Advancements in EIFS for Today's Building Envelope Design Challenges

Thursday, May 24, 2018

AIA Learning Units - 1.0 CEU's

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Learning Objectives

1. Re-introduce Exterior Insulation and Finish Systems (EIFS) composition and versatility through examination of component layer functions, system choices with an emphasis on system performance.
2. Introduce new technology and design enhancements related to impact resistance, durability and specific environmental performance needs.
3. Explore the full range of options for EIFS assemblies for commercial buildings.
4. Understand building envelope wall code complexity such as continuous insulation requirements, air/water-resistive barrier integration and fire testing performance and how a single sourced EIFS cladding can easily comply.

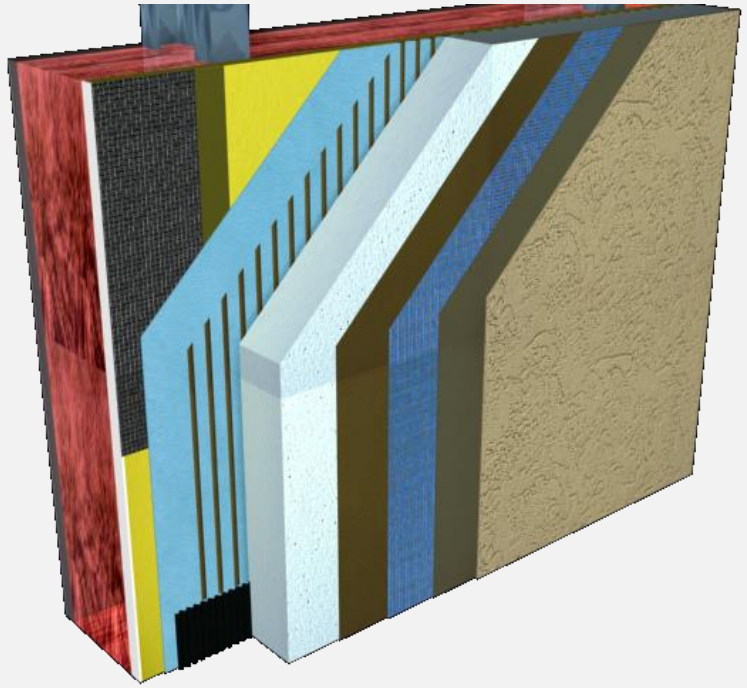
Goals and Objectives

- Advancements in EIFS
  - Fluid Applied Air/Water-Resistive Barrier Coatings & Flashings
  - Machine Base-Coated Components
  - High-Impact Assemblies
  - Water-Repellant Hydrophobic Chemistry
  - High Performance UV Resistant Colorants
  - Engineered Systems
  - Pre-Fabricated EIFS Panels
  - Code Compliance
- Quality Control / Assurance Program

EIFS Composition

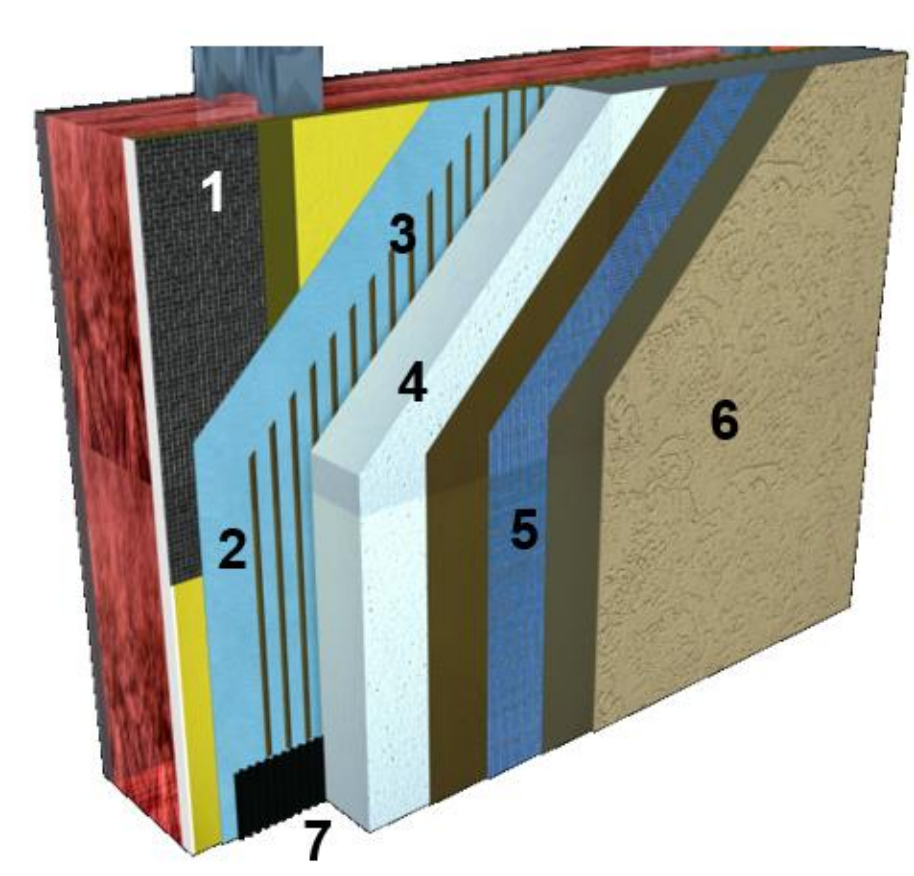
Exterior Insulation and Finish Systems (EIFS)

- ***Continuous Insulation (CI)*** *and* ***AWRB*** are integral *components* of the 'system'
- Single-Sourced Solution for:
  - Building and Energy Code Compliance
    - Flashing
    - Air & Water-Resistive Barrier
    - Continuous Insulation (CI)
    - Fire – **NFPA 285**
  - Integral Color / Texture Finish
  - Any Architectural Style & Aesthetic
  - Comprehensive Warranty



Exterior *Continuous Insulation* Cladding

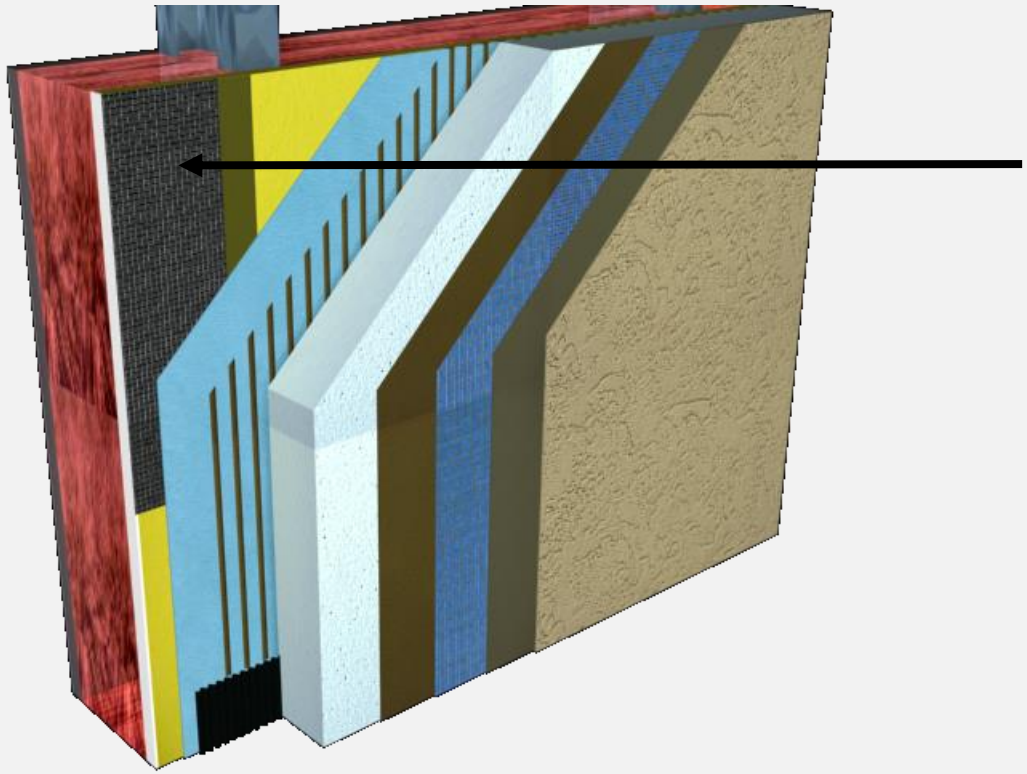
EIFS Composition



EIFS With Drainage

1. Fluid applied flashing
2. Fluid applied air/water-resistive barrier (AWRB)
3. Vertical notched Adhesive / Drainage Plane
4. Expanded polystyrene insulation (EPS)
5. Reinforcing Mesh embedded in Base Coat
6. Textured Finish
7. Weep / Drainage Accessories

EIFS with Drainage



Critical Components:

Flexible Flashing Material

- “Fluid” applied with reinforcing mesh scrim
- Seamless assembly
- Protects against moisture penetration into wall structure
- Flexible - accommodates all shapes, sizes, conditions

Flash Wall Penetrations / Integrate In-fill Components

Flashing Rough Openings

Flash in rough openings

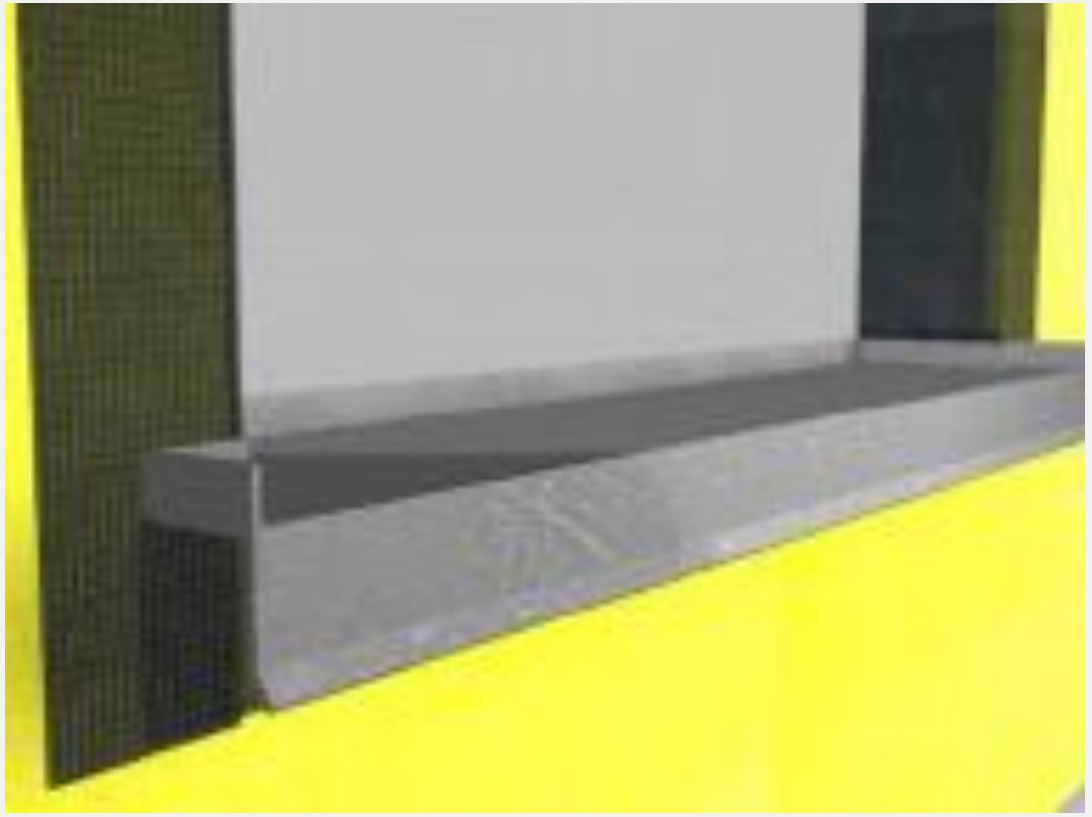
All penetrations – windows, doors, louvers, etc.

Flashing Wall Penetrations

- Electrical boxes / conduits / Scuppers
- PTAC / HVAC / Plumbing
- Expansion Joints – Floor line / Building
- Change of substrate

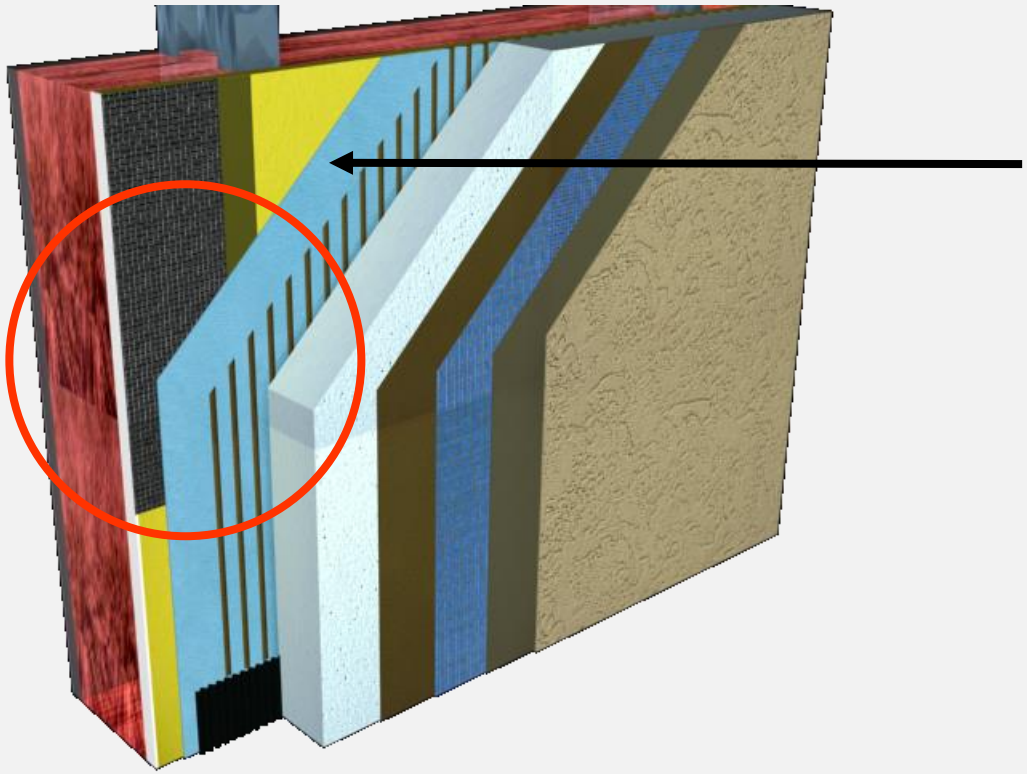
Flash all Penetrations / Joints / Transitions

Integrating Metal Flashings



Flash in the Flashings – Head & Sill Pan

EIFS with Drainage



Meet the intent of the code

Critical Components:

Fluid Applied Air/Water-Resistive Barrier

- Seamless air & water-resistive barrier
- Protects against moisture penetration into wall structure
- Permeable and non-permeable versions
- **For use “Behind all Claddings”**

Chemical Bond – Either layer can come first

Treating Board Joints & Fasteners

Apply Air / Water-Resistive Barrier

Integrate Flashing & Barrier

Either layer can come first

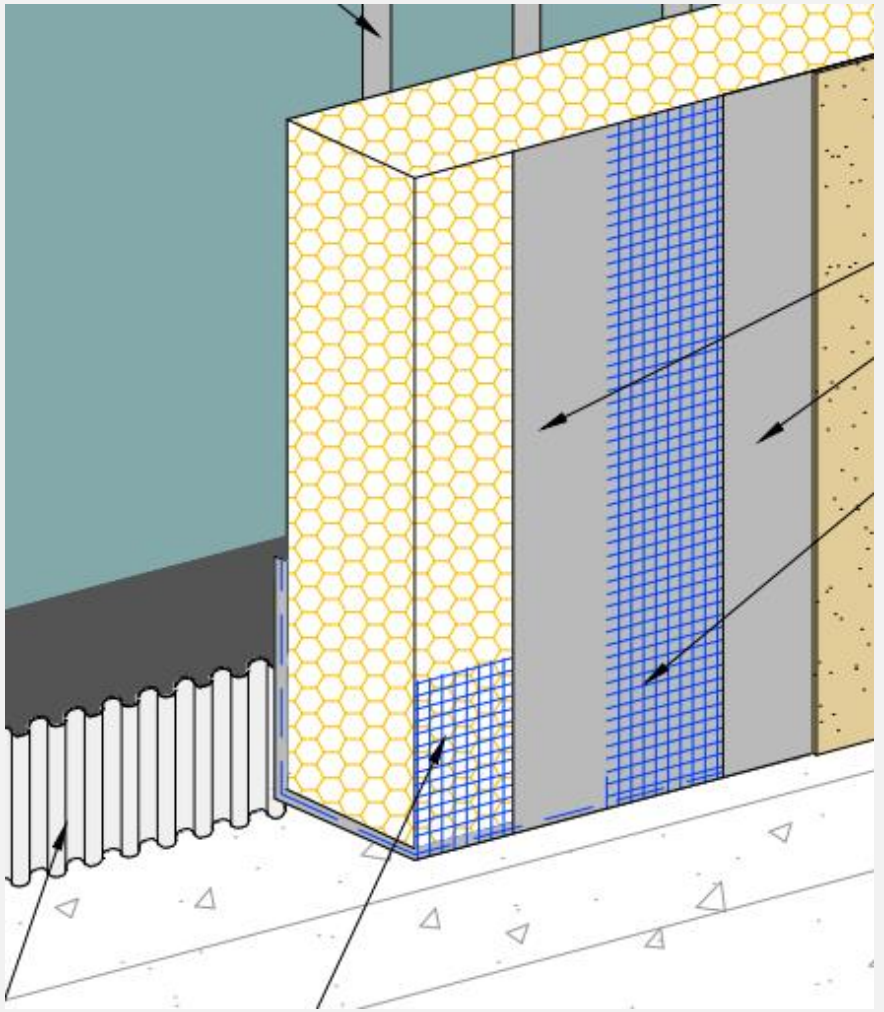
Continuous Seamless Protection

Fully prepared secondary weather barrier envelope

Machine Base-Coated Components

"Backwrapping" is the most fundamental and critical installation aspect of an EIF system

- Full encapsulation of return edge of EPS insulation
  - Detail mesh installed 2.5" behind / onto face of EPS insulation
  - Fully embedded in Base Coat depth of EPS (thickness)
  - Smooth return surface for primer and sealant application

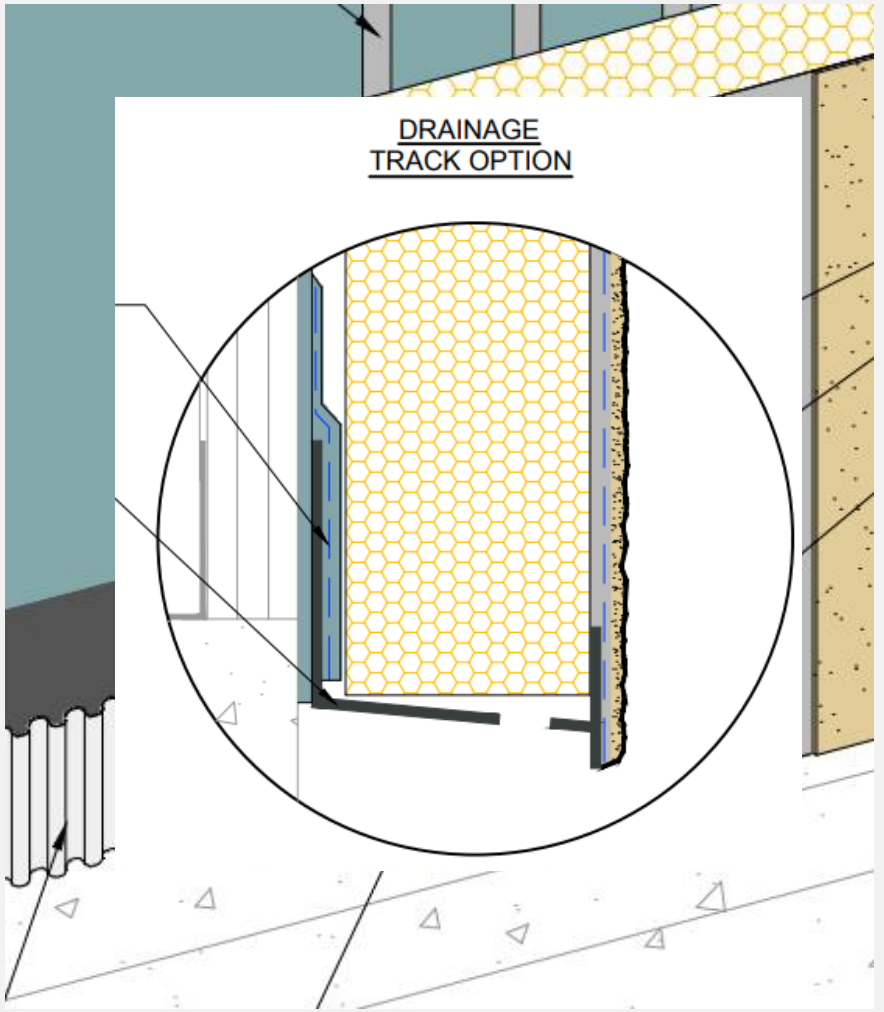


Machine Base-Coated Components

"Backwrapping"

- Provides for Fire Resistance rating / testing compliance
- Done by hand in what can be challenging access

- *PVC starter tracks can be substituted for horizontal termination edges*
  - ***BUT ONLY IN COMBUSTIBLE CONSTRUCTION***



Machine Base-Coated Components

Specifying for Pre-Based Starter Boards

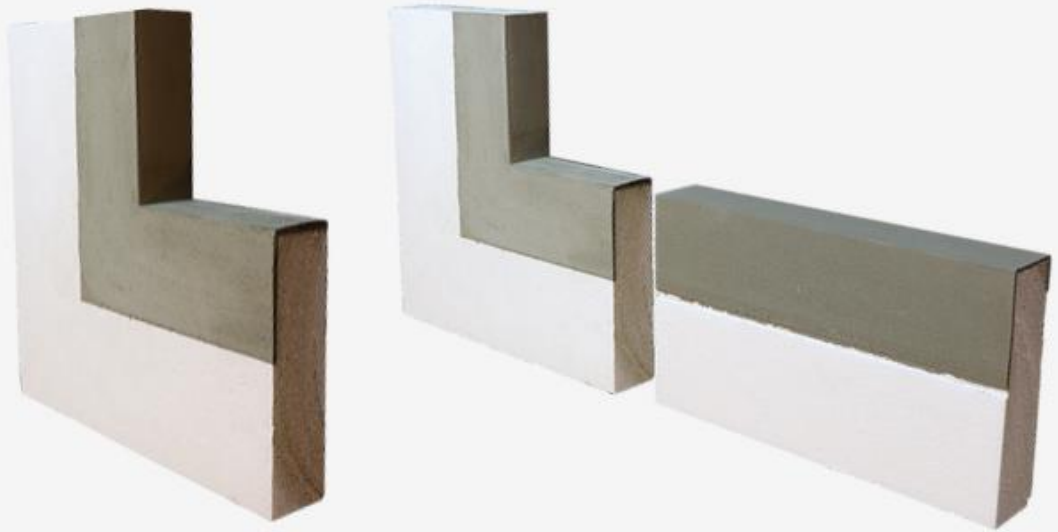
- Eliminates any question to this critical installation step
- Exceptional quality and precision
- **Skilled labor shortage**
- **Must be made with materials by selected EIFS Manufacturer for compatibility / warranty coverage**

Various Thickness and Edge Treatments

Machine Base-Coated Components

Specifying for Pre-Based Trims and Corners

- Eliminates any question to this critical installation step
- Exceptional quality and precision
- **Must be made with materials by selected EIFS Manufacturer for compatibility / warranty coverage**



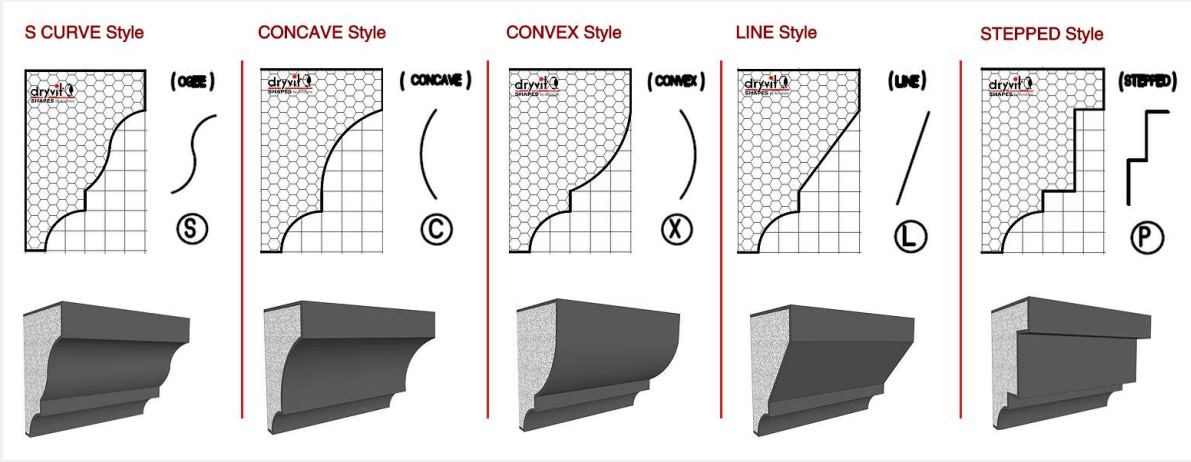
Various Thickness

Machine Base-Coated Components

Warranty

- Integration of Pre-Base Coated Starter Boards, Trims, Corners or Shapes ***ADDS 2 additional years to the standard system warranty***
  - 10-year up to 12-year

- **3X** Faster. **3X** Thicker. **3X** Better

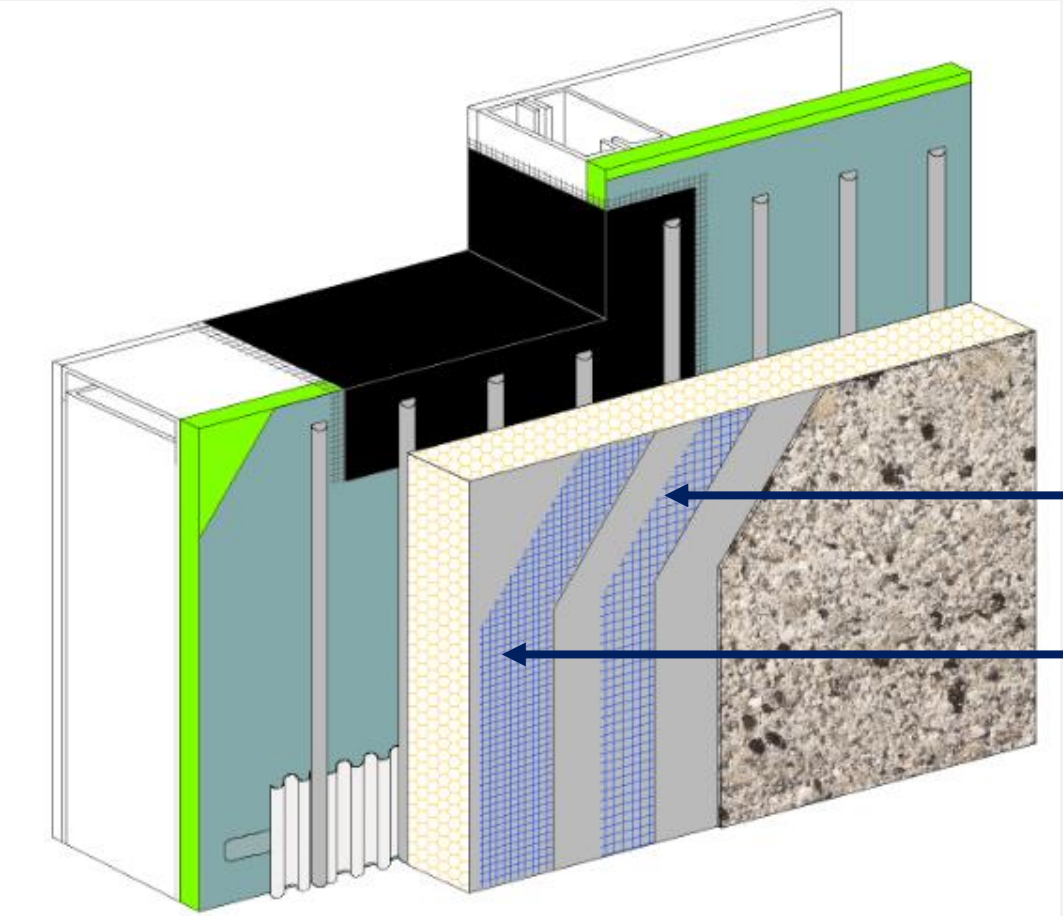


High Durability CI EIFS

Common impact challenges:

- New High Durability Continuous Insulation (HDCI) EIFS
  - ***20 year impact warranty protection***
    - Normal wear-and-tear / unintentional surface impact damages
    - ***Repaired at no cost to building owner***
  - Ultra-High Impact Resistance Mesh Assembly required throughout

High Durability CI EIFS

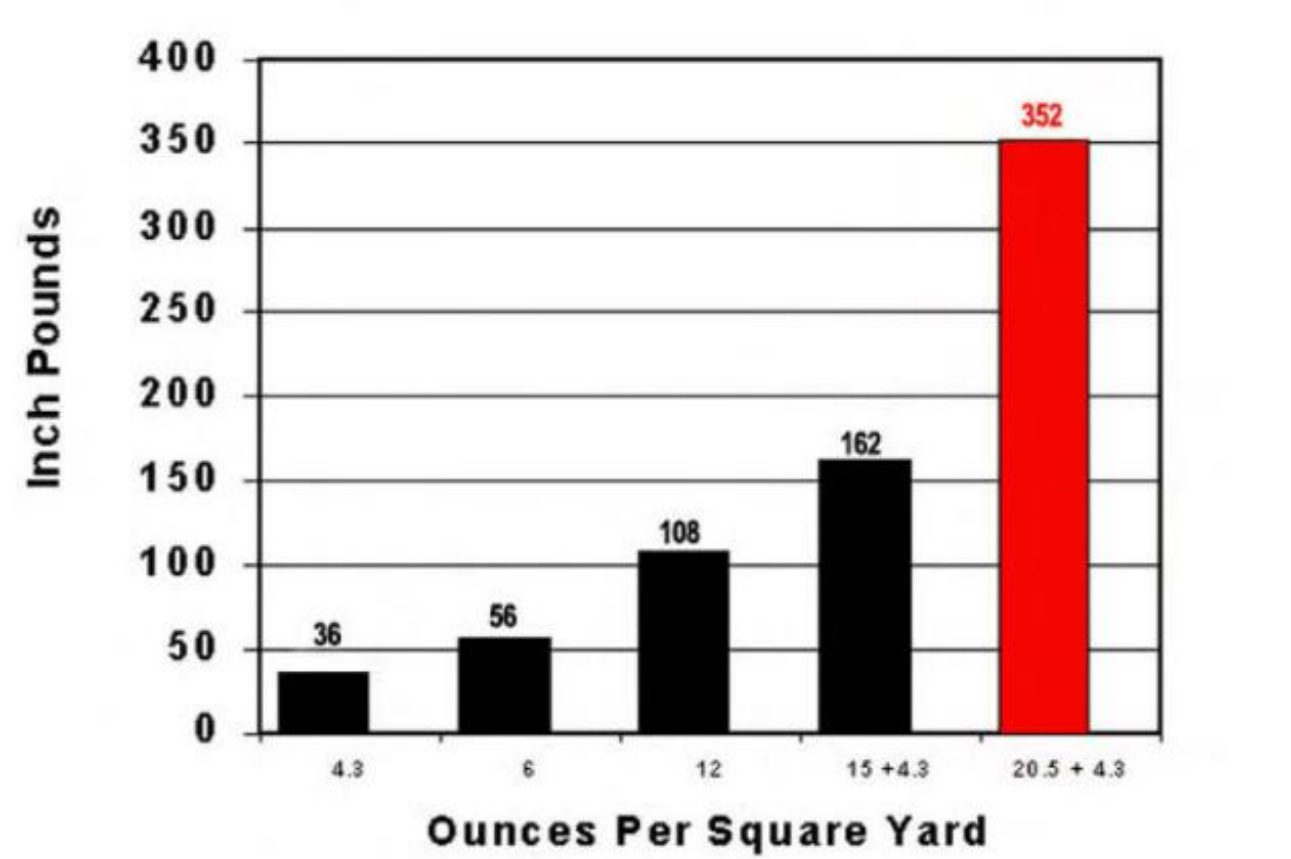


Ultra-High Impact Reinforcing Mesh

- Reinforcing mesh installed in 2 individual layers
- 4.3 oz. / sy reinforcing mesh installed over
- 20 oz. / sy reinforcing mesh

High Impact Mesh over Entire EIFS Wall Areas

High Impact Mesh Assembly



For high traffic areas, specify 20.5 + 4.3 oz. of mesh, achieving 352 inch pounds of impact resistance.

ASTM E 2486 – Impact Resistance of EIFS

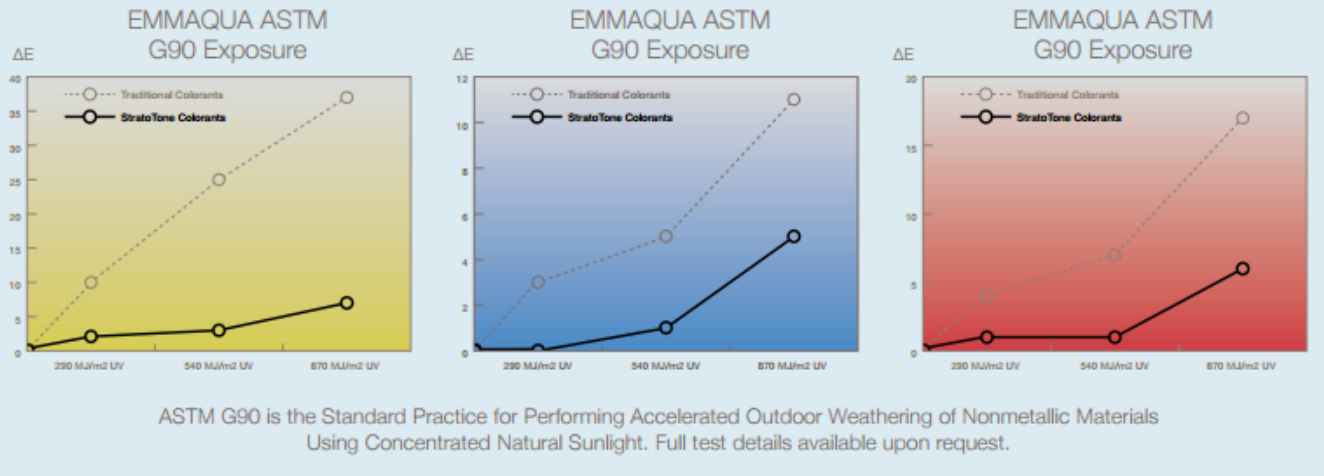
Hydrophobic Chemistry
Water Repelling Surface

Available in both textured finish and paint coatings

- Beads and repels water
- Reduces dirt pick-up
- Lends to cleaner surface

High Performance Colorant

- Enabling high profile, brand imaging colors
- Enhanced fade resistance / dramatically reduced maintenance cost



ASTM G90 is the Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight. Full test details available upon request.

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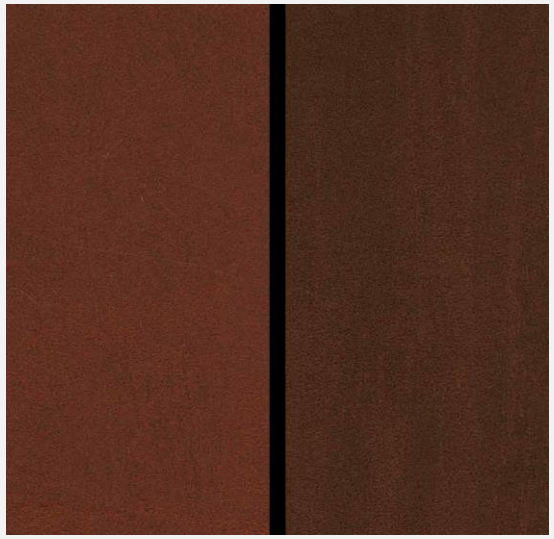
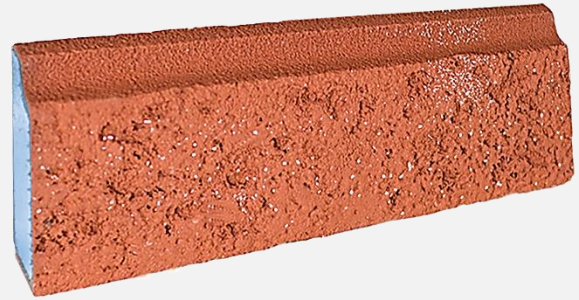
Aesthetic Options



Weathered Steel

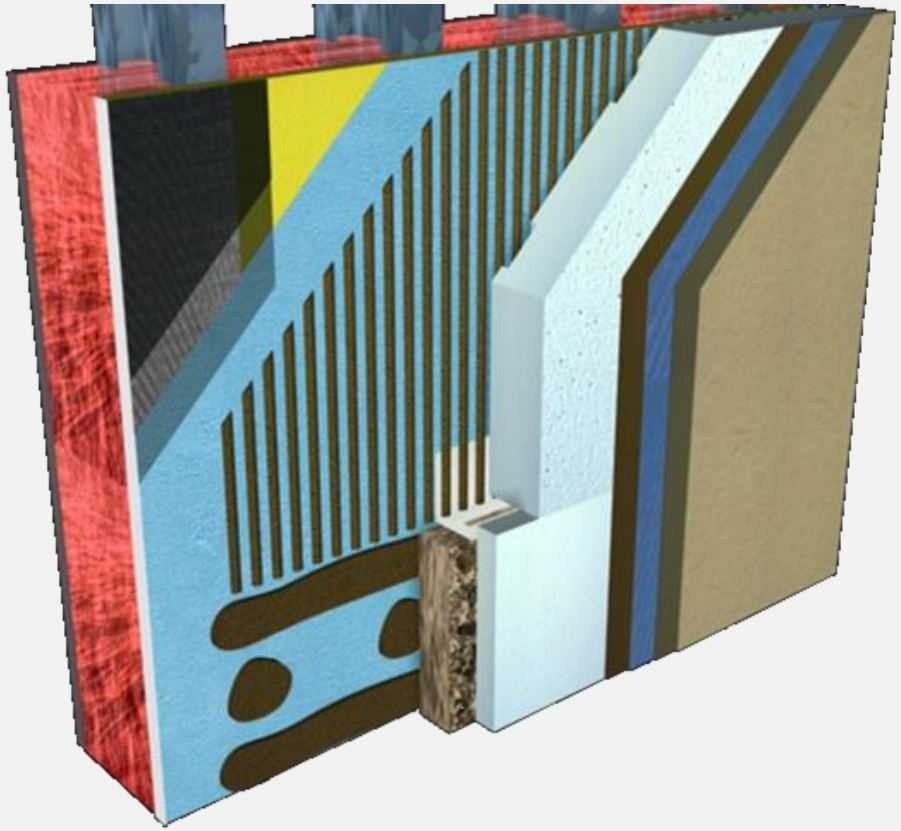
Lightweight Insulated Brick Veneer



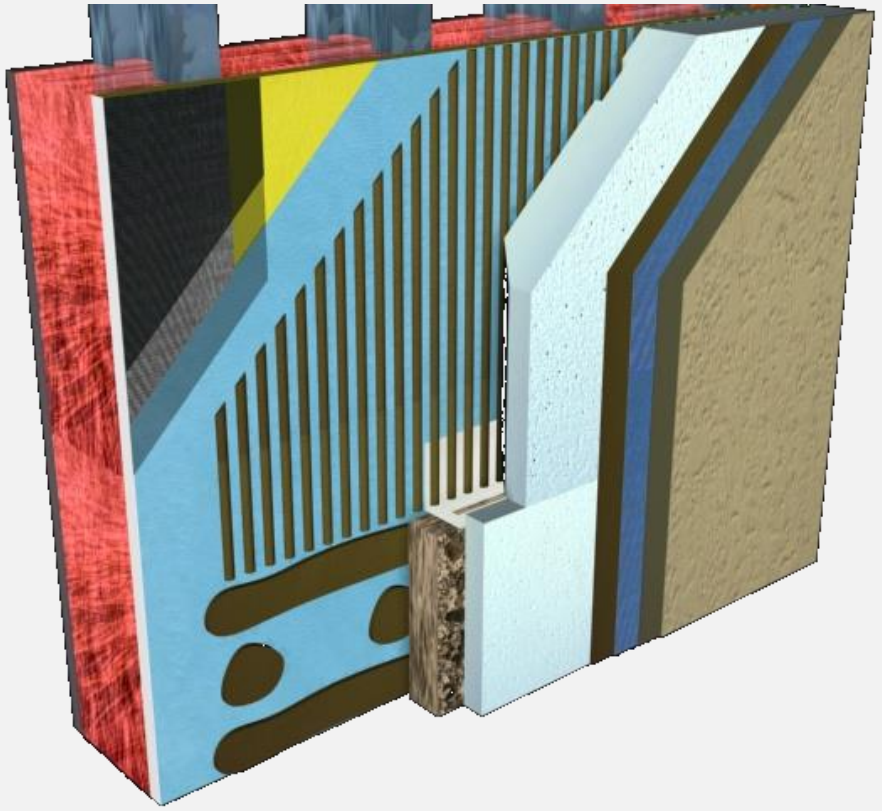
A different way to design with brick

- Highly durable, lightweight, insulated Brick veneer
- Integrate with CI EIFS cladding or specify direct over solid commercial substrates
- 12-15 times lighter
- ‘Zero’ structure
- NFPA 285 compliant
- Design flexibility
  - Standard Colors & Blends
  - Textures
  - Shapes, Sizes & Effects

Engineered / Pressure Equalized



Engineered MD



Pressure Equalized

System Upgrade Options

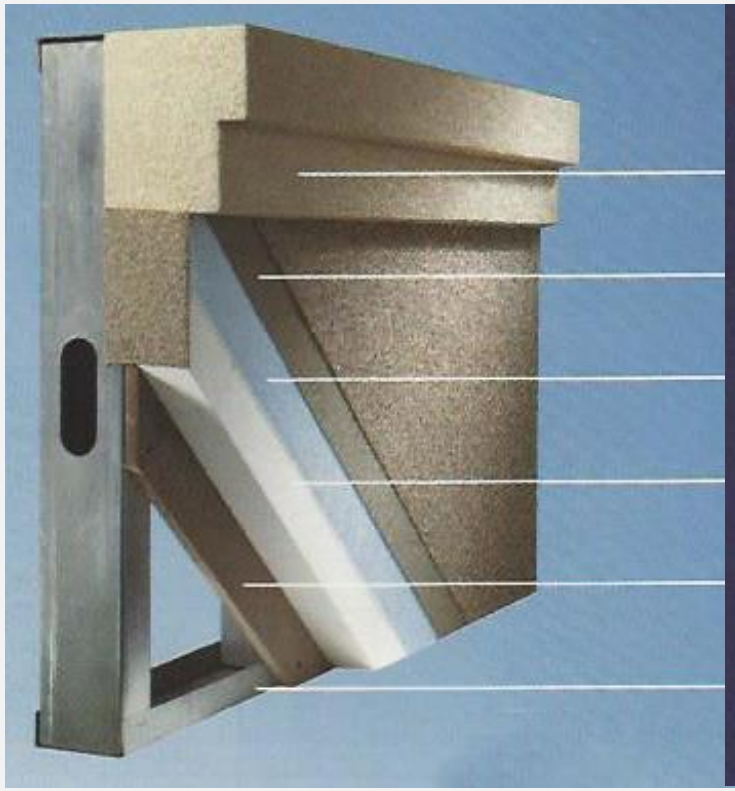
EIFS Panelization

Panelization – Why?

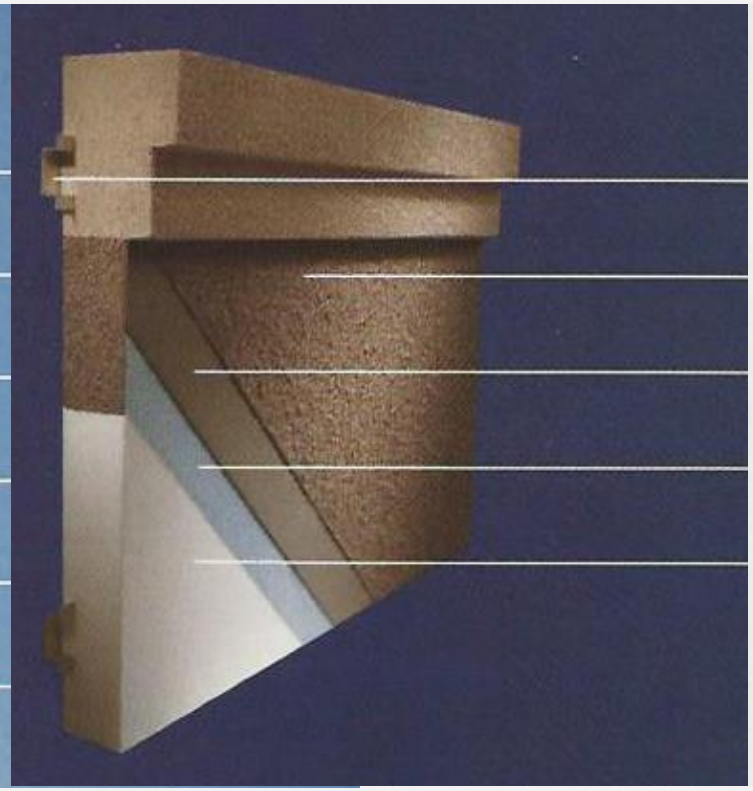
- Limited access or space on site
- Fast track project schedules
- **Skilled labor shortage**
- Address weather challenges
- Quality control through warehouse production
- Ready, Transport, Lift, Install

EIFS Panelization

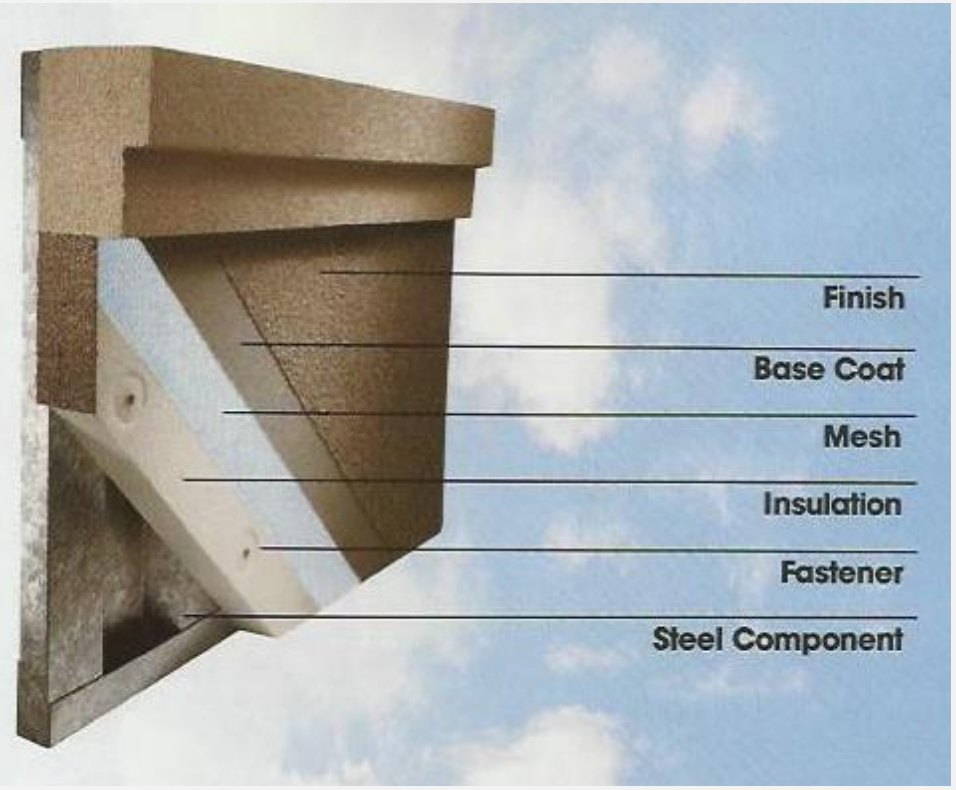
Full Composite



Lightweight



Metal Deck Backed



Mystic Lakes Casino Hotel

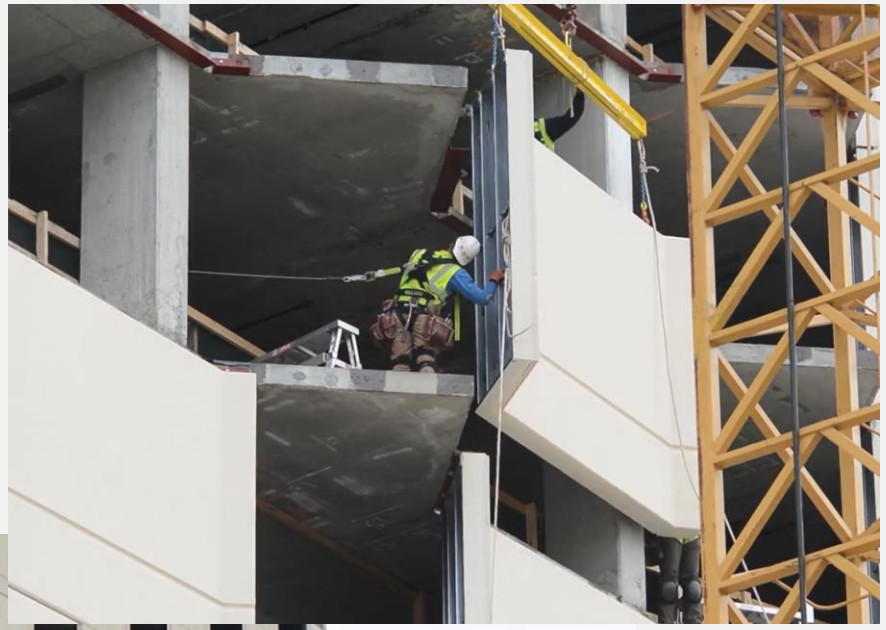
- 265 panels
- 45,000 sf
- 37 days

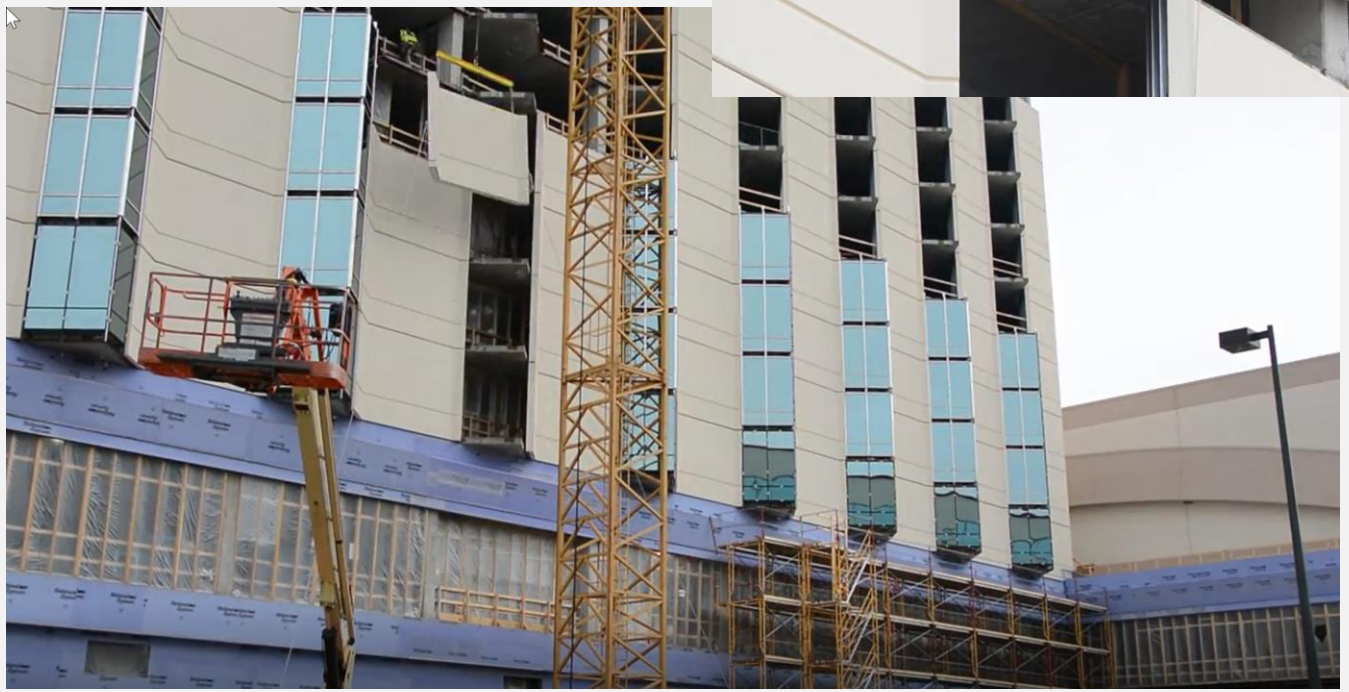
S&Y SWANSON YOUNGDALE

PCL CONSTRUCTION

Mystic Lakes Casino Hotel

- 265 panels
- 45,000 sf
- 37 days





SWANSON YOUNGDALE

PCL CONSTRUCTION

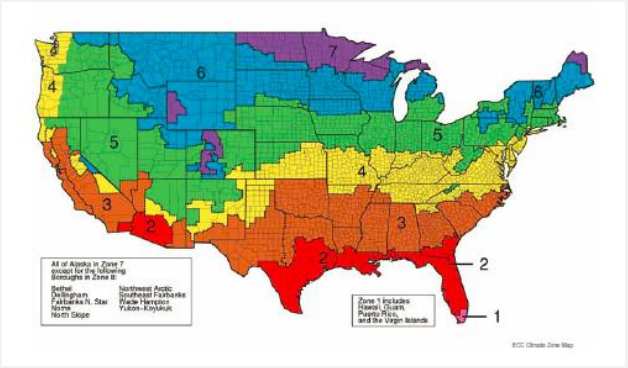
Code Compliance

Specific to the Building Envelope Walls

- IBC Chapter 14
  - Weather Resistive Barrier (WRB)
- IECC / ASHRAE Standard 90.1
  - Continuous Air Barrier
  - **Continuous Insulation**
- IBC Chapter 26
  - **NFPA 285** “Assembly” Fire Testing
    - Type I-IV Commercial Construction
  - Mixed Use **Podium Design**
    - Type 3-B wood framed
    - 2-Hour Load Bearing Wall required
      - ASTM E-19

Code Compliance

IECC 2012 / 2015 Insulation Requirements



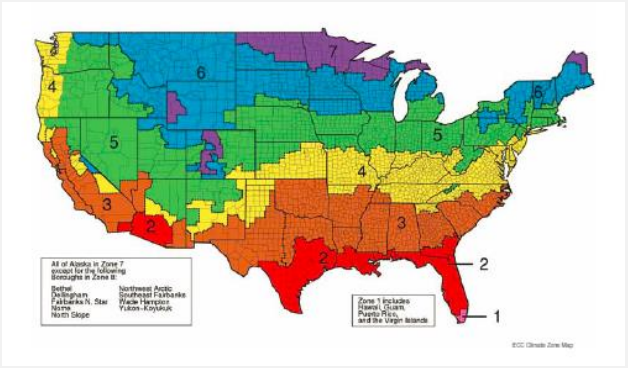
- **Prescriptive R-value** - ***Cavity + Exterior Continuous Insulation (CI)***

CLIMATE ZONE	1	2	3	4 except Marine	5 and Marine 4	6	7	8
Commercial								
Metal framed	R-13 + R-5.0 CI	R-13 + R-5.0 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI
Wood framed and other	R-13 + R-3.8 CI or R-20	R-13 + R-3.8 CI or R-20	R-13 + R-3.8 CI or R-20	R-13 + R-3.8 CI or R-20	R-13 + R-3.8 CI or R-20	R-13 + R-7.5 CI or R-20 + R-3.8 CI	R-13 + R-7.5 CI or R-20 + R-3.8 CI	R-13 + R-15.6 CI or R-20 + R-10.0 CI
Commercial - Use Group R Overnight Occupancies								
Metal framed	R-13 + R-5.0 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI	R-13 + R-7.5 CI	R-13 + R-15.6 CI	R-13 + R-17.5 CI
Wood framed and other	R-13 + R-3.8 CI or R-20	R-13 + R-3.8 CI or R-20	R-13 + R-3.8 CI or R-20	R-13 + R-3.8 CI or R-20	R-13 + R-7.5 CI or R-20 + R-3.8 CI	R-13 + R-7.5 CI or R-20 + R-3.8 CI	R-13 + R-7.5 CI or R-20 + R-3.8 CI	R-13 + R-15.6 CI or R-20 + R-10.0 CI

Flash Wall Penetrations / Integrate In-fill Components

Code Compliance

IECC 2012 / 2015 Insulation Requirements



- **Prescriptive R-value** - ***Cavity + CI = Wall Components***

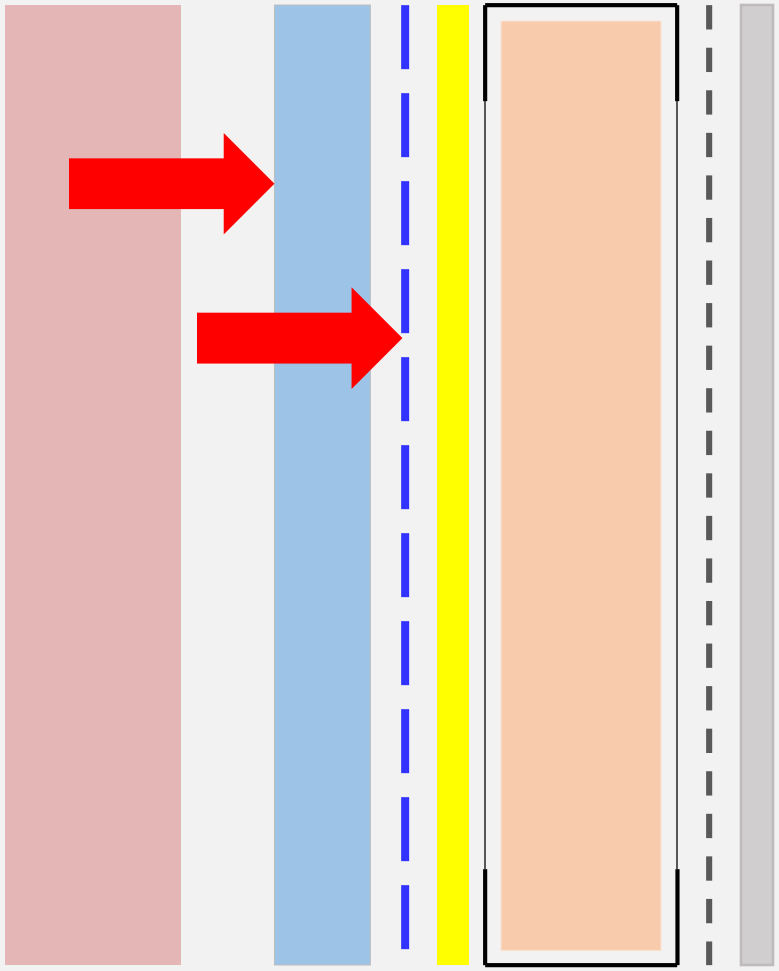
CLIMATE ZONE	1	2	3	4 except Marine	5 and Marine 4	6	7	8
Commercial								
Metal framed	U-0.077	U-.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.045
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.036
Commercial - Use Group R Overnight Occupancies								
Metal framed	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.057	U-0.052	U-0.045
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.036

U-0.064 = R-15.625

w/ R-13 cavity Insulation = 2.5” of EPS or 1.925” of XPS

w/ out cavity Insulation = 4.058” of EPS or 3.125” of XPS

Code Compliance

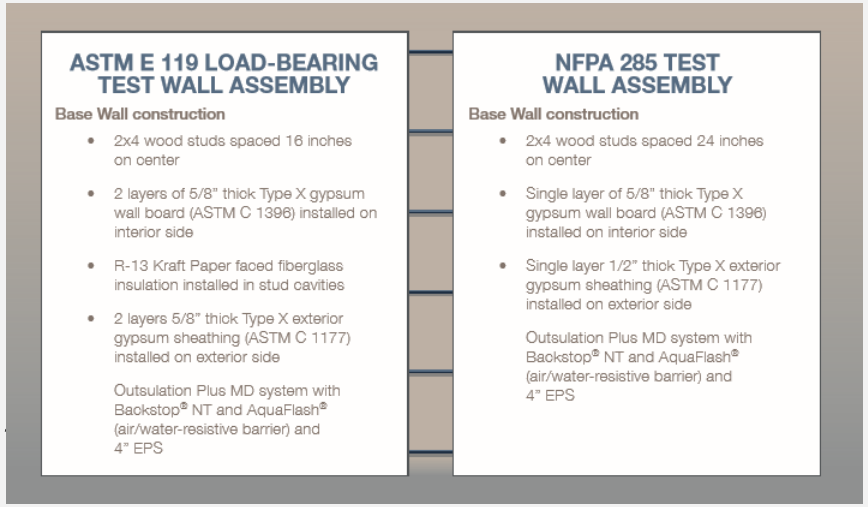


NFPA 285 Fire Testing Compliance

Exterior walls in Type I - IV constructions

- Combustible Cladding
- **Continuous Insulation (CI)**
  - Walls of any height
- **Air/Water-Resistive Barrier (AWRB)**
  - Walls greater than 40’-0”
- ***Specific Assembly Test***
  - Exact materials that will be installed in the wall assembly
  - Very few tested assemblies

Fire Testing Compliance

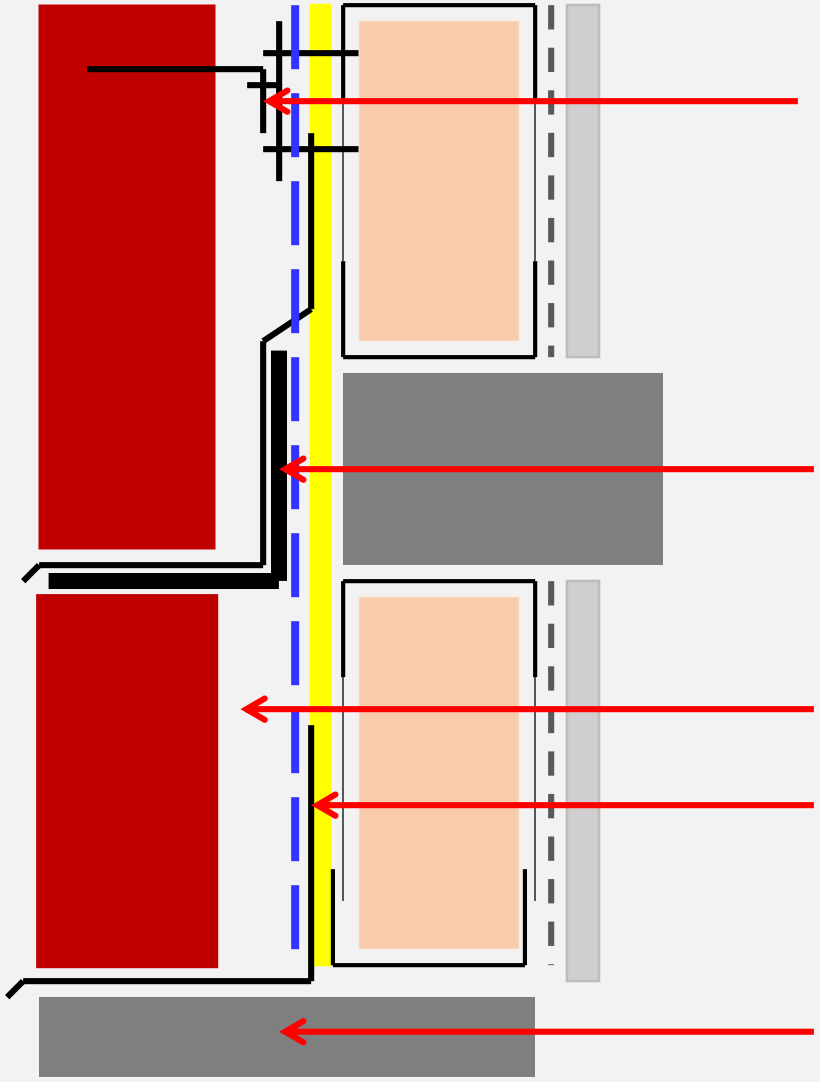


Podium Design

- Load bearing wood framed wall assembly
- 2-hour requirement
  - ASTM – E119
- NFPA 285
  - Continuous Insulation (CI)
  - Weather-Resistive Barrier (WRB)

Note: Not all EIFS Manufacturers have passed these test

Traditional Wall Assembly



Attachment and Support

Anchors & Ties

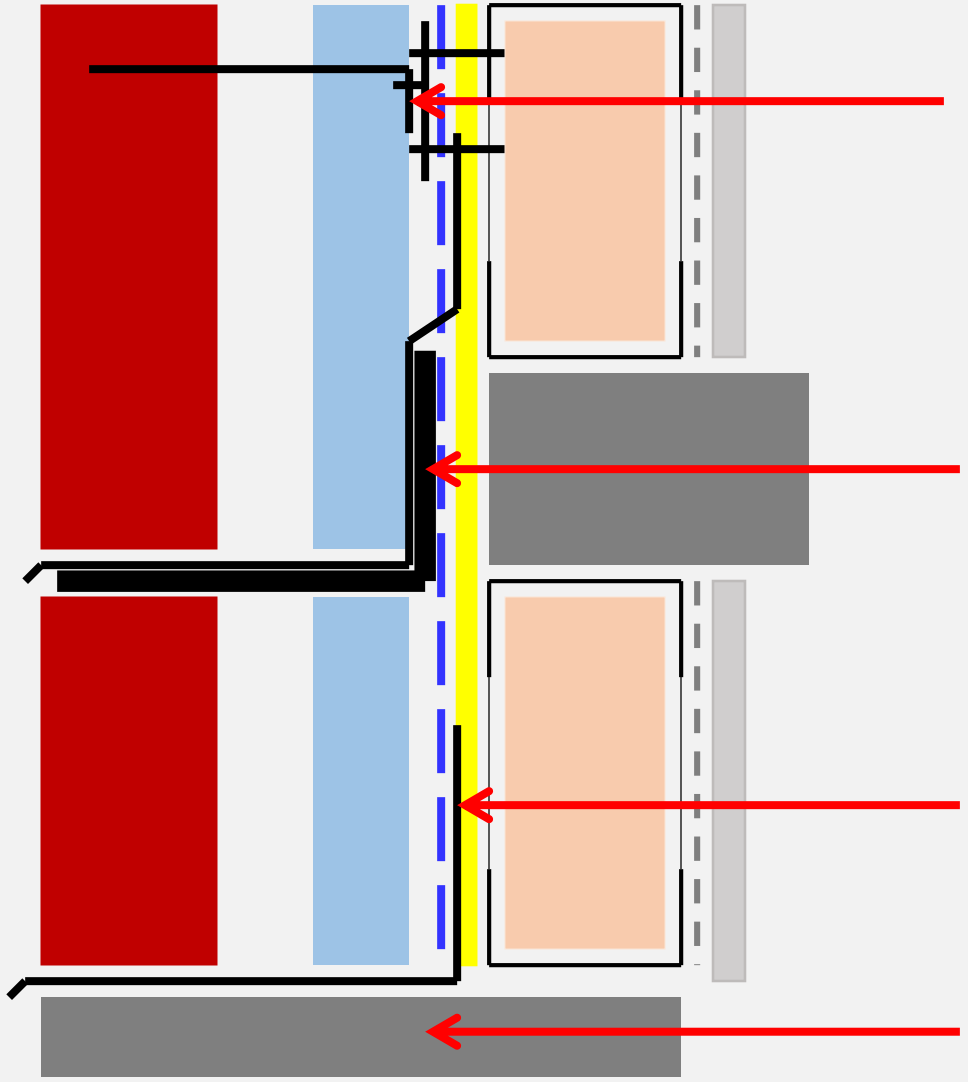
Bearing Angles, Lintels and Flashing

Min. 1” air space

Base Wall Flashing

Concrete foundation

Integration of CI



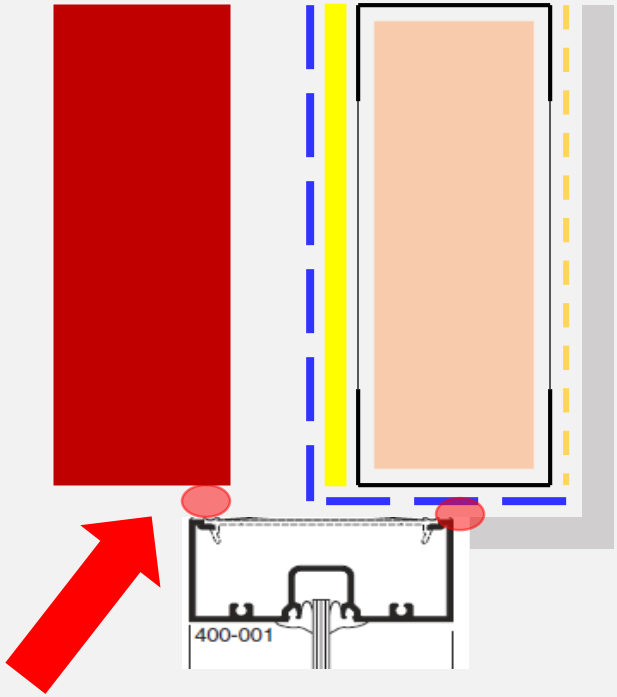
Attachment and Support

Everything must get bigger, longer, stronger

- **Increasing engineering / structural requirements and cost**
  - Anchors & Ties
  - Bearing Angles, Lintels and Flashing
  - Base Wall Flashing
  - Concrete Foundation

Cost is substantially increased

Traditional Detailing

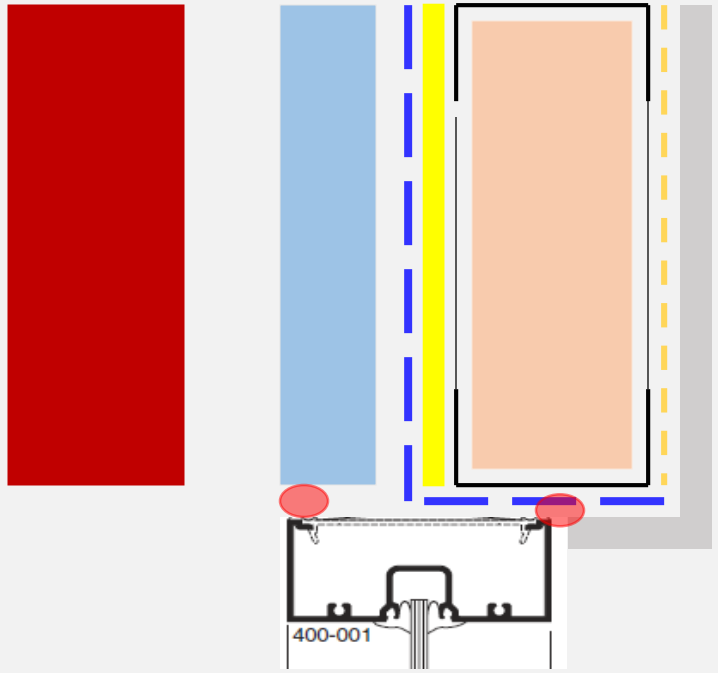


Typical Detailing – Jamb

Wall components are sized, designed and detailed to fit traditional wall conditions

- Windows, doors, louver frames, electrical boxes, etc.
- Solid structural attachments can be made
- Proper “seal” can be accommodated between cladding and wall component
  - Sealant and baker rod

Traditional Detailing

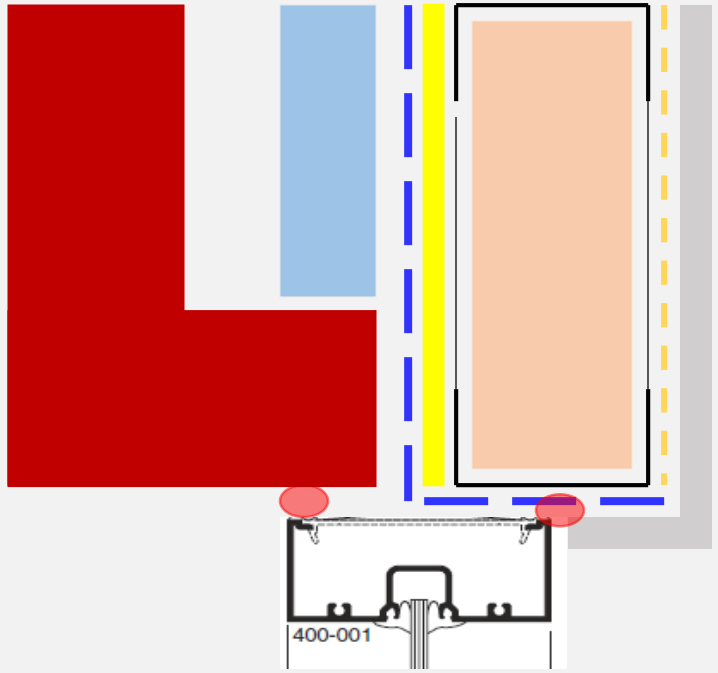


Typical Detailing – Jamb

Conditions Change Drastically

- Traditional wall components no longer “fit” the conditions
- Proper “seal” cannot be accommodated
  - Veneer cavity is left open
  - Sealant cannot bond to CI

Add in Continuous Insulation



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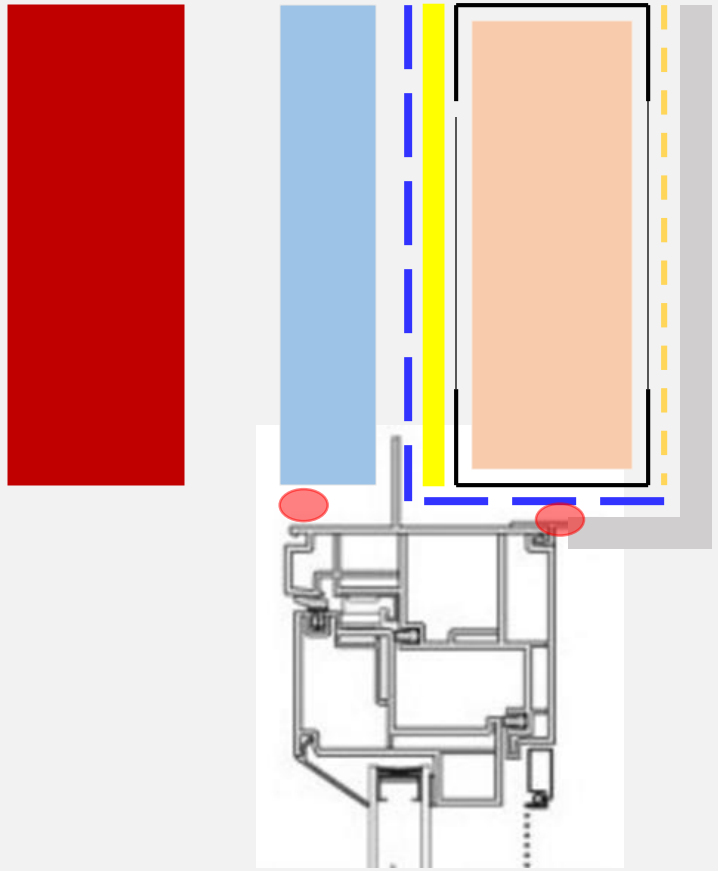

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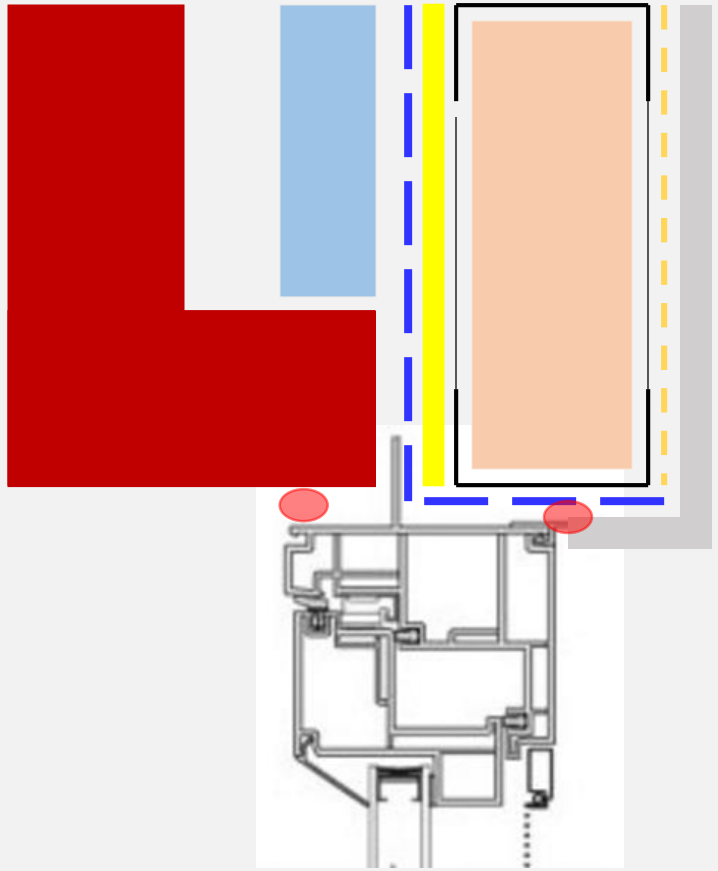

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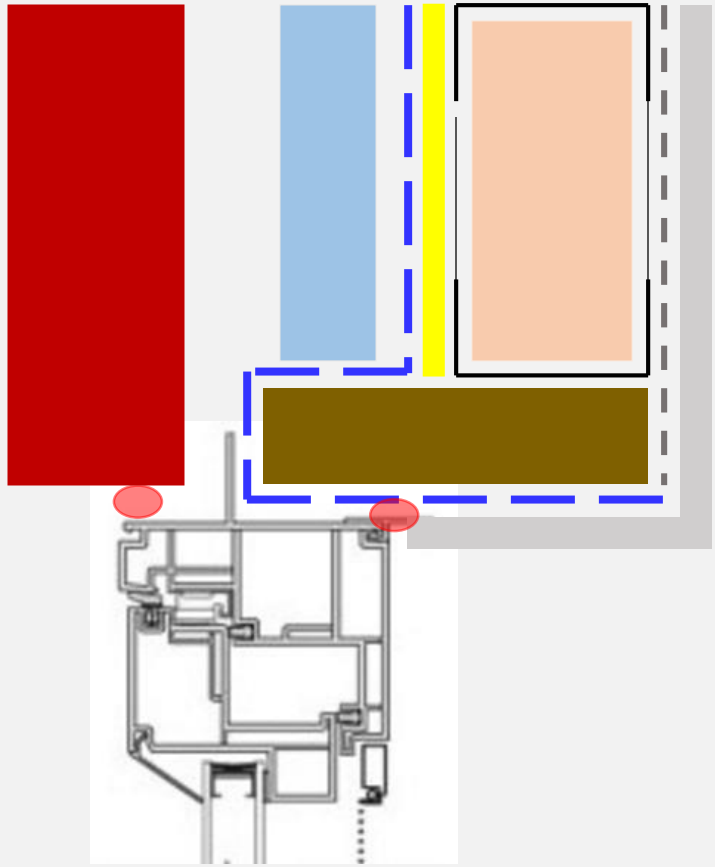
  - Sealant cannot bond to CI

Add in Continuous Insulation

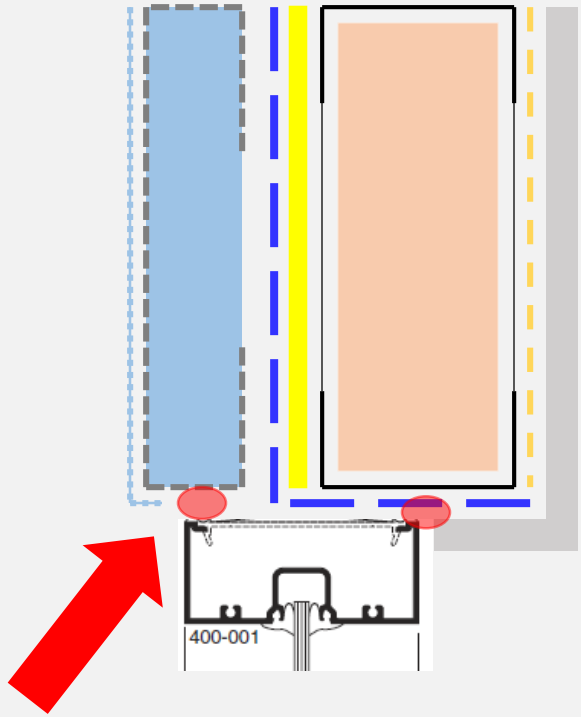


Typical Detailing – Jamb

Conditions Change Drastically

- Traditional wall components no longer “fit” the conditions
- Proper “seal” cannot be accommodated
  - Veneer cavity is left open
  - Sealant cannot bond to CI

Traditional Detailing

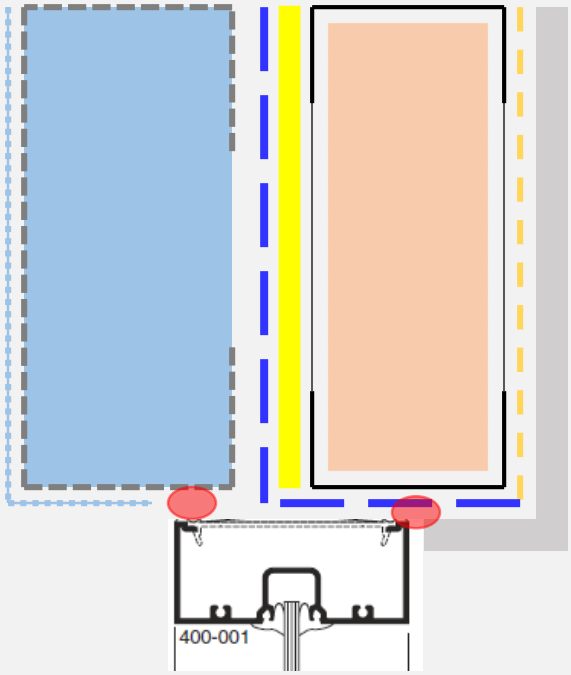


Typical Detailing – Jamb

No need for “Enhanced Detailing”

- Accommodates standardized wall components
- Provides for proper seal
- Accommodates requirements for CI at ‘all’ penetrations

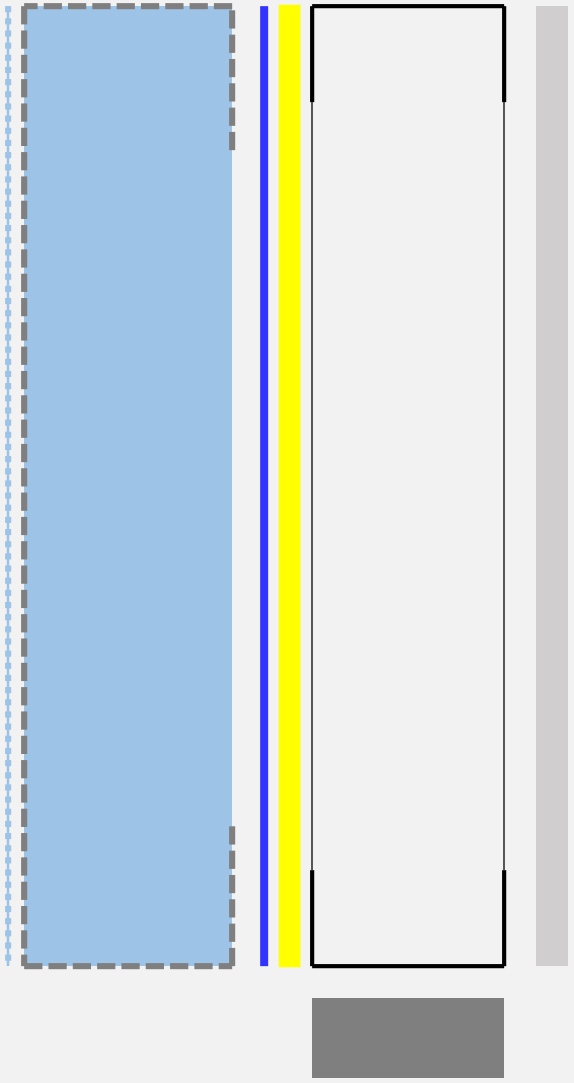
Traditional Detailing



Typical Detailing – Jamb

And it all works regardless of how much insulation is specified

Traditional Detailing



All Continuous Insulation

Can easily accommodate “NO CAVITY INSULATION” design options

- Delete interior vapor retarder
- Delete cavity insulation
- Change exterior AWRB to ‘non-permeable’
  - Rule of Thumb
  - Run Water Vapor Transmission Analysis

Huge Additional COST SAVINGS opportunities

This concludes the AIA Continuing Education System Program

Robert W. Dazel, AIA, CSI, LEED GA

Strategic Accounts Manager

Dryvit Systems, Inc.

Bob.dazel@dryvit.com

734.276.0404

A'18 AIA Conference on Architecture 2018
June 21-23, New York City

www.dryvit.com / www.newbrick.com

800.556.7752

Quality Control / Assurance Program

EIFS Quality Control / Assurance Program

Quality Control / Assurance Program

Key Ingredients

- Commitment
- Identify and implement key vendor partnerships
- Integrated Design Process (IDP) approach
- ***Third party inspection component***
- Proactive – not reactive
- Early – not late
- To the phrase, ***"Less is More***"
  - In Bidding – Less ($$$) is typically not more

Quality Control / Assurance Program

EIFS QC Program Elements

- Design assist
  - Code compliance, detailing and specification assist
- Partner supported services
  - Plan / detail / specification review
  - Building / fire / energy code compliance review
  - Water vapor transmission analysis
- Bidding / qualified contractor support
- Pre-installation conference / construction coordination
- Interim site / field visit
- Warranty close-out

Quality Control / Assurance Program

Pre-Installation Conference

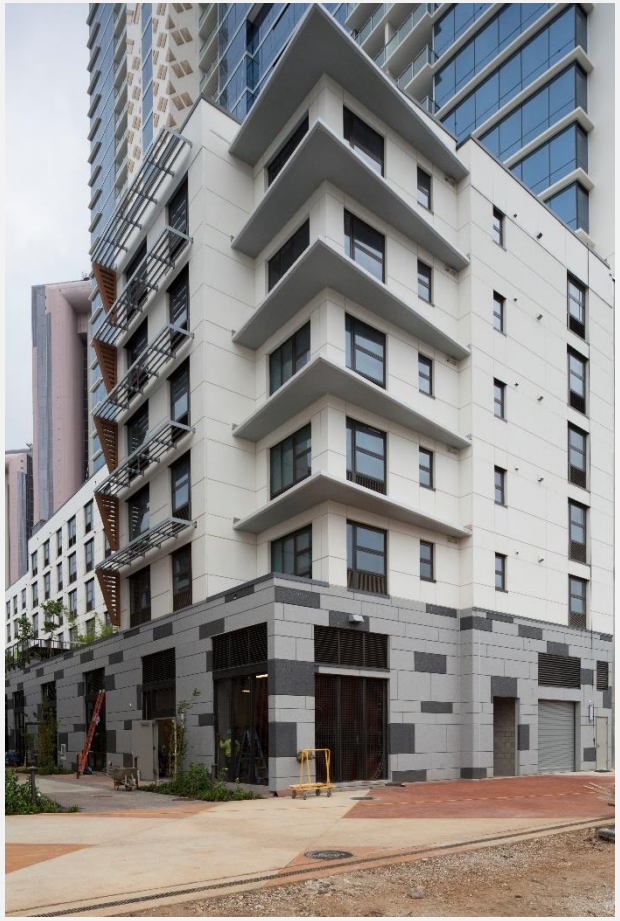
- All envelope materials and trades
- Proper EIFS and AWRB interface, installation and sequencing
- Detailing between EIFS and contiguous wall components
  - Alternate cladding / veneer types
  - Wall penetrations - Ex. windows, doors, etc.
  - Roof transitions / terminations
- Proper sealant / installation
- Interim site / field visit scheduling

Quality Control / Assurance Program

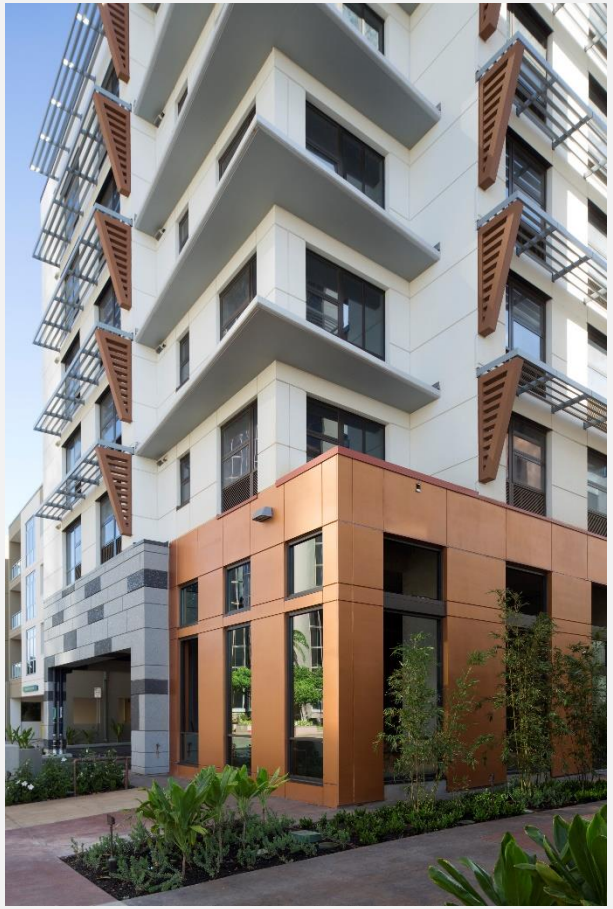
Most Comprehensive Warranty available

- Material defect
- Moisture intrusion and related damage
- Lifetime rust protection
- Fade resistance
- No proration / depreciation
- Extended terms through partnerships
  - Pre-base coated components, sealant partners
- Renewable for the life of the building

Single Source Solution



Keahou Lane - Hawaii



Specification, Manufacturer, Installer, Warranty, Performance

Thank you for your time!
Questions?

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Do and DON'Ts

- Expansion Stress / Stress Cracks

Do and DON'Ts

- EIFS tight to dissimilar material
- No sealant
  - Floating slab
  - Metal coping

Do and DON'Ts

- Tight to dissimilar material
  - Hose bib
  - Over-tighten compression

Do and DON'Ts

- Poor mesh embedment

Do and DON'Ts

- Temperature and / or moisture protection
  - Frozen finish