abaa 2026 building enclosure conference

Building Enclosure Architectural Details – Conveying Construction Drawing Clarity

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Tremco Construction Products Group Inc.

AIA Continuing Education Provider

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Building Enclosure Architectural Details – Conveying Construction Drawing Clarity

Robert Dazel has been a registered Architect in the State of Ohio since 1992, a long-standing member of American Institute of Architects (AIA), Construction Specifications Institute (CSI) and maintains his Leadership in Energy and Environmental Design (LEED) Green Associate (GA) credentials.

Under his current role as a Senior Building Enclosure Specialist, Robert focuses on all six-sides of a building envelope through assessment and diagnostics leading to development of comprehensive solutions directly addressing the challenges and pain points experienced by building owners in all market segments.

His professional experience as an architect, consultant, educator, manufacturer's representative, and industry association advocate has allowed him to become an authority and expert on exterior building envelope performance, code(s) compliance, material testing, compatibility, design, detailing, specification, and solution execution.

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Introduction / Biography

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Building Enclosure Architectural Details – Conveying Construction Drawing Clarity

Learning Objectives

At the end of this session, participants will be able to:

- Understand the **importance of building enclosure architectural details**, and explain the consequences of not illustrating essential details as part of construction documents
- Understand **what exterior wall envelope details must be provided** in construction documents, and interpret how this translates into their design to meet code
- Produce building enclosure design **details which recognize utilize building science practices resulting in sustainable buildings**
- Recognize how materials and sequencing can play into the constructability of the systems, and apply this knowledge into enclosure design to avoid premature failure

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Know and Quiz Your Audience

1. Know
2. Quiz

"God is in the Details"

Ludwig Mies ven der Rohe

"The Devil is in the Details"

Friedrich Wilhelm Nietzsche

German philosopher and poet (1844-1900)

Definitions

Detail

- *An individual feature, fact, or item*

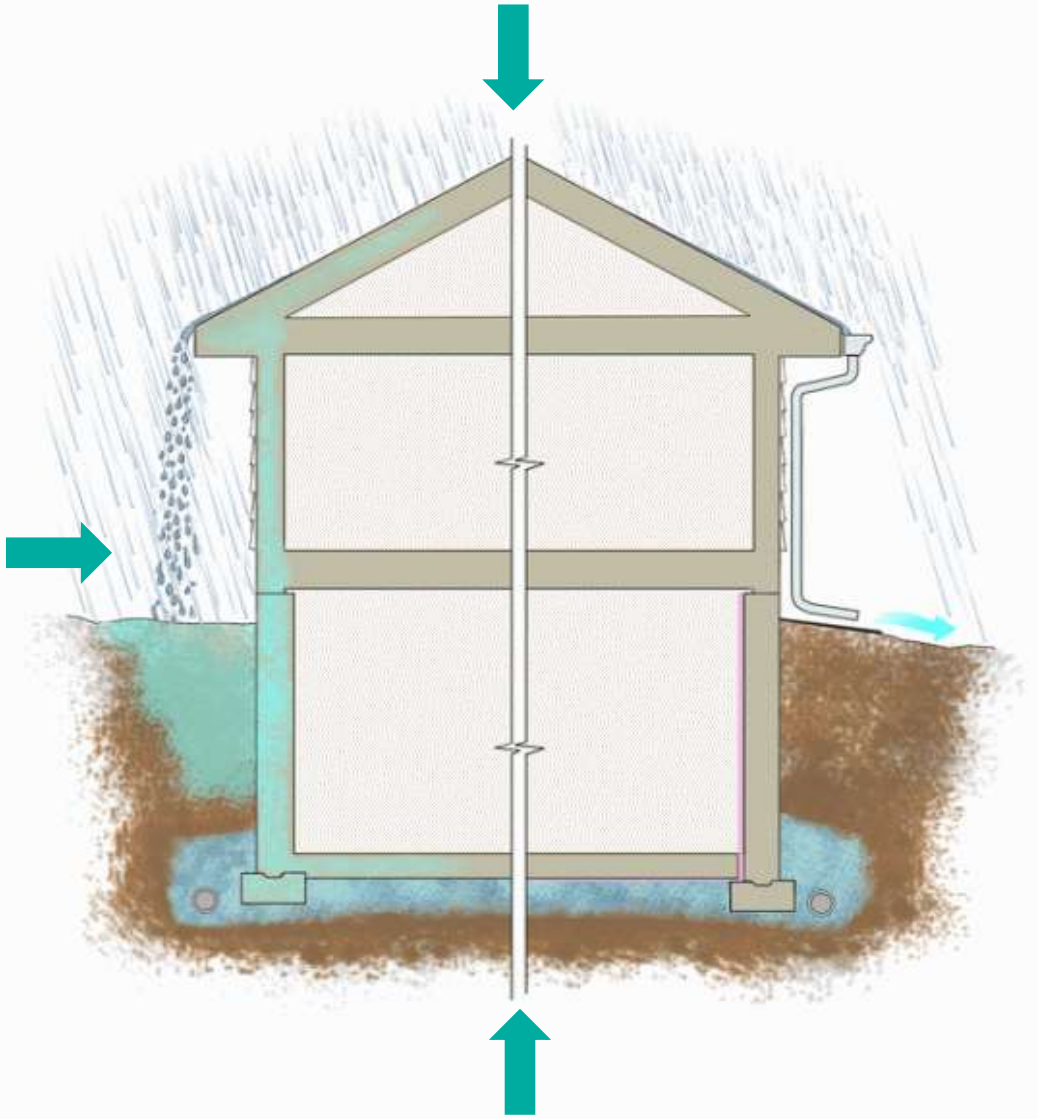
Architectural Detail

- *Depicts an element shown in other construction drawings on a larger scale*
- *Provides more thorough information about the placement of and the connections between different parts*

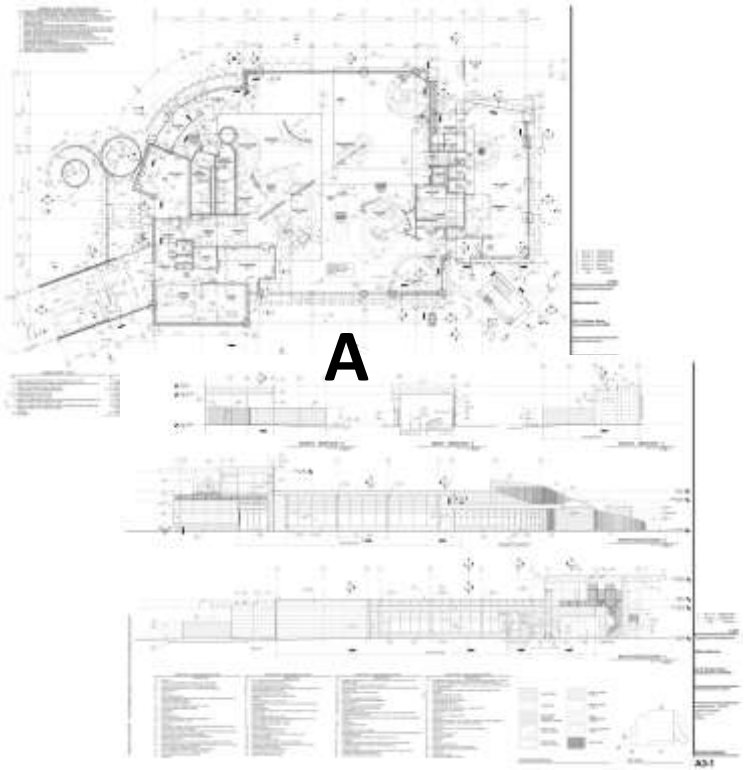
Definitions

Building Enclosure

- *The assembly of materials connected by elements **(i.e. Architectural Details)** creating a system that provides environmental separation between the interior conditioned space and the exterior environment*
- *The 6-sided enclosure*
  - *Roof*
  - *Walls*
  - *Below Grade – Foundation / slab / blind side*



Find the Detail



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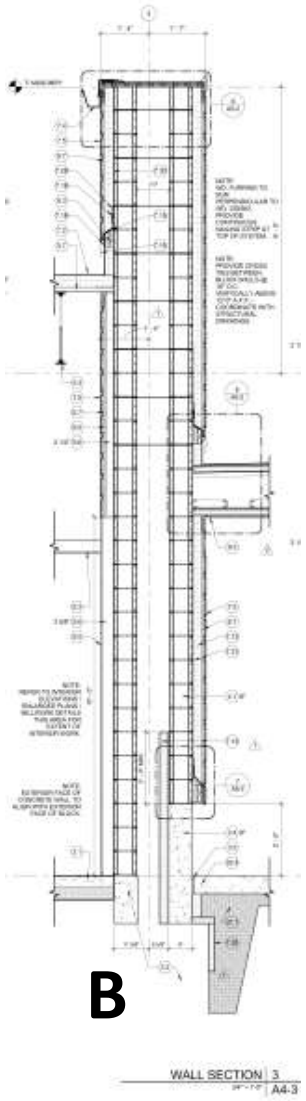

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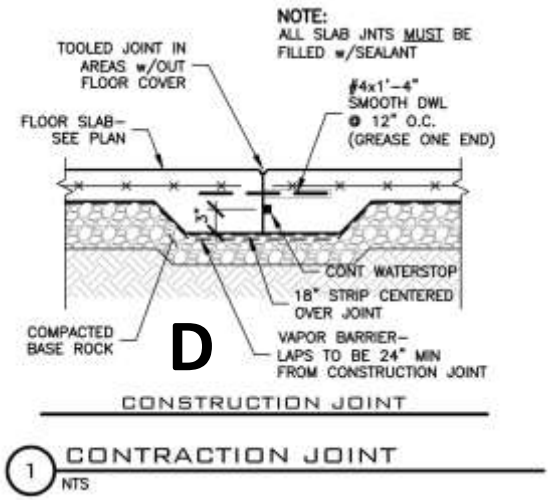

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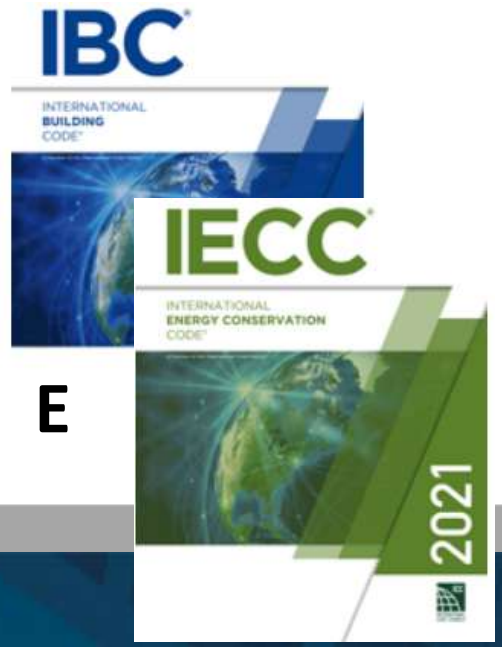

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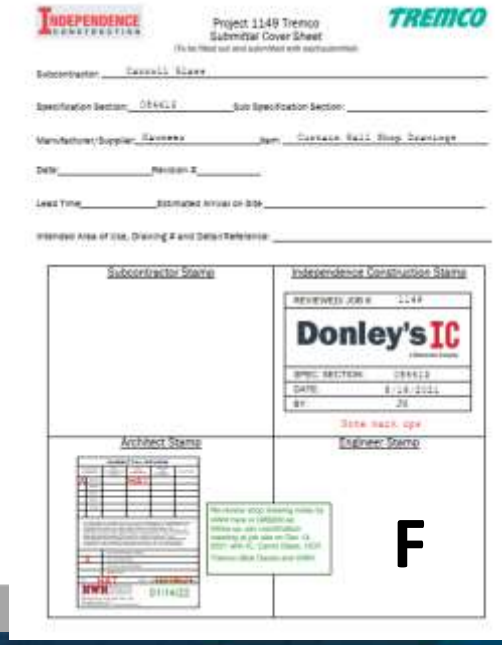

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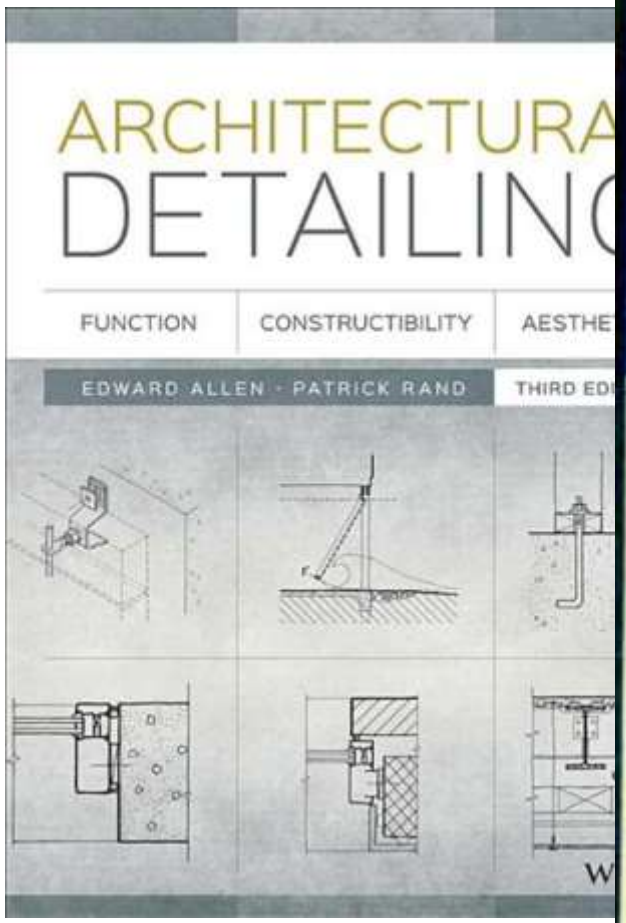
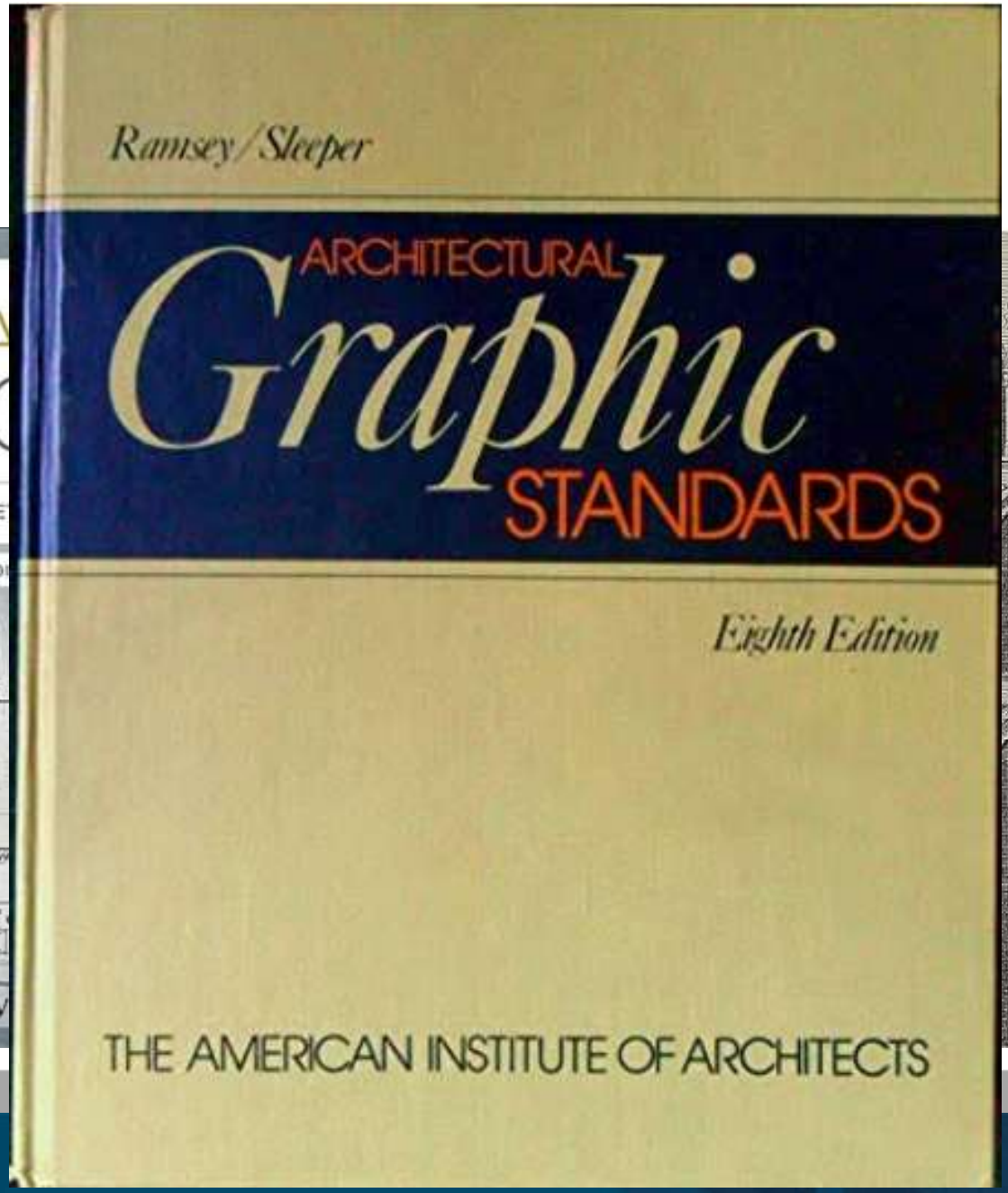
Resources


ARCHITECTURA
DETAILING
FUNCTION
CONSTRUCTIBILITY
EDWARD ALLEN · PATRICK RAND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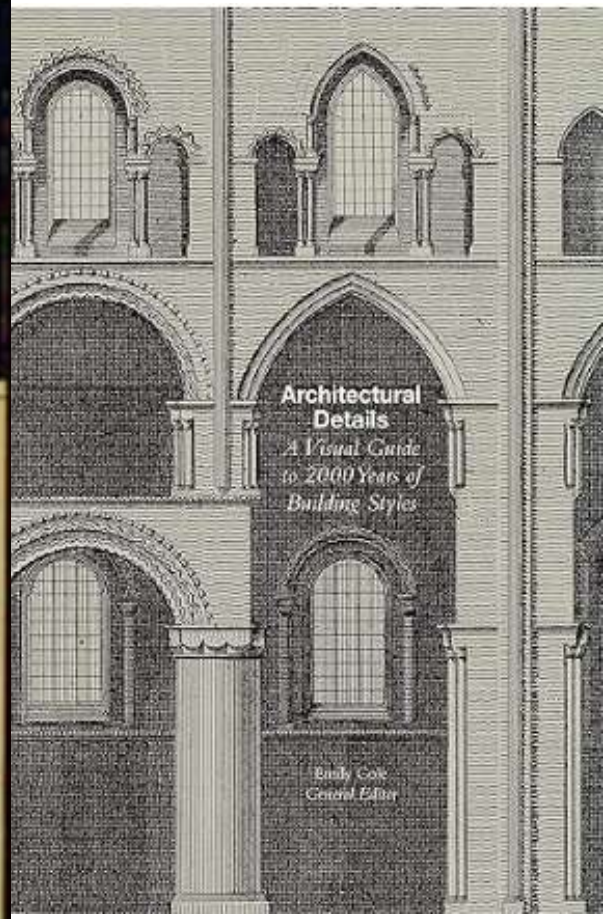
THE AMERICAN INSTITUTE OF ARCHITECTS


Architectural
Details
A Visual Guide
to 2000 Years of
Building Styles

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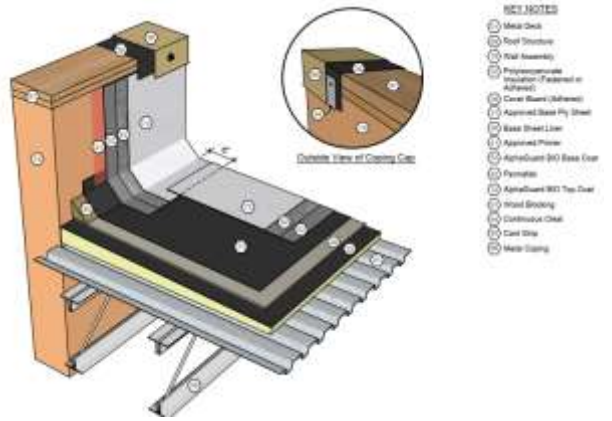
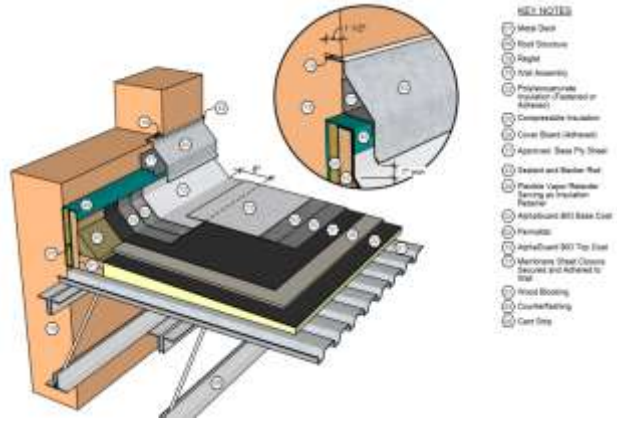
Resources

+ Systems | + Products | Our Solutions | Inspire & Learn | Tools & Resources | Why Dryvit?





Manufacturer

- *Website*
- *Technical Support*
- *Details, Specifications*
- *Physical Material / Assembly Testing*
- *Sales Representative*

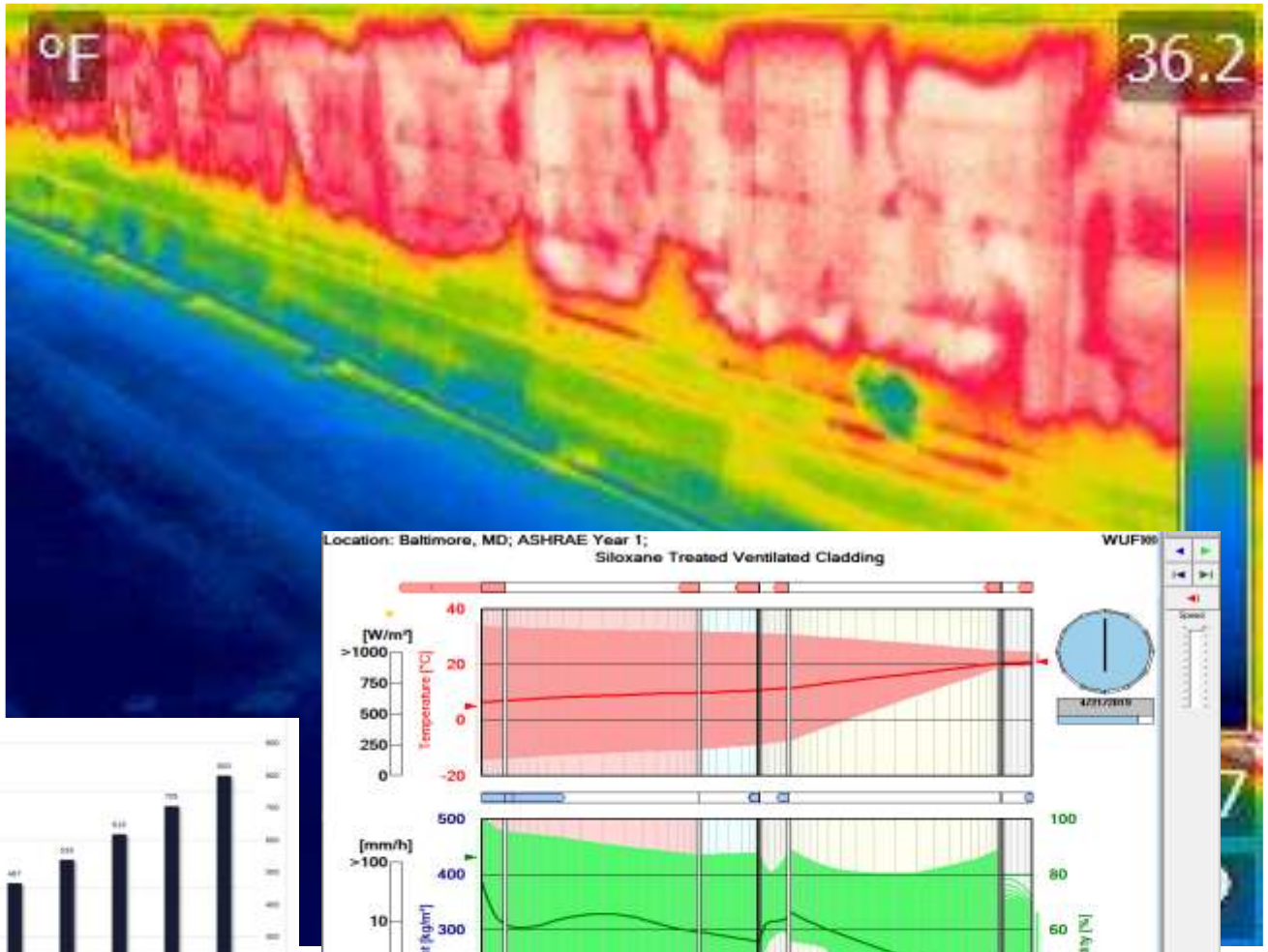
Past Projects

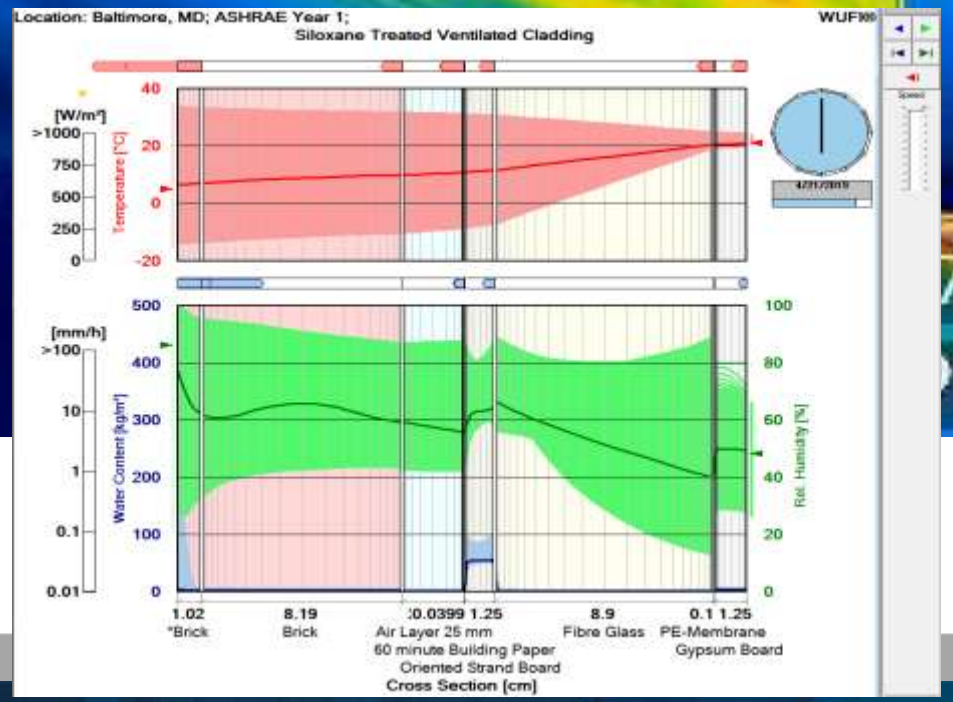
- *If completed in the last decade*

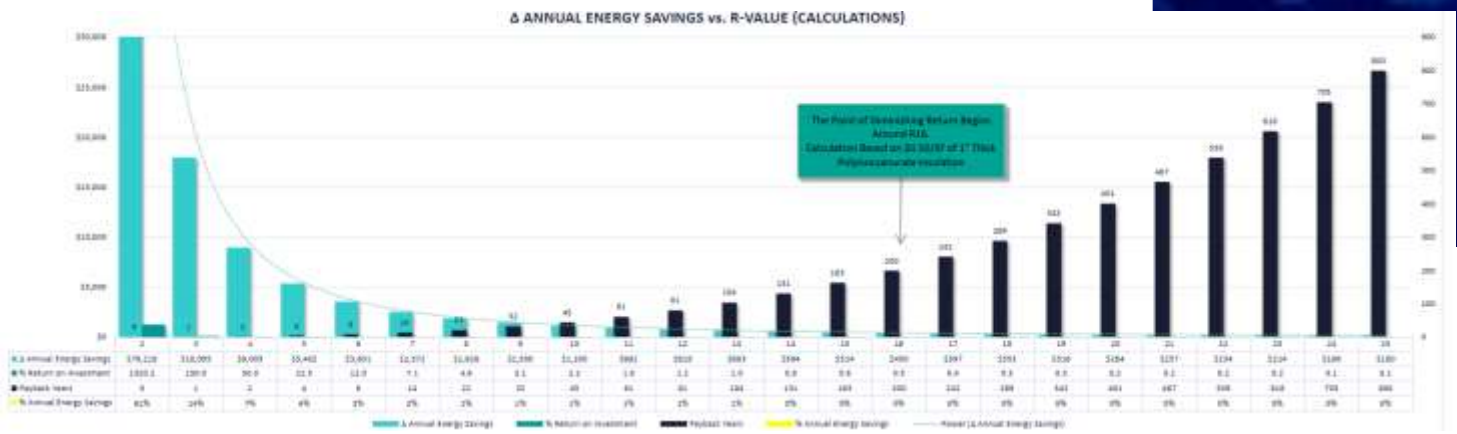
Resources

Third Party Consultants

- *Condensation Analysis - **WUFI Modeling***
- *Thermal Imaging – walls and roof*
- *Energy Modeling*



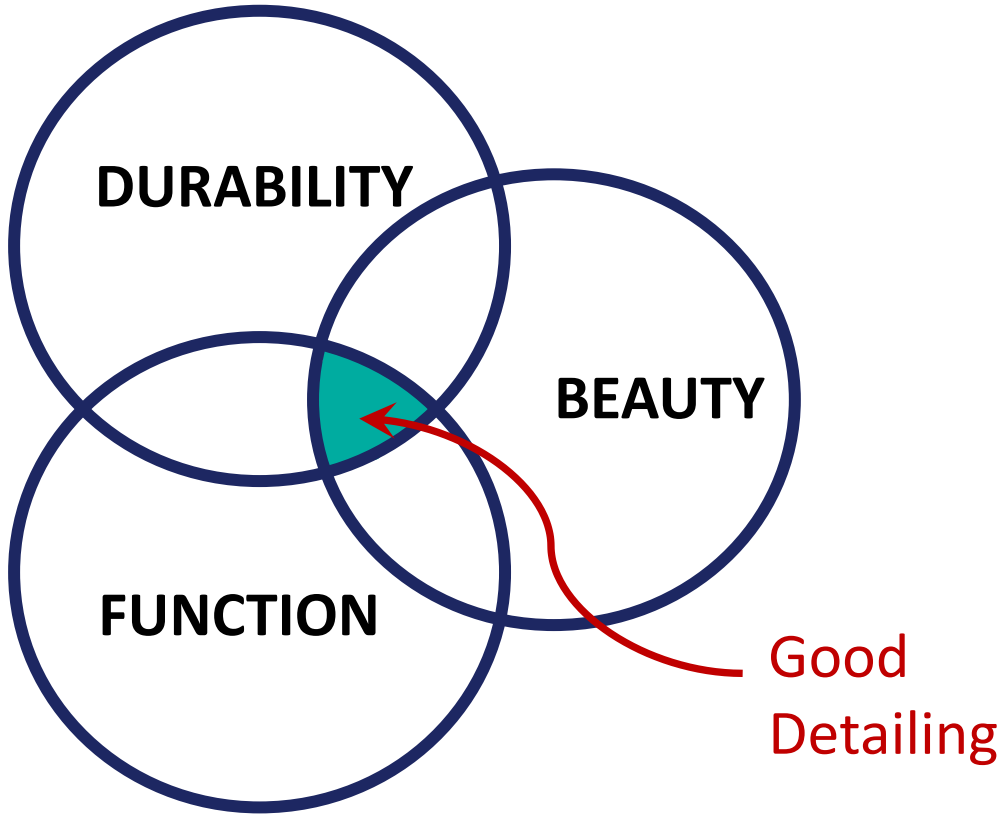




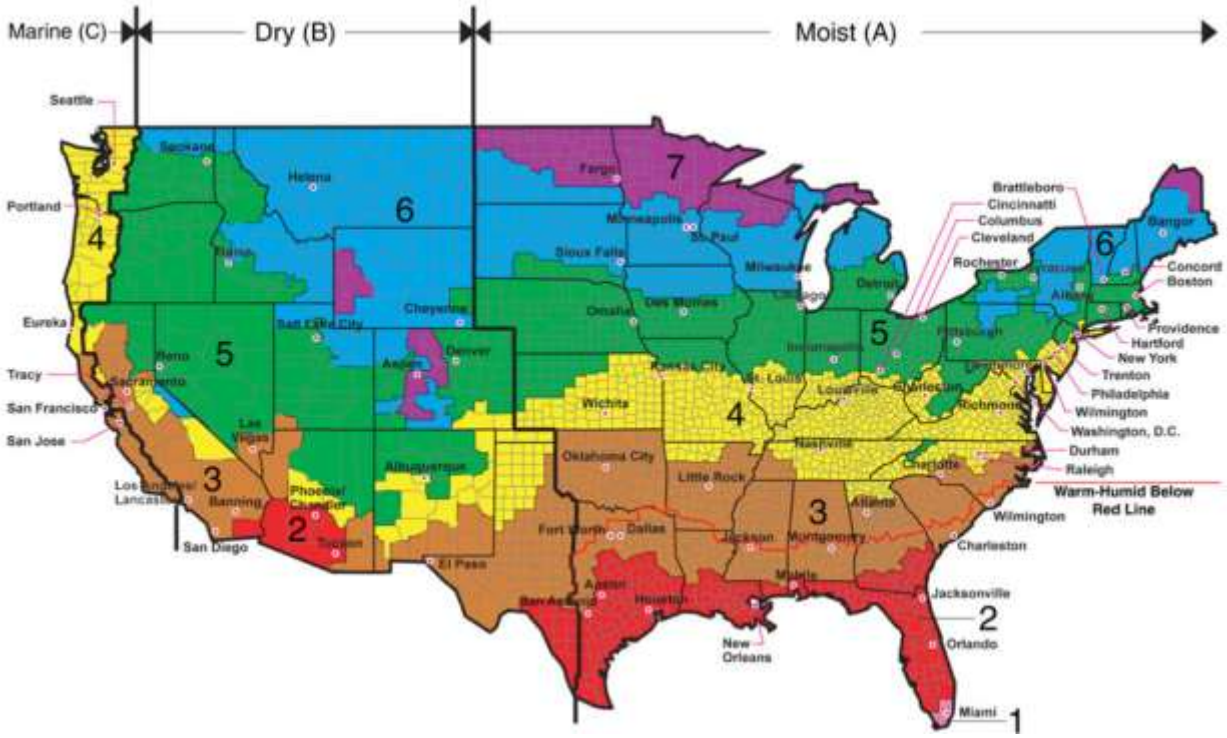
Considerations

Good Detailing Must Consider:

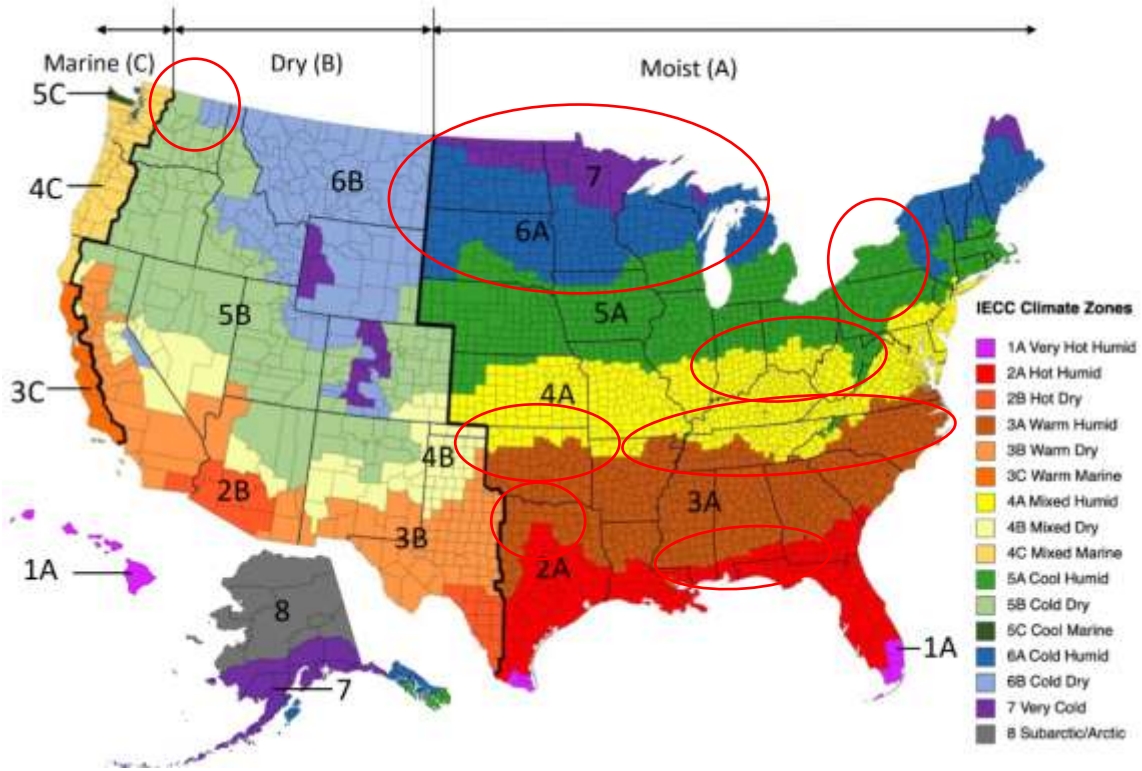
- *Site, orientation*
- *Building height, shape*
- *Environmental influences*
- *Climate Zone*
- *Occupancy*
- *Operations*
- ***Building Codes***
  - ***IBC, IECC, etc.***



Climate Zone

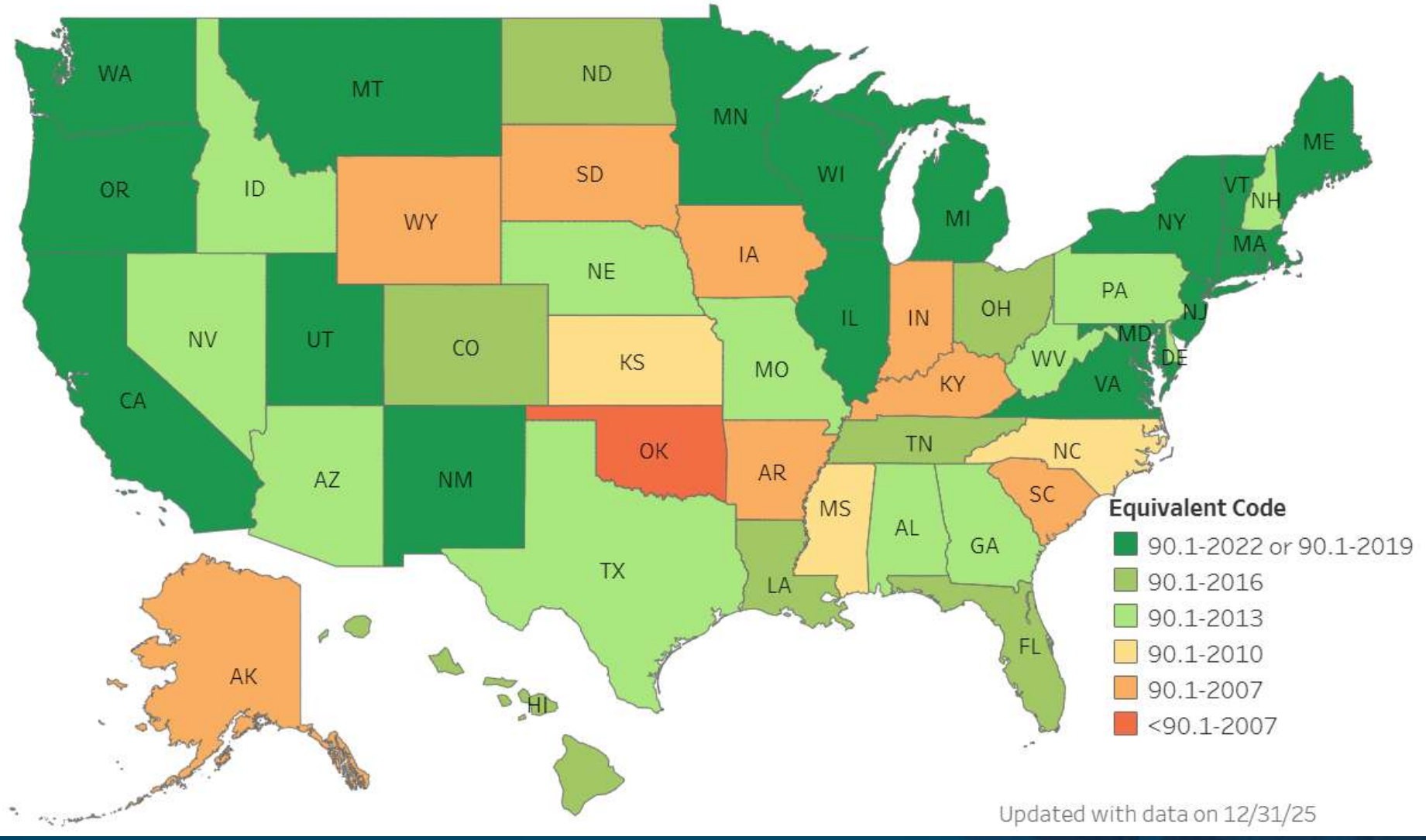


IECC – before 2021



IECC 2021

Energy Code Adoption – Commercial Buildings



https://www.energycodes.gov/state-portal

What Does the Building Code Say?

Code Impacts

International Building Code (IBC)

- *Construction Documents . . . **sufficient detail** **to demonstrate compliance** with the code.*
- *. . . Shall **provide details** of the exterior wall envelope as required including **flashing, intersections with dissimilar materials, corners, end details, control joints, intersections at roof eaves or parapets, means of drainage, water-resistive barrier and details around openings**.*
- *Exterior walls on **buildings of Type I, II, III, IV construction** **that are greater than 40 feet** . . . contain a **combustible water-resistive barrier** . . . contain **foam plastic insulation** . . . shall be tested in accordance . . . **NFPA 285***

NFPA 285 is a Test of a “Specific Wall Assembly”, NOT a ‘Materials’ test

Code Impacts

International Building Code (IBC)

- *Not fewer than one layer of* ***water-resistive barrier . . . with flashing*** *. . .*
- ***Vapor retarder materials*** *shall be classified . . . or an approved design using accepted engineering practice for* ***hygrothermal analysis****.* ***Appropriate climate zone*** *shall be selected*
- ***Flashing shall be installed at perimeters of exterior door and window assemblies, penetrations and terminations . . . with roofs, chimneys, porches, decks, balconies, . . .***

Code Impacts

International Energy Conservation Code (IECC)

- ***Commercial Buildings shall comply with . . .***
  - ***Prescriptive Performance . . . (R-value)***
  - ***Total Building Performance . . . (U-factor);*** *OR,*
  - *ASHRAE Standard 90.1*

Code Impacts

- *Building thermal envelope opaque assembles . . .*
  - *The opaque portions of the building thermal* ***envelope shall comply with the specific insulation requirements . . . based on climate zone***

Climate Zone	0 and 1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	ALL OTHER	GROUP R	ALL OTHER	GROUP R	ALL OTHER	GROUP R	ALL OTHER	GROUP R	ALL OTHER	GROUP R	ALL OTHER	GROUP R	ALL OTHER	GROUP R	ALL OTHER	GROUP R
Prescriptive R-value for Above Grade Walls																
Mass	R-5.7ci	R-5.7ci	R-5.7ci	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal framed	R-0 + R-10ci or R-13 + R-5ci or R-20 + 3.8ci	R-0 + R-10ci or R-13 + R-5ci or R-20 + 3.8ci	R-0 + R-10ci or R-13 + R-5ci or R-20 + 3.8ci	R-0 + R-12.6ci or R-13 + R-7.5ci or R-20 + 6.3ci	R-0 + R-12.6ci or R-13 + R-7.5ci or R-20 + 6.3ci	R-0 + R-12.6ci or R-13 + R-7.5ci or R-20 + 6.3ci	R-0 + R-12.6ci or R-13 + R-7.5ci or R-20 + 6.3ci	R-0 + R-12.6ci or R-13 + R-7.5ci or R-20 + 6.3ci	R-0 + R-15.2ci or R-13 + R-10ci or R-20 + 9ci	R-0 + R-15.2ci or R-13 + R-10ci or R-20 + 9ci	R-0 + R-17.3ci or R-13 + R-12.5ci or R-20 + 11ci	R-0 + R-17.3ci or R-13 + R-12.5ci or R-20 + 11ci	R-0 + R-17.3ci or R-13 + R-12.5ci or R-20 + 11ci	R-0 + R-21ci or R-13 + R-15.6ci or R-20 + 14.3ci	R-0 + R-24ci or R-13 + R-18.8ci or R-20 + 17.5ci	R-0 + R-24ci or R-13 + R-18.8ci or R-20 + 17.5ci
Wood framed and other	R-0 + R-12ci or R-13 + R-3.8ci or R-20	R-0 + R-12ci or R-13 + R-3.8ci or R-20	R-0 + R-12ci or R-13 + R-3.8ci or R-20	R-0 + R-12ci or R-13 + R-3.8ci or R-20	R-0 + R-12ci or R-13 + R-3.8ci or R-20	R-0 + R-12ci or R-13 + R-3.8ci or R-20	R-0 + R-12ci or R-13 + R-3.8ci or R-20	R-0 + R-12ci or R-13 + R-3.8ci or R-20	R-0 + R-16ci or R-13 + R-7.5ci or R-20 + R-3.8ci or R-27	R-0 + R-16ci or R-13 + R-7.5ci or R-20 + R-3.8ci or R-27	R-0 + R-16ci or R-13 + R-7.5ci or R-20 + R-3.8ci or R-27	R-0 + R-16ci or R-13 + R-7.5ci or R-20 + R-3.8ci or R-27	R-0 + R-16ci or R-13 + R-7.5ci or R-20 + R-3.8ci or R-27	R-0 + R-16ci or R-13 + R-7.5ci or R-20 + R-3.8ci or R-27	R-0 + R-27.5ci or R-13 + R-18.8ci or R-20 + R-14ci	R-0 + R-27.5ci or R-13 + R-18.8ci or R-20 + R-14ci
Perscriptive U-factor for Above Grade Walls																
Mass	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.071	U-0.037	U-0.037
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.055	U-0.055	U-0.049	U-0.049	U-0.049	U-0.042	U-0.037	U-0.037
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.151	U-0.151	U-0.151	U-0.151	U-0.151	U-0.151	U-0.032	U-0.032

Blue color represents changes within the IECC 2024

Code Impacts

International Energy Conservation Code (IECC)

- *A **continuous air barrier shall be provided throughout the building thermal envelope**.*
  - *Air barriers are not required in buildings located in Climate Zone 2B.*
  - *Other exceptions apply depending on use group, size, etc.*
- *Air barrier **joints and seams shall be sealed**, including sealing transitions in places and changes in materials . . .*
- ***Penetrations** of the air barrier **shall be caulked, gasketed, or otherwise sealed** . . .*

Code Impacts

International Energy Conservation Code (IECC)

- ***Air Barrier Materials***
  - *Materials with an **air permeability not greater than 0.004 cfm/ft²** under a pressure differential of 0.3 inch water gauge (75 Pa)*

- ***Air Barrier Assemblies***
  - *Assemblies of materials and components with an average **air leakage not greater than 0.04 cfm/ft²** under a pressure differential of 0.3 inch of water gauge (75 Pa)*

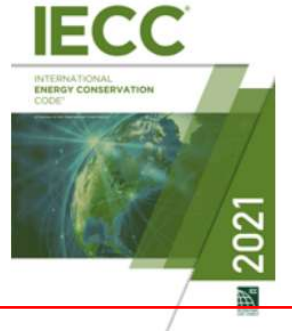
Code Impacts

International Energy Conservation Code (IECC)

- *Building envelope performance verification*

- *The installation of the **continuous air barrier shall be verified by the code official**, a registered design professional or approved agency in accordance with the following:*
  - *A **review** of the construction documents . . .*
  - ***Inspection** of continuous air barrier components and assemblies shall be conducted . . .*
  - *A **final commissioning report** shall be provided for inspections completed . . .*

Code Impacts



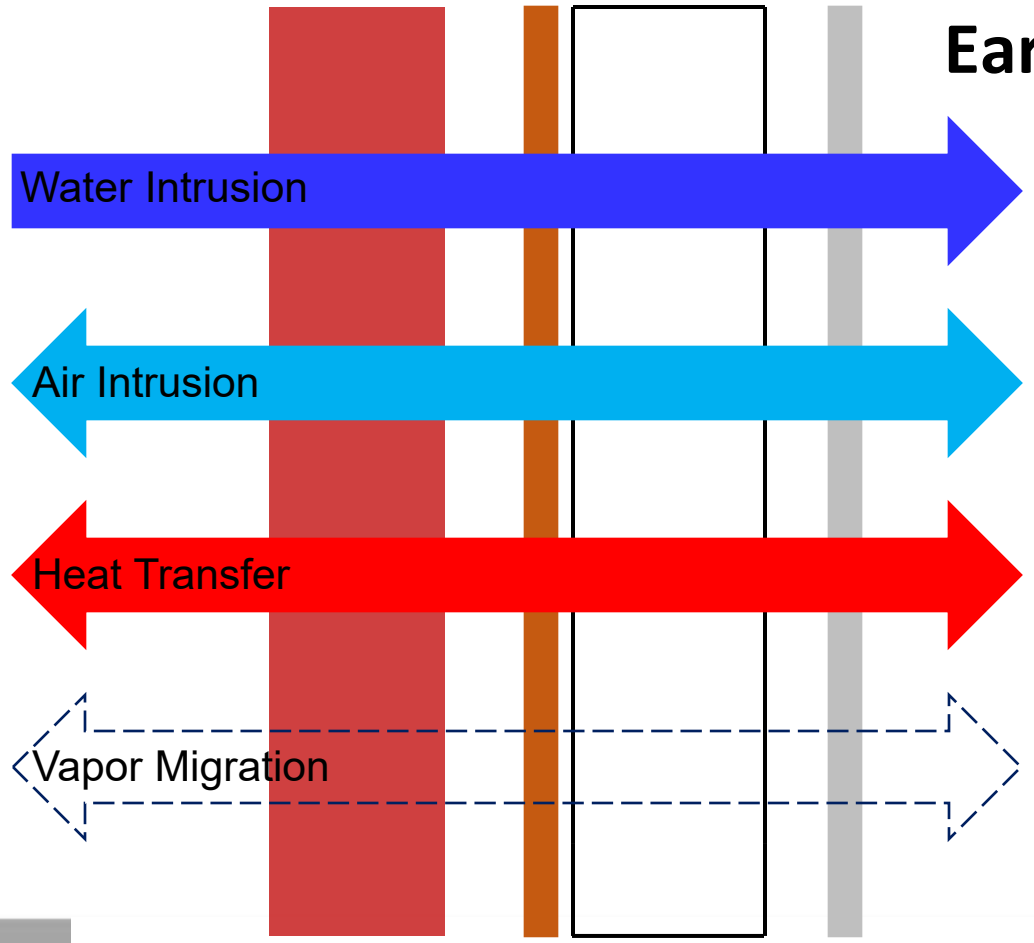
International Energy Conservation Code (IECC)

- *The **building thermal envelope** **shall be tested** . . . the measured **air leakage shall not exceed 0.40 cfm/ft²** . . . Pressure differential of 0.3 inch water gauge (75 Pa)*

Code Summary

- ***Continuous Water-Resistive Barrier (WRB)*** *– based on wall design and permeability*
  - *Drainage Plane – behind veneer / cladding*
  - *Incorporate Flashings – to daylight or at least drainage plane*
- ***Vapor Retarder*** *– Influenced by Climate Zone*
- ***NFPA 285 Fire Tested 'Wall Assembly' Complaint*** *– commercial type I, II, II, IV*
- ***Thermal Resistance (TR)*** *– R-value / u-factor*
  - *Based on Climate Zone*
- ***Continuous Air Barrier (AB)*** *– entire envelope perimeter – Roof to Wall to Foundation*
  - *Influenced by Climate Zone*
- ***Transition / Connectivity***
  - *Materials tested to = 0.004 cfm/ft², Assemblies to = 0.04 cfm/ft², Buildings to = 0.40 cfm/ft²*
- ***Building Air Leakage Performance Verification, Inspection, Building Thermal Envelope Testing***
  - *Air leakage shall not exceed 0.40 cfm/ft²*

Challenges to Address



Early Framed Wall

Cladding / veneer / siding

Exterior sheathing

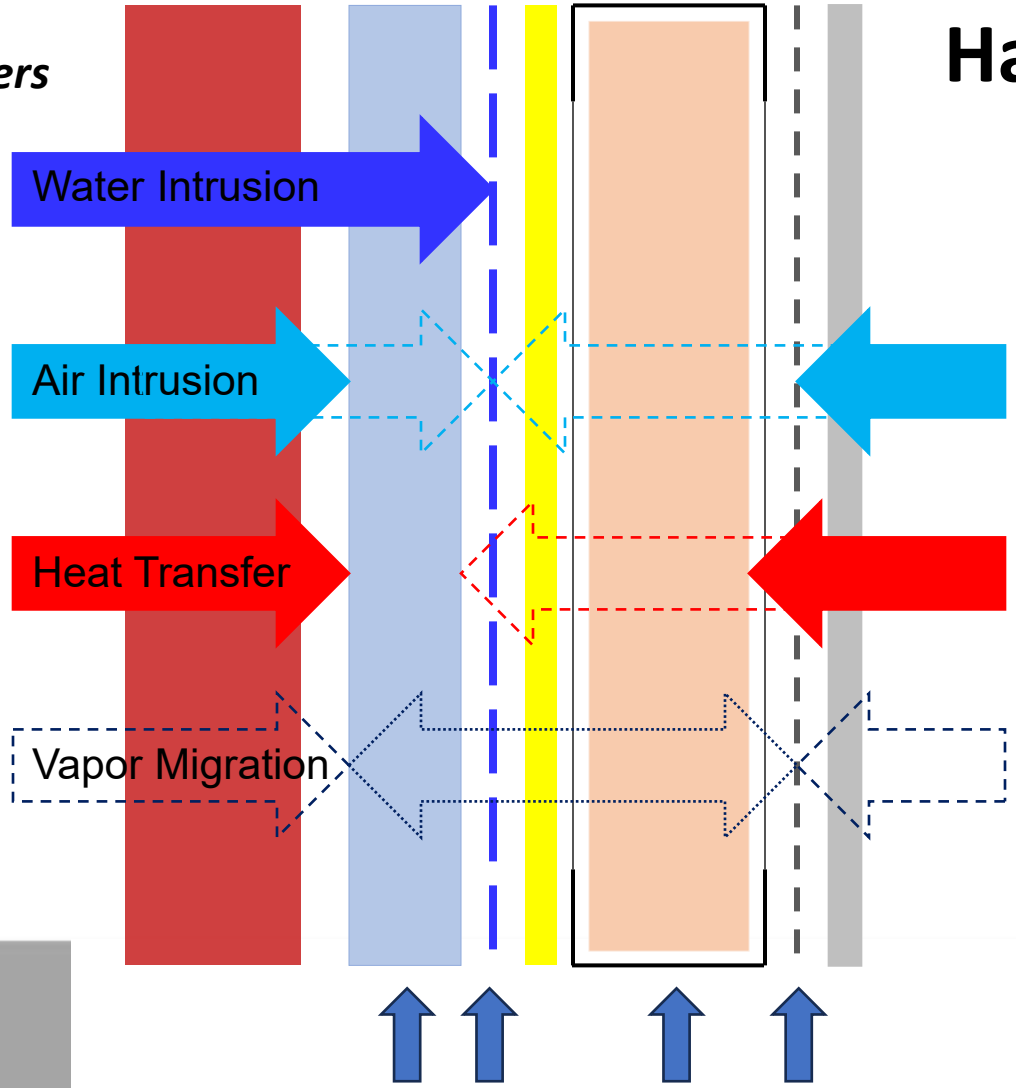
Wood framing

Interior sheathing / drywall

Primer / 2-coats latex paint

Conditions Have Changed

Control Layers

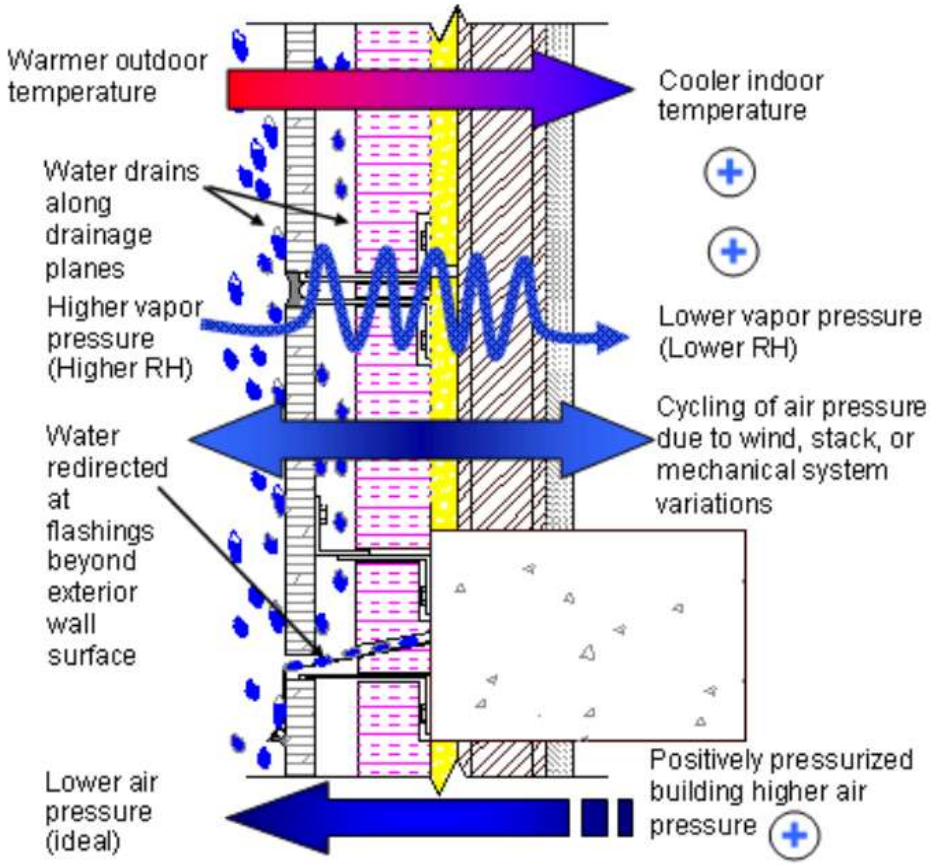


Has become rather complicated

Requiring:

- *Code Compliance*
- *Coordination*
- *Compatibility*
- *Sequencing*
- *Proper installation*
- *Testing compliance*
- *Long-term performance*

Conditions Have Changed

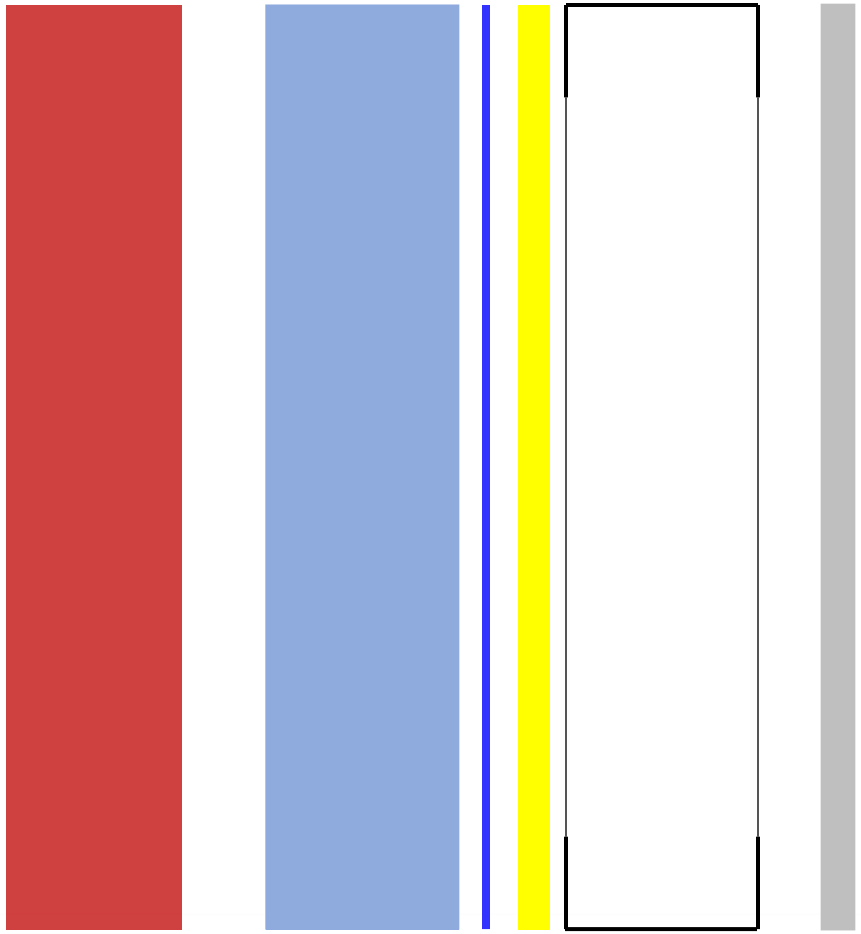


Has become rather complicated

Managing Physics:

- *High temperature to low temperature*
- *High humidity to low humidity*
- *Gravity drainage, flashing and weeping*

Building Science Suggest



Highest Performing Framed Wall Assembly

- *Eliminate cavity insulation*
- *Eliminate interior Vapor Retarder (VR)*
- *Change WRB to vapor barrier*
  - *Class I – non-permeable*
- *Increase CI to address thermal barrier requirements**

* CI Thickness determined by Performance Design Approach – *U*-factor – by Climate Zone

Objectives – Maximize Potential

- ***Illustrate details to bring clarity*** *to the construction of the building enclosure*
- ***Convey design intent*** *is desired to give contractors the chance to succeed and the building to be installed per the architect's design*
- ***Ultimately,*** *provide the Owner with a functional, durable, efficient, ON BUDGET building design which is compliant, constructible and sustainable*

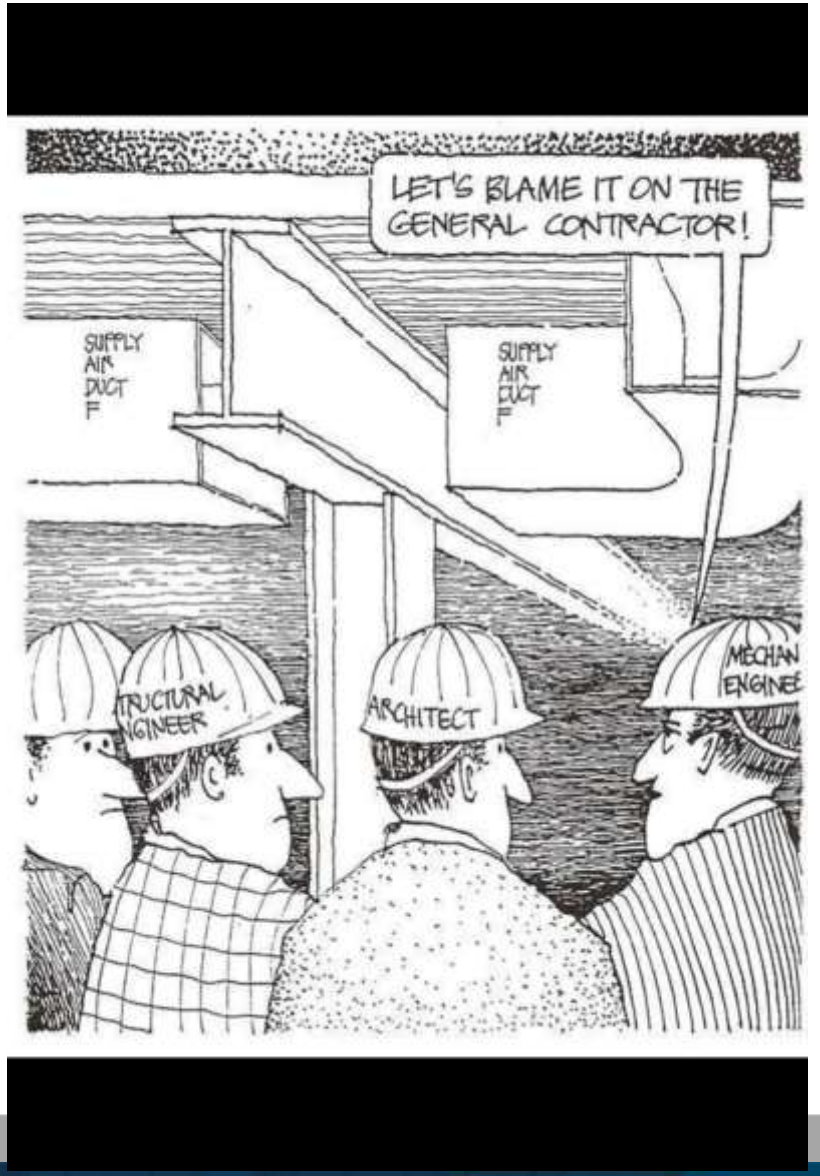
Who Represents the Owner?

In all its complexity, the answer is pretty simple –

Overriding Goal

- *Minimize Risk through comprehensive and well coordinated detailing*

Objectives – Minimizing Risk



No design is possible until the materials with which you design are completely understood

— Ludwig Mies van der Rohe —

AZ QUOTES

Mathematical Impact

What can we see? Multiple:

- *materials, components,*
- *transitions, combinations / configurations*

Do the math

- ***5*** *visible material components*
- *Specs – 3 Manufacturers listed =* ***15***
- *Assembled in any combination =* ***10's***
- ***As determined by who?***
  - ***The CM / GC and the sub-contractor***

Mathematical Impact

What can we see? Multiple:

- *materials, components,*
- *transitions, combinations / configurations*

Do the math

- ***15*** *visible material components*
- *Specs – 3 Manufacturers listed =* ***45***
- *Assembled in any combination =* ***100's***
- ***As determined by who?***
  - ***The CM / GC and the sub-contractor***

Mathematical Impact

What can we see? Multiple:

- *materials, components, flashings*
- *transitions, combinations / configurations*

Do the math

- ***500*** *visible material components*
- *Specs – 3 Manufacturers listed =* ***1500***
- *Assembled in any combination =* ***1000's***
- ***As determined by who?***
  - ***The CM / GC and the sub-contractor***

Of Critical Importance . . .

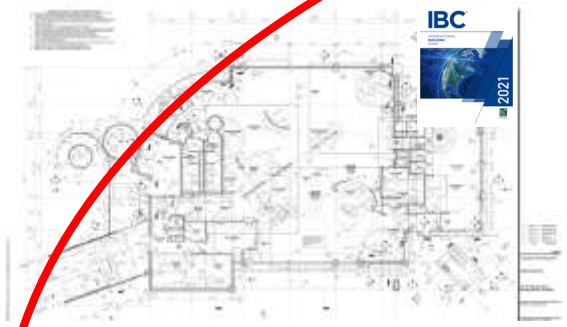
- *Protect underlying wall assembly against moisture intrusion and air, vapor infiltration*
- *Manage condensation potential*
- *Resist thermal transfer / bridging*
- *Reduce energy consumption*
- *Support sustainable design, construction, & operation*
- *Reduce environmental impact*
- ***Comply with current model building codes***

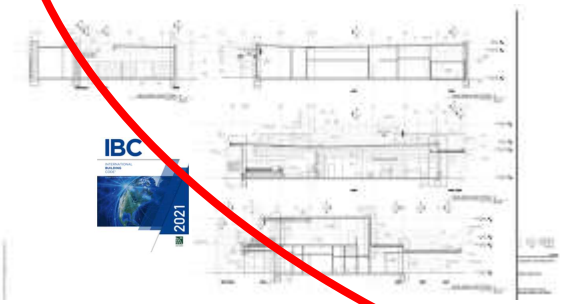
Opportunities

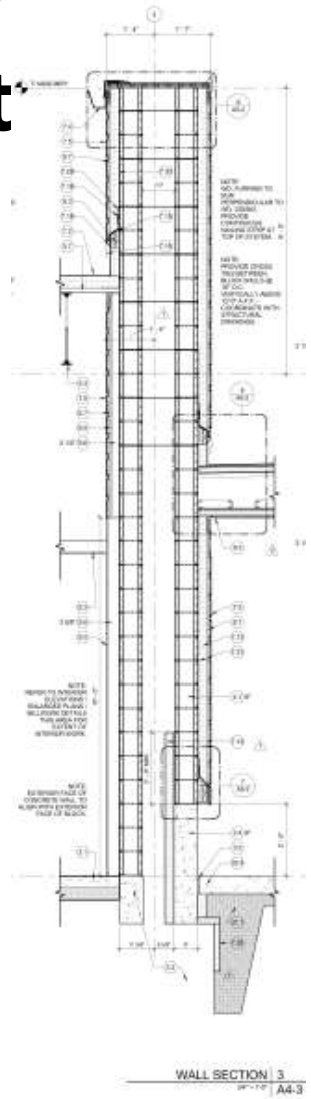
Look for areas of consolidation in material selections / performance attributes:

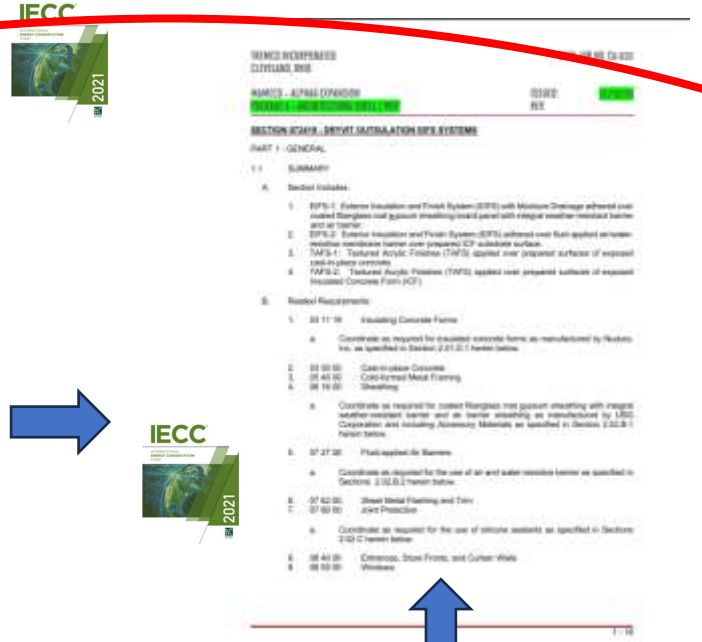
- *Identify materials that accomplish multiple tasks*
  - *One WRB / AB for the entire building, behind all veneers / claddings*
    - *Single source material, compatible and tested flashing materials, assemblies, installation, warranty*
- *Verify required code compliance testing – Performance and Compatibility*
  - *Air leakage for material, assembly and building*
  - *NFPA 285*

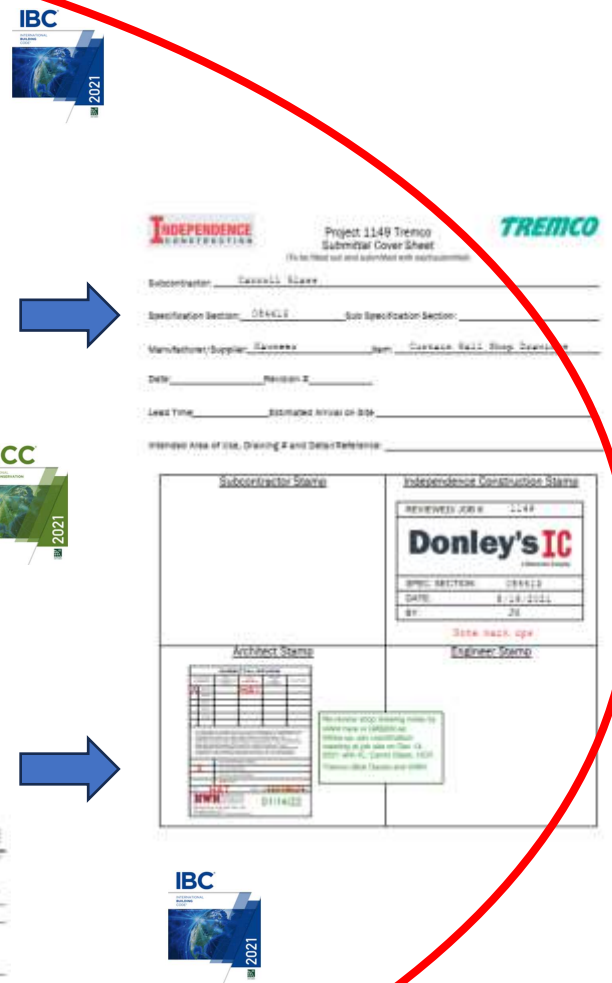
Process – Lets get











Which is the Detail?

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Principles of Detailing

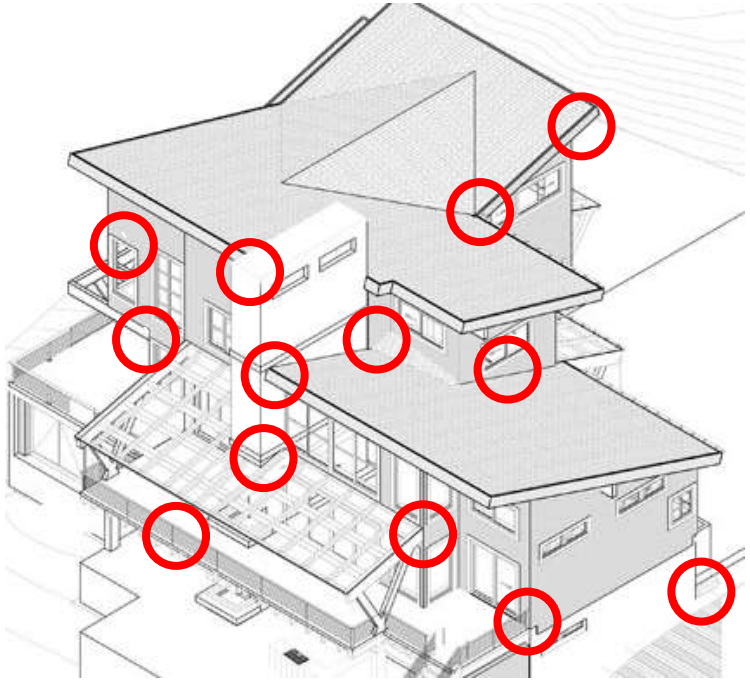
The What: do we detail? –

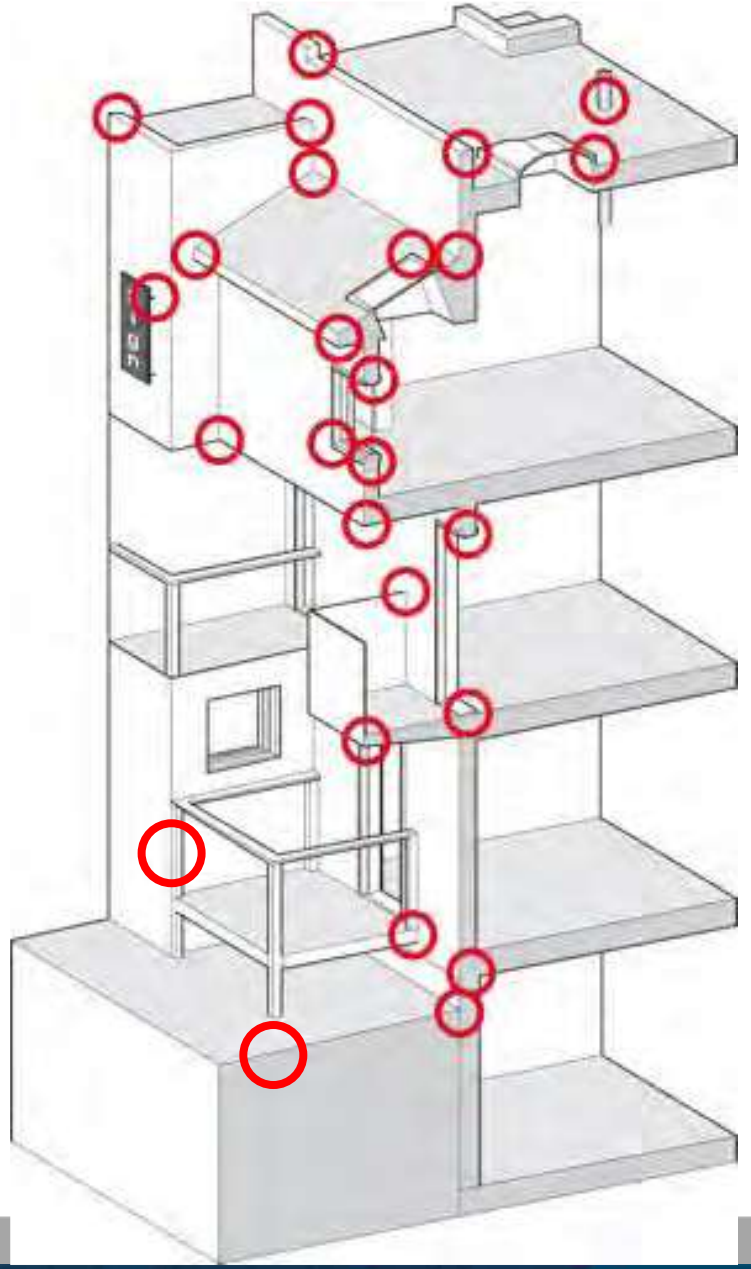
All of them

- "Complexity is the biggest challenge designers have to deal with when it comes to design."

  - Dr. John Straube

RDH BUILDING SCIENCE LABORATORIES



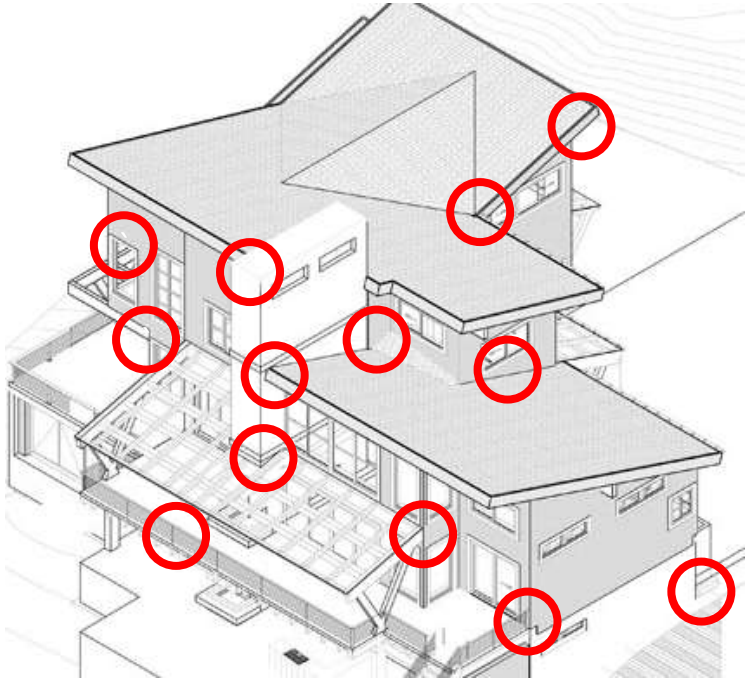


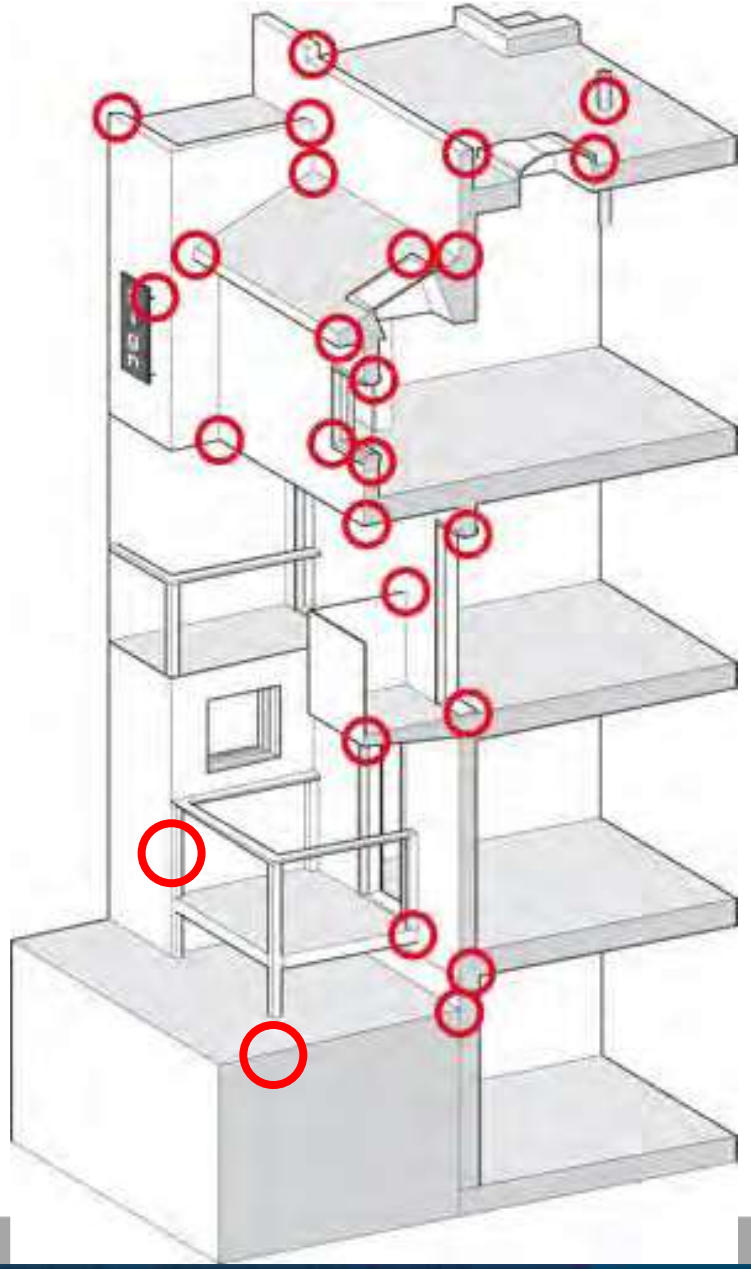
Principles of Detailing

The Why: do we detail?

- *If you do not show a way to construct/build within the Construction Documents,*

  - contractors will just make it up in the field!

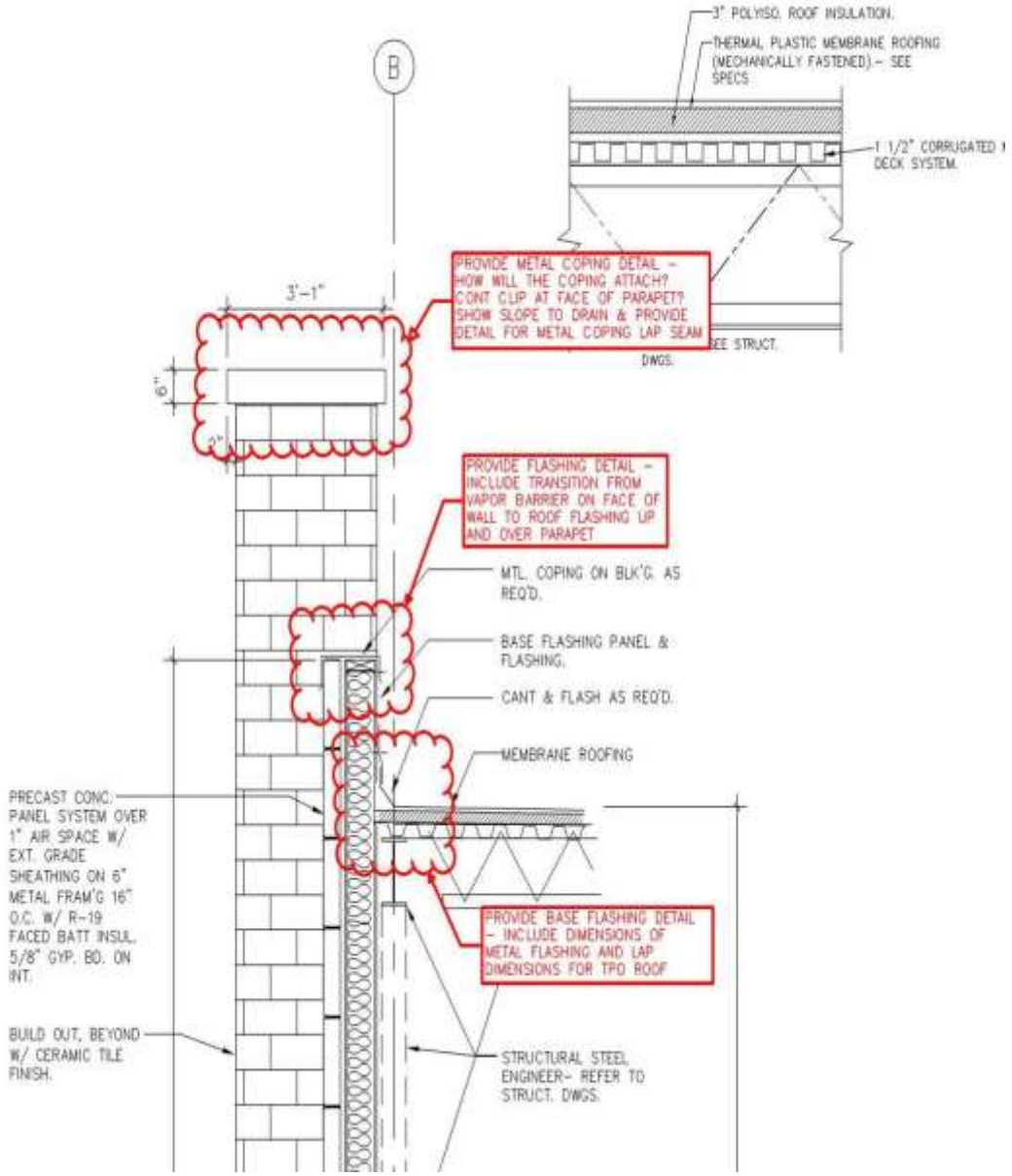




Principles of Detailing

Integrity and Continuity of Code Compliance

- *Water-Resistive Barrier*
- *Flashing*
- *Moisture Resistance / Drainage Plane*
- *Vapor Retarder*
- *Air Barrier*
- *Thermal Barrier – i.e. Continuous Insulation (CI)*
- *Compliance Testing – Fire, Air Leakage*



Principles of Detailing

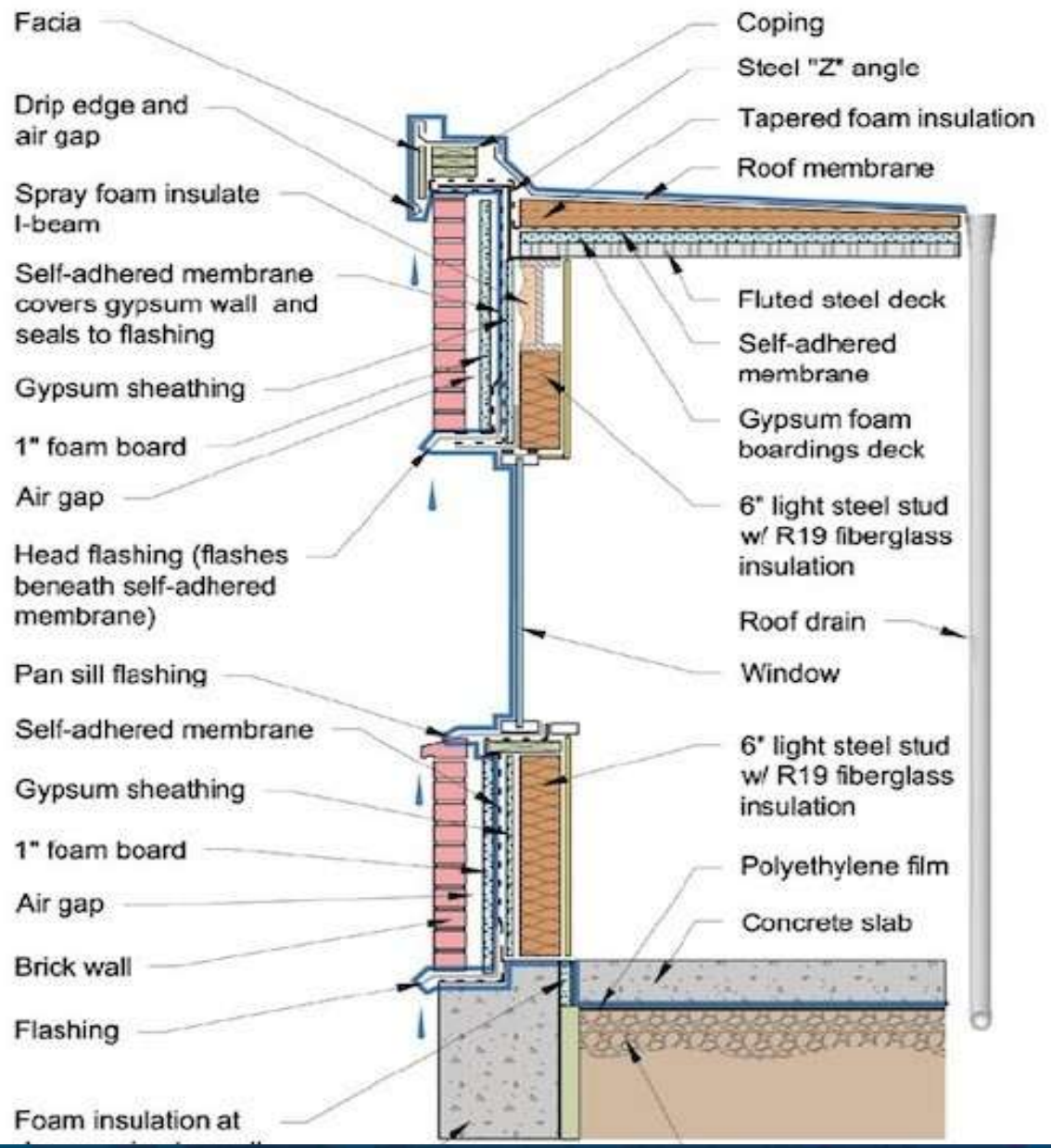
Air Resistance

Moisture Resistance

Connectivity / Transitions

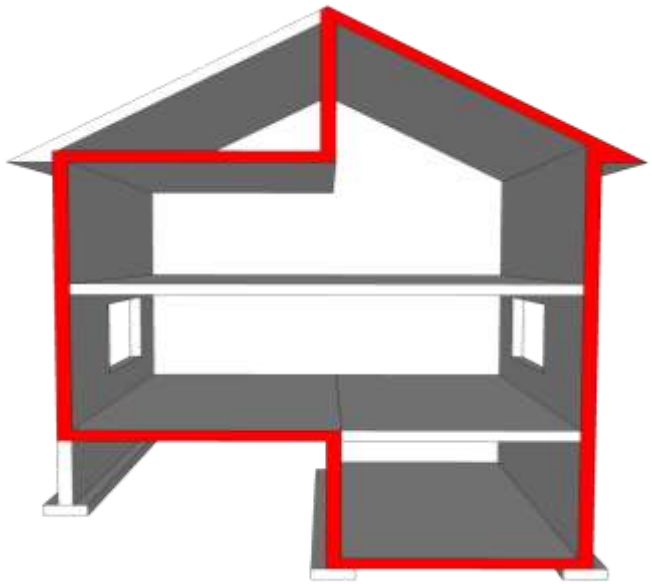
Drainage Paths

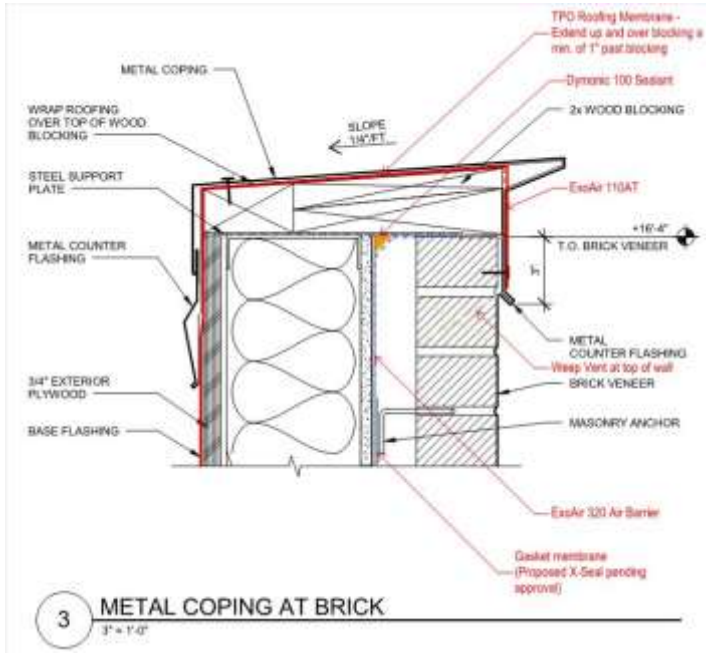
Flashing / Weeping

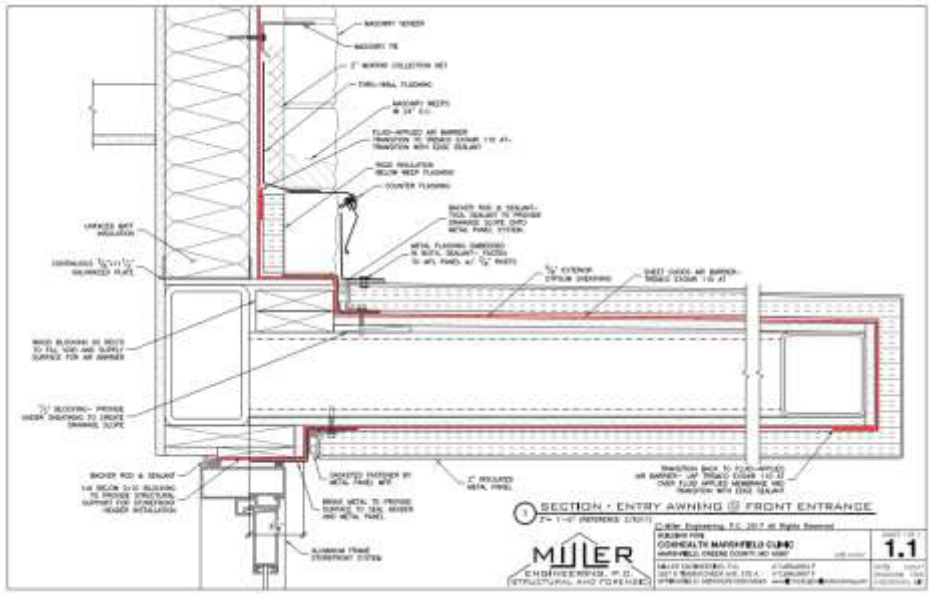


Principles of Detailing

Continuous Air Barrier “Red Pen Test”



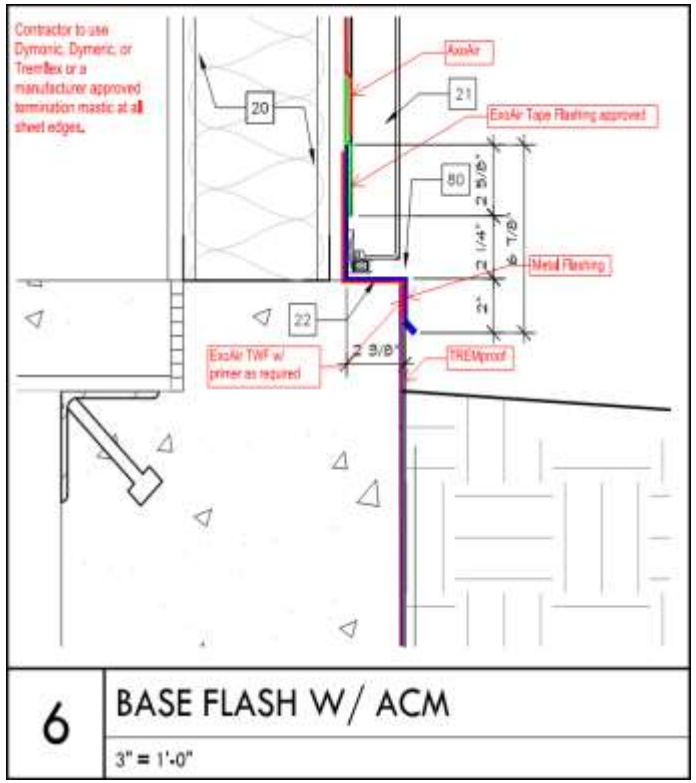




Principles of Detailing

Sequencing

- *Think about proper shingle lapping of materials*
- *Think about how multiple trades will "NEED" to interface*



Principles of Detailing

Sequencing

- *Think about proper shingle lapping of materials*
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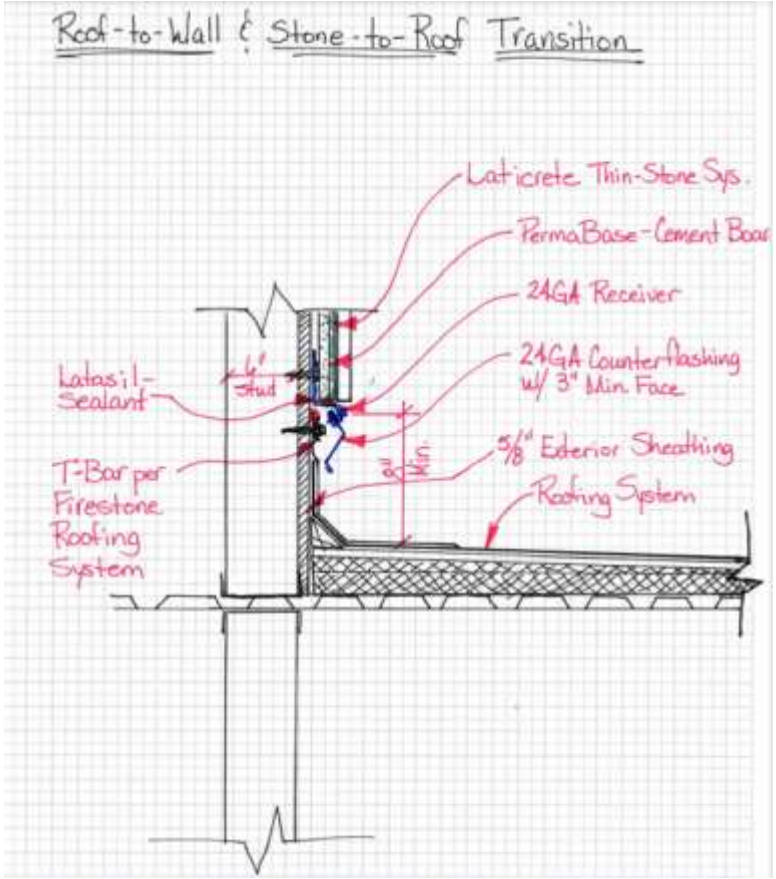
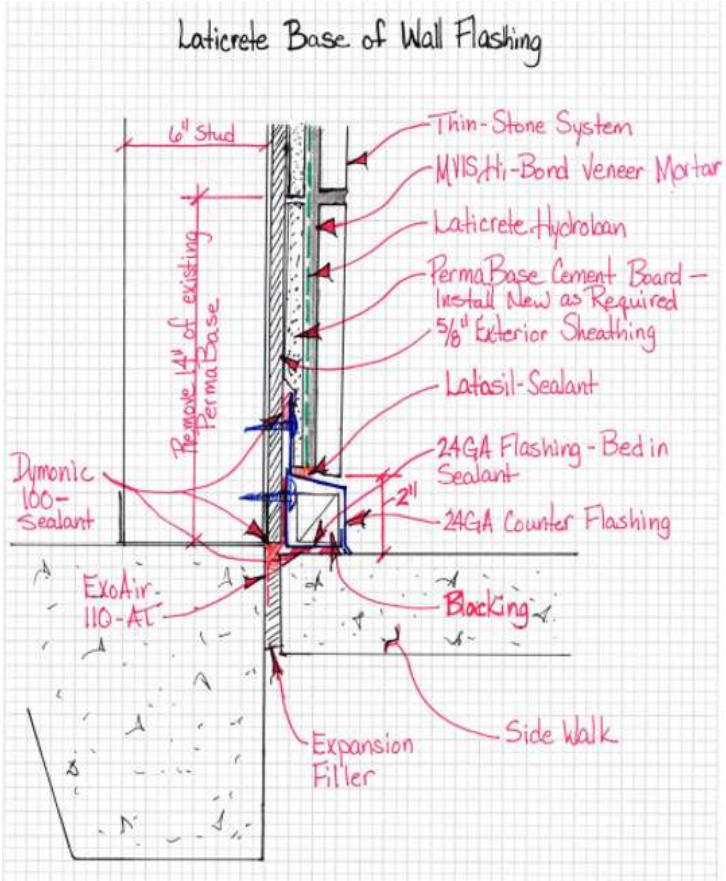
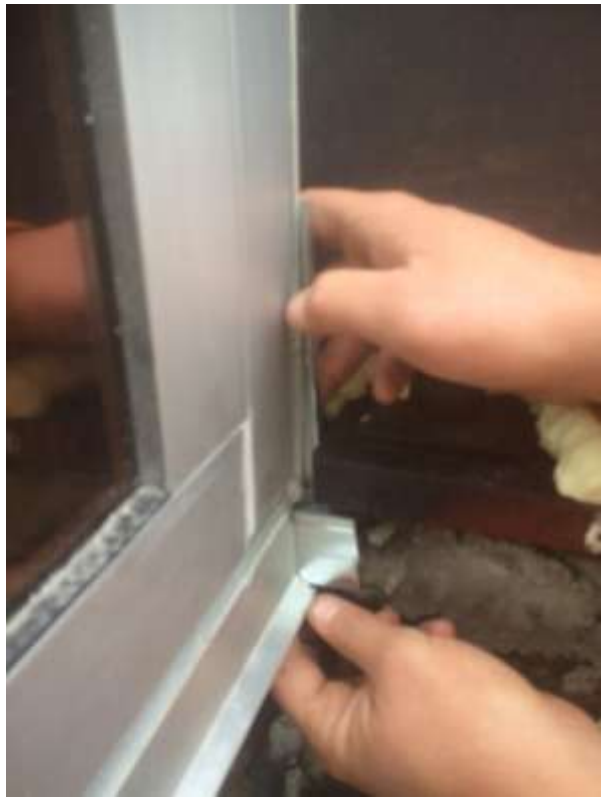




Principles of Detailing

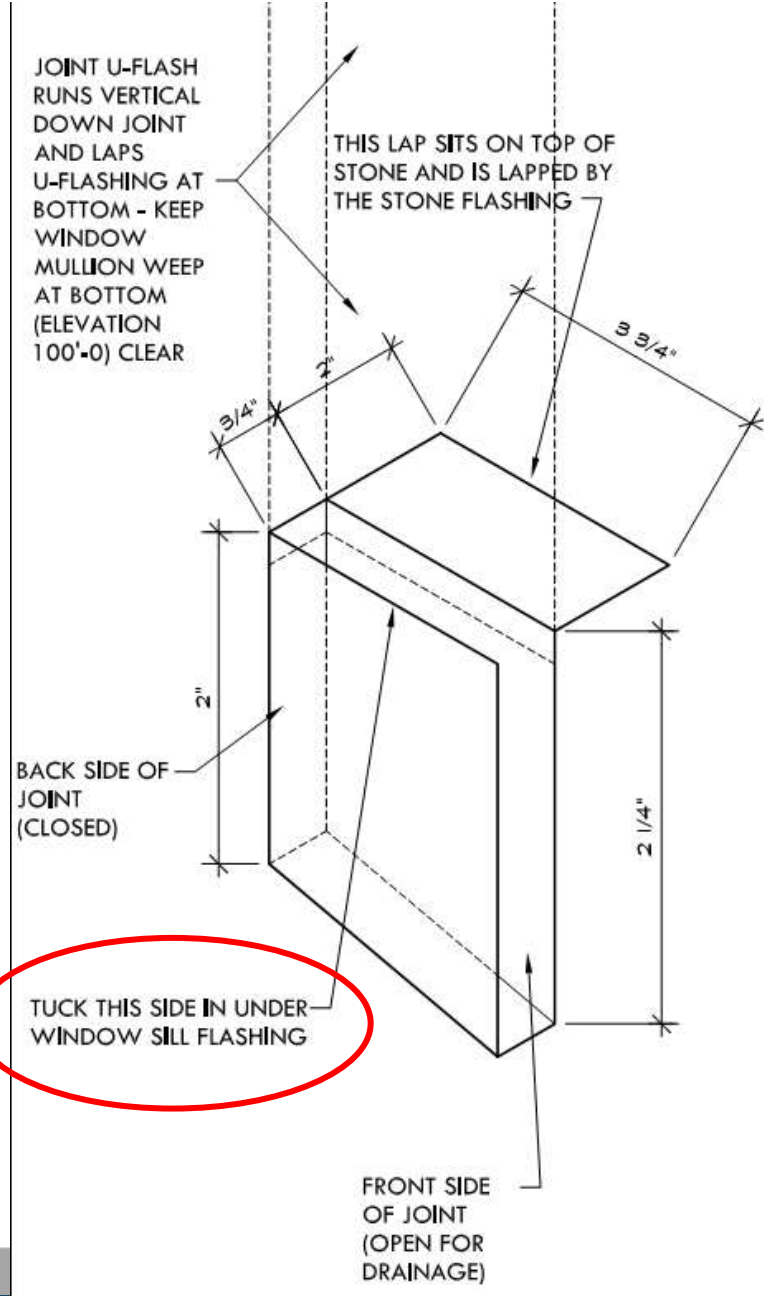
Functional Tolerance

- *Materials, finishes, adjacencies*
- *Recognize the size of a* ***hand / tool and angle of approach***
- ***Be realistic***



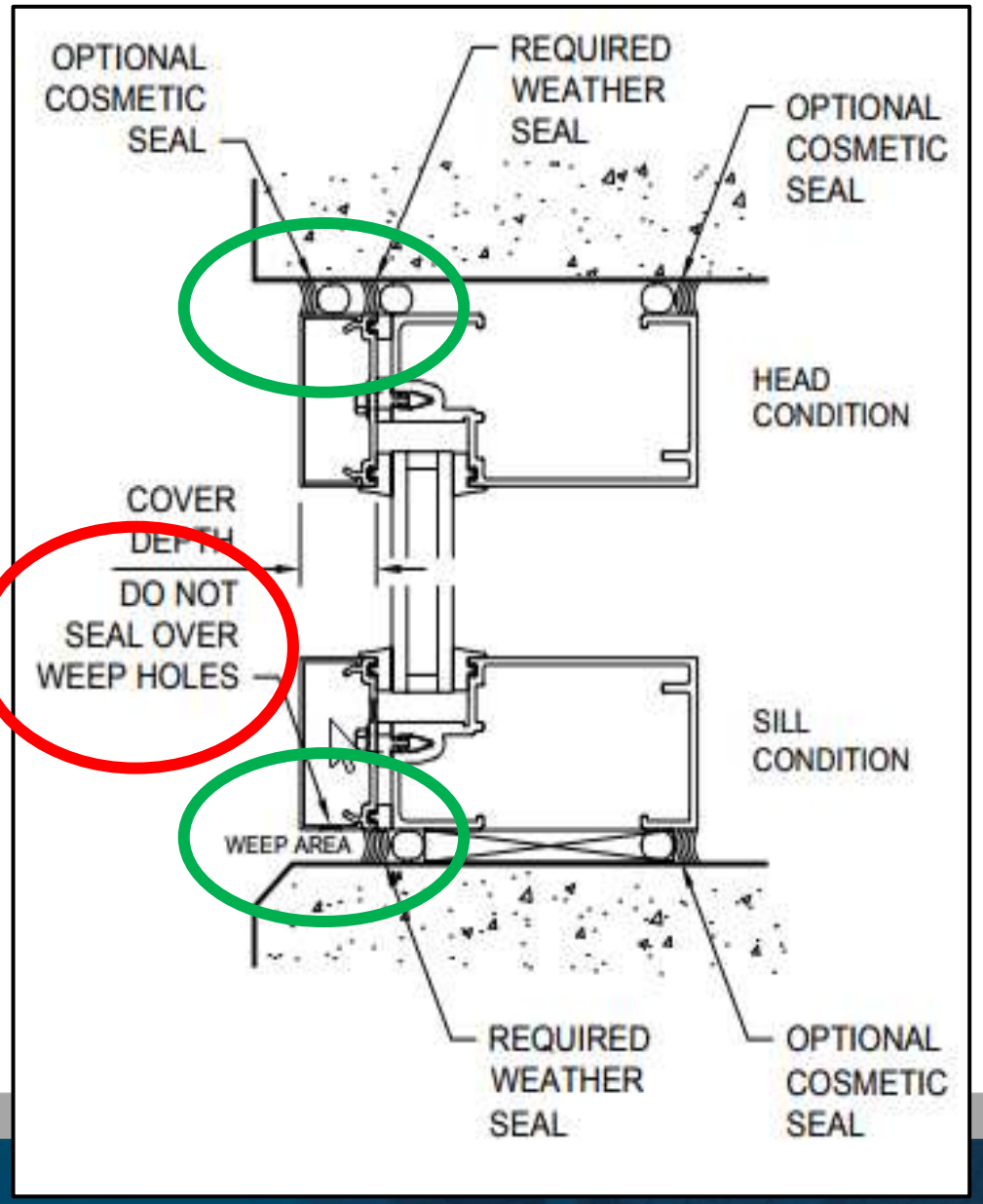
Principles of Detailing

Functional Tolerance



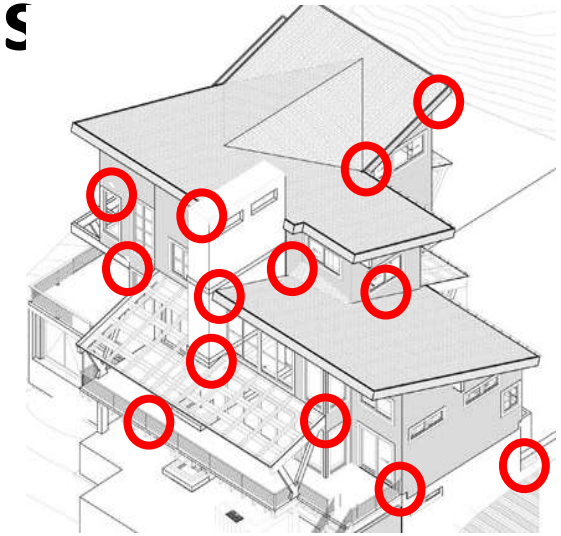
Principles of Detailing

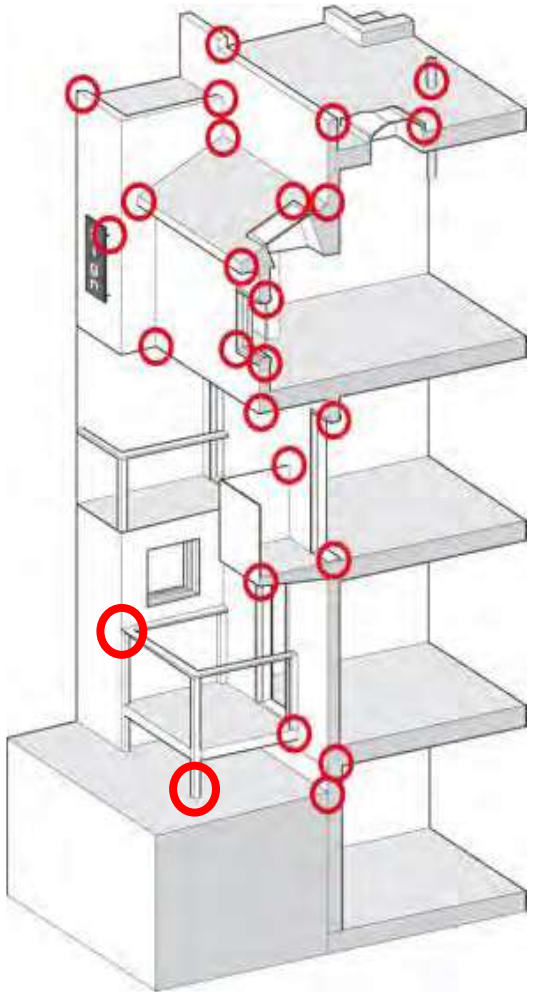
Component Complexity and Performance Attributes



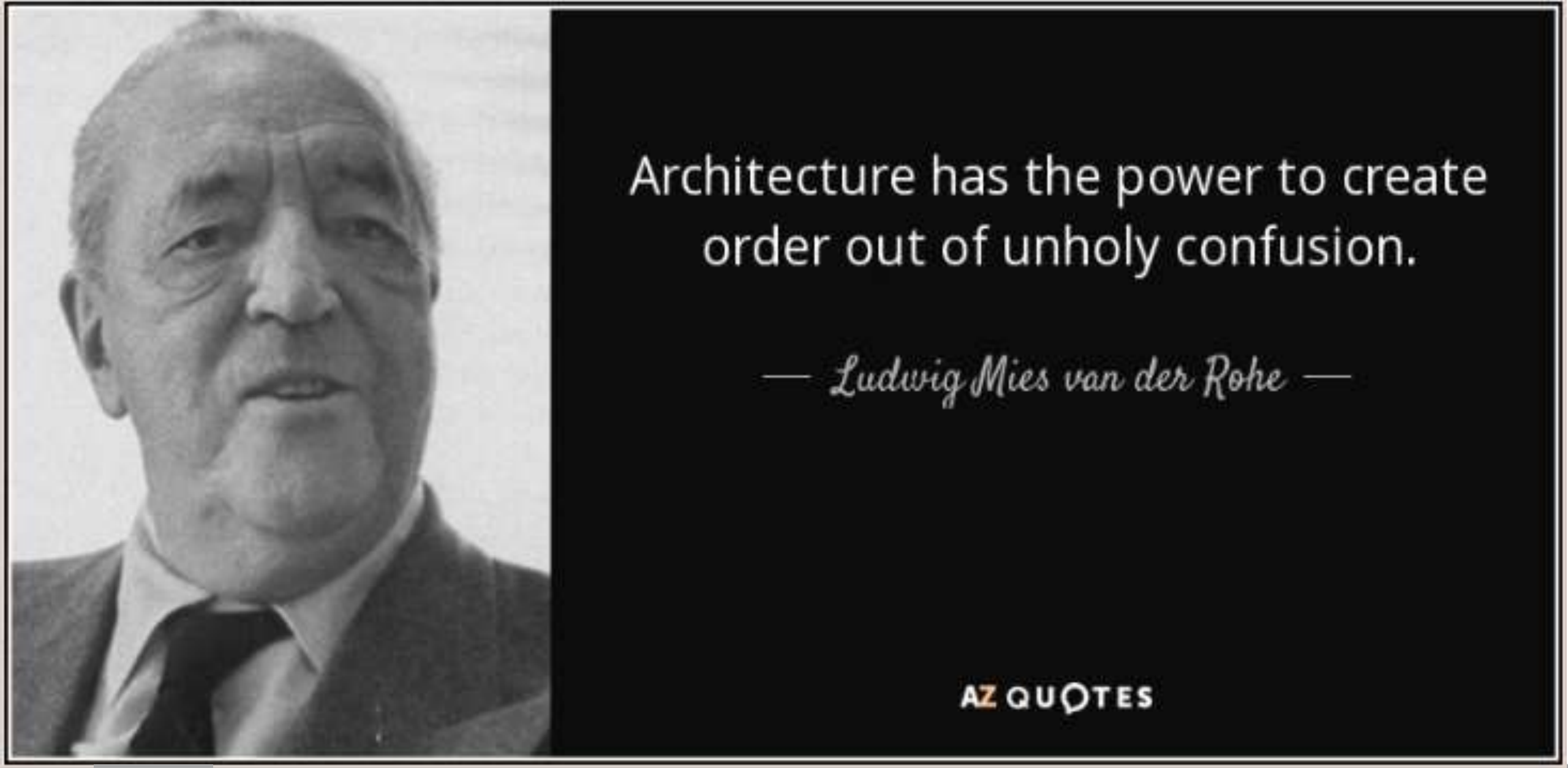
Drawings curtesy of Kawneer 1600 System [2] Installation Directions

Critical Interfaces and Transitions





- ***Roof / Wall***
  - *Maintain Continuous Air Barrier (Red Pen Test)*
- ***Floor to Floor***
- ***Wall Penetrations***
- ***Window, Doors, Curtain Wall, Storefronts***
  - *Comply with Materials / Assemblies cfm/sf² IECC Energy Code*
- ***Base of Wall to Foundation***
- ***Foundation in General***
  - ***Footing / Interior Slab / Blind Side Waterproofing / Perimeter Drain Tile to Sump***
- ***Seismic and Expansion Joints***



A Final Thought

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Detail for Risk Mitigation and Assignment of Responsibility?

"Design Intent" pushes compliance, compatibility and performance responsibility down to General Contractor in a traditional design-bid-build delivery model

- *Who is 'making' the material decisions and what is their expertise?*
  - *A typical spec lists 3 options for each individual envelope barrier material creating 100's of combinations*
- ***Will the Materials that show up on site be***
  - ***In Compliance with Code Testing and Performance?***
  - ***Coordinated, Compatible, Properly Sequenced and Assembled, Provide Long-Term Performance***
  - ***Can a more Comprehensive Warranty be Delivered?***

Air Impacts all 4 Control Layers of the Building Envelope

Air, Water, Thermal, Vapor

- ***Air*** *carries* ***Water***
- *Air transports temperature and derates* ***Thermal*** *Resistance*
- *Air carries* ***Vapor***

- ***Air Barrier Materials***
  - *Air permeability not greater than* ***0.004 cfm/ft²***
- ***Air Barrier Assemblies***
  - *Air leakage not greater than* ***0.04 cfm/ft²***
- ***Building Thermal Envelope***
  - *Air leakage shall not exceed* ***0.40 cfm/ft²***

Detail for Responsibility and Risk Mitigation

- *Determine your objectives early in process*
- *Solve and detail for compatibility and testing through consideration of:*
  - *Specifications built on Basis of Design;*
  - *Coordinate around a Single Source Manufacturer to assure compatibility*
  - *Identify Warranty Intent, Enhancements and Term*
    - *I.e. Single Sourced Manufacturer Warranty*
  - *Develop a Division 1, 01 83 16 – Building Enclosure Performance Requirements section outlining design intent*
  - *Do not leave available and complimentary enhanced / extended warranty terms on the table just to facilitate an inherent need for multiple manufacturer's listed*
  - ***Specify Up to Available High Performance, Not Down to perceived compatibility***

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Building Enclosure Architectural Details – Conveying Construction Drawing Clarity

Robert Dazel, AIA, CSI, LEED GA

Tremco Construction Products Group Inc.

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