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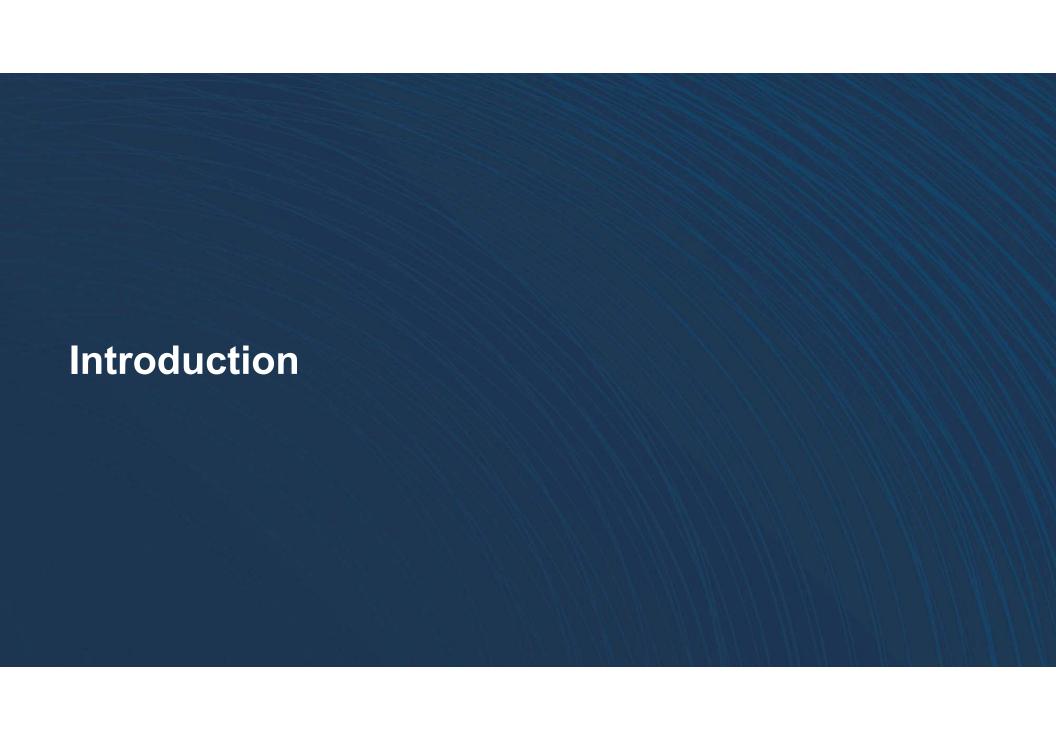
Saddle Up! Integrating Control Layers at Parapet to Rise Wall Conditions





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.
- 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.







Saddle Condition

Interface Condition

- Parapet Termination
- Adjacent Facade





Complexity

Enclosure Systems

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





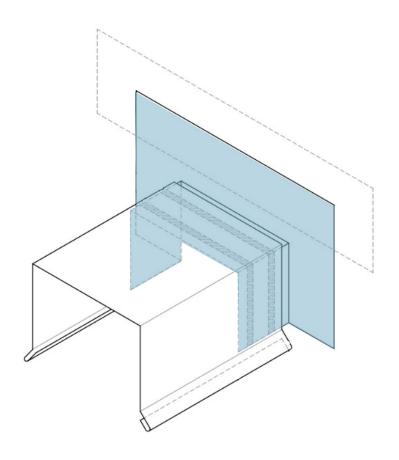
Components

Materials

- Typically sheet metal
- Sometimes roofing membrane

Configuration

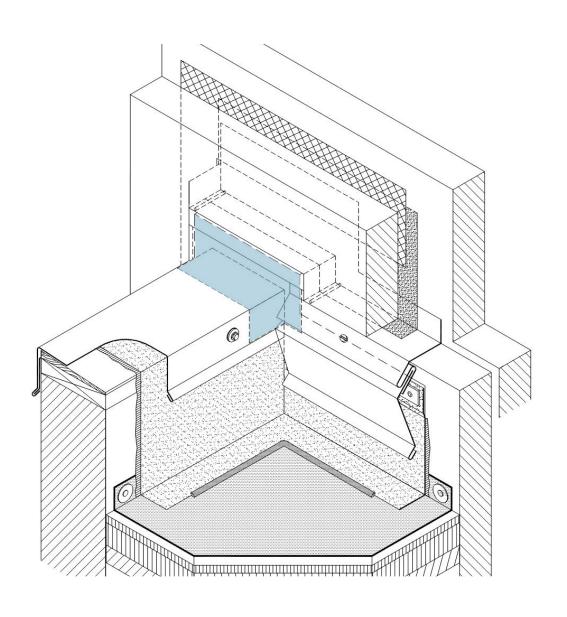
- Top and side flanges
- Top and sides projection



Integration

Control Layers

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

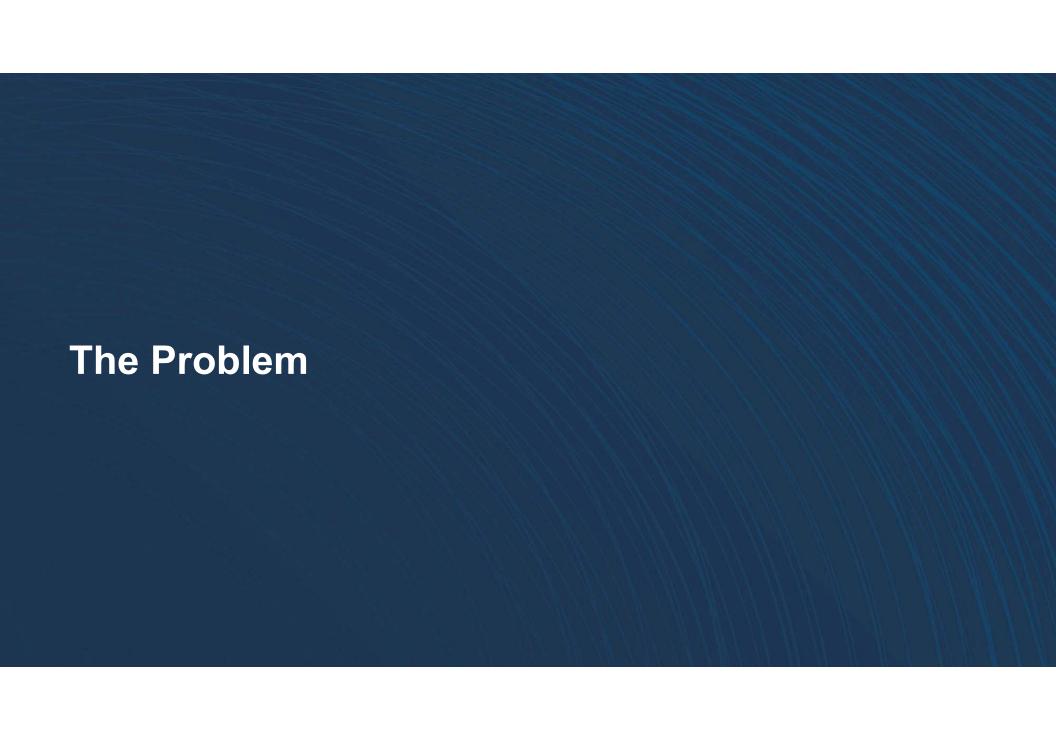


What it's not!







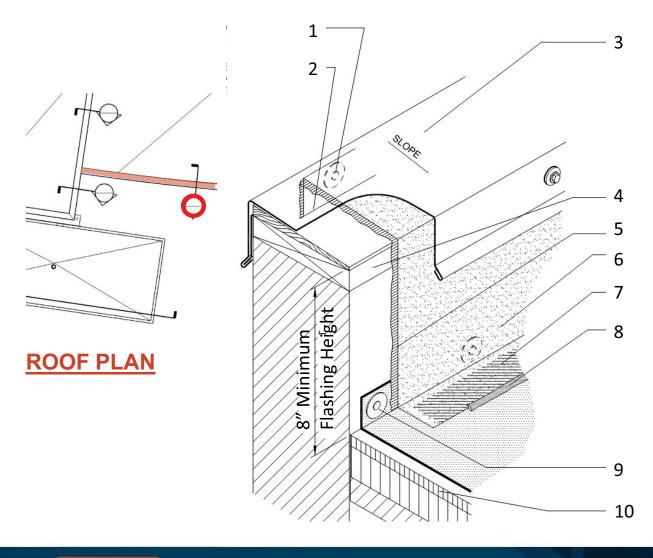


The Problem

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





Parapet Detail

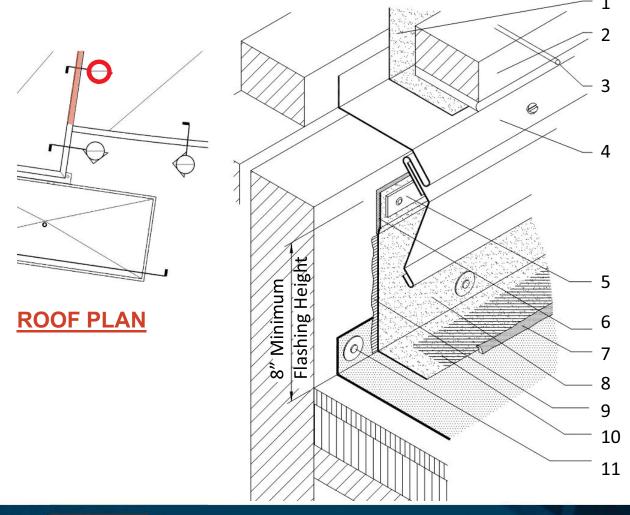
- 1 Fasteners
- 2 Membrane Lap
- 3 Sheet Metal Coping
- 4 Wood Nailer
- 5 Bonding Adhesive
- 6 Adhered Membrane Flashing
- 7 Hot-Air Welded Seam
- 8 Sealant (if required)
- 9 Seam Plates and

Fasteners

10 – Coverboard Insulation

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





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



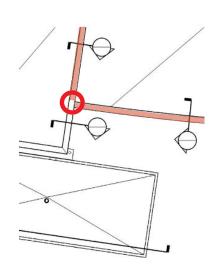




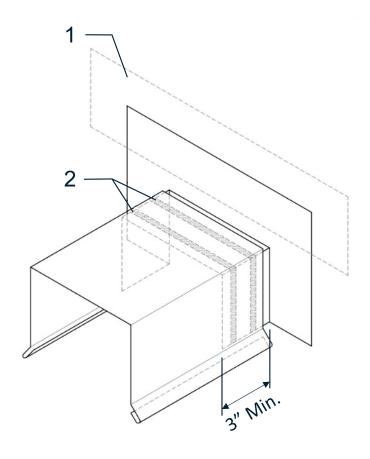
Saddle Flashing Detail







ROOF PLAN



Saddle Flashing Detail

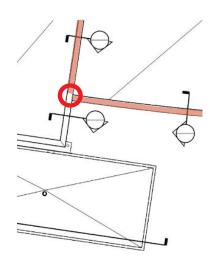
1 – Counterflashing (See Fig. 2-20)

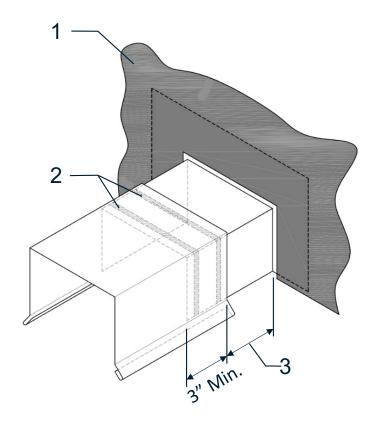
2 – Set Coping in Sealant

Note: Roof Membrane and Cleat Not Shown for Clarity.

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







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.

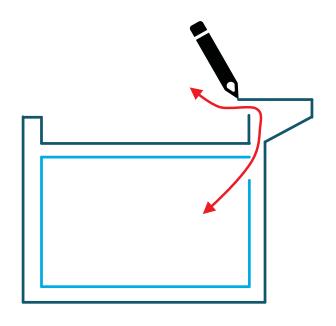
NRCA ROOFING MANUAL Architectural Flashing (2022), Figure 2-8

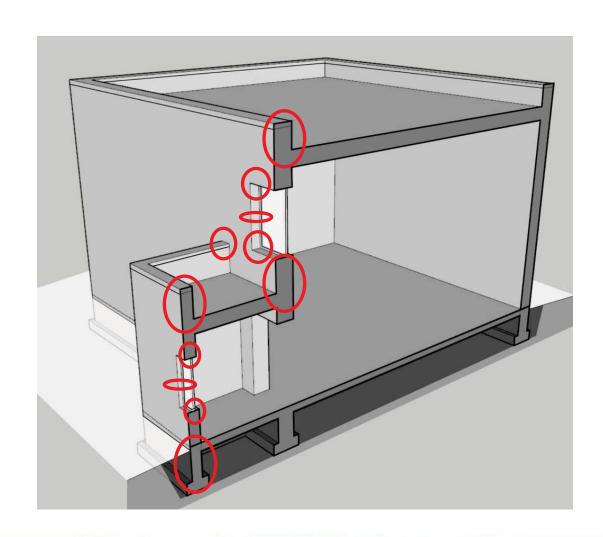


ROOF PLAN



Critical Interfaces

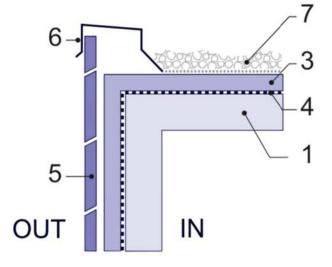




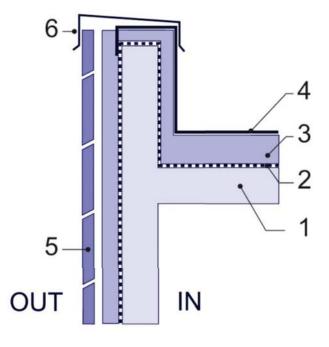


Configurations

- 1. Structure
- Air/Vapor Control Layer
- 3. Thermal Control Layer
- 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

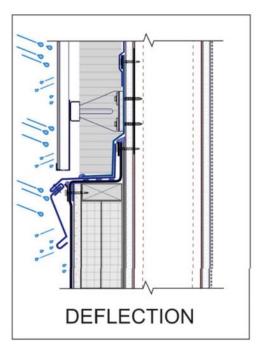
diffusion

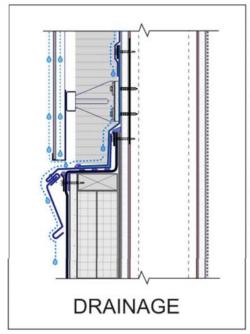
Thermal Control Layer Controls the transfer of thermal energy

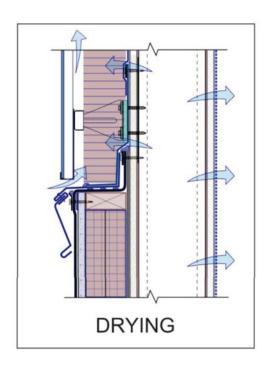
(heat)

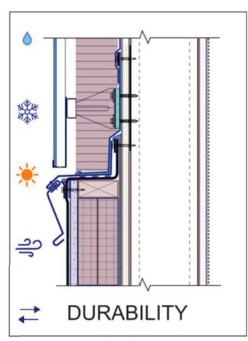


Moisture Flow



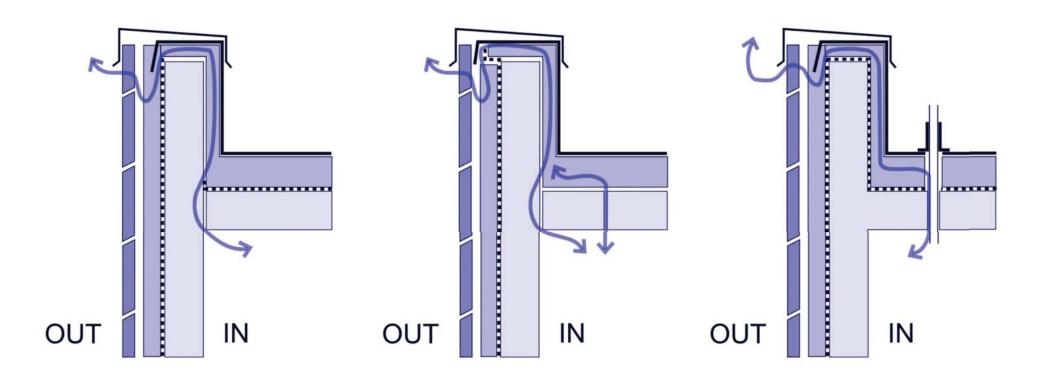






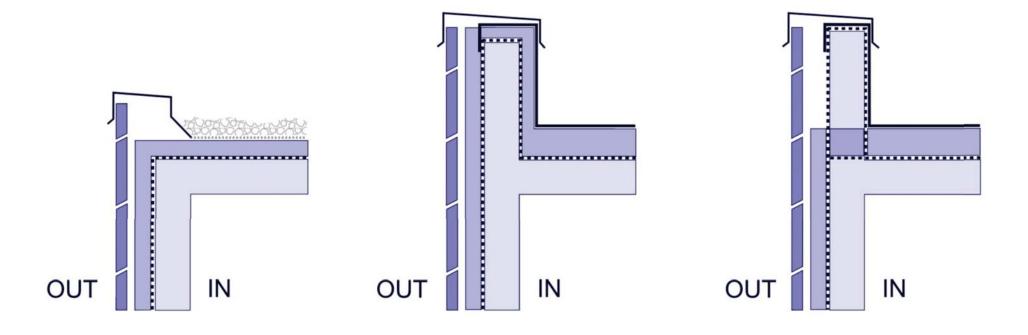


Air / Vapor Control





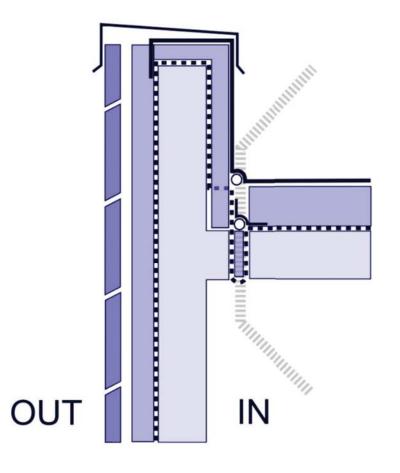
Thermal Continuity





Building Movement

- Roof Deck Deflection
- Building Expansion
- Expansion / Contraction

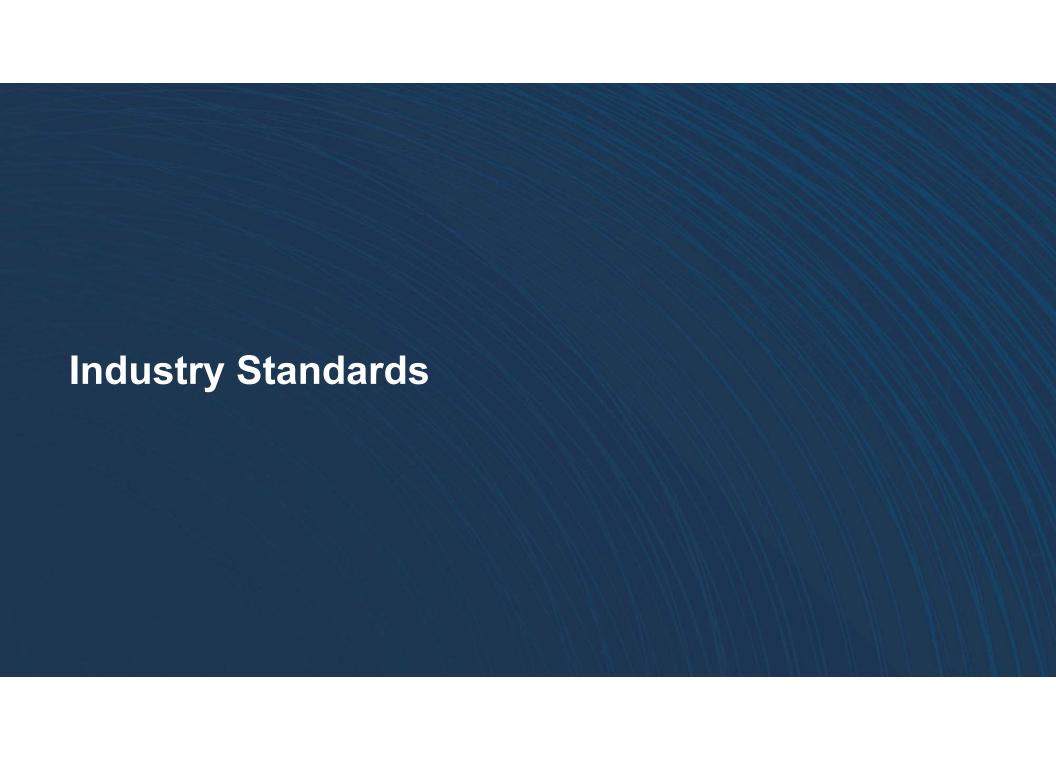




Other Factors

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





Early Saddle Flashing Resources

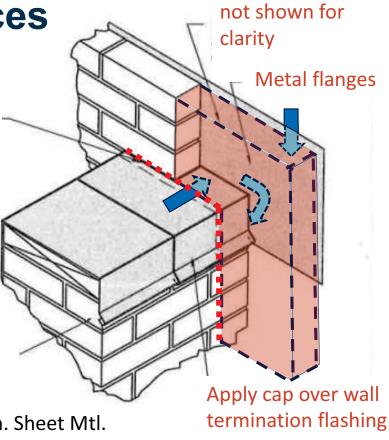
Architectural Graphic Standards, 4th Edition, 1954

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



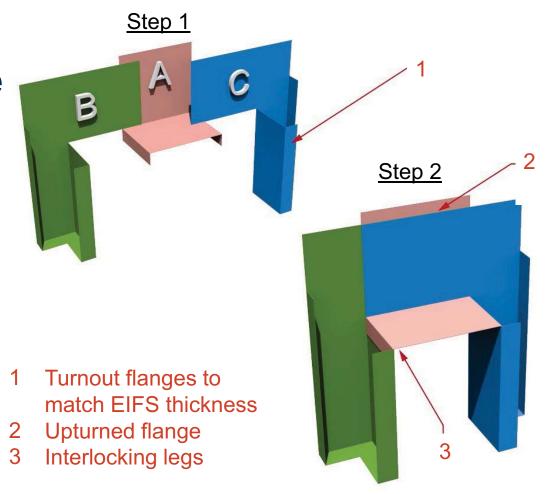
Contemporary Saddle Flashing Resources

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

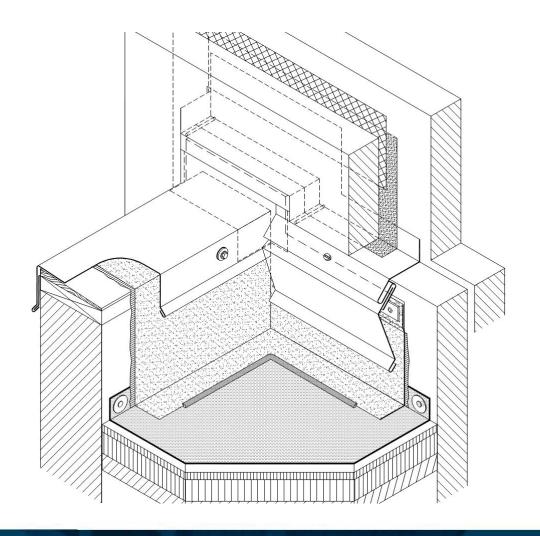


Authored Resources

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

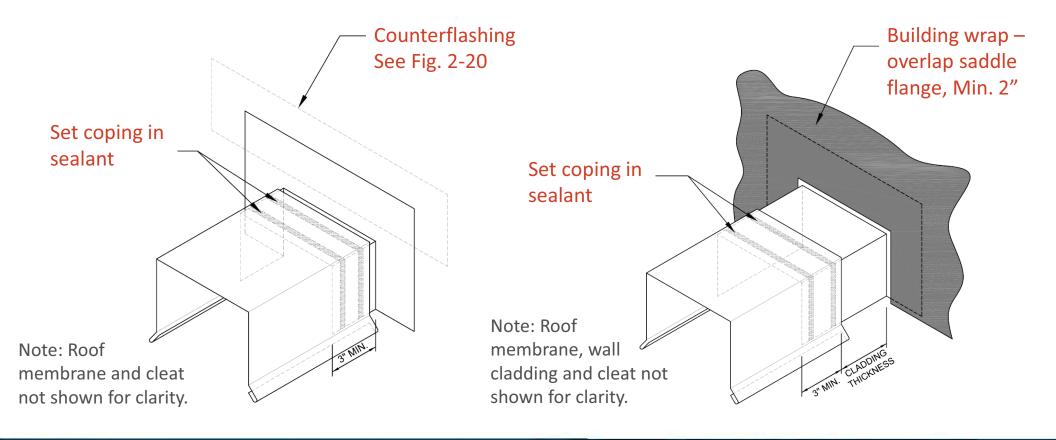
"An Architect's Guide to Parapet-to-Wall Detailing," Build Meets World Blog: Sponsored by Tremco Commercial Sealants & Waterproofing, October 2020

"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

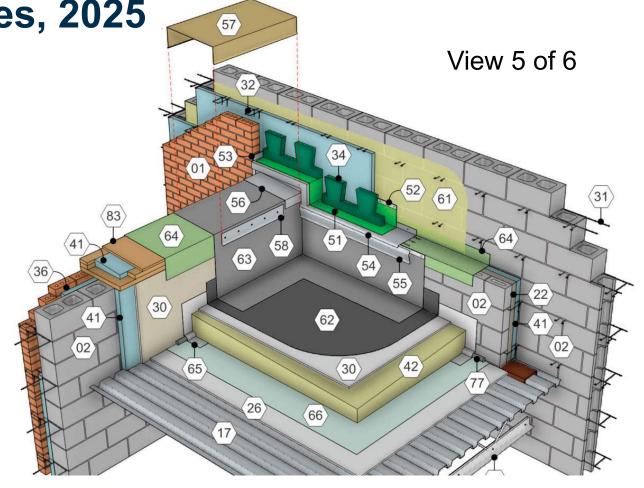
57 - Coping

58 - Cleat

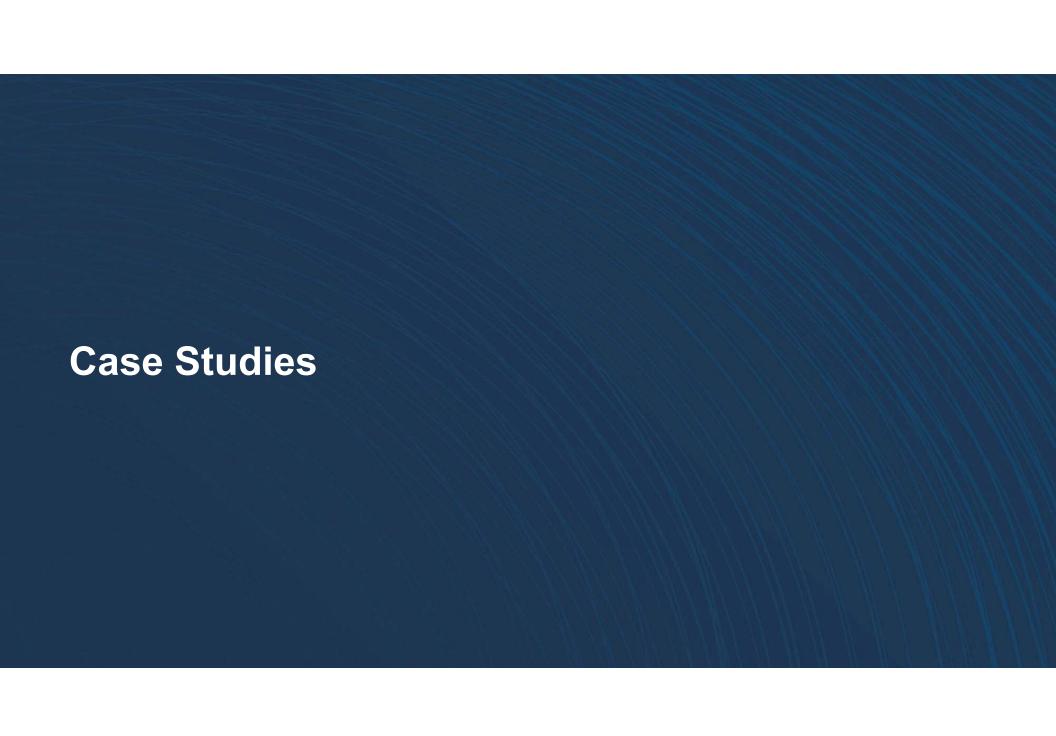
61 - Air/water/vapor as req'd

62 - Roofing

63 - Adhered membrane







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





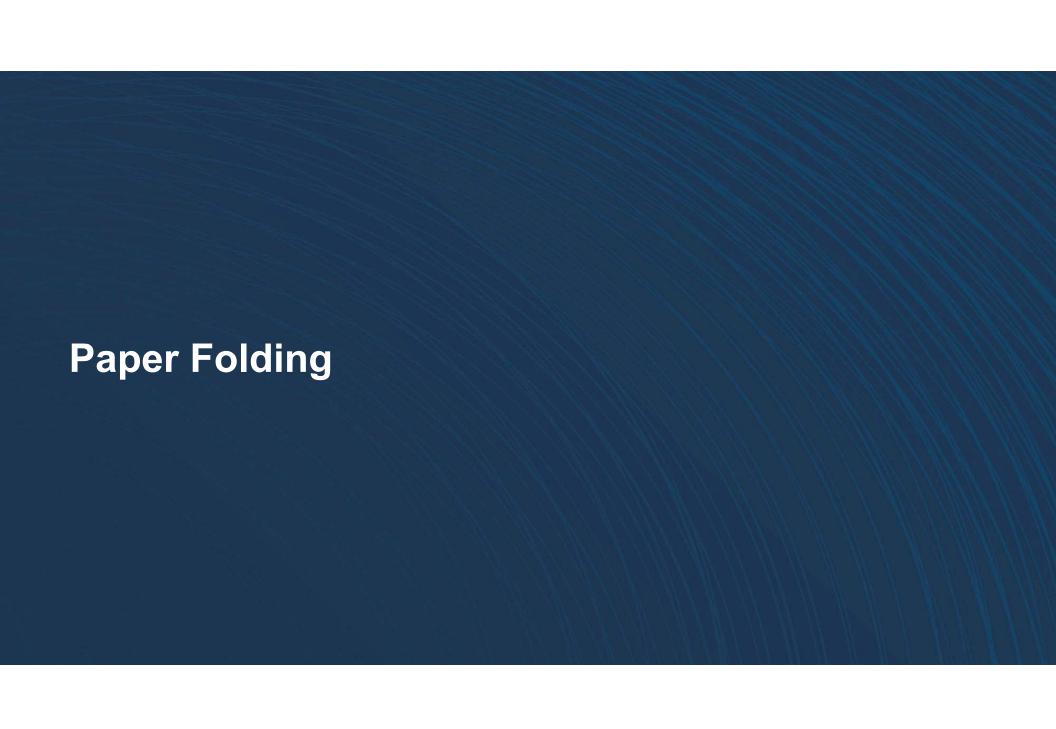


Every Which Way, but the Right Way

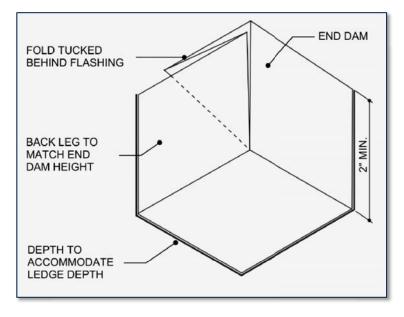




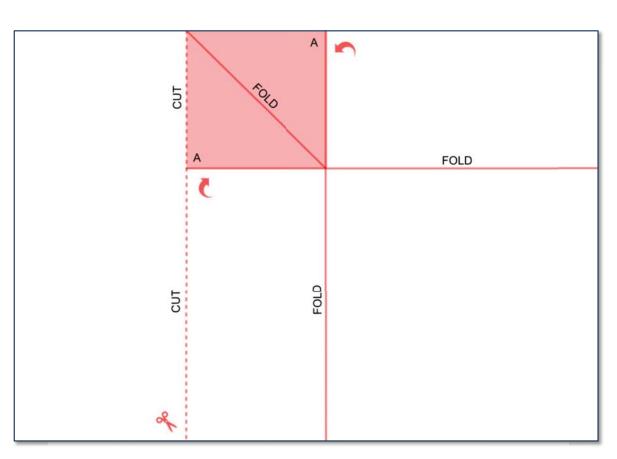




End Dam Exercise

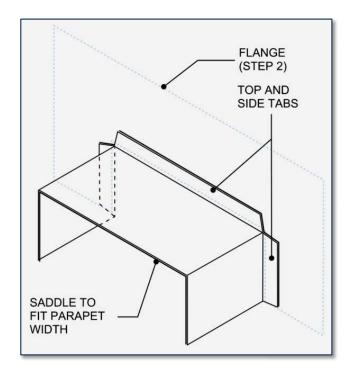


END DAM

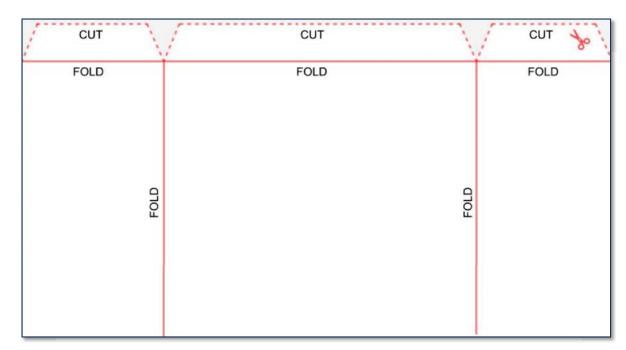




Saddle Exercise (Step 1)

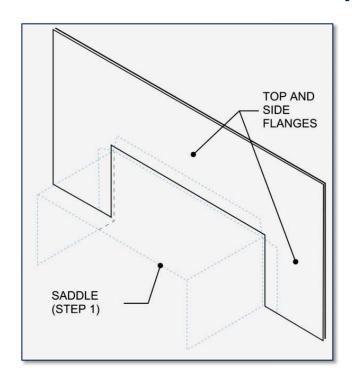


SADDLE

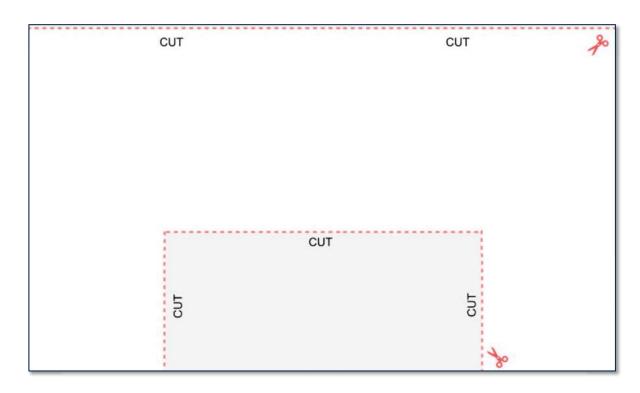




Saddle Exercise (Step 2)

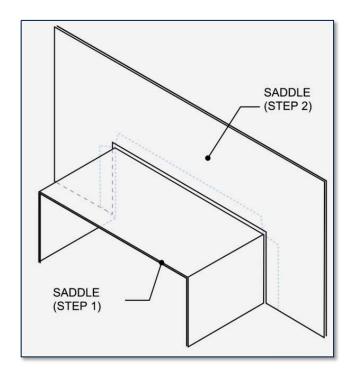


FLANGE

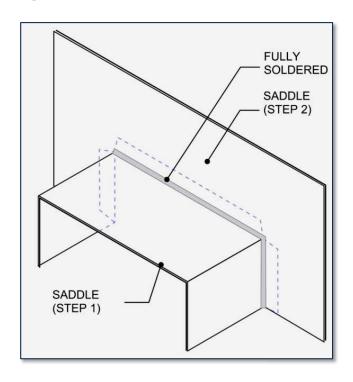




Saddle Exercise (Step 3 and 4)

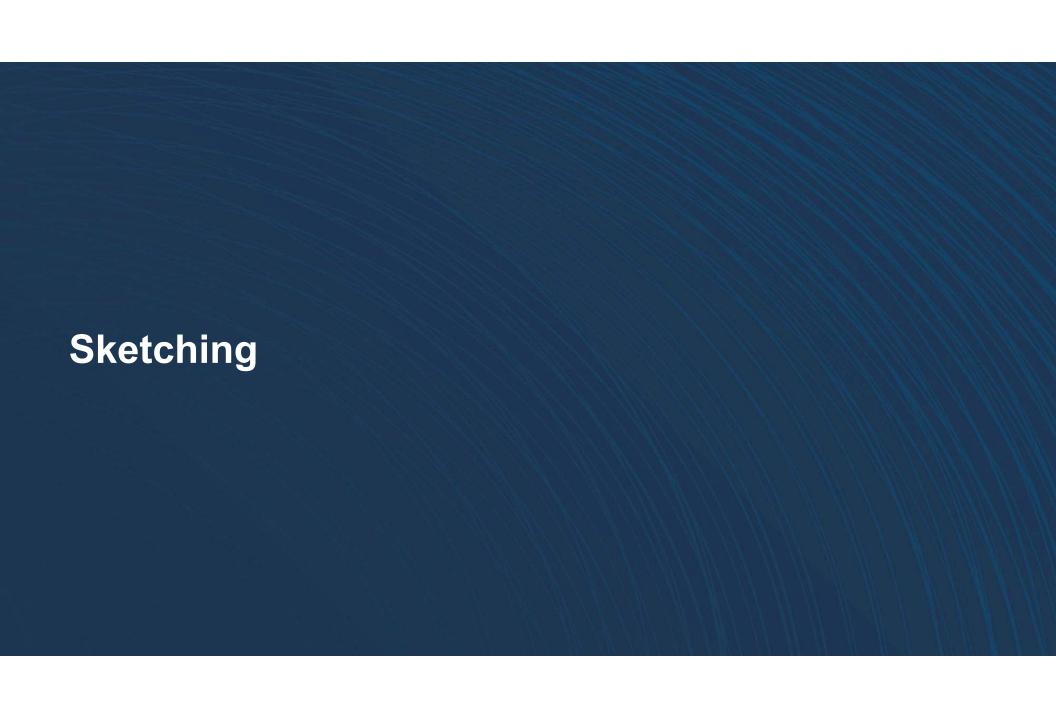


ASSEMBLY

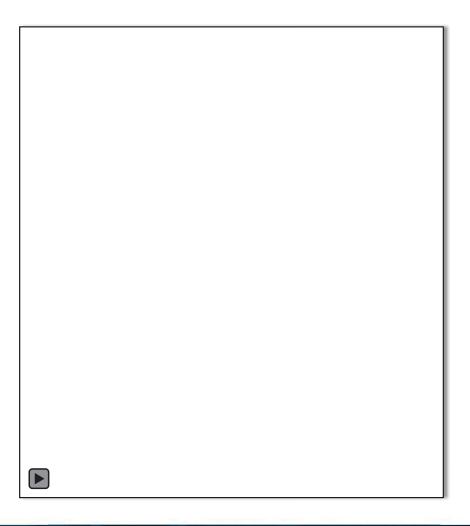


SOLDERING



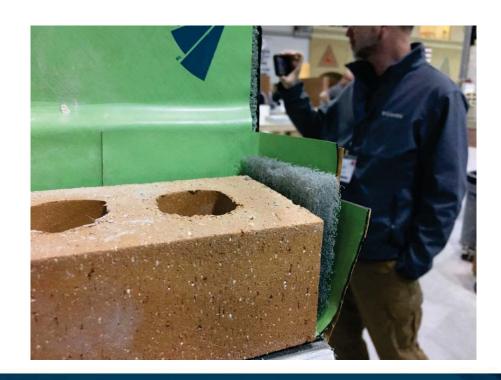


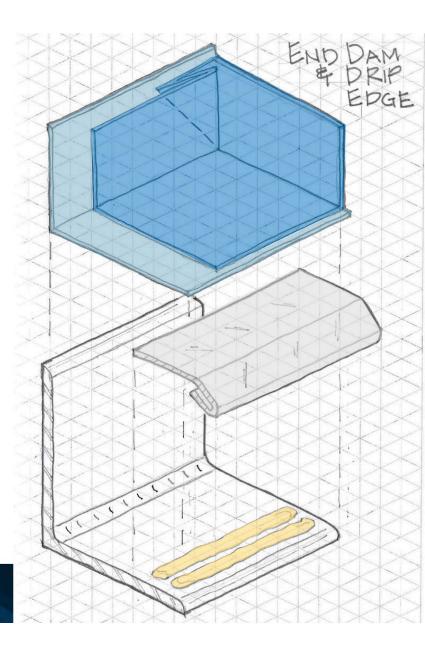
Isometric Tutorial





Through-Wall Flashing and End Dams

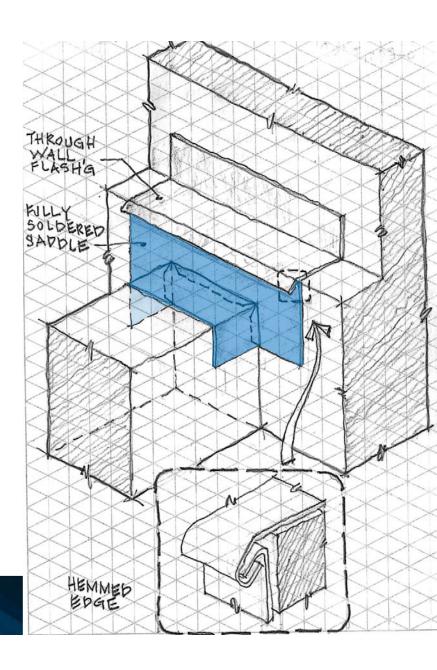






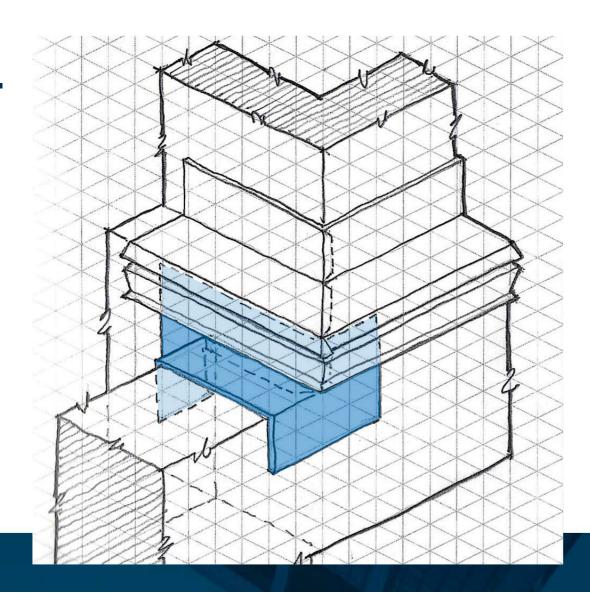
Saddle Flashing – Straight



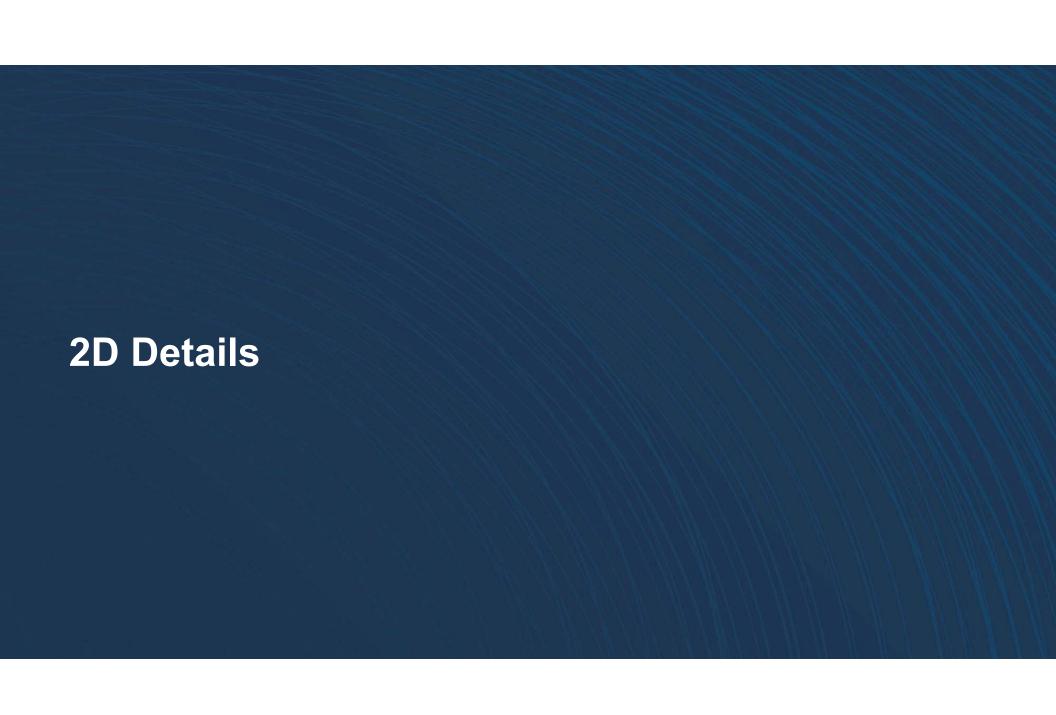




Saddle Flashing - Corner

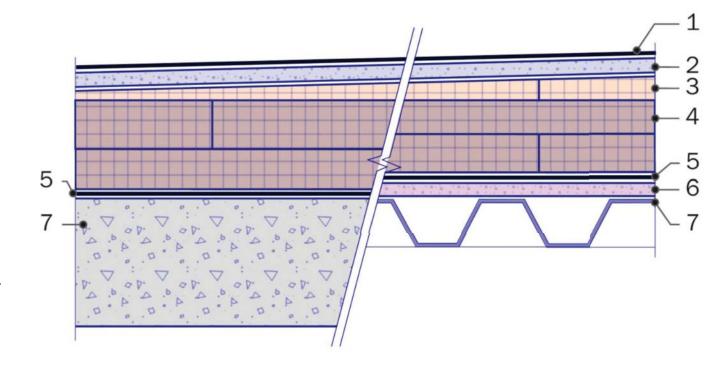






Roofing Assembly

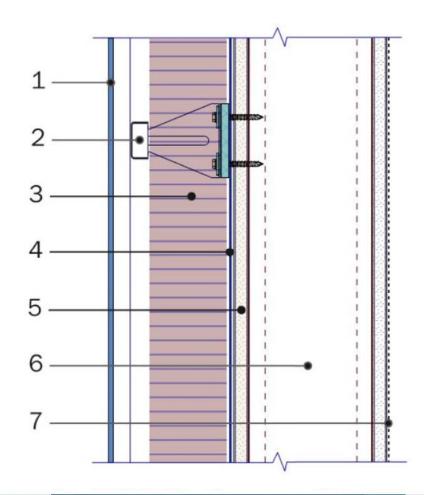
- 1 ROOFING, SINGLE -PLY
- 2 COVER BOARD
- 3 TAPERED INSULATION
- 4 RIGID INSULATION, MIN. 2 STAGGERED LAYERS
- 5 AIR/VAPOR CONTROL LAYER
- 6 SUBSTRATE BOARD
- 7 STRUCTURAL DECK





Exterior Wall Assembly

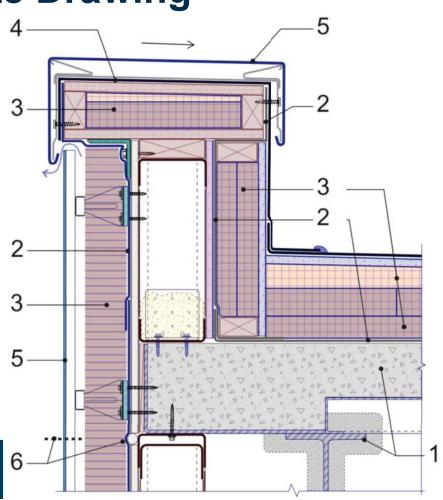
- 1 RAINSCREEN CLADDING (PREFORMED METAL)
- 2 WALL BRACKET SYS. W/ THERMAL ISOLATED INTERMITTENT CLIPS
- 3 MINERAL WOOL INSULATION
- 4 AIR/VAPOR CONTROL LAYER
- 5 EXTERIOR SHEATHING
- 6 COLD FORMED METAL FRAMING
- 7 PERMEABLE FINISH ON INTERIOR GYPSUM WALLBOARD

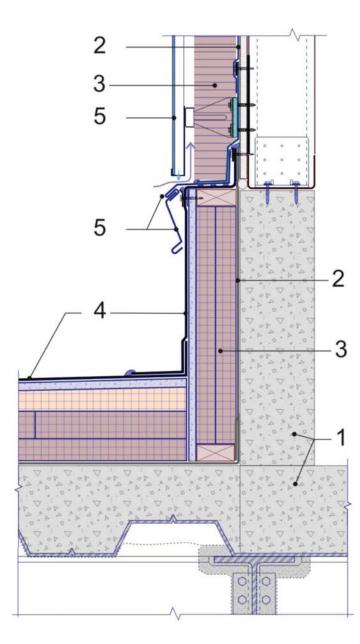




Composite Drawing

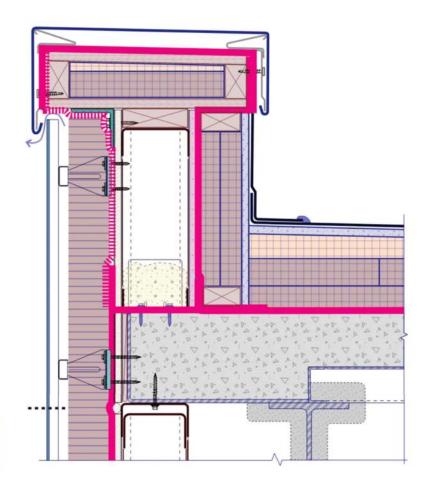
- 1. STRUCTURE
- 2. AIR/VAPOR CONTROL
- 3. THERMAL CONTROL
- 4. ROOFING MEMBRANE
- 5. CLADDING, COPING, FLASHING
- 6. MOVEMENT FUNCTION

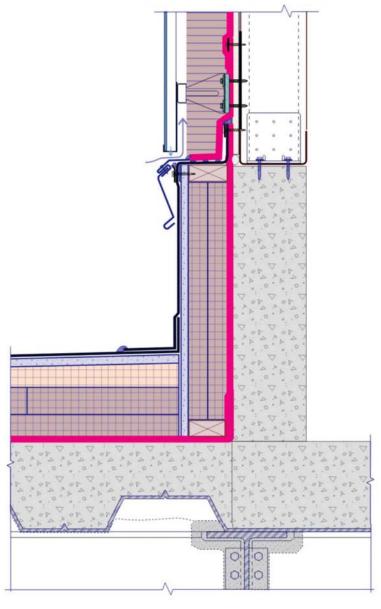






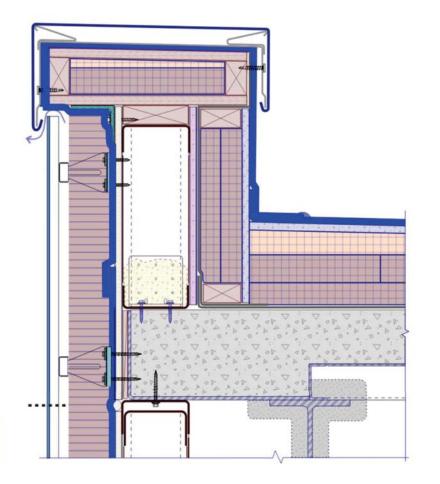
Air/Vapor Control Layer

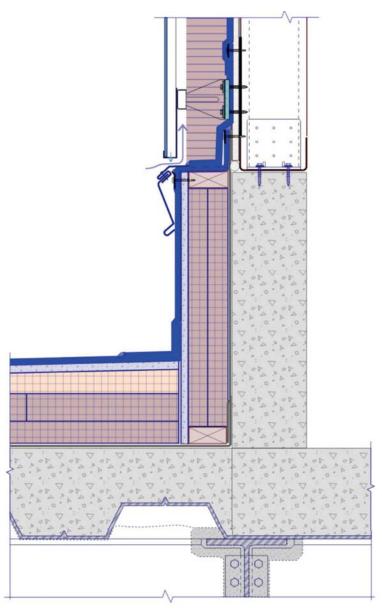






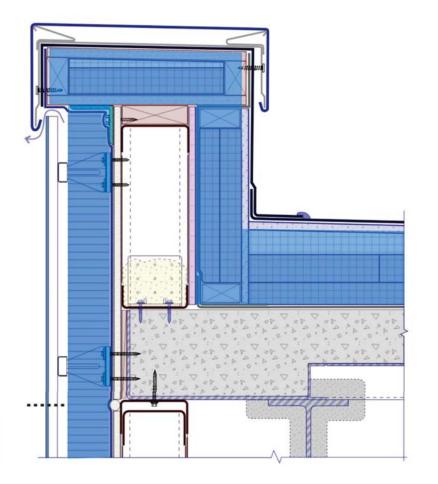
Moisture Control Layer

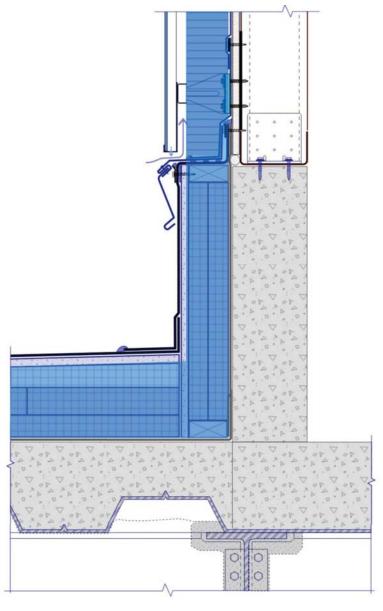




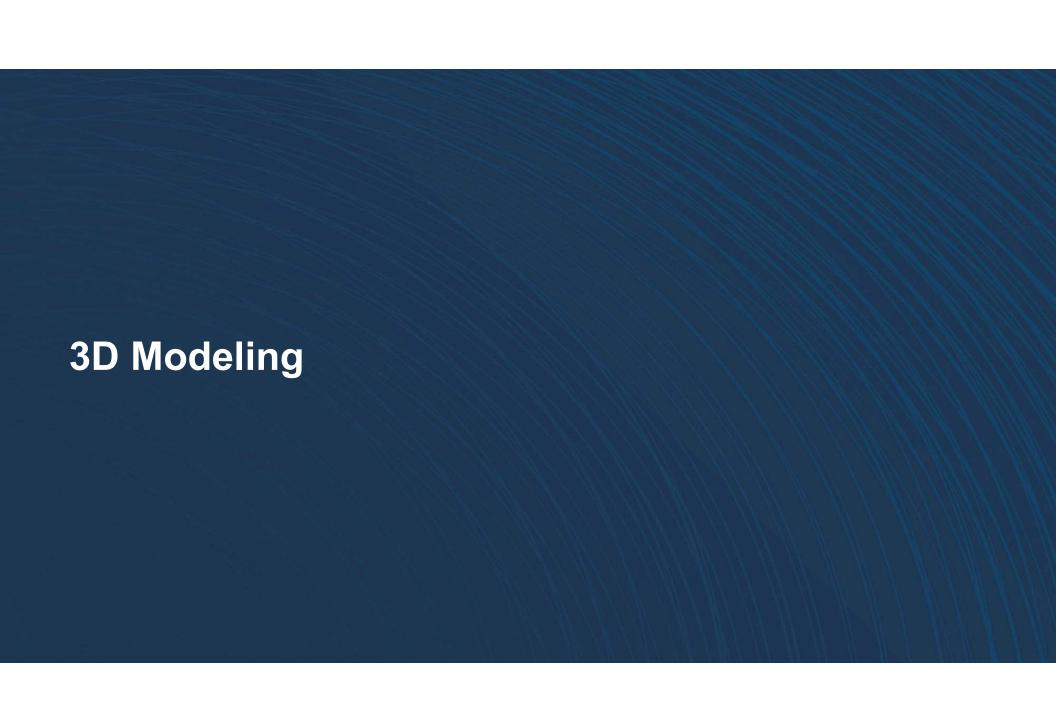


Thermal Control Layer

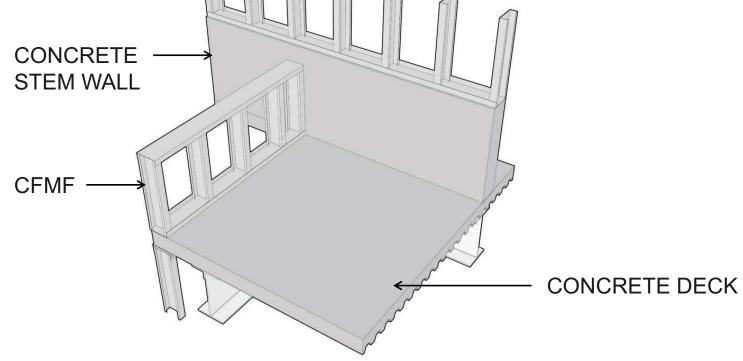




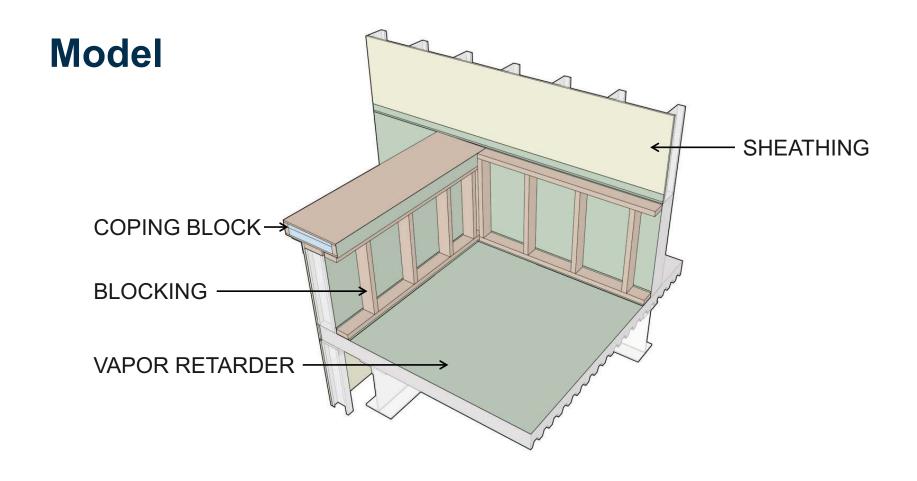




Model CONCRETE



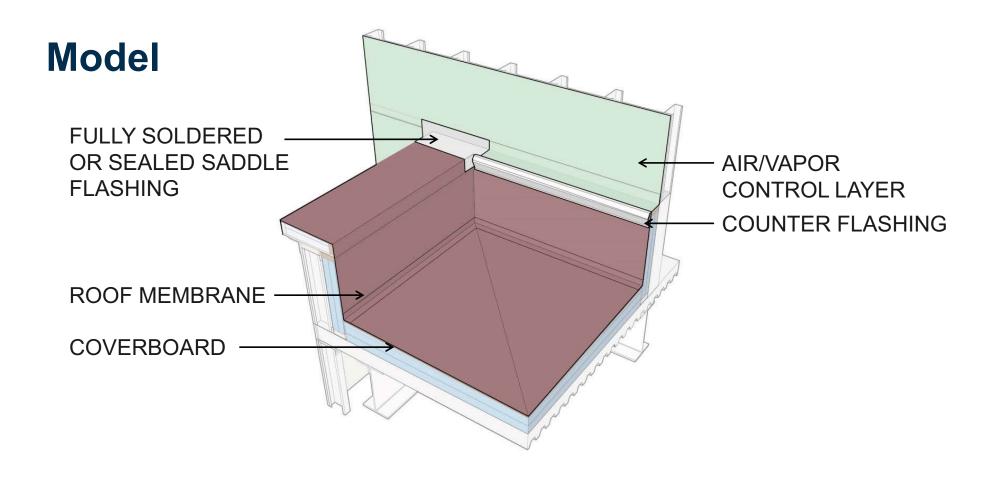




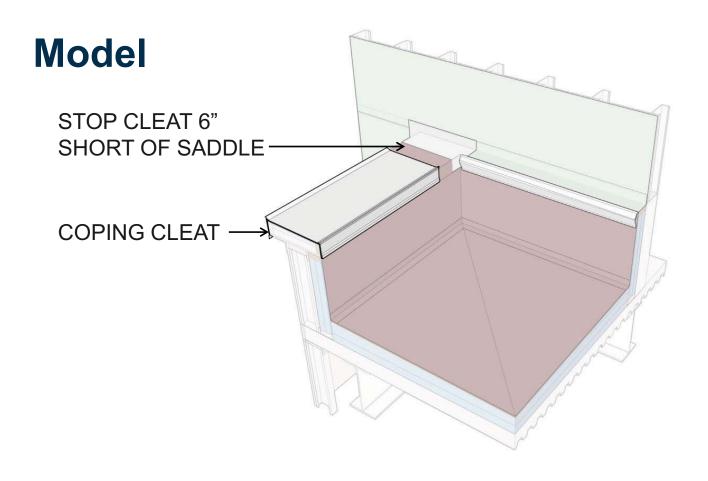


Model ROOF INSULATION -

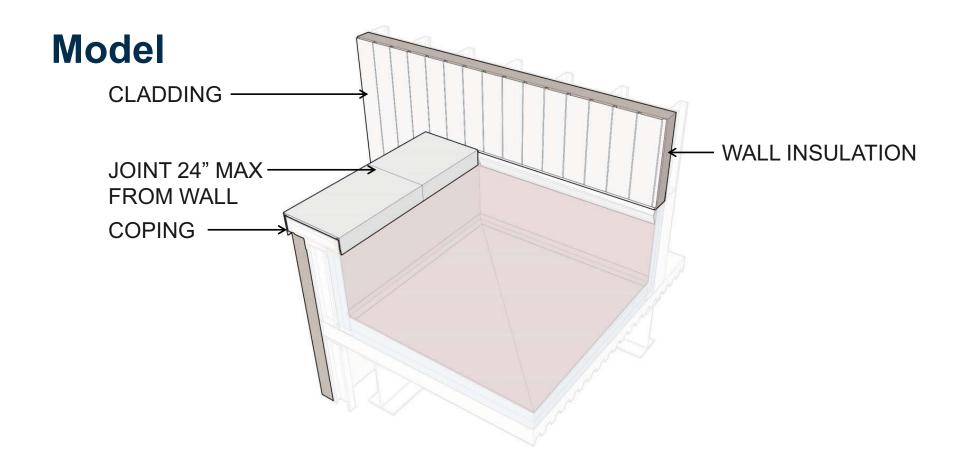




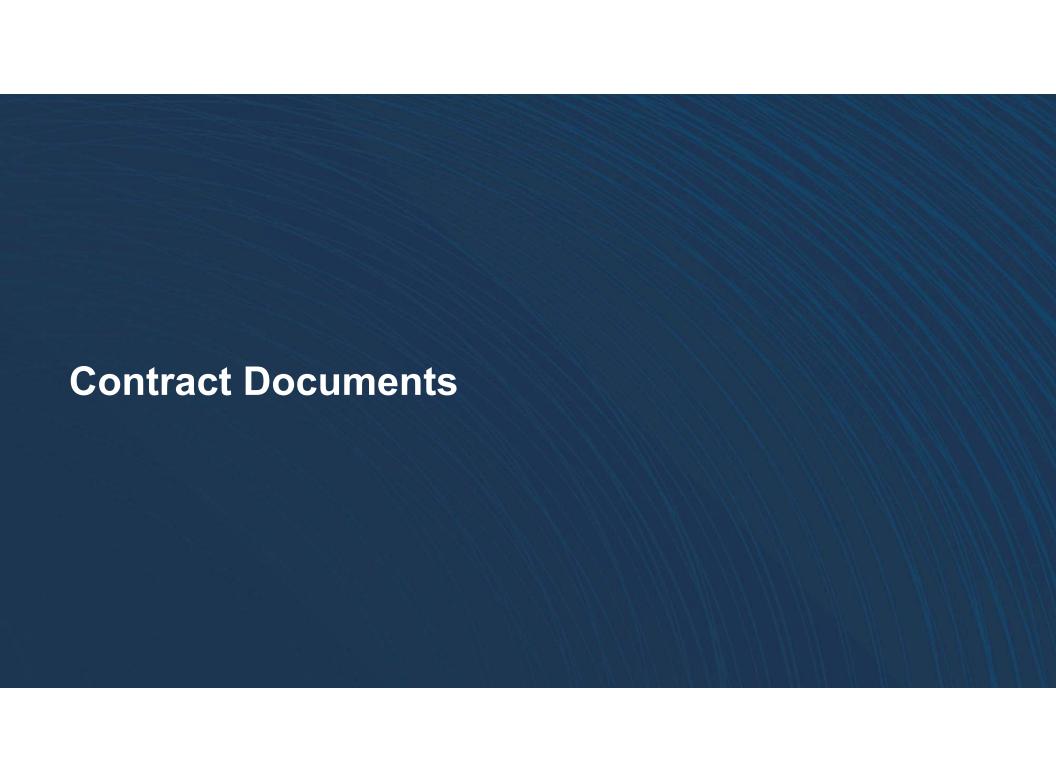








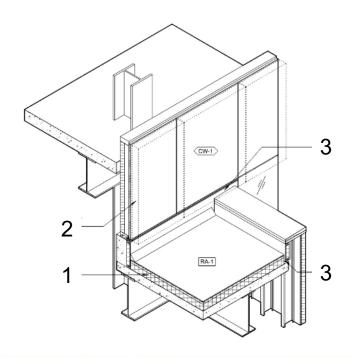


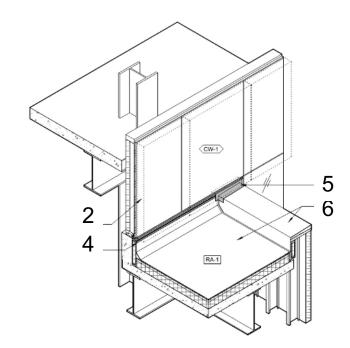


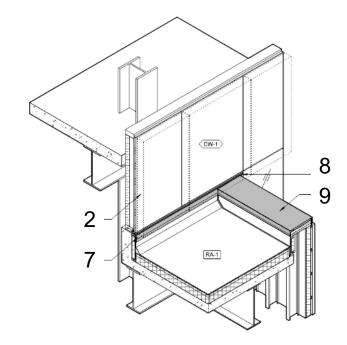
Drawings

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

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









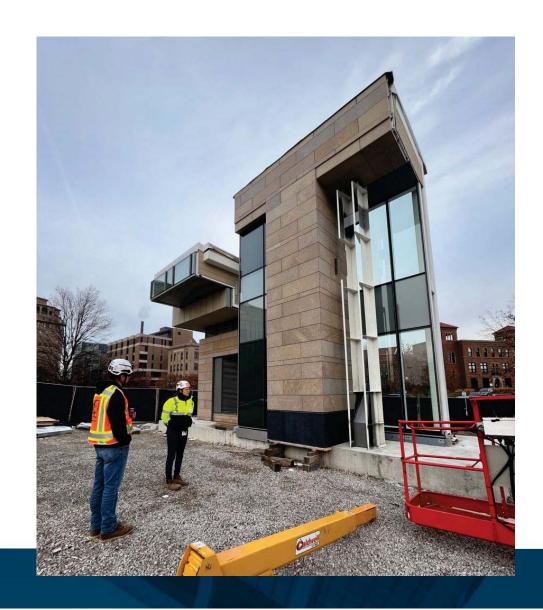
Specifications

Part 1 - General

- Shop drawings
- Mock-ups

Part 2 - Products

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





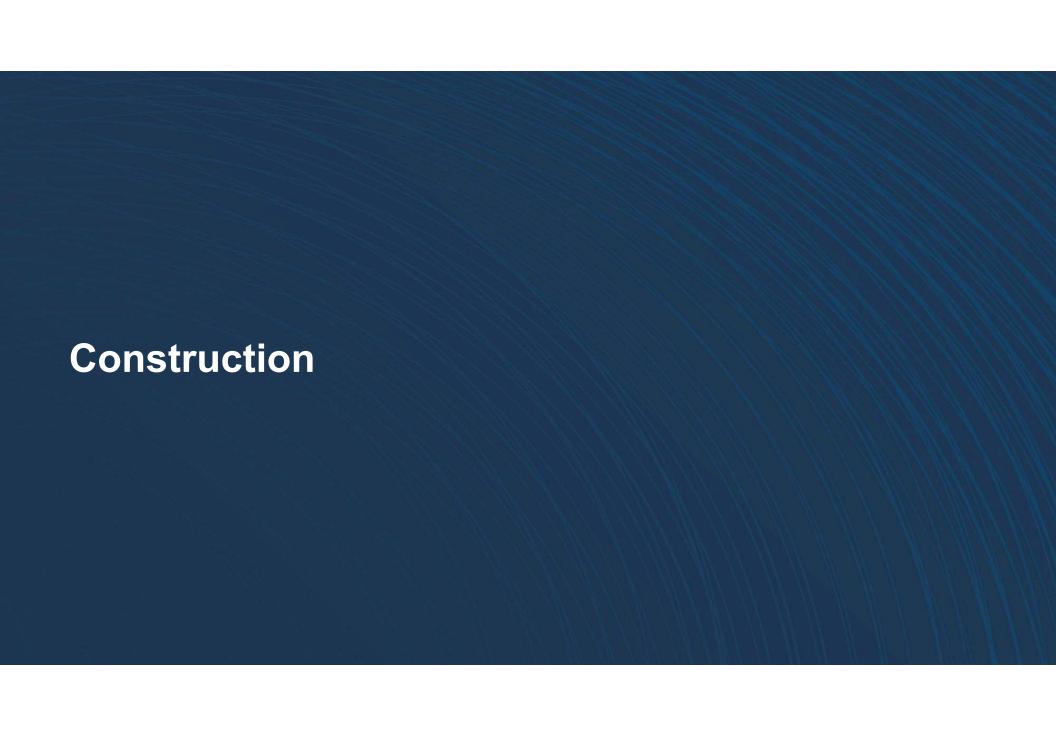
Specifications



Part 3 - Execution

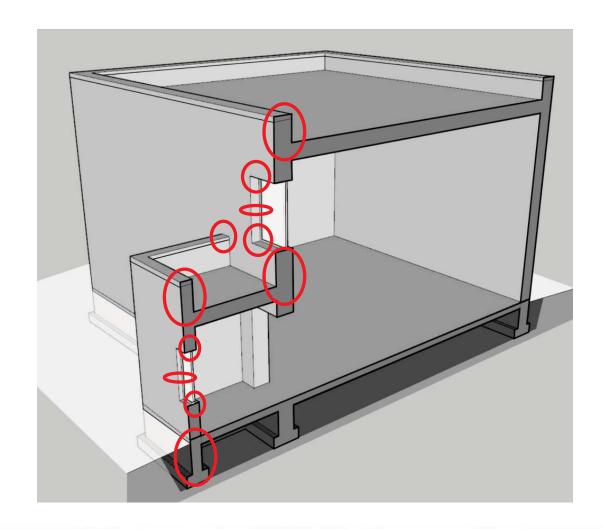
- Pre-fabricated saddles with fully soldered or fully sealed seams
- Upturned back legs that integrate with the side flanges
- Installation of Roof Flashings
 - Integration of the coping, saddle flashing, air barrier, through-wall flashing, and counter flashings
- Trade Coordination
 - Air barrier, flashing, 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





Critical Interfaces

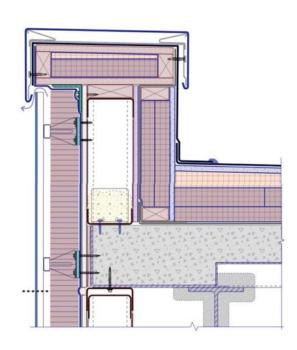
Identify conditions

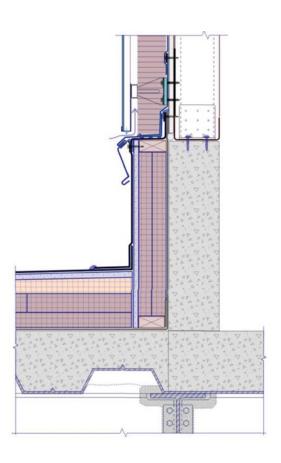




Sequencing

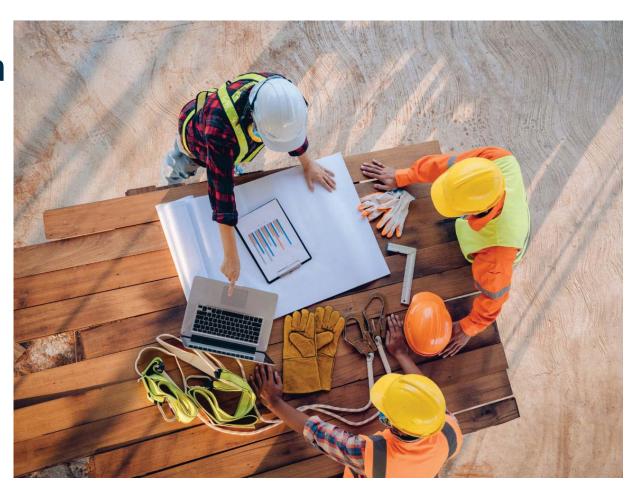
- Air Barrier
- Cladding
- Flashing
- Framing
- Glaziers
- Insulation
- Roofing
- Sealant
- Sheet Metal Workers
- Specialty
- Waterproofing







Pre-Construction Meetings





Trade Coordination





Mock-ups

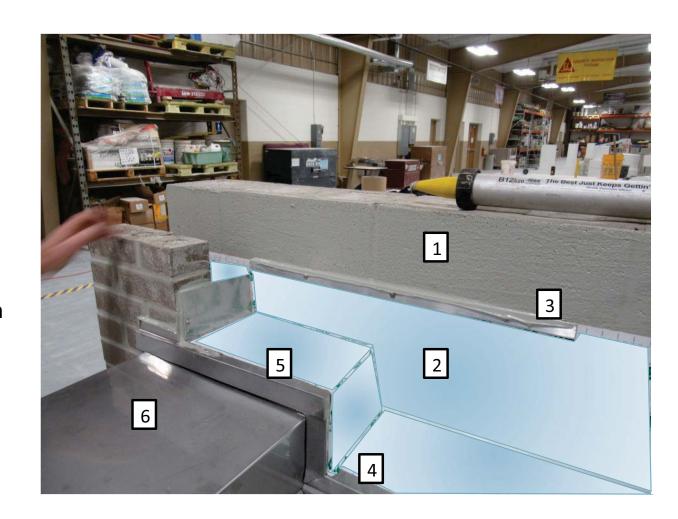
- 1. Masonry Training Facility
- Three Saddle Flashing Mockups
- 3. Brick Masonry and CMU
- 4. Single-ply Roofing
- 5. Participants
 - a) International Masonry Institute
 - b) Bricklayers and Allied Craftworkers
 - c) Roofing Contractor
 - d) Manufacturer





Mock-ups

- 1. Air/Vapor Barrier
- 2. Self-Adhering Flashing
- 3. Sealed Termination Bar
- 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





Technical Leader – Building Enclosure CannonDesign

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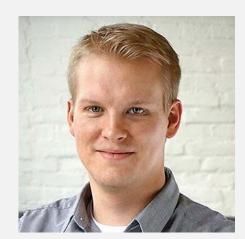
Designer III CannonDesign

E: jmorrison@cannondesign.com

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Mike Nagle



Jake Morrison



