"The Interface"

Adam Ugliuzza, P.E. CPHC

abaa EDUCATION

Air Barrier Association of America (ABAA) is a Registered Provider with The American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available on request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

air barrier
abaa
association of
america

CONTINUING EDUCATION
AIA

THE INTERFACE

01 **The Building Enclosure**

02 **Past Construction**

03 **New Construction**

04 **Roof to Wall**

05 **Air Control**

01

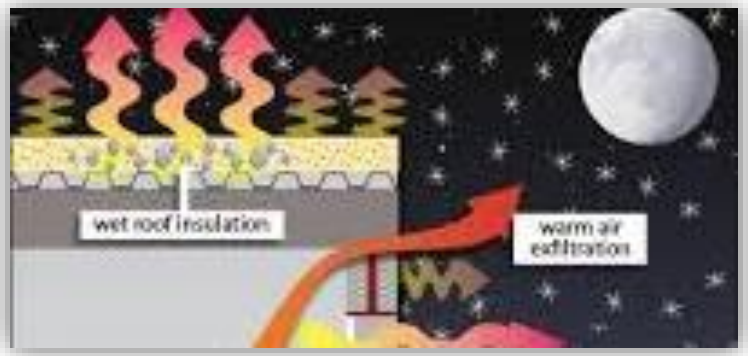
THE BUILDING ENCLOSURE

THE BUILDING ENCLOSURE

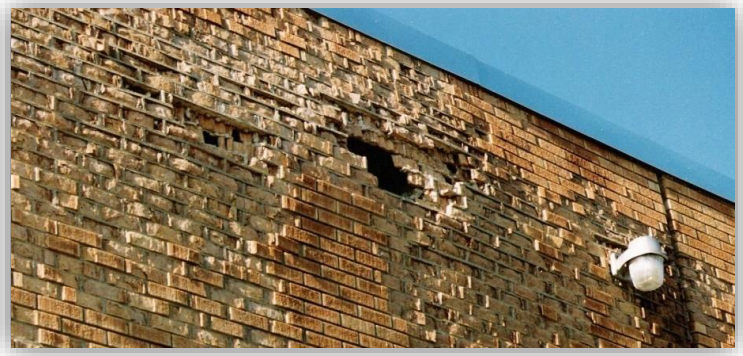
Shelter

Aesthetics

Security



Energy & Comfort



Durability

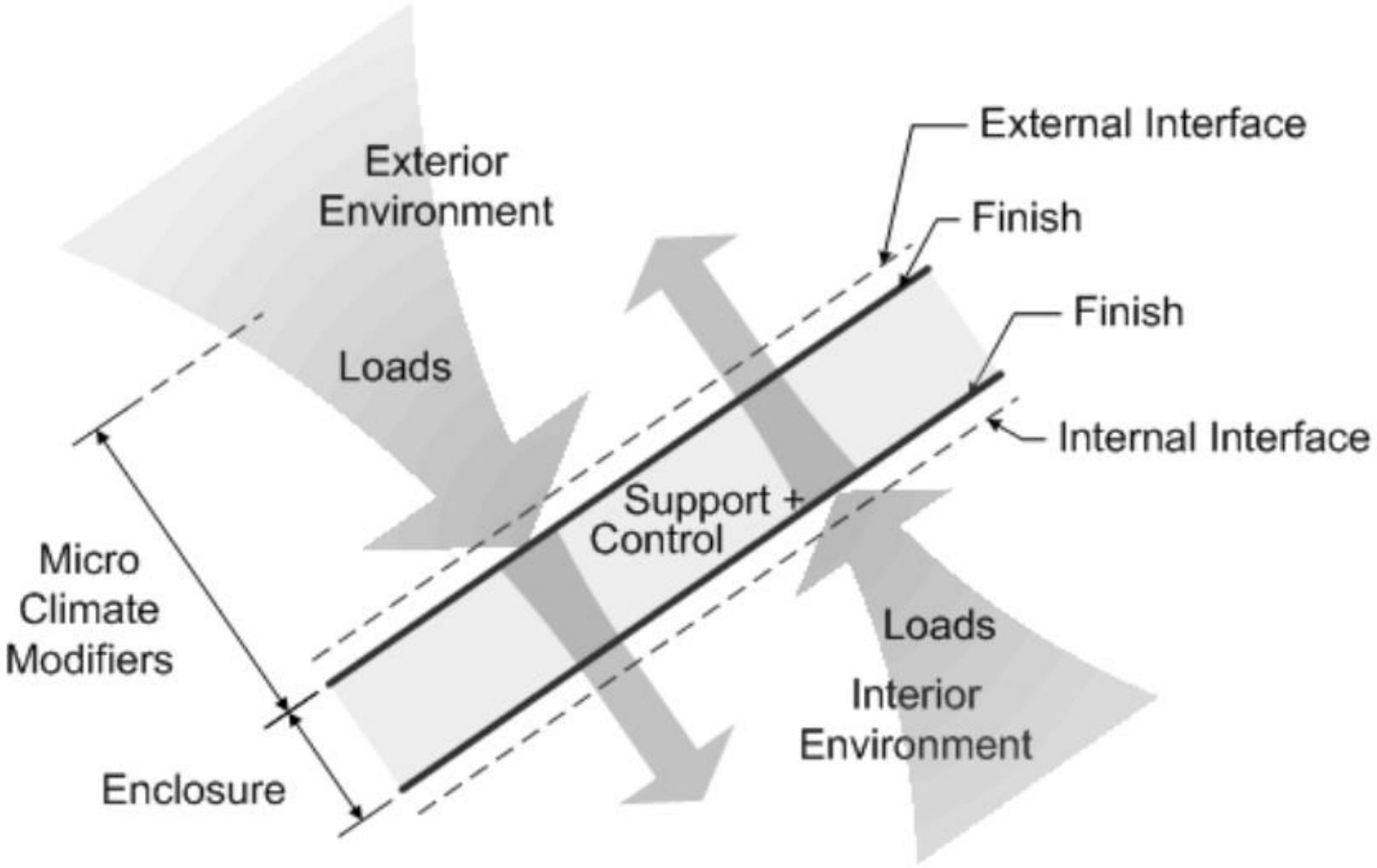
Serviceability

THE BUILDING ENCLOSURE

Complex

Simple

THE BUILDING ENCLOSURE

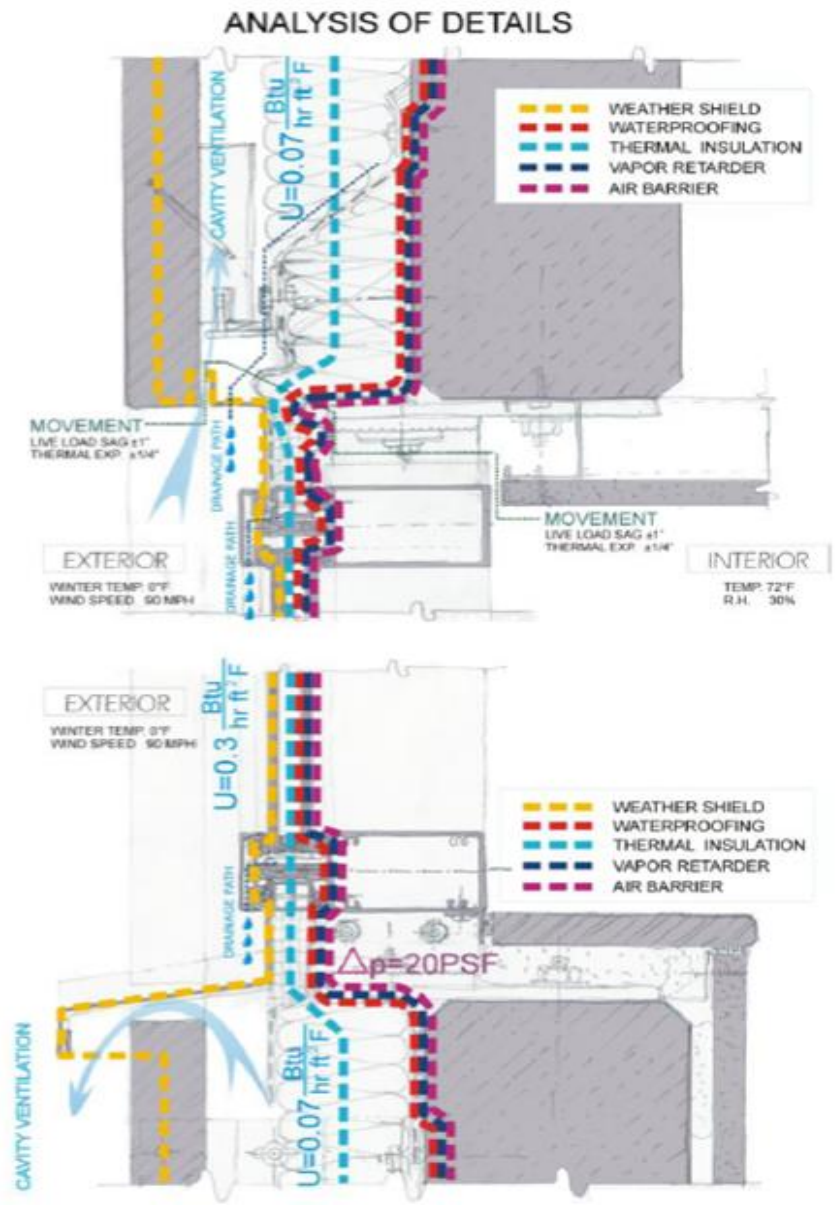


THE BUILDING ENCLOSURE

Control Layers

Building Enclosures are designed to control multiple loadings this presentation will primarily be concerned with the following in order of importance:

1. Water Control Layer
2. Air Control Layer
3. Vapor Control Layer
4. Thermal Control Layer



02

PAST CONSTRUCTION

PAST CONSTRUCTION

Historic Building Enclosure

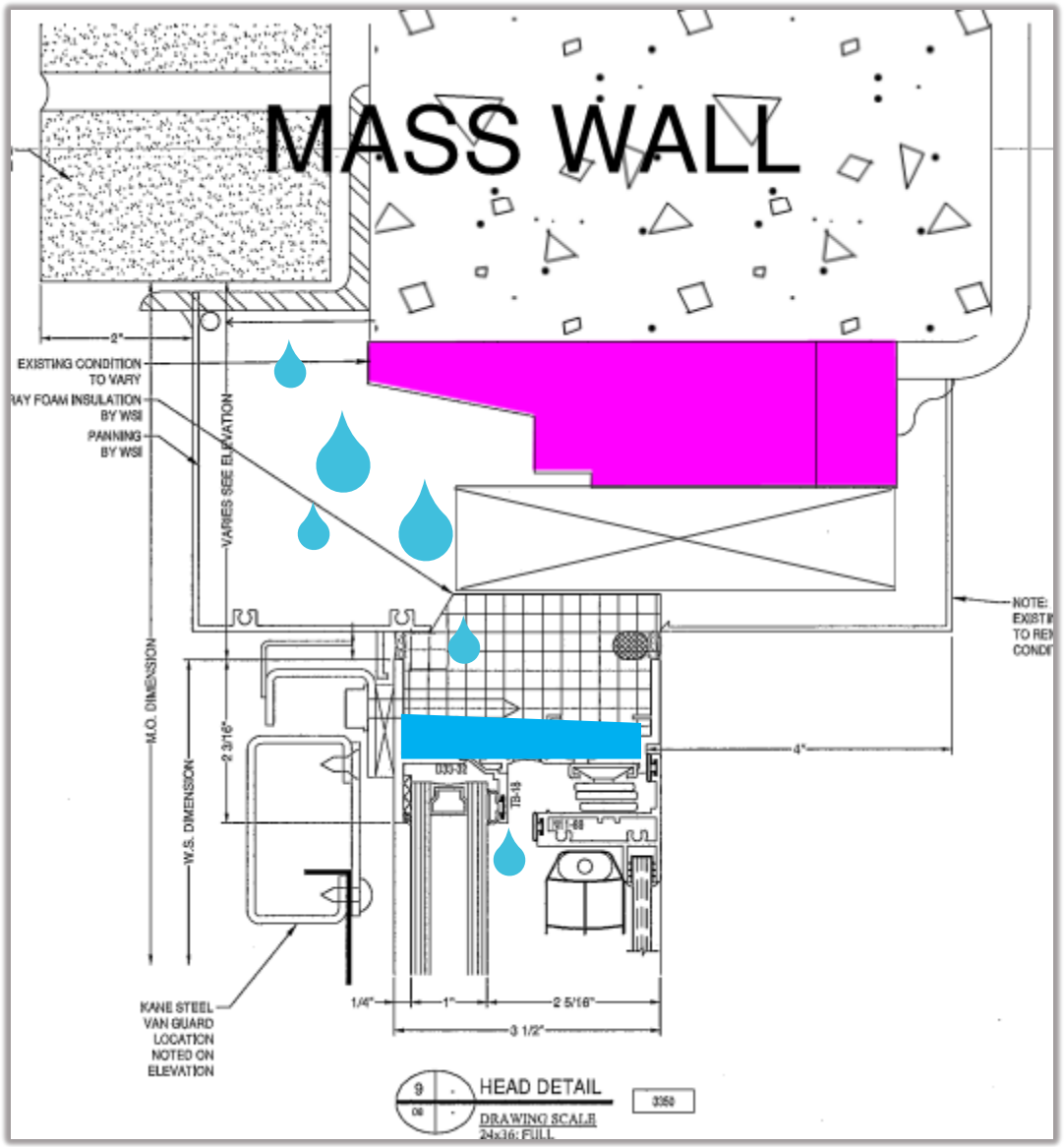
- Simpler building systems
- Fewer layers
- Master tradesmen
- Apprenticeship training
- Lower Expectations?

https://en.wikipedia.org/wiki/Old_Stone_House_(Washington,_D.C.)#/media/File:Old_Stone_House_-_ca._1890.jpg

OLD STUFF

- Mass masonry
- Durable materials
- OK to get wet deep into wall
- Able to dry to interior and exterior
- Did it matter if window leaked?

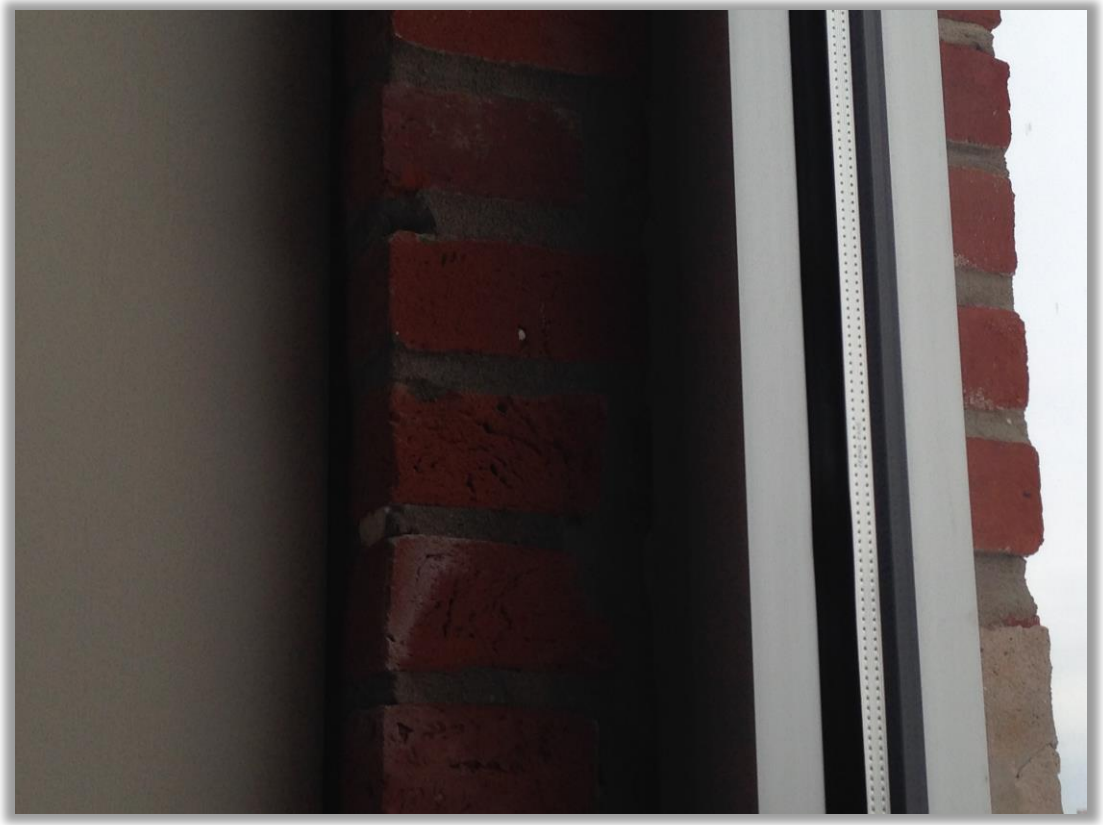
OLD STUFF



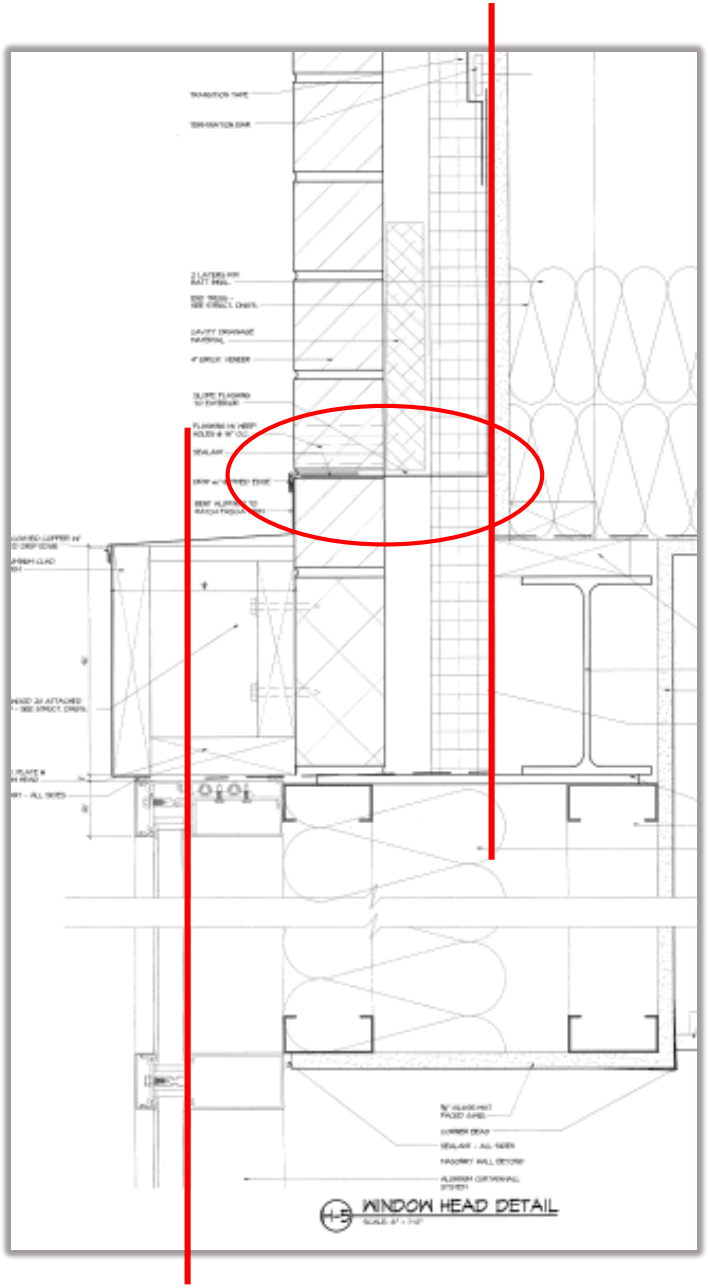
Mass Wall

Plane of air and water tightness is difficult to define.

THE TRANSITION FROM MASS WALL



THE TRANSITION FROM MASS WALL

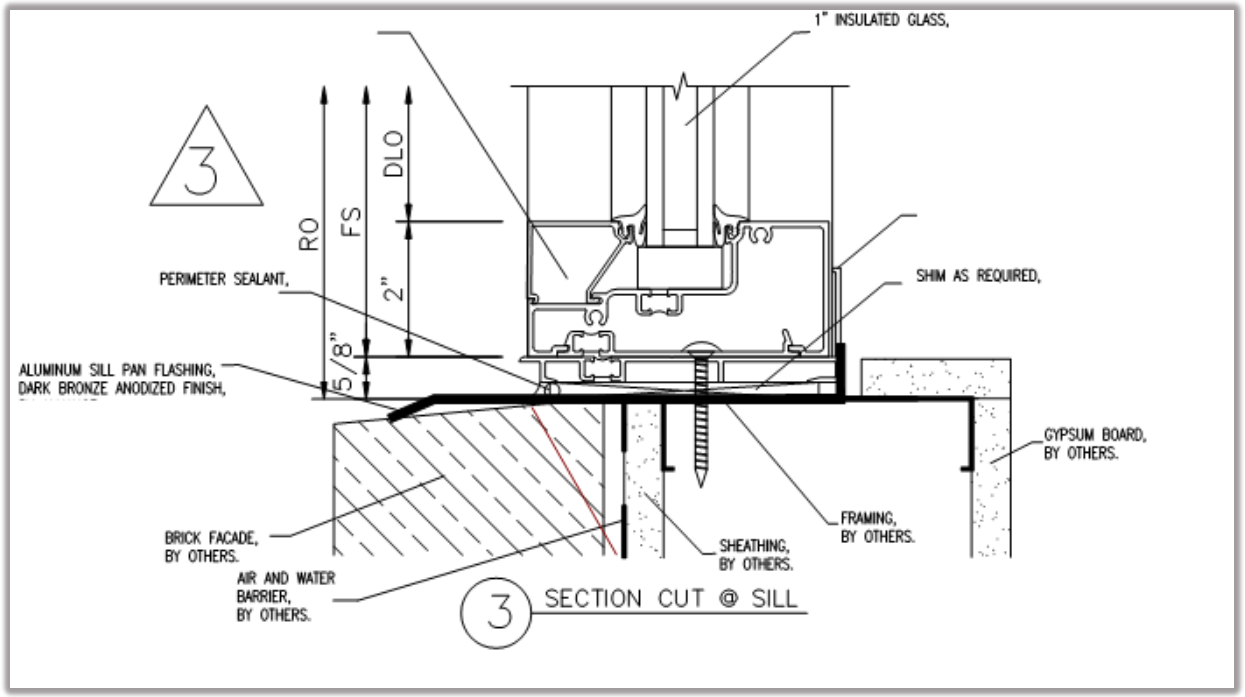


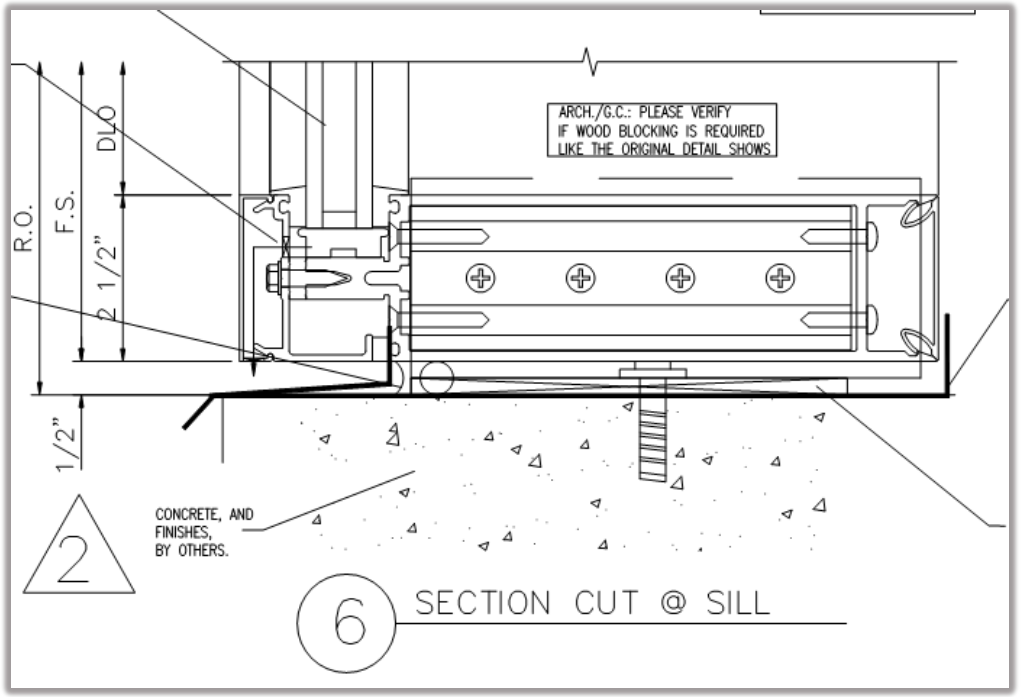
- Drainage/rainscreen assemblies widely utilized.
- Materials behind cladding/WRB/WP are sensitive to moisture or cannot get wet.
- Requires cavity drainage flashing
- Requires defining air and water plane, else there will likely be building enclosure performance issues.

THE TRANSITION FROM MASS WALL

THE TRANSITION FROM MASS WALL

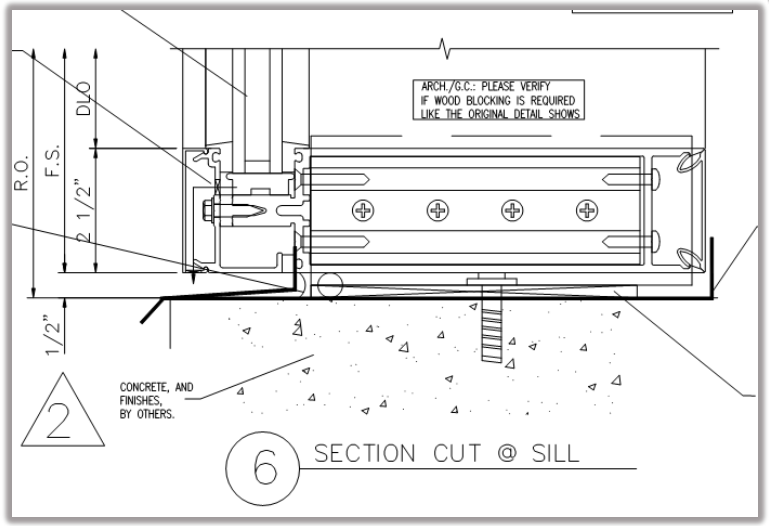
Sill pans were the answer to managing water at the opening……but where is the water coming from? The window or the wall or both and how much? Is this the best solution for new construction?

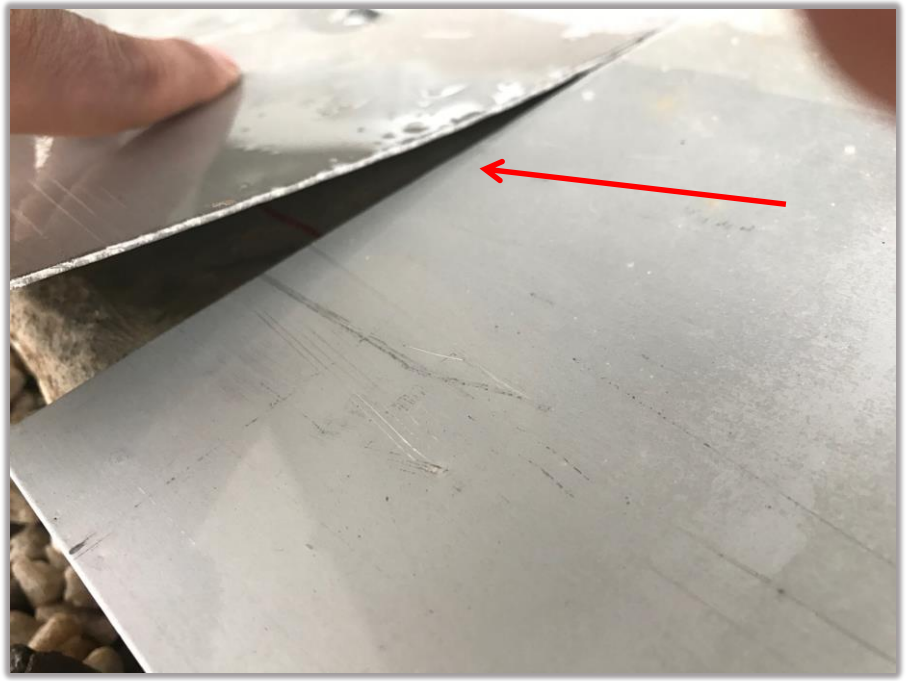




THE TRANSITION FROM MASS WALL

Sill pans were the answer to managing water at the opening……but where is the water coming from? The window or the wall or both and how much? Is this the best solution for new construction?





NEW CONSTRUCTION | 03

NEW CONSTRUCTION

Today's Building Enclosure

- Complex building materials
- Multi-layer construction / multiple trades
- Thinner construction
- Limited on-the-job training
- Higher expectations
- Schedule Critical
- Cost Sensitive

http://www.mgac.com/projects/house-of-sweden/33

PERFORMANCE

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

   a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.

2. Entrance Doors:

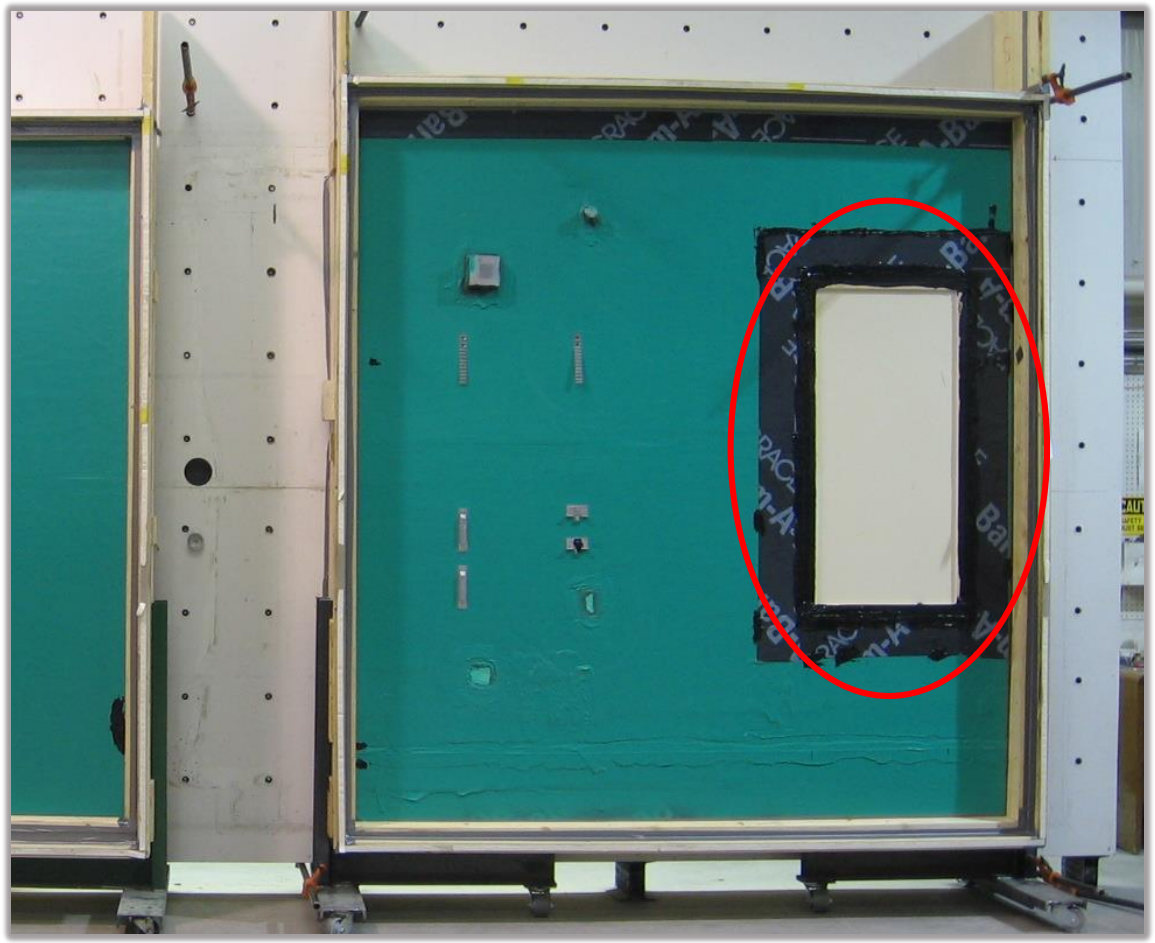
   a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
   b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..

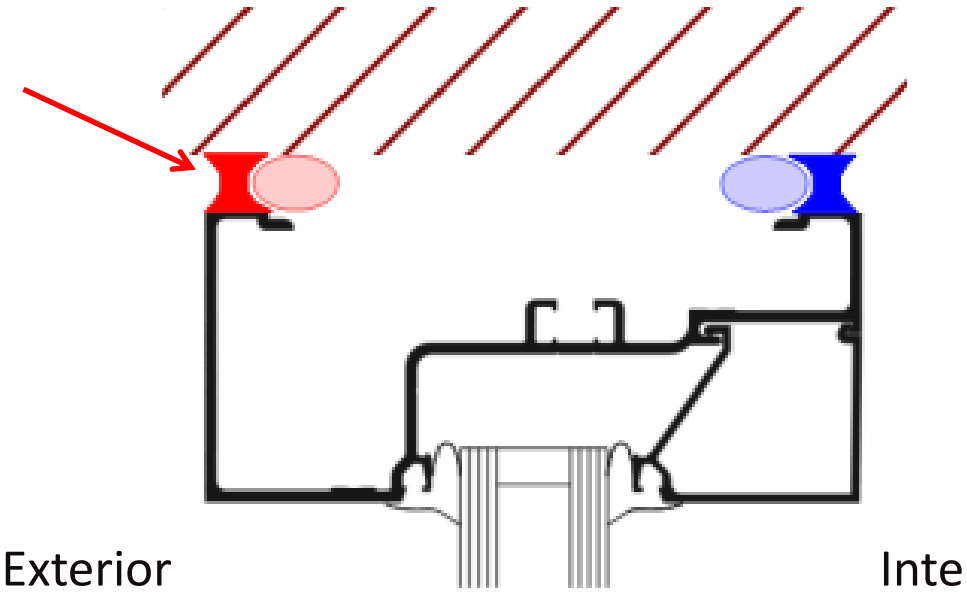
MUST REVIEW TEST REPORT TO UNDERSTAND HOW ASSEMBLY WAS TESTED. THIS IS CRITICAL TO PROPER INTERFACING WITH ADJACENT ASSEMBLIES.

ASSEMBLIES – AIR BARRIERS



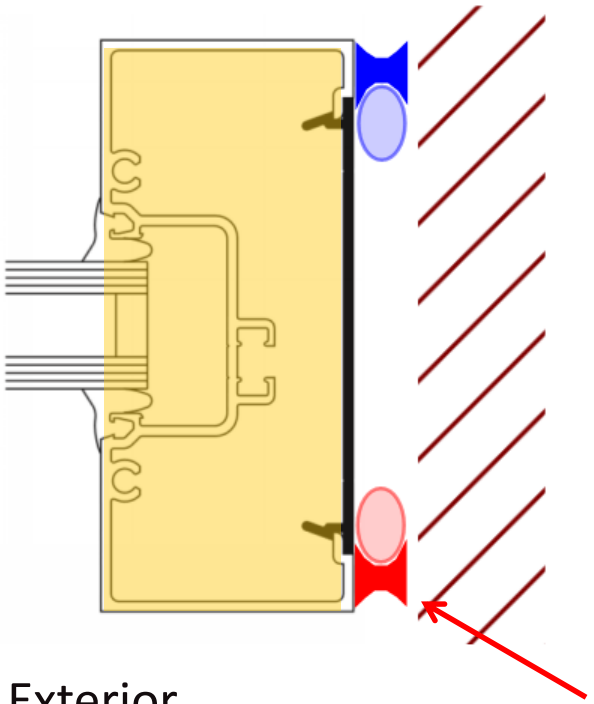
ASTM E2357*

- < 0.040 cfm/ft2 75 Pa
- Structural loading
- **Simulated window**
- Detailing included
- **No interface details**
- No impact of weather or site conditions



Exterior Interior

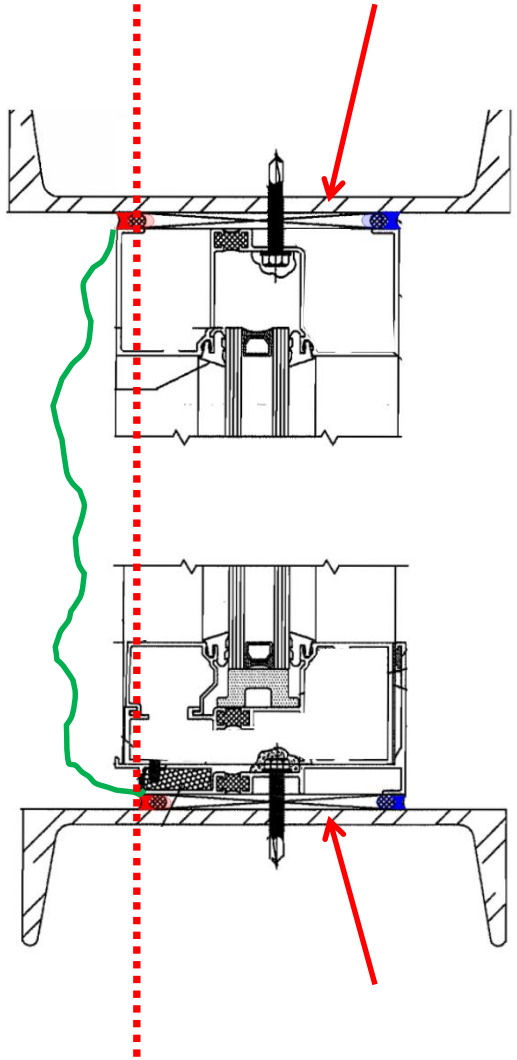
Interior



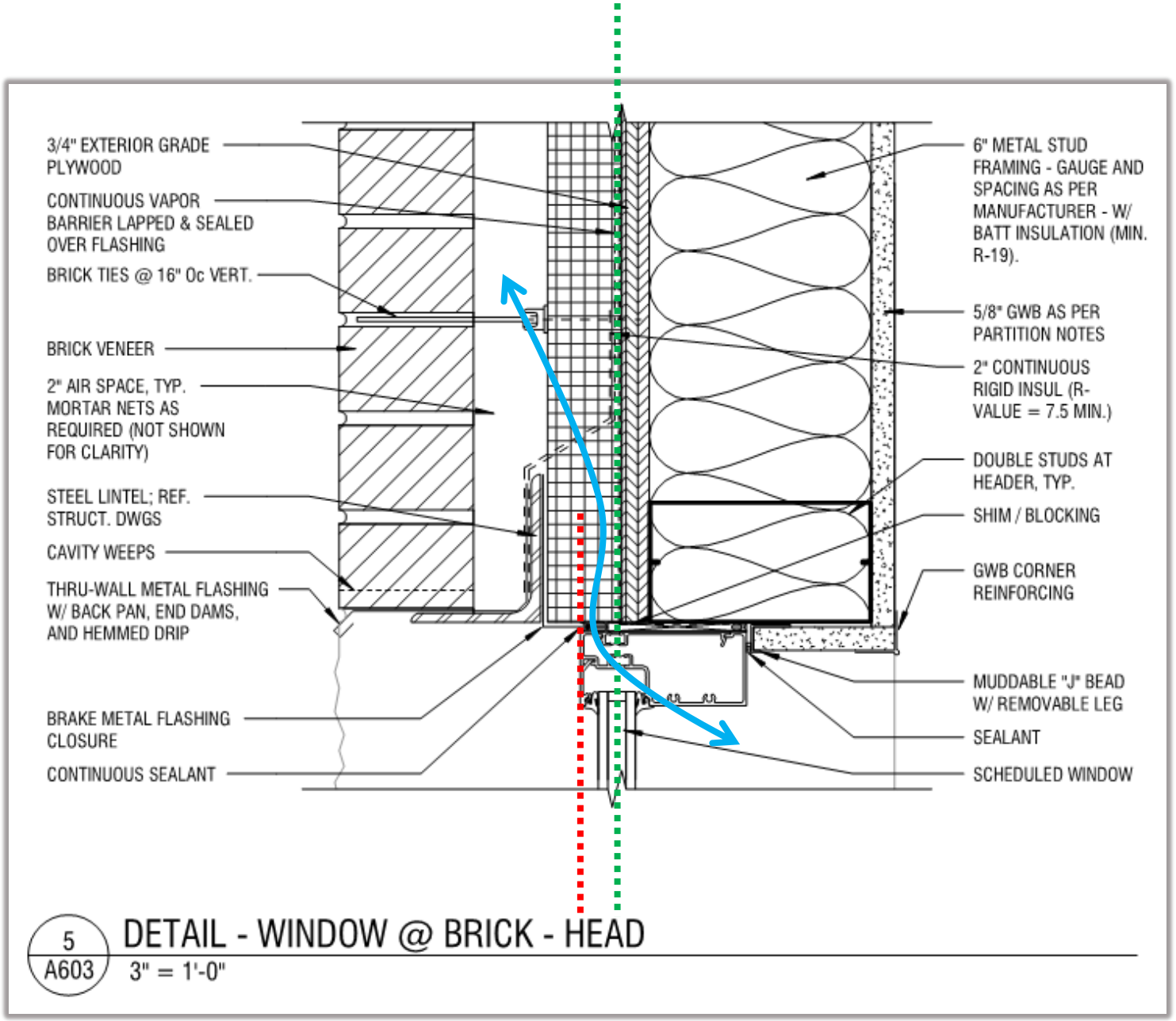
Exterior

PLANE OF AIR AND WATER TIGHTNESS

ASSEMBLIES – FENESTRATION
ASTM E283 AIR LEAKAGE/ASTM E331 WATER PENETRATION



THE INTERFACE



THERMAL PERFORMANCE

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.47 Btu/sq. ft. x h x deg F as determined according to AAMA 1503.
2. Solar Heat Gain Coefficient: Refer to Section 088000 "Glazing."
3. Condensation Resistance: Fixed glazing and framing areas shall have a condensation resistance rating of no less than the values indicated below as determined according to AAMA 1503.1.

    a. Frame: 70 (glass to exterior).
    b. Glass: 69 (glass to exterior).

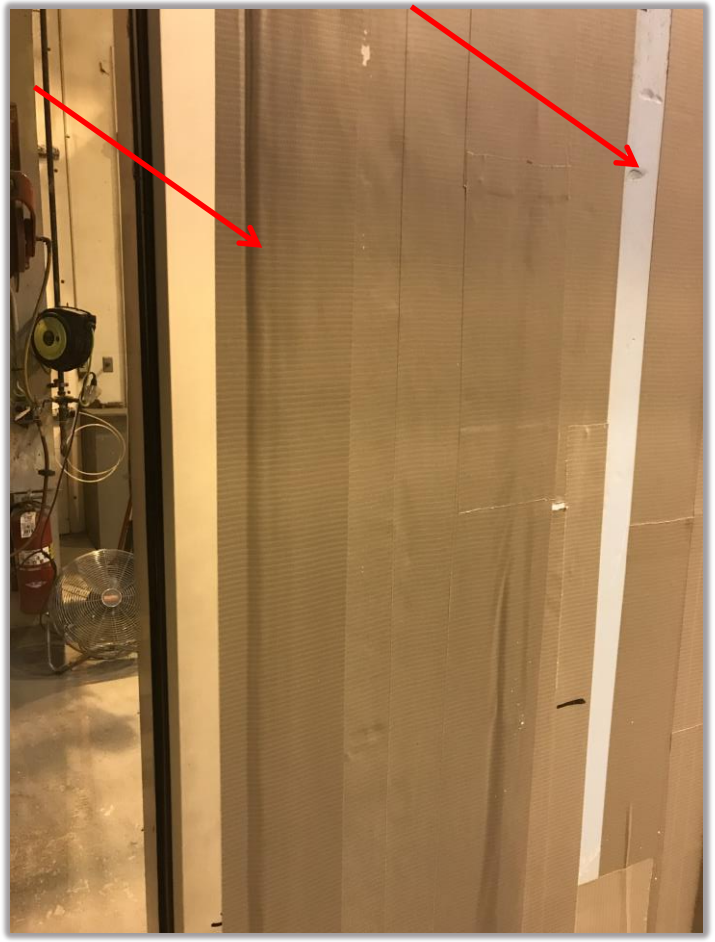
MUST REVIEW TEST REPORT TO UNDERSTAND HOW ASSEMBLY WAS TESTED. THIS IS CRITICAL TO PROPER INTERFACING WITH ADJACENT ASSEMBLIES.

THERMAL PERFORMANCE TESTING

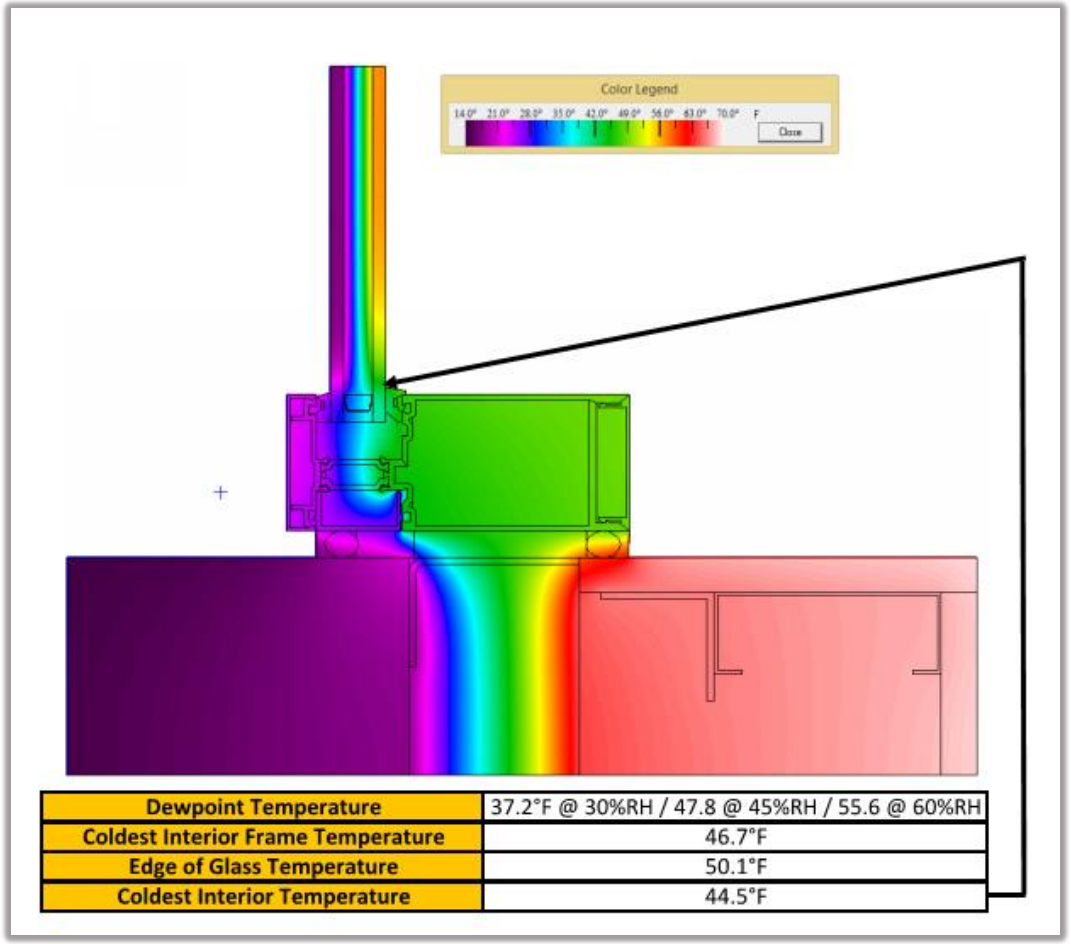
- **Air infiltration eliminated for testing**
- Perimeter condition is taped/sealed
- Framing joinery is taped/sealed
- Rough opening is comprised of rigid insulation

If air is allowed to bypass thermal brake of assembly, the thermal performance of the assembly is significantly impacted.

THERMAL PERFORMANCE TESTING



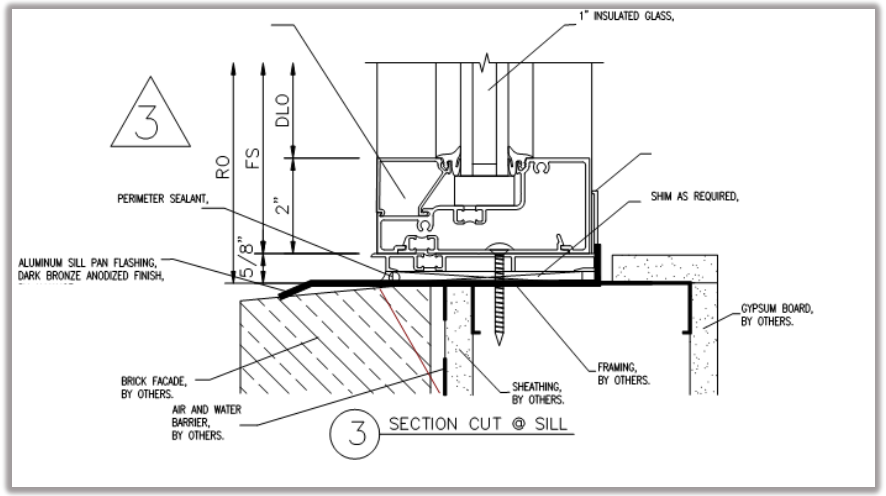
THERM

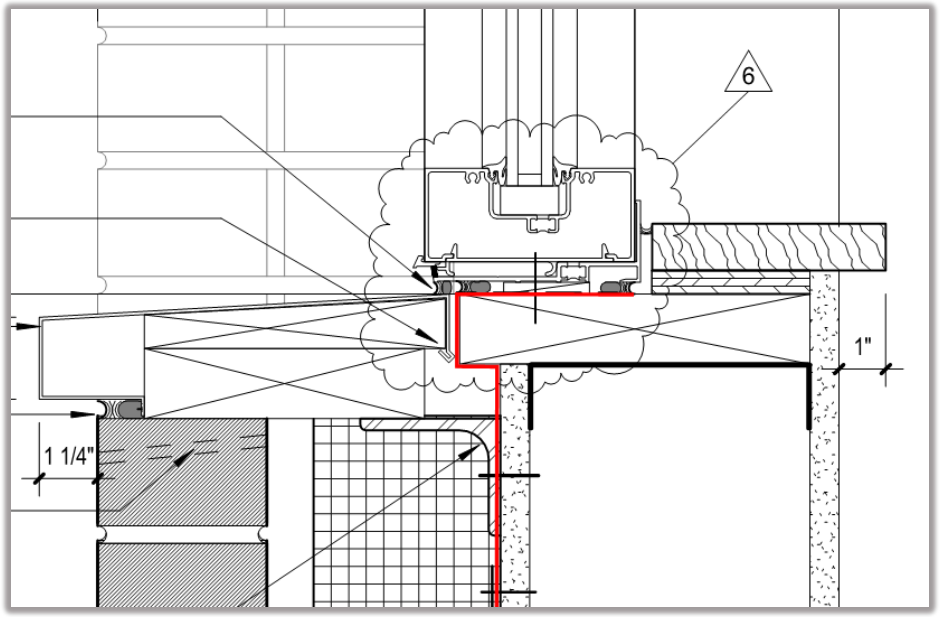


Dewpoint Temperature	37.2°F @ 30%RH / 47.8 @ 45%RH / 55.6 @ 60%RH
Coldest Interior Frame Temperature	46.7°F
Edge of Glass Temperature	50.1°F
Coldest Interior Temperature	44.5°F

Does not accurately model impact of air leakage at perimeter condition.

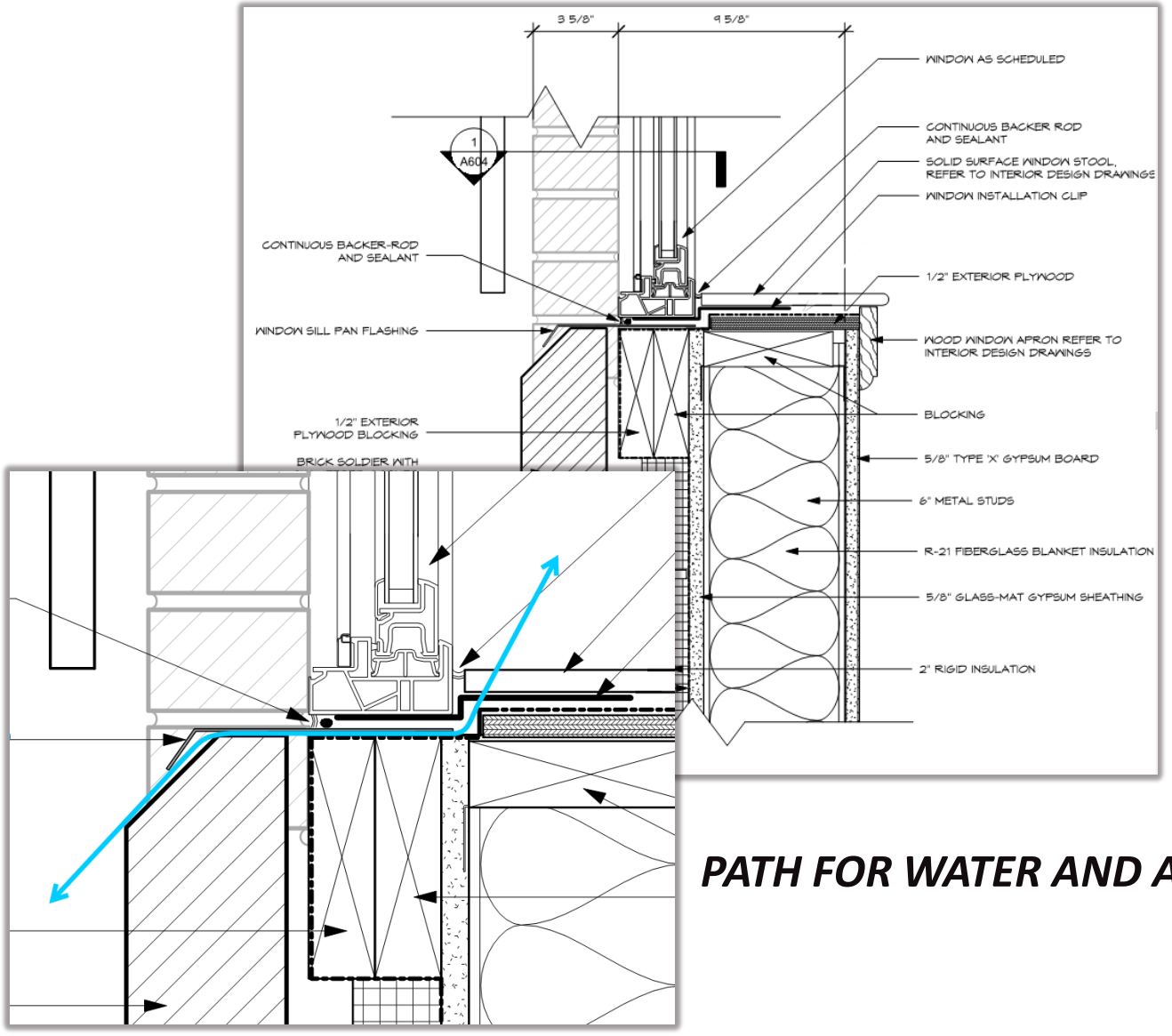
NEW CONSTRUCTION





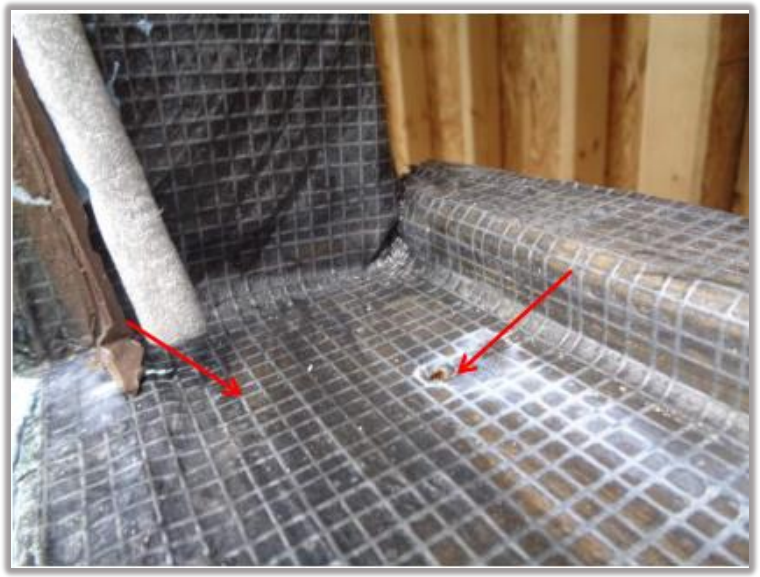
- ***First Priority****: Ensure design depicts continuous tie-in air and water control at perimeter of assembly. Prefer to not rely on metal flashings or through-wall flashing to provide transition of primary air and water control.*
- *Metal sill pan vs. membrane. Consider the following for metal sill pans*
  - *Must be bed in full bed of sealant and will likely be blindly penetrated*
  - *Requires critical detailing of end dams to be effective. If installer cant get subsill end dam right how will they do with metal sill pan?*
  - *Construction sequencing, must be installed first.*
  - *Thermal bridging*
- *Insulation alignment*
- *Can assembly be tested before cladding is installed?*

METAL FLASHING

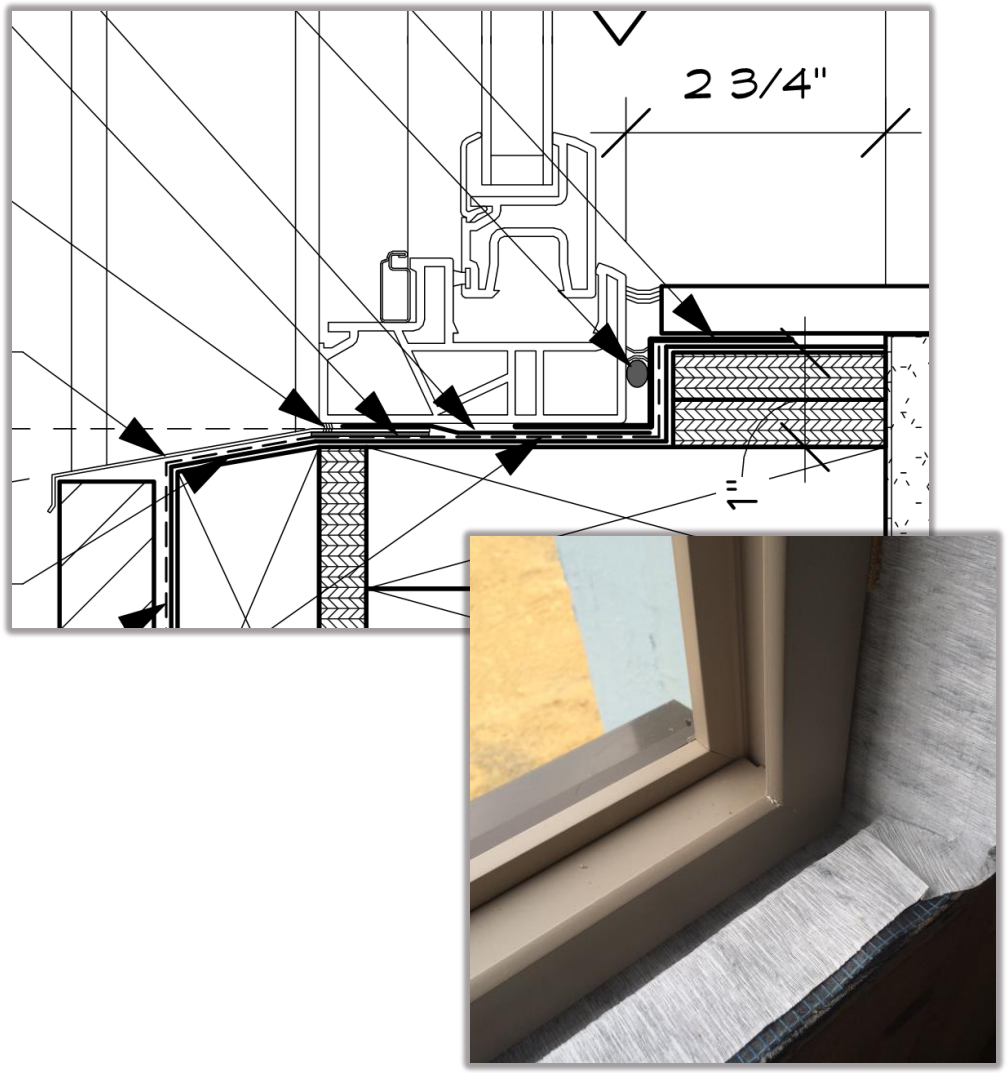


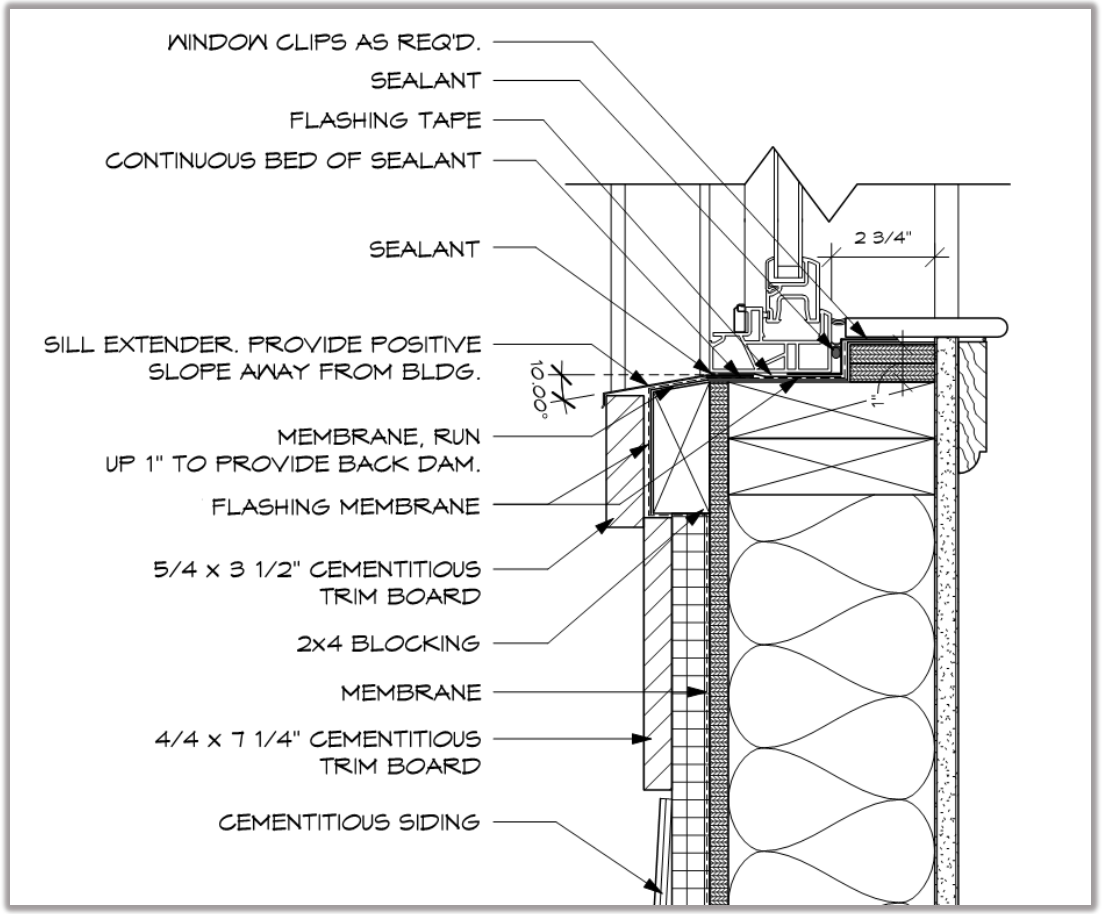
PATH FOR WATER AND AIR

METAL SILL FLASHING



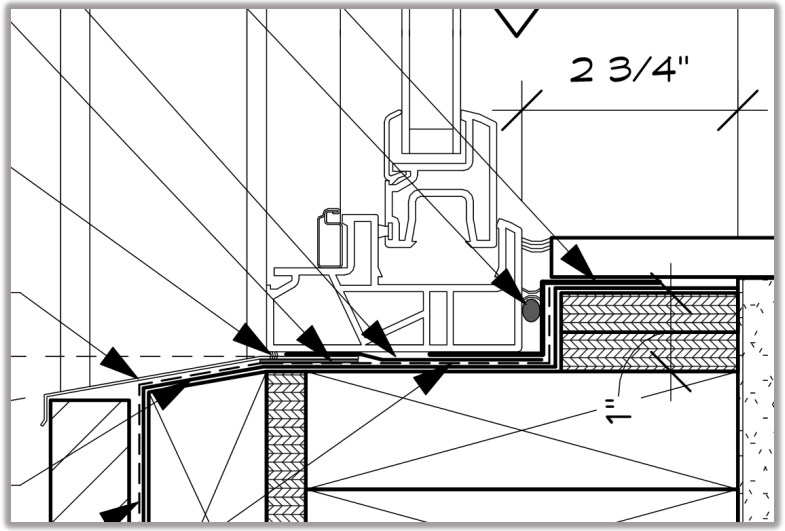
INTEGRATED METAL FLASHING



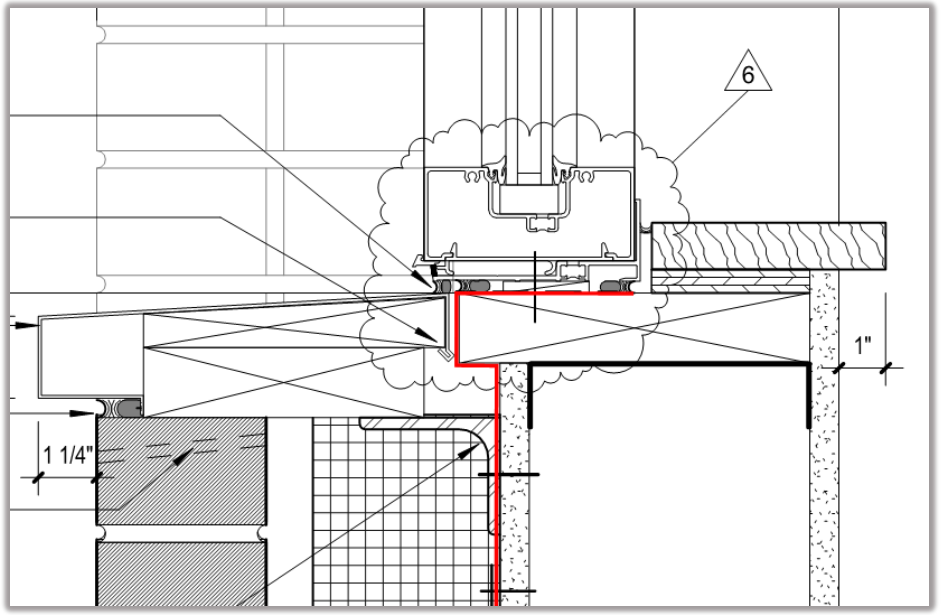


FIELD QC

CONSTRUCTION SEQUENCING



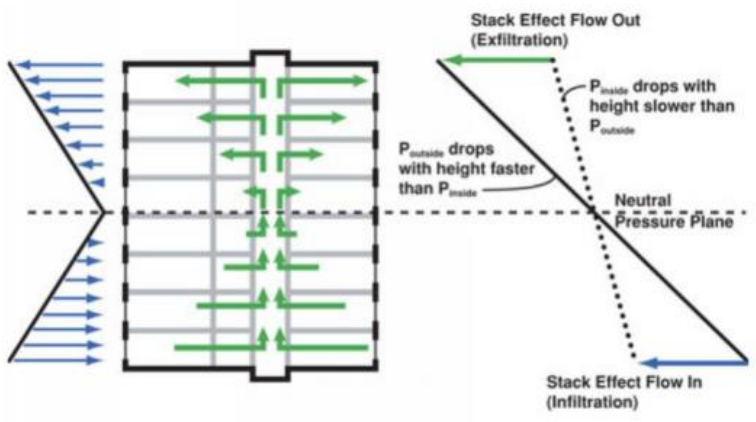
CONSTRUCTION SEQUENCING/SEPARATION OF TRADES



PERFORMANCE MOCK-UPS

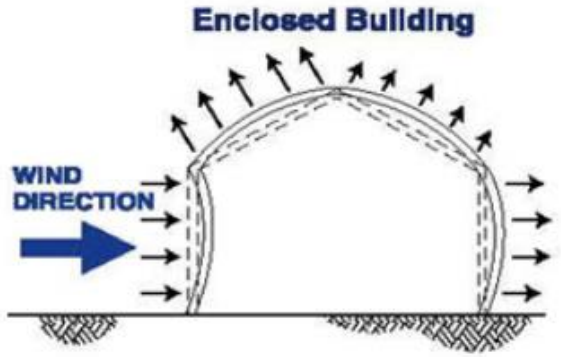
- Laboratory
- Onsite stand-alone
- In-situ

AIR LEAKAGE (WIND AND STACK EFFECT)

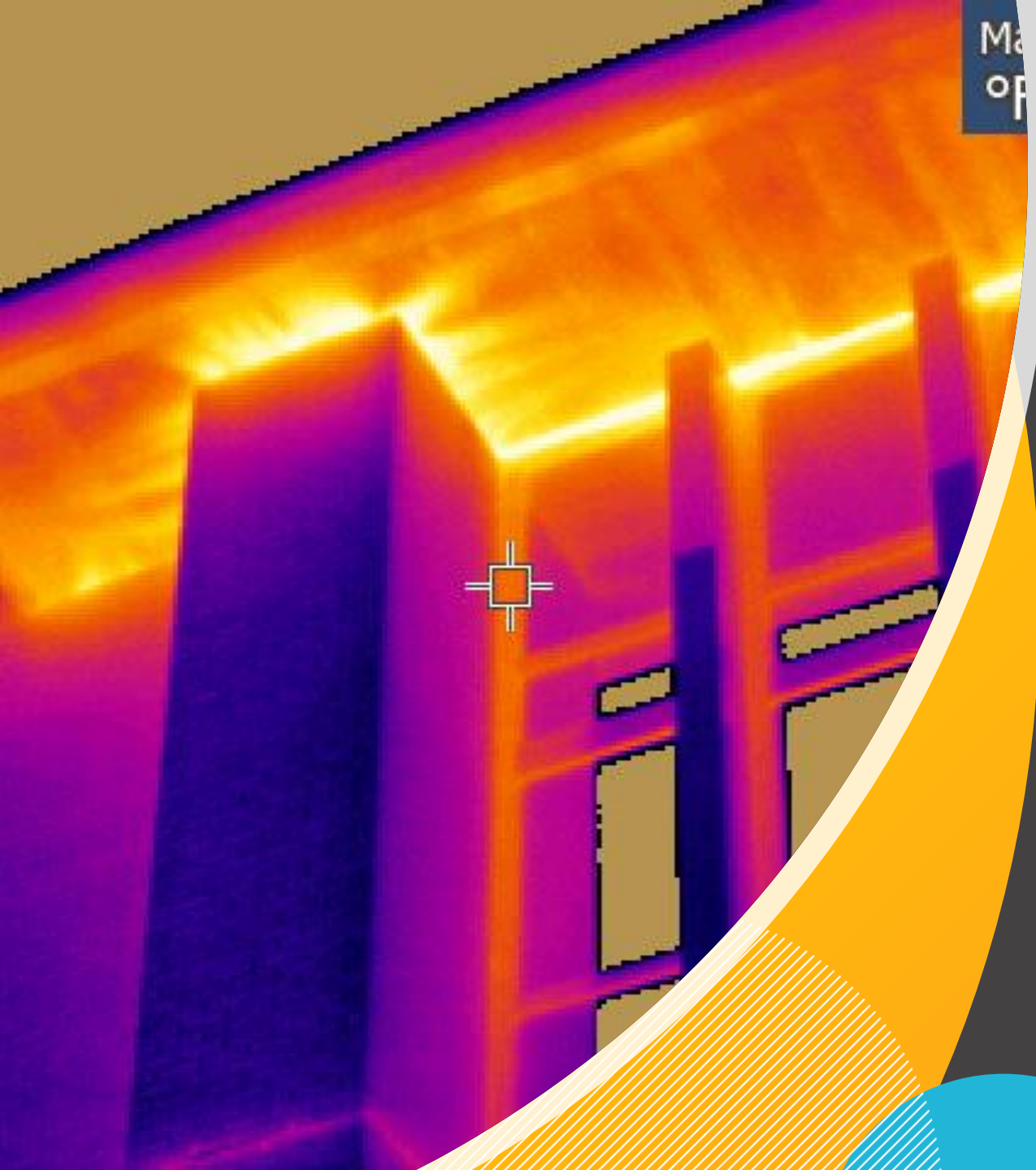


Joseph Lstiburek, February 14, 2014, BSI-075: How Do Buildings Stack Up?, Figure 7

- **What does a "balanced" HVAC system mean?**
- **Do HVAC systems neutralize wind pressure?**
- **Do HVAC systems account for stack pressure?**
- **Product Testing, Energy Modeling, THERM modeling typically don't or can't accurately account for air leakage resultant from wind or stack pressure.**



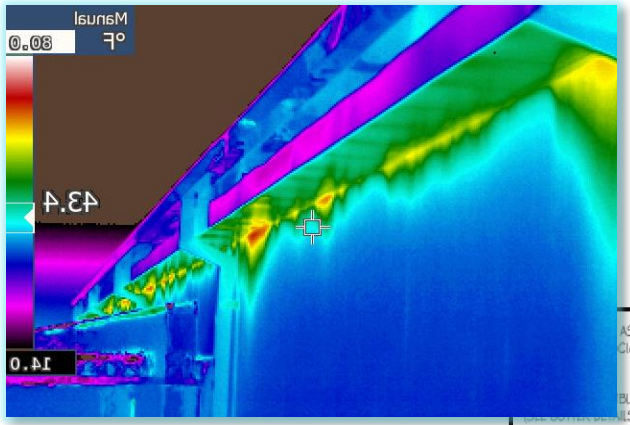
https://seblog.strongtie.com/2013/02/open-front-structure-wind-pressure-design/,Structural Engineering Blog, Simpson Strong-Tie

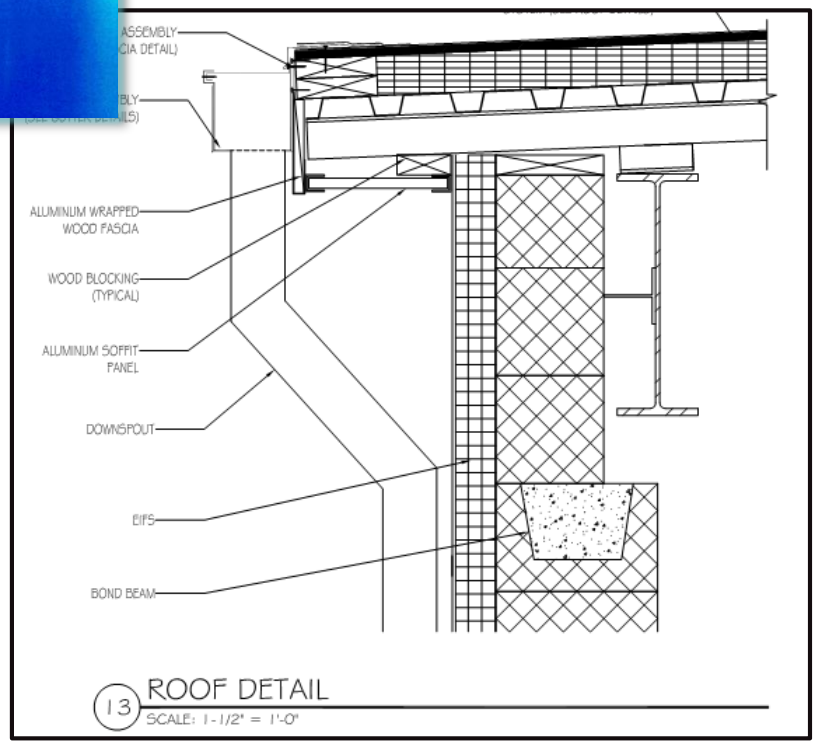


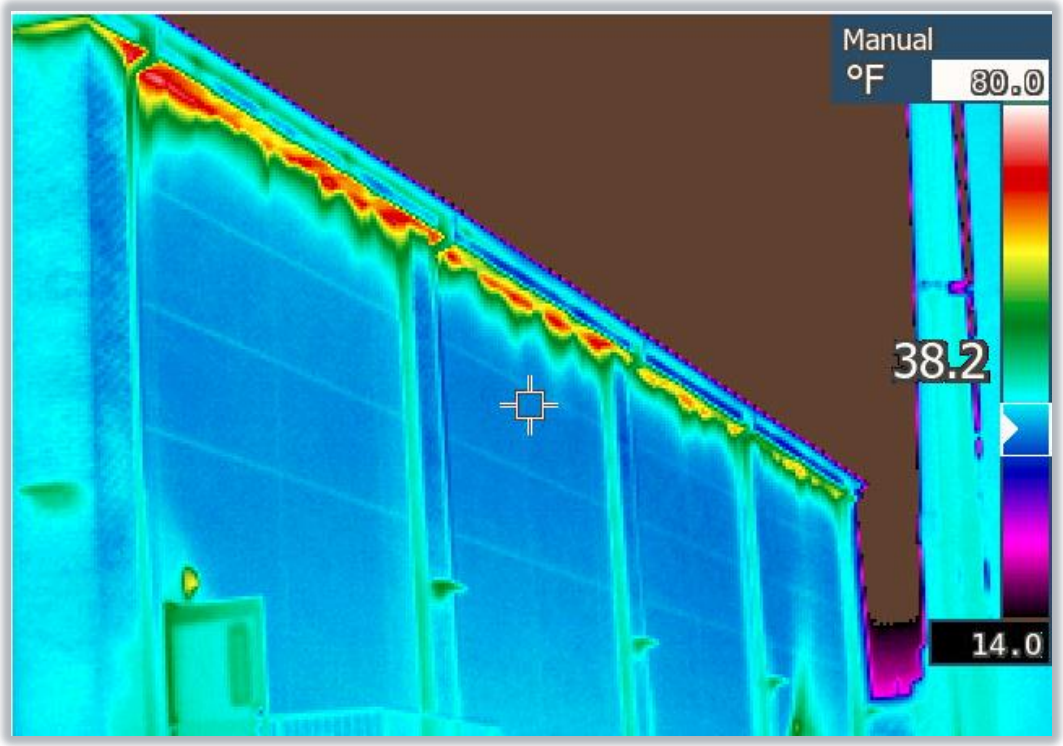
ROOF-TO-WALL

04

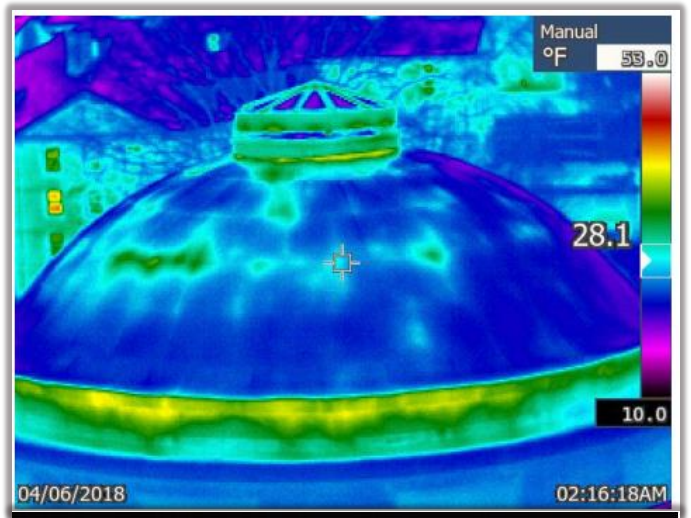
THE INTERFACE: ROOF-TO-WALL







BUILDING ENCLOSURE FAILURES
<0.25 CFM/SF



05

AIR CONTROL

AIR CONTROL: INSULATION LOCATION

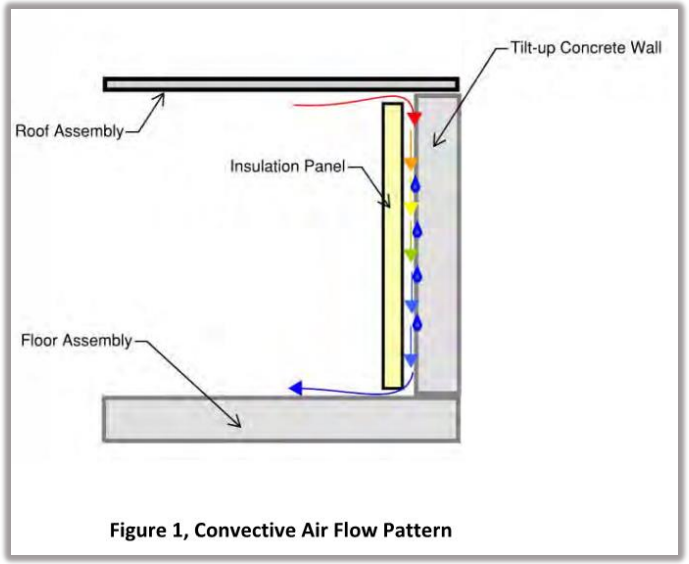
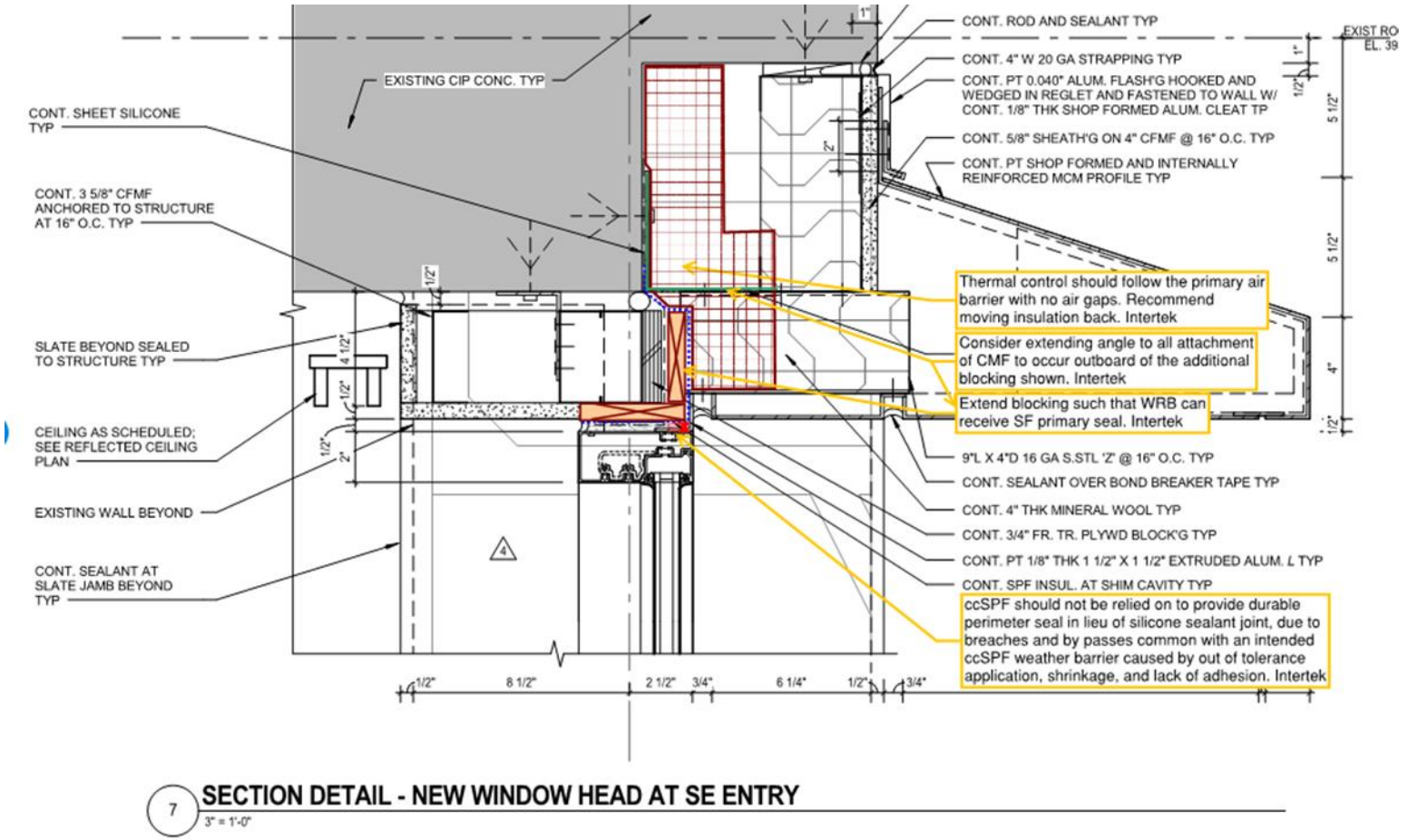


Figure 1, Convective Air Flow Pattern

BUILDING ENCLOSURE

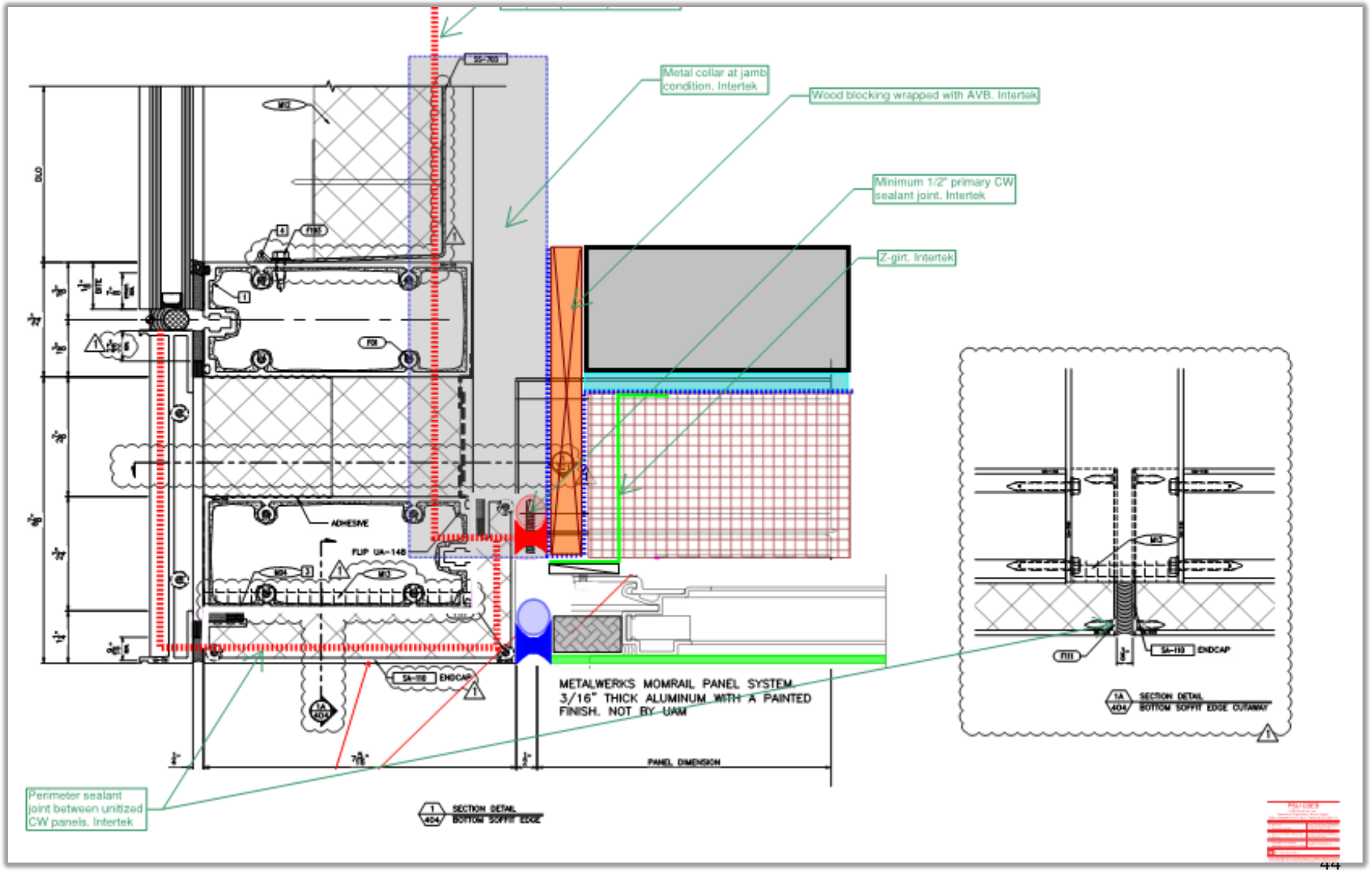
Design Review

Make sure we are sealing to the air barrier...but also make sure to tie-in with the primary seal line of the curtain wall/window system.



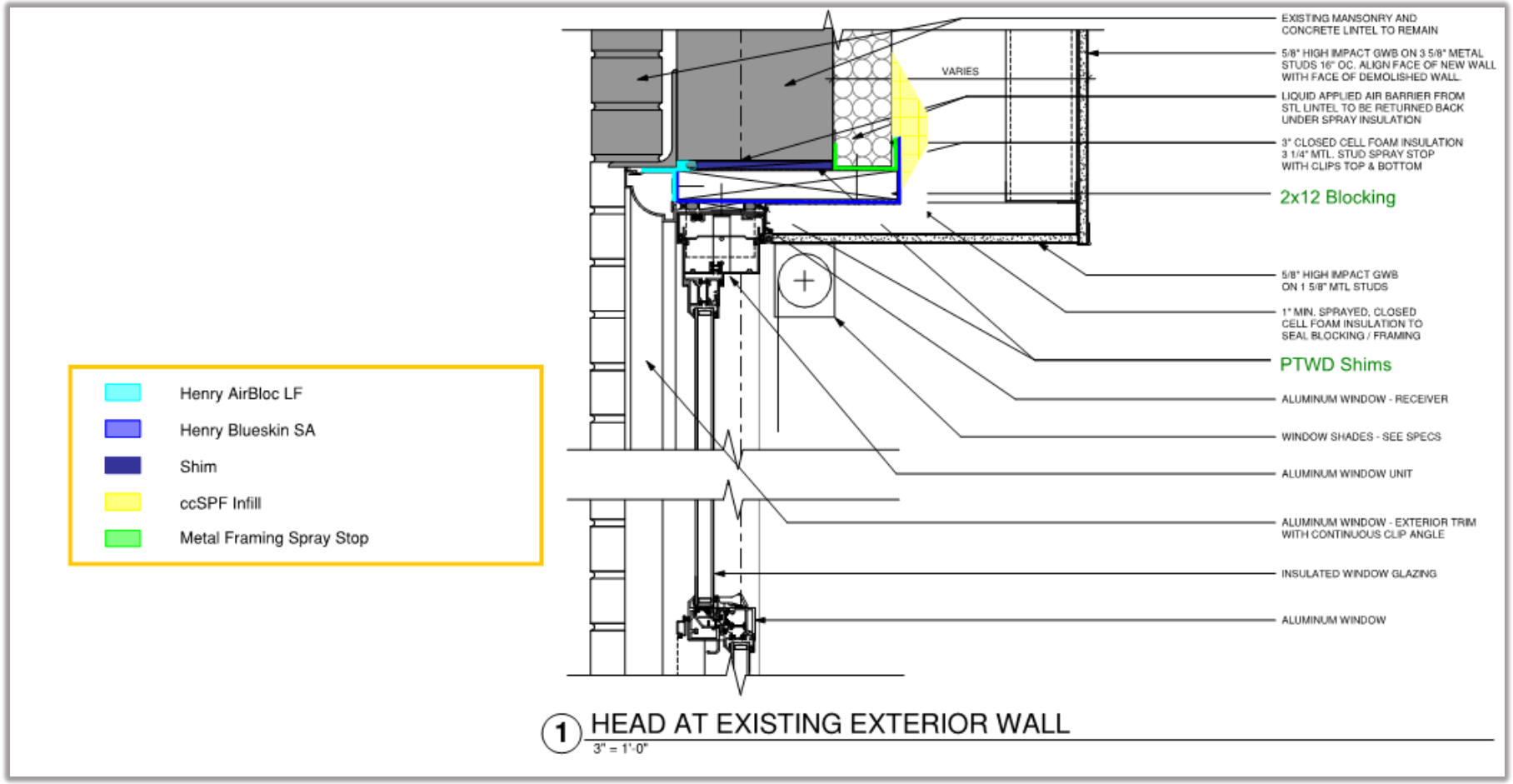
BUILDING ENCLOSURE

Submittal Reviews/ Coordination Details



BUILDING ENCLOSURE

Coordination Details



Adam Ugliuzza, P.E. CPHC

Senior Manager, Building Science Solutions

Intertek Building and Construction

adam.ugliuzza@Intertek.com

717-309-5305

air barrier abaa association of america CONFERENCE & TRADE SHOW MARCH 26-27 2019 NORFOLK

Thank You Sponsors!

TREMCO
Commercial Sealants & Waterproofing

GJC GENERAL
INSULATION COMPANY, INC.

TMI
Air Barrier Testing

Master Wall Inc.
30 YEARS STRONG

BE BUILDING ENCLOSURE

CoatingsPro MAGAZINE

PRISM

Architect's Newspaper