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Lessons learned –Trades that need to include an AVB discussion in their specification and preinstallation meetings

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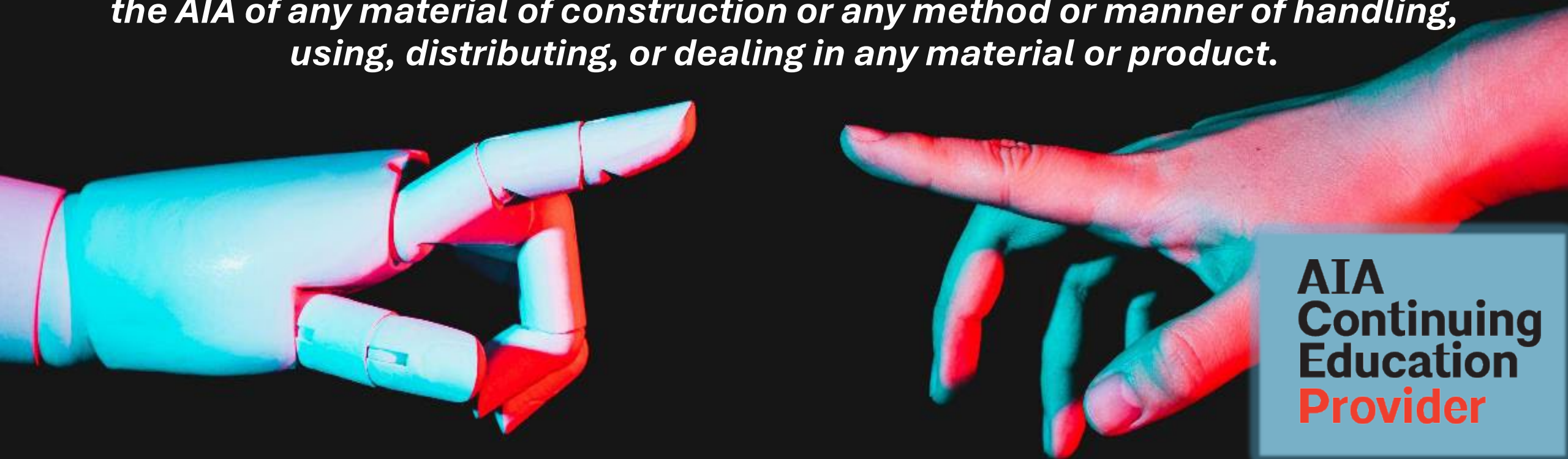

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Couse Description

When designing a building envelope wall system, specifying, detailing, and having a pre-installation discussion about the backup substrate and façade elements, considering the water, air, vapor, and insulation systems detailing, is critical. This involves careful coordination with all façade trade elements, consideration of construction and installation tolerances, addressing the installation requirements for the substrate wall, water and air resistive barriers, insulation, and façade support system, and learning lessons from each installation. Each component must be thoroughly understood and specified within their respective specification sections to ensure comprehensive detailing. By understanding the necessary connections, material compatibility, tested systems, and limitations of construction materials, you can develop pre-installation conversation points within each building envelope and substrate meetings to proactively develop an advanced conversation about detailing, grasping the construction requirements for each component and incorporating lessons learned will enhance future detailing and specifications will significantly improve the chances of project success.

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Learning Objectives

1. Discuss and dissect early structural design considerations to maintain the air, vapor, water, and insulation control systems, as well as the rainscreen façade support system to ensure adequate bid document detailing.
2. Understanding and include construction tolerances for systems and components to properly detail the substrate wall and air, vapor, water, and insulation control systems for different types of building façade installations.
3. Review different types of substrate and façade wall systems and their associated detailing to coordinate with the Specifications and detailing.
4. Apply different requirements and lessons learned about continuity, structural fastening detailing, wall membrane requirements, limitations and tolerances of systems, and what is needed for drawing and specification coordination and determine what discussion points to make during each pre-installation meeting of corresponding substrate and façade elements.

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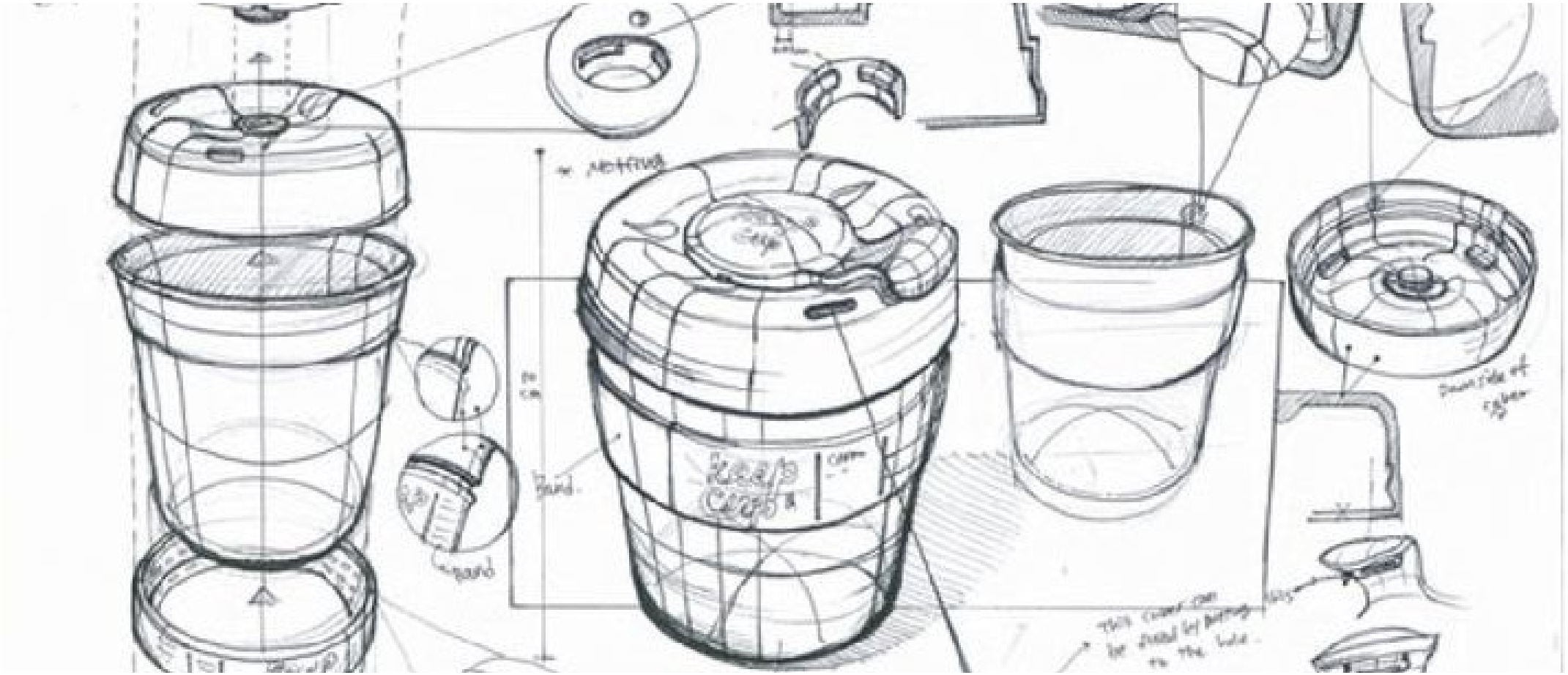
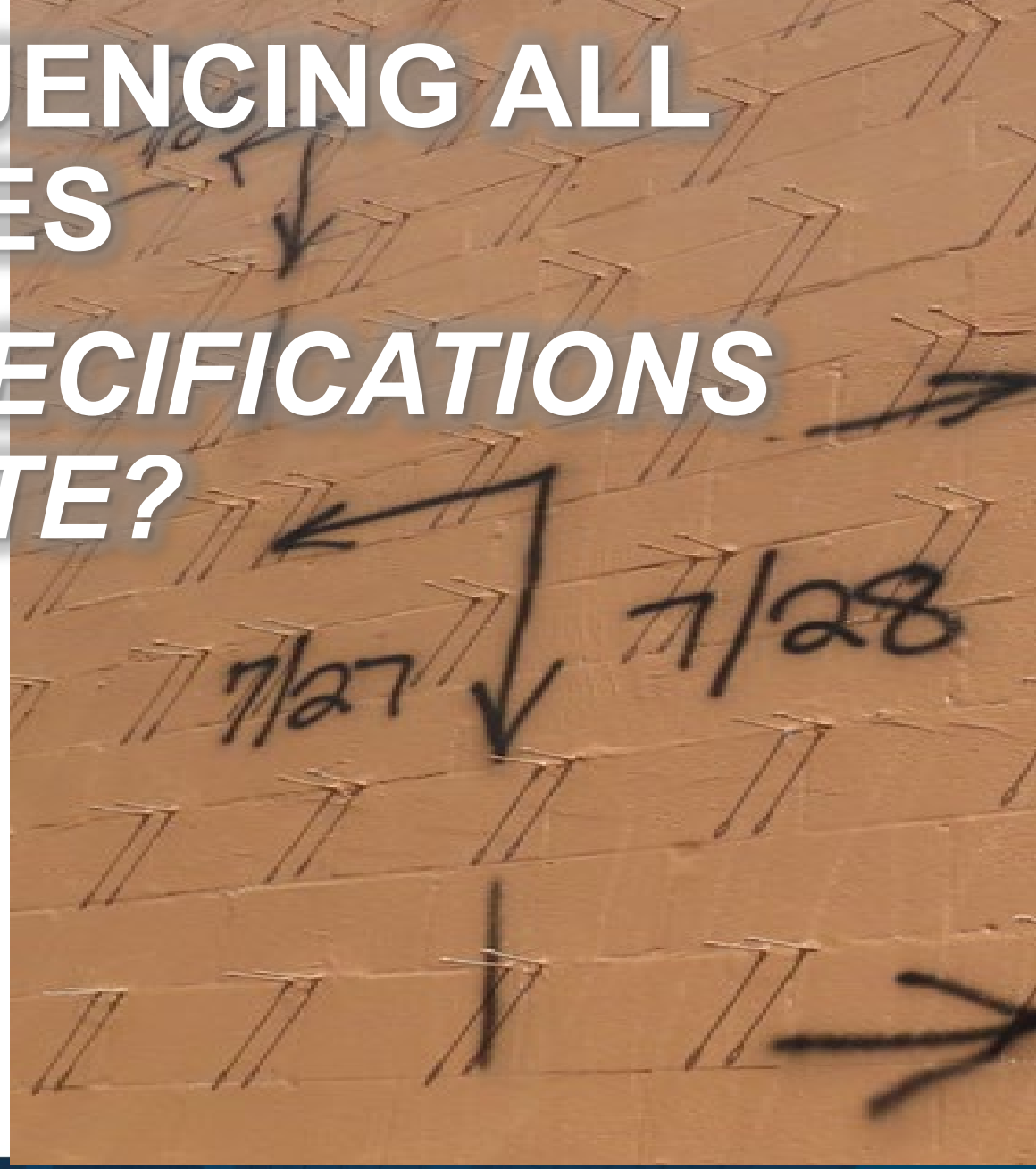
GO OVER EACH SPECIFICATION SECTION AND REVIEW THE STRUCTURAL DRAWINGS FOR SUBSTRATE SPECIFICATIONS AND ARCHITECTURAL DRAWINGS FOR NOTES



ITS ABOUT SEQUENCING ALL TRADES

WHAT DO THE SPECIFICATIONS INDICATE?



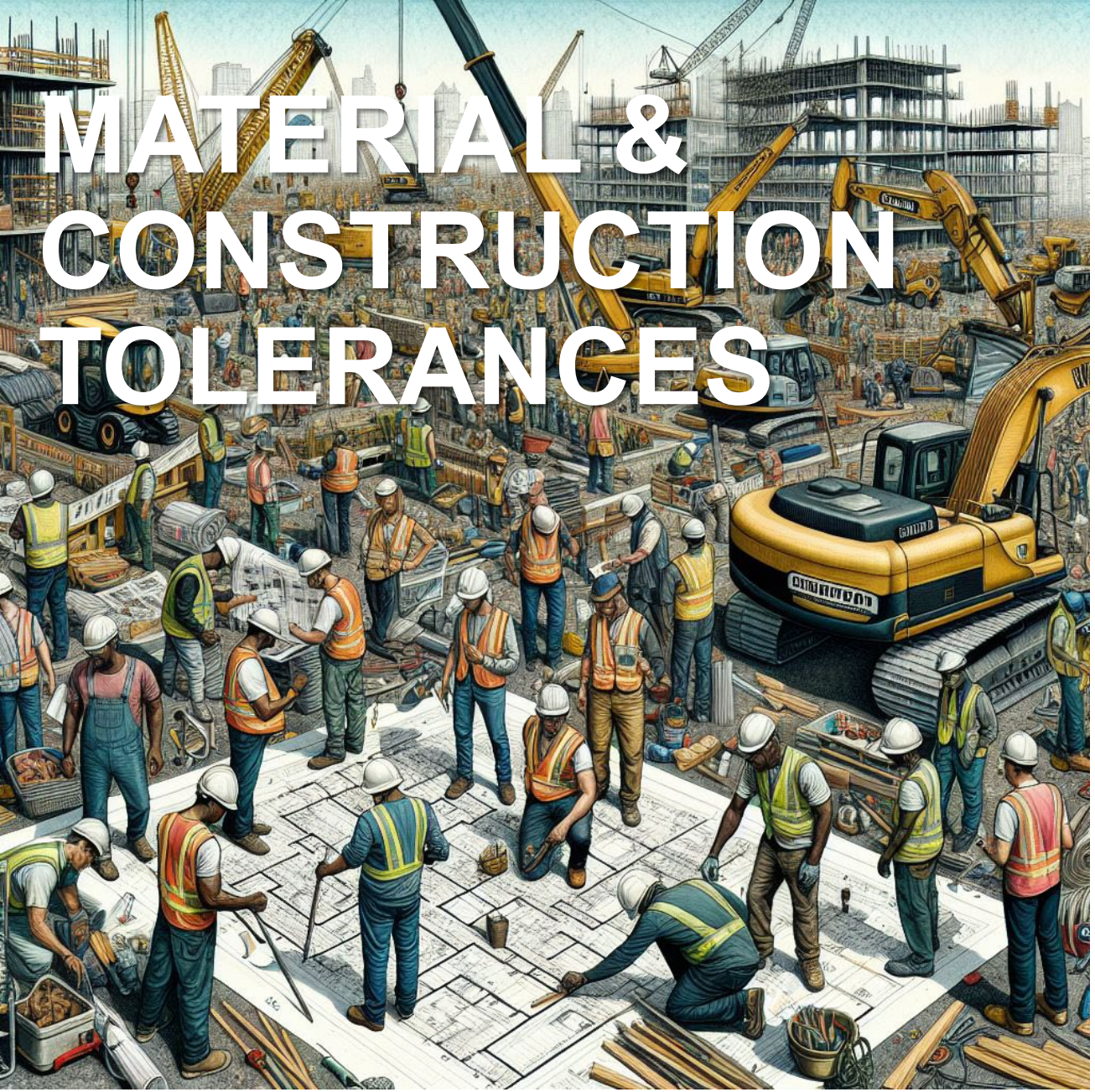
Compatibility with air barrier components & other building materials

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

Look in both directions!



I am frequently asked about installation and material tolerances after the installation…

Your specifications should clearly identify what the tolerances are for each material and system so that the next trade is able to properly coordinate before the work starts.

Don’t wait until it is too late – ask the questions in the preinstallation meetings for each trade and think what is next in line.

Installation of:

- ✓ Concrete
- ✓ Precast
- ✓ Masonry
- ✓ Steel
- ✓ CFMF
- ✓ Curtainwall/ Storefront

Material:

- CMU
- Masonry
- Precast
- Steel
- CFMF
- Insulation
- Cladding

List of References:

Handbook of Construction Tolerances 2ed

by David Kent Ballast, AIA, CSI

ACI 117, Specifications for Tolerance for Concrete & Materials

MNL 116 / MNL 117, Quality Control for Structural Concrete / Architectural Concrete

MNL-135, Tolerance Manual for Precast & Prestressed Concrete

ASTM A6, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, & Sheet Pilings

AISC 303, Code of Standard Practice for Steel Buildings & Bridges

ASTM C55, ASTM C90, ASTM C129, ASTM 744 – CMU

ASTM C62, ASTM C216, ASTM 652, ASTM C1088 - Masonry

ACI 530.1/ASCE 6/TMS 602 – Specifications for Masonry Structures Dimension Stone Design Manual VI

Indiana Limestone Institute 21st ed.

AAMA MCWM 1-89, Metal Curtainwall Manual

ANSI H35.2-2003, Dimensional Tolerances for Aluminum Mill Products

GANA Glazing Manual

SFM-1-87, Aluminum Storefront and Entrance Manual

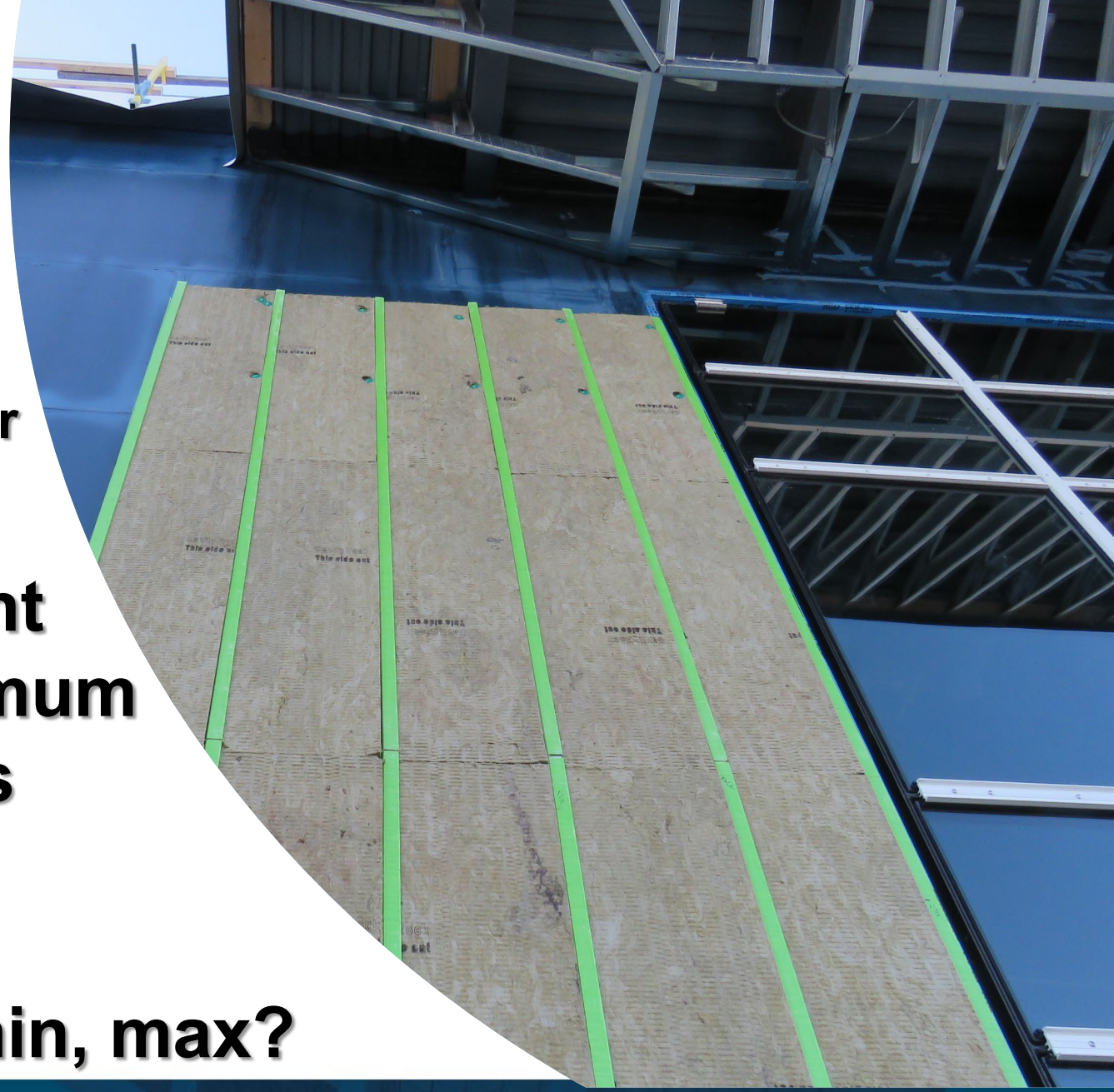
MATERIAL & CONSTRUCTION TOLERANCES

Tolerances need to be based on many items, including:

- Deflection
- System(s) tolerances
- Material Installation Tolerance

MATERIAL & CONSTRUCTION TOLERANCES

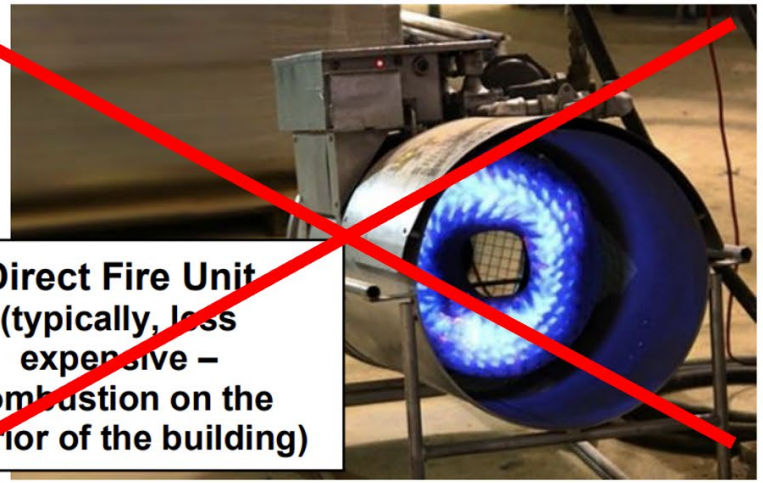
Dimensions to the outside of the veneer might modify the gap size based on different manufacturers of the veneer.



Decide what is important

- **Provide minimum / maximum**
  - **Insulation thickness or R-value**
  - **Air gap size**
- **Overall Dimensions, hold, min, max?**

Two typical systems are direct fire (propane or natural gas) and indirect fire system. Direct fire units are similar to a fireplace without a chimney. Indirect units are similar to a home furnace with a flue to the exterior.



If your work is happening in colder months, ask the General Contractor how they plan to temporarily heat the interior.

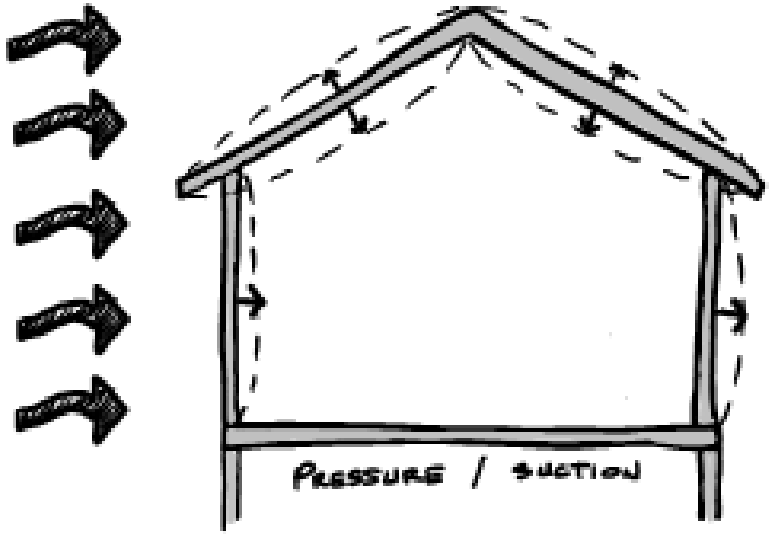
Make sure that they are using

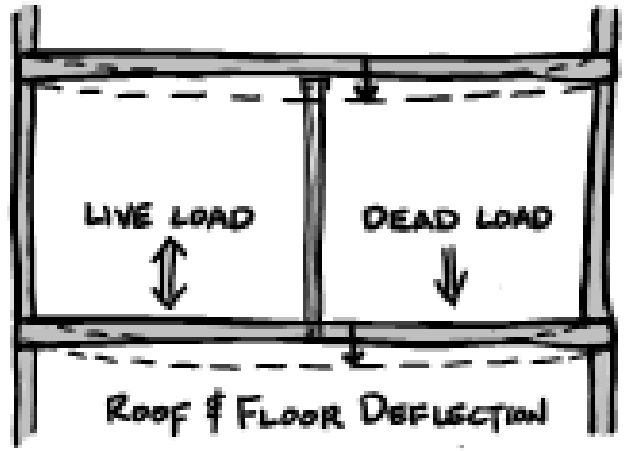
INDIRECT HEAT

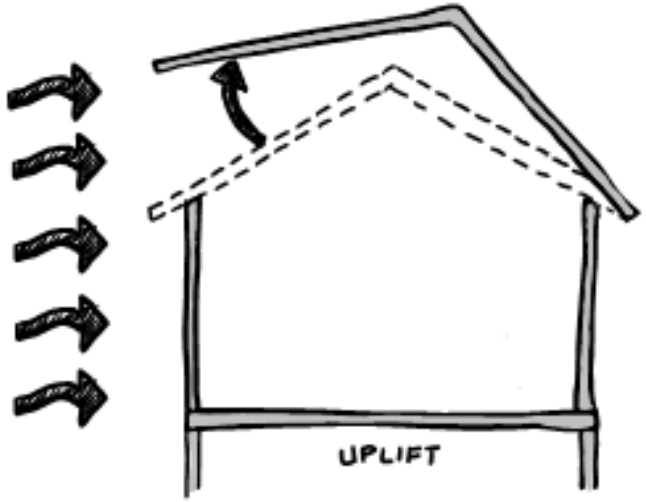
not

Direct fired propane or natural gas!

BUILDING DEFLECTIONS



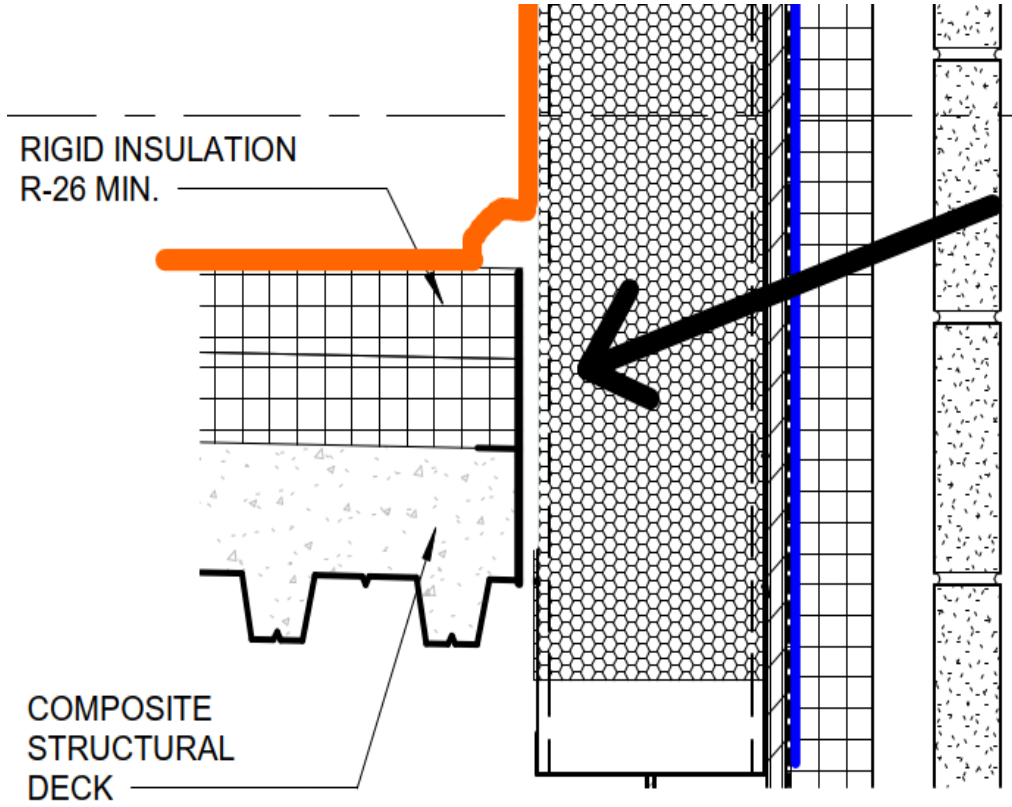




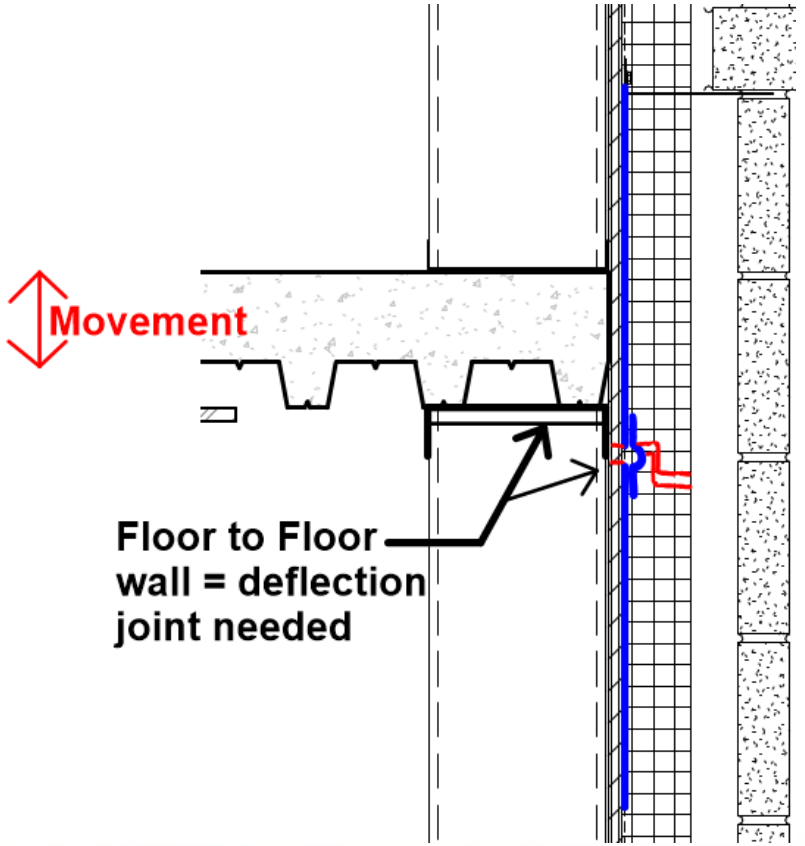

Live
Load
Deflection

Floor slab edge detailing

substrate stops and starts at the floor/floor or floor/roof = Deflection
substrate "flys-by" the Floor/floor or floor/roof = No Deflection



Wall is deadloaded on foundation or floor below and bypasses the floor or roof (in this case) - therefore, no deflection is taken in the wall.



Talk to the insulator about how the insulation is attached – peel stick material can pull the AVB away from the substrate

The Importance of Updated Data Sheets

Limitations

- eXP Sheathing is not a finished surface, nor is it a substrate for the direct application of joint compound, stucco, paint or textures in exterior wall applications. Placement of vapor retarders within the wall assembly is the responsibility of the design professional.
- Do not use eXP Sheathing as a nailing base. Mechanical fasteners should pass through the sheathing and engage the framing member behind the panel.
- Install materials used in conjunction with eXP Sheathing per the respective manufacturer's recommendations.
- eXP Sheathing is resistant to weather, but it is not intended for immersion in water and should not be subjected to ponding or to cascading water conditions.
- Do not apply eXP Sheathing below grade. Comply with building code grade clearance requirements.
- Do not laminate eXP Sheathing directly to masonry surfaces; fasten panels to furring strips or framing.
- eXP Sheathing is not intended for tile applications. For tile applications, Gold Bond® BRAND eXP® Tile Backer or PermaBase® BRAND Cement Board is recommended.
- Gypsum sheathing is not a replacement for specific structurally engineered sheathing in shear wall designs.
- Adhesive-only application of eXP Sheathing to framing is not recommended.
- Framing supports must not exceed 24 in. (610 mm) o.c.
- Design details, including fasteners, sealants and control joints, must be properly installed per system specifications. Openings and penetrations must be properly flashed and sealed according to code, building design and weather-resistive barrier manufacturer's instructions. Failure to do so will void the warranty; refer to eXP Sheathing warranty for terms, conditions and limitations.
- Avoid conditions that will create moisture in the air and condensation on eXP Sheathing. The use of unvented or improperly vented forced air heaters in the building creates water vapor volumes which can condense on the exterior sheathing. The use of these heaters and any resulting damage is not the responsibility of National Gypsum. Please consult heater manufacturer for proper use and ventilation.

111046 Rev. 3/19

So, can you spot the difference?

We have an extra paragraph under limitations. This is extremely important for the entire team to understand…including the subcontractor!

The Manufacturer determined an issue and placed that issue under the limitations section, telling us that there might be a new problem that we need to understand.

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111046 Rev. 6/17

Specifications to Review

- CONCRETE
- MASONRY
- PRECAST CONCRETE
- CFMF & SHEATHING
  - GYPSUM BOARD
  - WOOD
- PREFABRICATED CFMF PANELS
- SHELF ANGLES
- FIREPROOFING
- MEP – FP PENETRATIONS
- INTERIOR AVB
- ROOFING
- SOUND DECK

Concrete

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Form Release

There are two different family types of form release:

Barrier Type

Petroleum based

Wax based

Silicone based

- *Can stain concrete*
- *Create surface voids*
- *Issues with form removal in cold & hot temperatures*
- ***Likely to prevent adhesion of coatings, waterproofing, or AVB***
- *Not recommended for architectural concrete*

Chemically Active / Reactive

Partially reactive (buffered)

Fully reactive

- *Both types produces a surfactant (soap) that prevents bonding to the formwork by creating a reaction with the calcium ions in the cement paste based on the reactivity.*
- *Winter grade version is available*
- *Organic chemical reaction utilizing fatty acids.*
- ***BEST FOR COATINGS, WATERPROOFING, AND AVB***
- ***Buffered** agents produce an improved soap film that helps remove entrapped air, promoting a better flow of a thin skin of cement paste at the surface. This produces fewer bug holes, stains, and surface irregularities. Best for architectural concrete.*
- ***Fully Reactive** agents provides a basic soap film which produces fewer bug holes, stains, and surface irregularities than the barrier type.*

Ask the General Contractor for the Form Release from the Concrete Contractor ASAP to send to the AVB MFR for review As Soon As Possible

Concrete Surface Expectations

Surface Finish - 1.0

- No formwork facing material is specified
- Patch voids larger than 1.5” wide or ½” deep
- Remove projections greater than 1”
- Tie holes need not be patched
- **Surface Tolerance Class D**

Surface Finish - 2.0

- Patch voids larger than ¾” wide or ½” deep
- Remove projections greater than ¼”
- Tie holes need to be patched
- **Surface Tolerance Class B**

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**

Concrete Surface Expectations

Surface tolerance: ACI 347 – Section 5.4

Class A: *is suggested for surfaces prominently exposed to public view where appearance is of special importance. OR COATED SURFACE.*

CLASS B: *is intended for course-textured, concrete formed surfaces intended to receive plaster, stucco, or similar.*

CLASS C: is a general standard for permanently exposed surfaces where other finishes are not specified.

CLASS D: is a minimum quality requirement for surfaces where roughness is not objectionable, usually applied where surfaces will be permanently concealed.

Abrupt Irregularities: ACI 347 – table 5.3.1

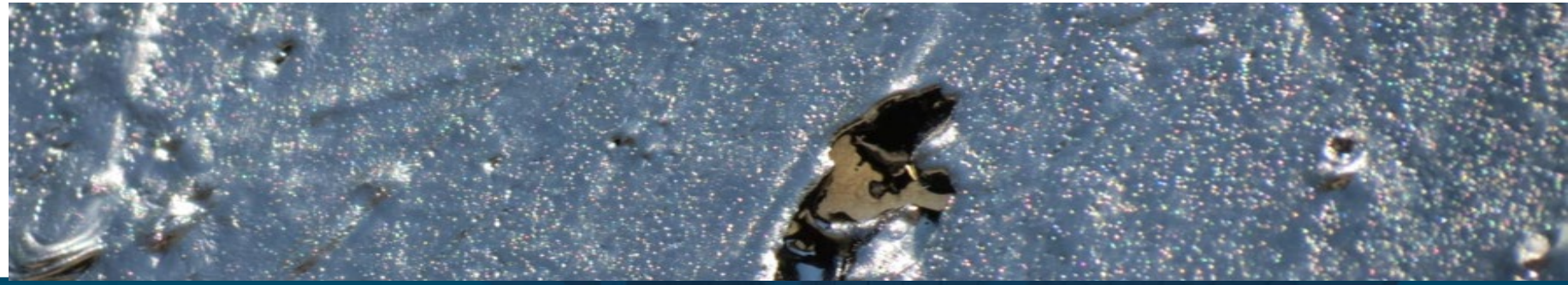
Abrupt irregularities measured within 1" of the irregularity. Gradual surface irregularities shall be measured by determining the gap between concrete and near surface of a 5'-0" straight edge, measured between contact points:

CLASS A: 1/8"

CLASS B: 1/4"

CLASS C: 1/2"

CLASS D: 1"



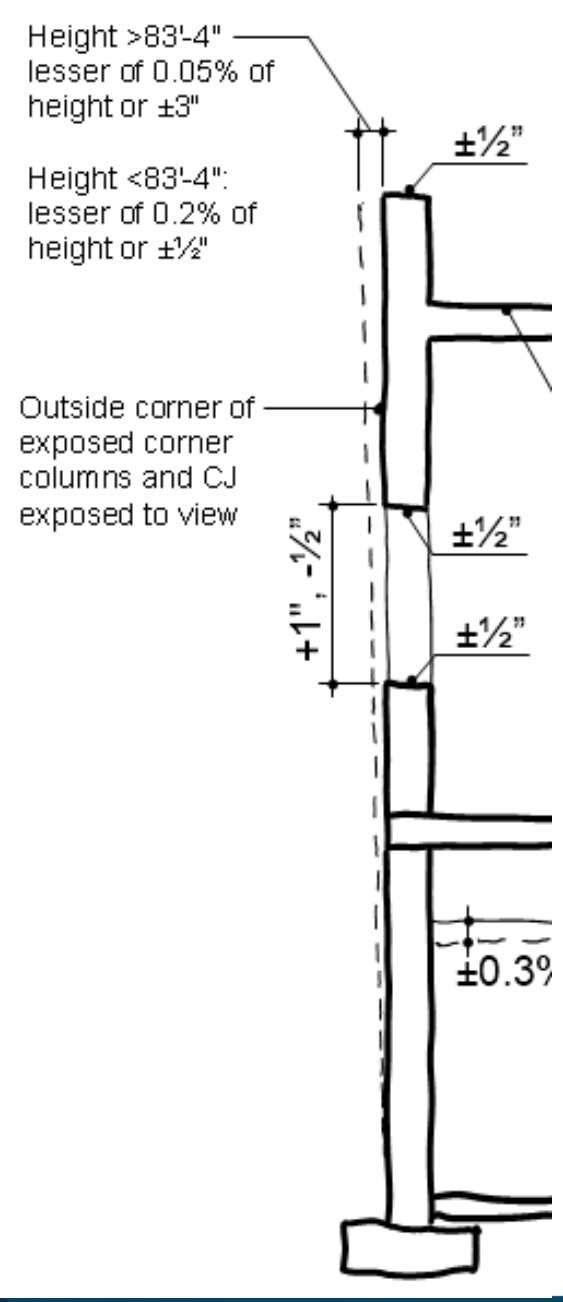
Concrete Surface Expectations

Review how the tie holes are being patch and with what material

Steel at least 1” back

Cementitious patch material only.

Concrete Tolerance Expectations



Masonry

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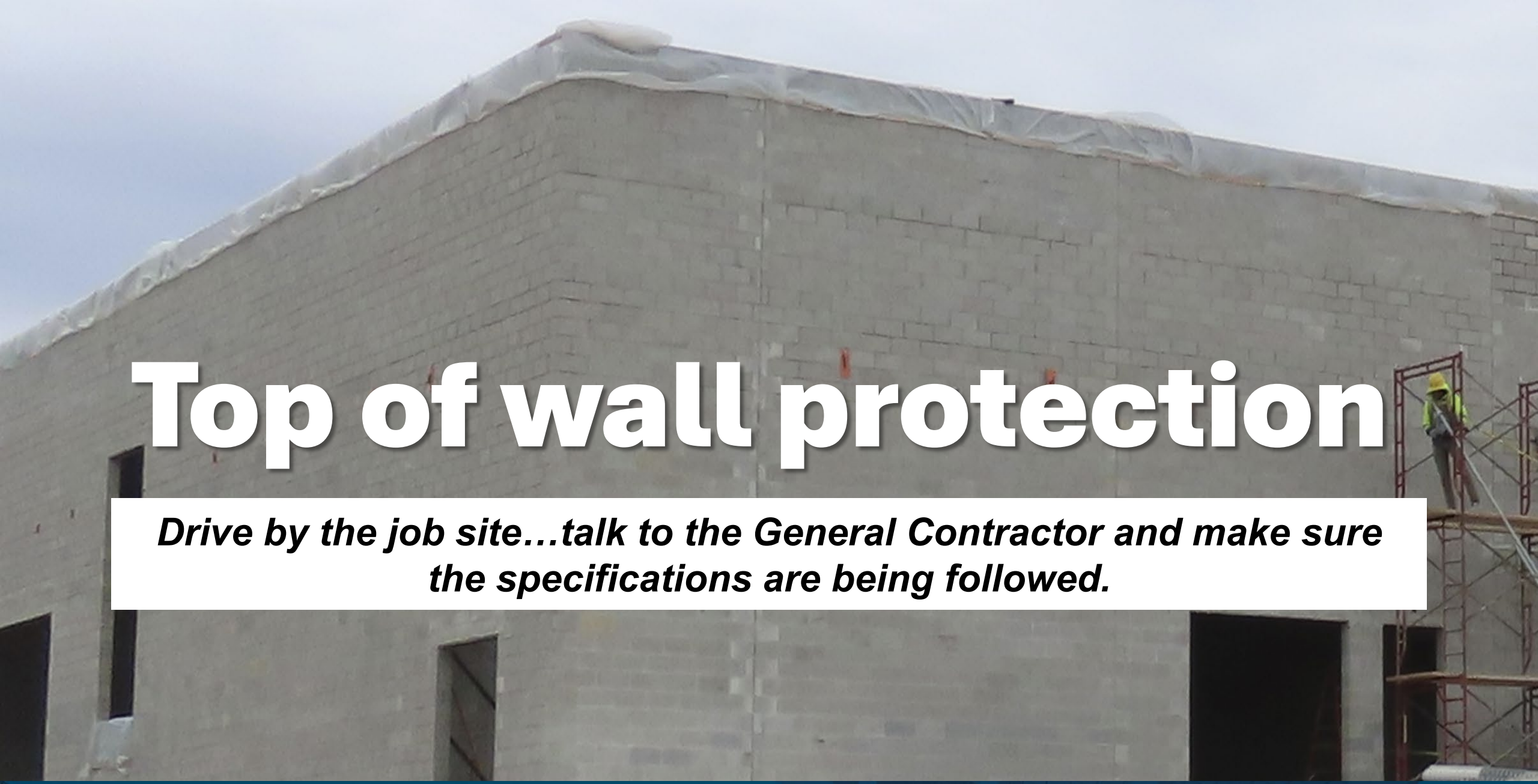


Top of wall protection

Drive by the job site…talk to the General Contractor and make sure the specifications are being followed.

Wall Protection

Walk around the site during construction

Protection to every opening is needed from the top to prevent excessive moisture

Even bond beams!

Interior issues will be exterior issues

Back of Wall Protection

The back of wall needs to be protected

When, how, and by whom?

Make sure that the masonry flashing does not go into the CMU

CMU Site Storage

Storage inside or outside should be protected per specifications

Look for a breathable tarp

Not plastic!

CMU should not be on a plywood sheet, as this will hold water

Efflorescence will create a debonding surface for the liquid or peel and stick.

Make sure that the mason cleans the wall if efflorescence develops

Only clean with a wire brush, little water.

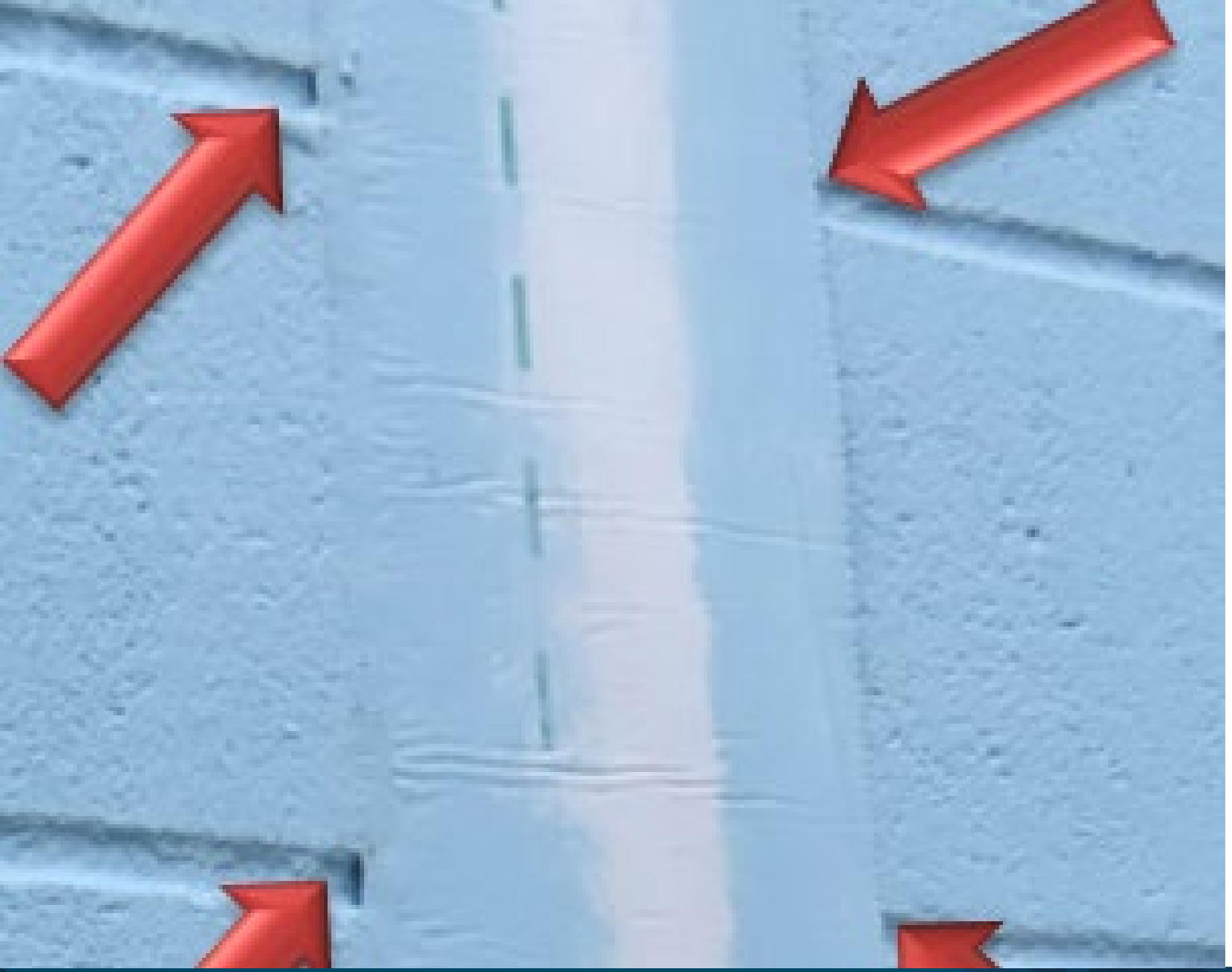
Type of CMU matters

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.*

Lightweight CMU will absorb more liquid material.

Know what CMU is being used – CMU type might have not match specifications – ASK THE QUESTION

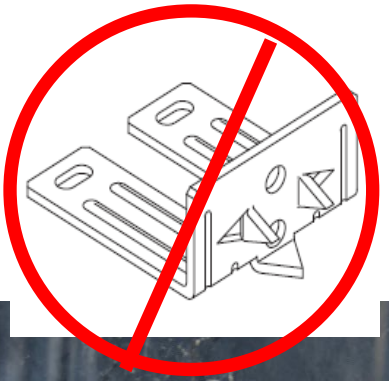


When installing liquid AVB and peel and stick membrane on CMU, <u>unless the CMU joints are struck flush</u>, the concave joints will create an opening in the air barrier system under the peel and stick membrane.

Installing the manufacturer's sealant over the joint between the peel and stick membrane and the liquid AVB will close off the openings that will likely exist at the CMU joints.

This may or may not be a requirement from the AVB Manufacturer; however, it will be necessary to avoid gaps at the CMU joints.

Type of anchor?

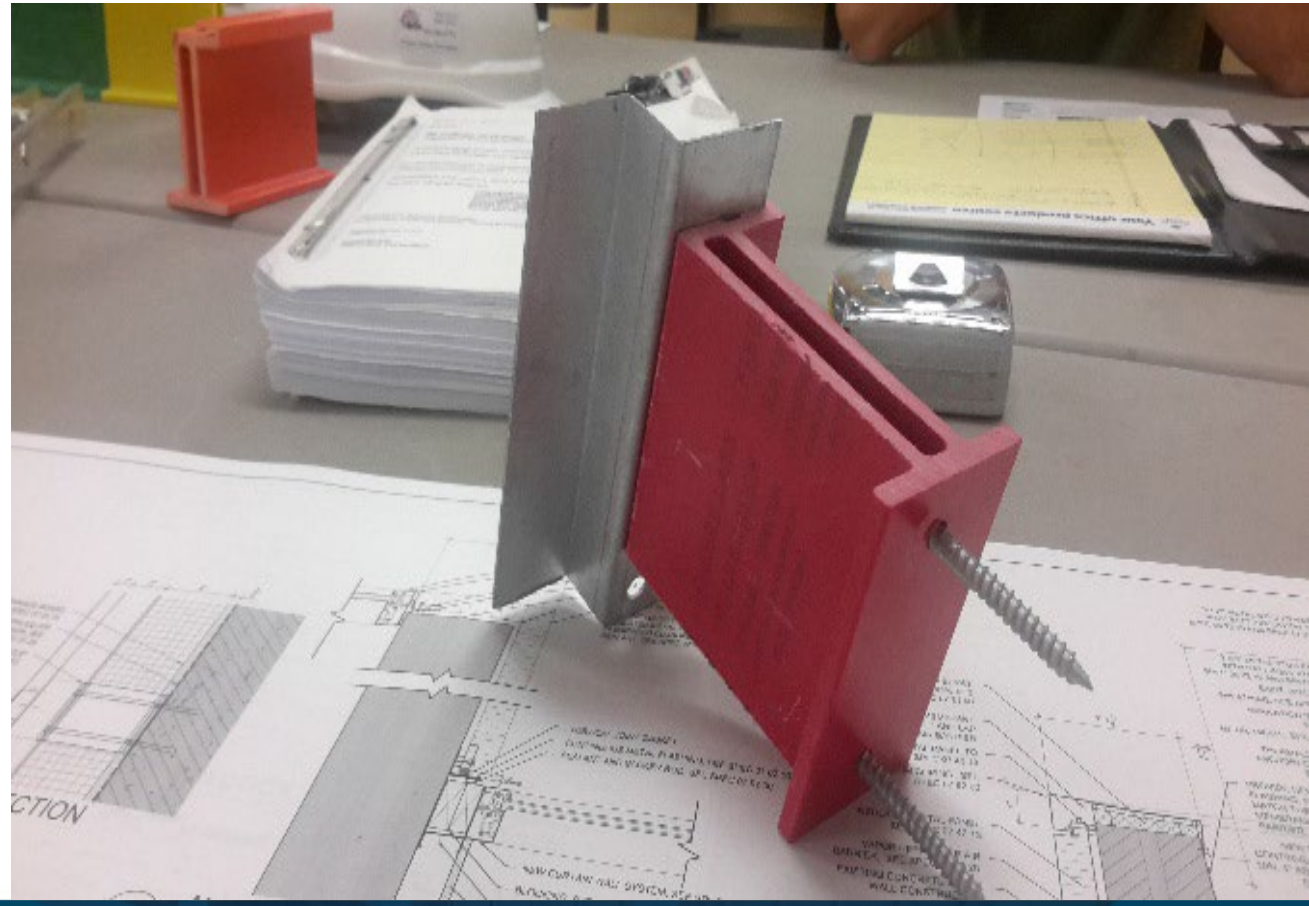


The anchor will rock and enlarge the penetrations

The anchor is not stiff and is easily bendable

There is NO AVB correction after the installation

Determine what trades will be penetrating the AVB and set up a meeting to discuss procedures to penetrate and correct the membrane(s)



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Might need epoxy filler to create a smooth surface


PROFILE COMPLEXITY


Filling the reveals might be an option/necessity

Review how the ends of the precast planks are being closed off

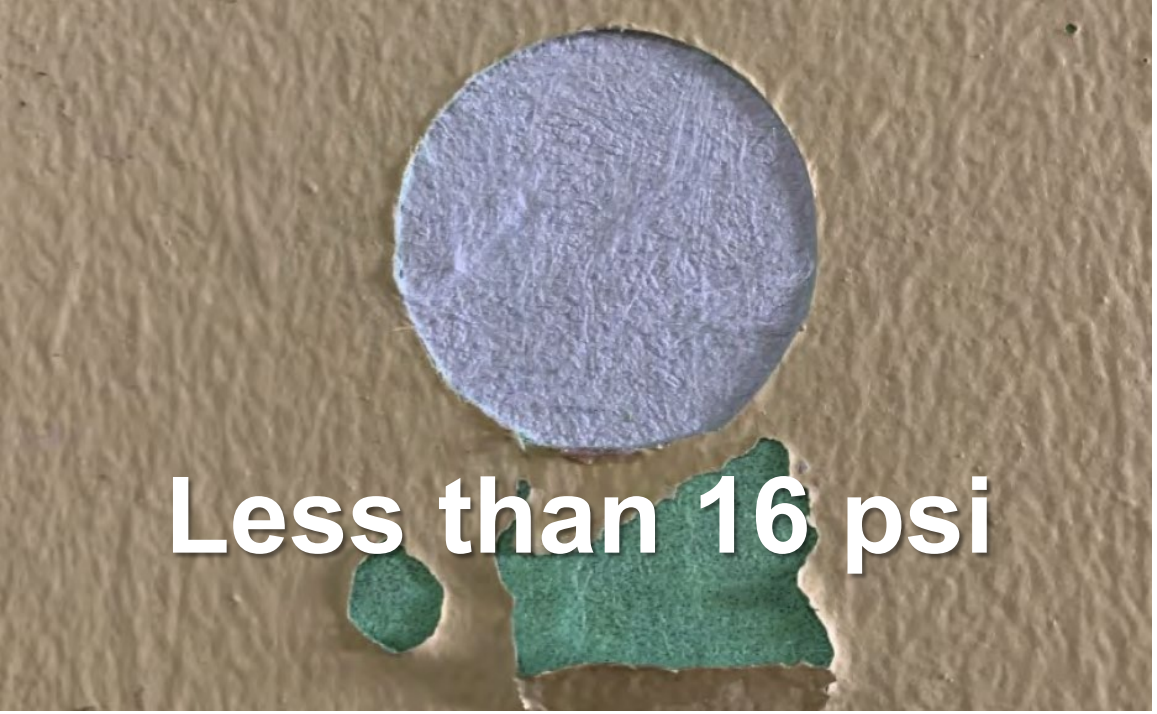
Must be grouted, not plugged with foam

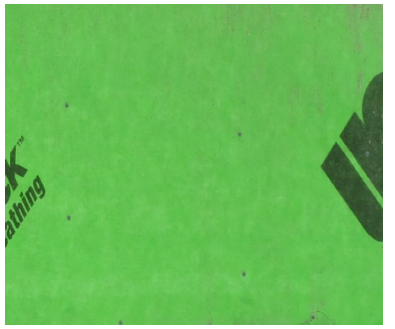
Do the panels have a solid face?

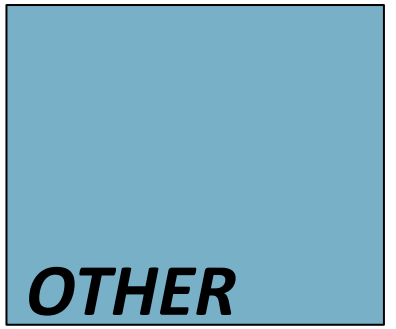
If yes, confirm the finish is smooth, otherwise, you might get a rough finish

Gypsum Sheathing

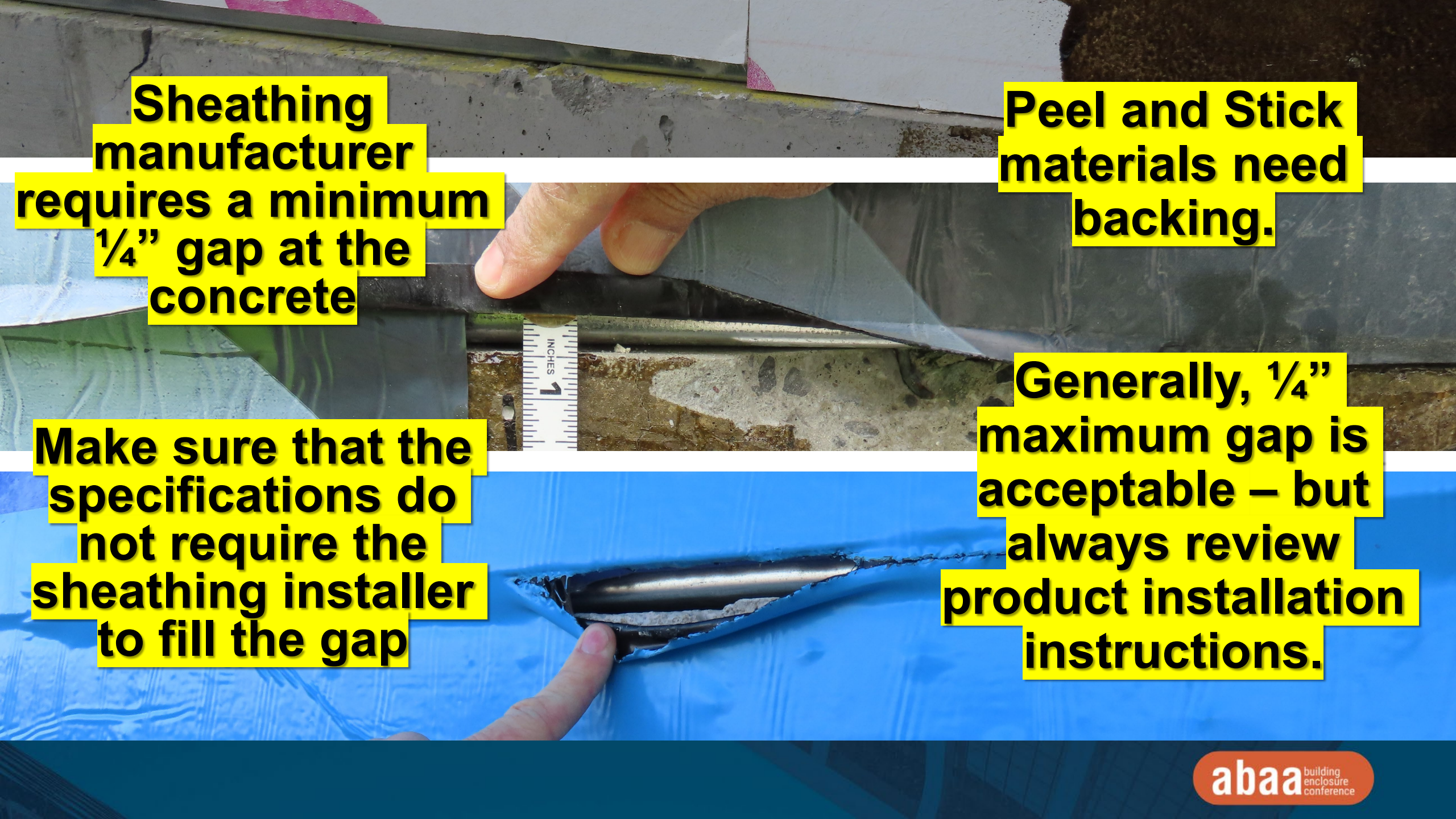
Substrate challenges

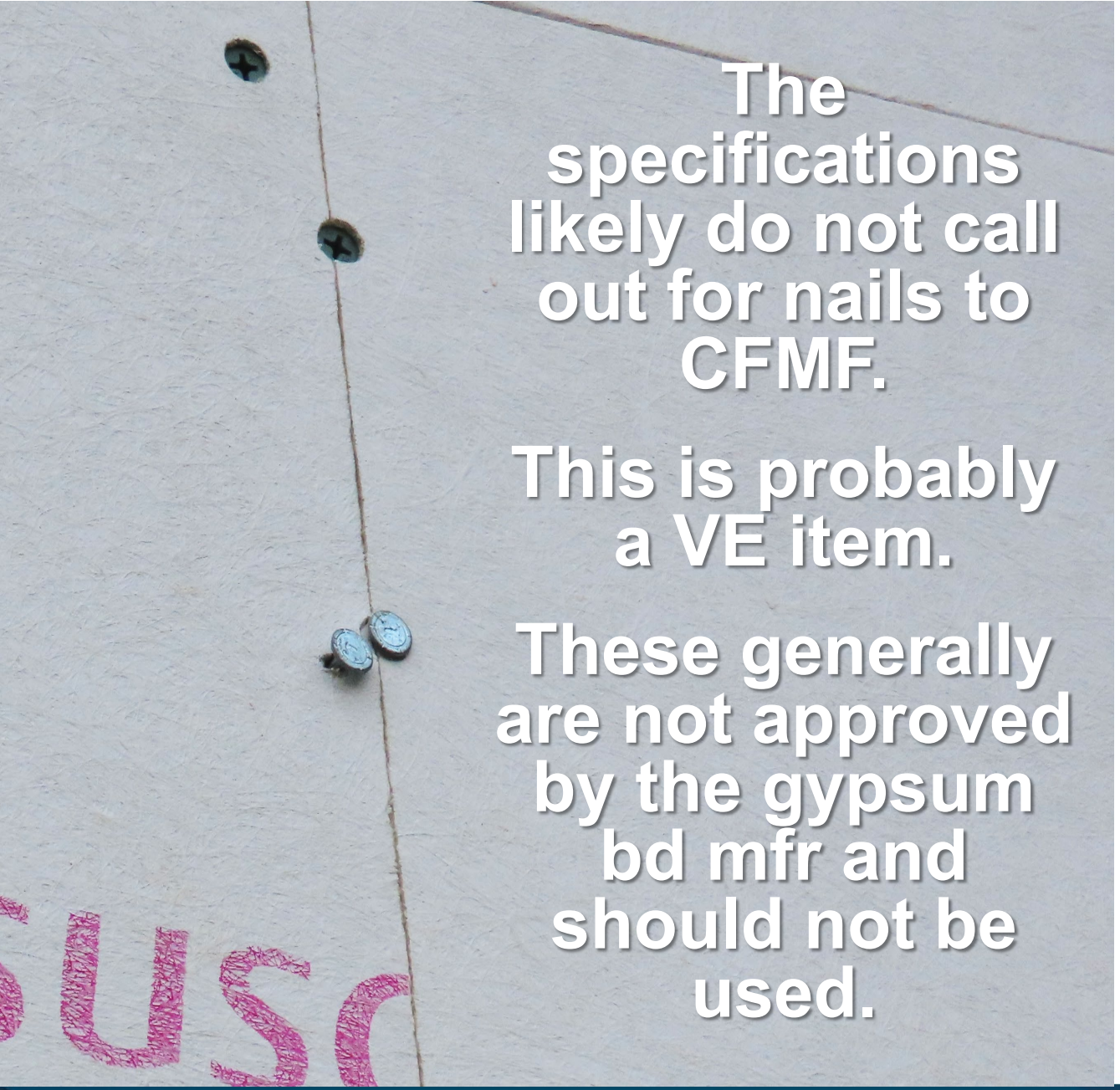






I recommend performing a simple pull-off test on gypsum board sheathing to confirm a min. pull-off of the glass facer


Sheathing manufacturer requires a minimum ¼” gap at the concrete
Peel and Stick materials need backing.
Generally, ¼” maximum gap is acceptable – but always review product installation instructions.
Make sure that the specifications do not require the sheathing installer to fill the gap
INCHES
1



The specifications likely do not call out for nails to CFMF.

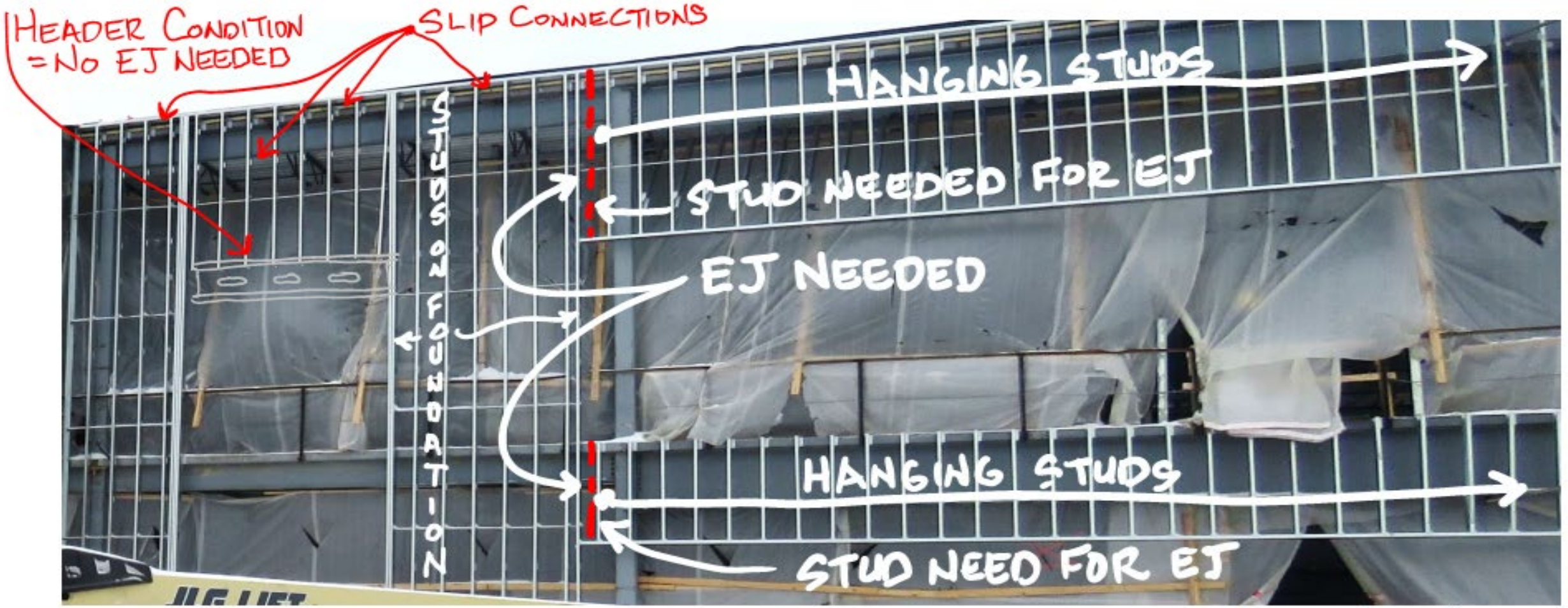
This is probably a VE item.

These generally are not approved by the gypsum bd mfr and should not be used.

Review the attachment of the sheathing early to avoid rework after the AVB need to begin installation

.

When we install Cold Formed Metal Framing (CFMF) in a window condition, *(ribbon windows for example)* **where the framing members are hanging off the roof or floor and the adjacent jamb is resting on the foundation, we have a differential movement condition, where the wall above the window is moving with the floor or the roof and the adjacent jamb is not moving at all.**

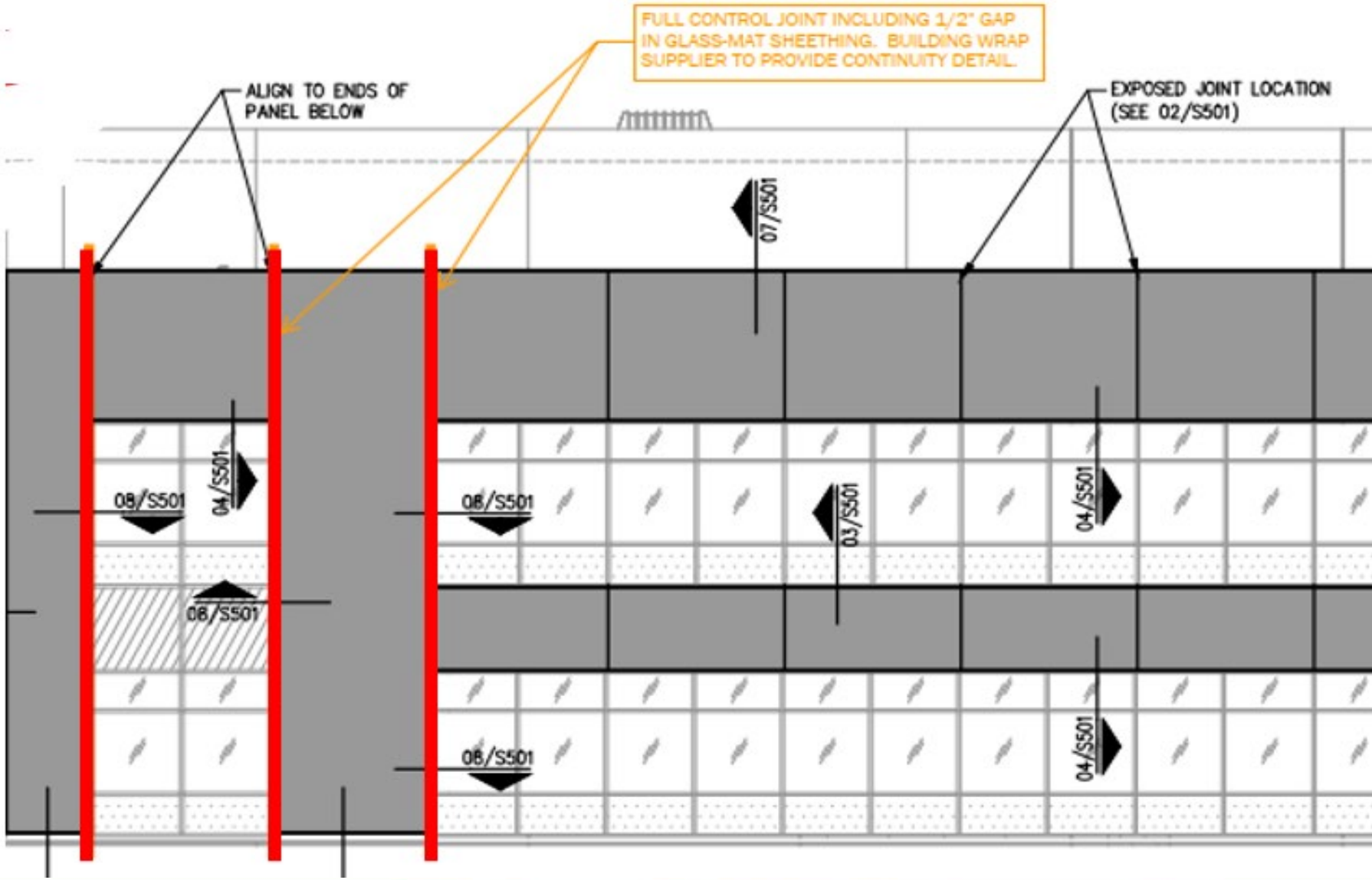


Differential movement

Walls supported by Foundation

Vs

Wall supported by structure (*such as hanging walls*)



Accounting for differential movement in elevations

In these conditions, we need to install an EJ in the framing, sheathing and AVB.

(Note –When a window has a header spanning the jamb – no EJ is needed)

Talk to your CFMF and AVB subcontractors before starting the work

Prefabrication

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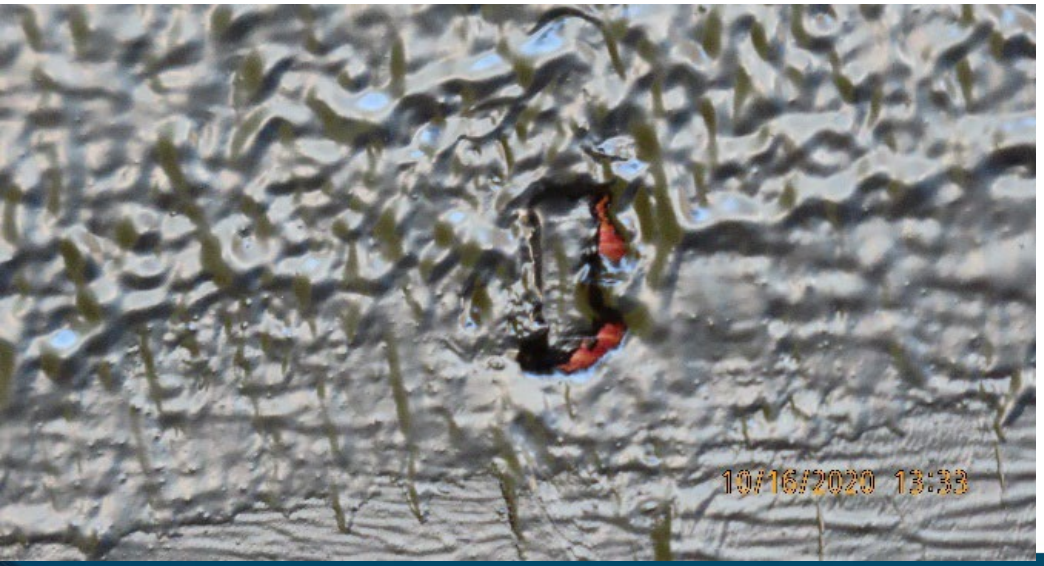
Make sure the panels are properly stored on site

DCCARGOMALL.com
SINGLE COIL HERE

Wood Sheathing

Substrate challenges



Steel – Shelf Angles

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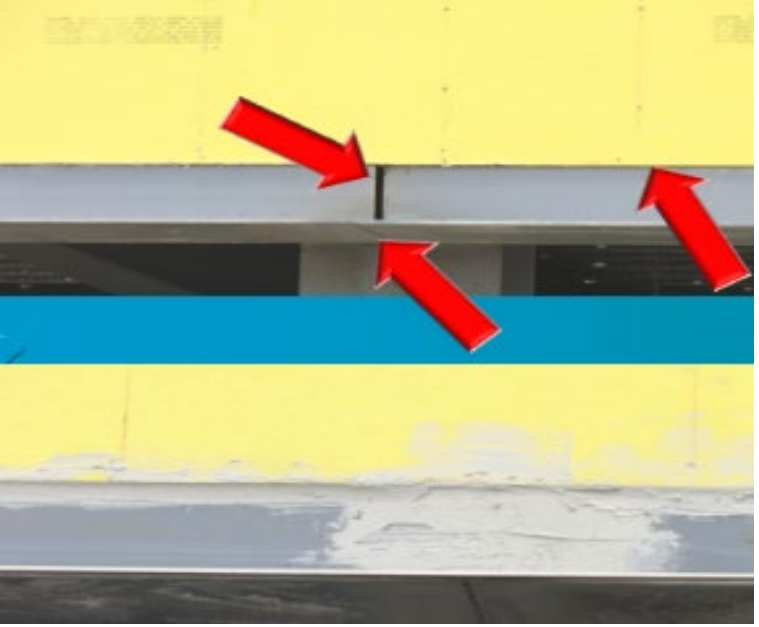
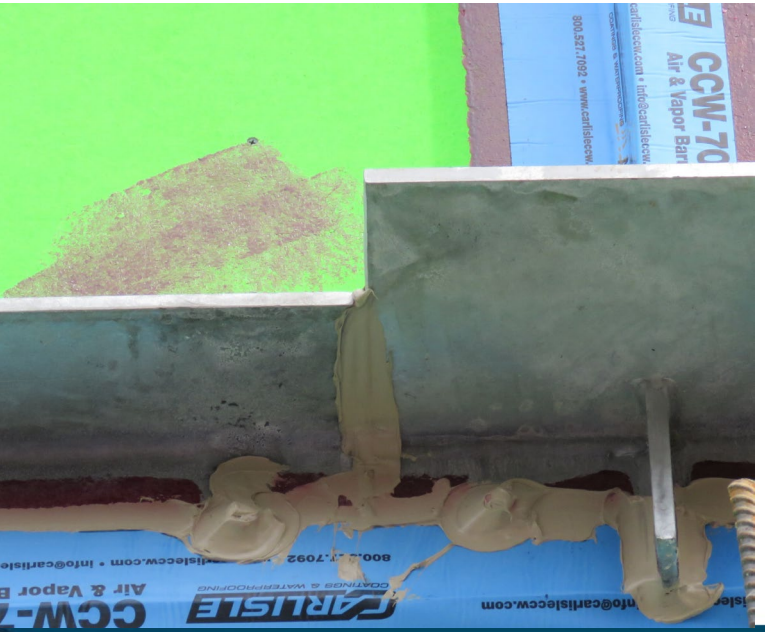
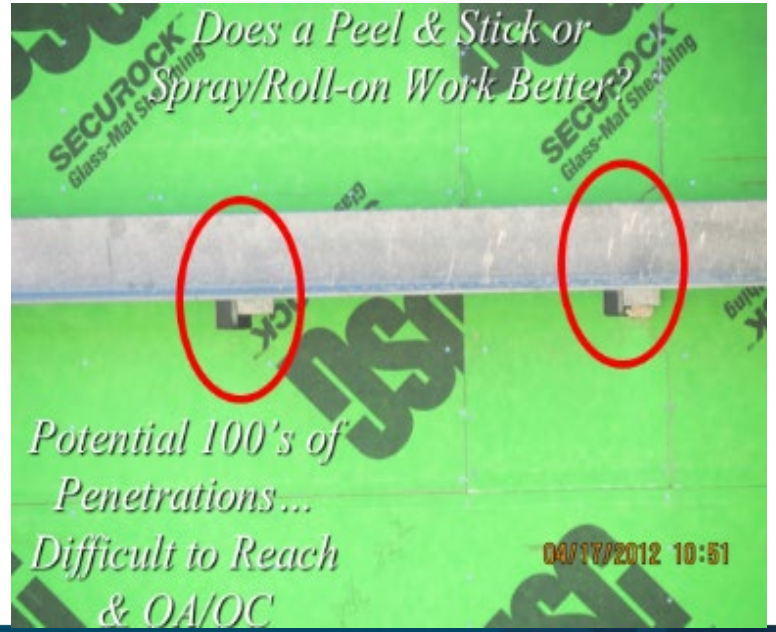
When the shelf angle becomes part of the air barrier system







Fireproofing

Spray insulation and AVB cannot be applied under or over spray or intumescent fireproofing

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 use ditions as that previously menti

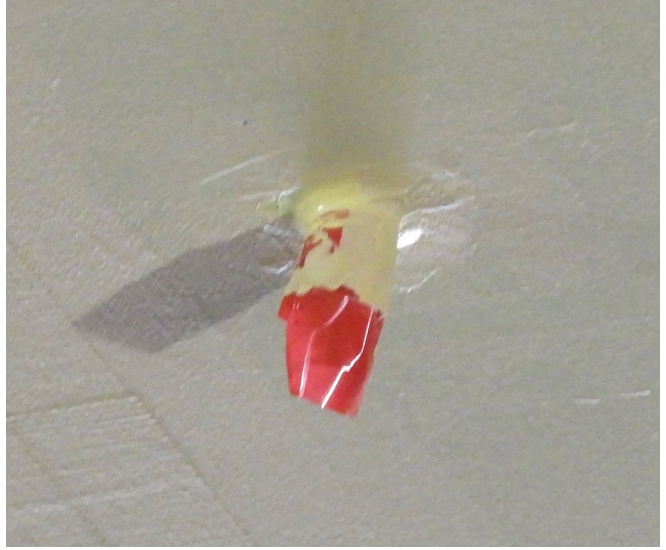
If you have any q

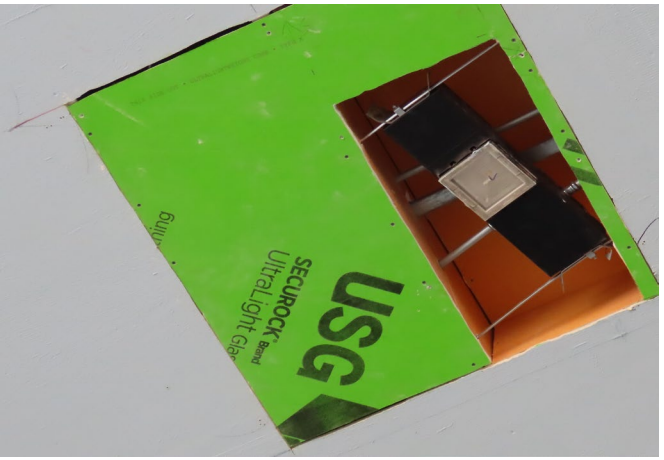
When UL states it has not been investigated, it likely means that there is no data to prove that the assembly will perform under fire conditions.

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





Secondary framing and substrate for spray insulation and AVB will be needed – boxout for electrical & sprinklers

MEP-FP Penetrations

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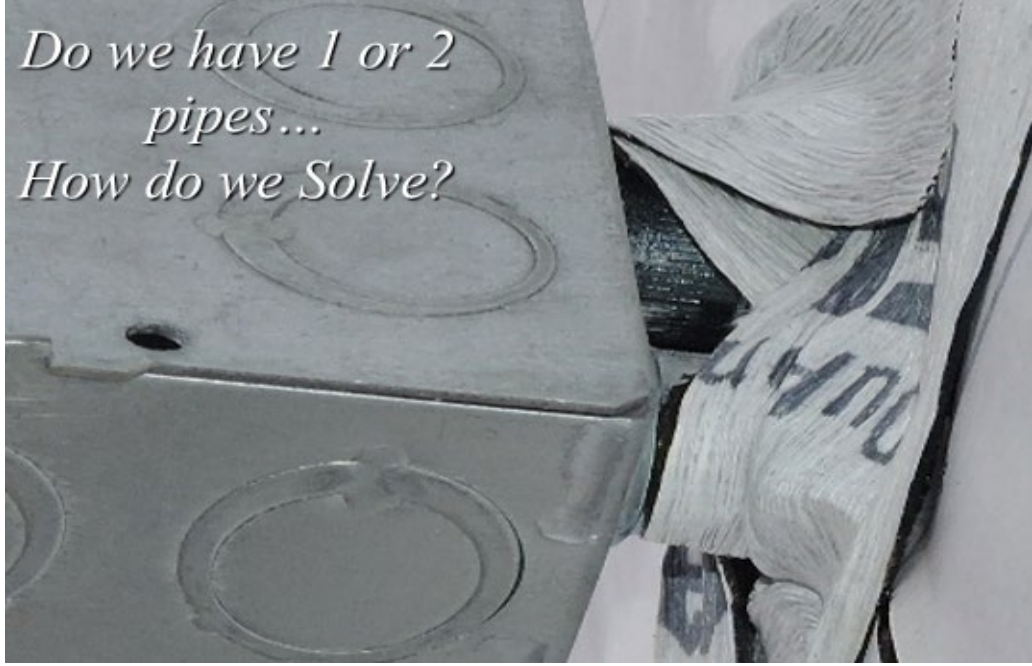
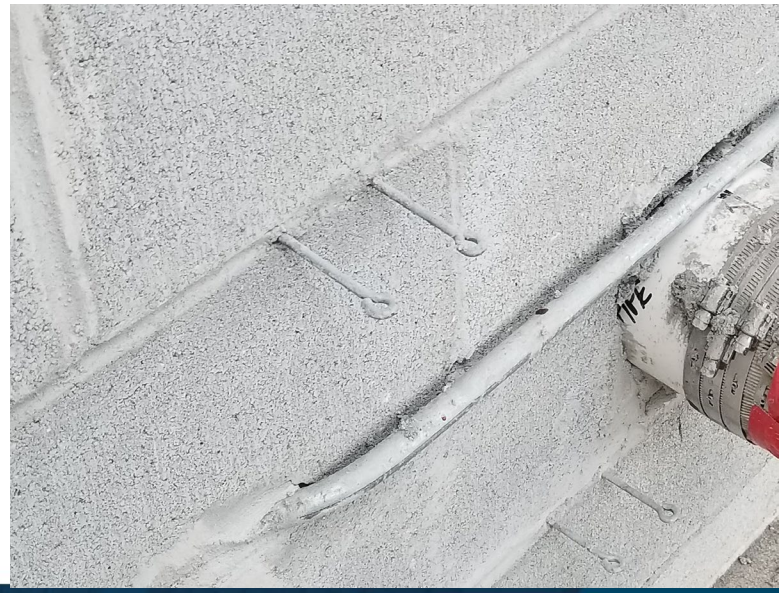
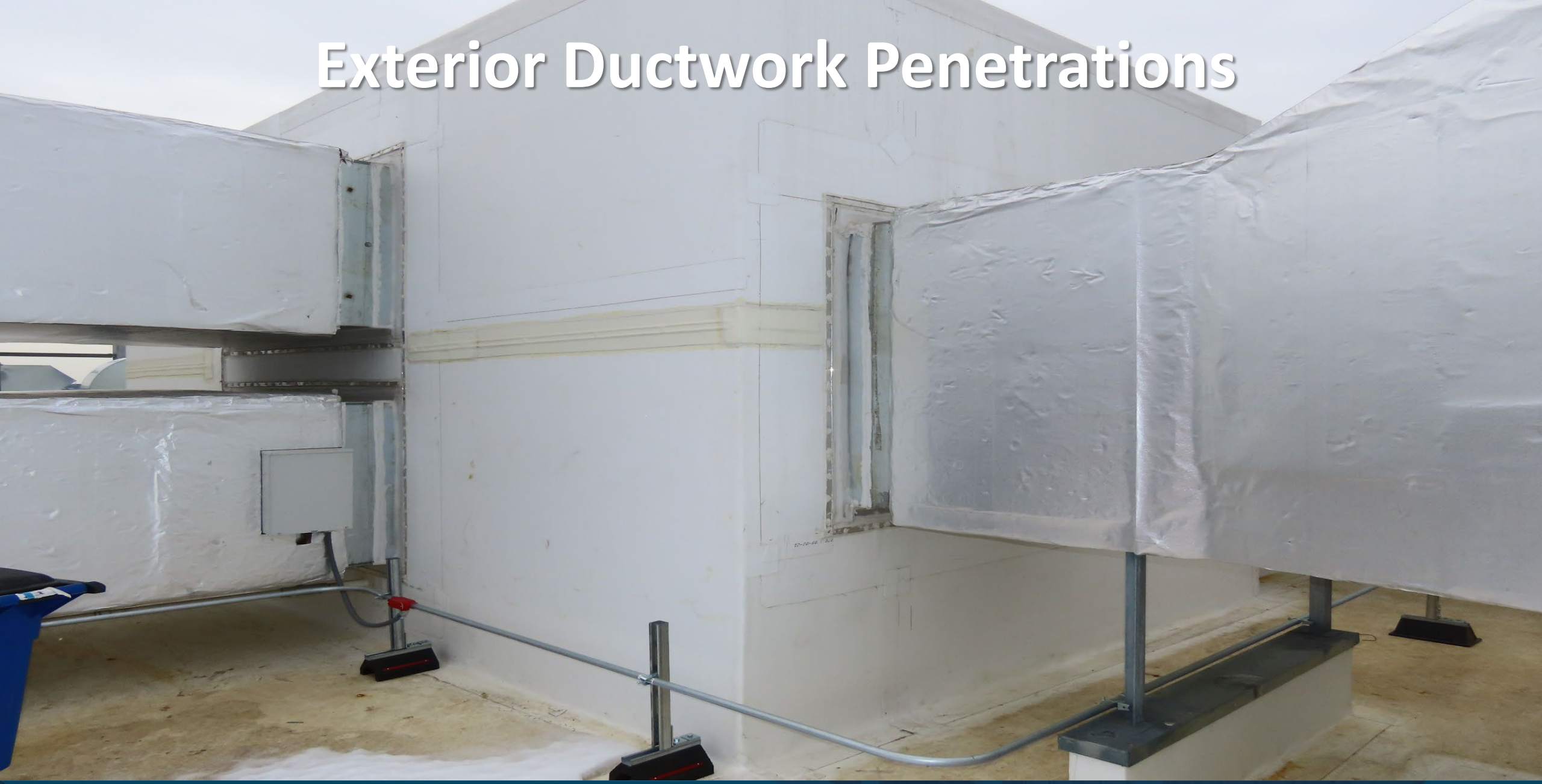
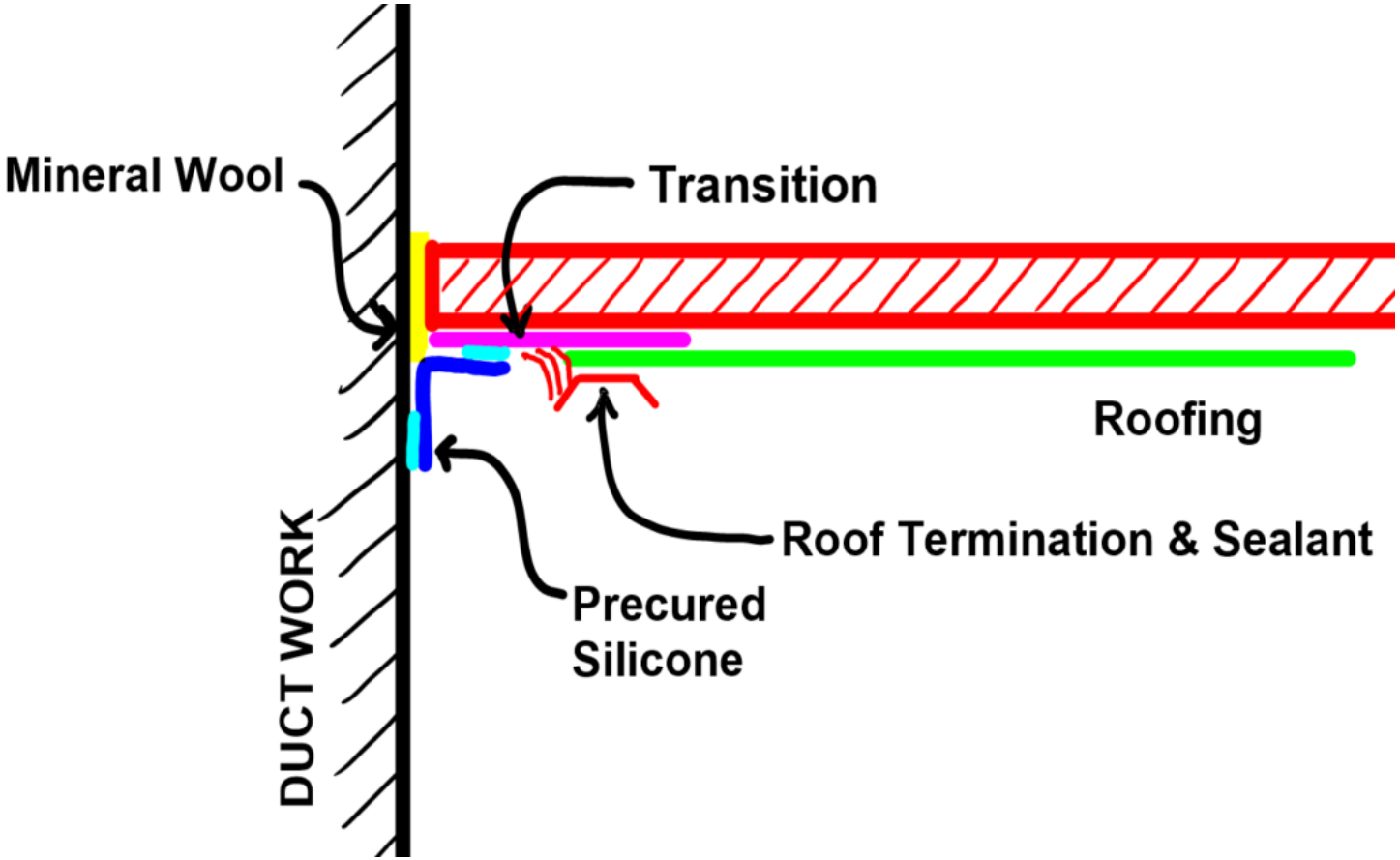

Do we have 1 or 2
pipes…
How do we Solve?


CCW-705
Air & Vapor Barrier



Exterior Ductwork Penetrations




Mineral Wool
Transition
Roofing
Roof Termination & Sealant
Precured
Silicone
DUCT WORK

Interior AVB

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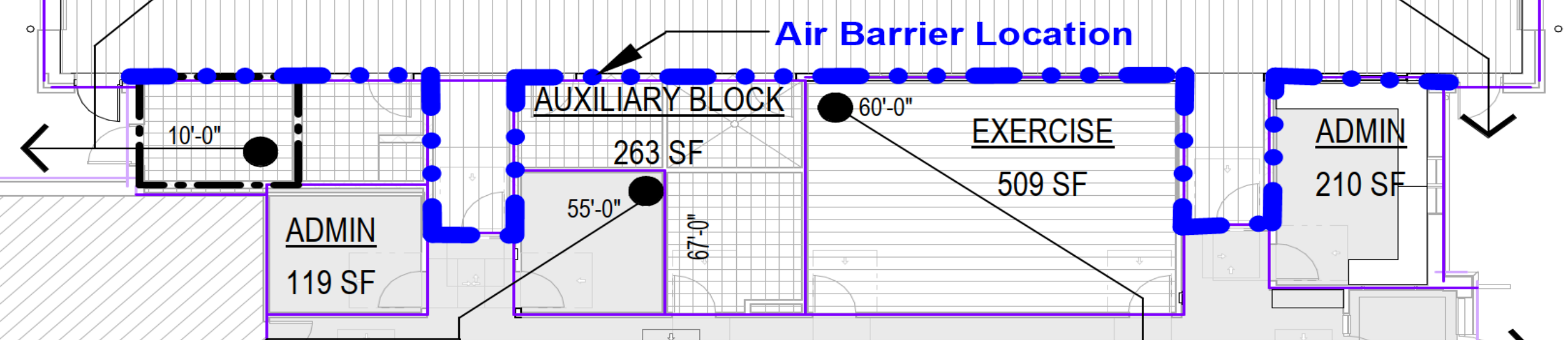
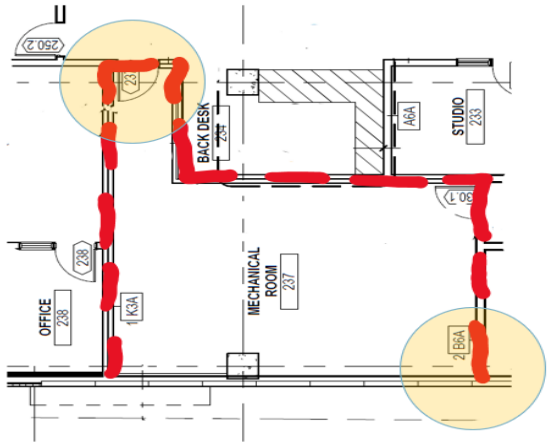
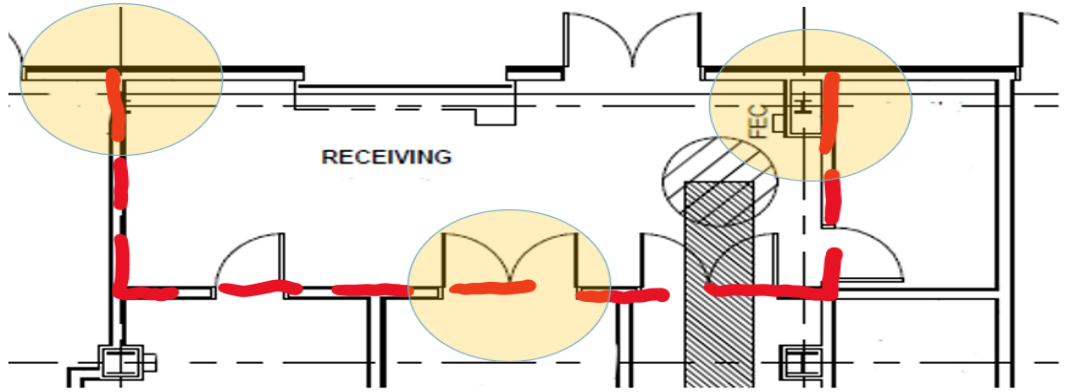
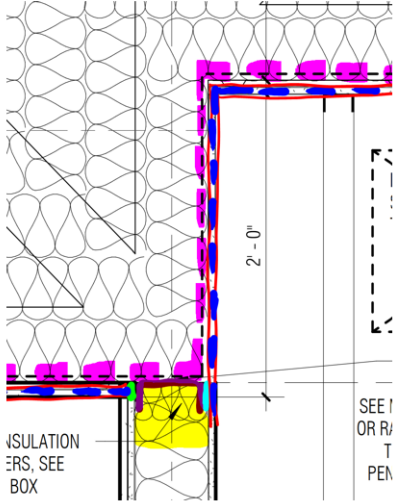




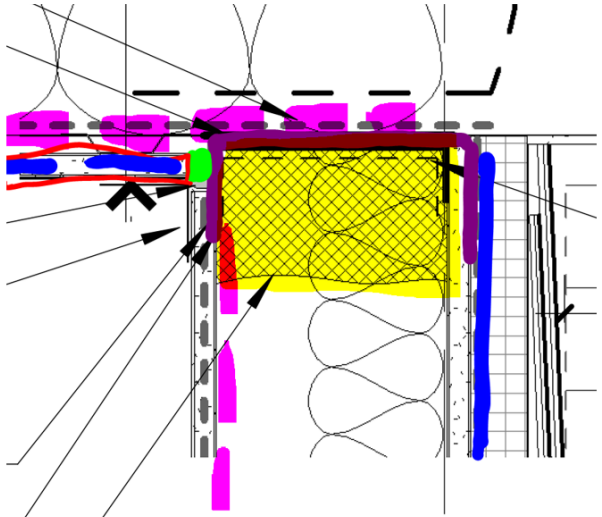


Sometimes, AVB is needed interior of the building and will separate the building into components…

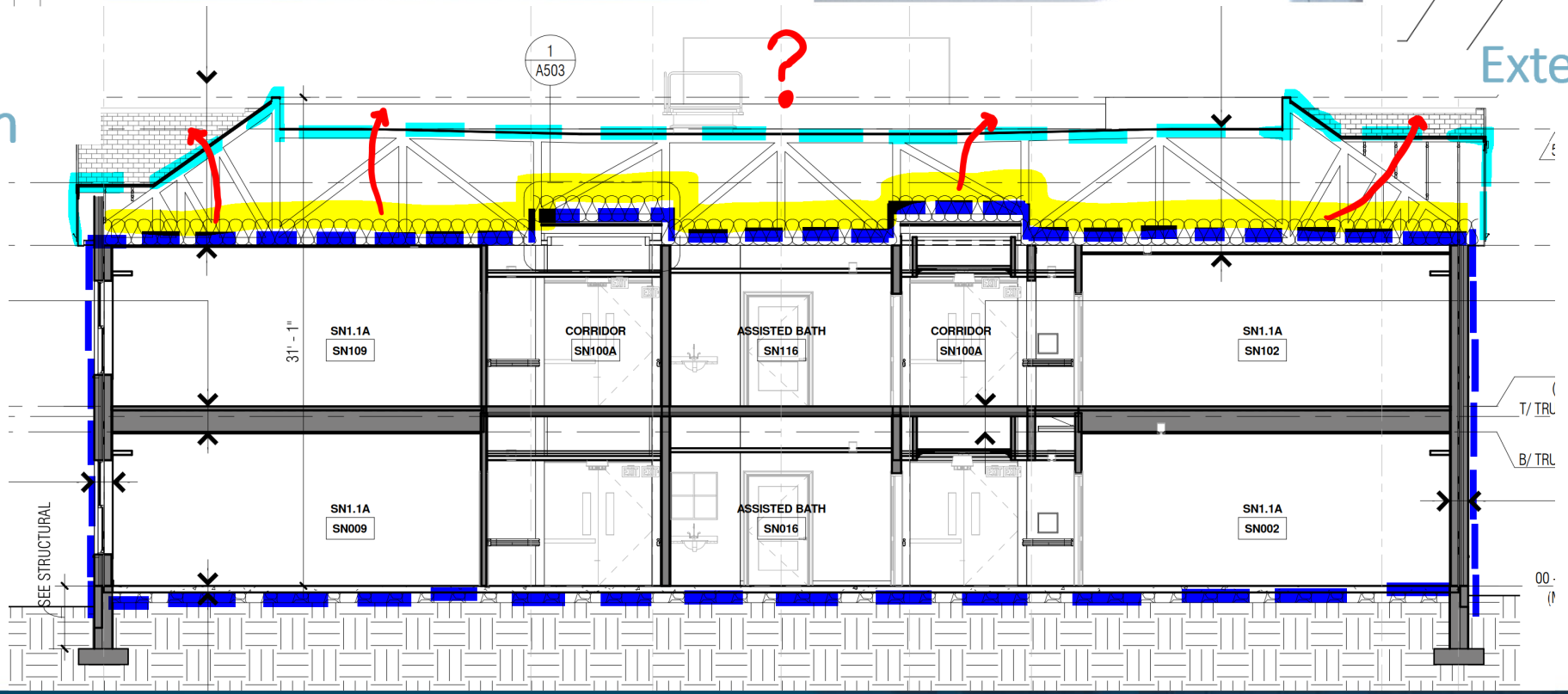
Garage ▫ Loading Docks ▫ Mech Rooms ▫ Vented Spaces



Interior Condition



Exterior Condition



Roofing

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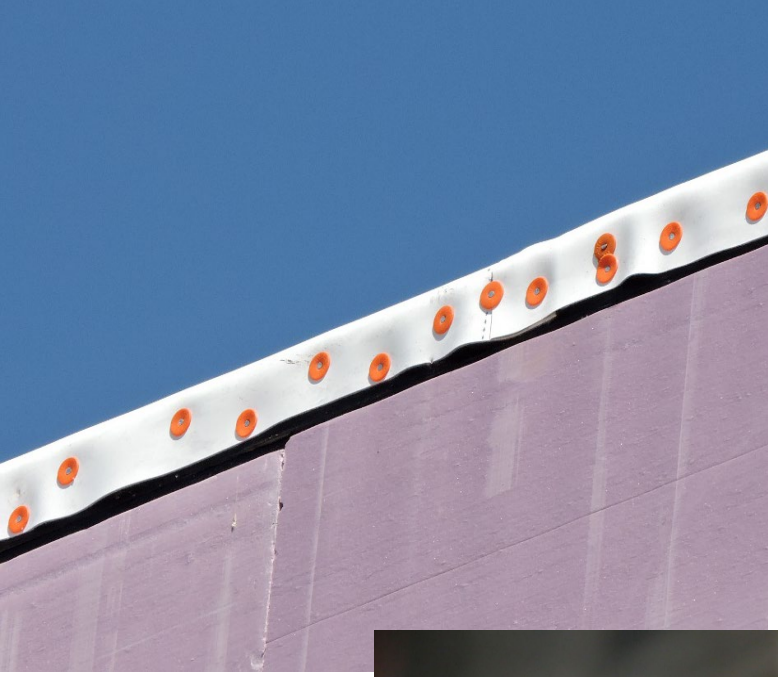
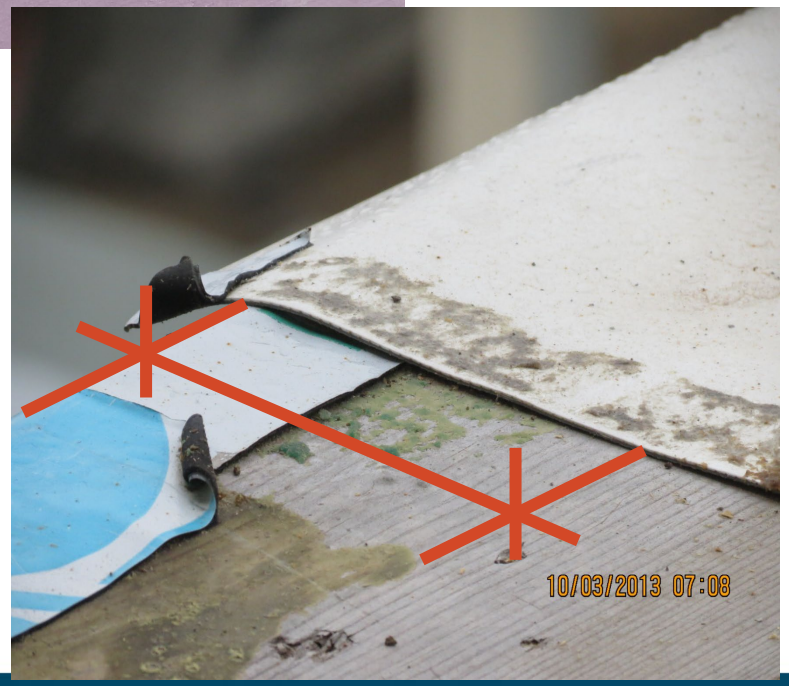
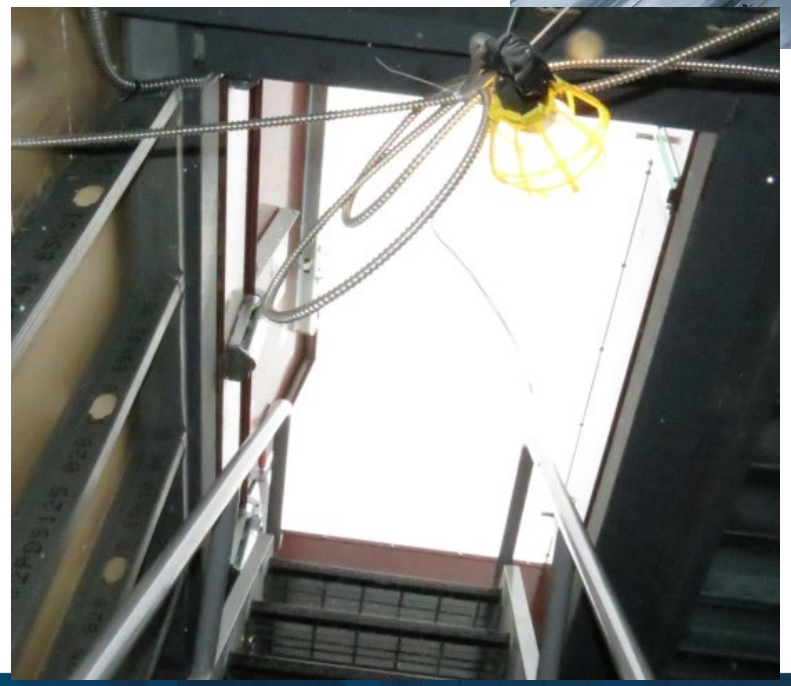
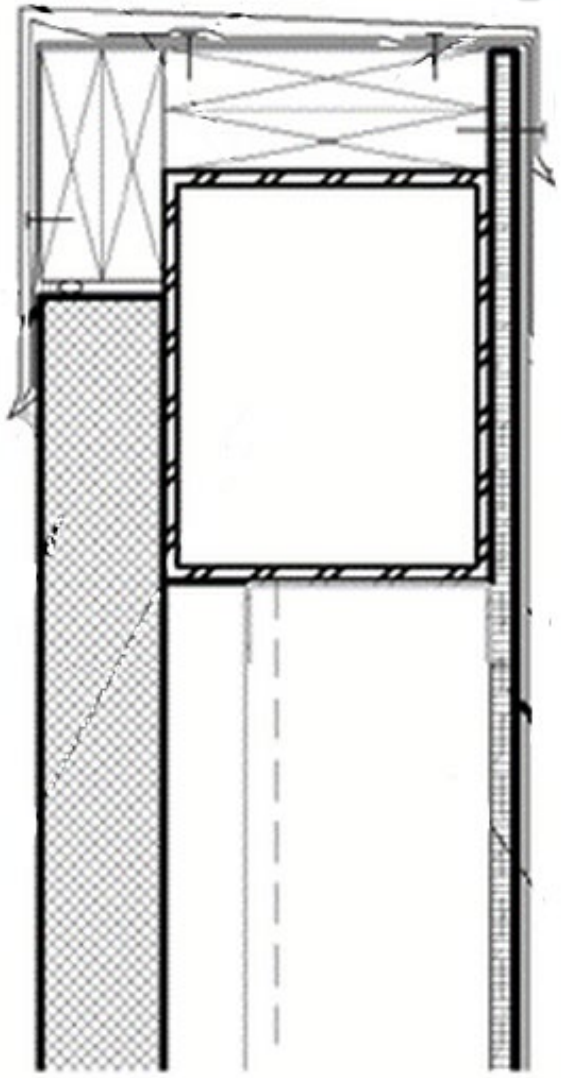


Typical roof concerns to discuss with the roofer





Parapet & Metal Wall Panel

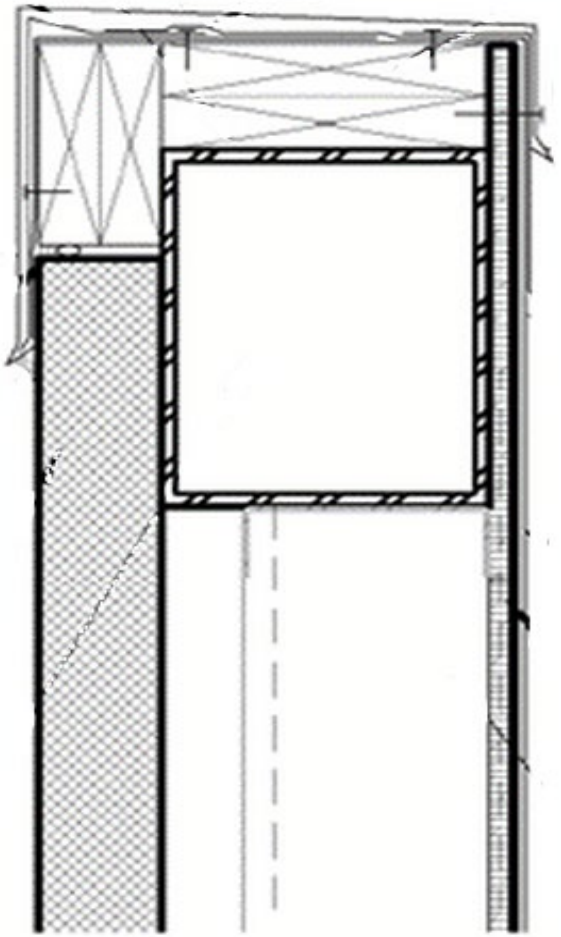


ROOFING

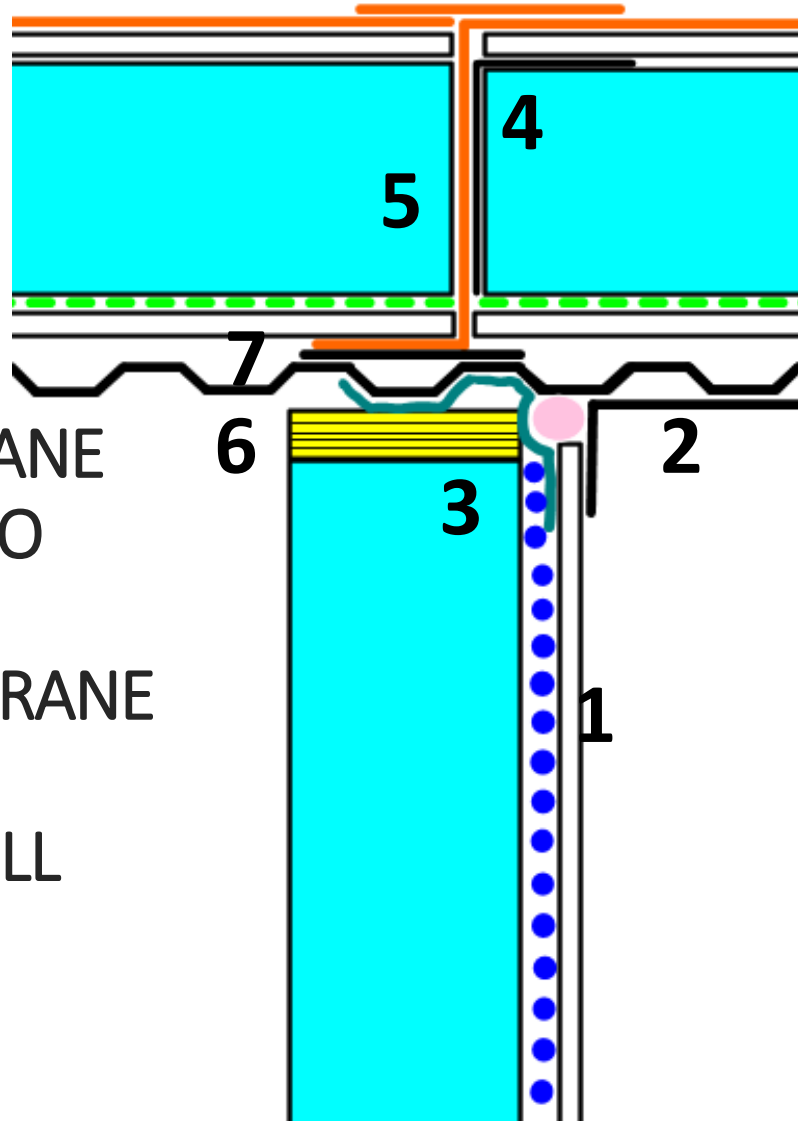
AVB TRANSITION MEMBRANE

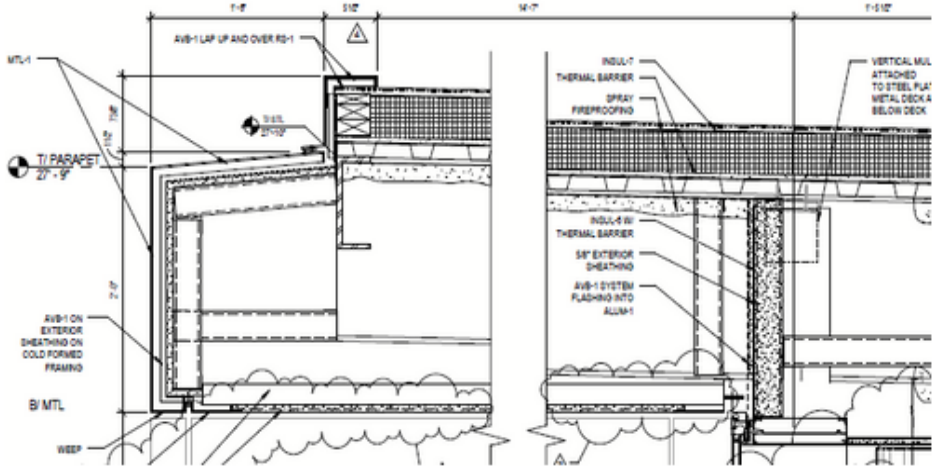
METAL PANEL FRONT FACE AVB PLANE

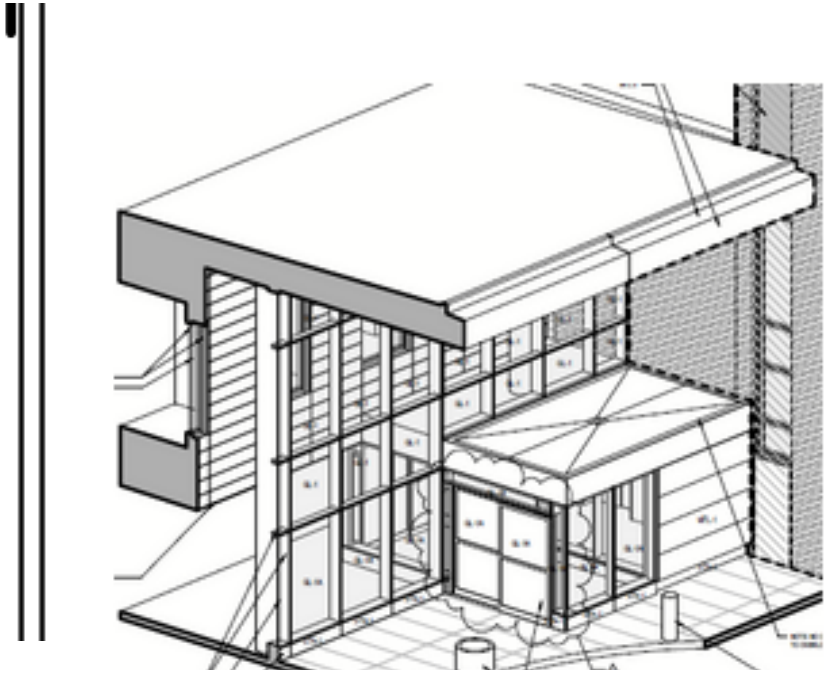
METAL PANEL BACK FACE AVB PLANE



1. AVB
2. BACKER ROD FOR LL MOVEMENT
3. TRANSITION MEMBRANE FLEXIBLE AND ABLE TO CONFORM
4. SUPPORT FOR MEMBRANE
5. ROOF MEMBRANE
6. MINERAL WOOL FOR LL DEFLECTION
7. SPF IN FLUTES WITH STRAP





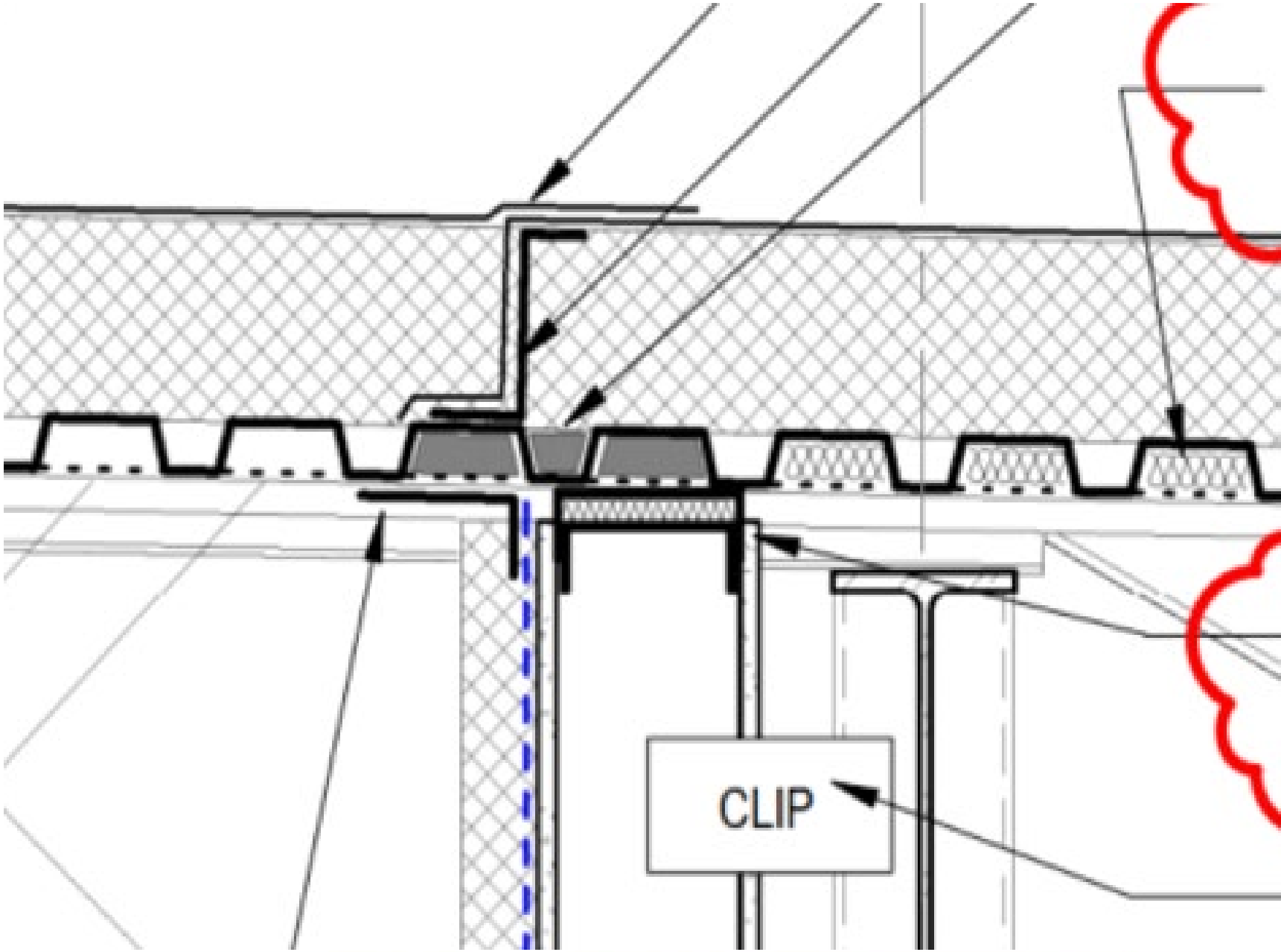


Sound Deck

Review the AVB line and determine where the line of air tightness is located. Work with the steel and roofer

The AVB line must go through the metal deck and the perforations must be sealed.

Detailing needs to happen in both parallel & perpendicular directions



Review the entire system, including the joists extensions or beams.

Confirm that fireproofing is not present

Each condition is different

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

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