

abaa2025 building enclosure conference

Saddle Up! Integrating Control Layers at Parapet to Rise Wall Conditions

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Saddle Up! Integrating Control Layers at Parapet to Rise Wall Conditions

Learning Objectives

1. Develop an understanding of the importance of critical detailing of control layers at complex conditions to avoid air and water-related problems.
2. Discuss effective ways to develop and design successful details at complex conditions that are constructable and durable.
3. Recognize the importance of considering construction sequencing and trade coordination when developing complex details.
4. Determine the importance of mock-ups for evaluating detailing, sequencing and performance testing to ensure water-resistant and airtight designs.



Introduction



Saddle Condition

Interface Condition

- Parapet Termination
- Adjacent Facade



Complexity

Enclosure Systems

- Cladding
- Roofing
- Parapets
- Flashing
- Fenestration
- Movement
- Sealant



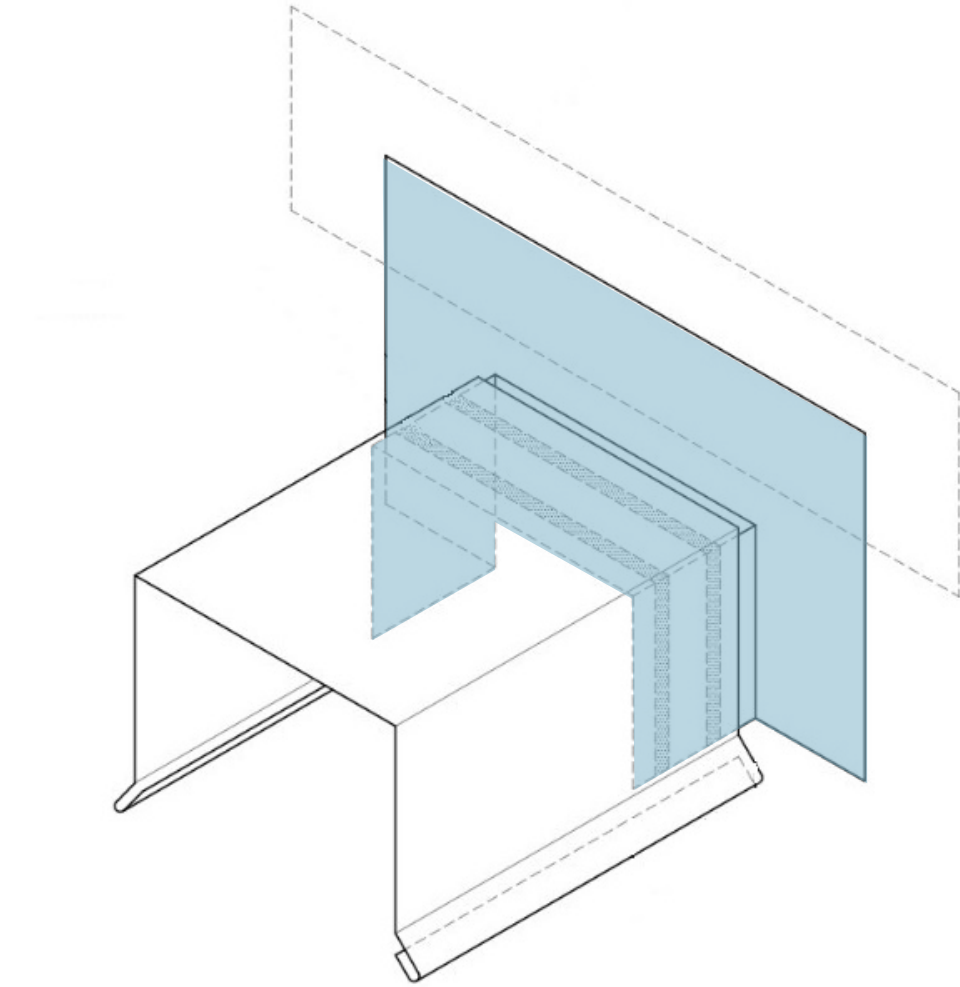
Components

Materials

- Typically sheet metal
- Sometimes roofing membrane

Configuration

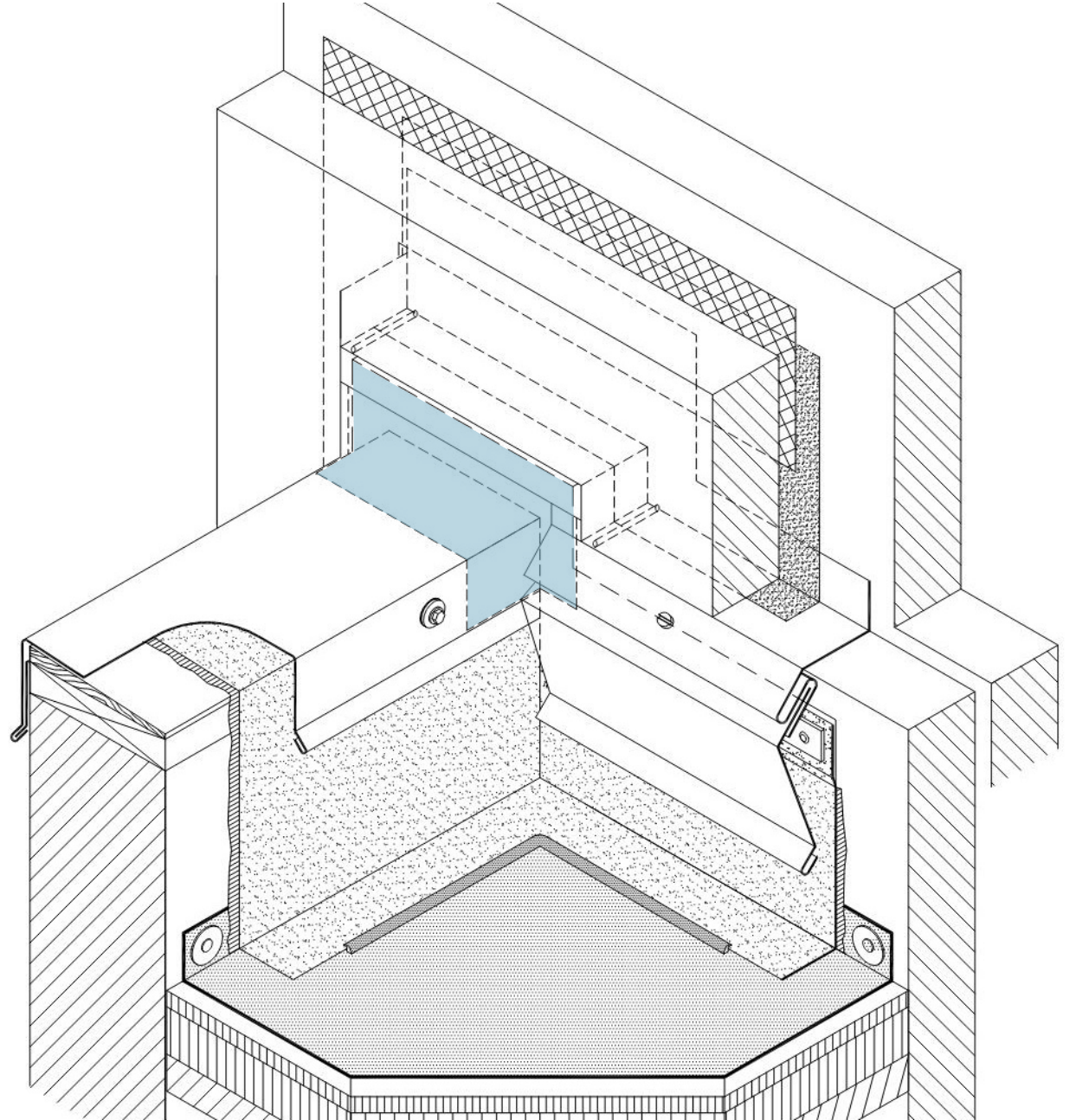
- Top and side flanges
- Top and sides projection



Integration

Control Layers

- Moisture
- Air
- Vapor
- Thermal
- Movement
- Aesthetics



What it's not!

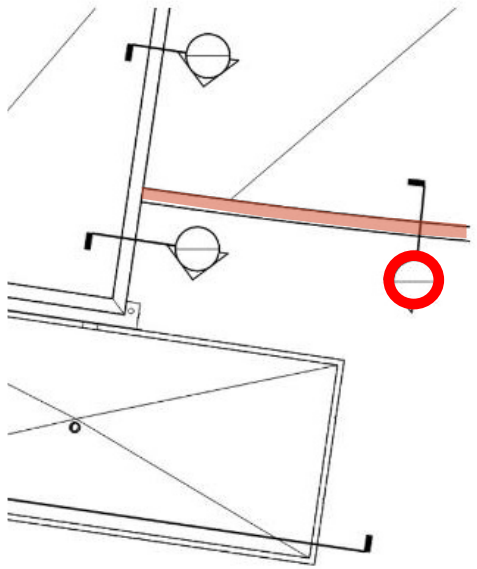


The Problem

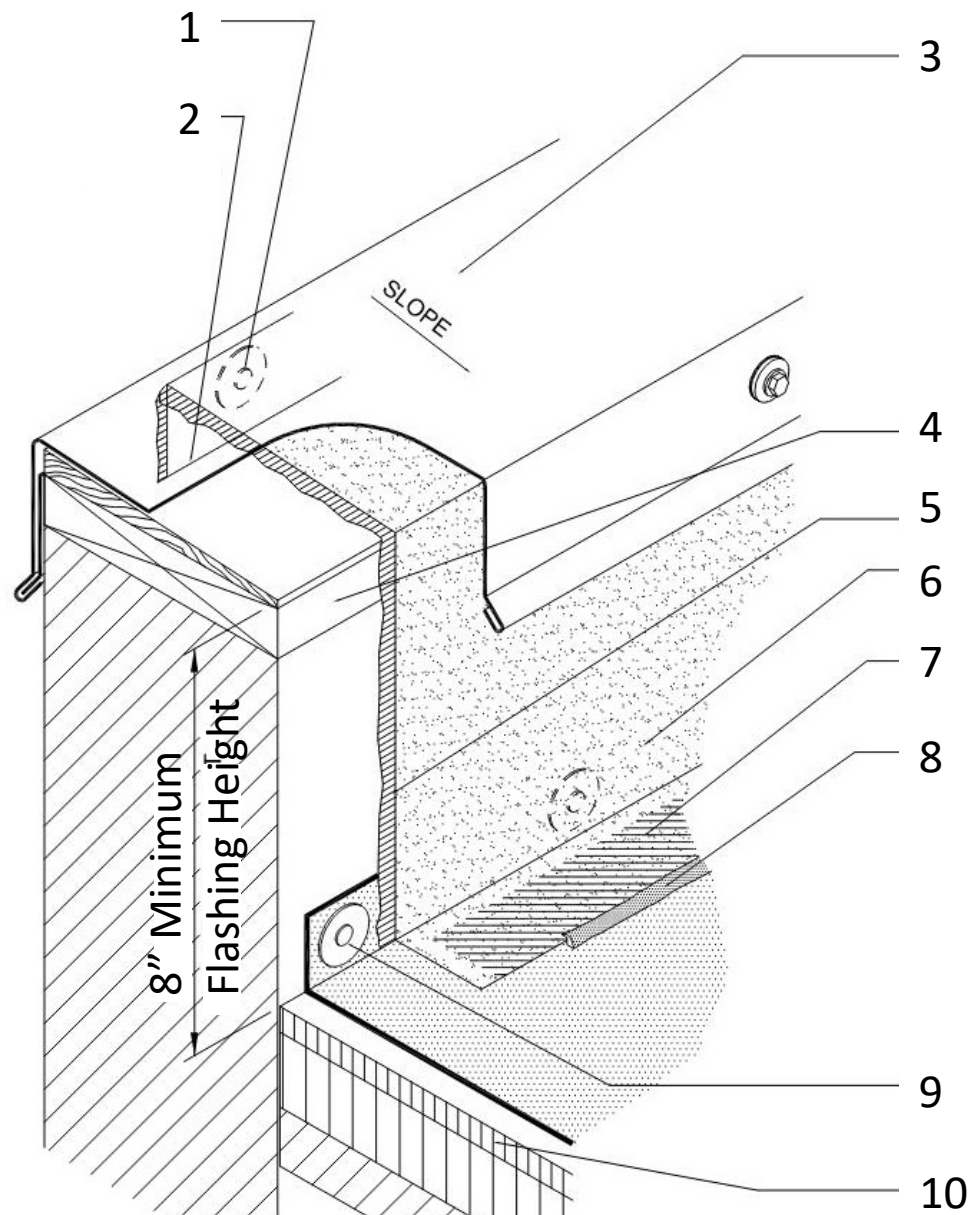
The Problem

Contributing Factors

- Lack of....
 - Awareness
 - Control layer continuity
 - Industry standards (until recently)
- Complex interface conditions
- Omitting multi-step 3D details
- Varying enclosure systems
- Trade coordination and sequencing



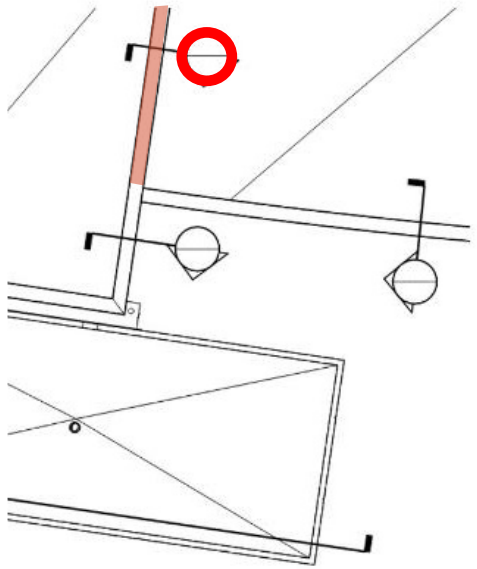
ROOF PLAN



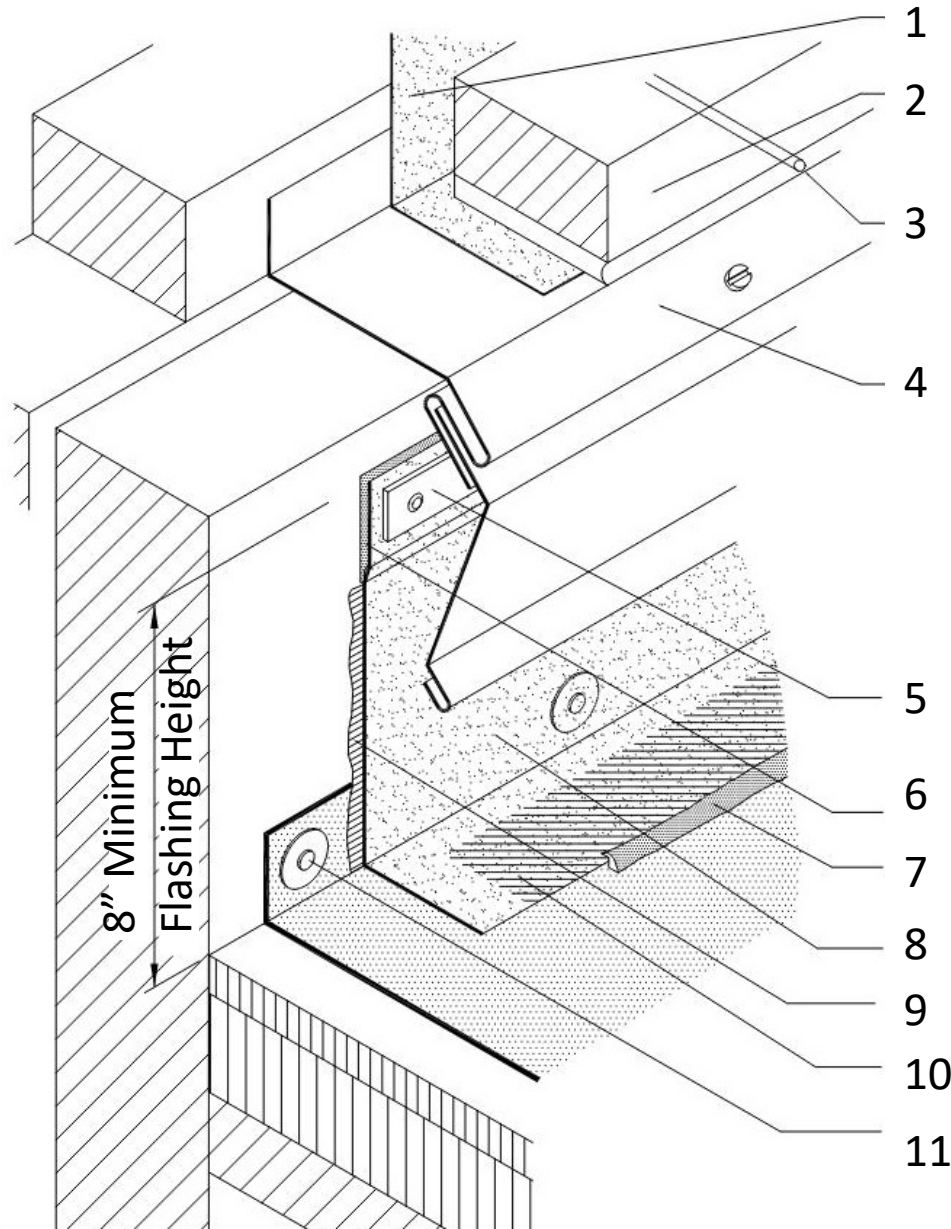
Parapet Detail

- 1 – Fasteners
- 2 – Membrane Lap
- 3 – Sheet Metal Coping
- 4 – Wood Nailer
- 5 – Bonding Adhesive
- 6 – Adhered Membrane Flashing
- 7 - Hot-Air Welded Seam
- 8 – Sealant (if required)
- 9 – Seam Plates and Fasteners
- 10 – Coverboard Insulation

NRCA ROOFING MANUAL
Membrane Roof Systems
(2023), TP-1



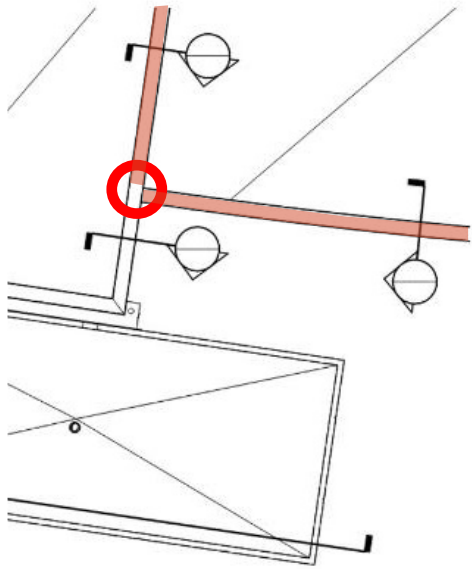
ROOF PLAN



Counterflashing Detail

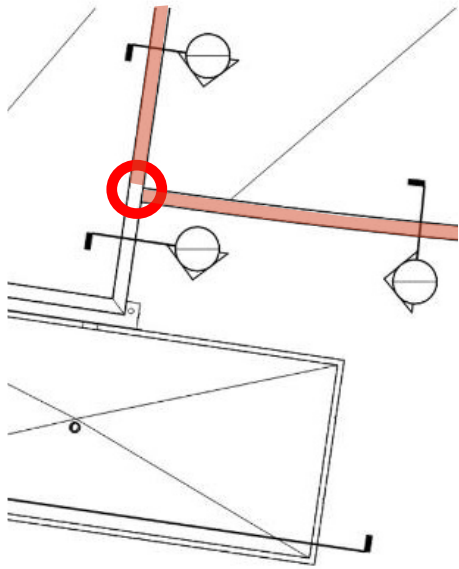
- 1 – Through-wall Flashing
- 2 – Masonry Wall
- 3 – Weep Hole
- 4 – Sheet Metal Receiver
- 5 – Termination Bar
- 6 – Sealant Behind Membrane
- 7 – Sealant (if required)
- 8 – Adhered Membrane Flashing
- 9 – Bonding Adhesive
- 10 – Hot-Air Welded Seam
- 11 – Seam Plates

NRCA ROOFING MANUAL
Membrane Roof Systems
(2023), TP-7

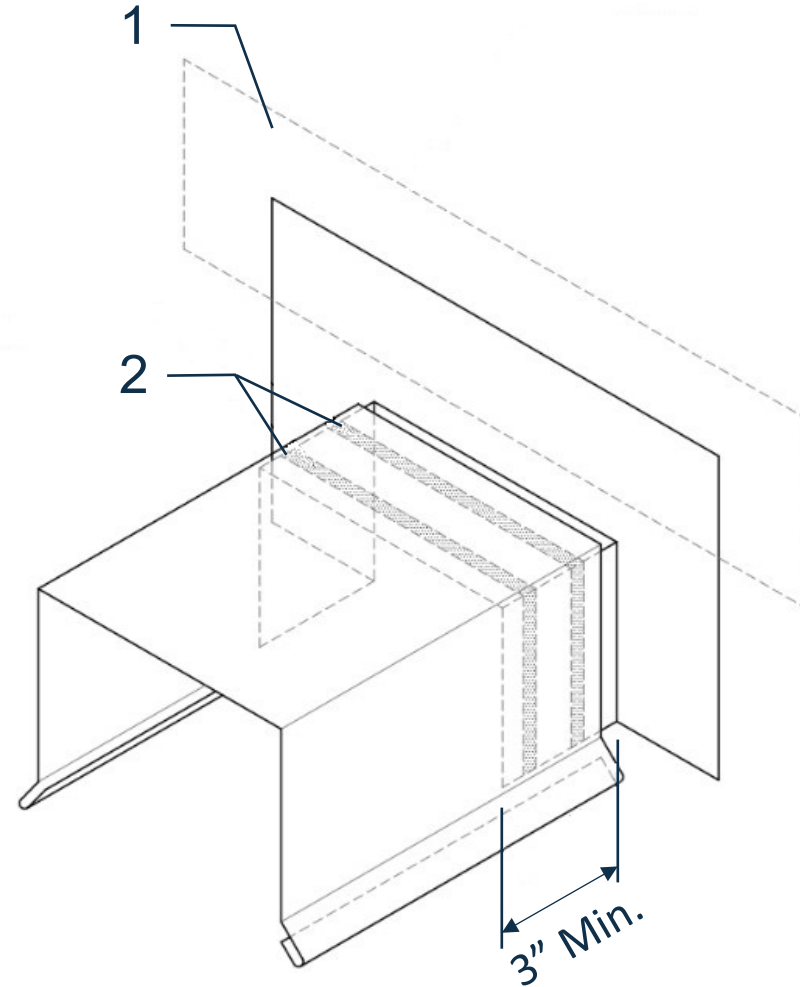


ROOF PLAN





ROOF PLAN



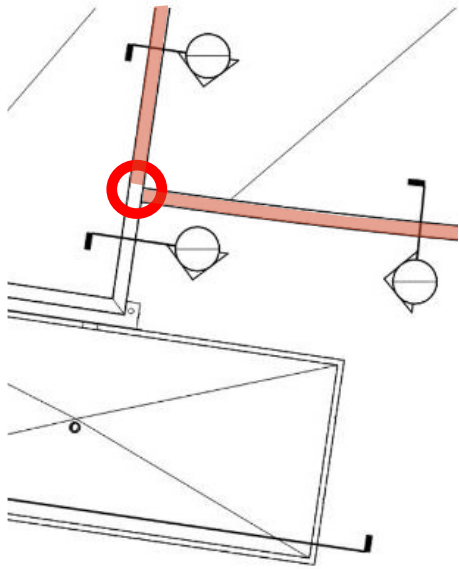
Saddle Flashing Detail

1 – Counterflashing (See Fig. 2-20)

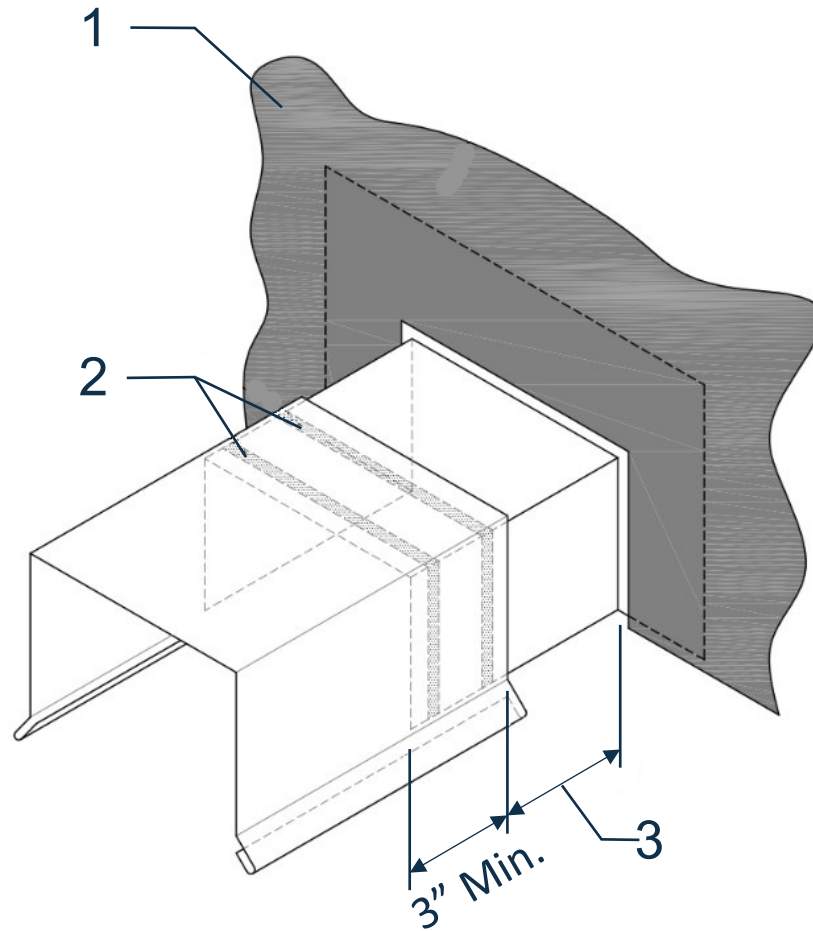
2 – Set Coping in Sealant

Note: Roof Membrane and Cleat Not Shown for Clarity.

NRCA ROOFING MANUAL
Architectural Flashing
(2022), Figure 2-8



ROOF PLAN



Saddle Flashing Detail

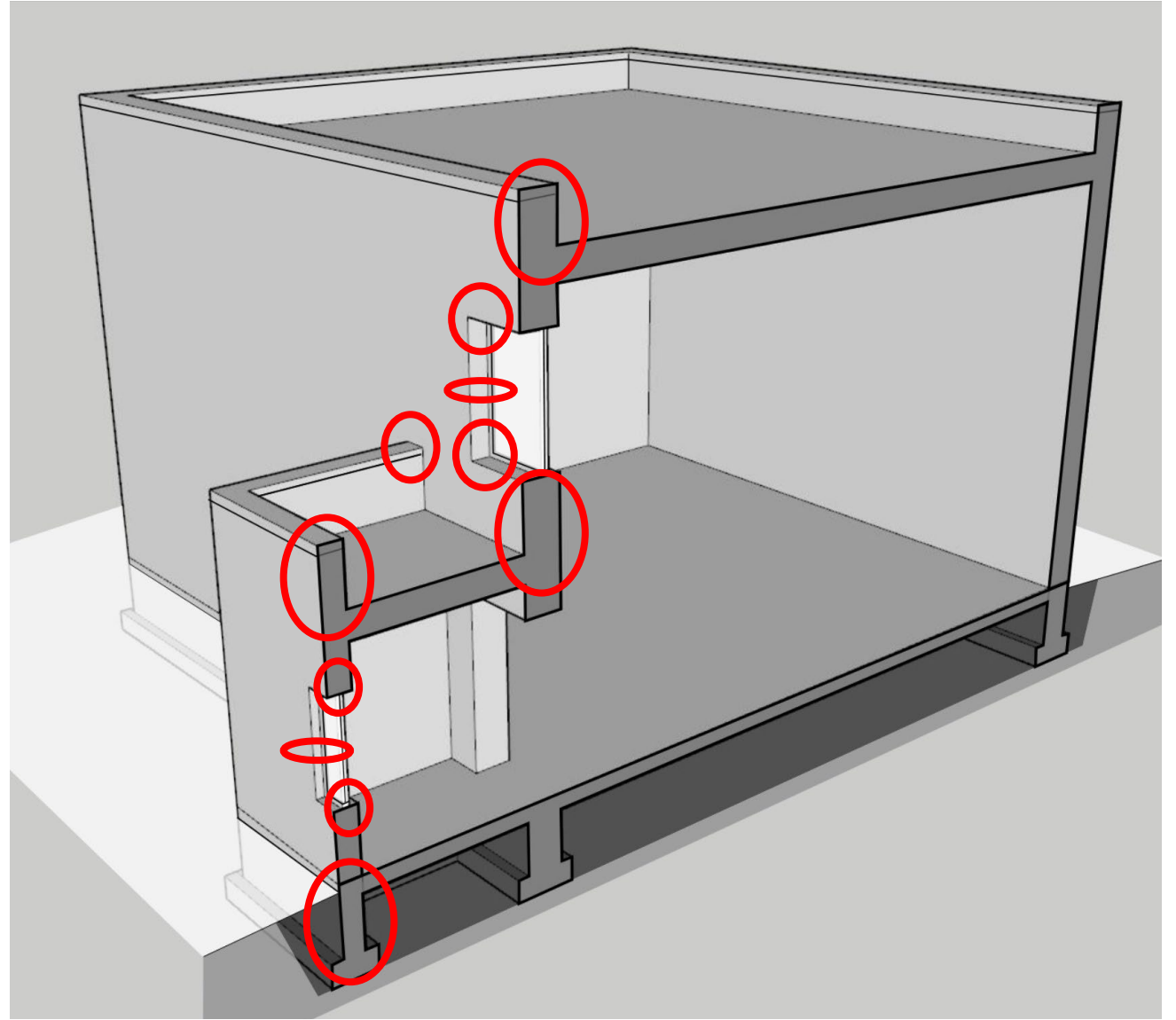
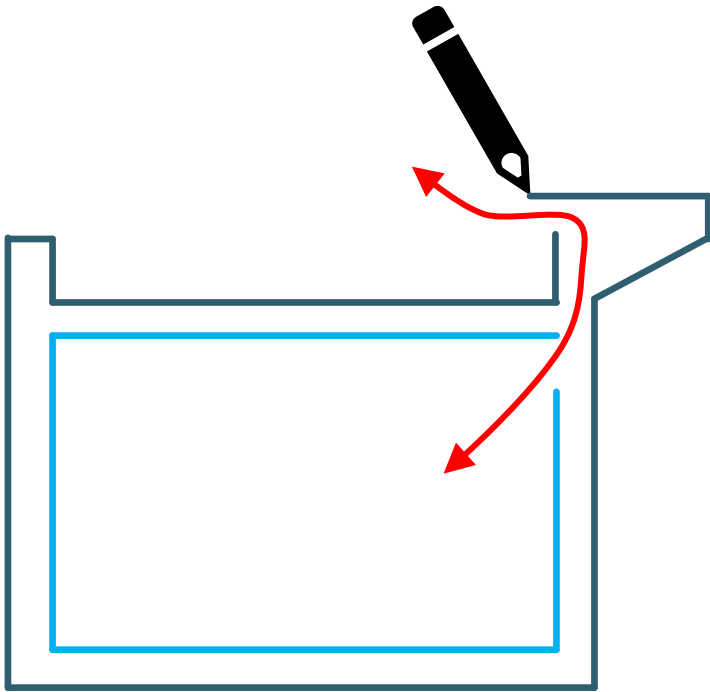
- 1 – Building Wrap – Overlap Saddle Flange 2" Min.
- 2 – Set Coping in Sealant
- 3 – Cladding Thickness

Note: Roof Membrane, Cladding and Cleat Not Shown for Clarity.

NRCA ROOFING MANUAL
Architectural Flashing
(2022), Figure 2-8

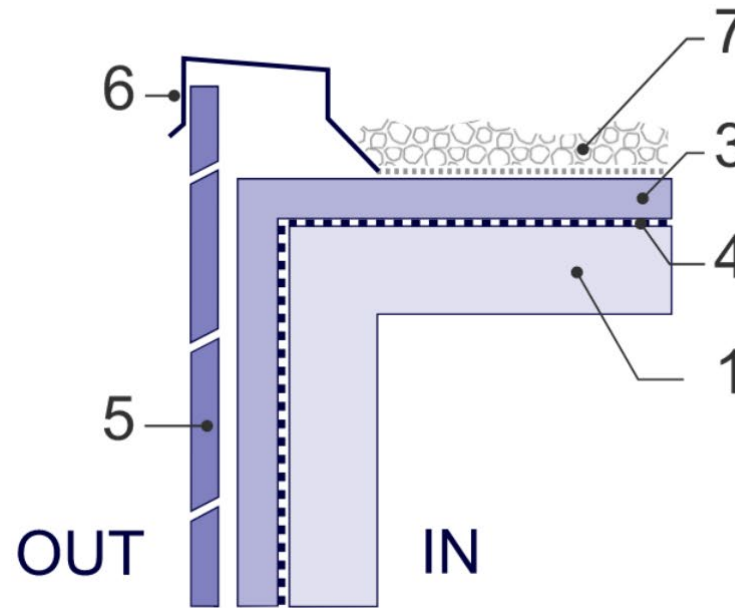
Design Fundamentals

Critical Interfaces

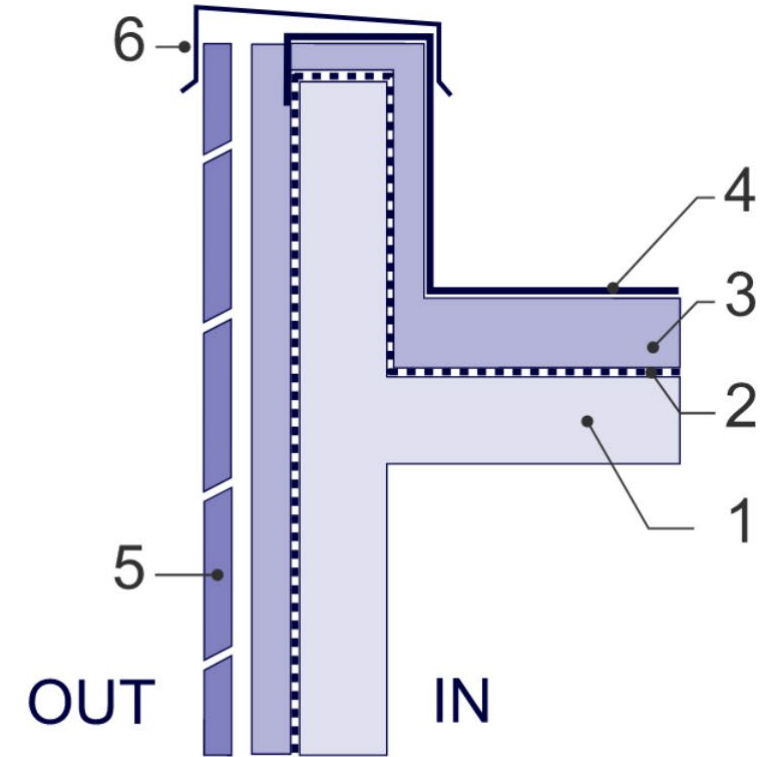


Configurations

1. Structure
2. Air/Vapor Control Layer
3. Thermal Control Layer
4. Roofing Control Layer
5. Cladding
6. Coping
7. Overburden



OUTBOARD WALL
INSULATION & PROTECTED
MEMBRANE ROOF
ASSEMBLY



OUTBOARD WALL
INSULATION &
CONVENTIONAL ROOF
ASSEMBLY

Control Layer Continuity

Water Control Layer

Controls water

Air Control Layer

Controls airflow between conditioned and unconditioned spaces

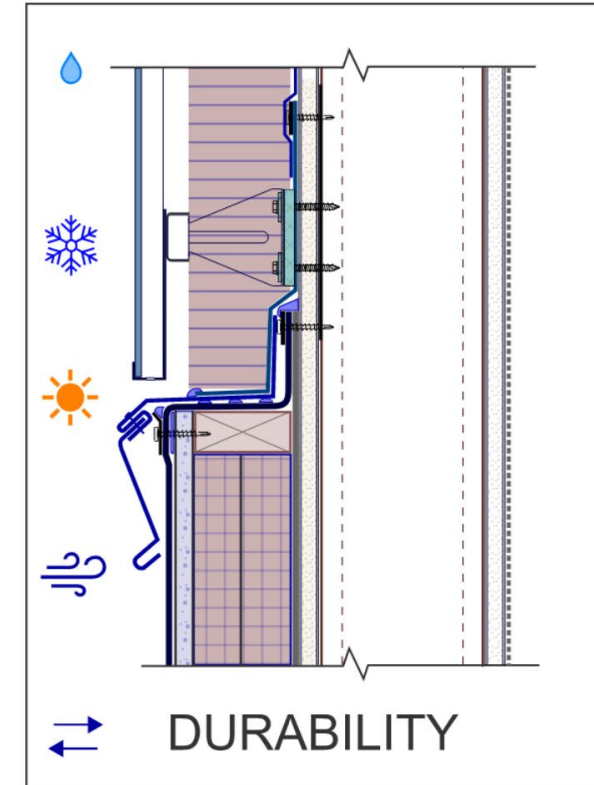
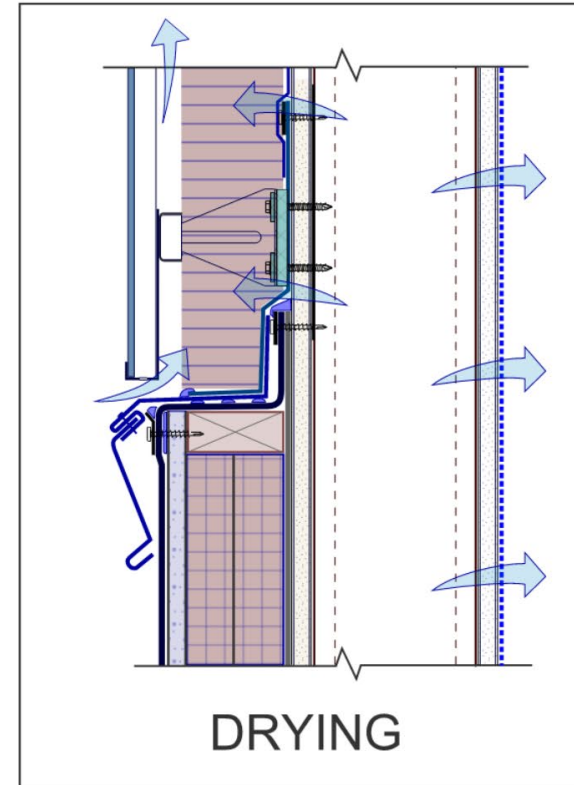
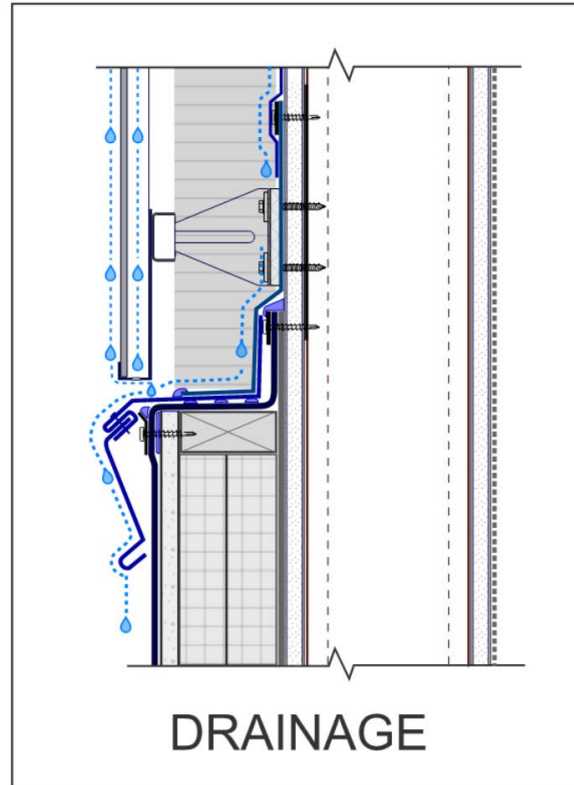
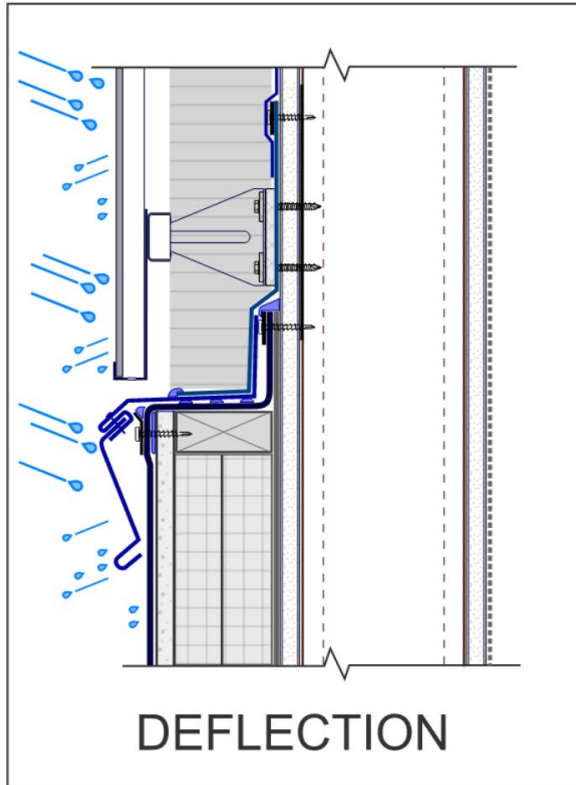
Vapor Control Layer

Control the movement of water vapor by diffusion

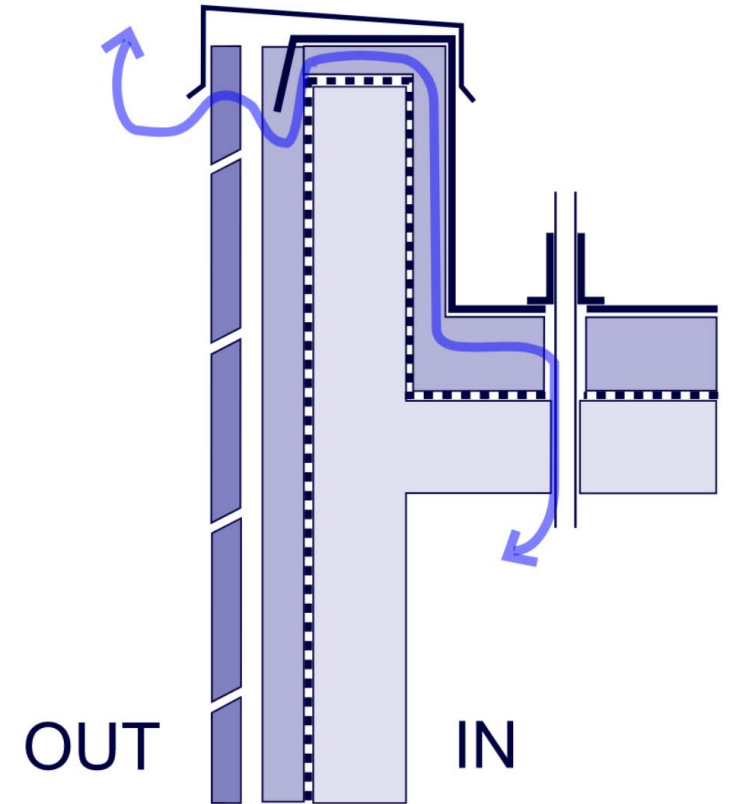
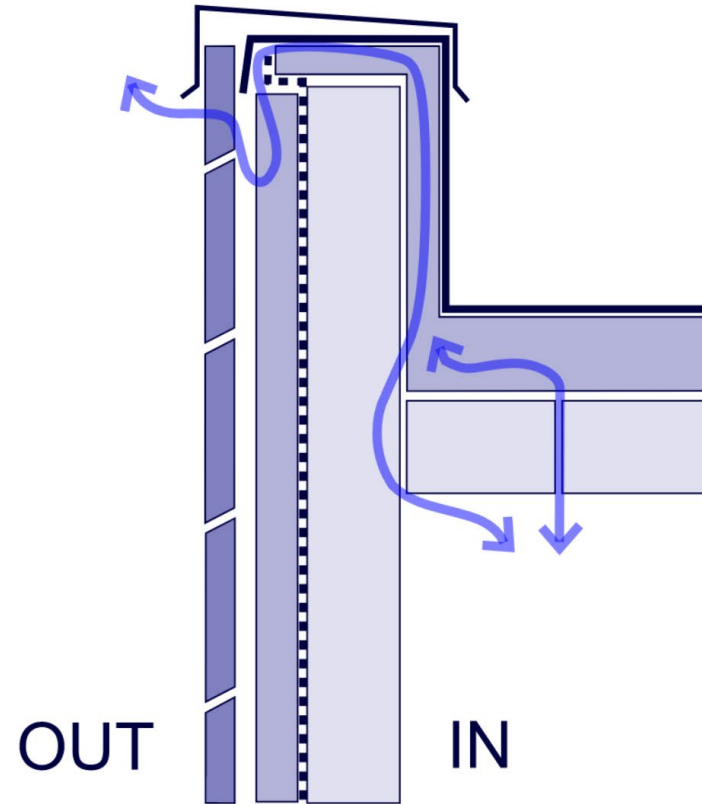
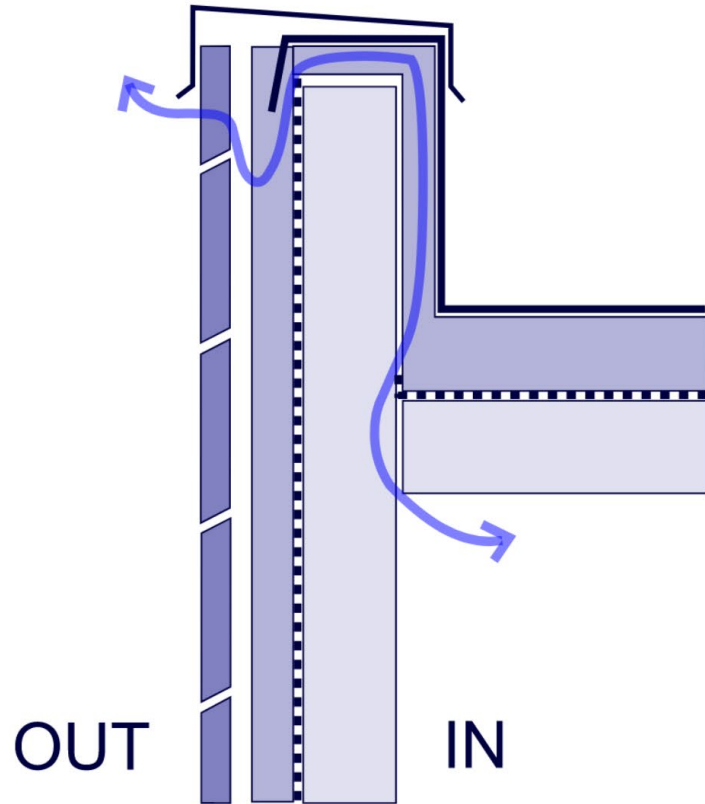
Thermal Control Layer

Controls the transfer of thermal energy (heat)

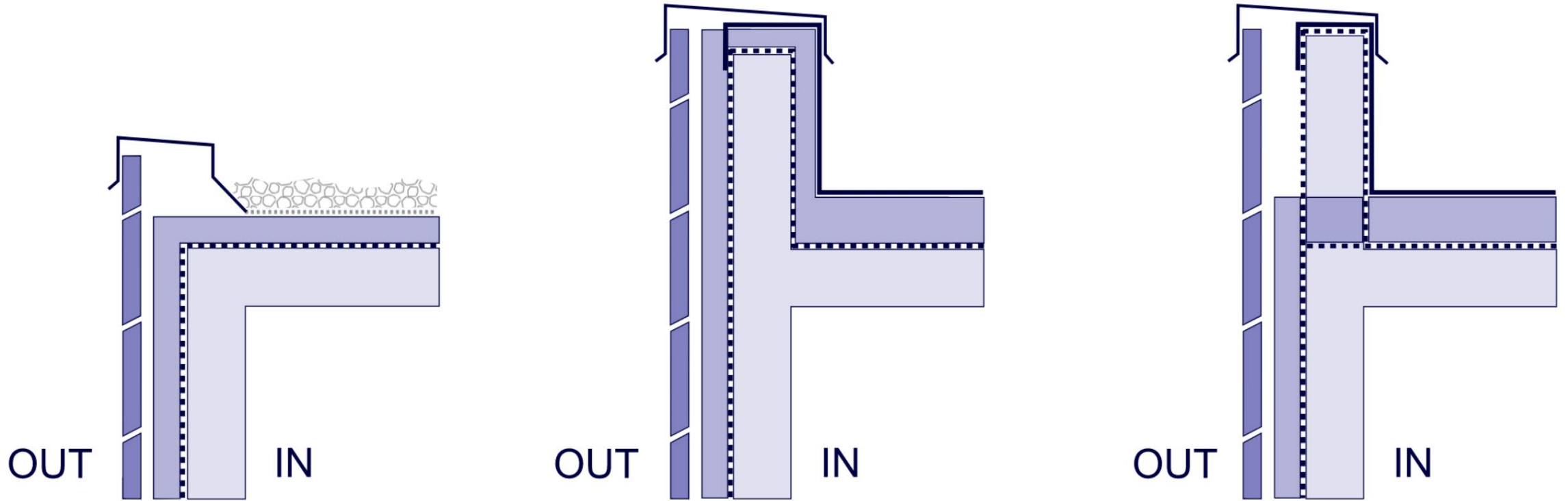
Moisture Flow



Air / Vapor Control

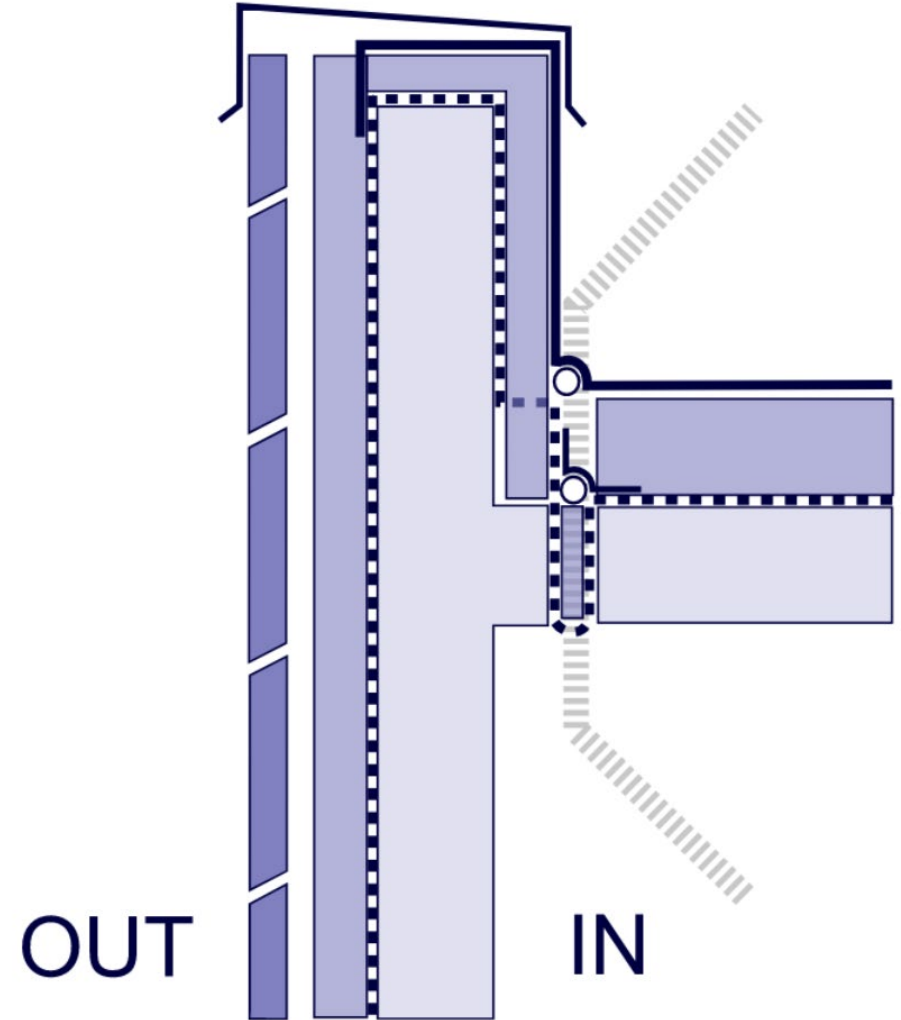


Thermal Continuity



Building Movement

- Roof Deck Deflection
- Building Expansion
- Expansion / Contraction



Other Factors

- Alignment
 - Plan – Perpendicular, curved, acute angle
 - Section – Coping above, aligned, below counterflashing
- Constructability
- Sequencing
- Material Compatibility

Industry Standards

Early Saddle Flashing Resources

Architectural Graphic Standards, 4th Edition,
1954

SMACNA Architectural Sheet Metal Manual,
5th Edition, 1993

Northwest Wall & Ceiling Bureau, Stucco
Resource Guide, 3rd Ed., 1997

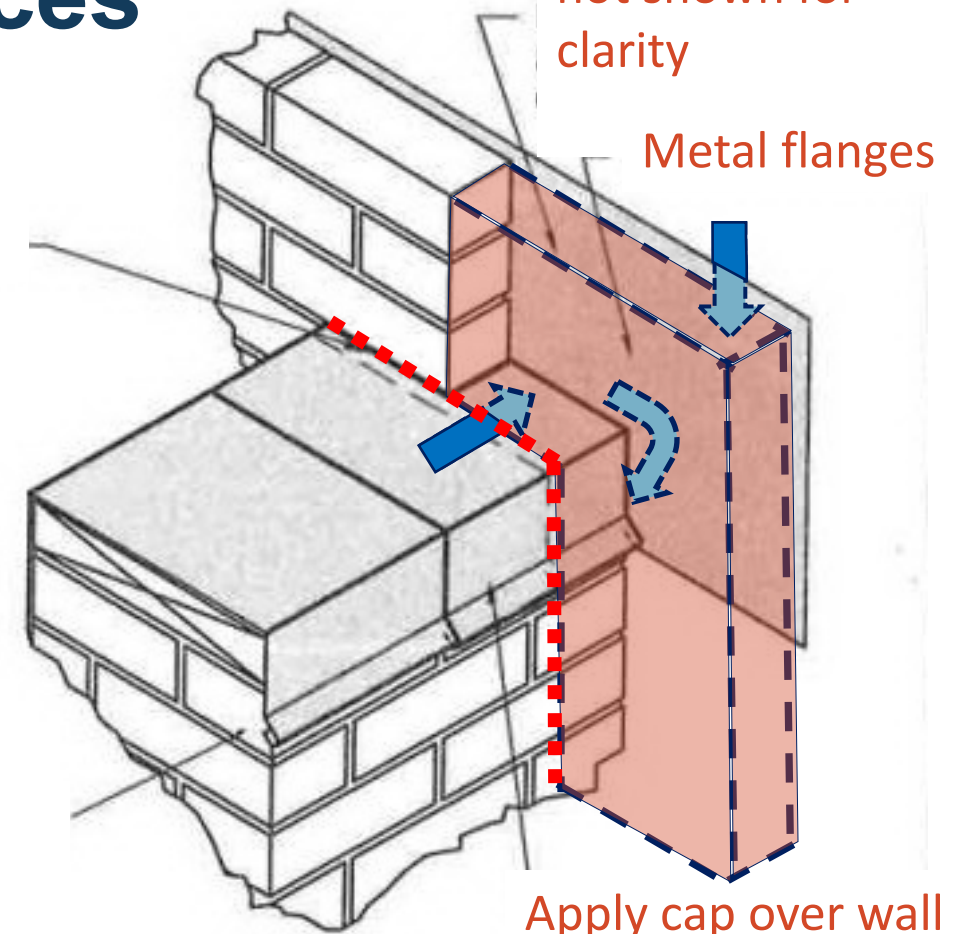
Sealant

Continuous
cleat

SMACNA Arch. Sheet Mtl.
Manual (5th Edition), 1993

Building material
not shown for
clarity

Metal flanges



Apply cap over wall
termination flashing

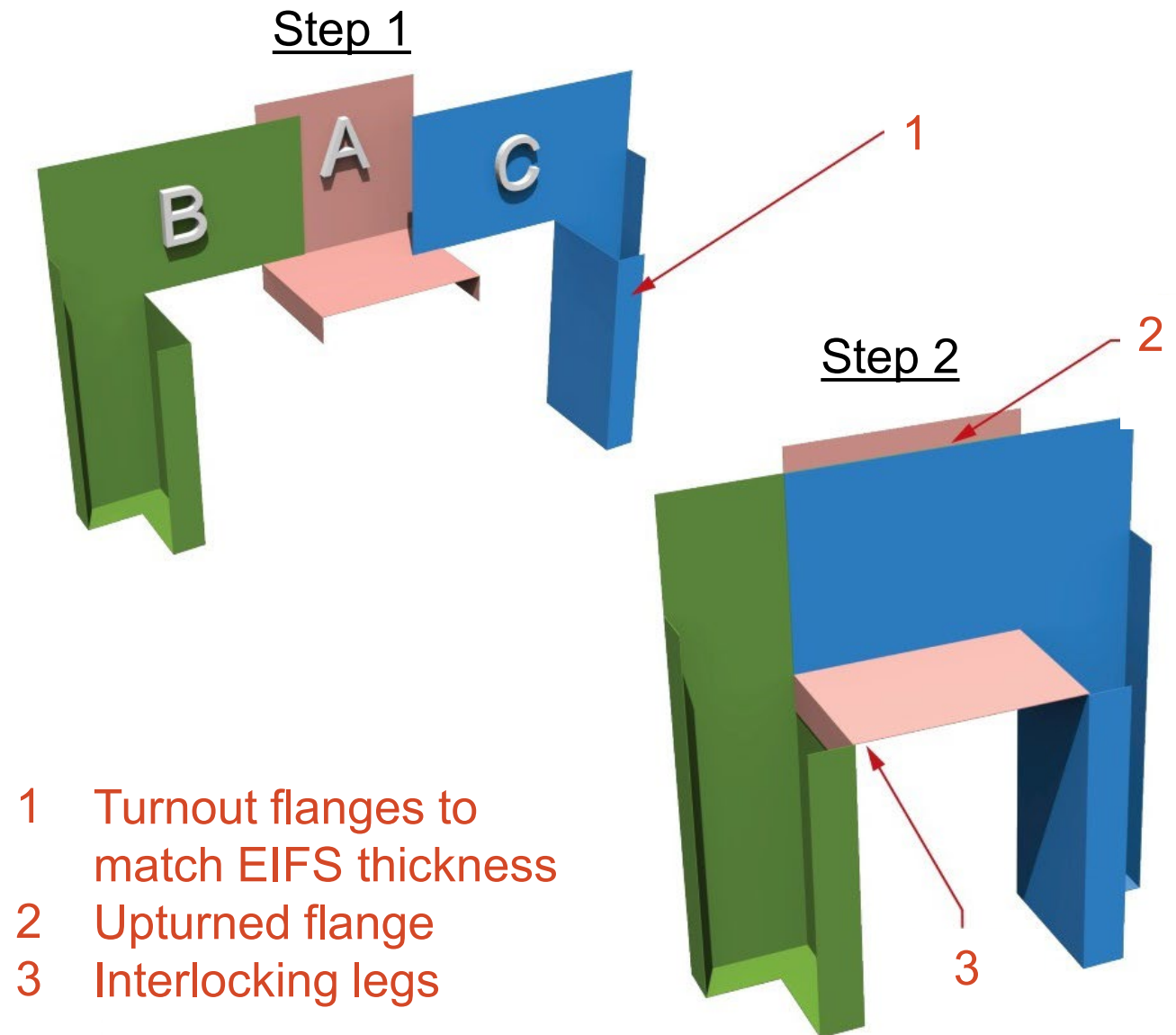
Contemporary Saddle Flashing Resources

ASTM, Moisture Control in Buildings:
The Key Factor in Mold Prevention,
2nd Edition, 2009

SMACNA Architectural Sheet Metal
Manual, 7th Edition, 2012

EIMA Guide to EIFS Drainage
Detailing, 2016

Exterior Insulation and Finish Systems
(EIFS) and Stucco Manufacturers



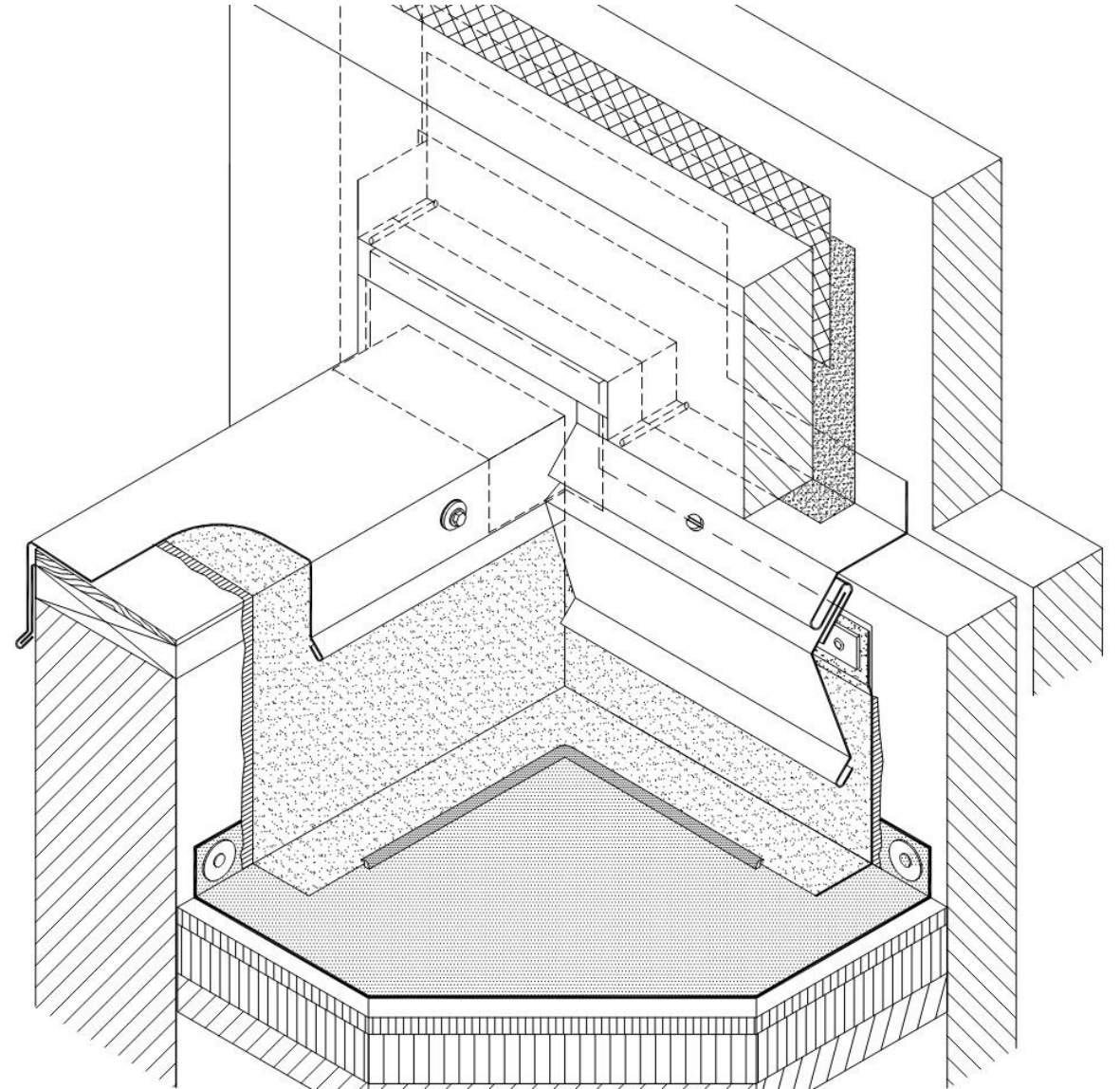
EIFS Manufacturer's Saddle Flashing Detail

Authored Resources

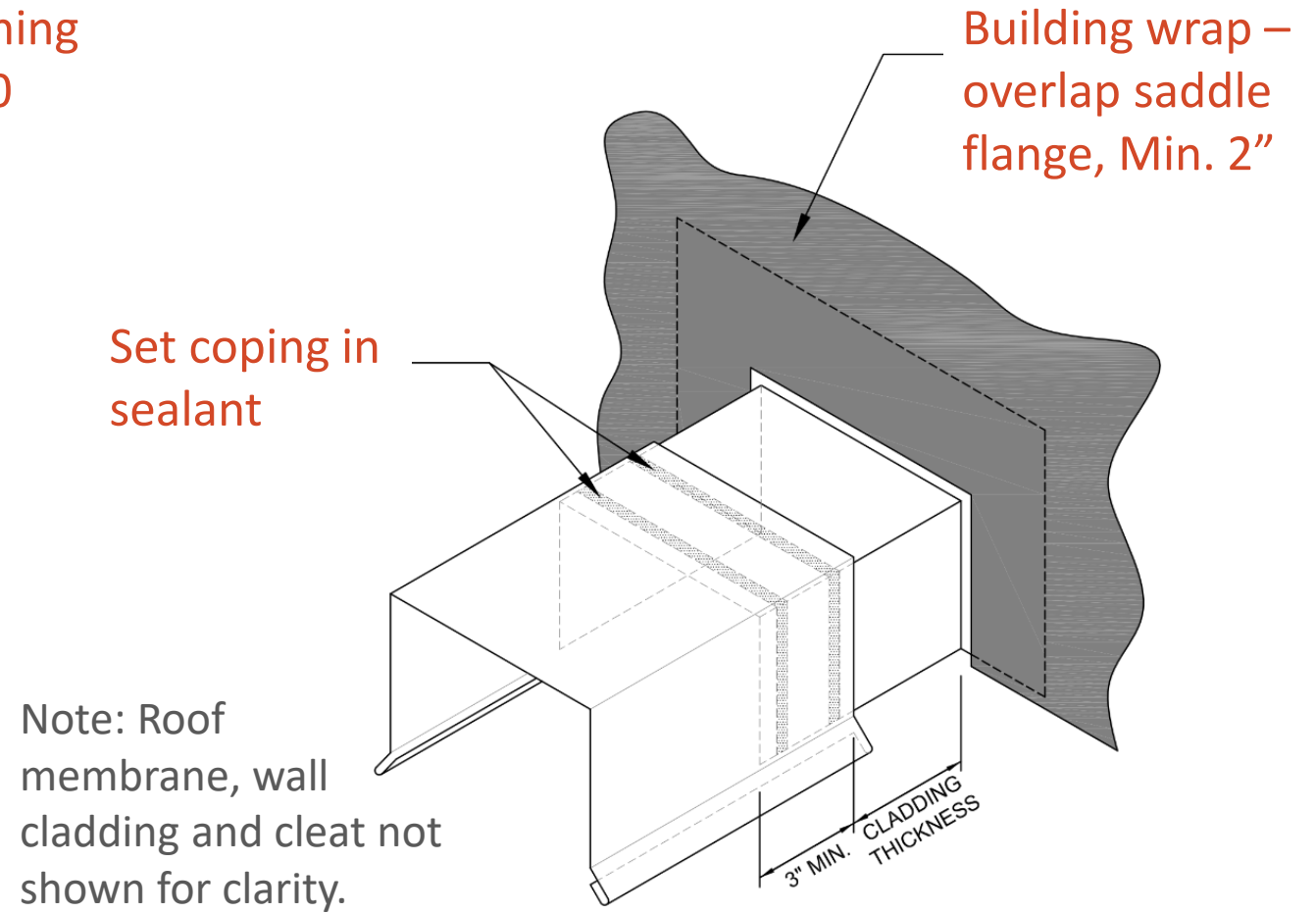
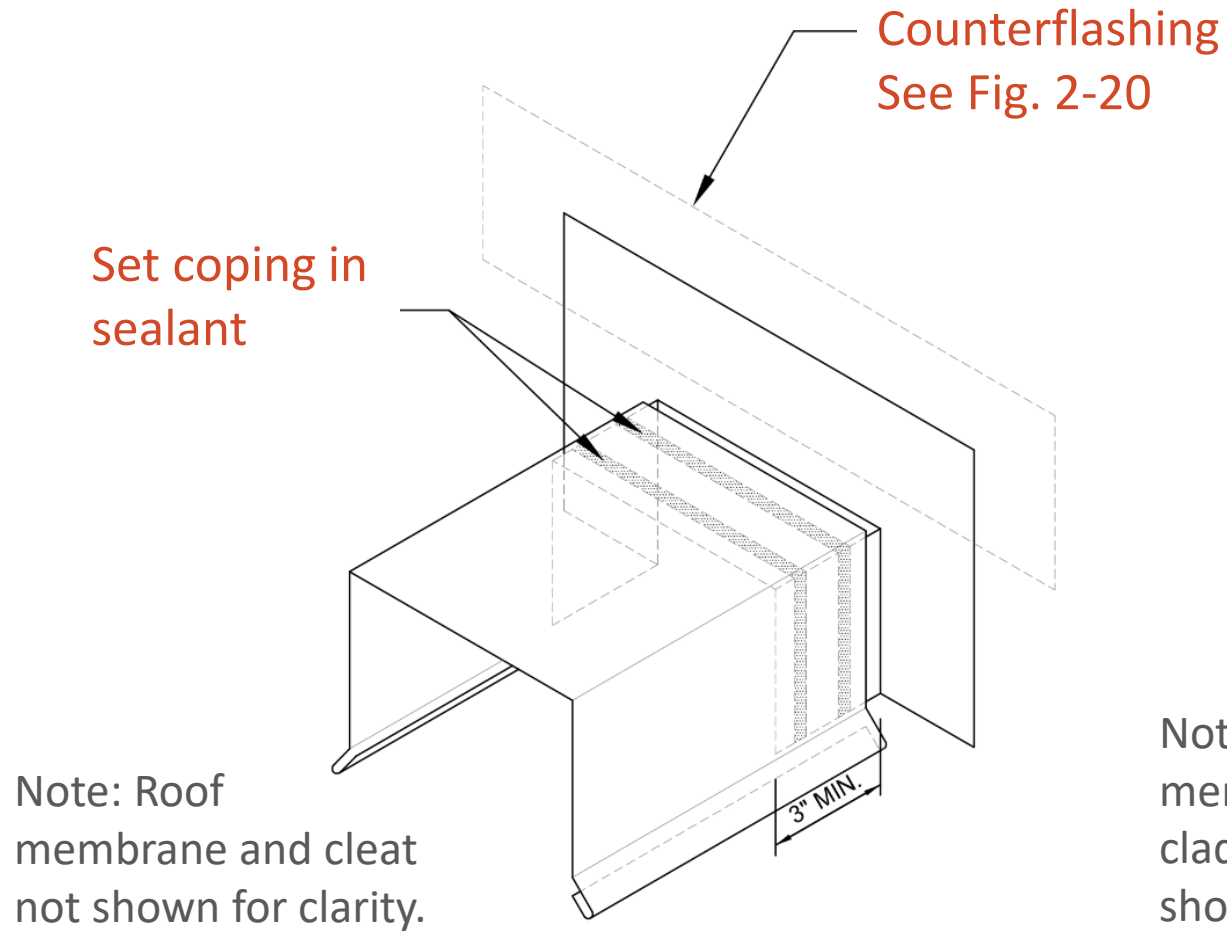
“It is Time to Saddle Up!”, Construction Specifier, December 2020

“An Architect’s Guide to Parapet-to-Wall Detailing,” Build Meets World Blog: Sponsored by Tremco Commercial Sealants & Waterproofing, October 2020

“Saddle Flashing Detailing, Mock-Ups and Construction Sequencing” proceedings, 2021 IIBEC International Convention & Trade Show



NRCA Manual: Architectural Metal Flashing, 2022



IMI Detailing Series, 2025

51 - Through-wall flashing

55 - Counterflashing

56 - Saddle Flashing,
fully sealed/soldered

57 - Coping

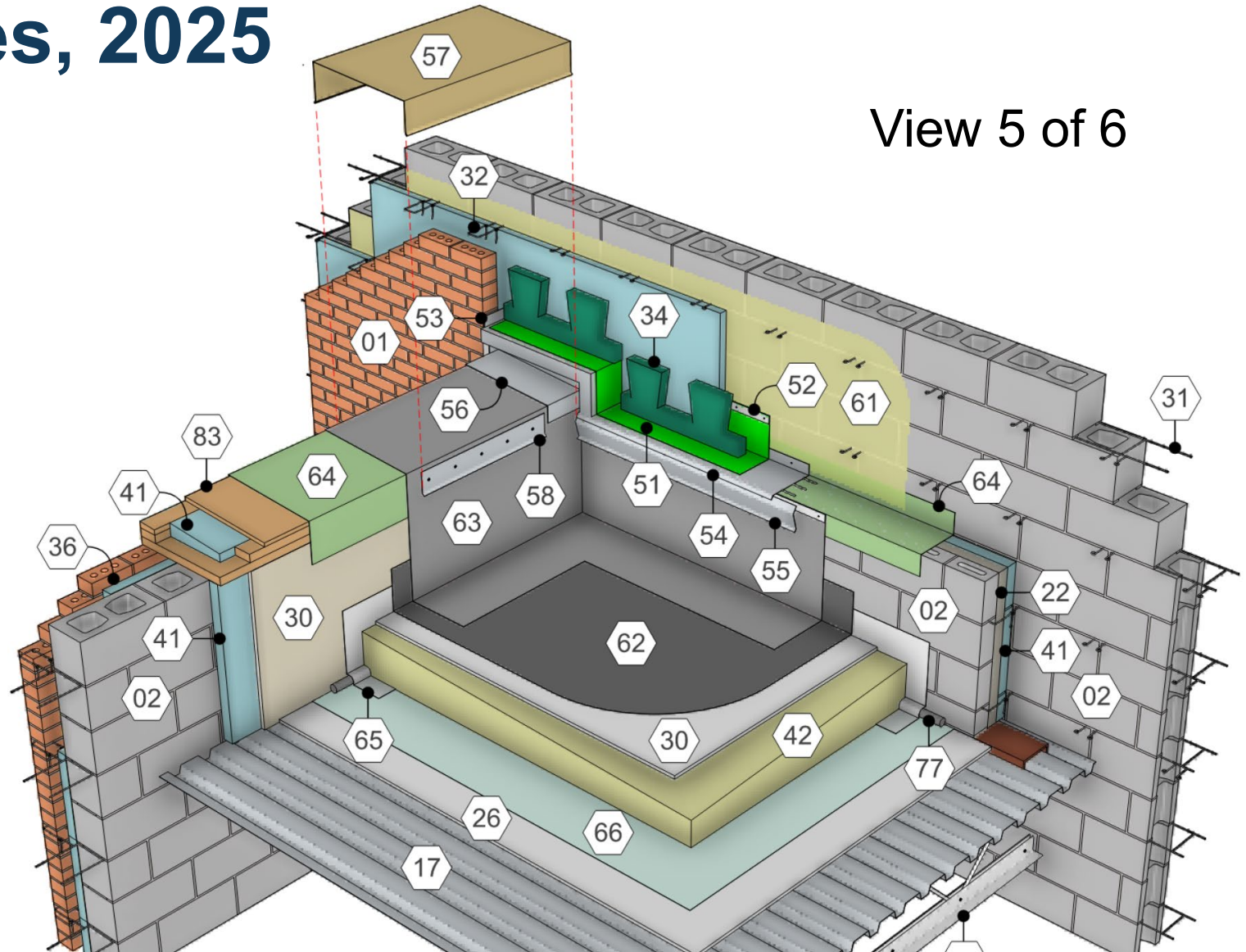
58 - Cleat

61 - Air/water/vapor as req'd

62 - Roofing

63 - Adhered membrane

View 5 of 6



Case Studies

The Up and Over Detail



The Up and Over Detail



Let's Expand On This



Let's Expand On This



Every Which Way, but the Right Way

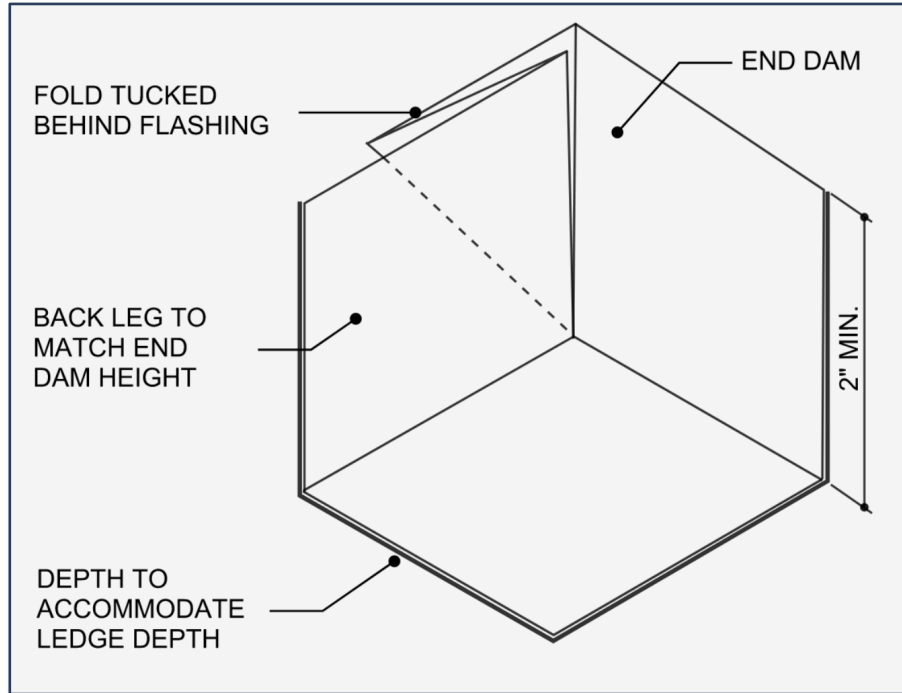


Every Which Way, but the Right Way

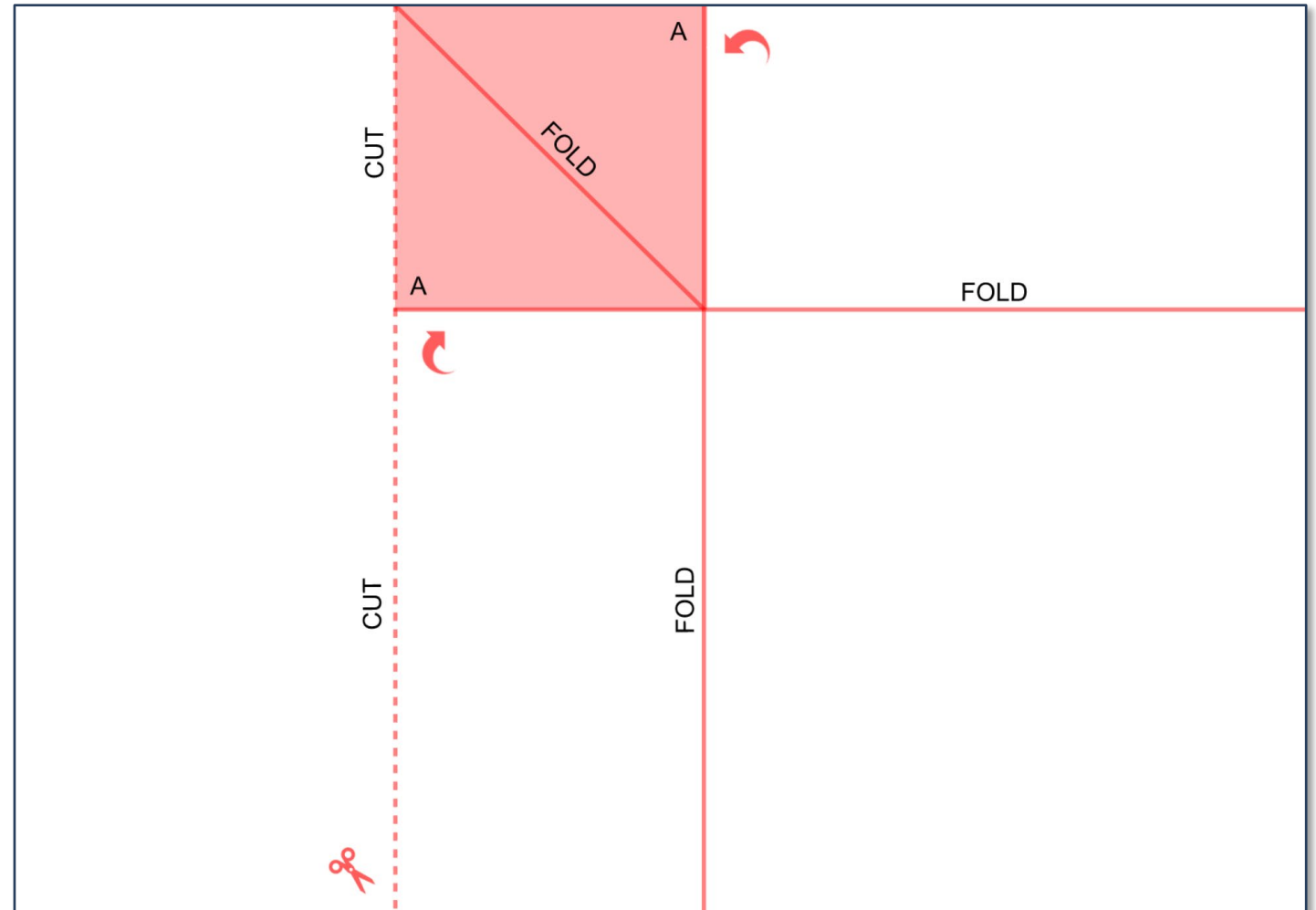


Paper Folding

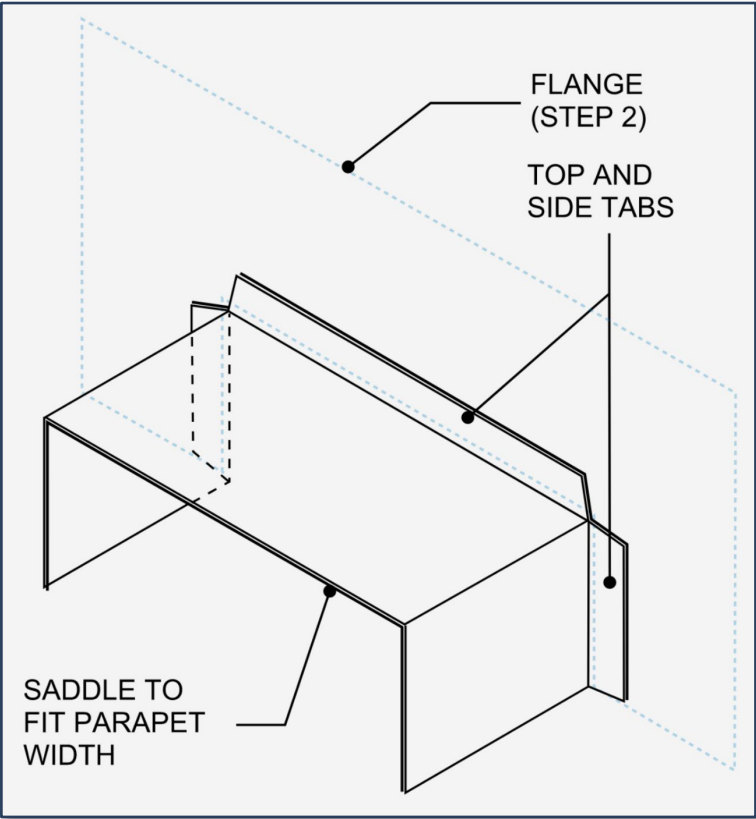
End Dam Exercise



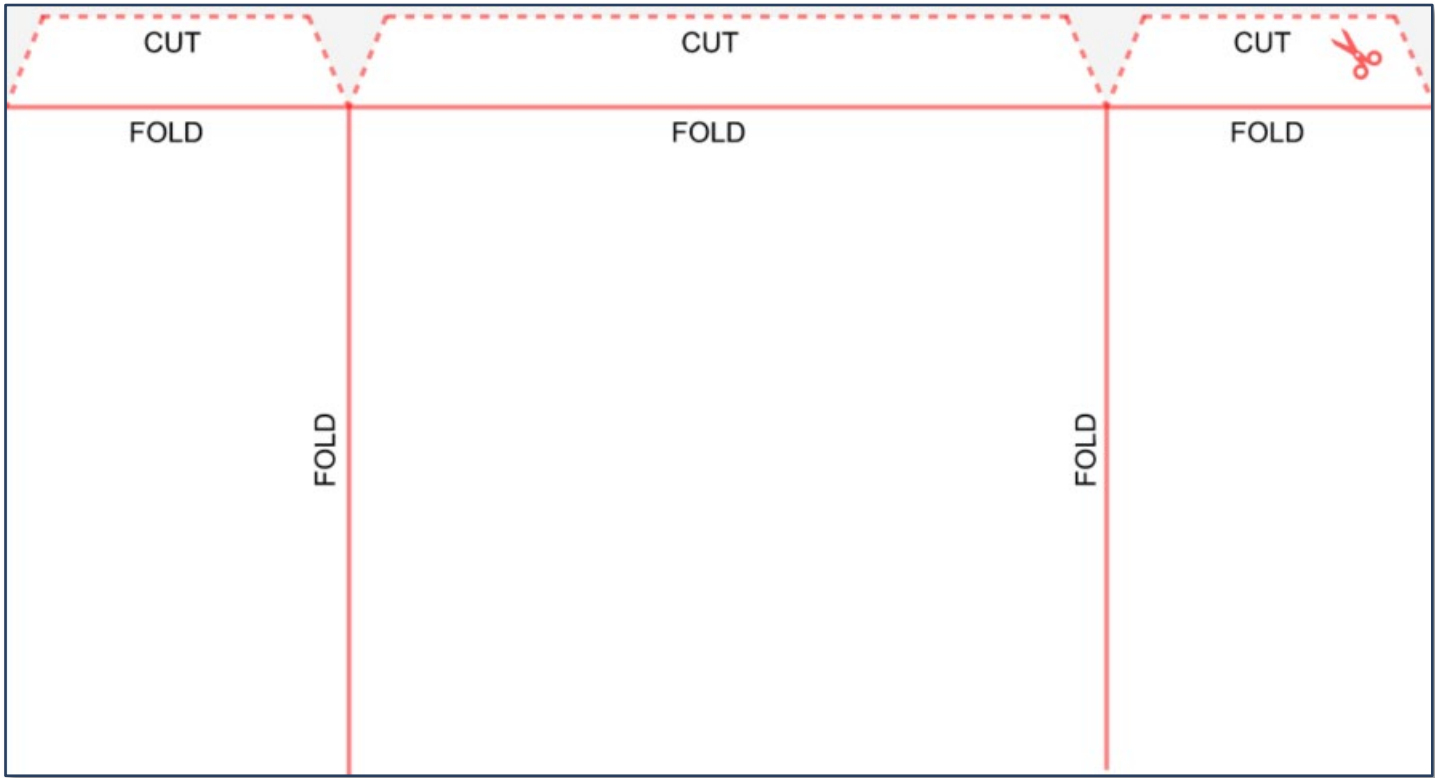
END DAM



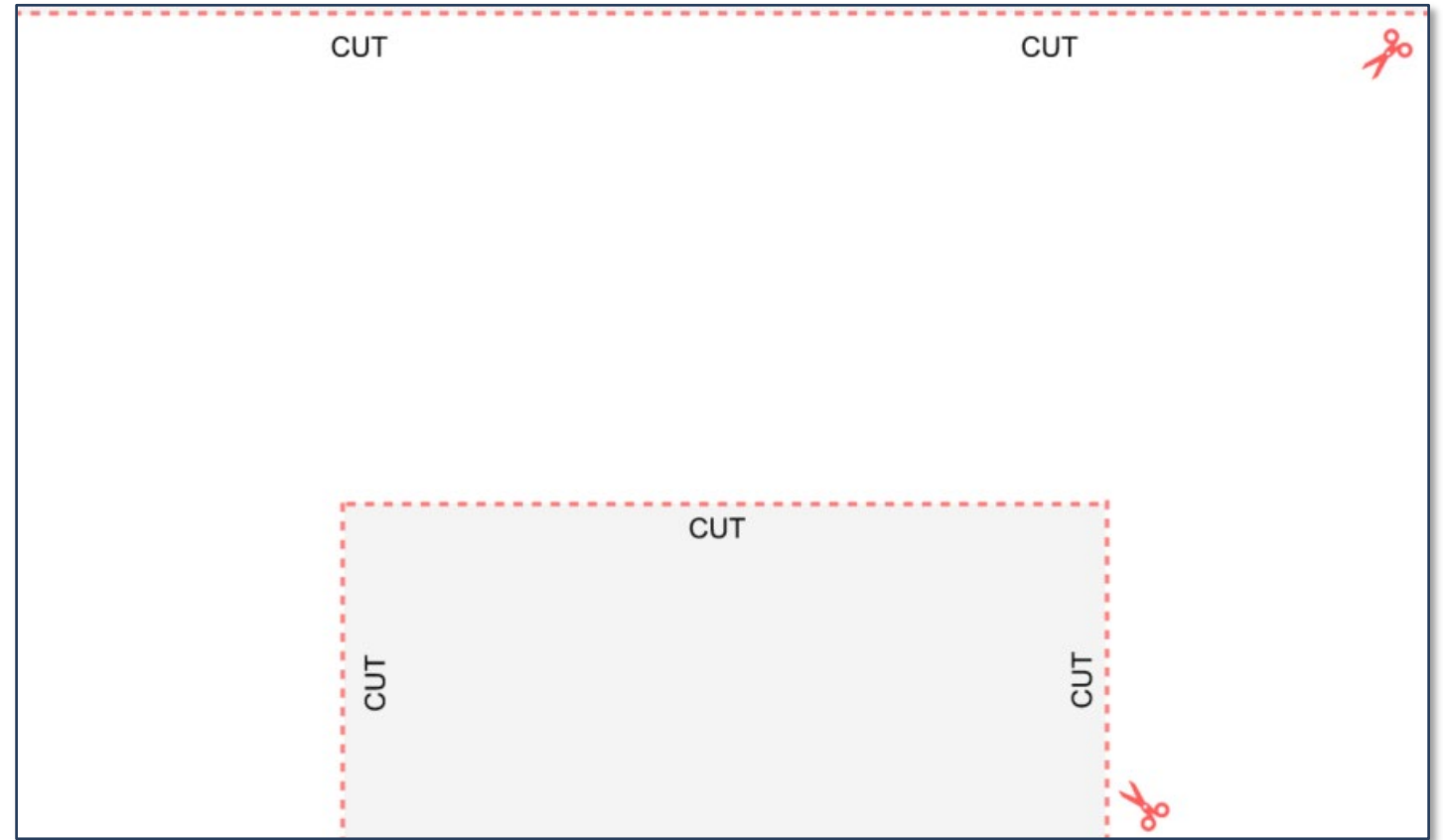
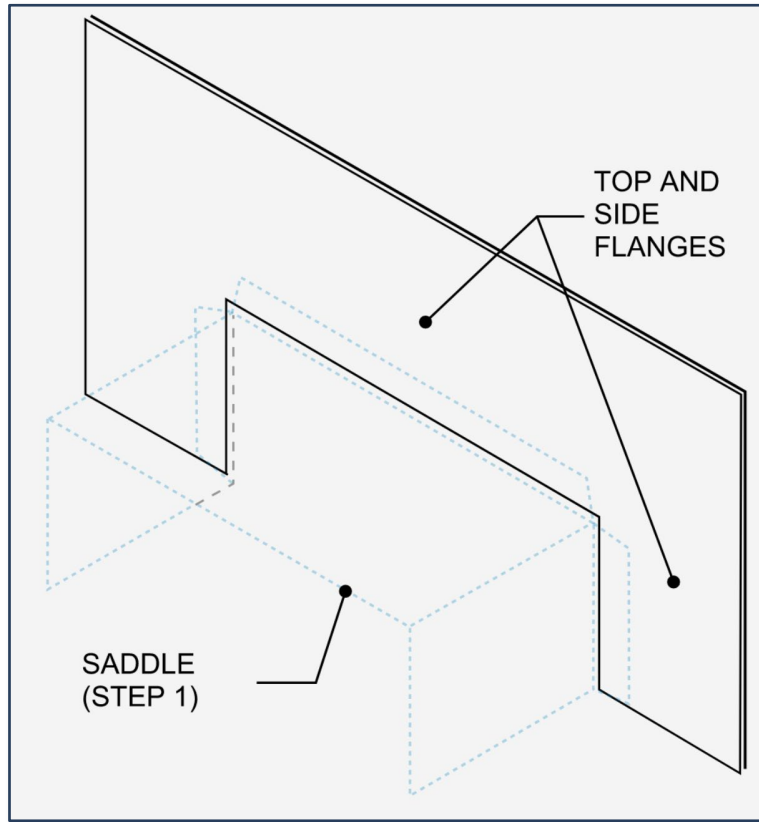
Saddle Exercise (Step 1)



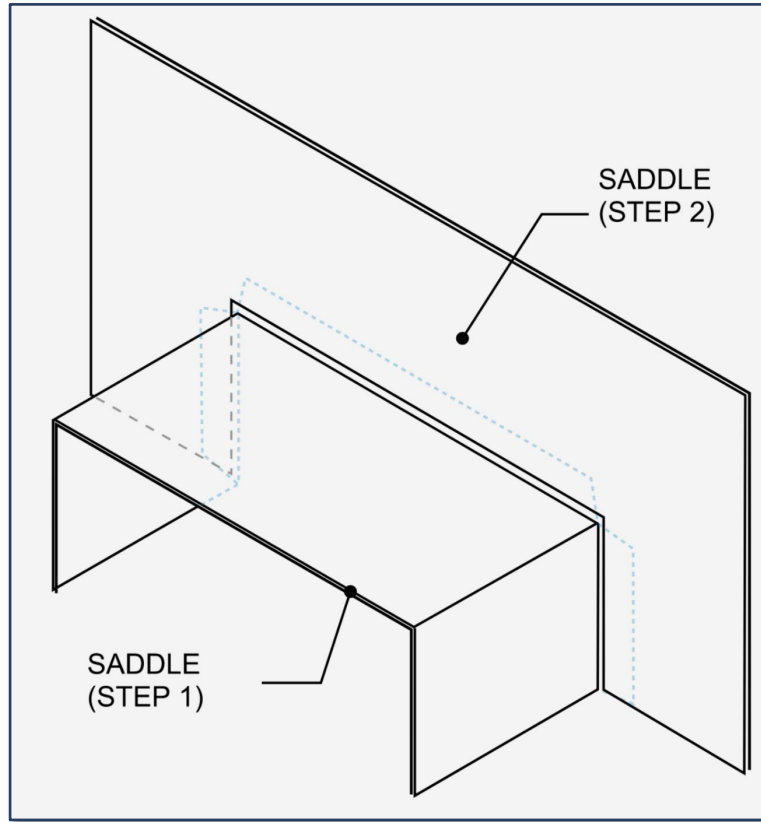
SADDLE



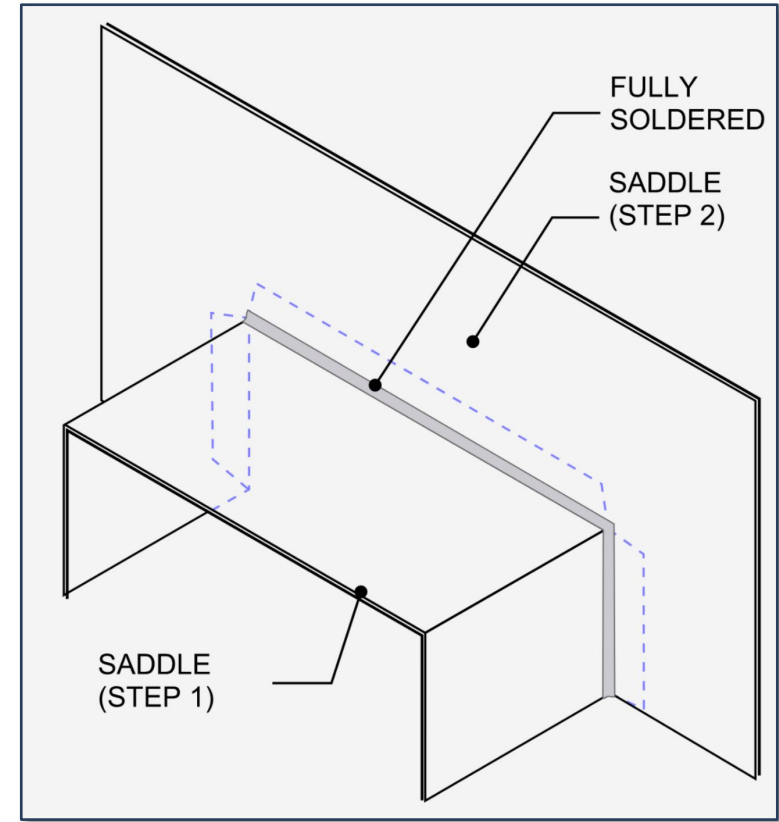
Saddle Exercise (Step 2)



Saddle Exercise (Step 3 and 4)



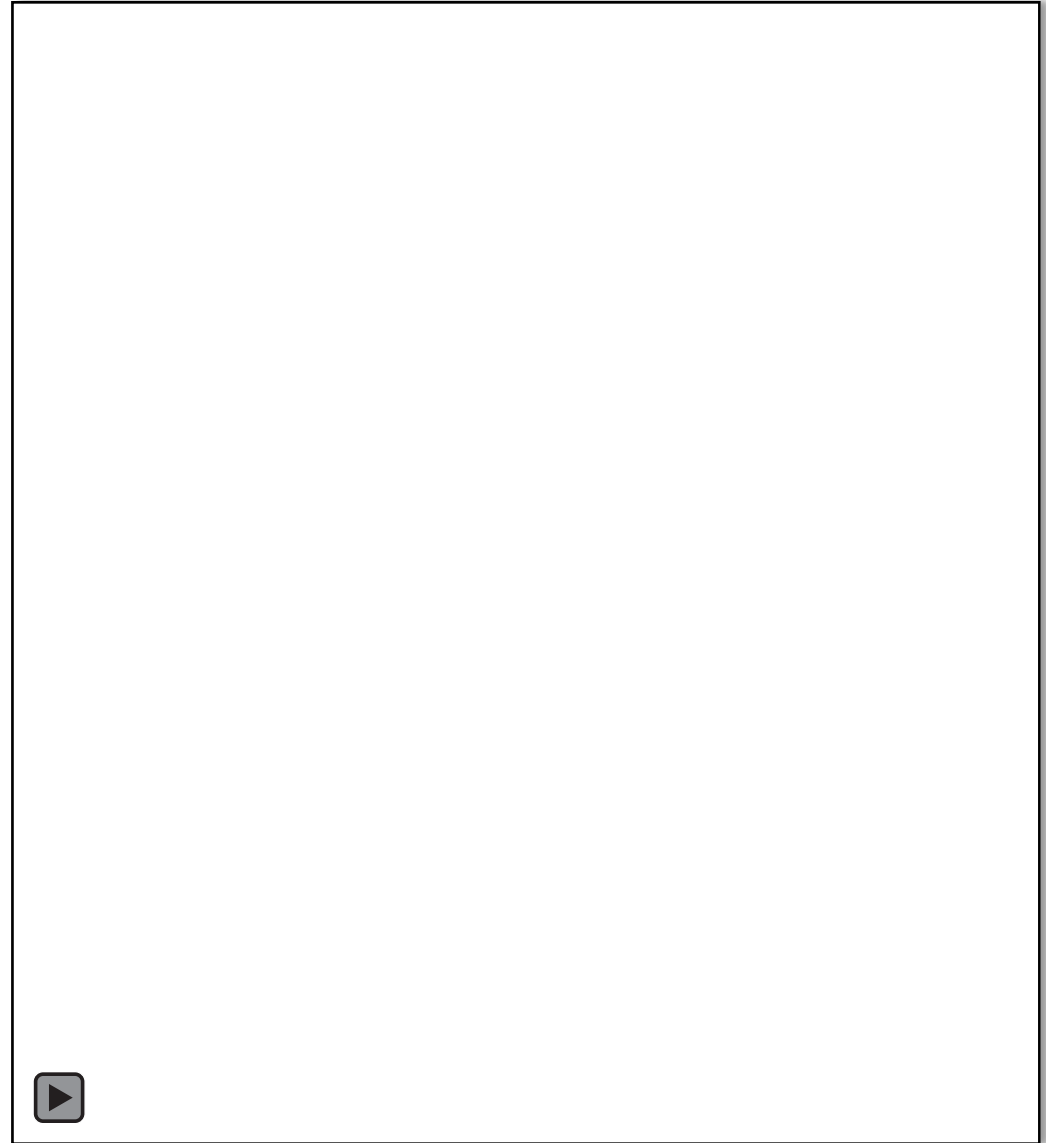
ASSEMBLY



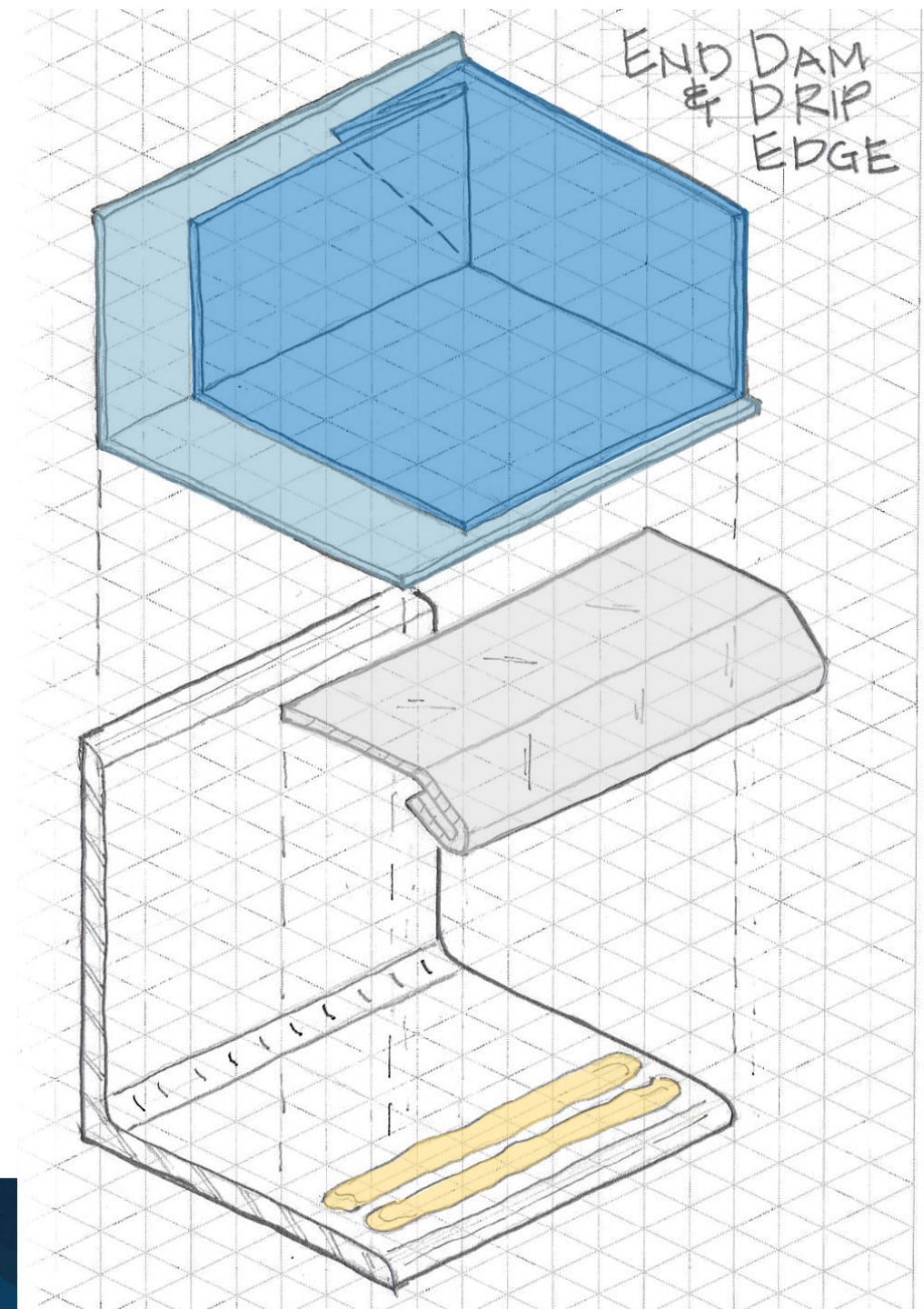
SOLDERING

Sketching

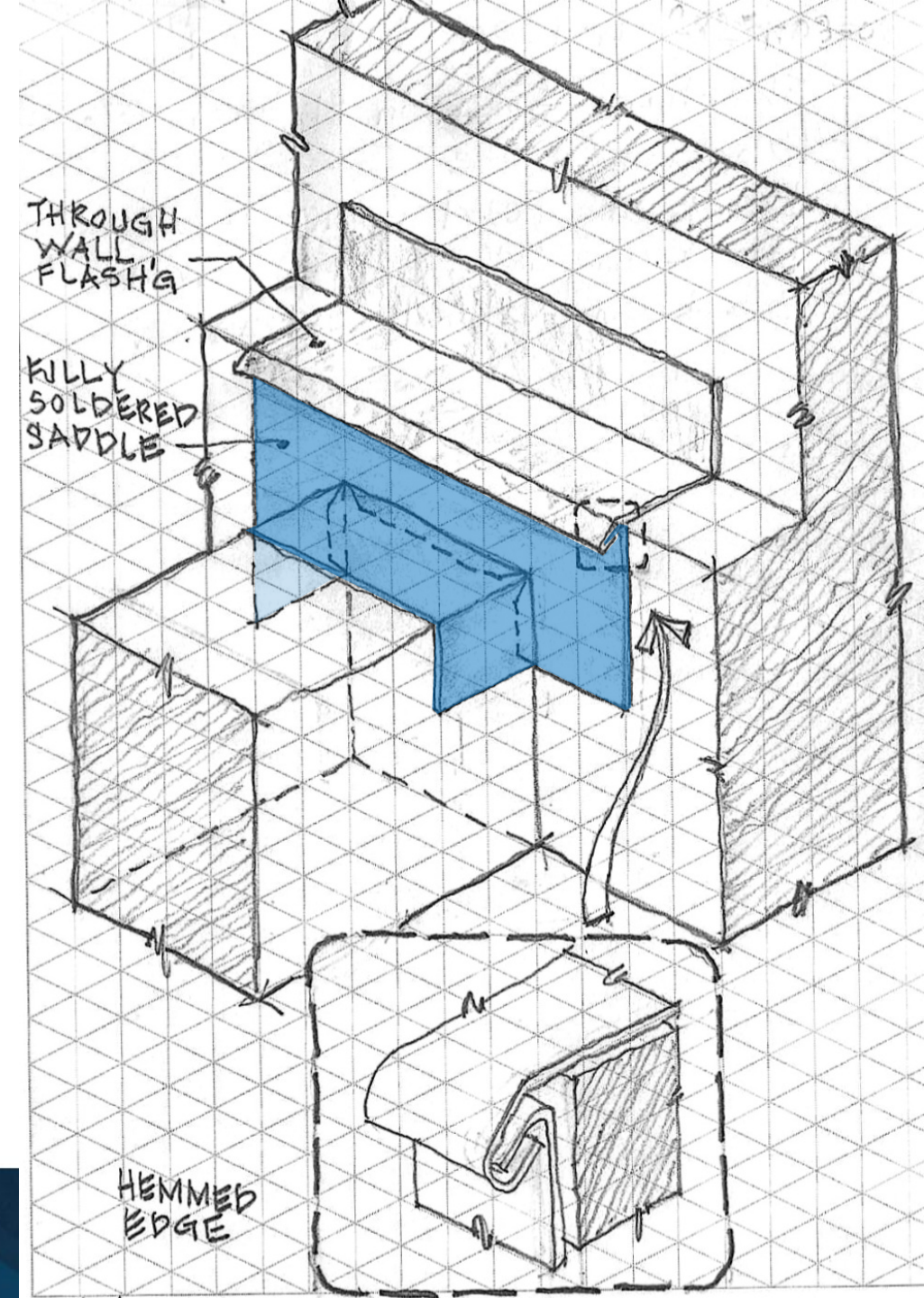
Isometric Tutorial



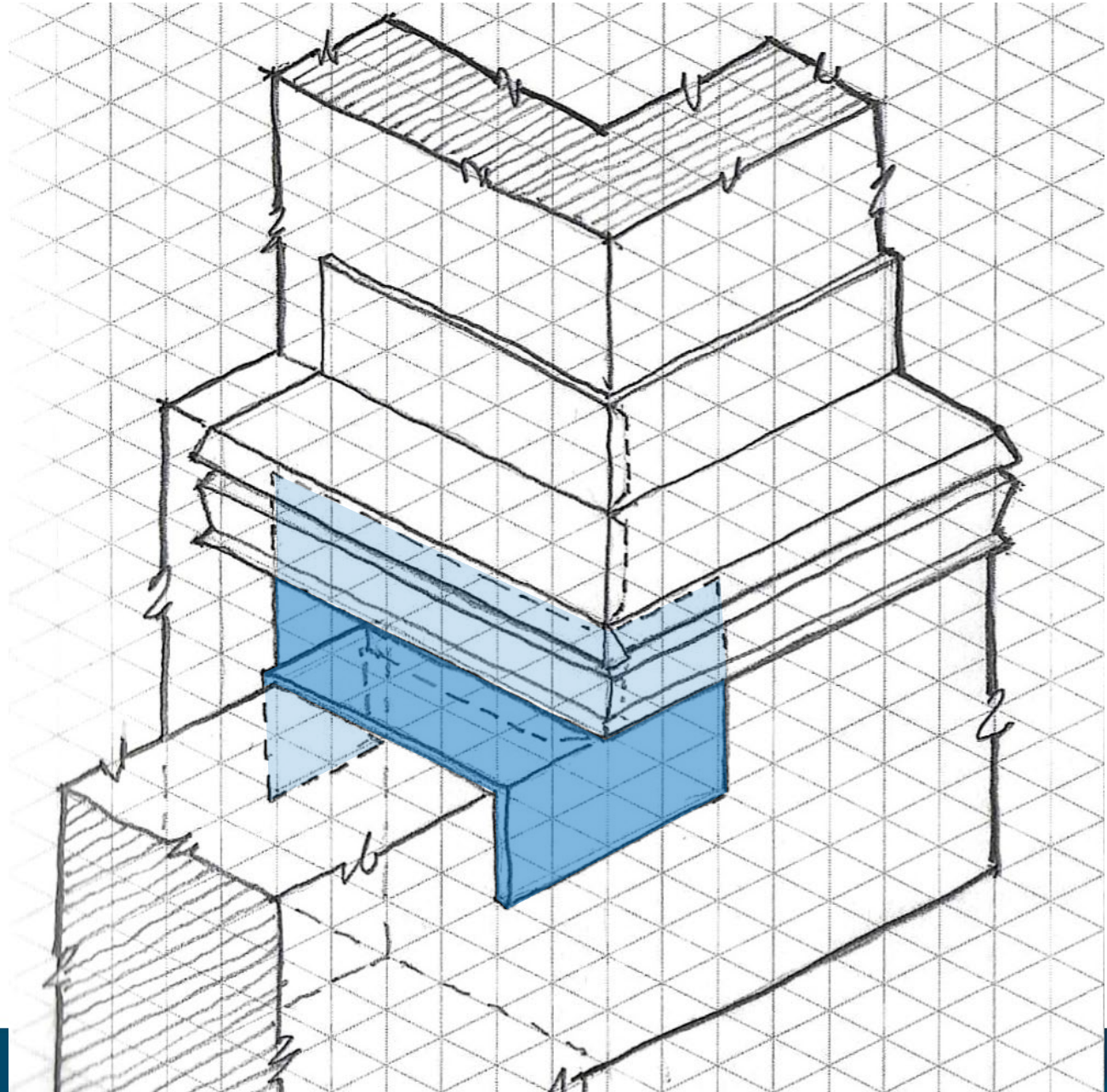
Through-Wall Flashing and End Dams



Saddle Flashing – Straight



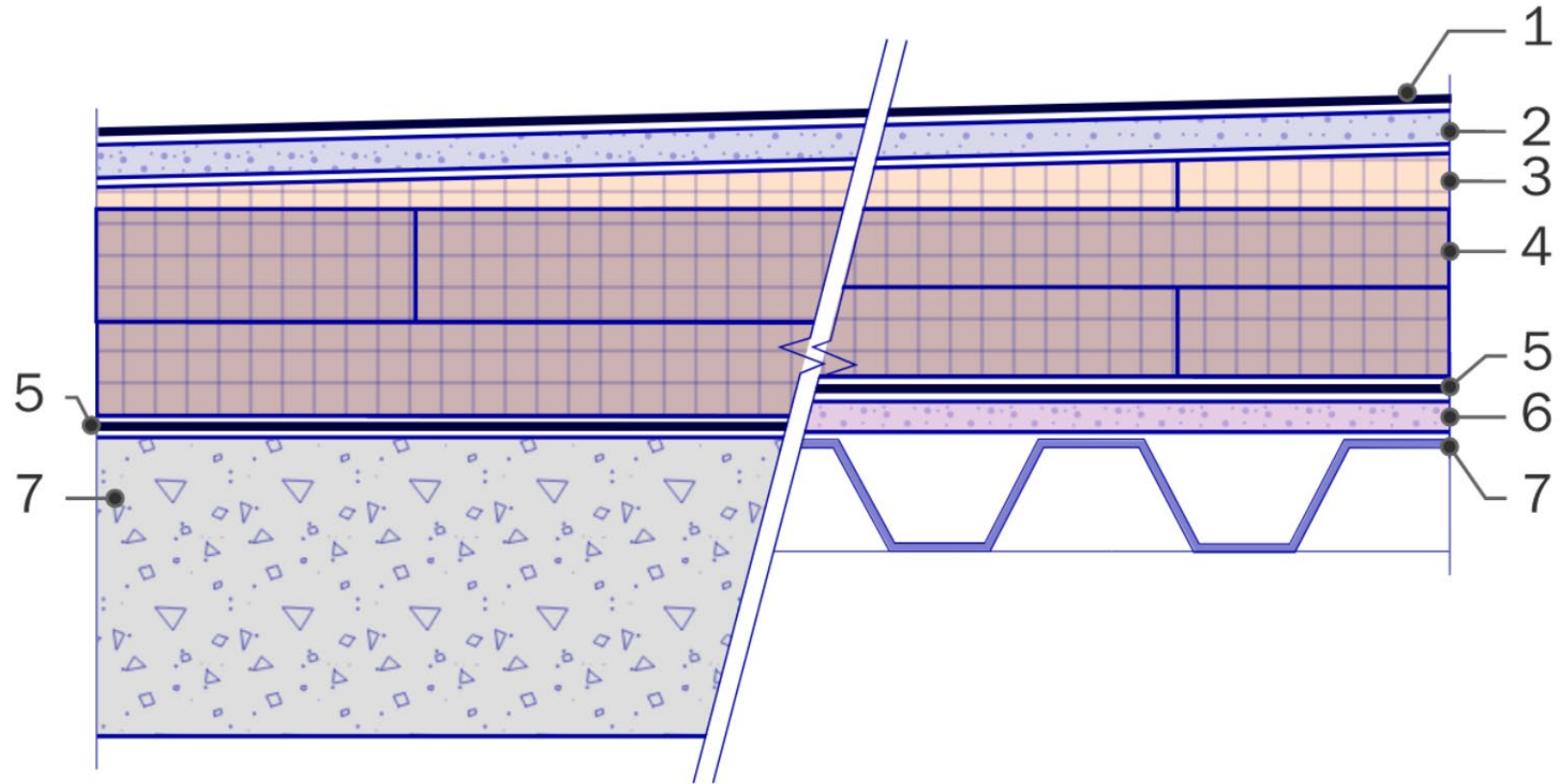
Saddle Flashing - Corner



2D Details

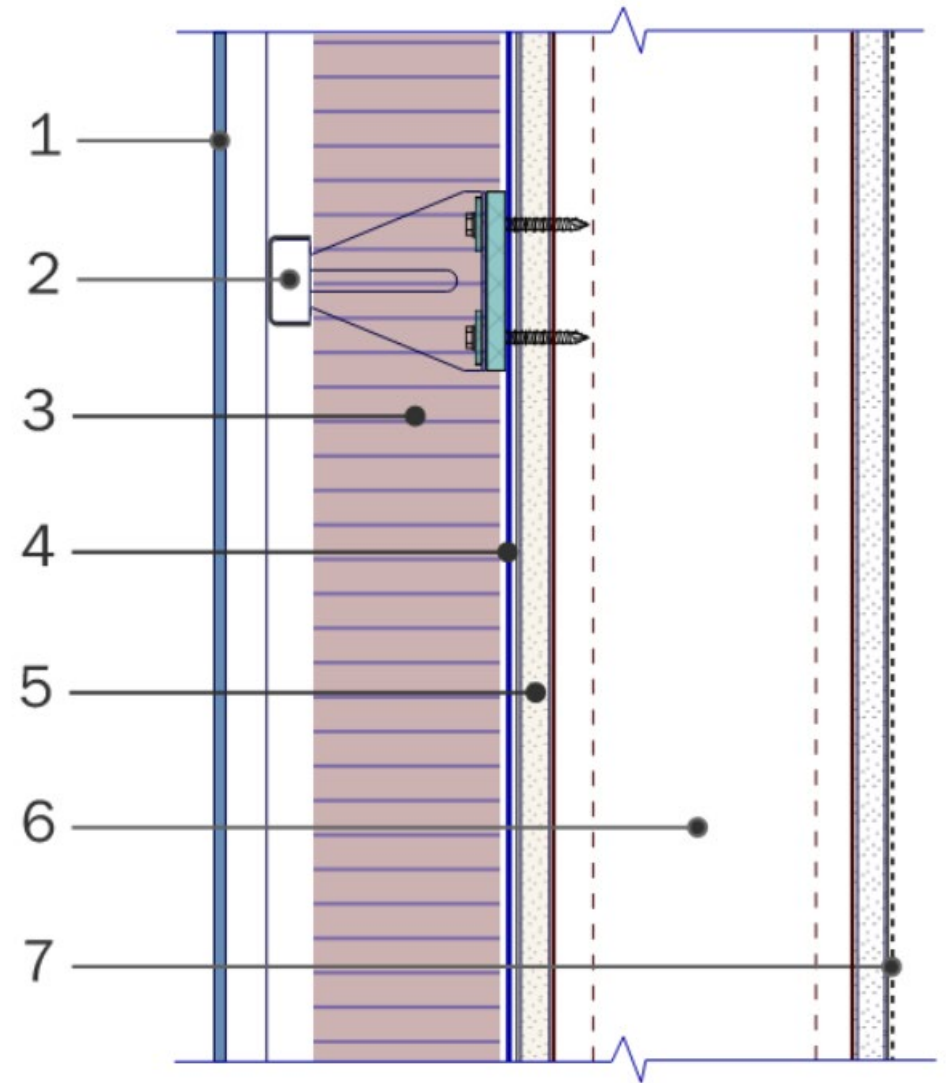
Roofing Assembly

- 1 ROOFING, SINGLE-PLY
- 2 COVER BOARD
- 3 TAPERED INSULATION
- 4 RIGID INSULATION, MIN. 2 STAGGERED LAYERS
- 5 AIR/VAPOR CONTROL LAYER
- 6 SUBSTRATE BOARD
- 7 STRUCTURAL DECK



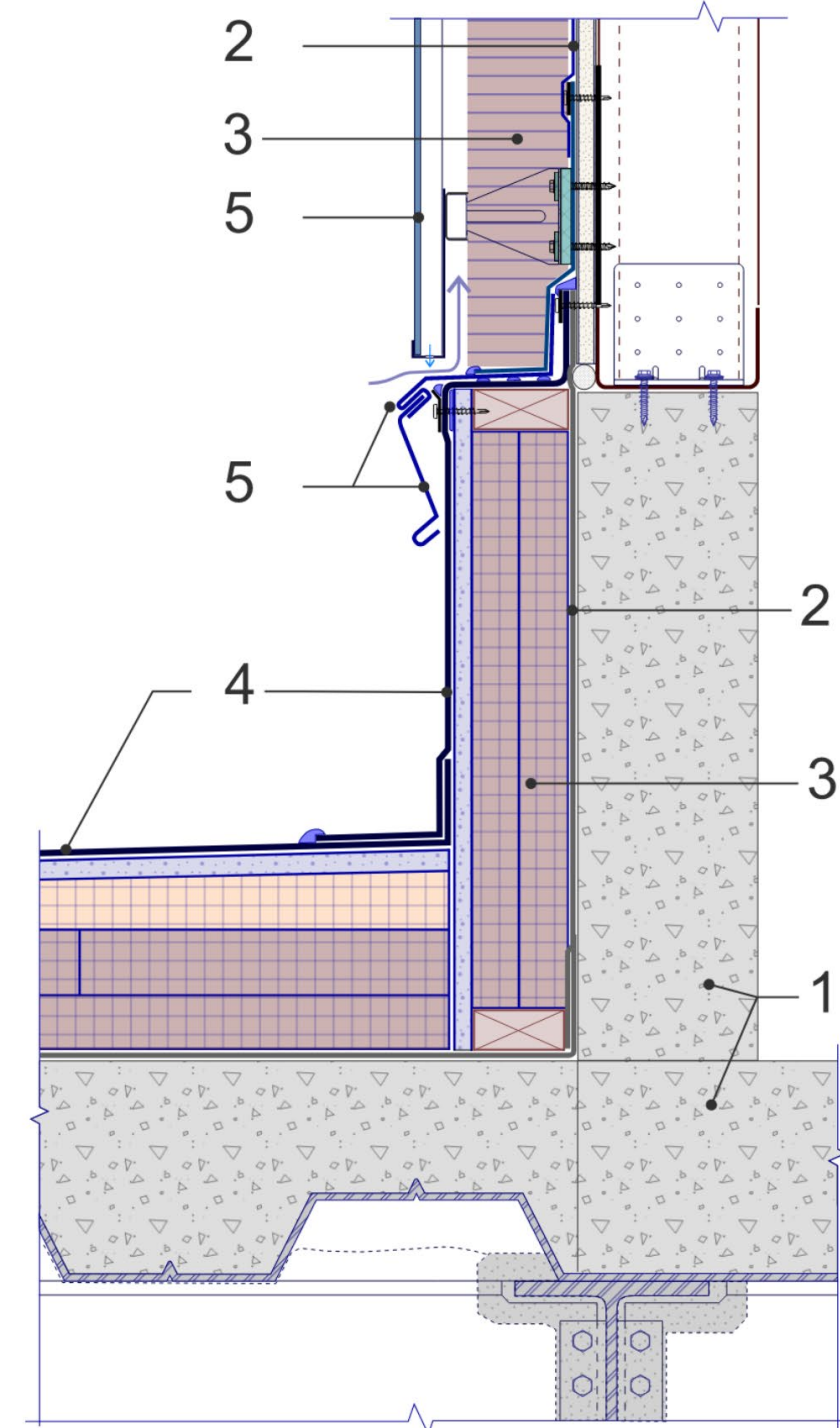
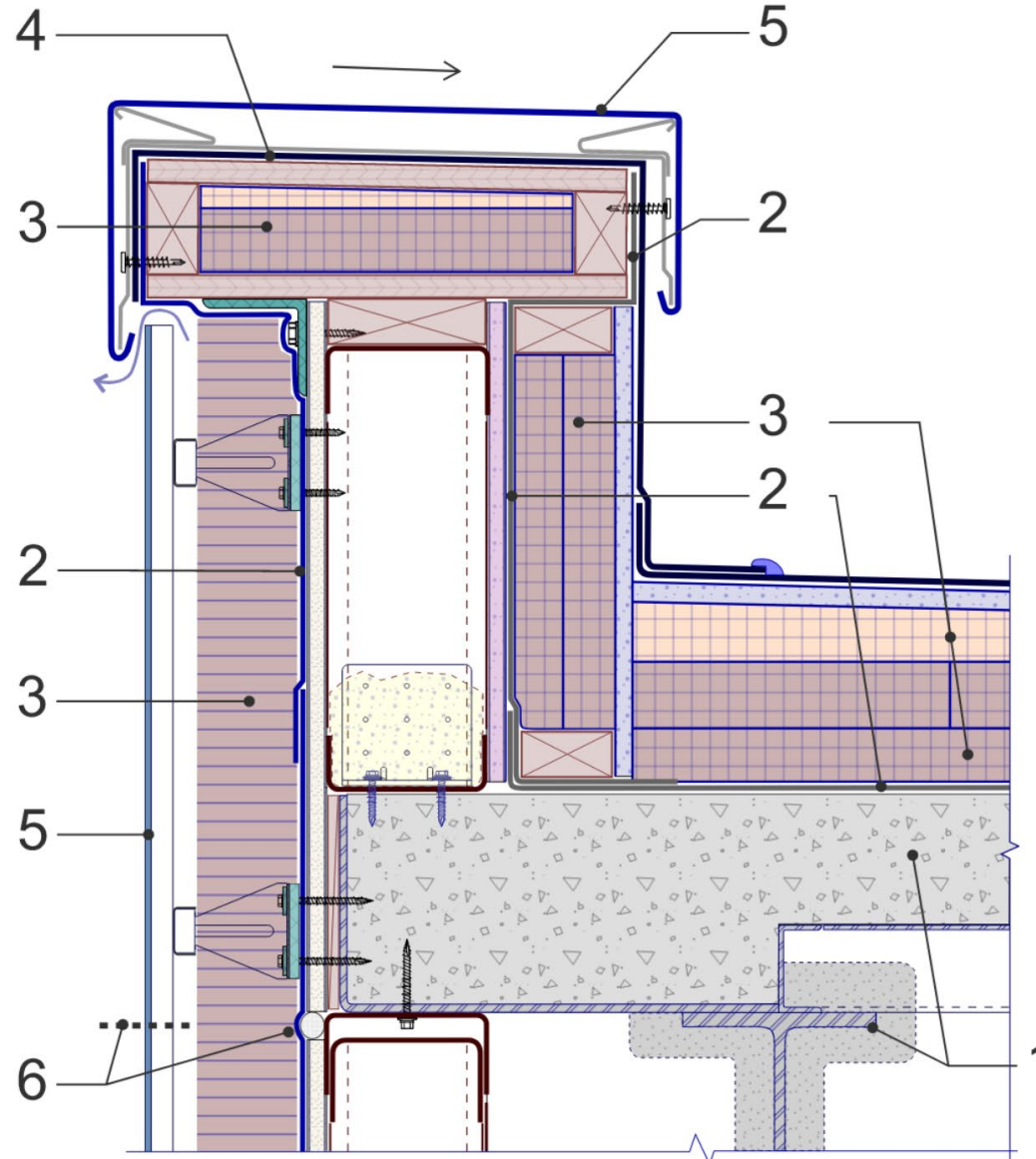
Exterior Wall Assembly

- 1 RAINSCREEN CLADDING (PREFORMED METAL)
- 2 WALL BRACKET SYS. W/ THERMAL ISOLATED INTERMITTENT CLIPS
- 3 MINERAL WOOL INSULATION
- 4 AIR/VAPOR CONTROL LAYER
- 5 EXTERIOR SHEATHING
- 6 COLD FORMED METAL FRAMING
- 7 PERMEABLE FINISH ON INTERIOR GYPSUM WALLBOARD

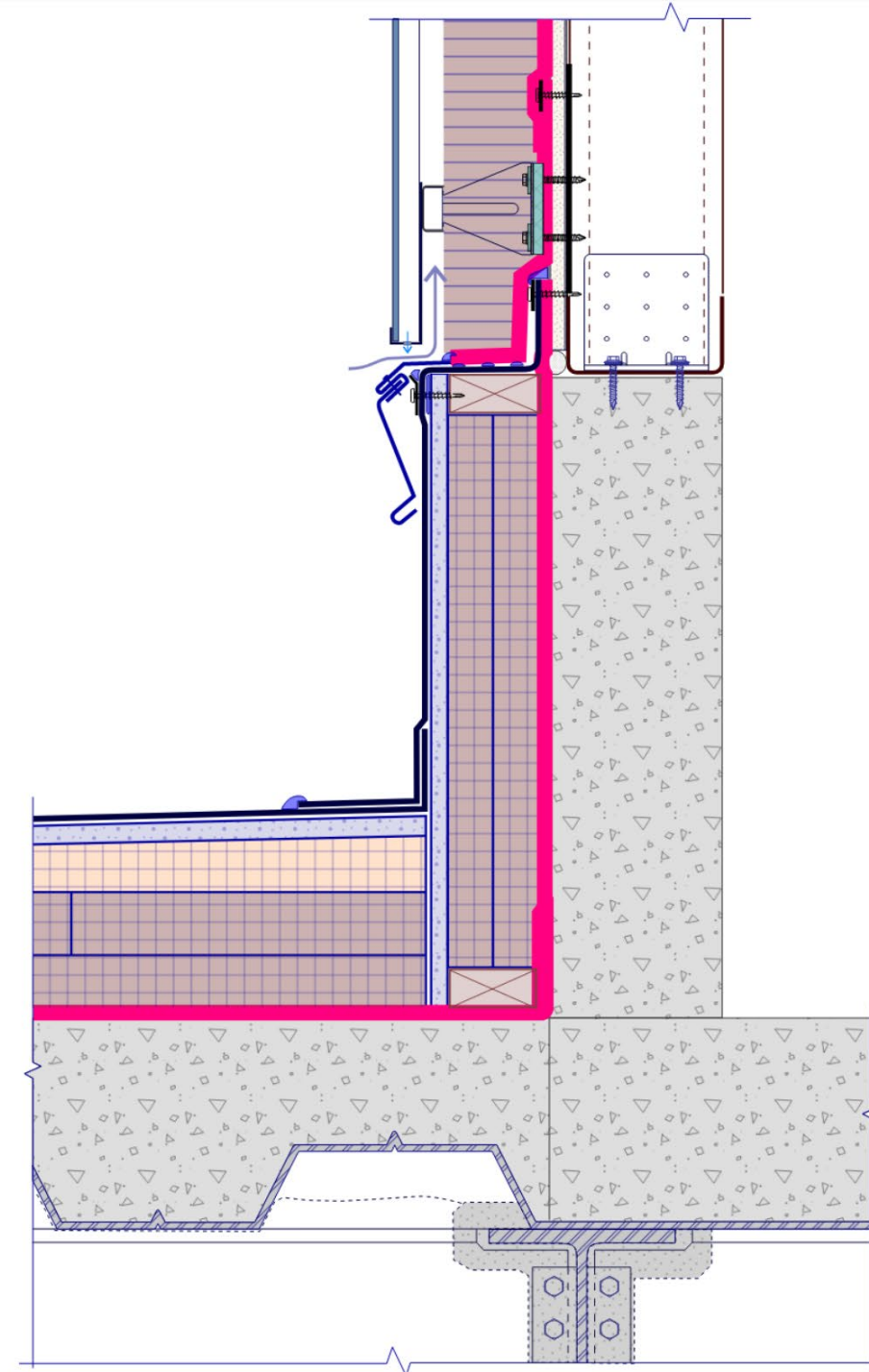
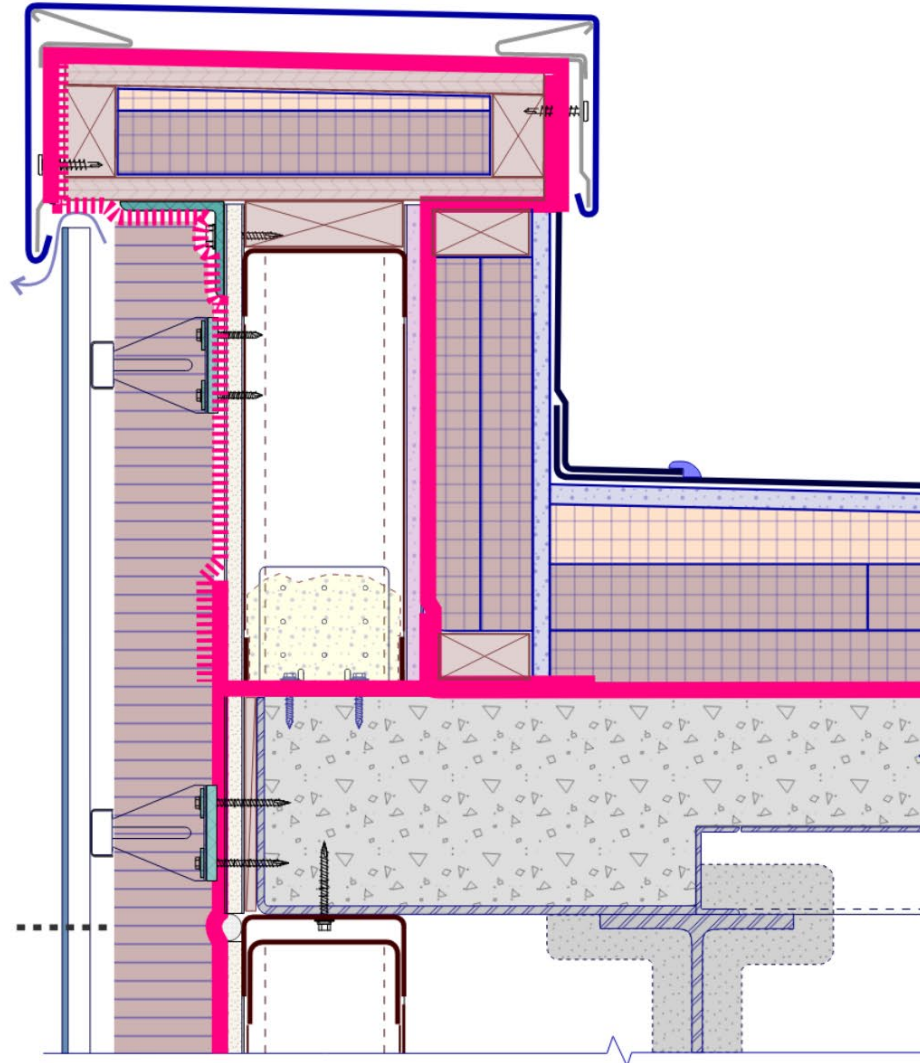


Composite Drawing

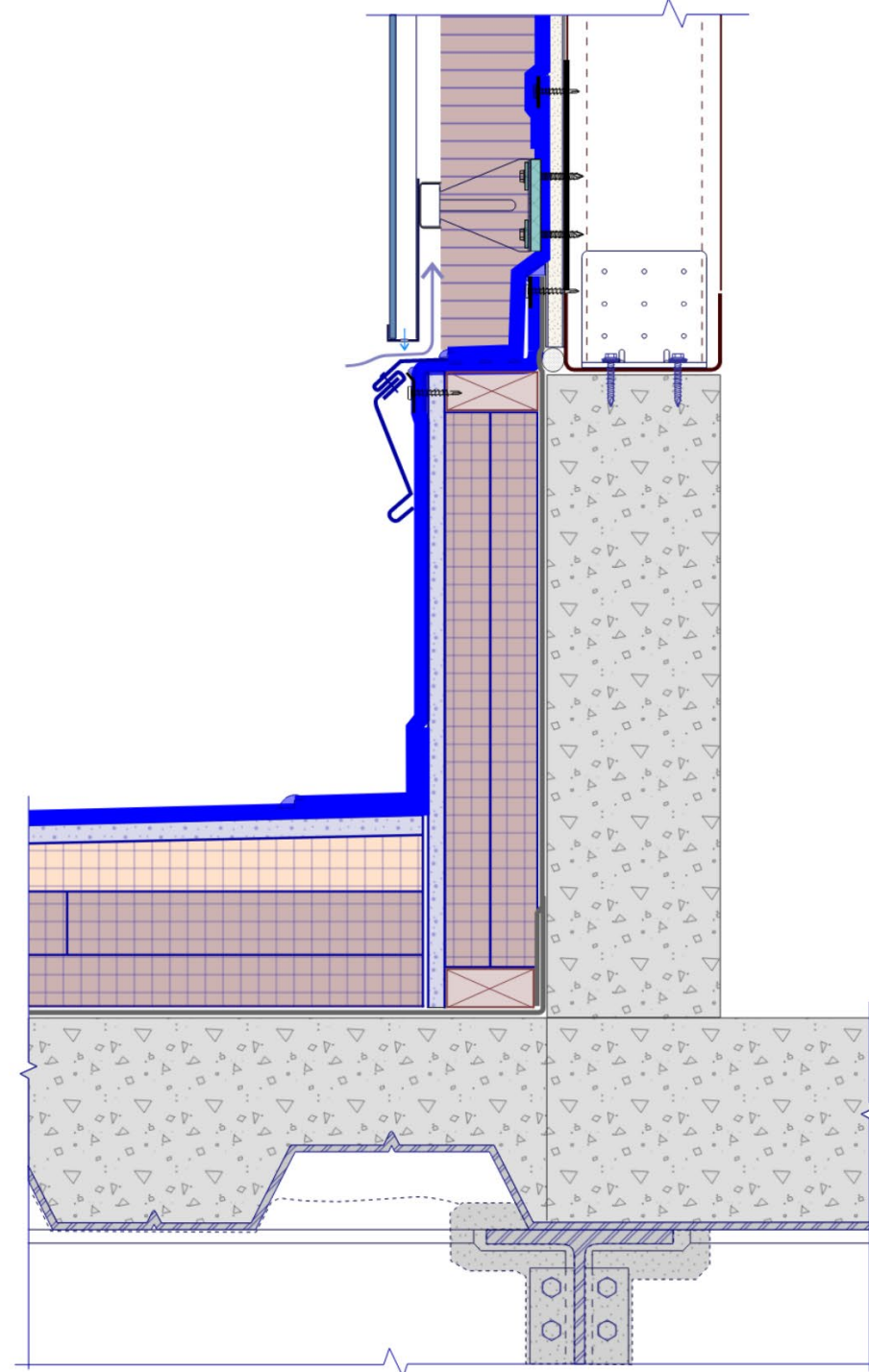
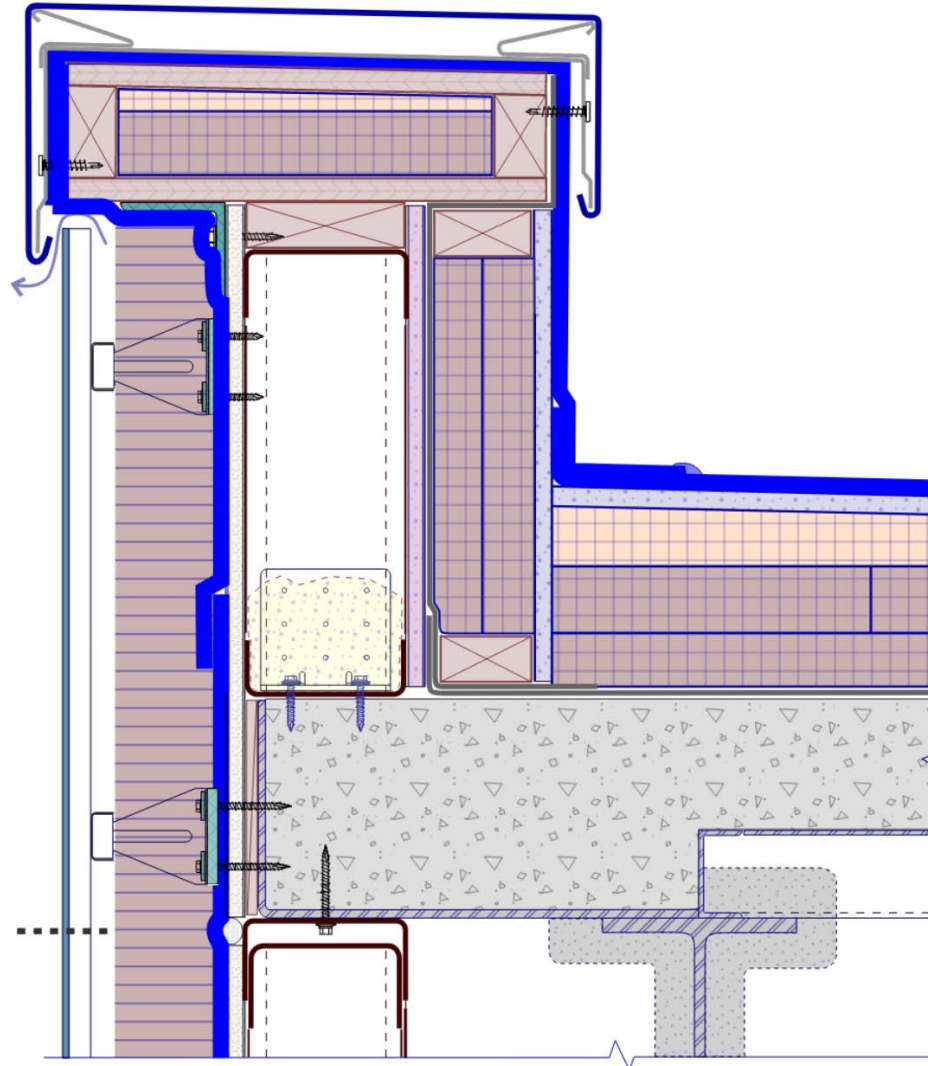
1. STRUCTURE
2. AIR/VAPOR CONTROL
3. THERMAL CONTROL
4. ROOFING MEMBRANE
5. CLADDING, COPING, FLASHING
6. MOVEMENT FUNCTION



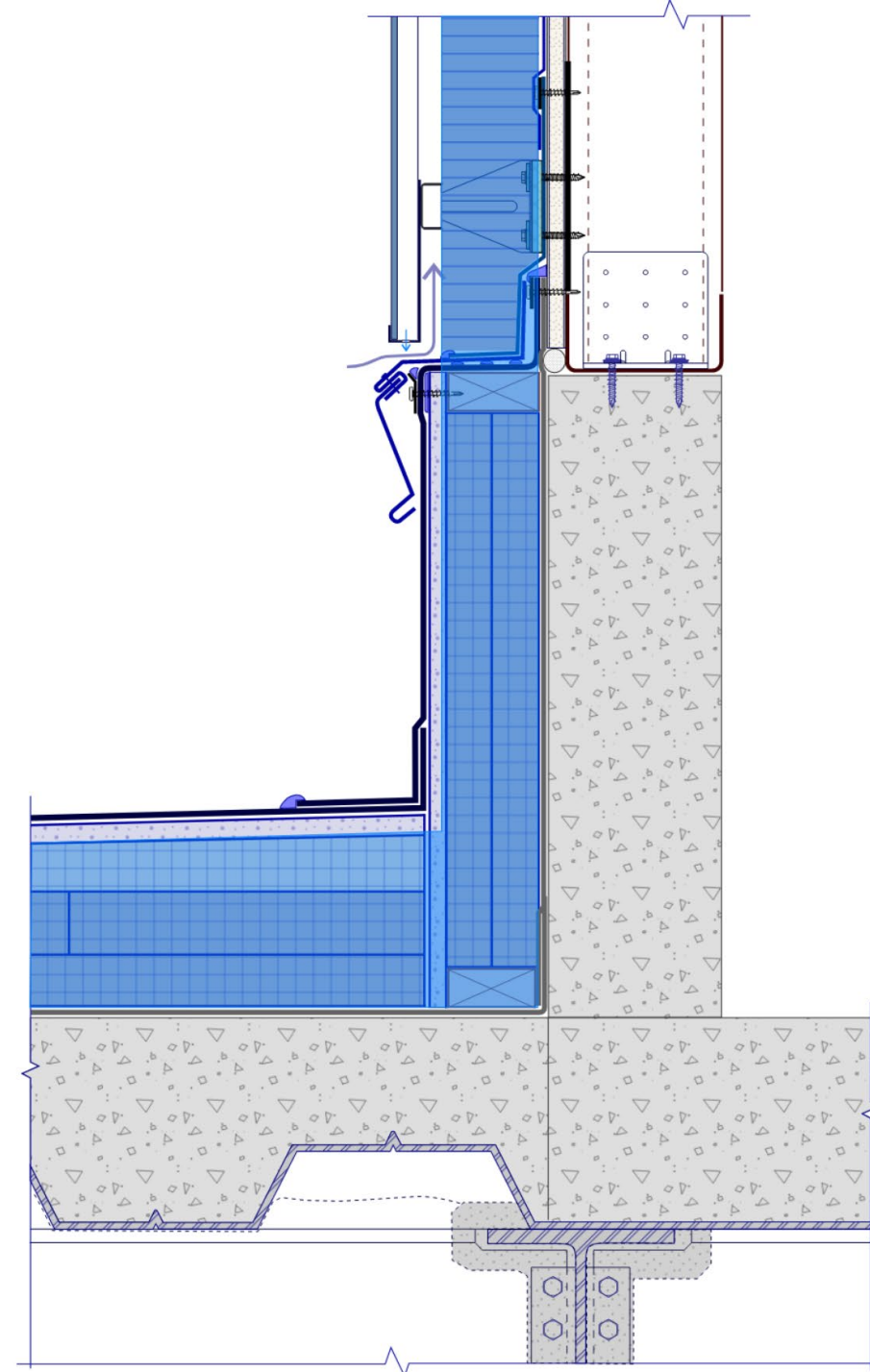
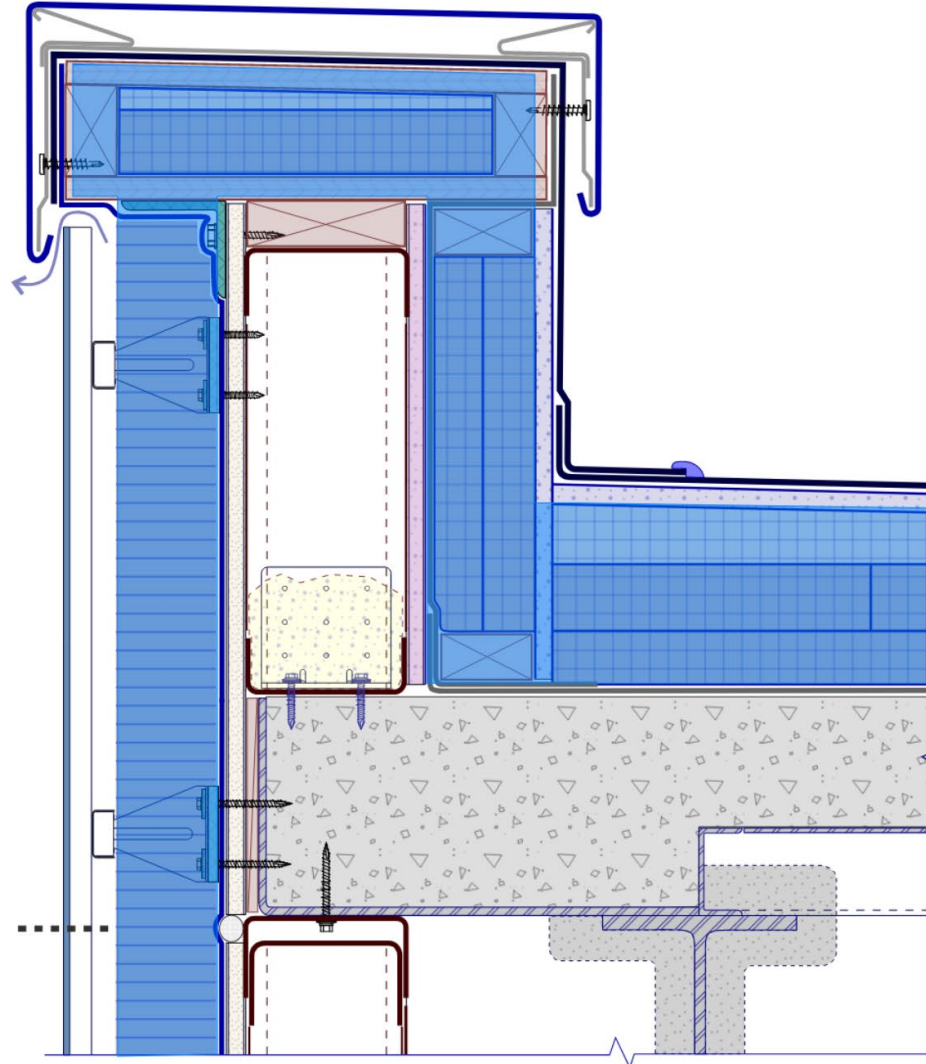
Air/Vapor Control Layer



Moisture Control Layer

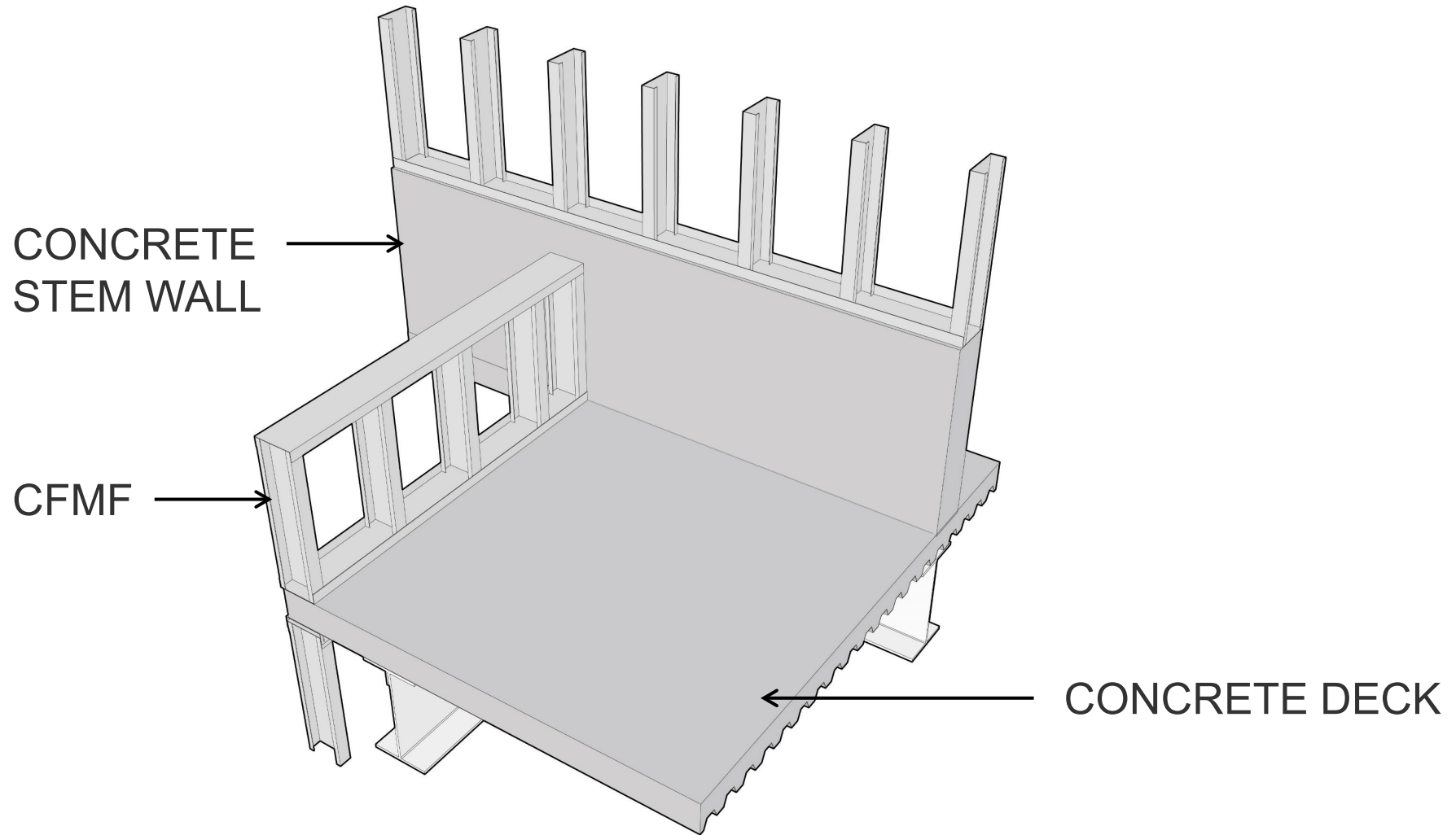


Thermal Control Layer

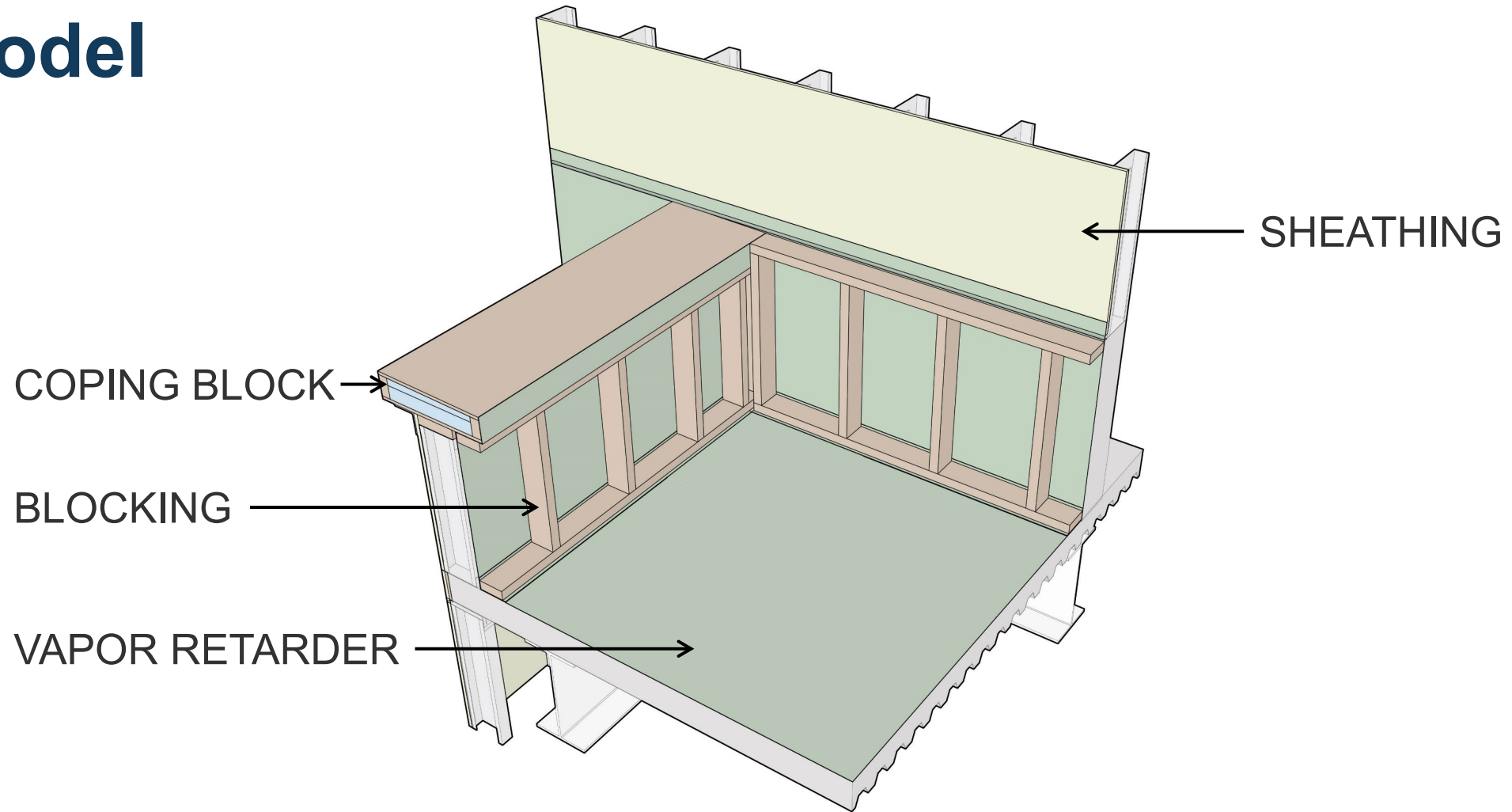


3D Modeling

Model

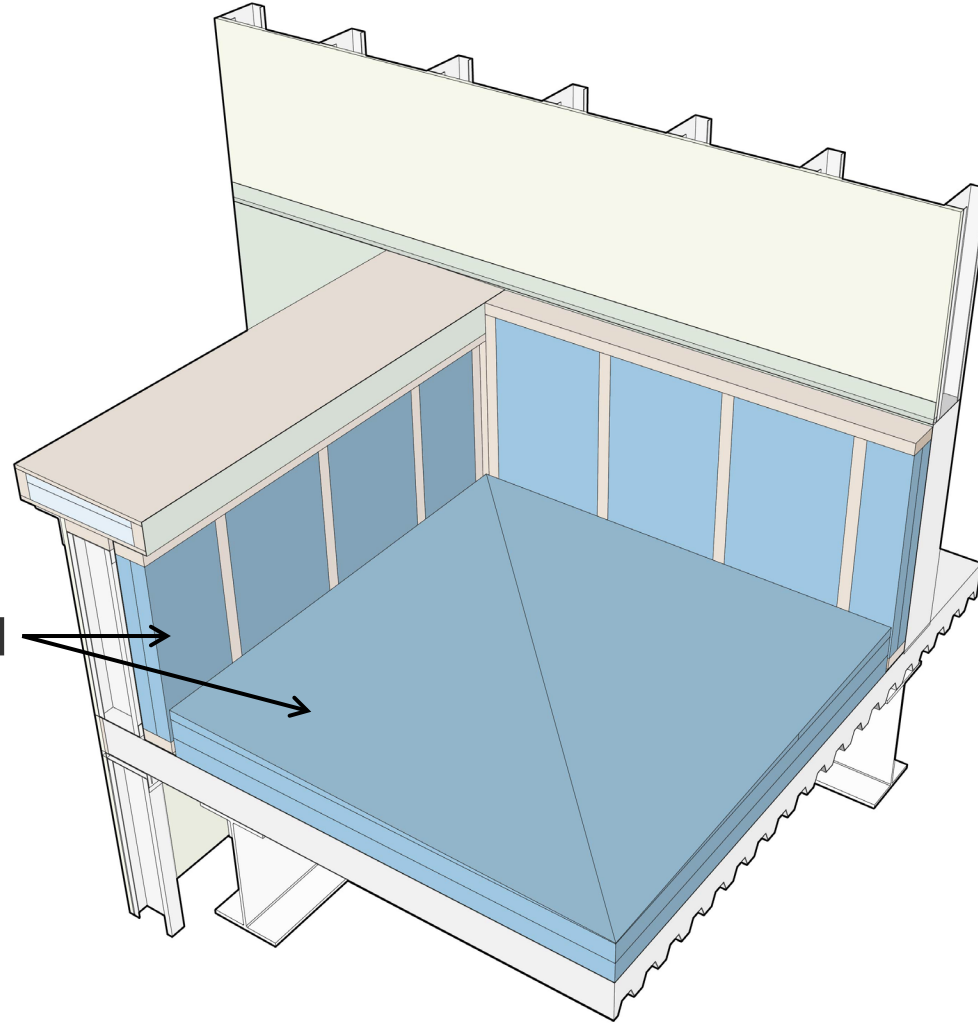


Model



Model

ROOF INSULATION



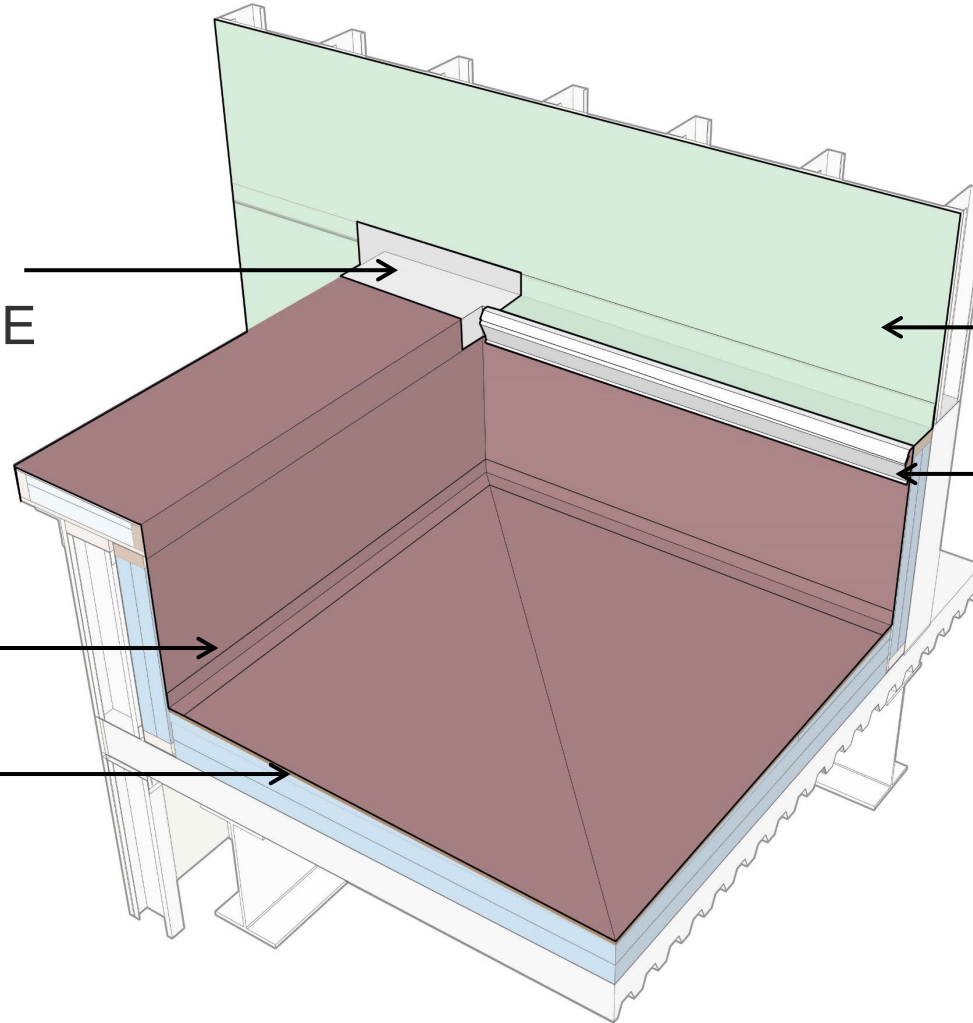
Model

FULLY SOLDERED
OR SEALED SADDLE
FLASHING

AIR/VAPOR
CONTROL LAYER
COUNTER FLASHING

ROOF MEMBRANE

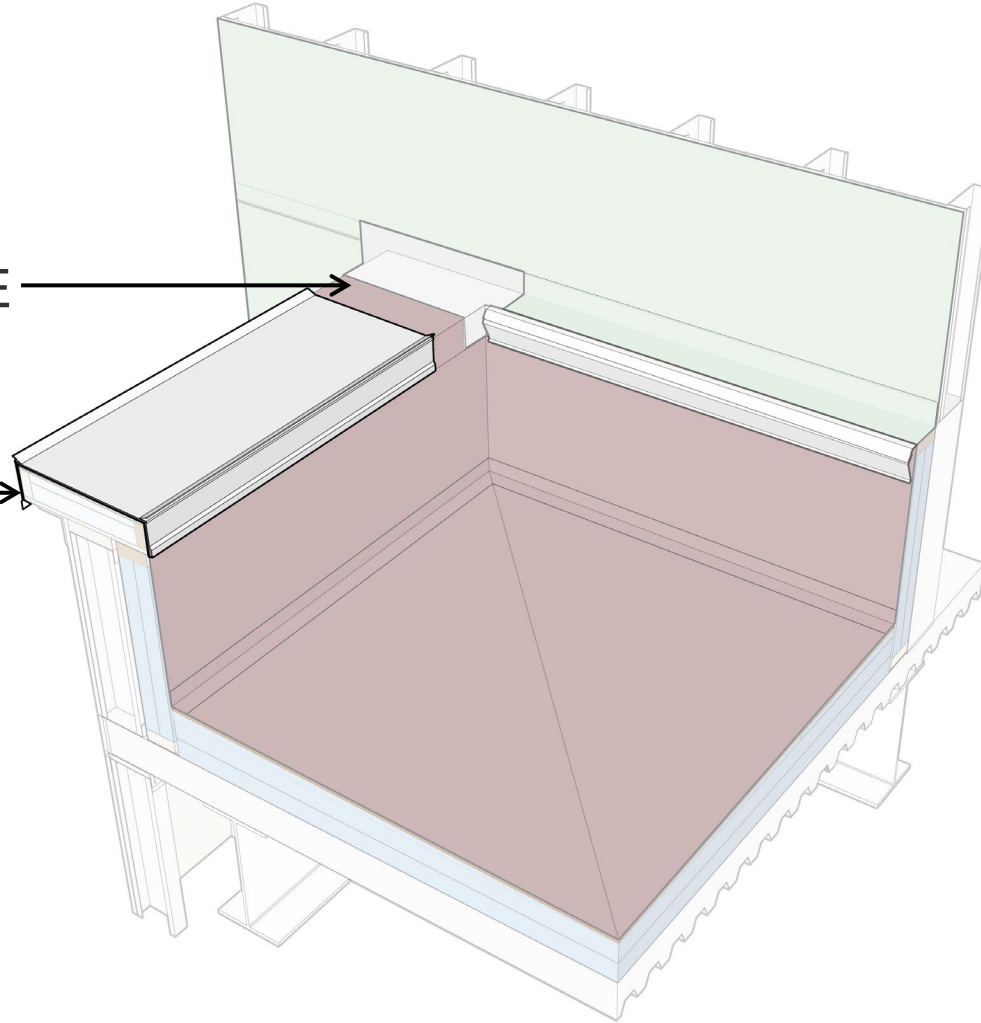
COVERBOARD



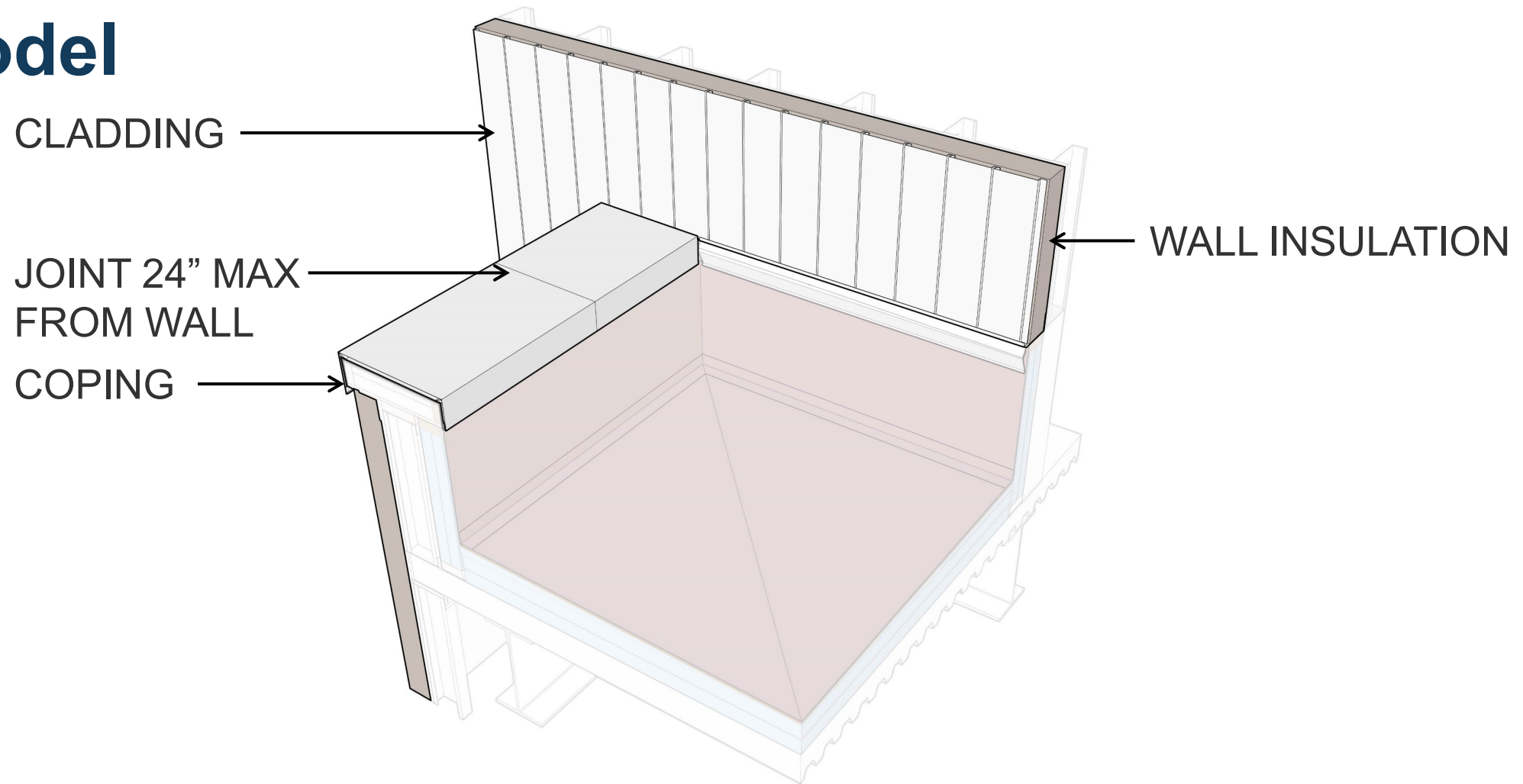
Model

STOP CLEAT 6"
SHORT OF SADDLE

COPING CLEAT



Model

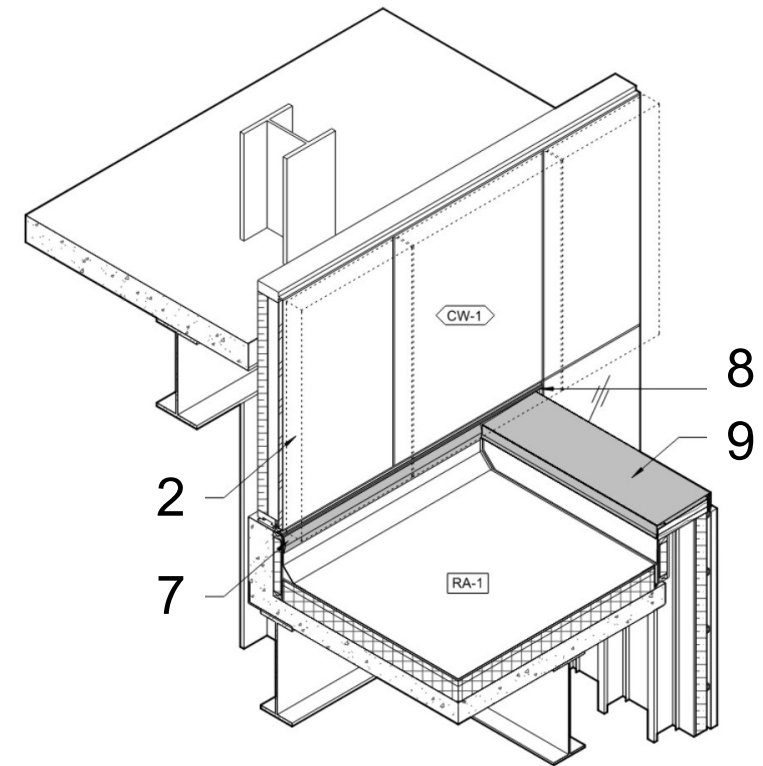
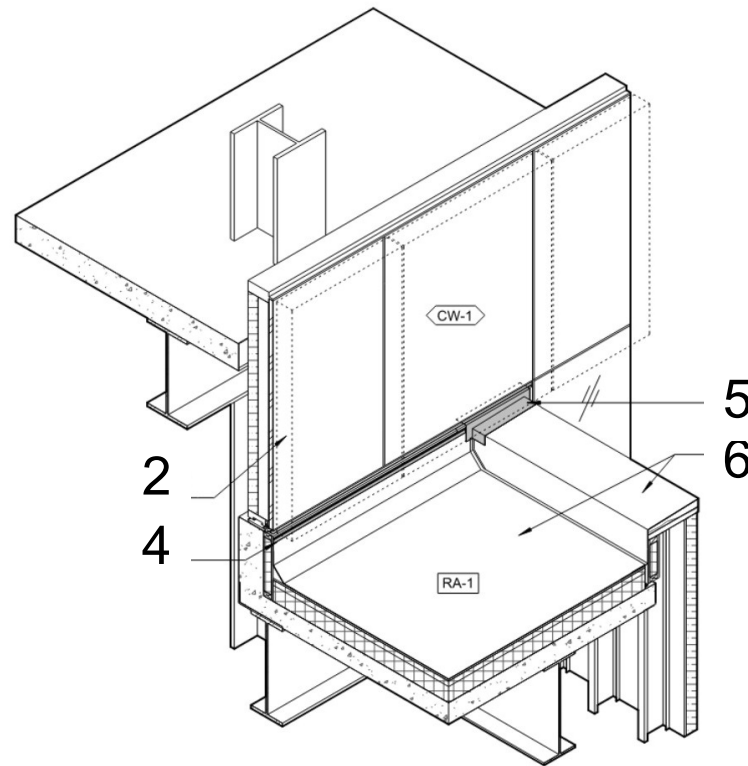
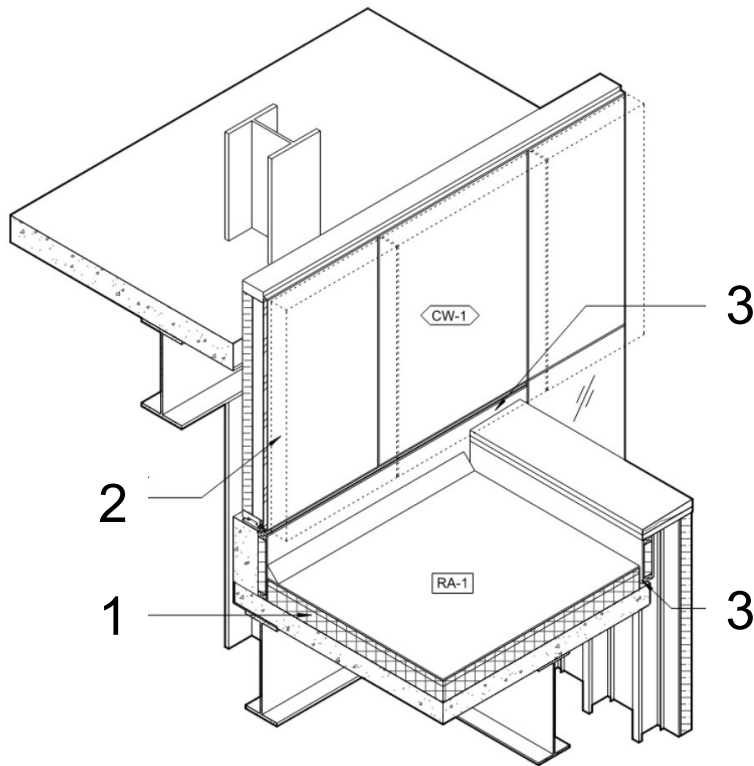


Contract Documents

Drawings

1. Roof Insulation
2. GFRP Panels (not shown)
3. Movement Joint
4. Termination Bar
5. Saddle Flashing

6. Roofing Membrane
7. Two-Piece Counterflashing
8. Drip Flashing
9. Coping



Specifications

Part 1 - General

- Shop drawings
- Mock-ups

Part 2 - Products

- Materials
- Gauge/thickness
- Finish
- Fastener type/spacing



Specifications



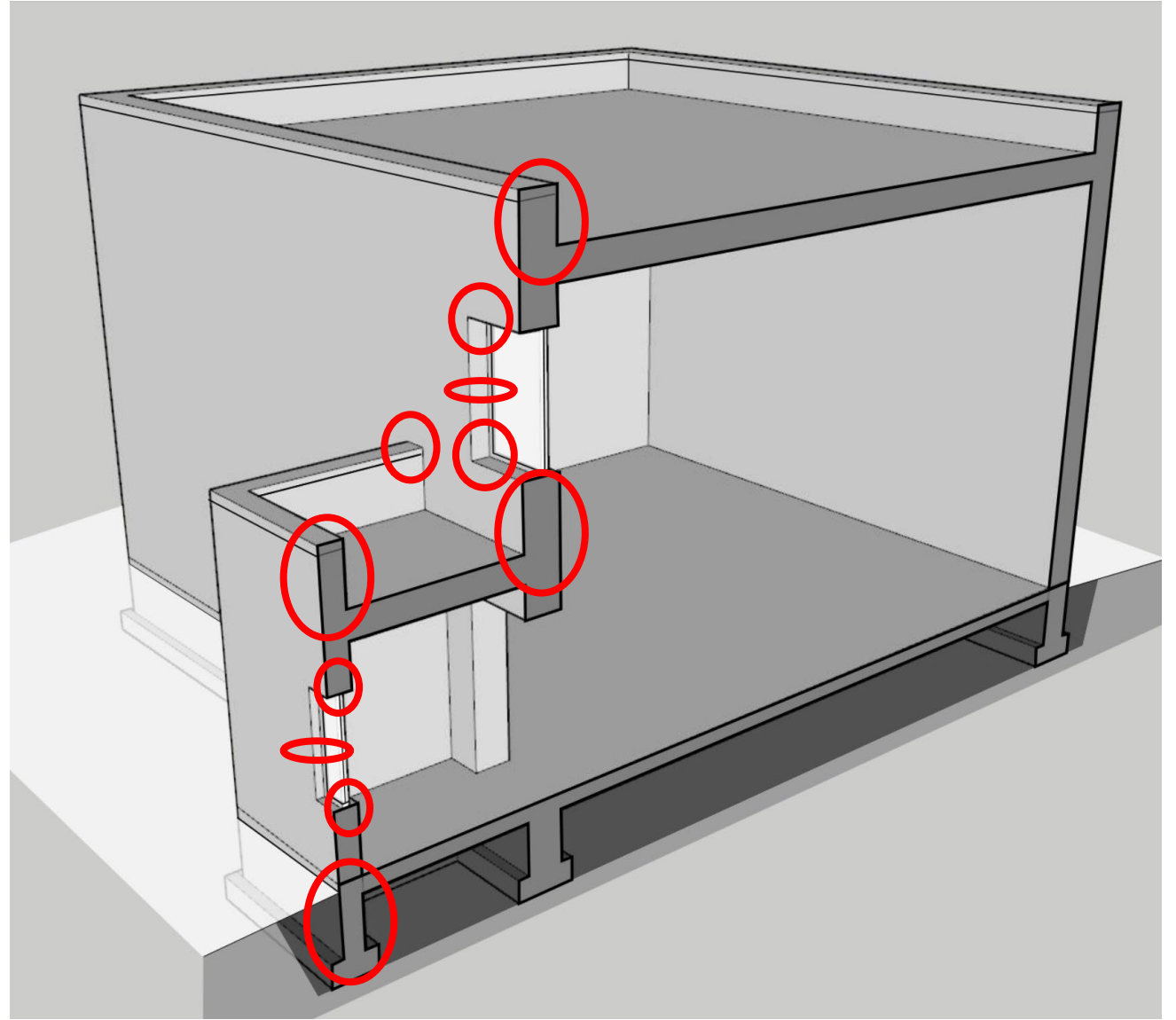
Part 3 - Execution

- Pre-fabricated saddles with fully soldered or fully sealed seams
- Upturned back legs that integrate with the side flanges
- Installation of Roof Flashings
 - Integration of the coping, saddle flashing, air barrier, through-wall flashing, and counter flashings
- Trade Coordination
 - Air barrier, flashing, transition membranes, roofing, sheet metal components, tapes, and seals
 - Mock-ups and construction
- Performance Testing
 - Water infiltration testing methods, test durations, # of tests, and pass/fail criteria

Construction

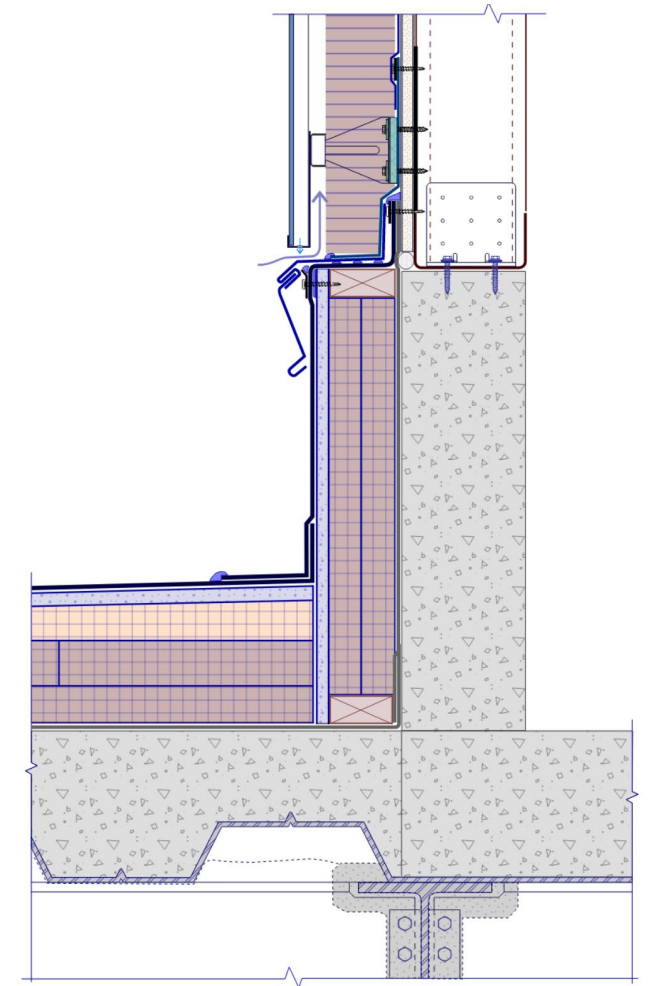
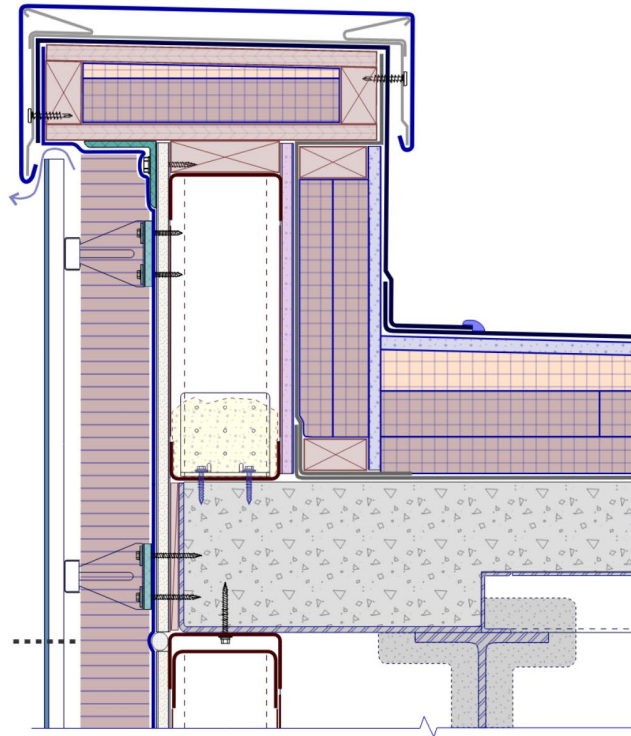
Critical Interfaces

Identify conditions



Sequencing

- Air Barrier
- Cladding
- Flashing
- Framing
- Glaziers
- Insulation
- Roofing
- Sealant
- Sheet Metal Workers
- Specialty
- Waterproofing



Pre-Construction Meetings



Trade Coordination



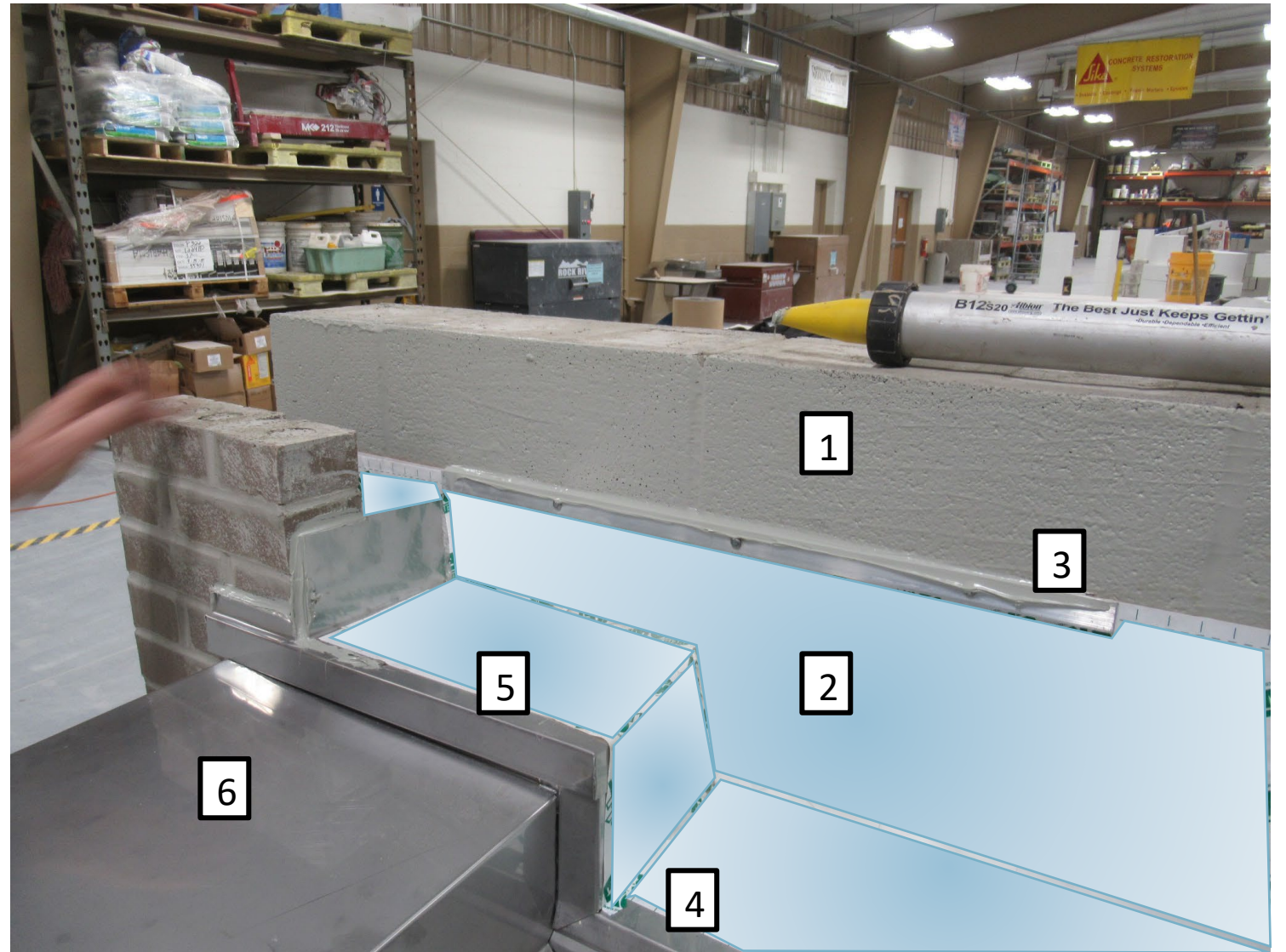
Mock-ups

1. Masonry Training Facility
2. Three Saddle Flashing Mock-ups
3. Brick Masonry and CMU
4. Single-ply Roofing
5. Participants
 - a) International Masonry Institute
 - b) Bricklayers and Allied Craftworkers
 - c) Roofing Contractor
 - d) Manufacturer



Mock-ups

1. Air/Vapor Barrier
2. Self-Adhering Flashing
3. Sealed Termination Bar
4. Sheet Metal Receiver with Sealed End Dam
5. Stepped Sheet Metal Through-Wall Flashing with Sealed End Dam
6. Sheet Metal Coping



It Takes a Village

1. Awareness
2. Industry Standards
3. Detail Development
4. Contract Documents
5. Organizations & Manufacturers
6. Project Team
7. Mock-ups
8. Sequencing & Constructability
9. Performance Testing
10. Pre-construction Meetings



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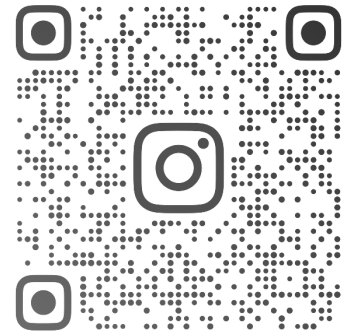
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