Air Barrier Integration – Don't Entangle Yourself in these Common Pitfalls

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CONTINUING EDUCATION
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Learning Objectives

- To gain an understanding regarding the importance of coordination of the various design disciplines and construction trades and how building failures are not necessarily caused by the obvious issues.
- To gain an understanding regarding the critical importance of airtightness in buildings and how unintended air leaks can lead to building failure.
- To demonstrate good detailing and design practices.
- To explain how big problems can be solved with simple cost-effective solutions when project teams work together.

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THE PROBLEM

Air leaks can also make it difficult or impossible for certain mechanical systems to maintain positive building pressure creating another set of interior control and comfort problems and may cause energy costs to skyrocket.

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THE PROBLEM

Mold, ice-damming, brick efflorescence and other problems like legal claims and uncomfortable buildings with miserable occupants

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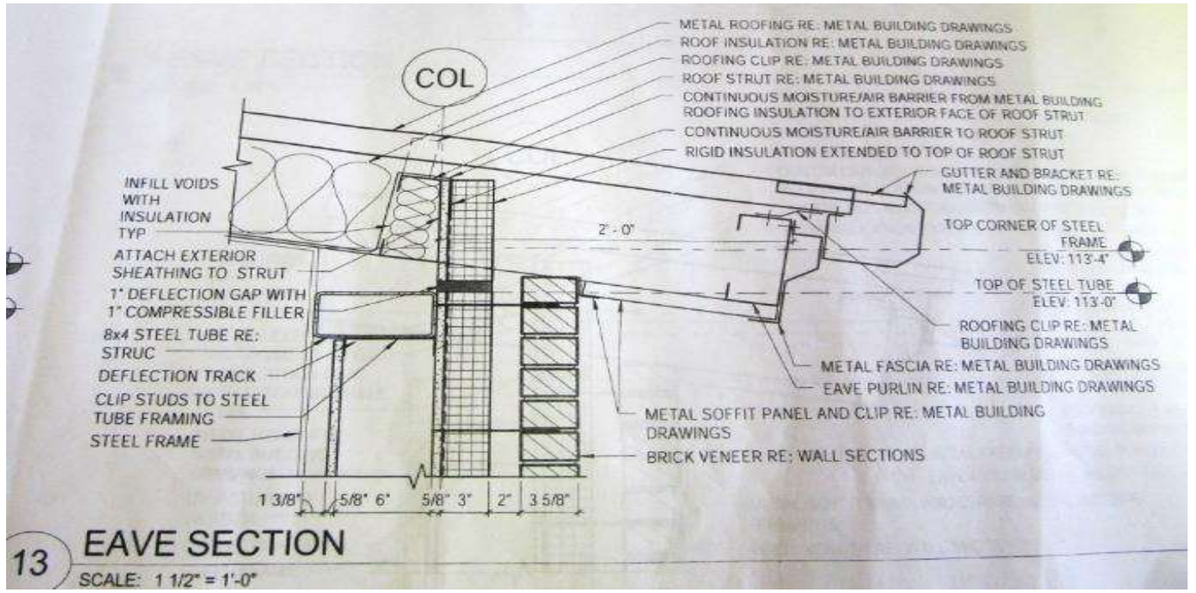
Introduction

A well-developed set of plans and specifications is a necessary start but not nearly enough to ensure a successful air barrier project.



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Introduction

The Air Barrier Association of America (ABAA) has developed and implemented an effective **industry-based** quality assurance model. The ABAA Quality Assurance Program (QAP) includes nine specific components.

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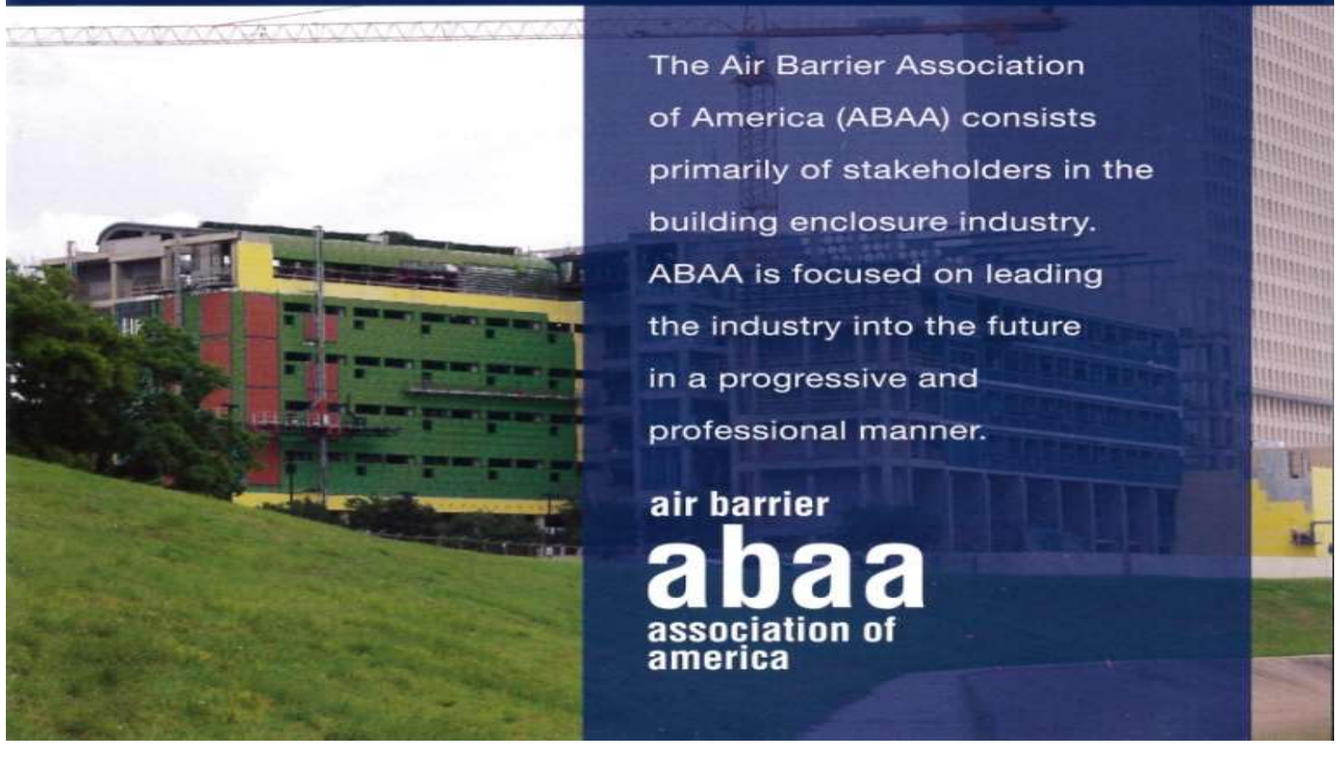
The Air Barrier Association of America Inc.

ABAA Quality Assurance Program Overview



The Air Barrier Association of America (ABAA) consists primarily of stakeholders in the building enclosure industry. ABAA is focused on leading the industry into the future in a progressive and professional manner.

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Moisture Problems

- Water vapor condensing in the building envelope leads to problems:
  - Mold
  - Corrosion
  - Wood rot
  - Structural damage
  - Occupant irritation
  - Costly repairs

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AIR BARRIERS

IMPERMEABLE MATERIAL

- A material that has been designated to provide the primary function of controlling the movement of air through a building assembly and when tested in accordance with ASTM E2178 and has a air permeance of less than:

  0.02 L/s/m2 @ 75 Pa

  0.004 CFM/ft2 @ 1.56 lb/ft2

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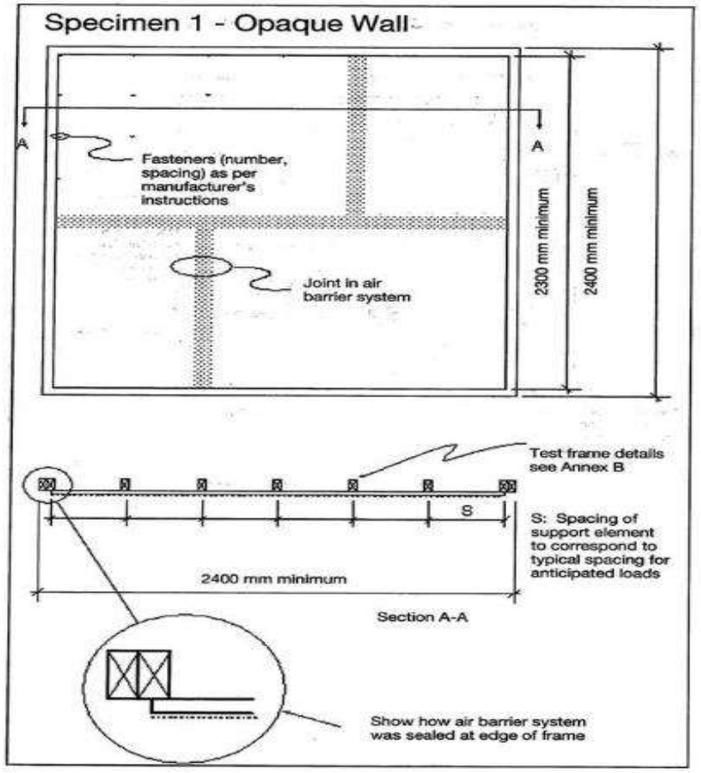
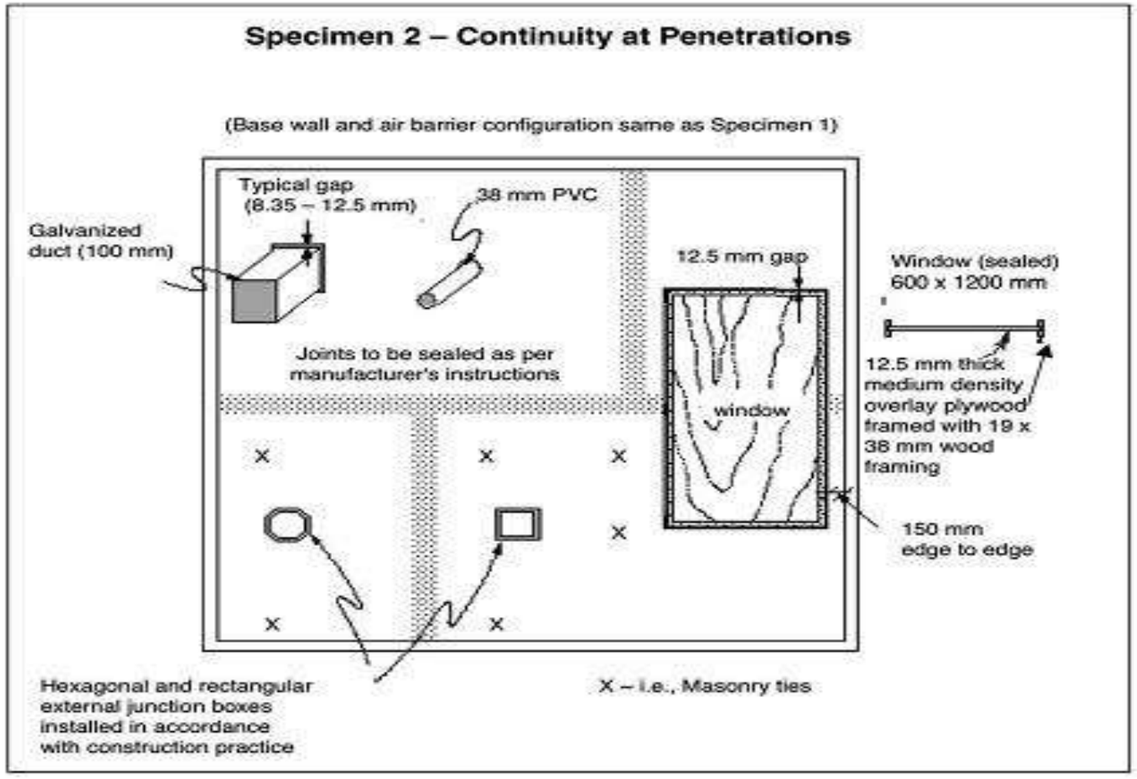
AIR BARRIERS

CONTINUOUS

- ASTM E 2357





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AIR BARRIERS

CONTINUOUS

- ASTM E 2357

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AIR BARRIERS

AIR LEAKAGE PERFORMANCE REQUIREMENTS

Material - 0.004 CFM/ft²@ 1.56 lbs/ft² pressure difference (ASTM E 2178)

Accessory – tapes, strips, caulking, etc - 0.004 CFM/ft²@ 1.56 lbs/ft² pressure difference (ASTM E 283)

Component – windows, doors, skylights, etc. - 0.04 CFM/ft²@ 1.56 lbs/ft² pressure difference (ASTM E 283)

Assembly (Wall assembly, roof assembly, foundation assembly)- 0.04 CFM/ft²@ 1.56 lbs/ft² pressure difference (ASTM E 2357)

System (Whole Building) - 0.40 CFM/ft²@ 1.56 lbs/ft² pressure difference (ISO 9972, ASTM E 779, CGSB 149.10)

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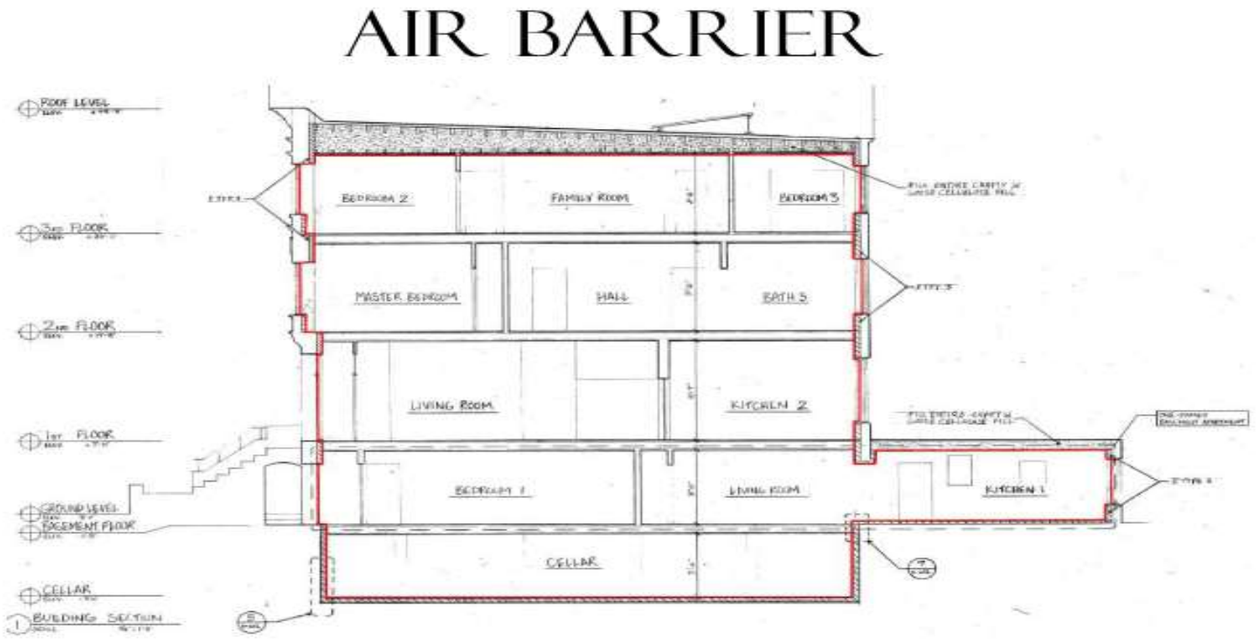
BUILDING CODES ASHRAE 90.1

ASHRAE 90.1 - 2010

5.4.3.1.1 Air Barrier Design
The air barrier shall be designed and noted in the following manner:

c. The continuous air barrier shall extend over all surfaces of the building envelope (at the lowest floor, exterior walls, and ceiling or roof).



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BUILDING CODES ASHRAE 90.1

INTERNATIONAL ENERGY CONSERVATION CODE - 2012

Material C402.4.1.2.1	Assembly C402.4.1.2.2	Building Test C402.4.1.2.3

• ASTM 2178
• 0.004 cfm / ft^2
• List of 15 materials that are acceptable – *provided joints are sealed and installed as an air barrier*
	• ASTM 2357, 1677 or 283
	• 0.04 cfm / ft^2
	• List of 2 assemblies deemed to comply, if joints are sealed
	  • Concrete Masonry Walls (coated with block filler or two coats of a paint or sealant)
	  • Portland Cement / sand parge, stucco or plaster (min ½ inch)
		• ASTM 779
		• 0.40 cfm/ft^2
		• Or equivalent method approved by code official

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The Solution

Meticulous attention to the continuity of the air barrier systems.

DESIGN RIGHT,
BUILD TIGHT

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Building Envelope – Critical Areas

- Roof to Wall transitions
- Door/Window/Curtainwall/Storefront openings
- Wall to Foundation transitions
- Expansion joints
- Transitions between dissimilar envelope systems

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Building Envelope – Critical Areas

- Transitions between dissimilar materials
- Plumbing, Mechanical, Electrical, Structural penetrations
- Floors over conditioned space
- Canopies, Overhangs, Exterior vestibules
- Walls between conditioned and unconditioned spaces

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Roof to Wall Transitions

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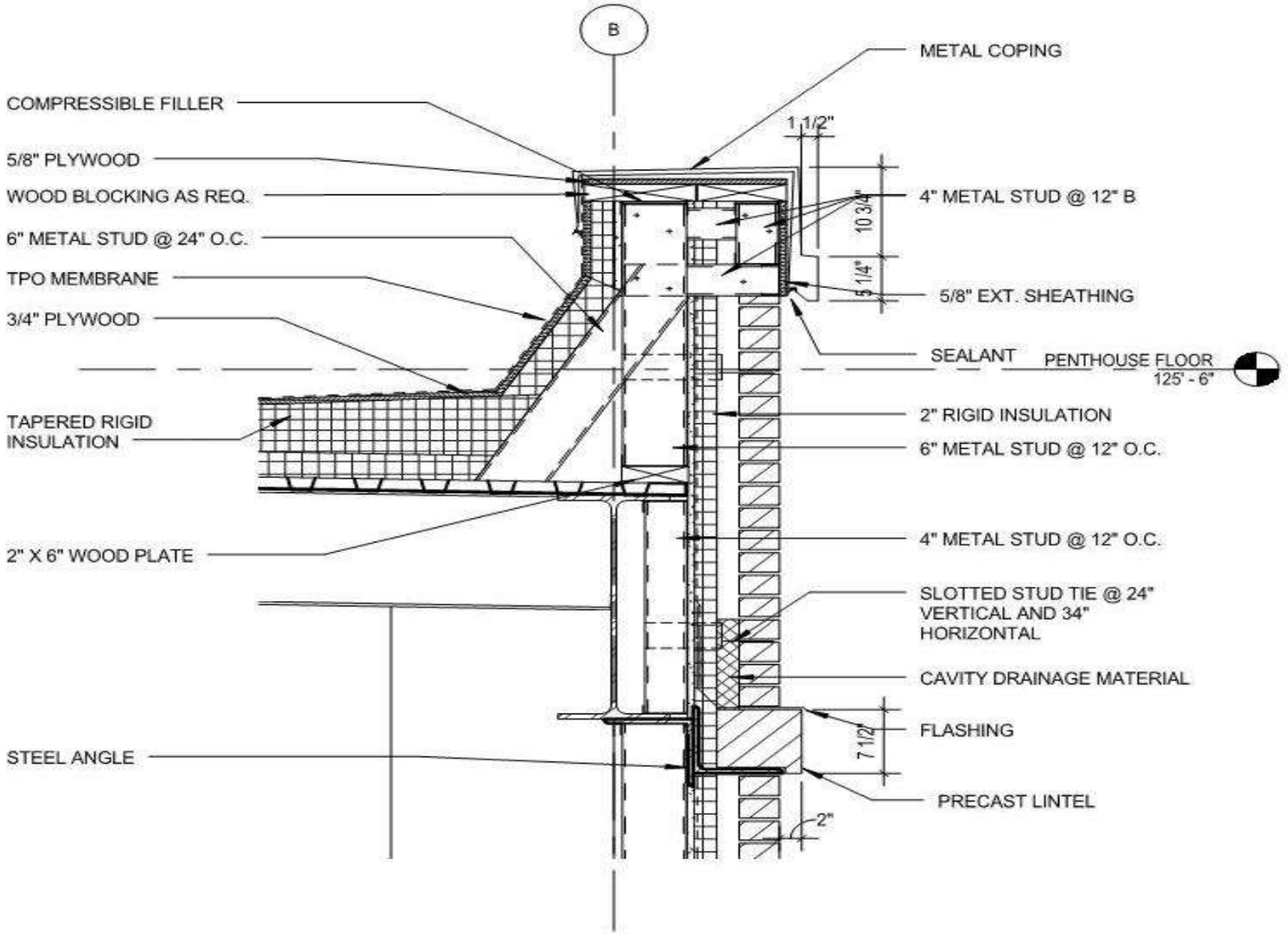
Roof to Wall Transitions



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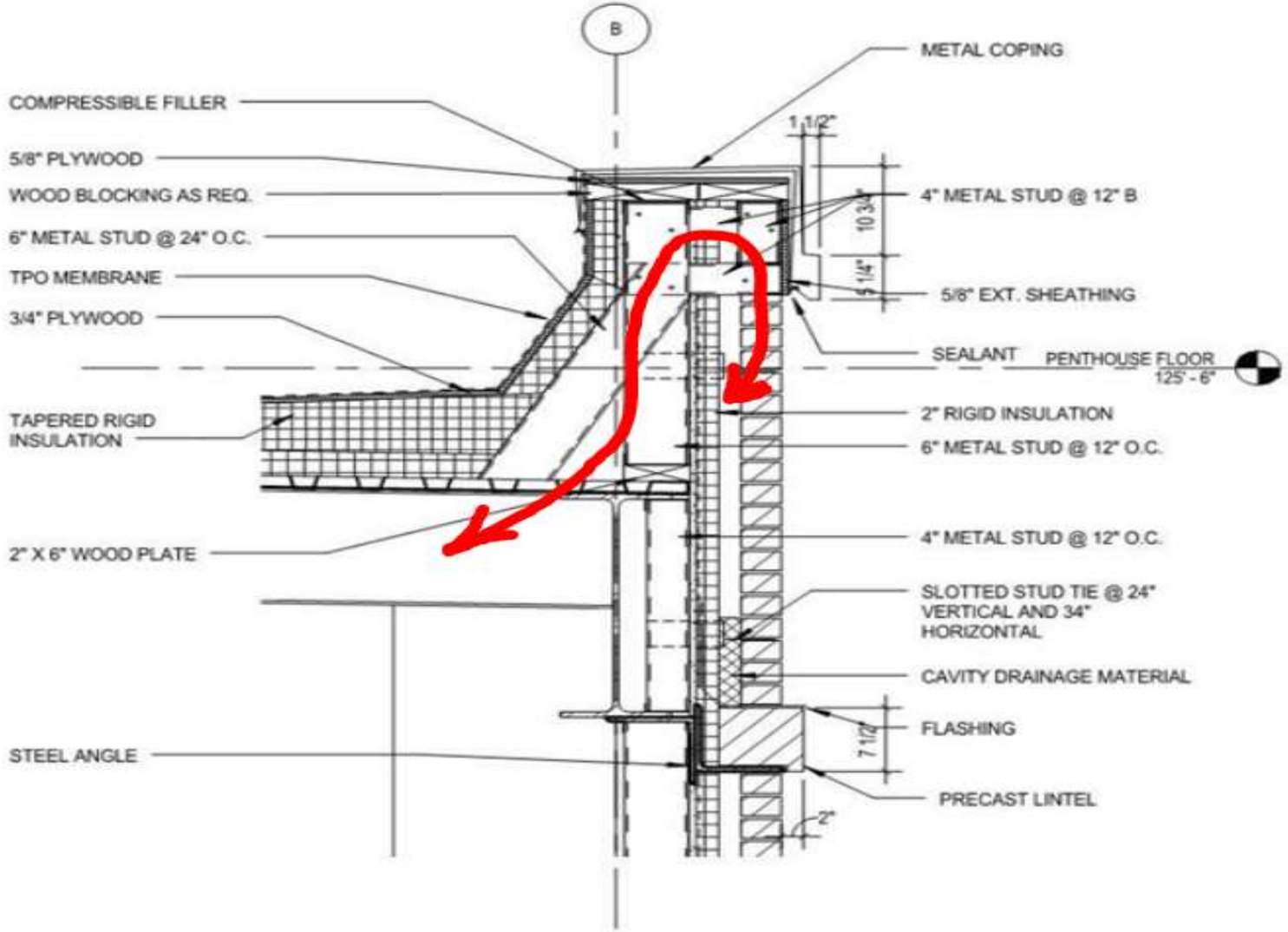
Roof to Wall Transitions



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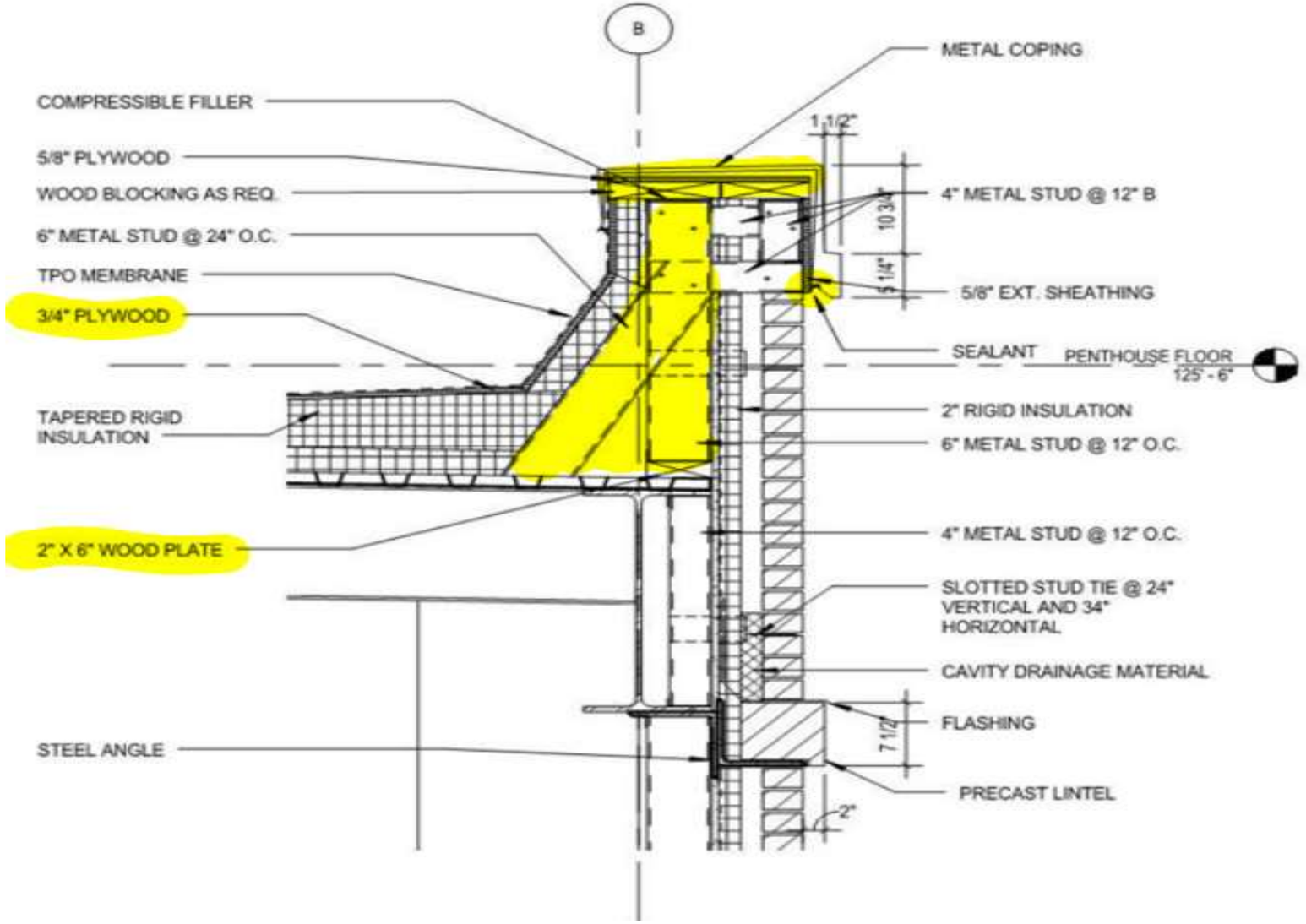
Roof to Wall Transitions



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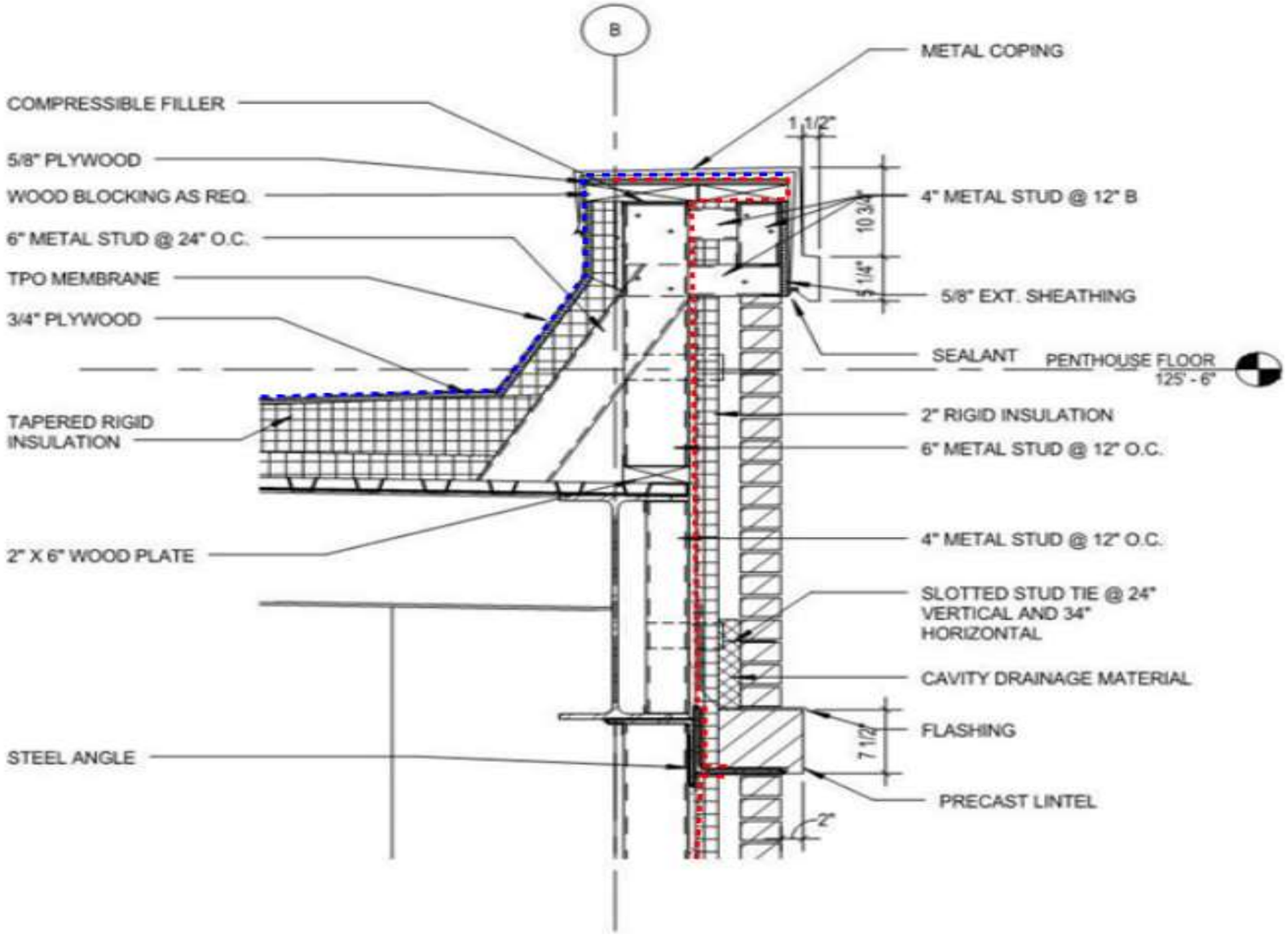
Roof to Wall Transitions



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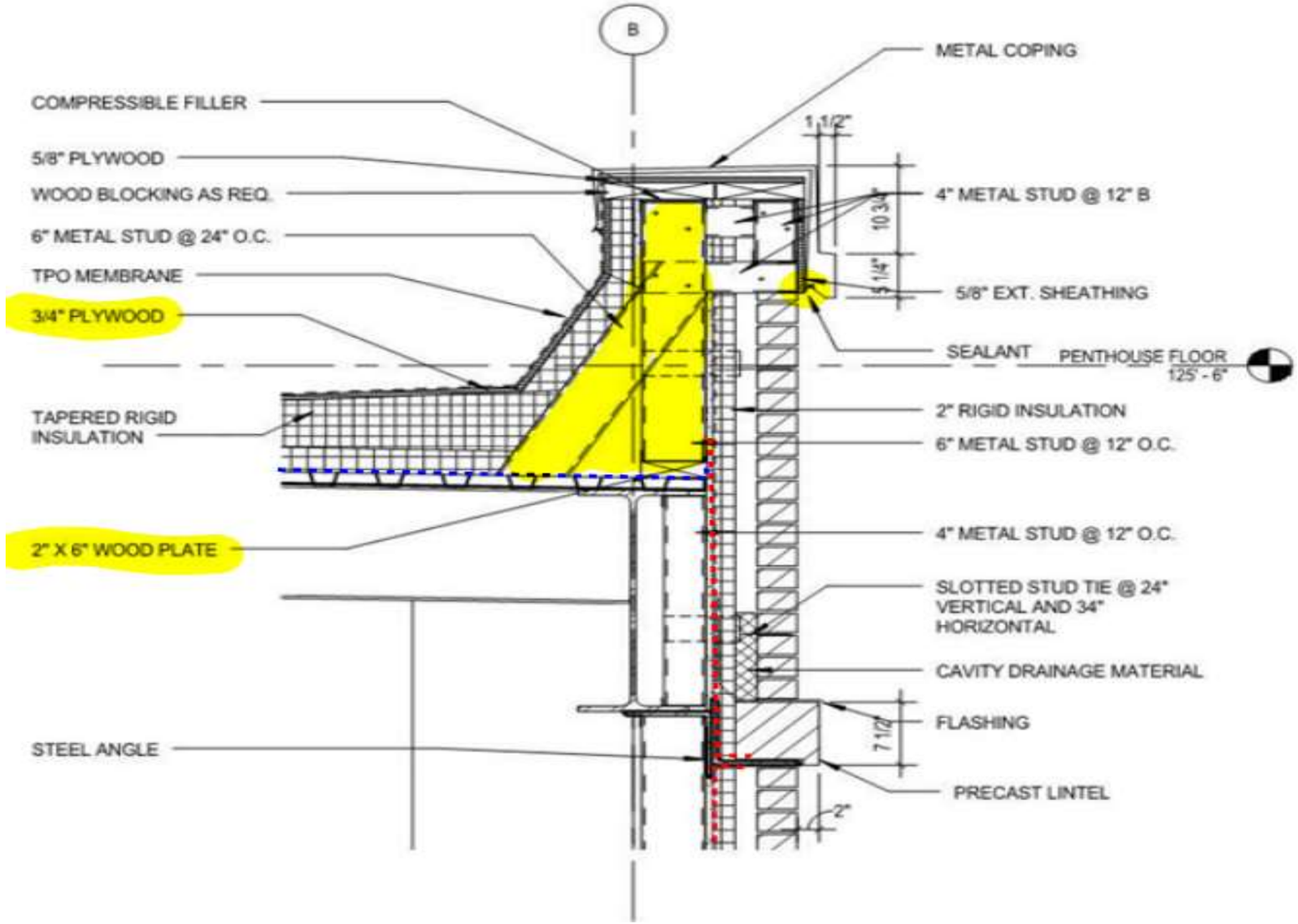
Roof to Wall Transitions



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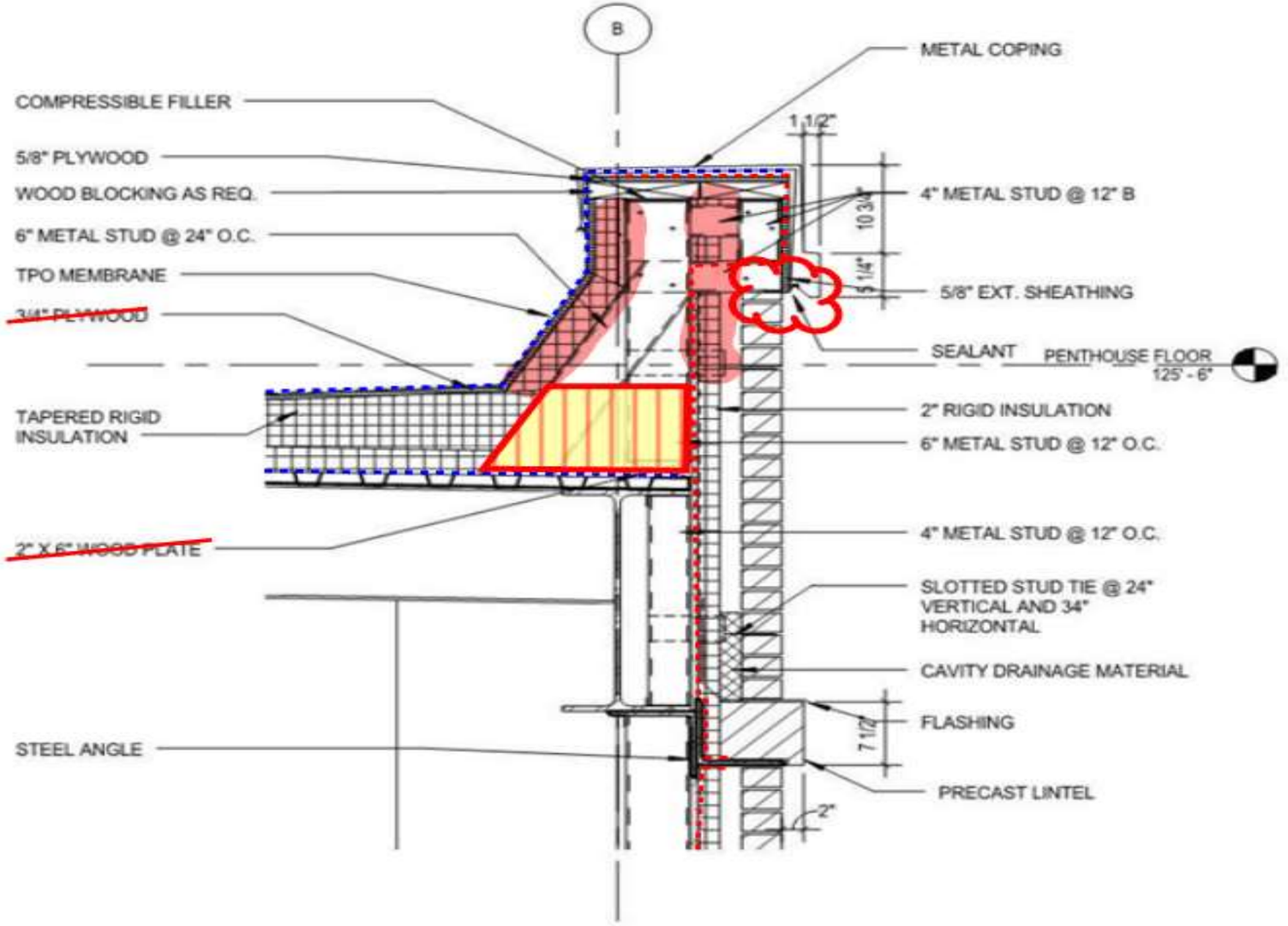

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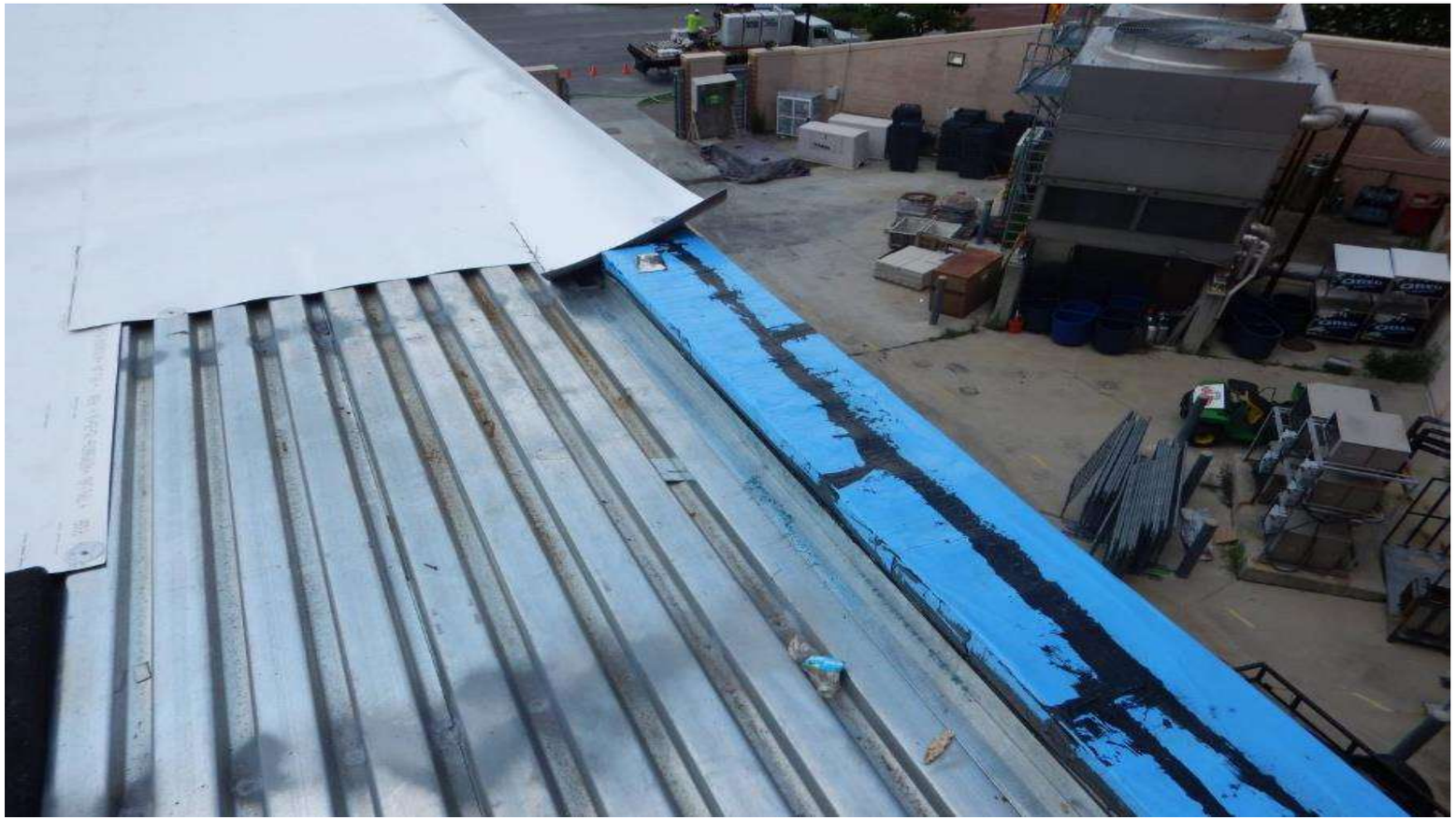

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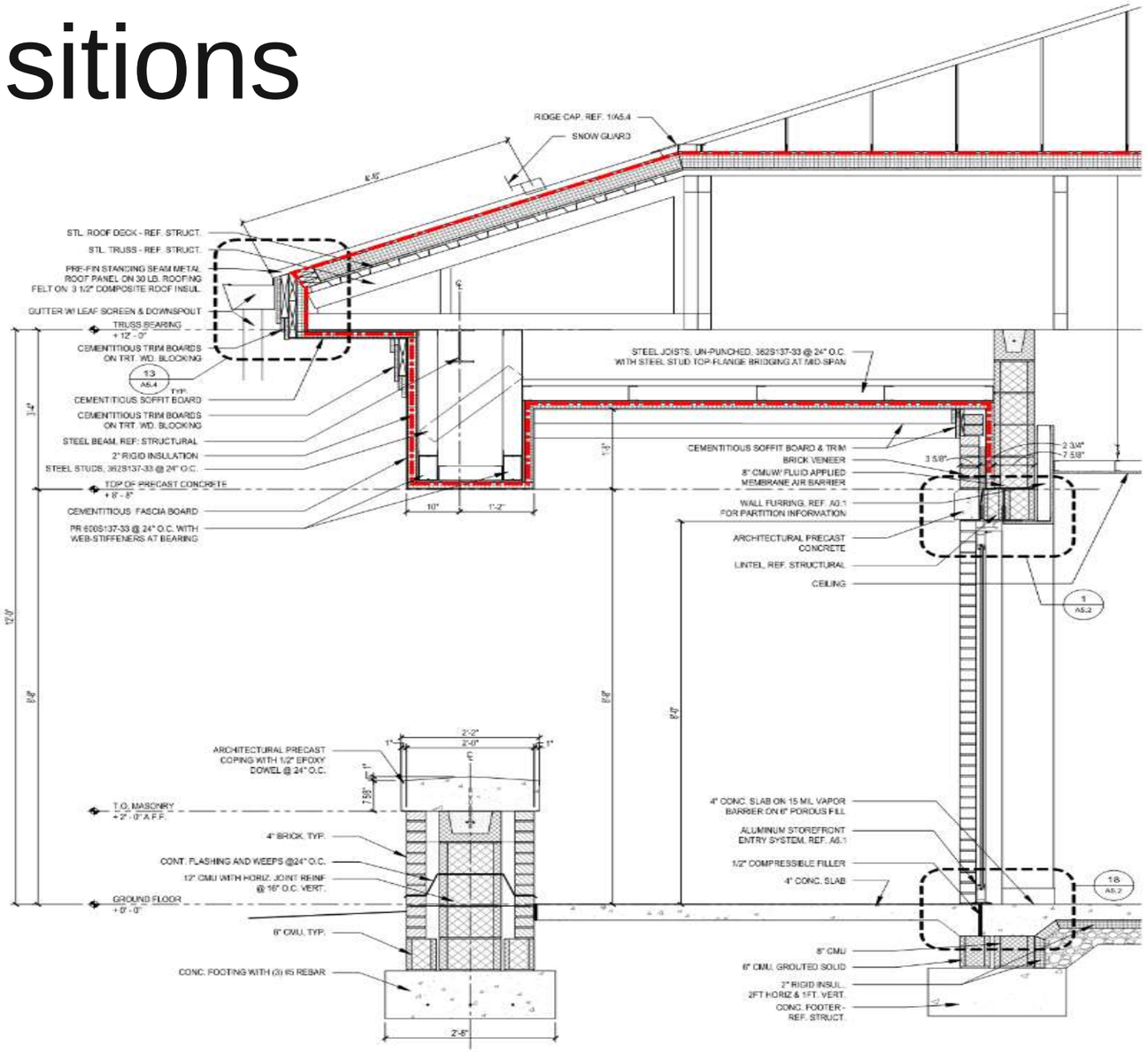
A depiction of a short parapet wall where the air barrier on the wall laps over the top of the parapet, allowing the roof membrane to continuously tie into it as it laps over and is attached to the face of the wall.

Roof to Wall Transitions



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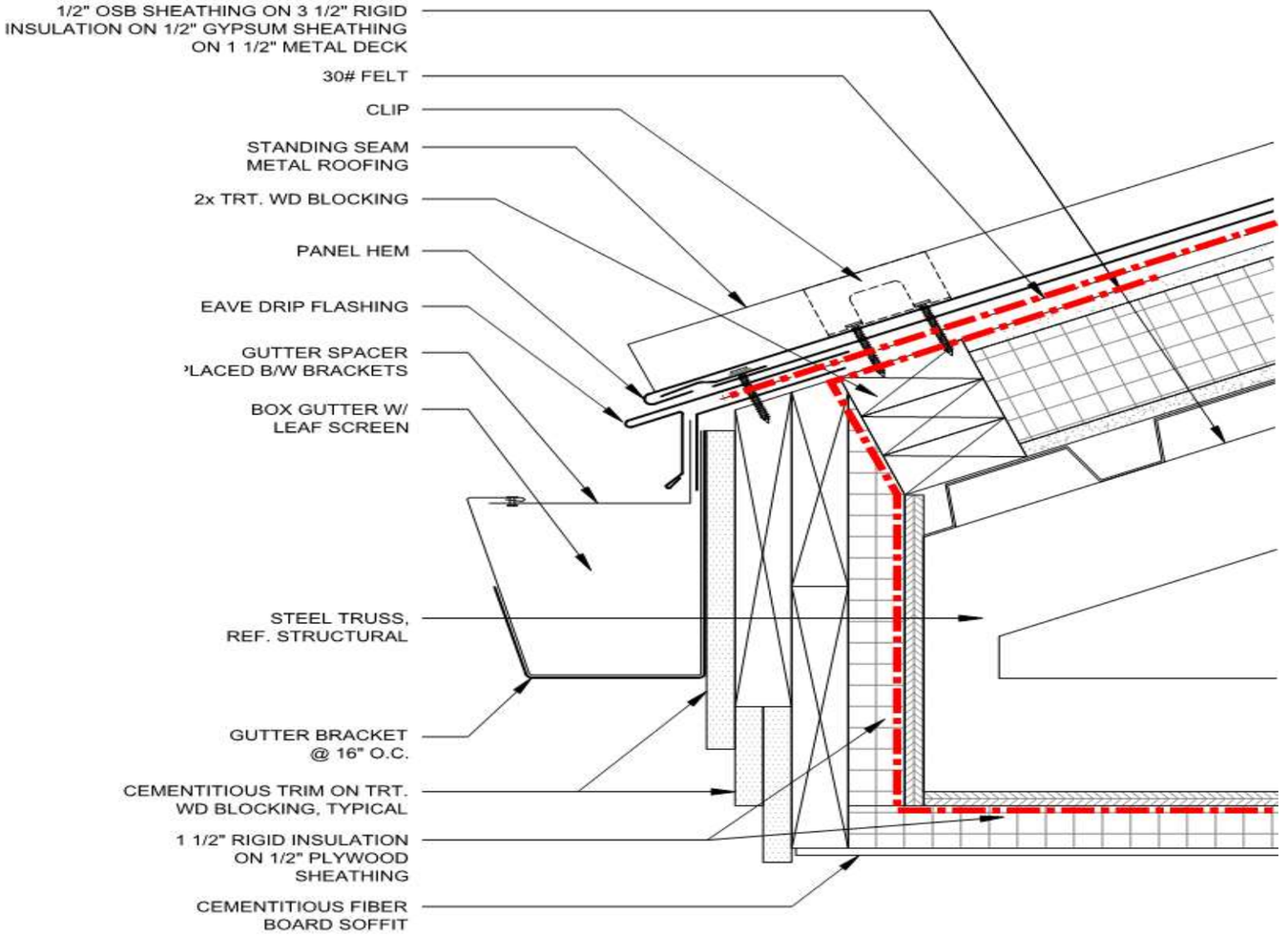
Roof to Wall Transitions



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Roof to Wall Transitions

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An example of a fluid applied air barrier installed on the wall, canopy, and soffit. The air barrier extends up onto the roof deck where it is weather lapped by the roofing system’s self-adhered air barrier sheet.

Roof to Wall Transitions

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Roof to Wall Transitions

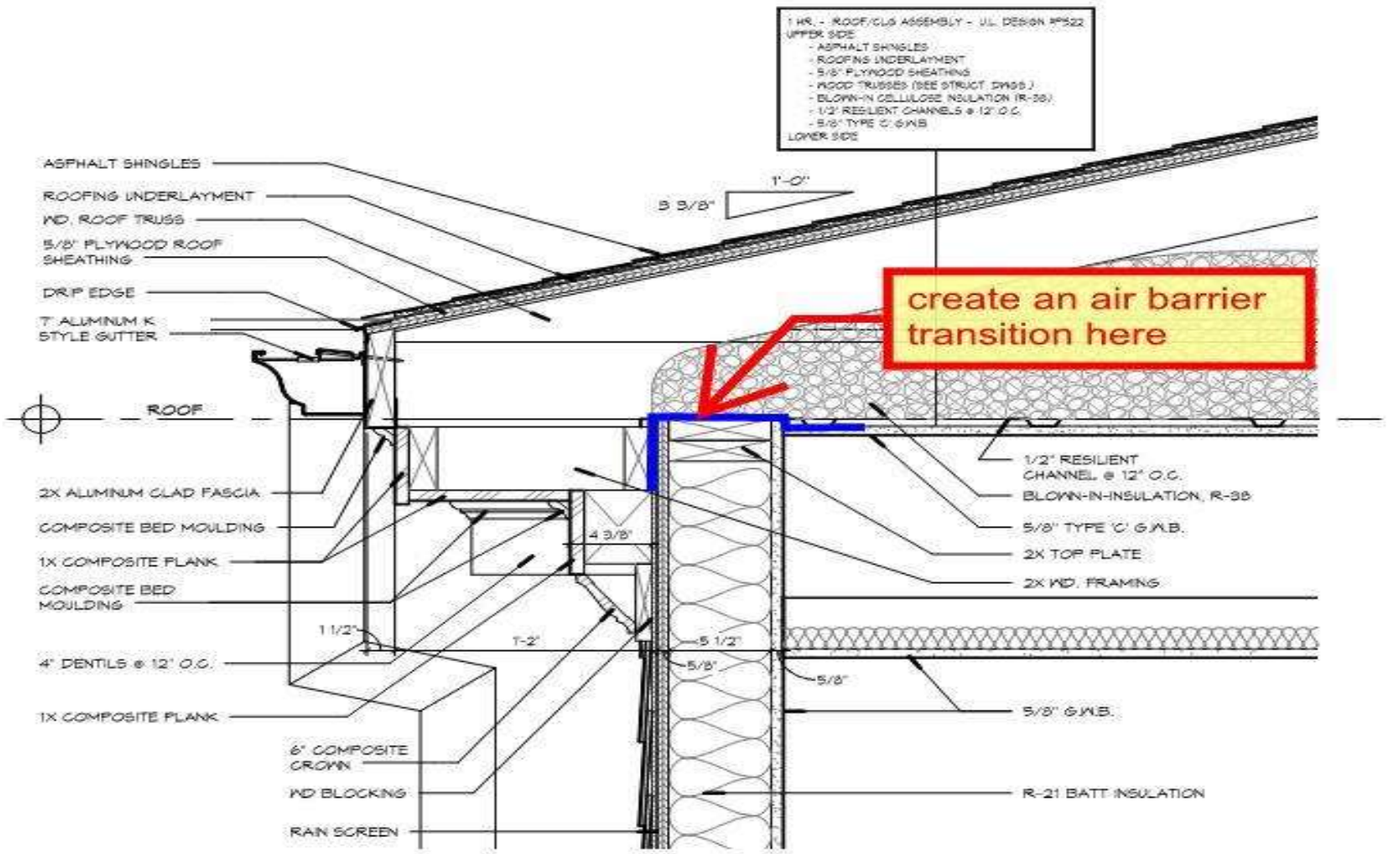

Figure 4: An example of where the transition needs to occur between an exterior wall and ceiling assembly air barrier when the air barrier occurs below an attic.

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Door/Window/Curtainwall/Storefront Openings

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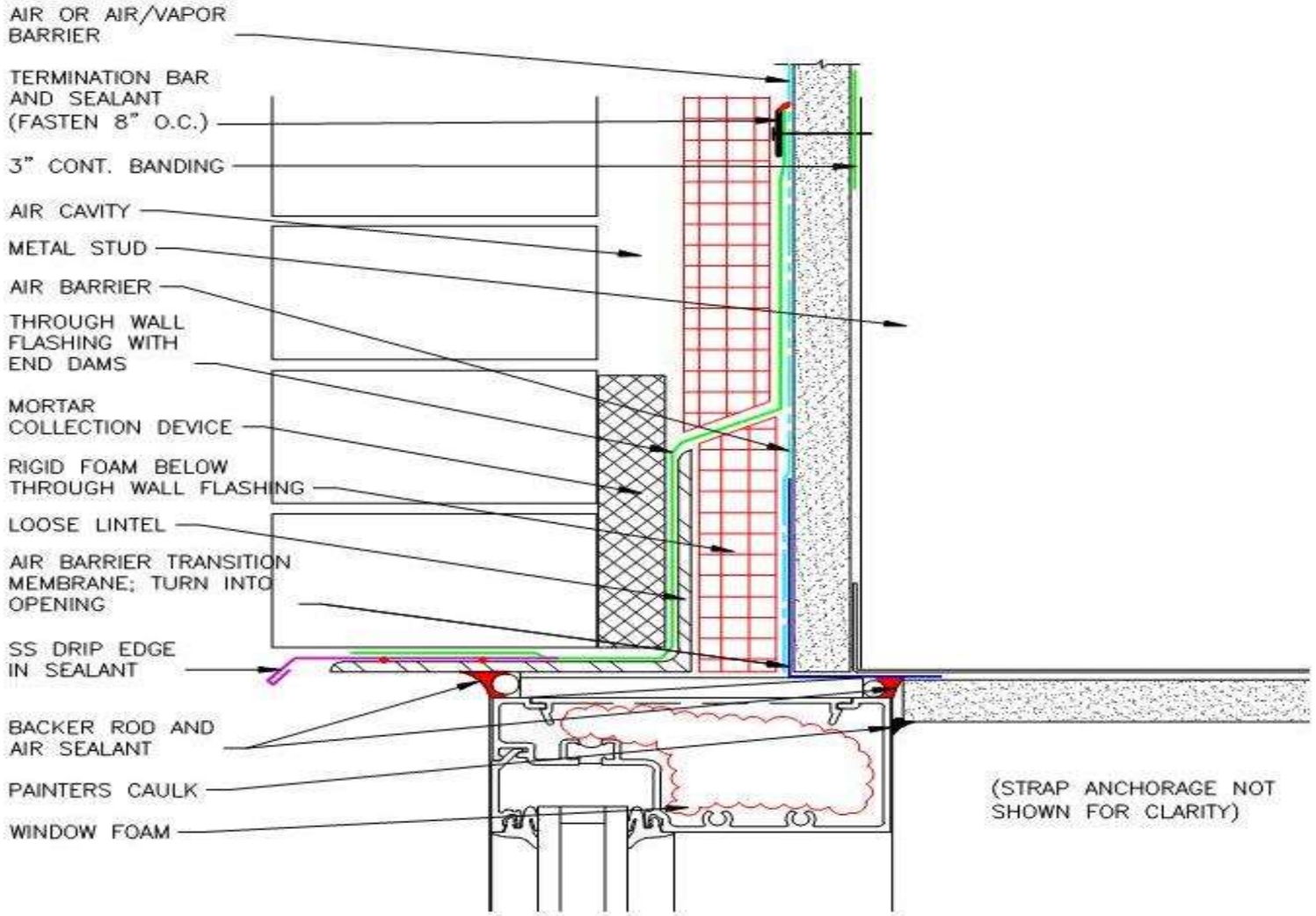
Door/Window/Curtainwall/Storefront Openings

An example of a storefront type window head condition where the air barrier system turns into the rough opening to accommodate transitioning at the sealant joint at the back of the window frame.



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Door/Window/Curtainwall/Storefront Openings

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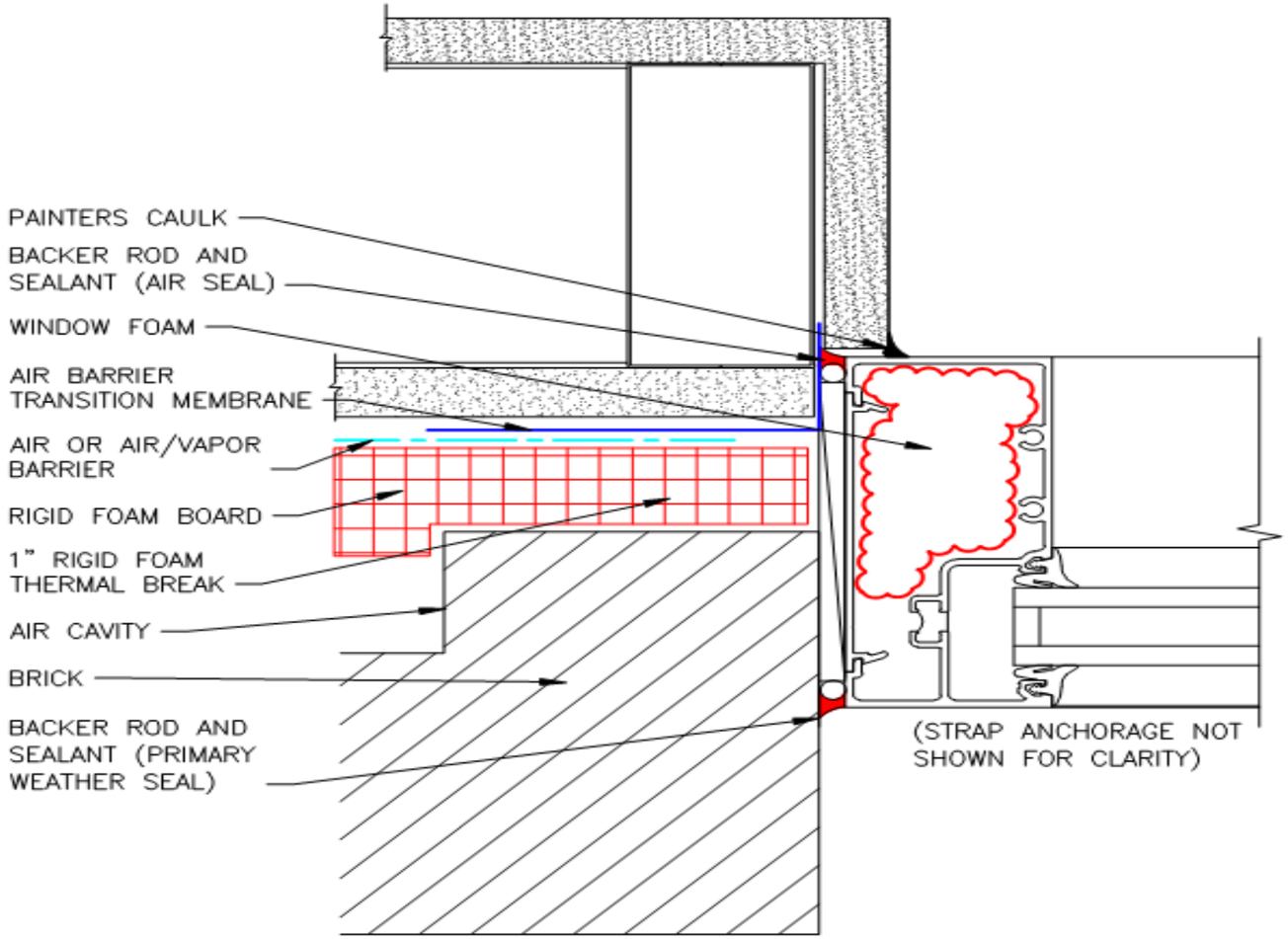

WINDOW JAMB WITH MASONRY RETURN

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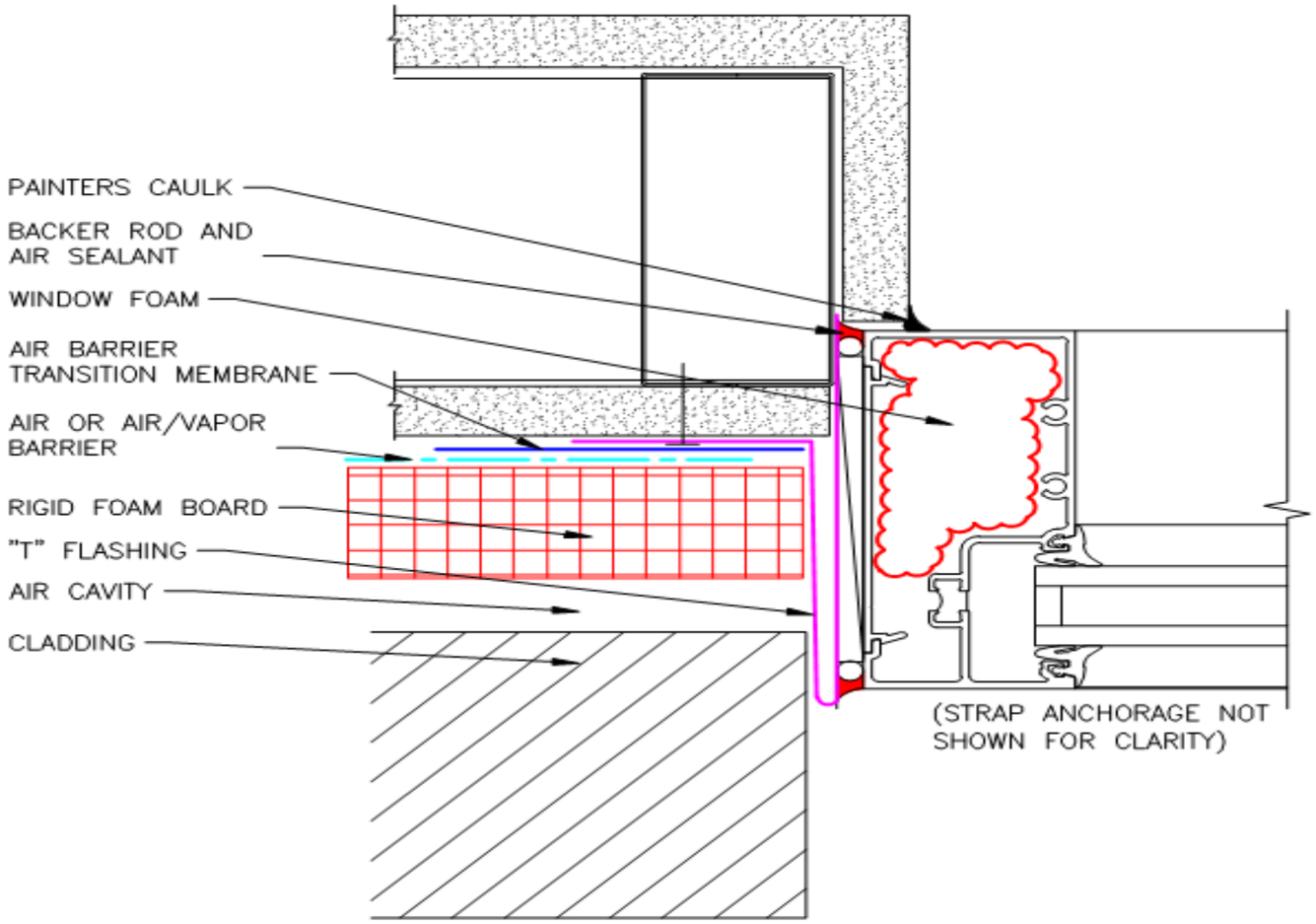
Door/Window/Curtainwall/Storefront Openings

An example of a storefront type window head condition where the air barrier system turns into the rough opening to accommodate transitioning at the sealant joint at the back of the window frame.



WINDOW JAMB WITH 'T' CLOSURE FLASHING

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Door/Window/Curtainwall/Storefront Openings

A primary air seal created with sealant transitioning the wall air barrier transition membrane to the window frame.

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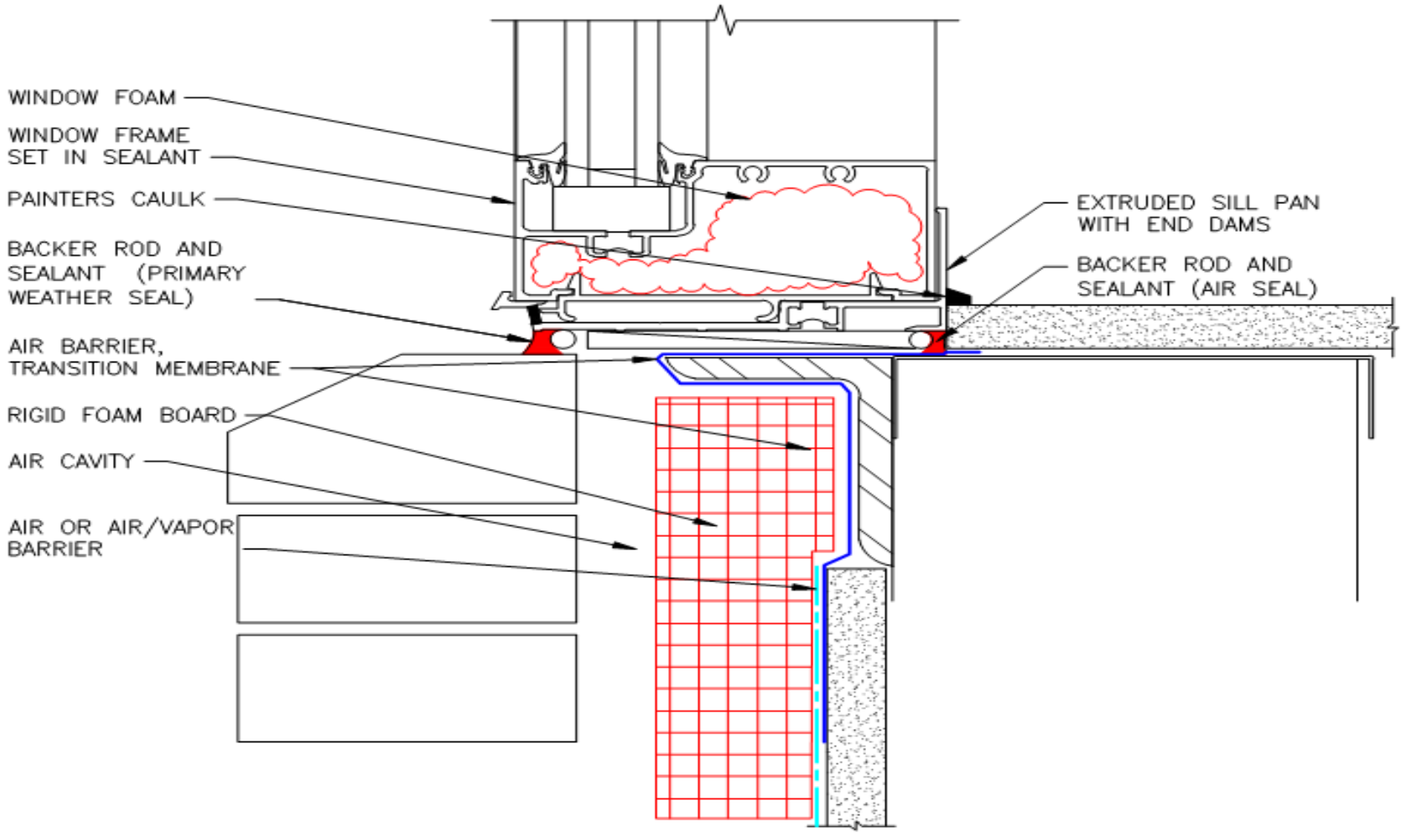
Door/Window/Curtainwall/Storefront Openings

An example of a storefront type window head condition where the air barrier system turns into the rough opening to accommodate transitioning at the sealant joint at the back of the window frame.



WINDOW SILL WITH EXTRUDED SILL PAN FLASHING

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Door/Window/Curtainwall/Storefront Openings

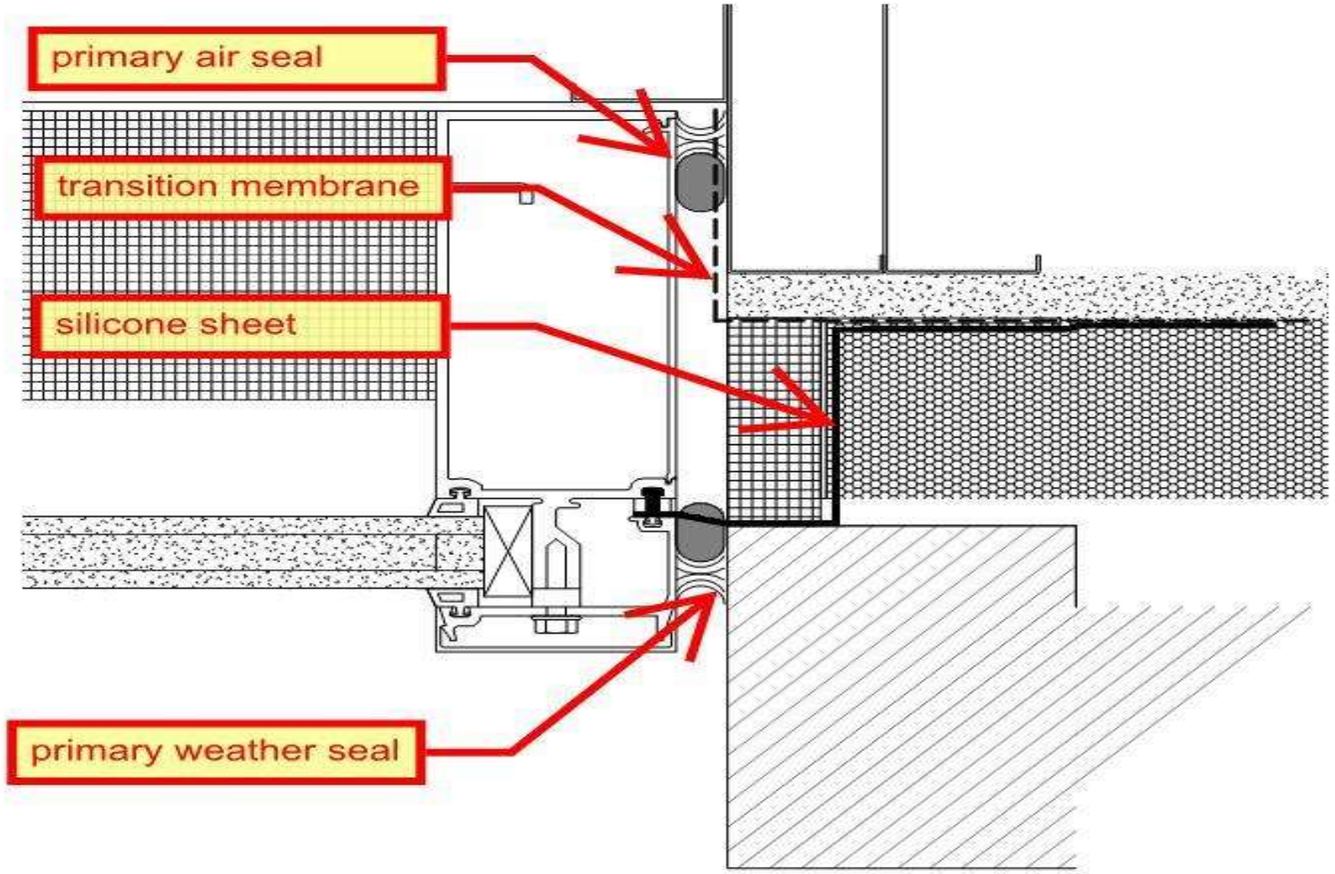

Figure 6: An example of a robust design where a silicone sheet creates a weather and primary air seal, and a backer rod and sealant joint also creates a secondary air seal.

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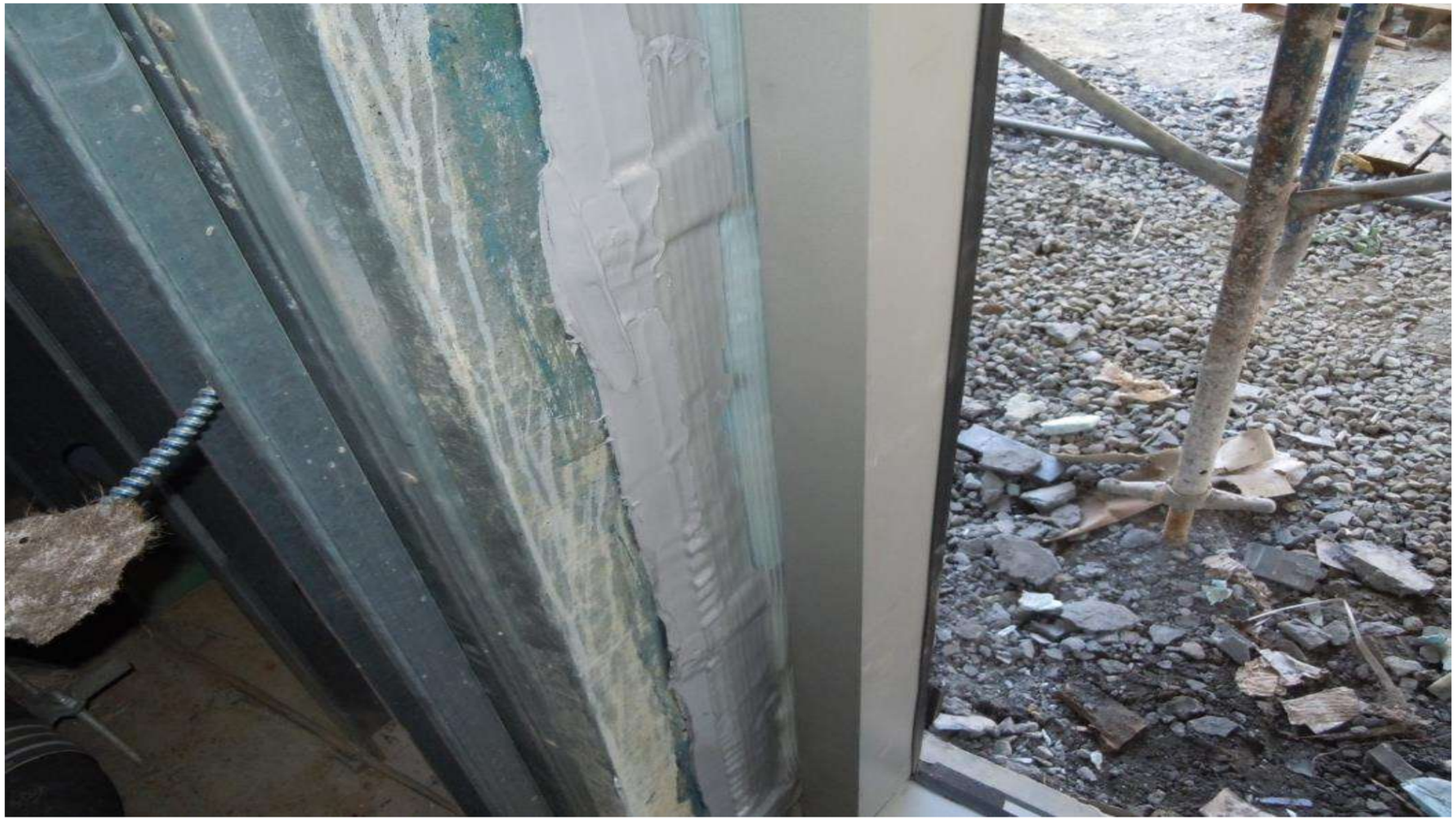
Door/Window/Curtainwall/Storefront Openings



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Door/Window/Curtainwall/Storefront Openings

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Door/Window/Curtainwall/Storefront Openings

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Figure 8: A view of the application of an SPF air barrier system where a self-adhered transition membrane is used to turn the air barrier system into the window rough openings.

Door/Window/Curtainwall/Storefront Openings

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Wall to Foundation Transitions

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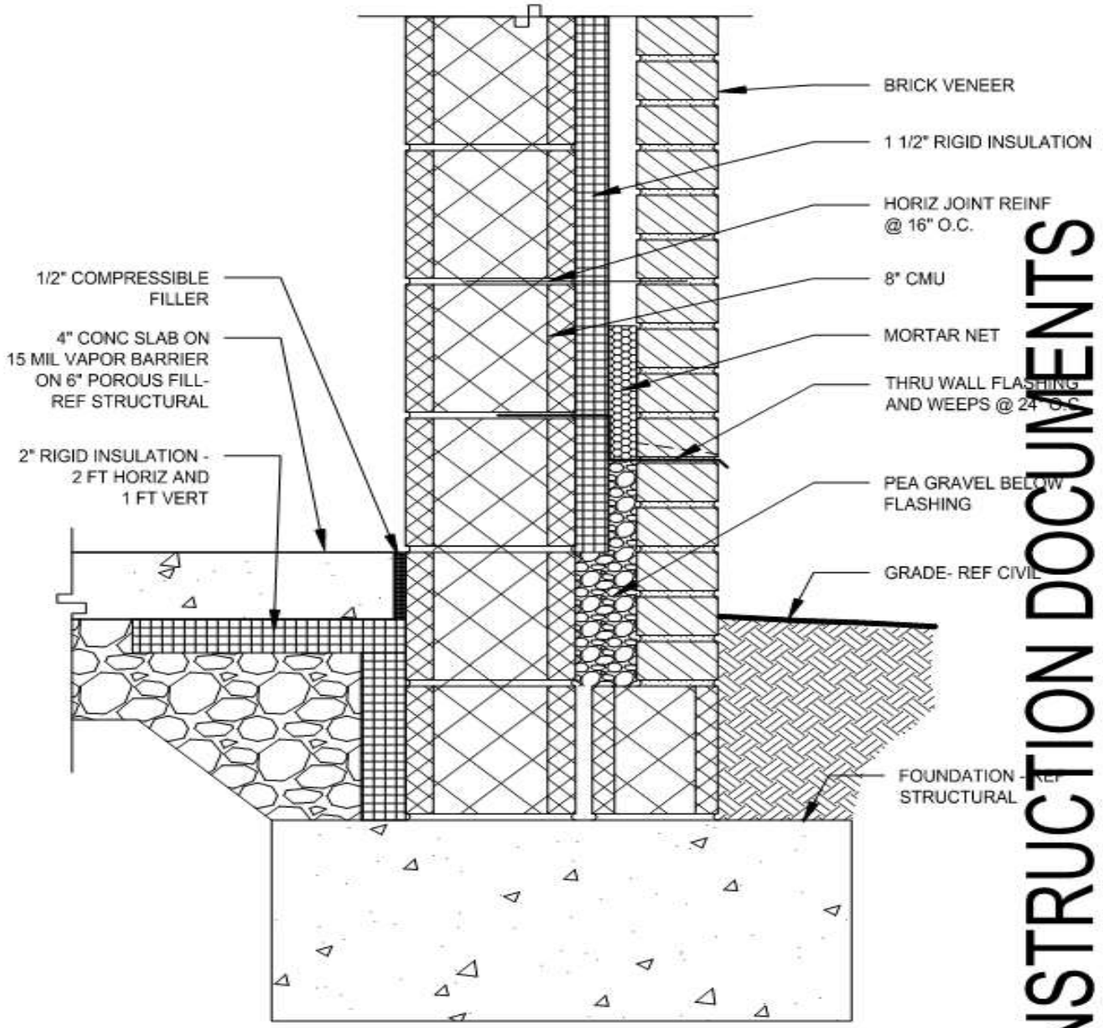
Wall to Foundation Transitions



CONSTRUCTION DOCUMENTS

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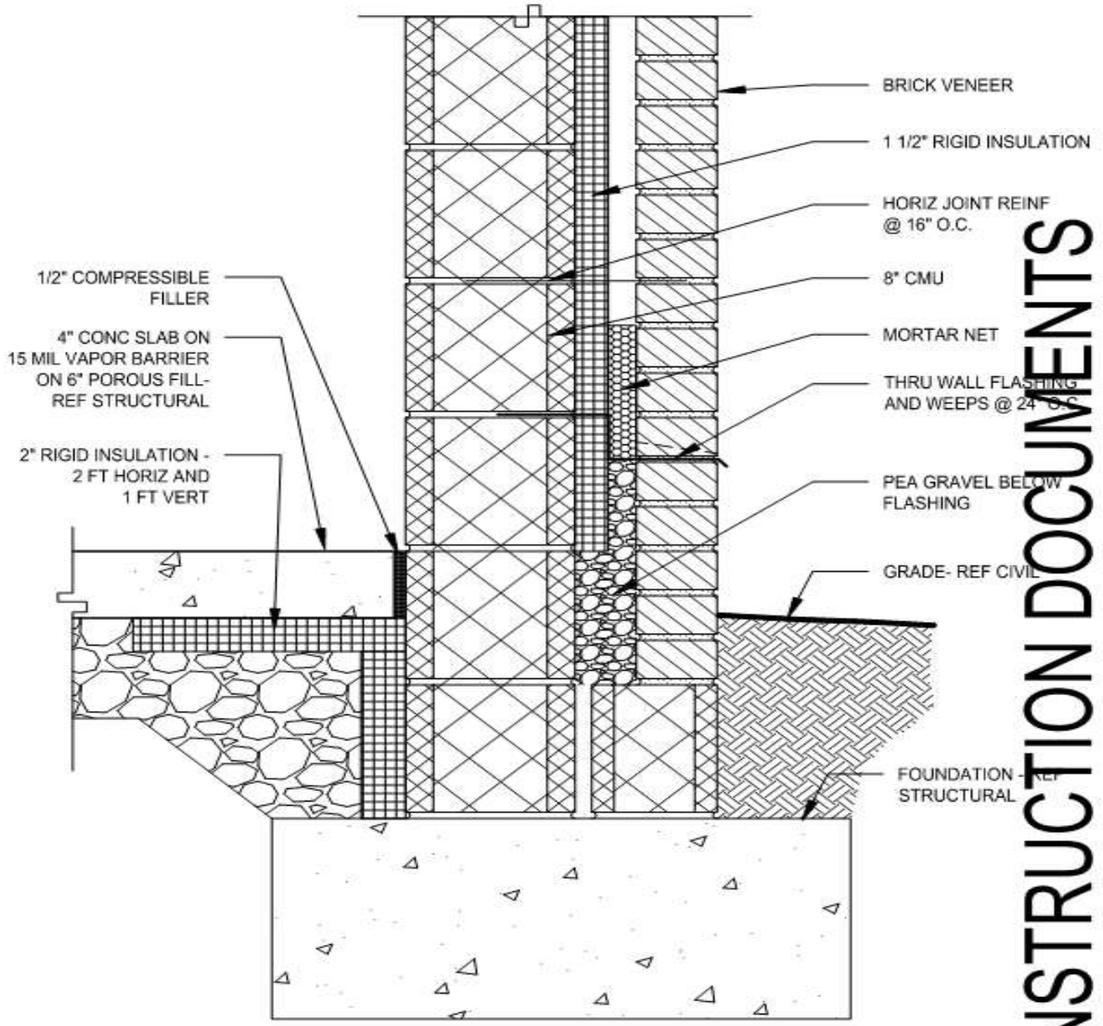
Wall to Foundation Transitions



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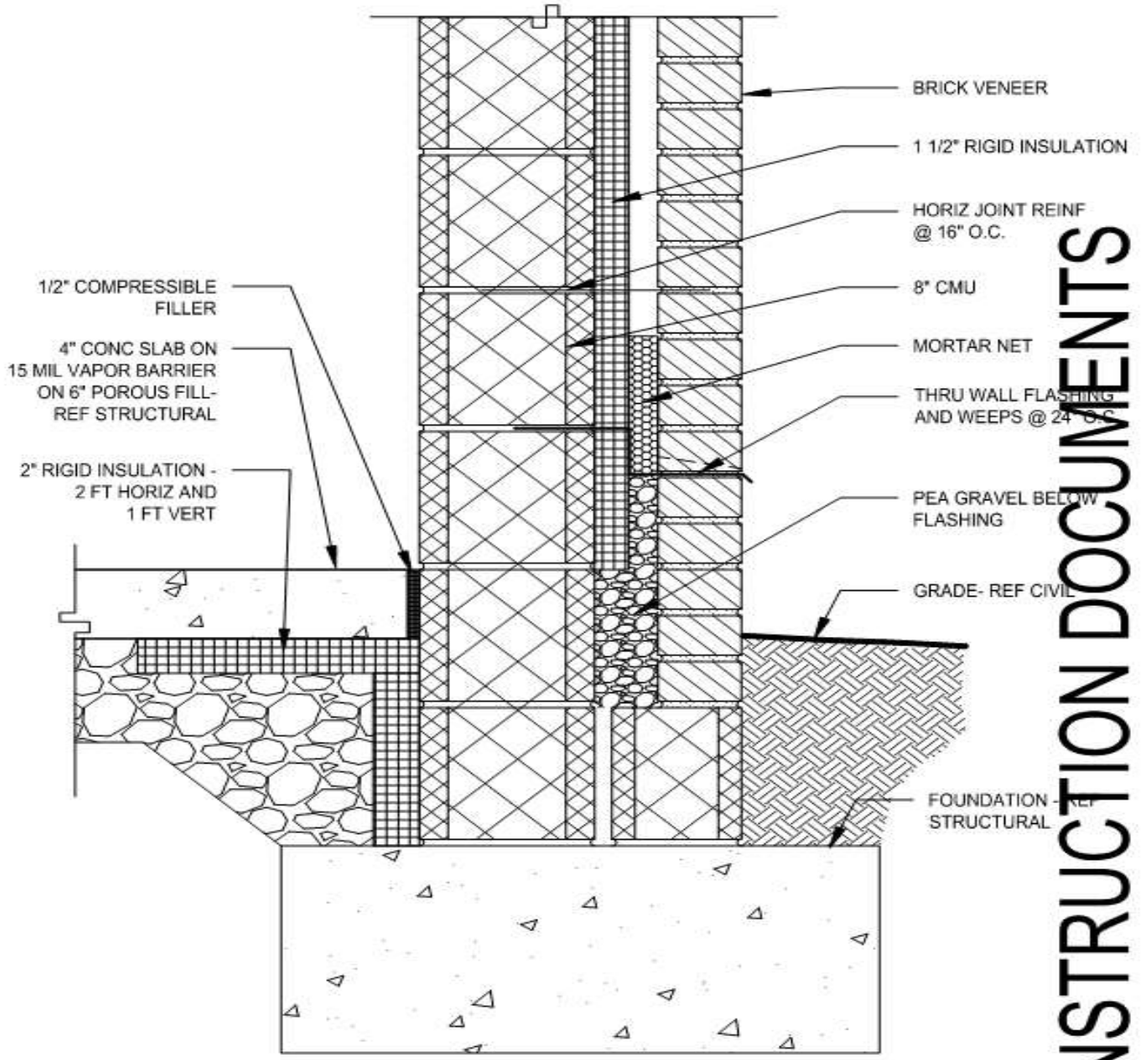
Wall to Foundation Transitions



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Wall to Foundation Transitions

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Wall to Foundation Transitions

An example of the use of a self-adhered transition membrane to create continuity between the wall air barrier system (currently being installed) and the concrete foundation wall.

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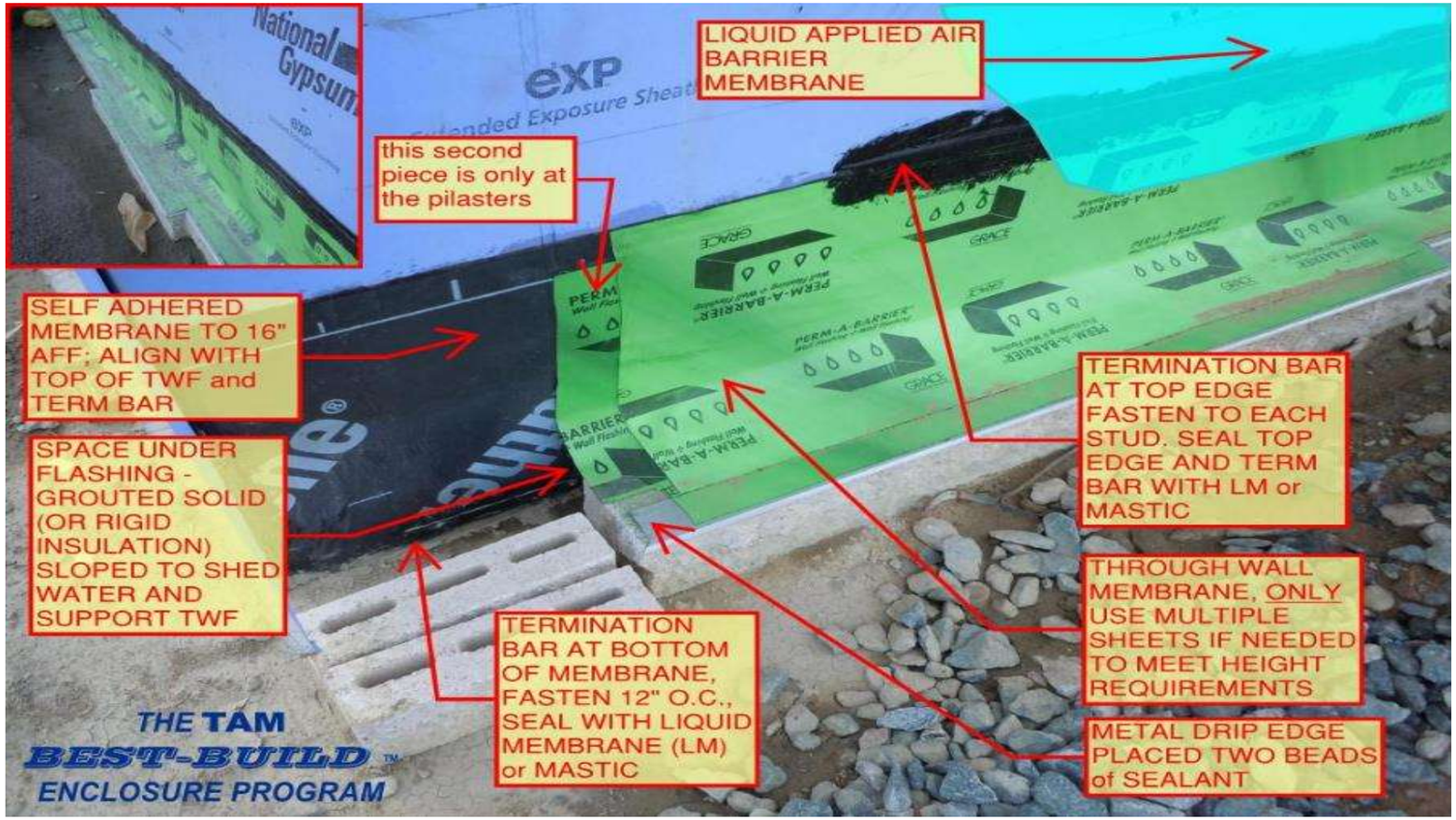
Wall to Foundation Transitions



An example of extending a foundation waterproofing to above grade and tying it into the air barrier system.

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Expansion Joints

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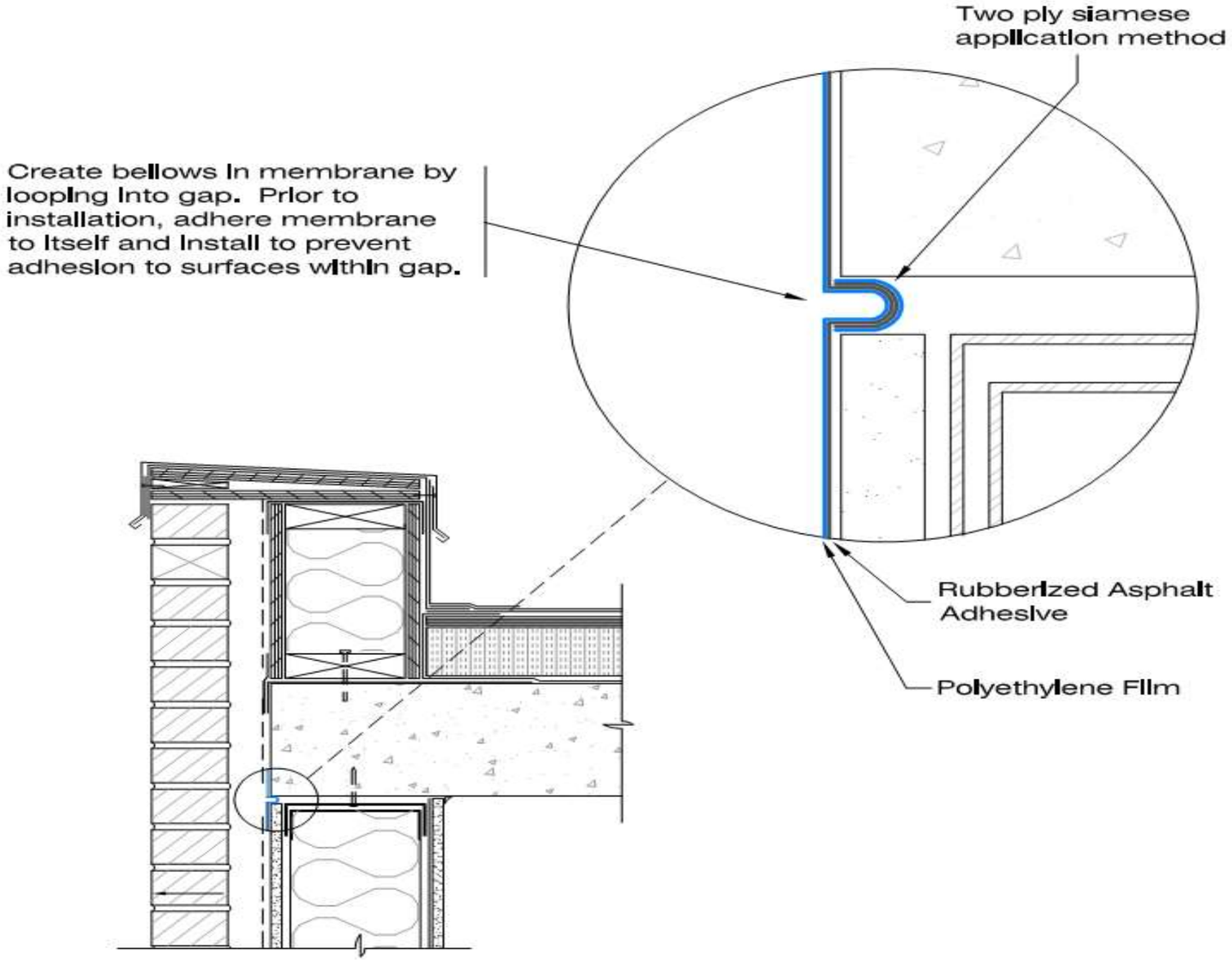
Expansion Joints



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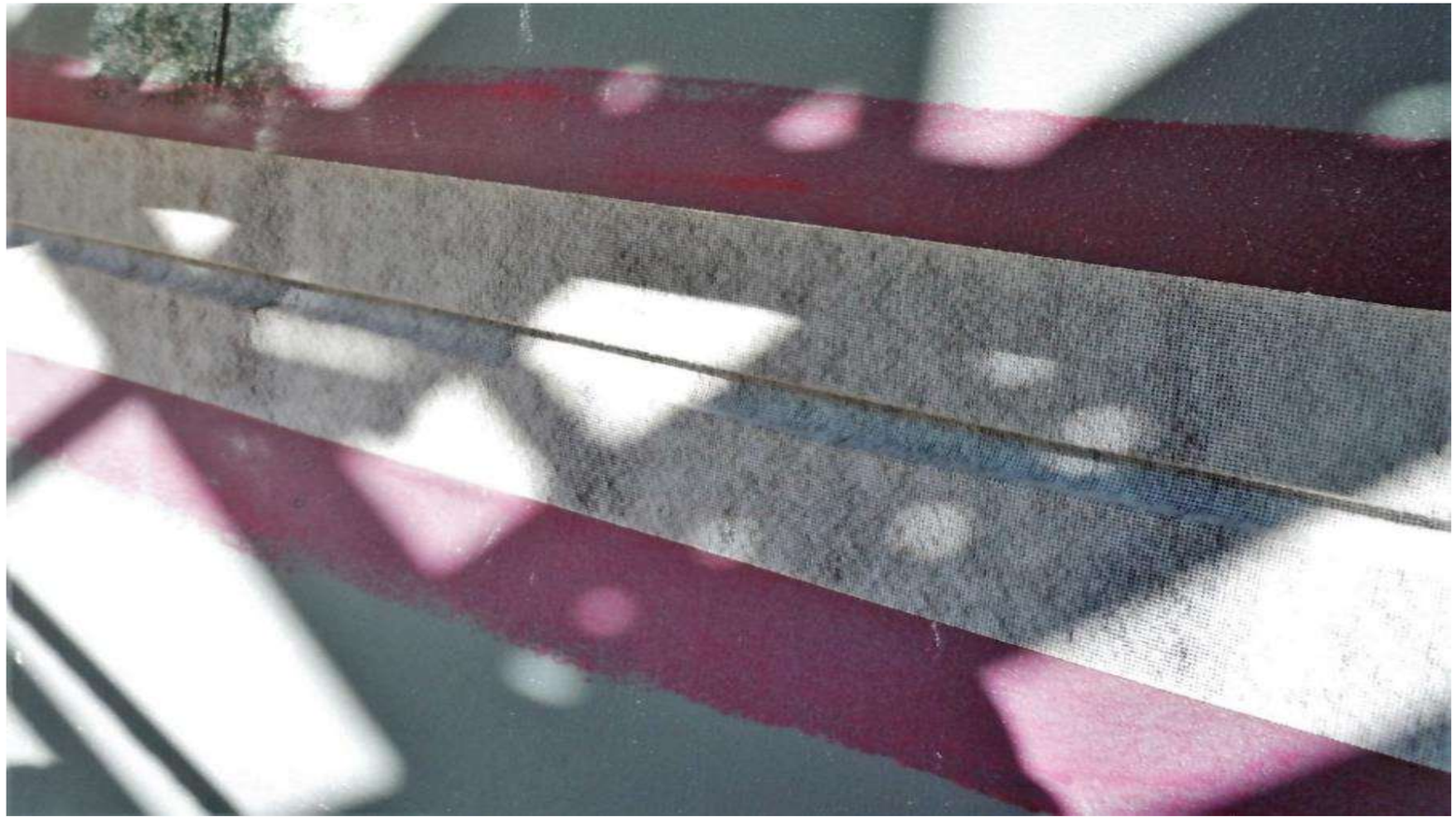
Expansion Joints



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A simple expansion joint created in an air barrier system at a horizontal gypsum board sheathing joint using self-adhered transition membrane material (final air barrier material is not yet installed).

Transitions Between Dissimilar Materials

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Transitions Between Dissimilar Materials

The use of a self-adhered transition membrane to create continuity between the gypsum board system and adjacent structural steel system.

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Plumbing, Mechanical, Electrical, Structural Penetrations

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Plumbing, Mechanical, Electrical, Structural Penetrations

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A well-executed roof pipe drain penetration detail prior to the application of a fluid applied air barrier product.

Canopies, Overhangs, Exterior Vestibules

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Canopies, Overhangs, Exterior Vestibules

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Canopies, Overhangs, Exterior Vestibules

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Canopies, Overhangs, Exterior Vestibules

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An example of the use of a spray foam plug in a roof deck (top and bottom) to provide a surface for a self-adhered or liquid-applied air barrier system to tie into a penetrating roof deck.

Canopies, Overhangs, Exterior Vestibules

Example of a fluted metal deck which spans over a building envelope line where the flutes must be sealed both top and bottom to create an airtight assembly.

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Canopies, Overhangs, Exterior Vestibules

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An example of a fixed canopy which is likely best served by keeping it out of the building envelope.

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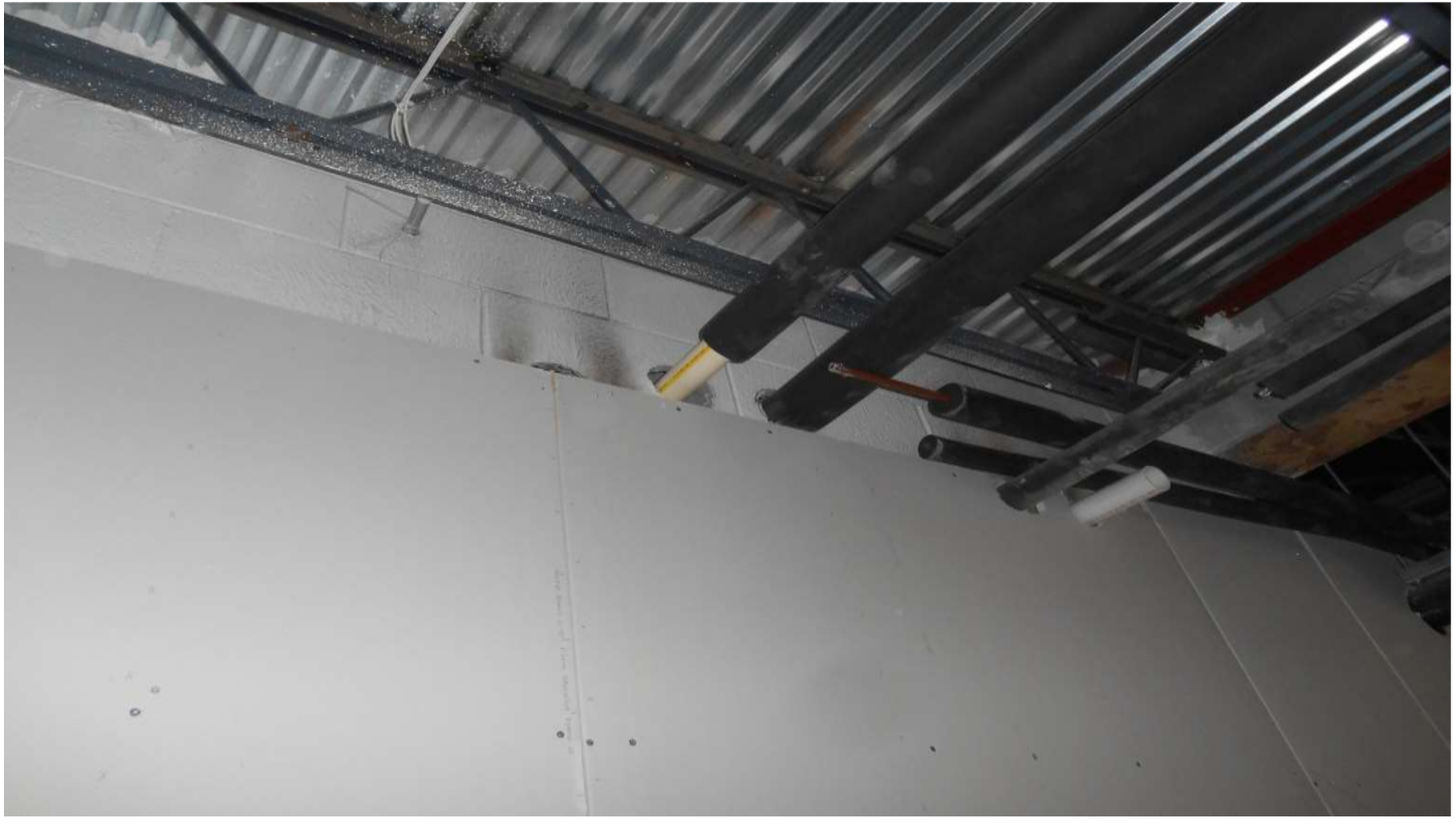

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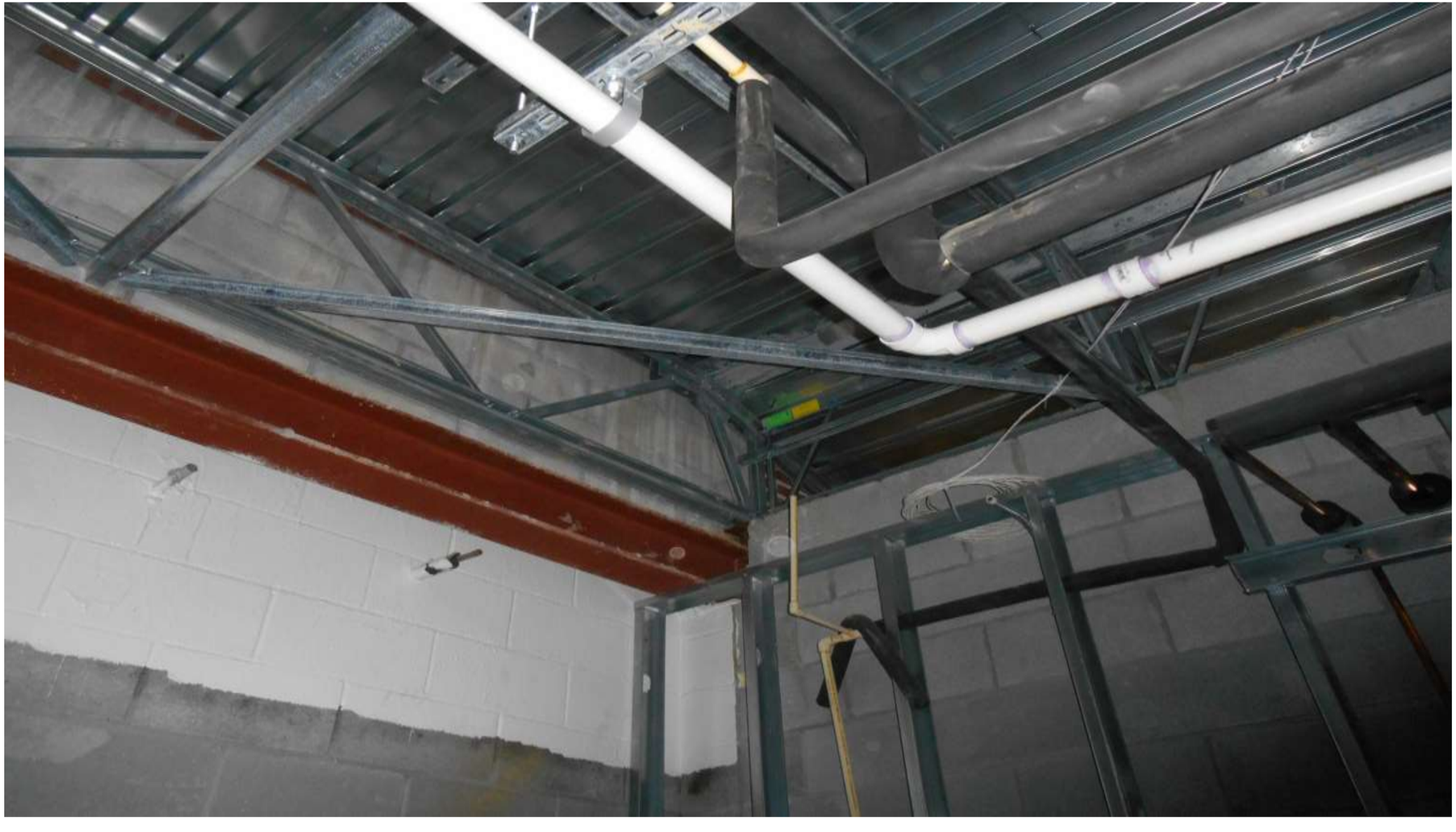

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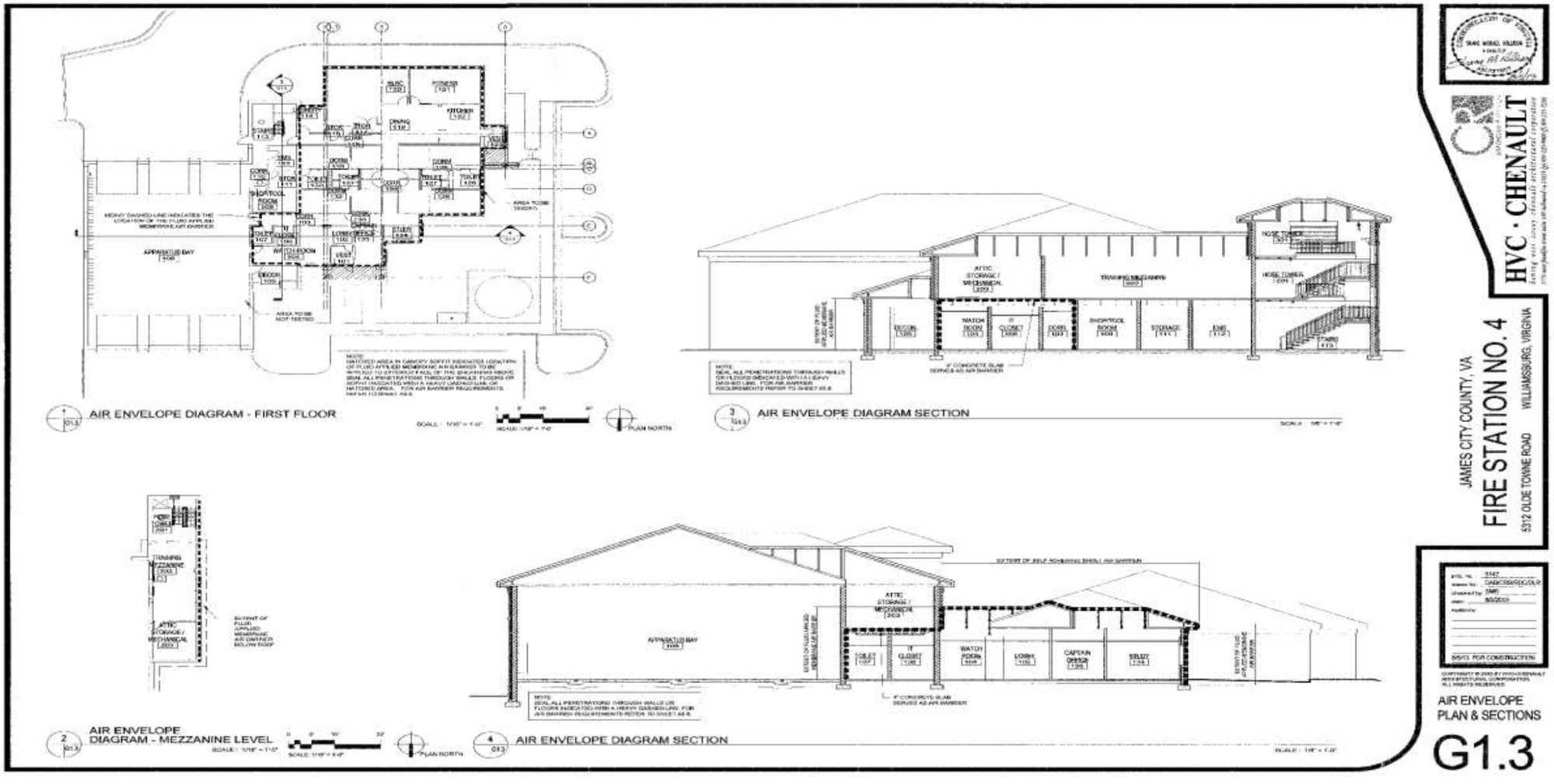

JAMES CITY COUNTY, VA

FIRE STATION NO. 4

5312 OLDE TOWNE ROAD WILLIAMSBURG, VIRGINIA

HVC · CHENAULT

BID / CONSTRUCTION

AIR ENVELOPE PLAN & SECTIONS

G1.3

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