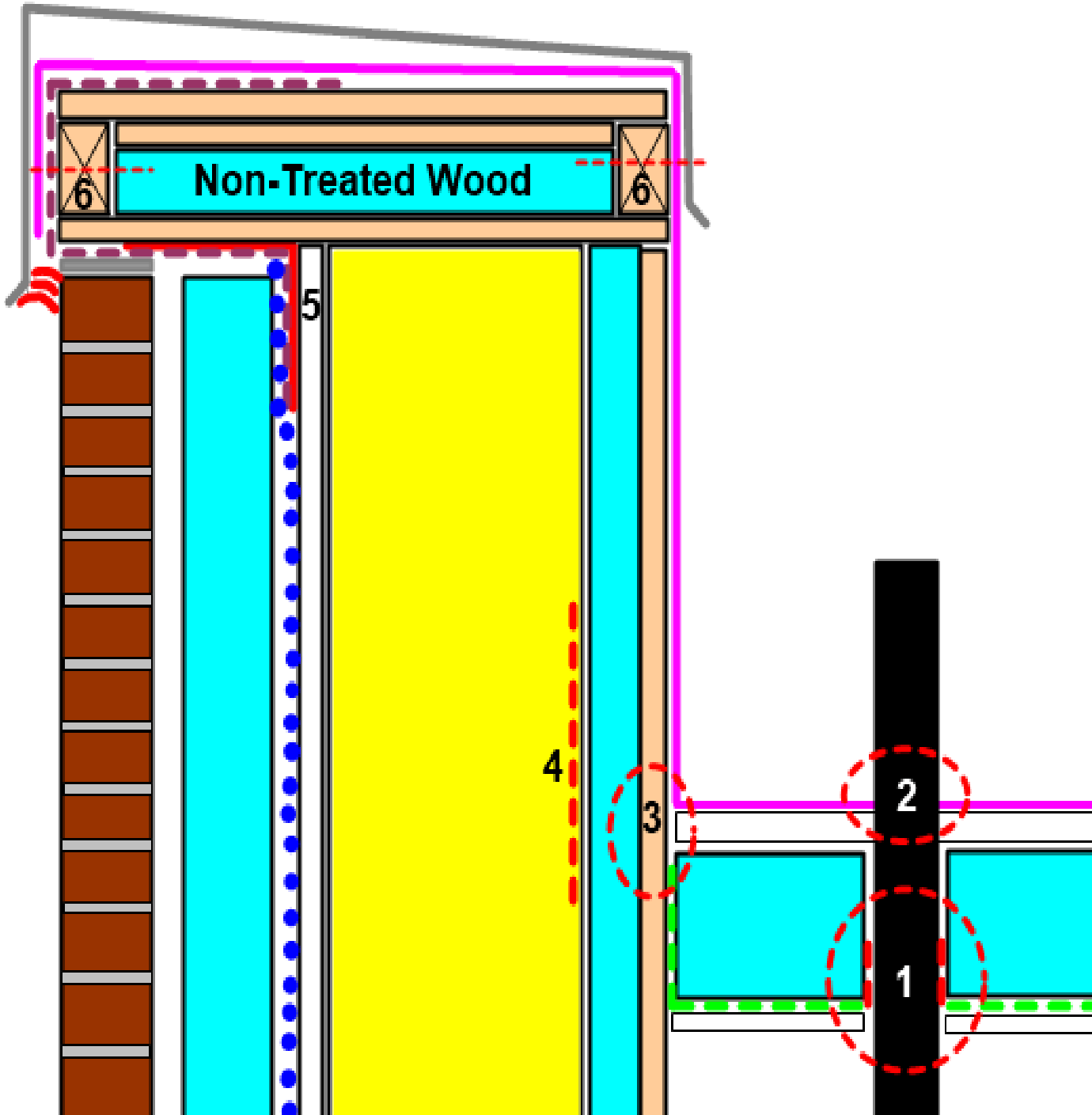




# Parapet

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

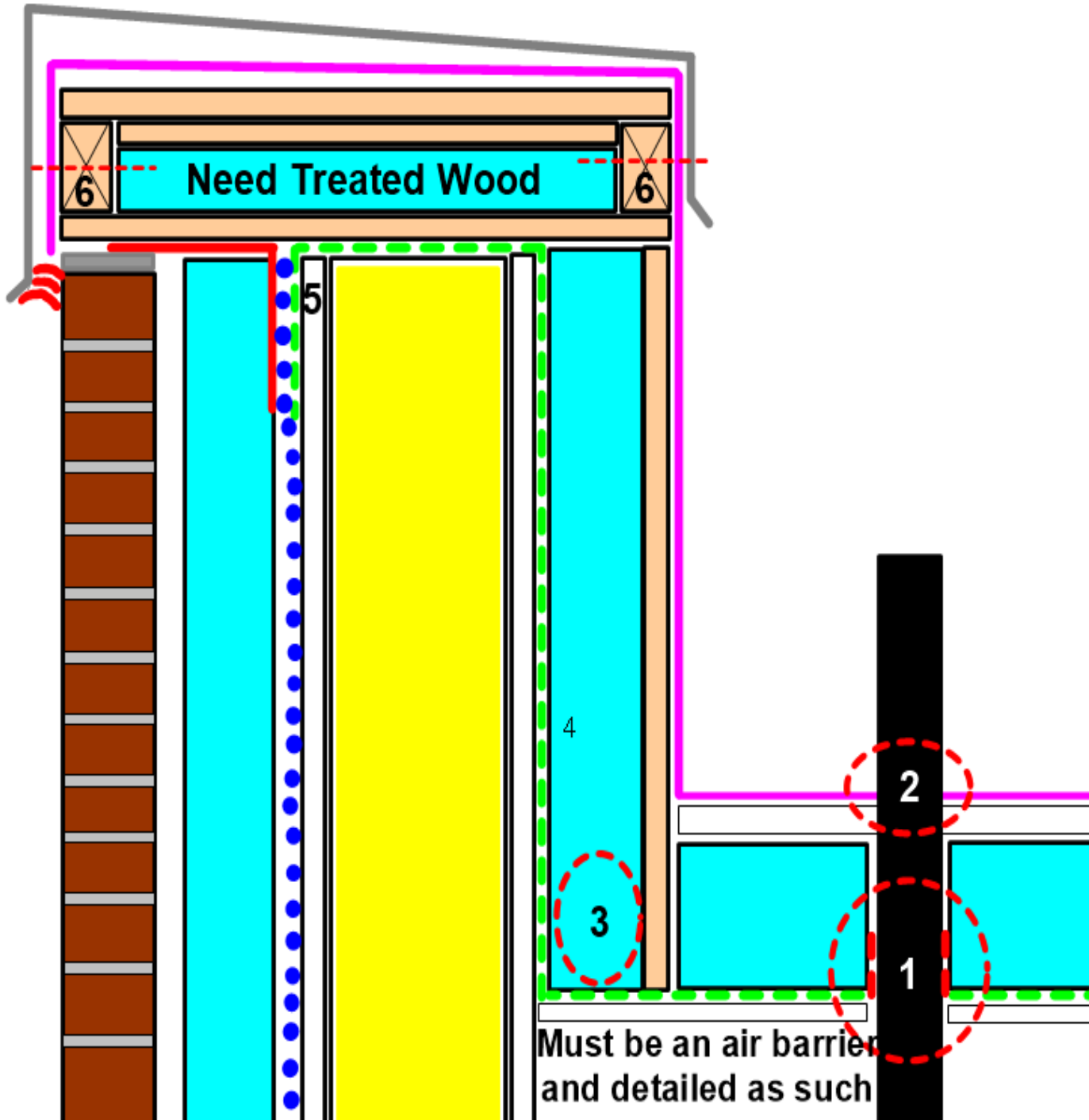
*Wood should be non-treated*



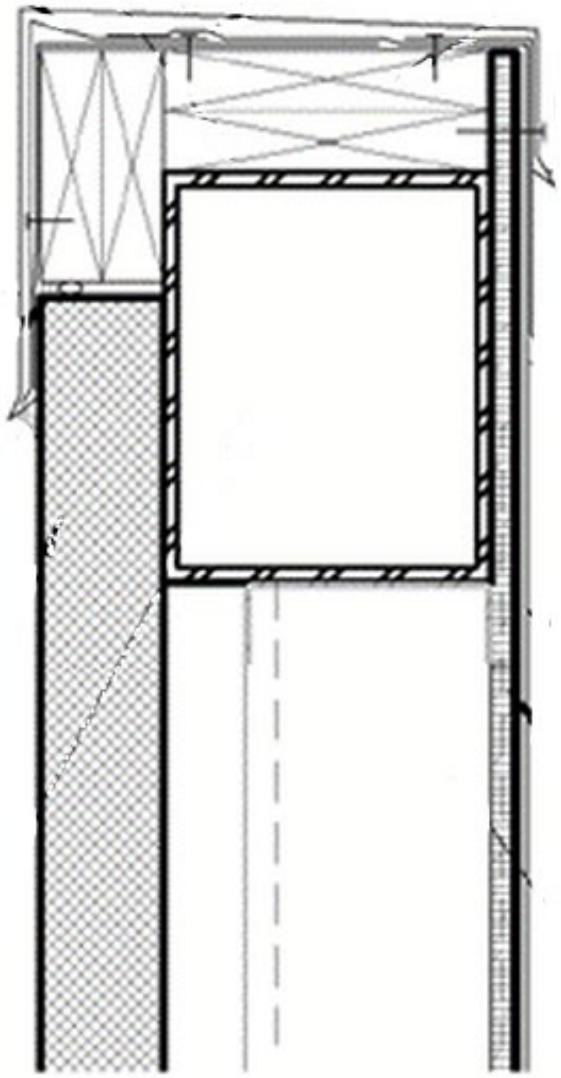
# Parapet

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

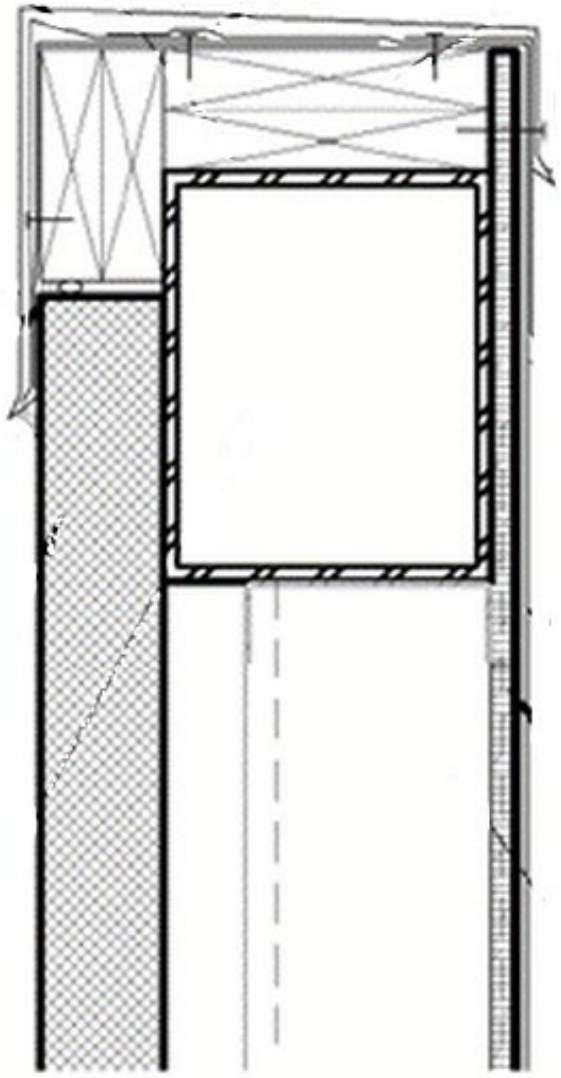
*Wood should be treated*



# Parapet



# Parapet

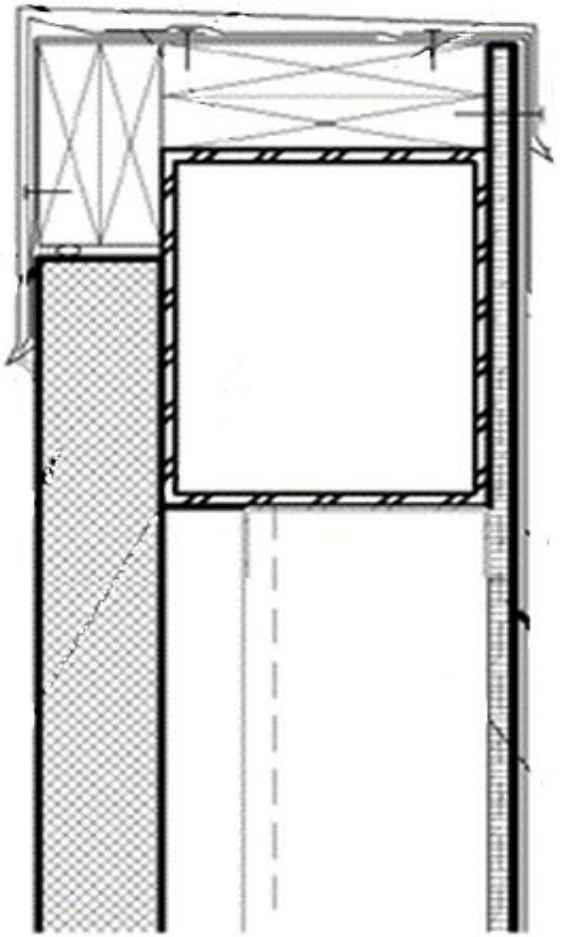


ROOFING

AVB TRANSITION MEMBRANE

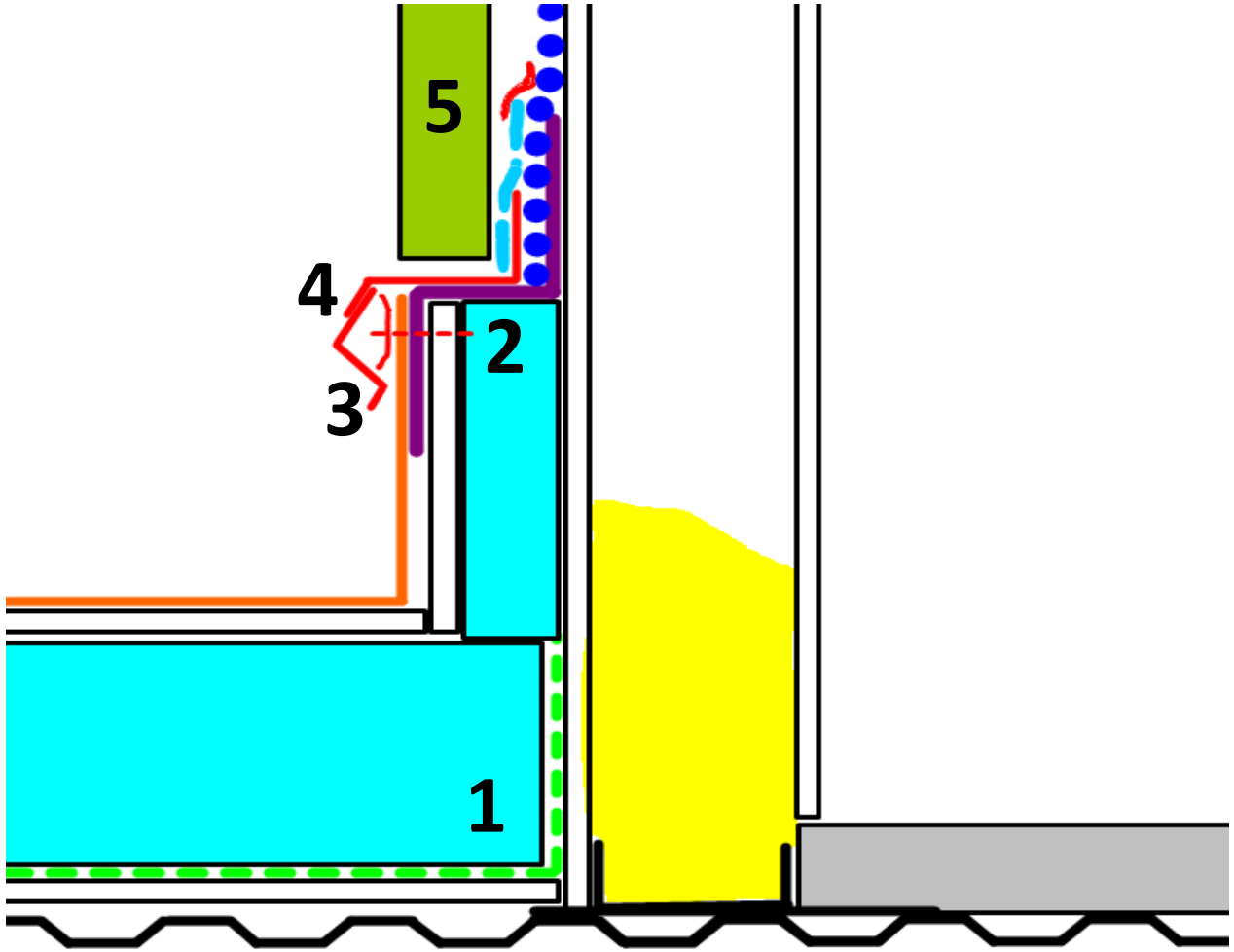
*METAL PANEL FRONT FACE AVB PLANE*

*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
Global Business Manager
UL LLC
Frederick.E.Hervey@ul.com

Luke C. Woods
Principal Engineer – Fire Resistance & Containment
UL LLC
Luke.woods@ul.com

# 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
Level II Thermographer

Vice President QA/QC

Quality Delivered

AECOM Hunt

847.513.2126

corey.zussman@aecom.com



abaa2025
building
enclosure
conference