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BUILDING ENCLOSURE CONFERENCE 2023

Challenges and Solutions for Projecting Facade Elements

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AIA Continuing Education Provider

abaa EDUCATION

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BE BUILDING ENCLOSURE

Learning Objectives

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

1. Identify projecting elements that have increased risk for condensation
2. Understand how air leakage, thermal bridging, and thermal shorting at projecting elements creates risk for condensation
3. Understand that there are two different general concepts for detailing projecting elements
4. Identify various ways to minimize risk for condensation in projecting elements

Outline

1. Legacy Concerns and Background
2. Parapets
3. Wing Walls
4. Overhangs

Outline

1. **Legacy Concerns and Background**
2. Parapets
3. Wing Walls
4. Overhangs

Legacy Concerns

Legacy Concerns

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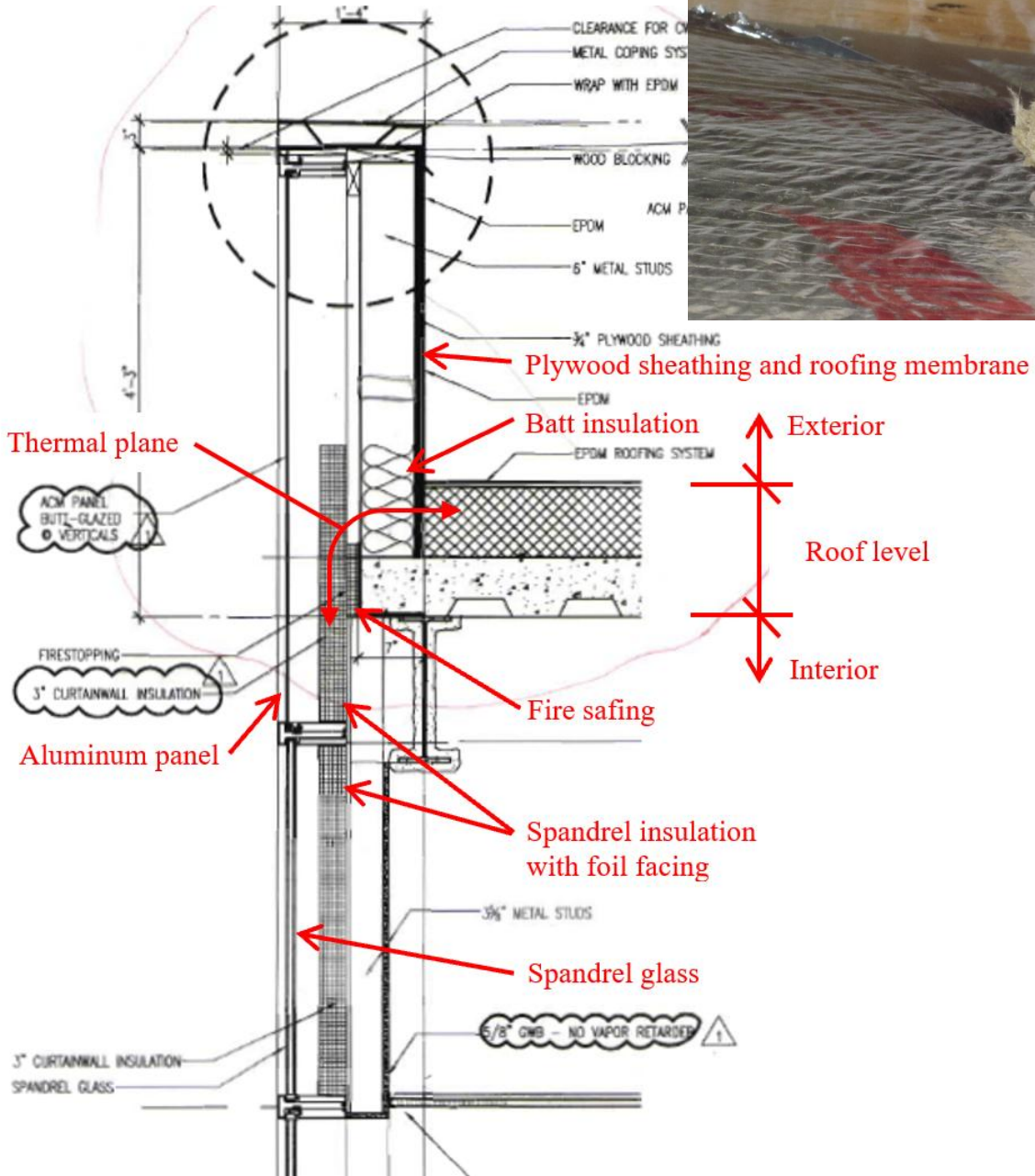
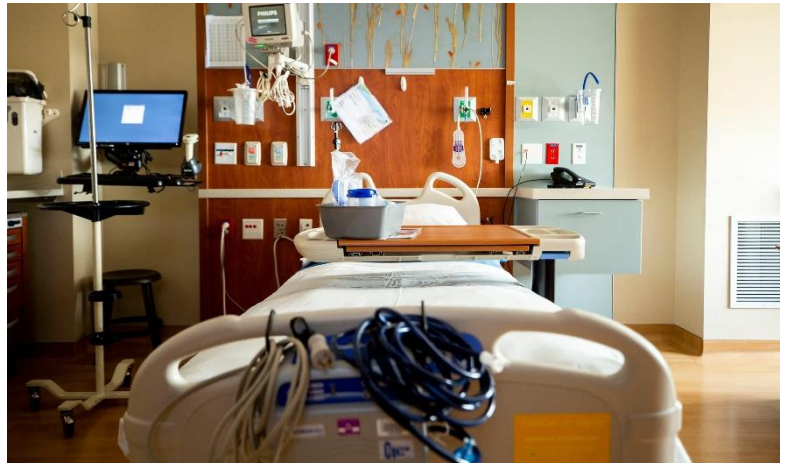


Risk Tolerance

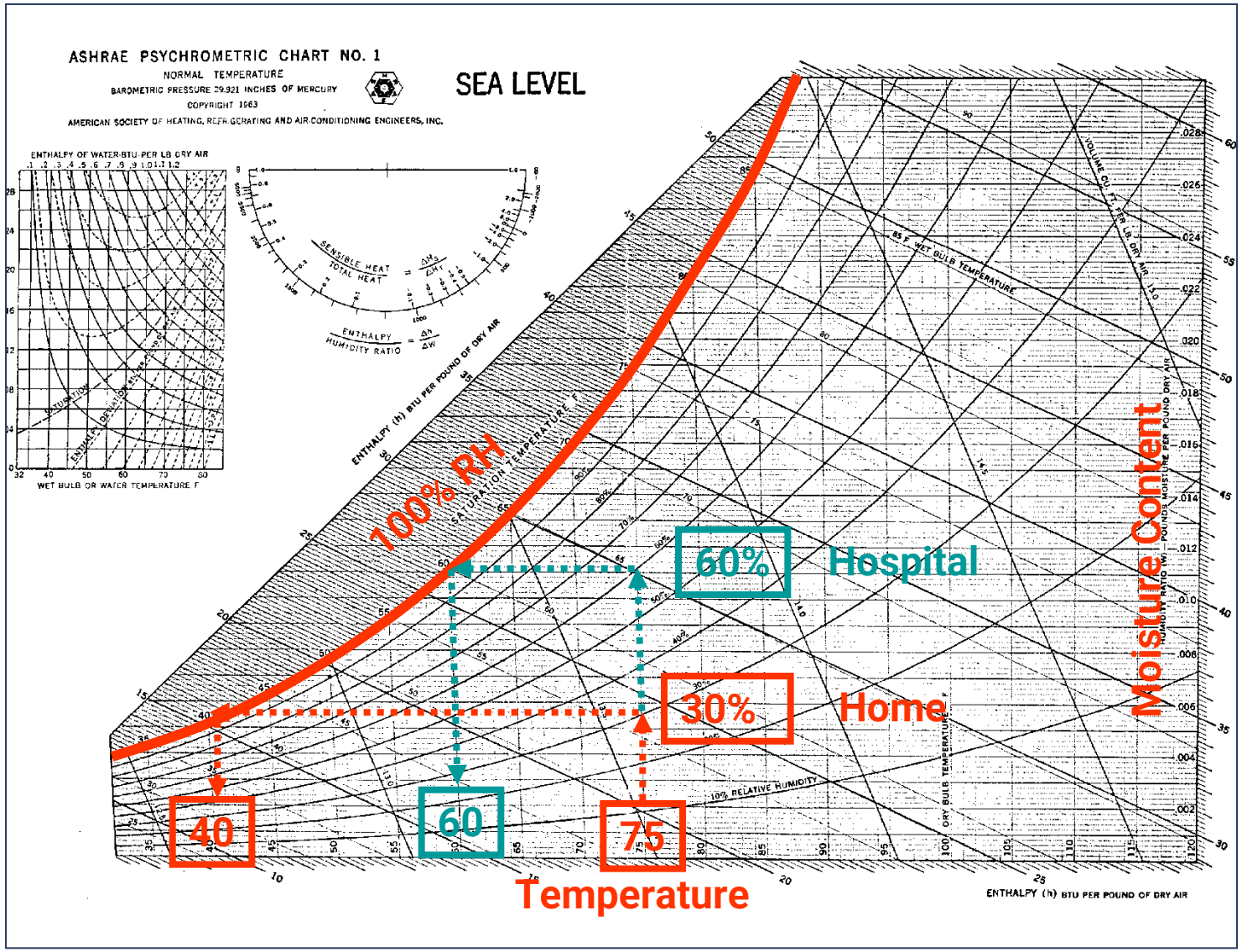


Lower Risk

Think as you draw

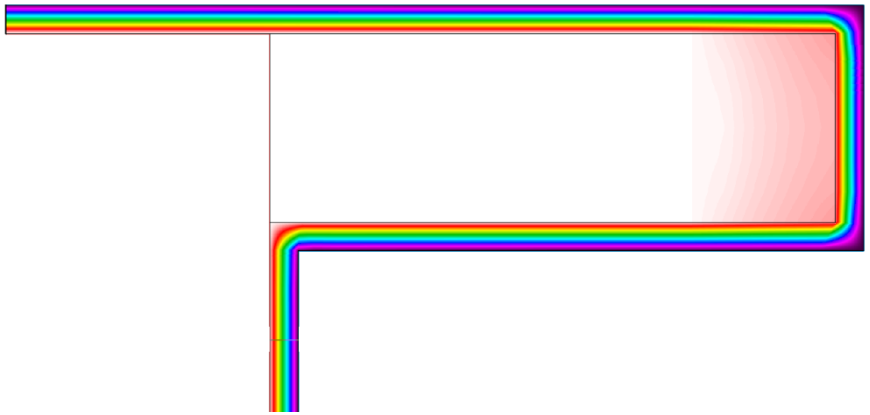
Seek help - High risk!

Condensation – Dew Point

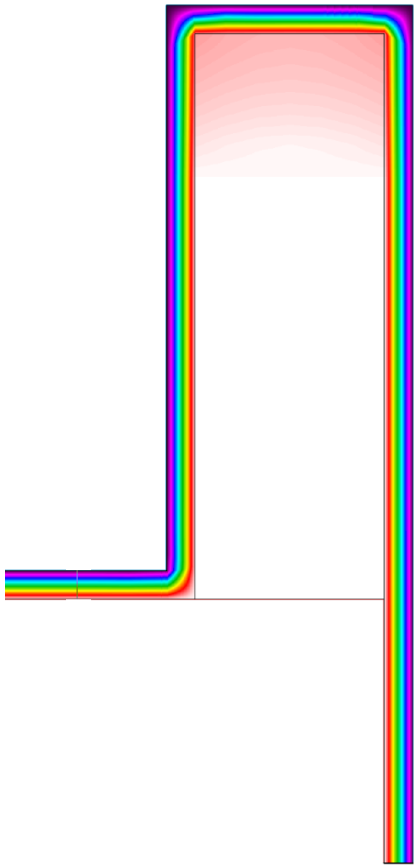


Air at 75° F and 30% RH = 40° F Air at 75° F and 60% RH = 60° F

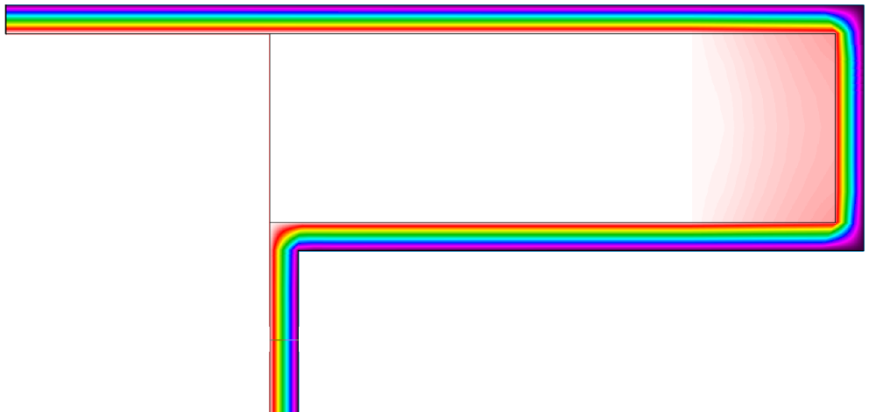
Issues with Projections



Overhang
(section)

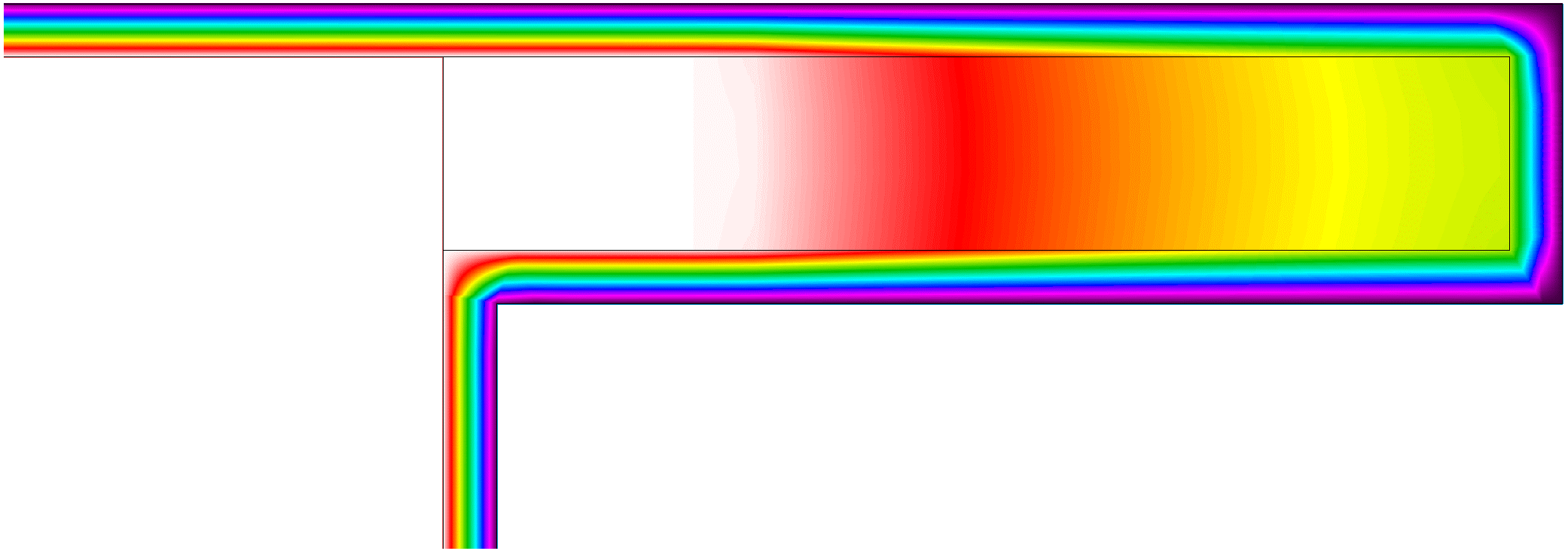


Parapet
(section)

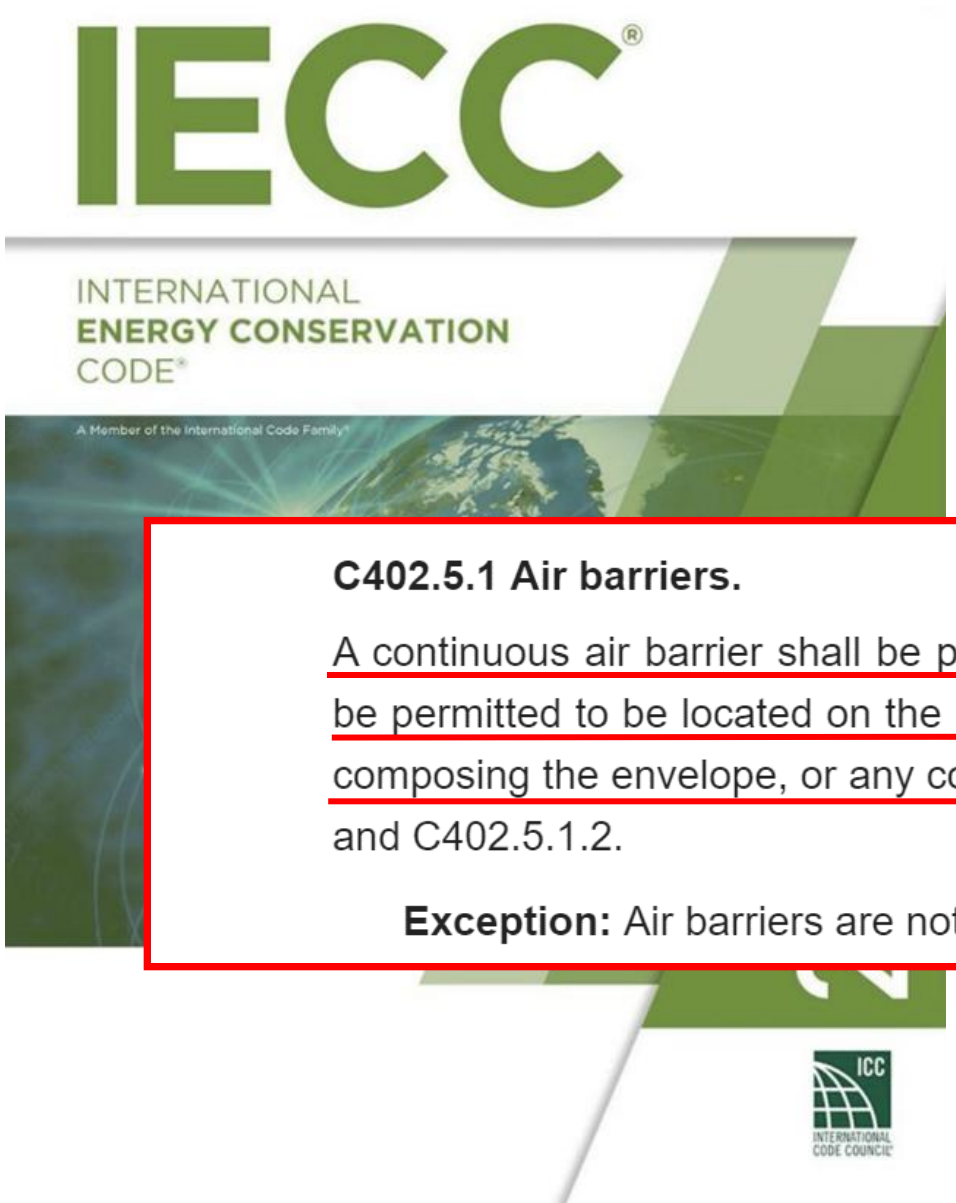


Wing Wall
(plan)

Issues with Projections



Air Control



C402.5 Air leakage—thermal envelope (Mandatory).

The *thermal envelope* of buildings shall comply with Sections C402.5.1 through C402.5.8, or the building *thermal envelope* shall be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) or an equivalent method approved by the code official and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft^2 (2.0 L/s • m^2). Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

C402.5.1 Air barriers.

A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1 and C402.5.1.2.

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Exception: Air barriers are not required in buildings located in *Climate Zone* 2B.

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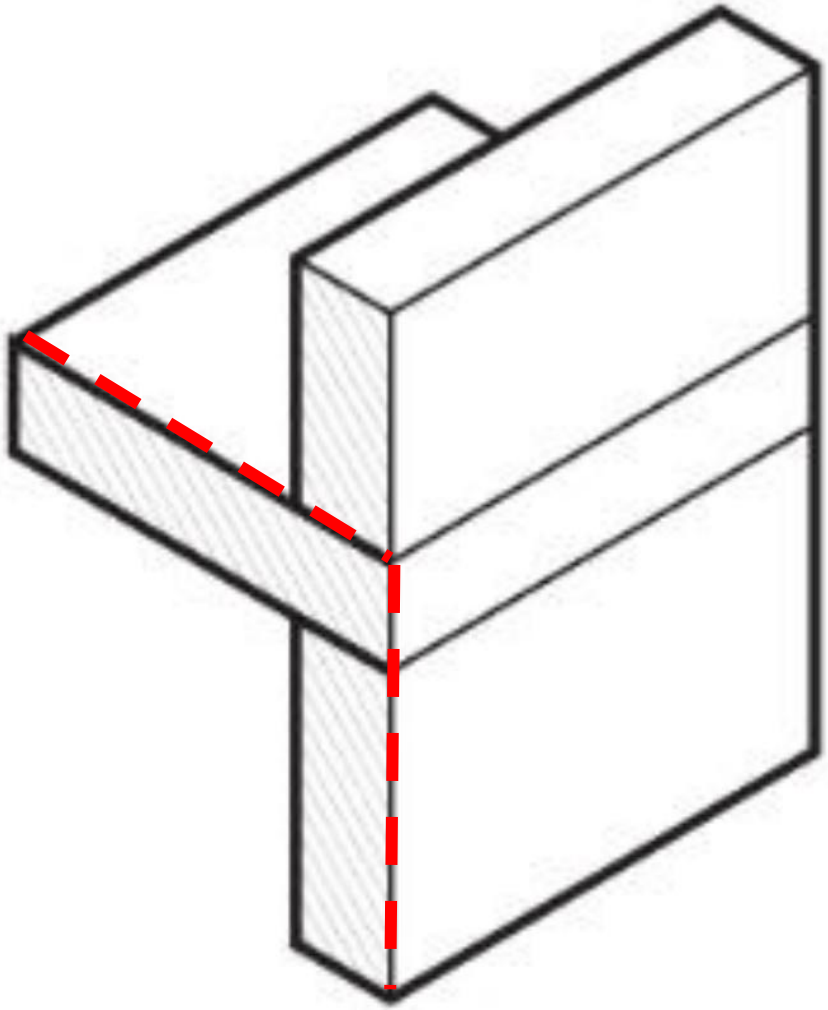
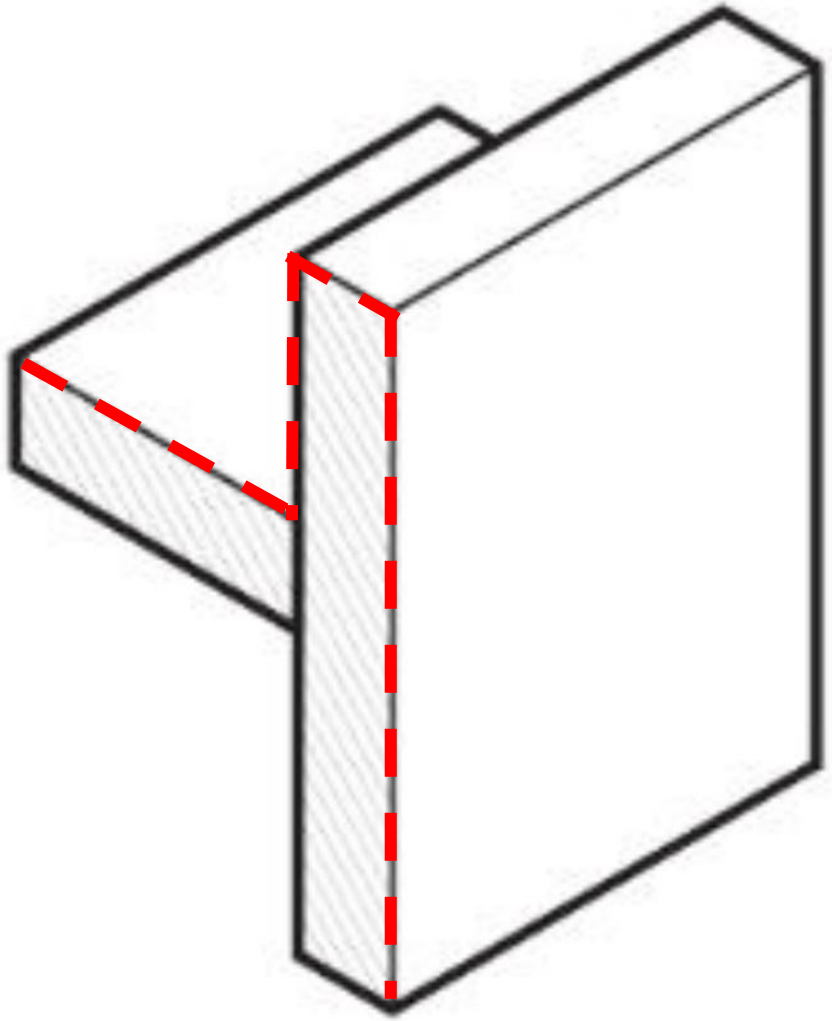
compatible with the construction materials and location. Sealing shall allow for expansion, contraction and mechanical vibration. Joints and seams associated with penetrations shall be sealed in the same manner or taped. Sealing materials shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair the penetrations' ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation. Sealing of

Air Control

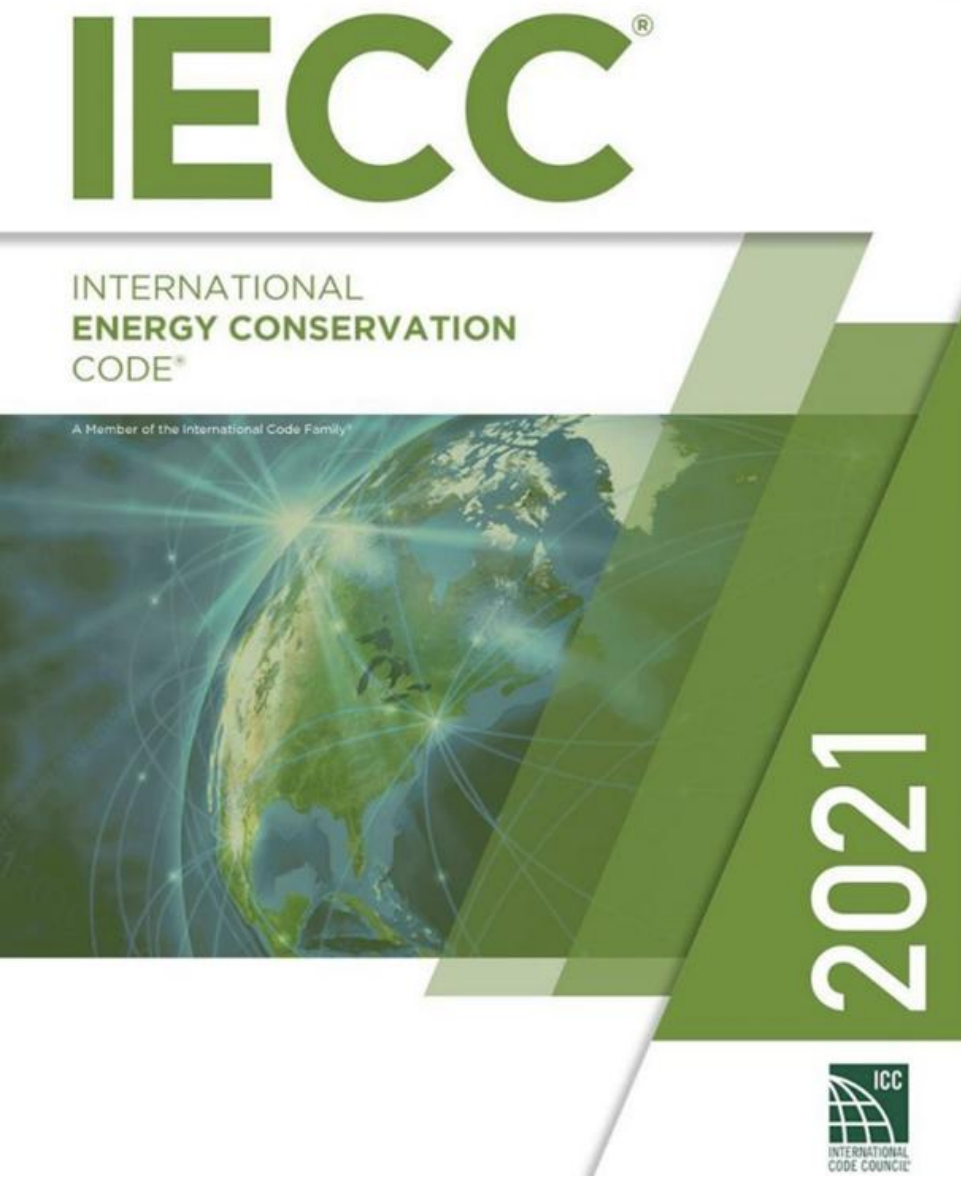


Platform Framed



Balloon Framed

Thermal Barrier

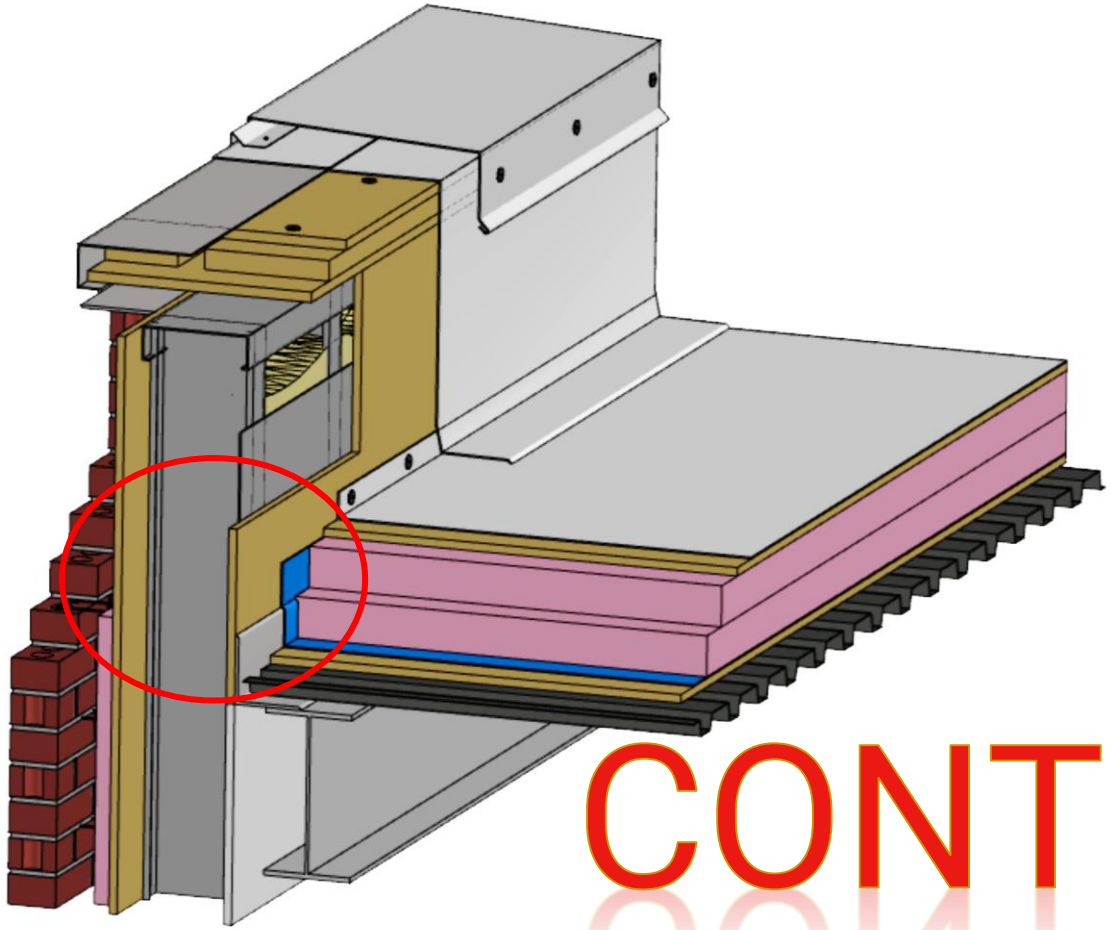


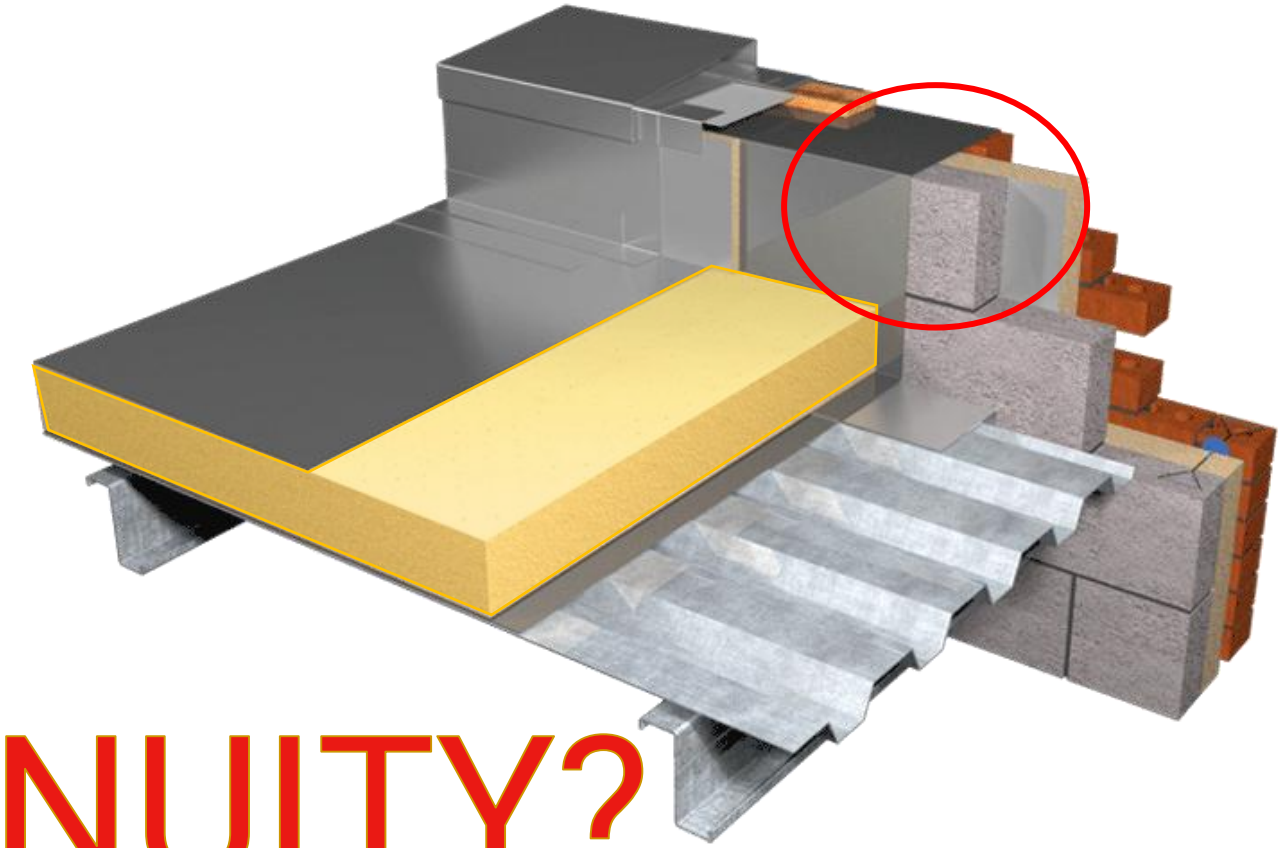
CLIMATE ZONE	5 AND MARINE 4	
	All other	Group R
Insulation entirely above roof deck	R-30ci	R-30ci
Metal buildings[b]	R-19 + R-11 LS	R-19 + R-11 LS
Attic and other	R-49	R-49
Mass[f]	R-11.4ci	R-13.3ci
Metal building	R-13 + R-14ci	R-13 + R-14ci
Metal framed	R-13 + R-10ci	R-13 + R-10ci
Wood framed and other	R-13 + R-7.5ci or R20 + R3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci
Below-grade wall[d]	R-7.5ci	R-10ci
Mass[e]	R-14.6ci	R-16.7ci
Joist/framing	R-30	R-30
Unheated slabs	R-15 for 24″ below	R-20 for 24″ below
Heated slabs[g]	R-15 for 36″ below + R-5 full slab	R-15 for 36″ below + R-5 full slab

CLIMATE ZONE	5 AND MARINE 4	
	All other	Group R
Insulation entirely above roof deck	U-0.032	U-0.032
Metal buildings	U-0.035	U-0.035
Attic and other	U-0.021	U-0.021
Mass[f]	U-0.090	U-0.080
Metal building	U-0.050	U-0.050
Metal framed	U-0.055	U-0.055
Wood framed and other[c]	U-0.051	U-0.051
Below-grade wall[c]	C-0.119	C-0.092
Mass[d]	U-0.057	U-0.051
Joist/framing	U-0.033	U-0.033
Unheated slabs	F-0.52	F-0.51
Heated slabs	F-0.62	F-0.62
Nonswinging door	U-0.31	U-0.31
Swinging door[g]	U-0.37	U-0.37
Garage door < 14% glazing[h]	U-0.31	U-0.31

For SI: 1 pound per square foot = 4.88 kg/m^2, 1 pound

Thermal Control





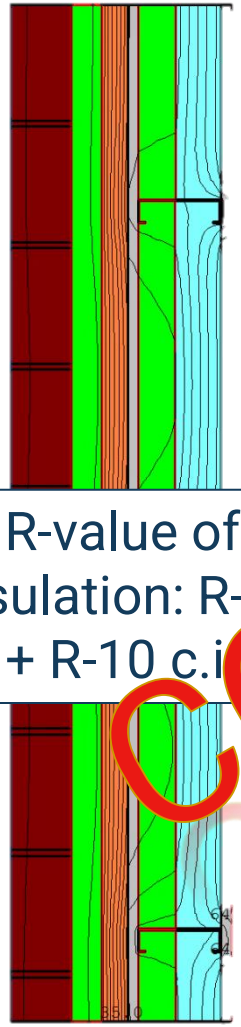
CONTINUITY?

Frame Construction

Masonry / Concrete Construction

Thermal Control

Prescriptive



R-value of insulation: R-13 + R-10 c.i

~ U-Factor: 0.048

U-Factor Model

R-value of insulation: R-20 + R-5 c.i.

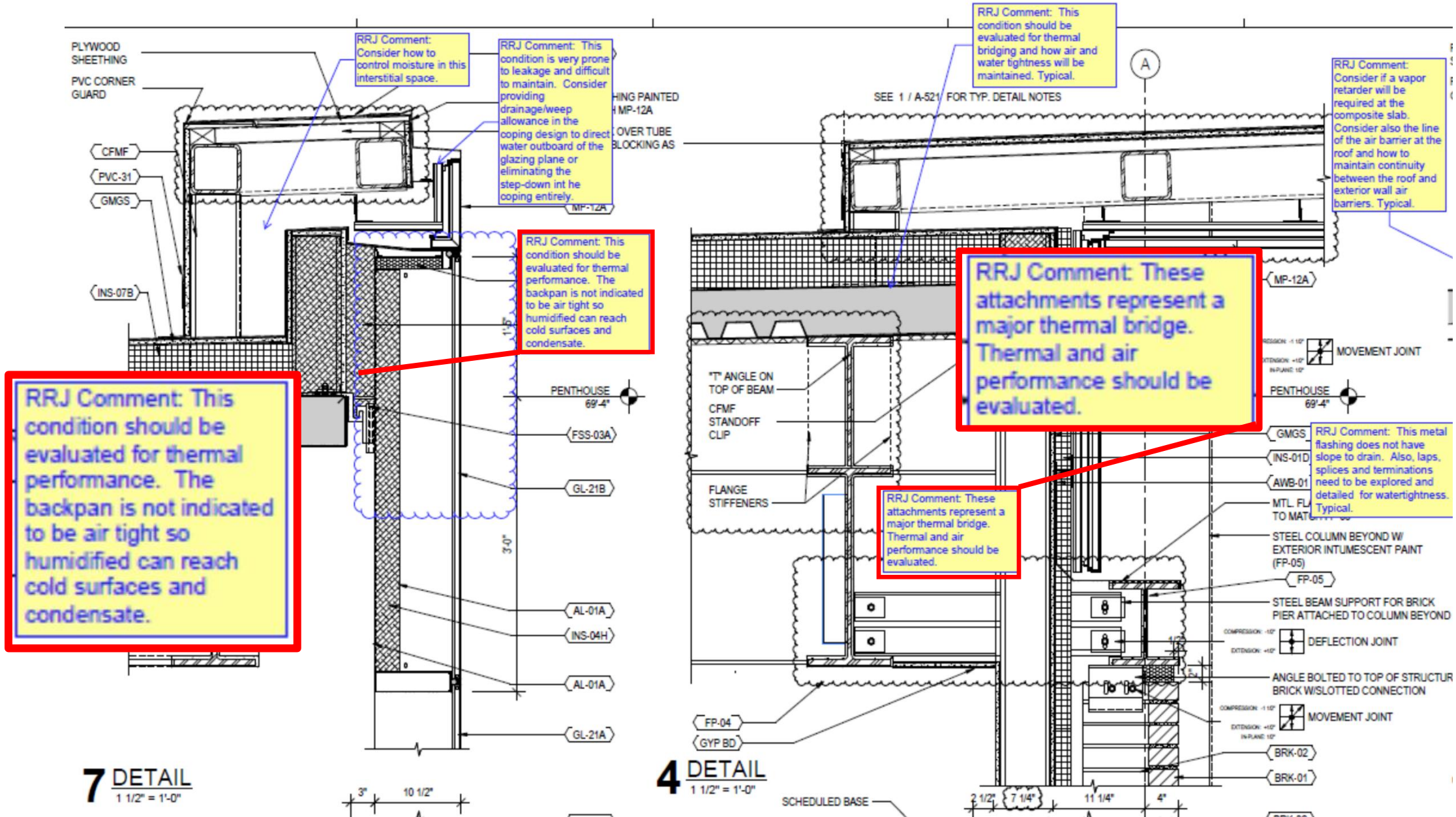
~ U-Factor: 0.040

COMPLIANT

Outline

1. Legacy Concerns and Background
2. **Parapets**
3. Wing Walls
4. Overhangs

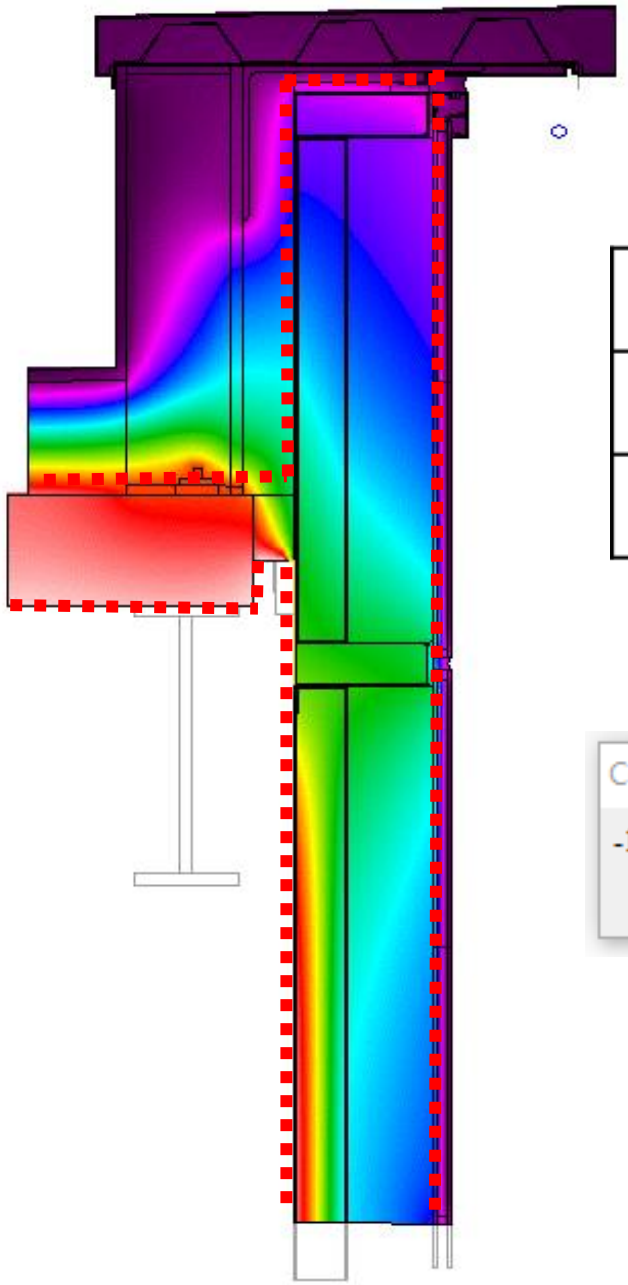
Drawing Review



Analysis – Thermal / Air

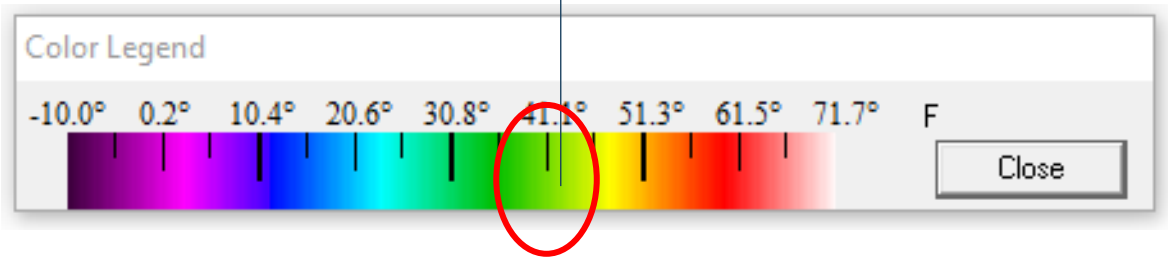
- What is the interior dew point?
- Determine air tightness plane
- Review surfaces inboard of the air tightness plane to verify temperatures are above the dew point

THERM

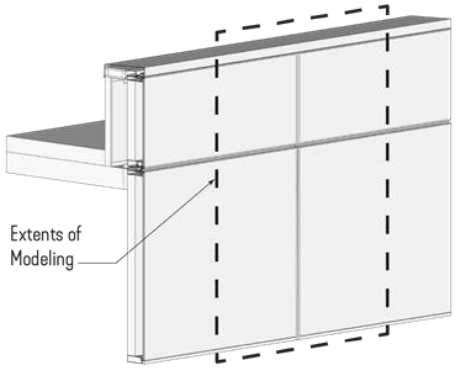


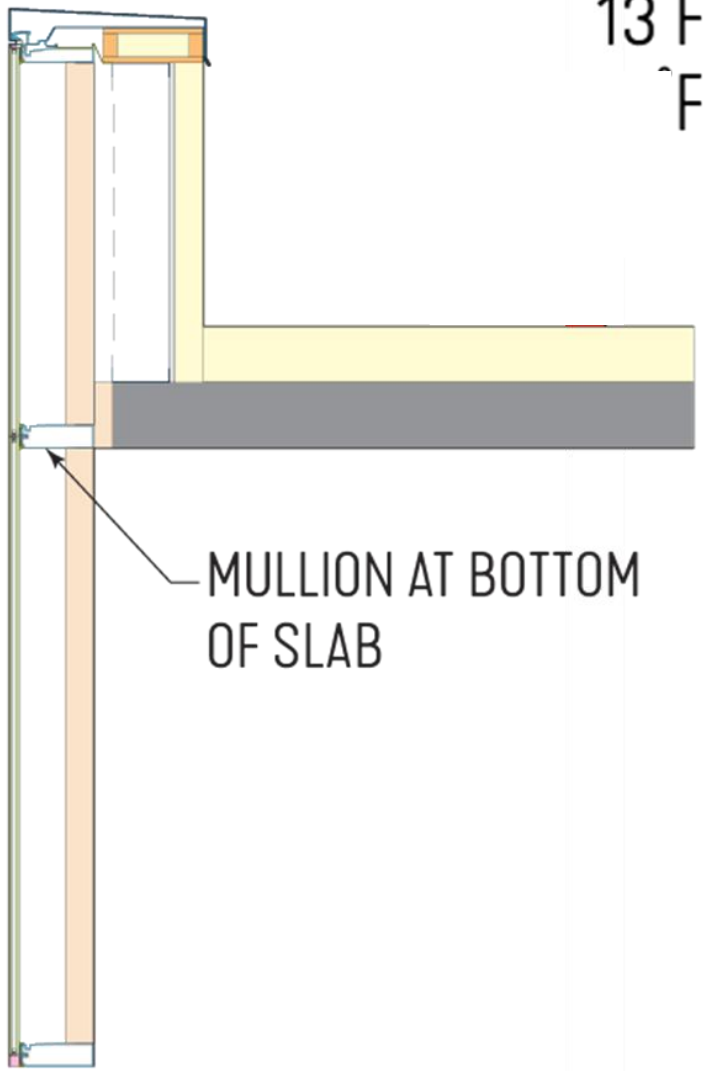
	DBT	RH
Outdoor	-10F	95%
Indoor	72F	35%

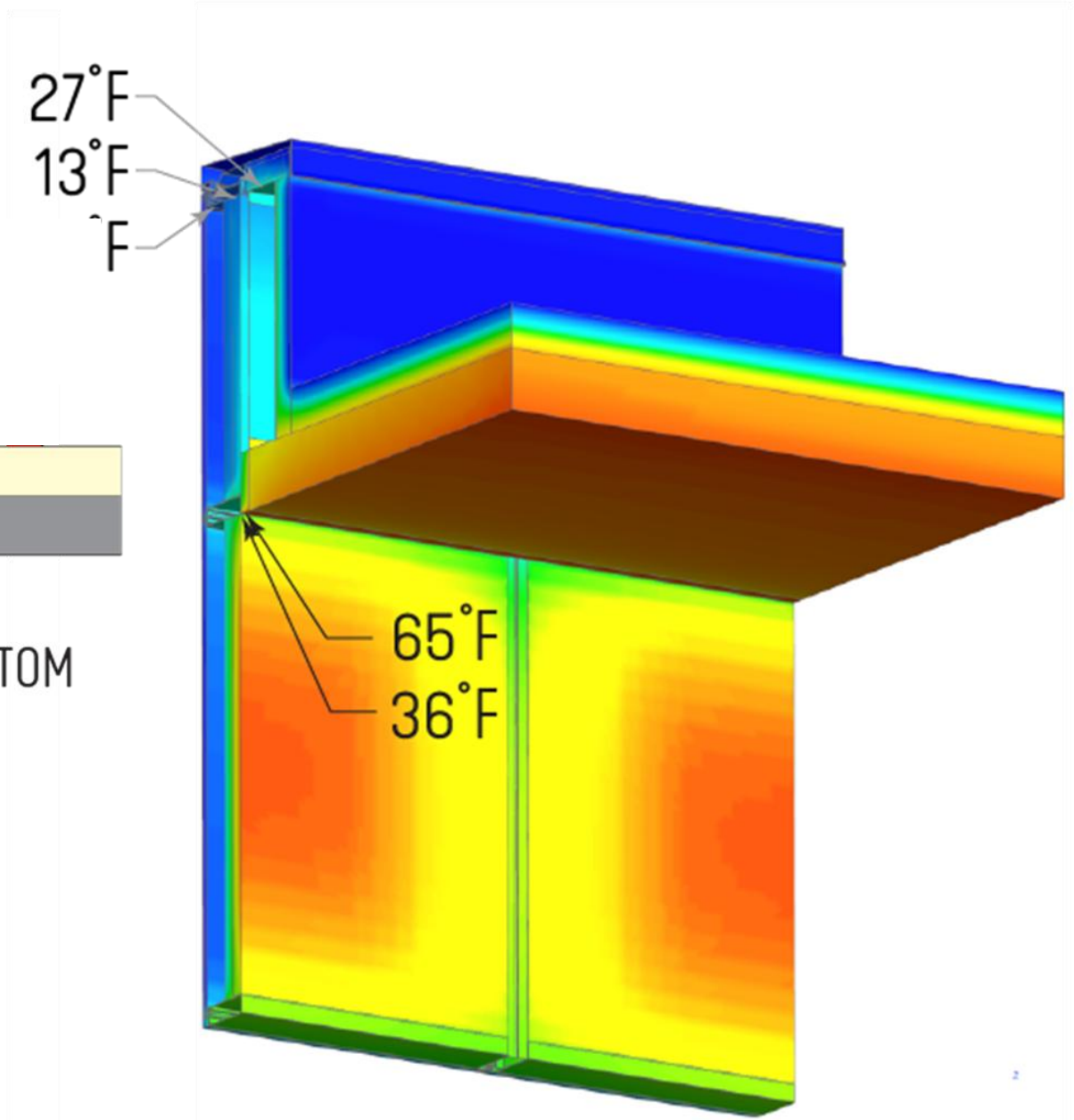
Dewpoint 42F

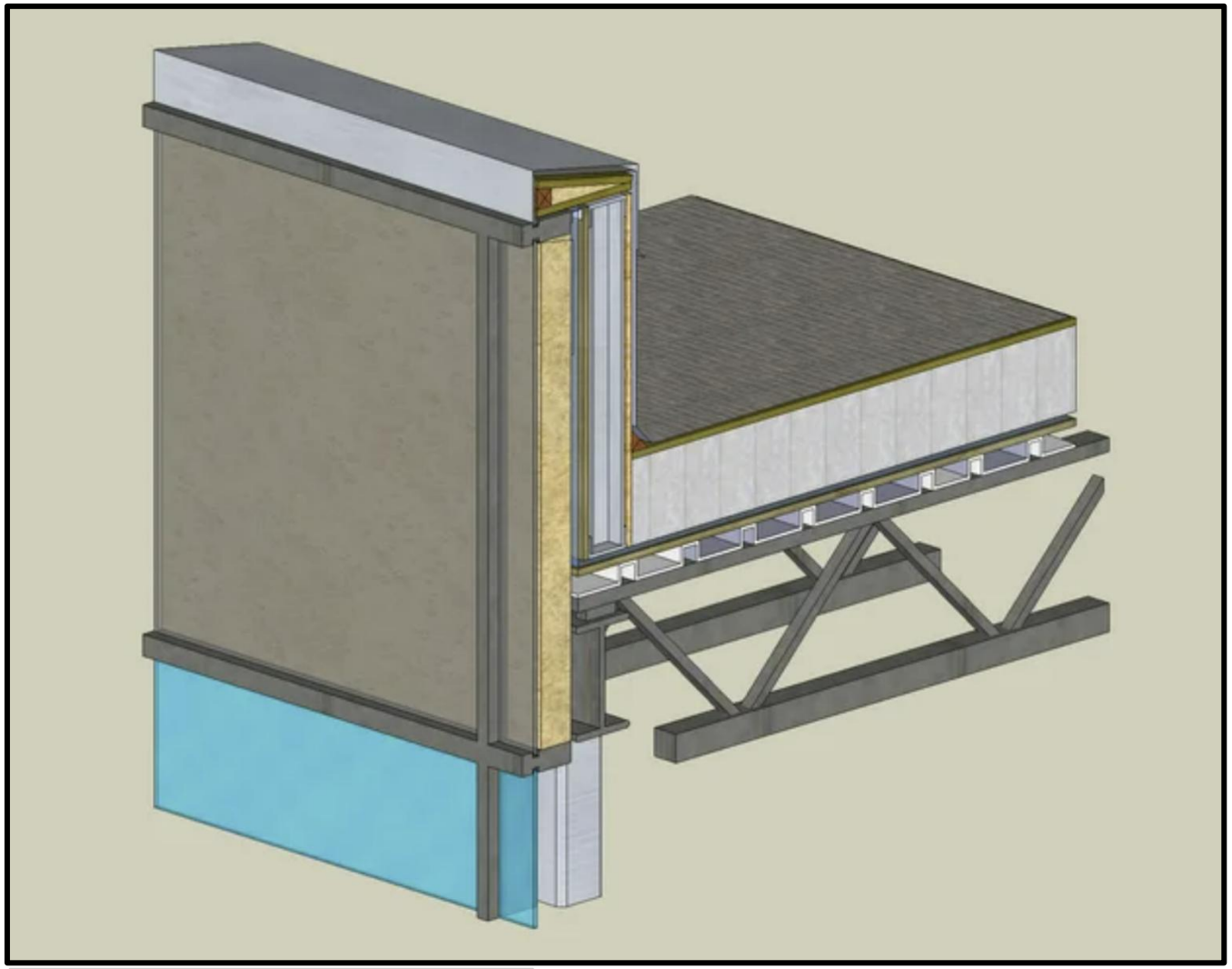


3D Effects


Extents of
Modeling

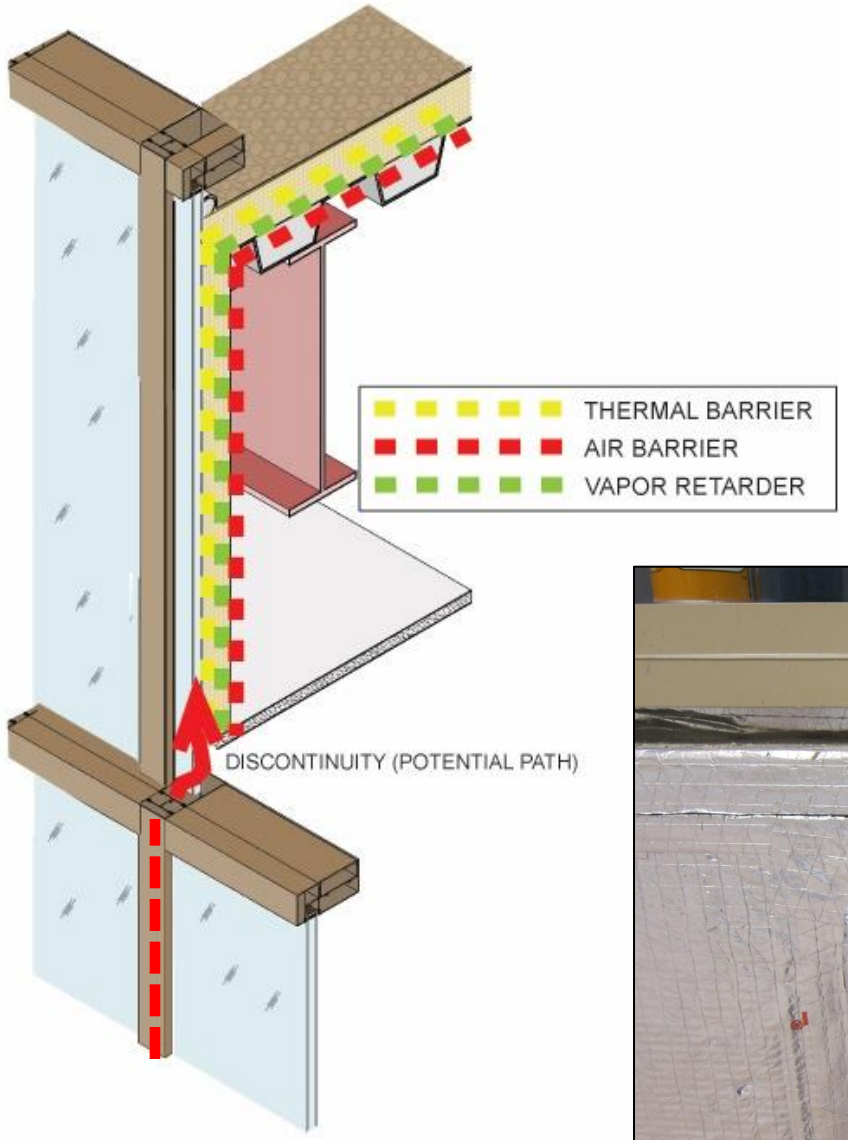

MULLION AT BOTTOM
OF SLAB


27˚F
13˚F
˚F
65˚F
36˚F



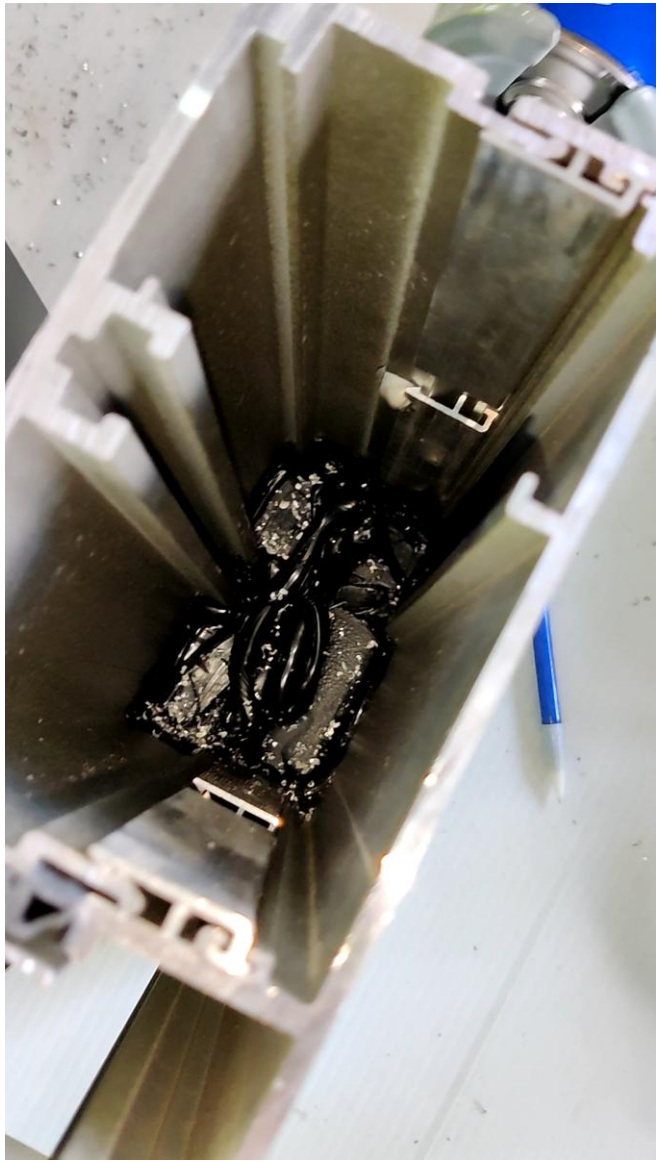
Courtesy of 3D Warehouse

Curtainwall Parapets

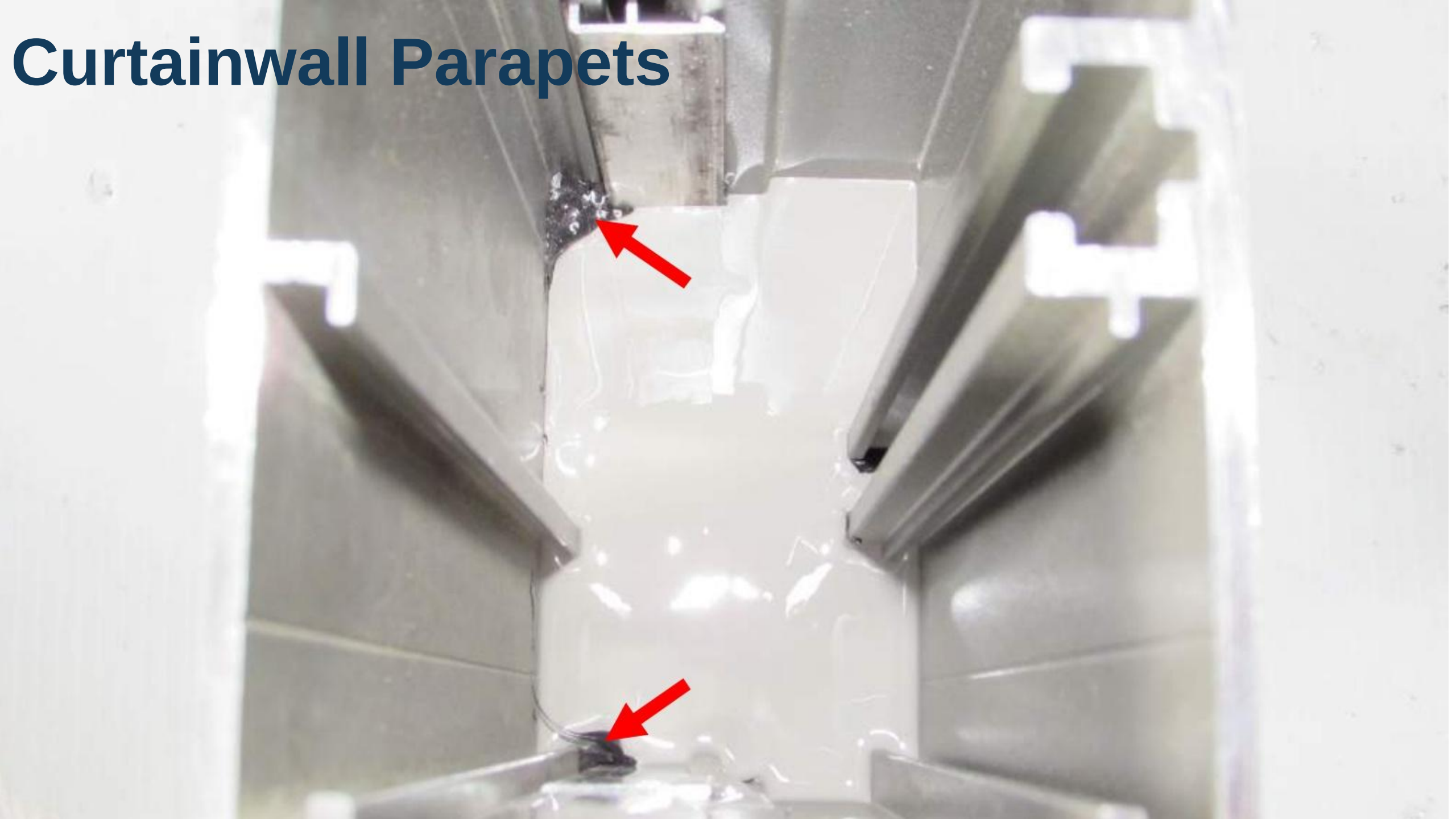


Curtainwall Parapets

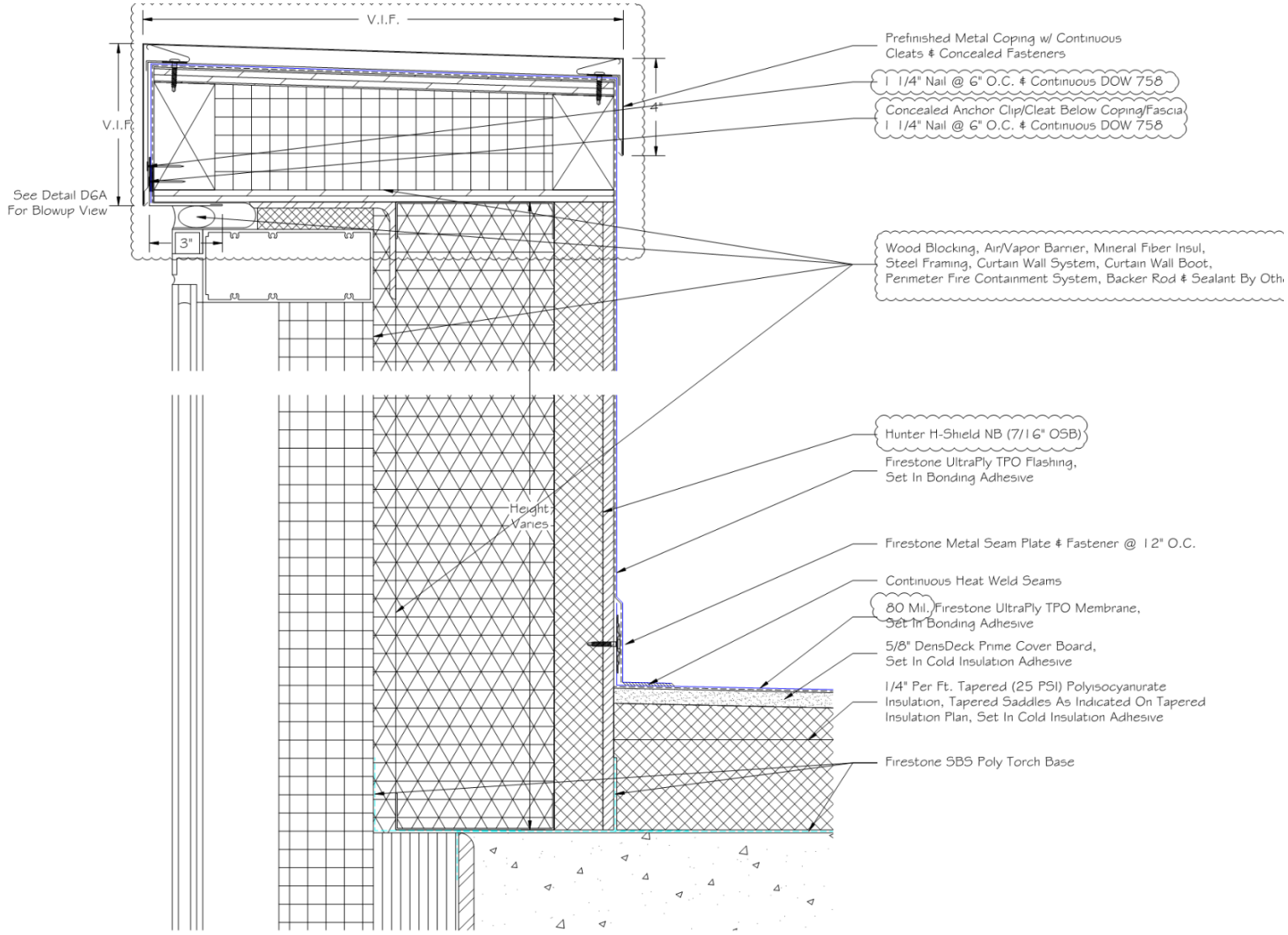
Curtainwall Parapets



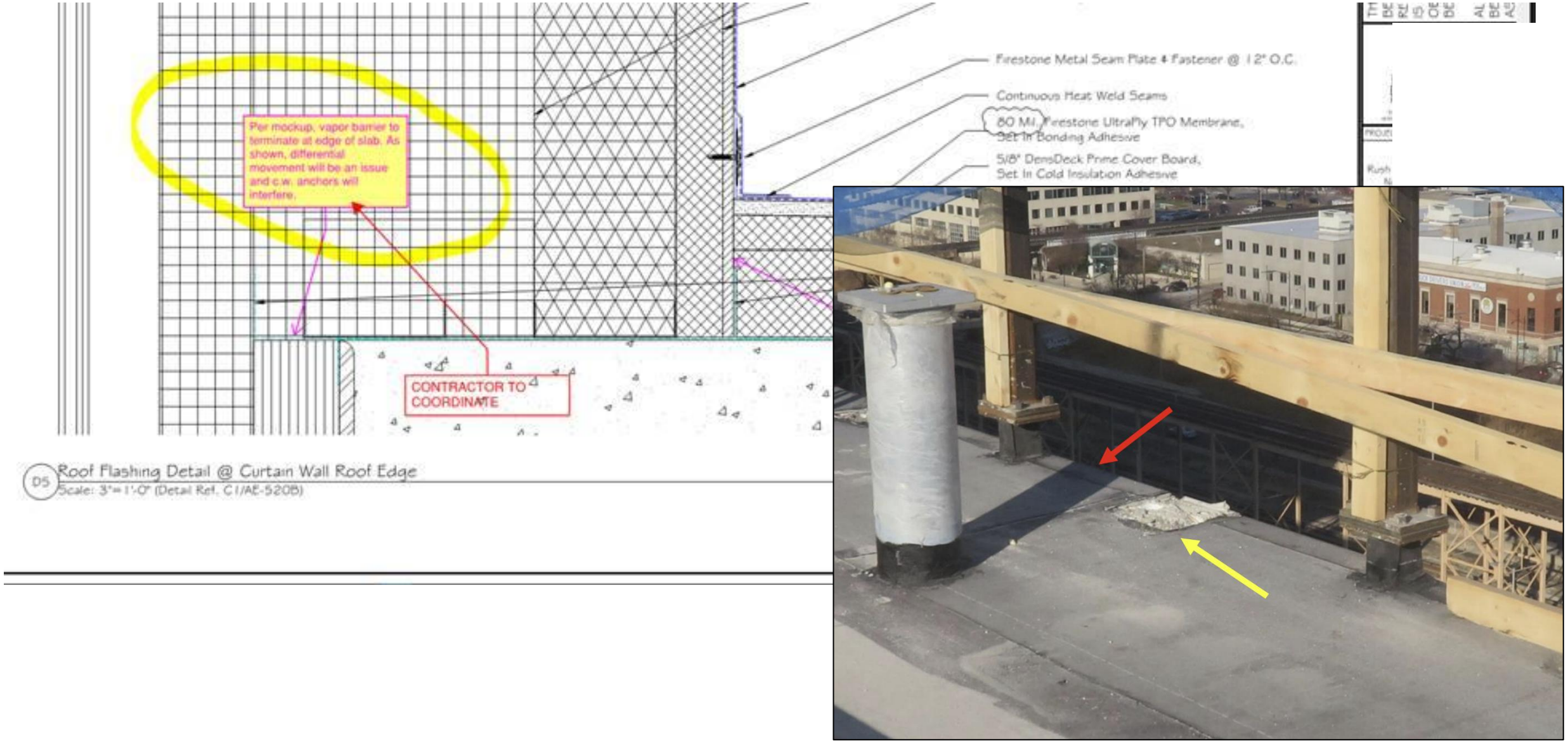
Curtainwall Parapets



Curtainwall Parapets

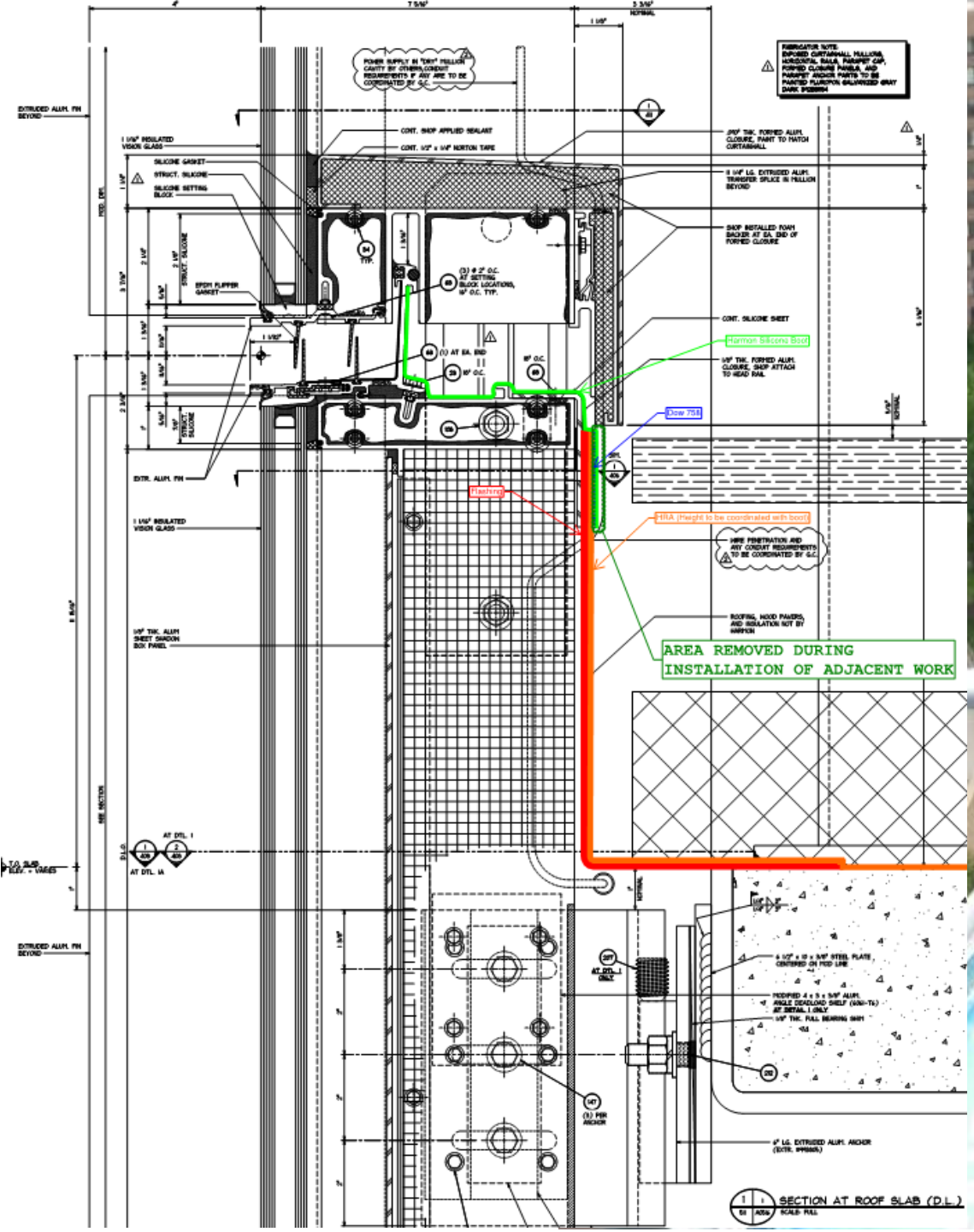


Curtainwall Parapets

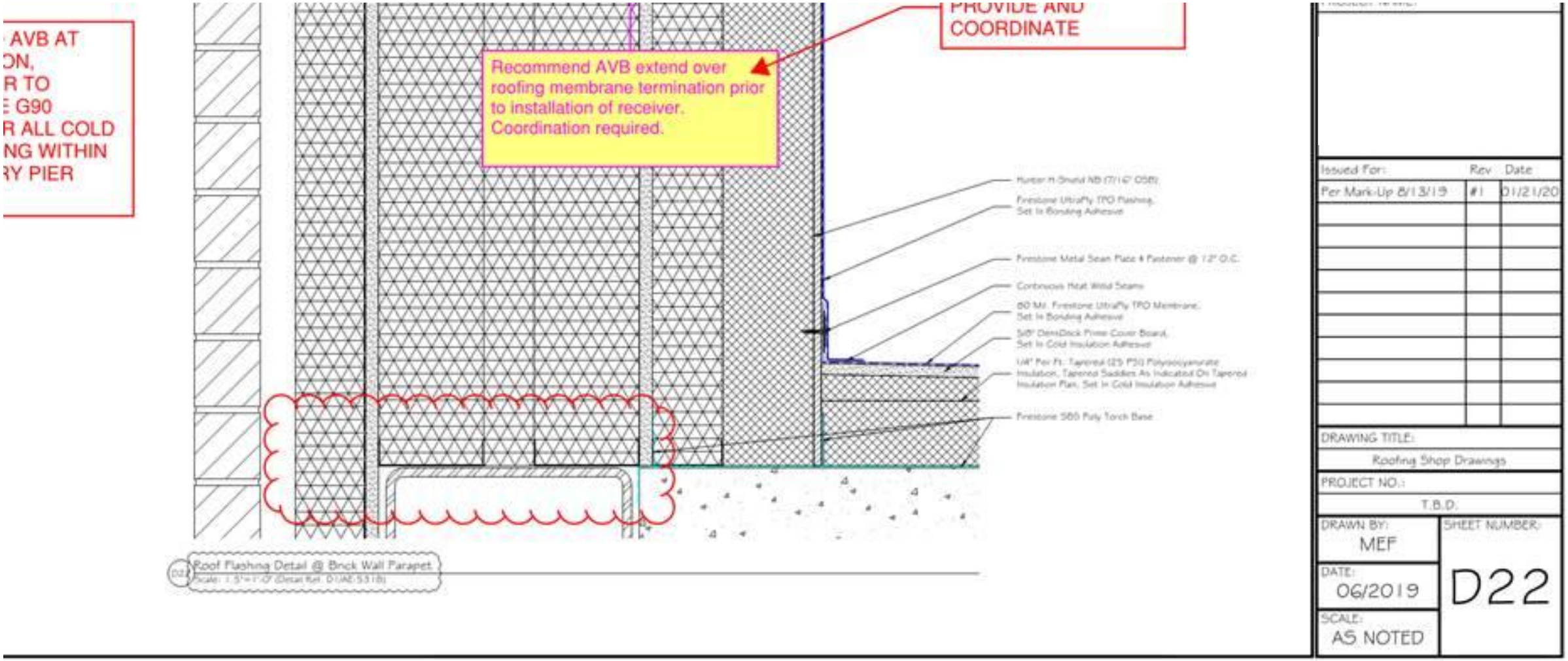


Curtainwall Parapets

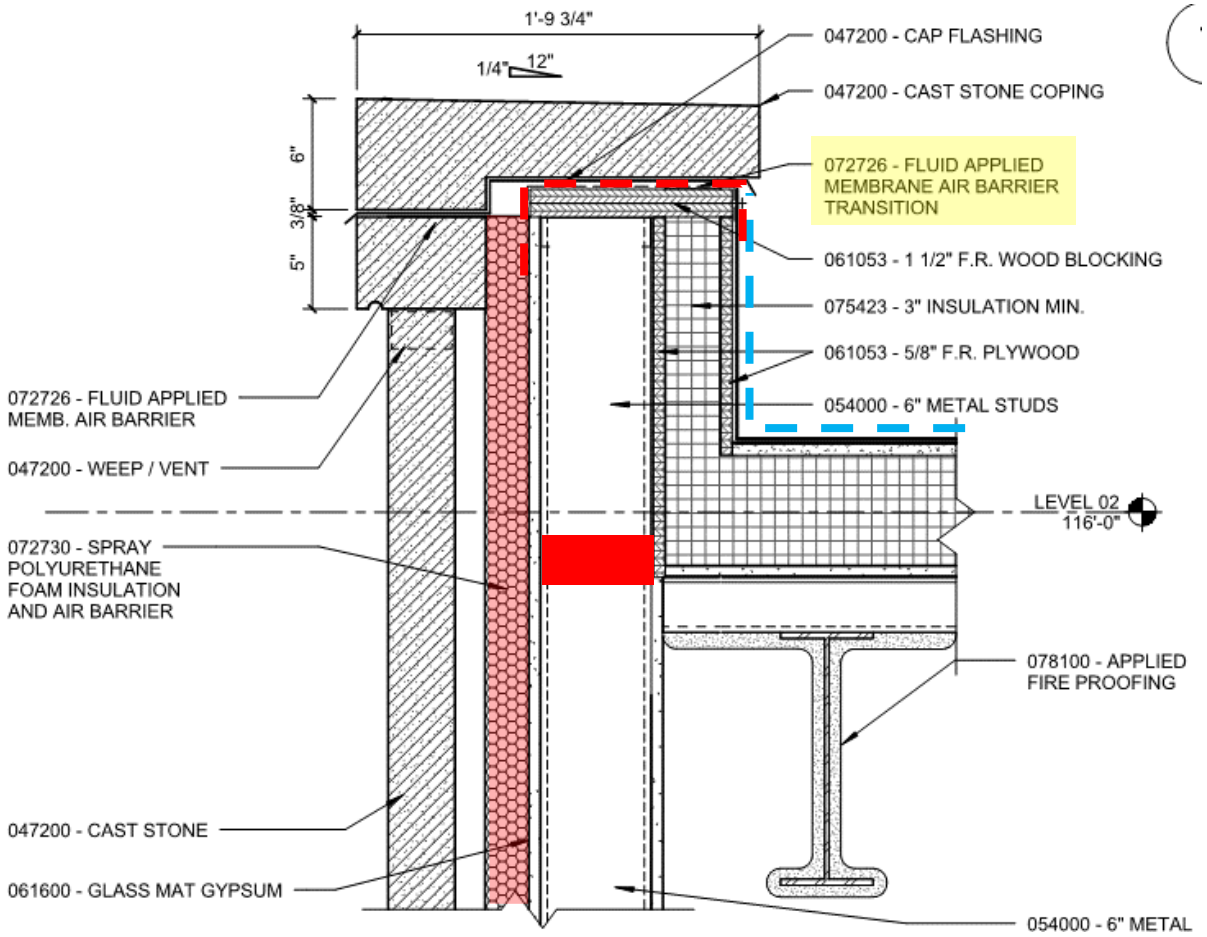
Curtainwall Parapets

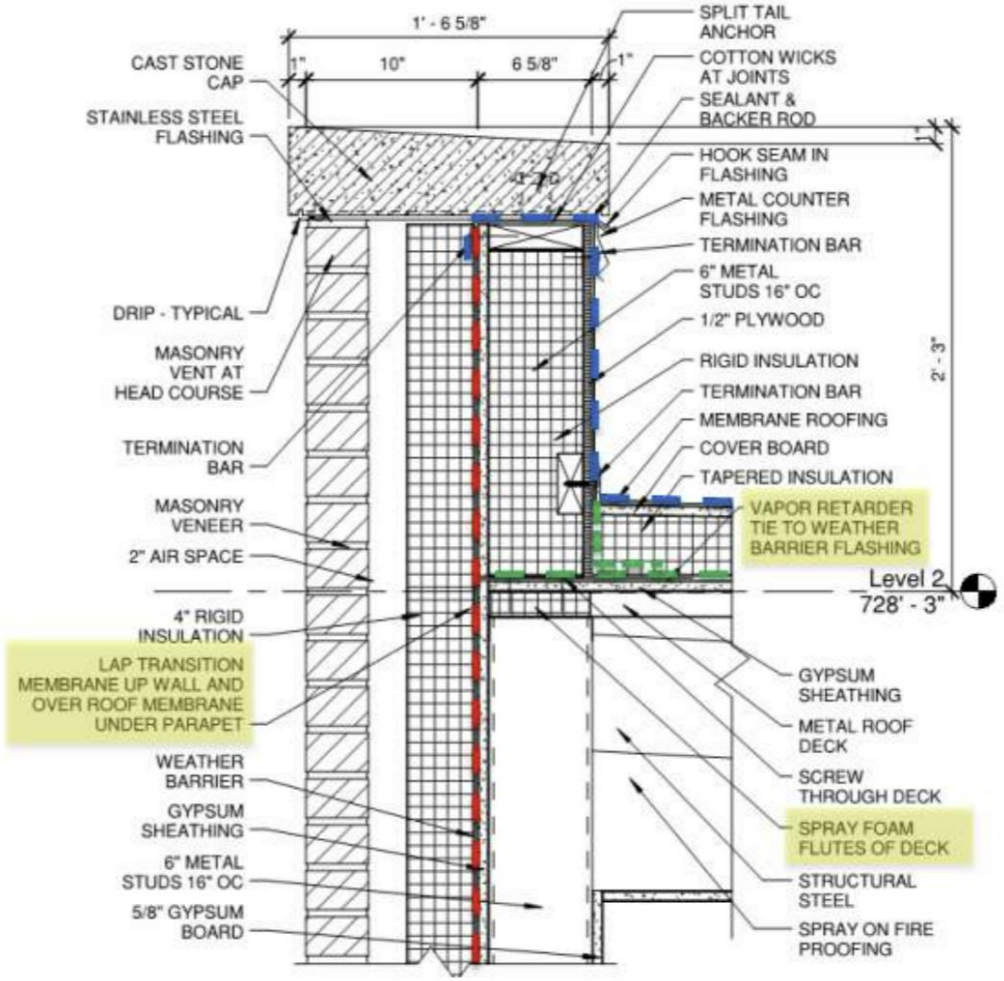

Harmon Silicone Bead
Dow 758
Flashing
HRA (Height to be coordinated with roof)
AREA REMOVED DURING
INSTALLATION OF ADJACENT WORK
SECTION AT ROOF SLAB (D.L.)

Parapets

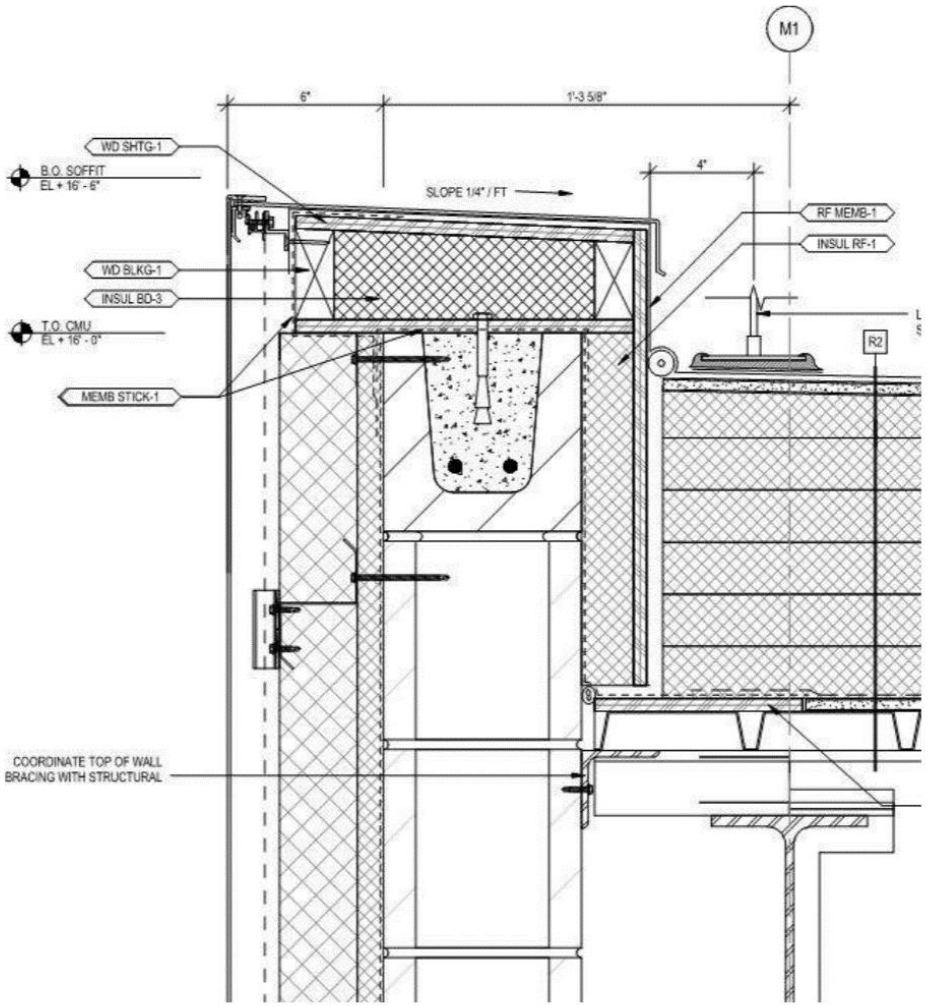

AVB AT
ON,
R TO
E G90
R ALL COLD
NG WITHIN
RY PIER
Recommend AVB extend over roofing membrane termination prior to installation of receiver. Coordination required.
PROVIDE AND COORDINATE
Roof Flashing Detail @ Brick Wall Parapet
Issued For:
Rev
Date
Per Mark-Up 8/13/19
#1
01/21/20
DRAWING TITLE:
Roofing Shop Drawings
PROJECT NO.:
T.B.D.
DRAWN BY:
MEF
SHEET NUMBER:
D22
DATE:
06/2019
SCALE:
AS NOTED

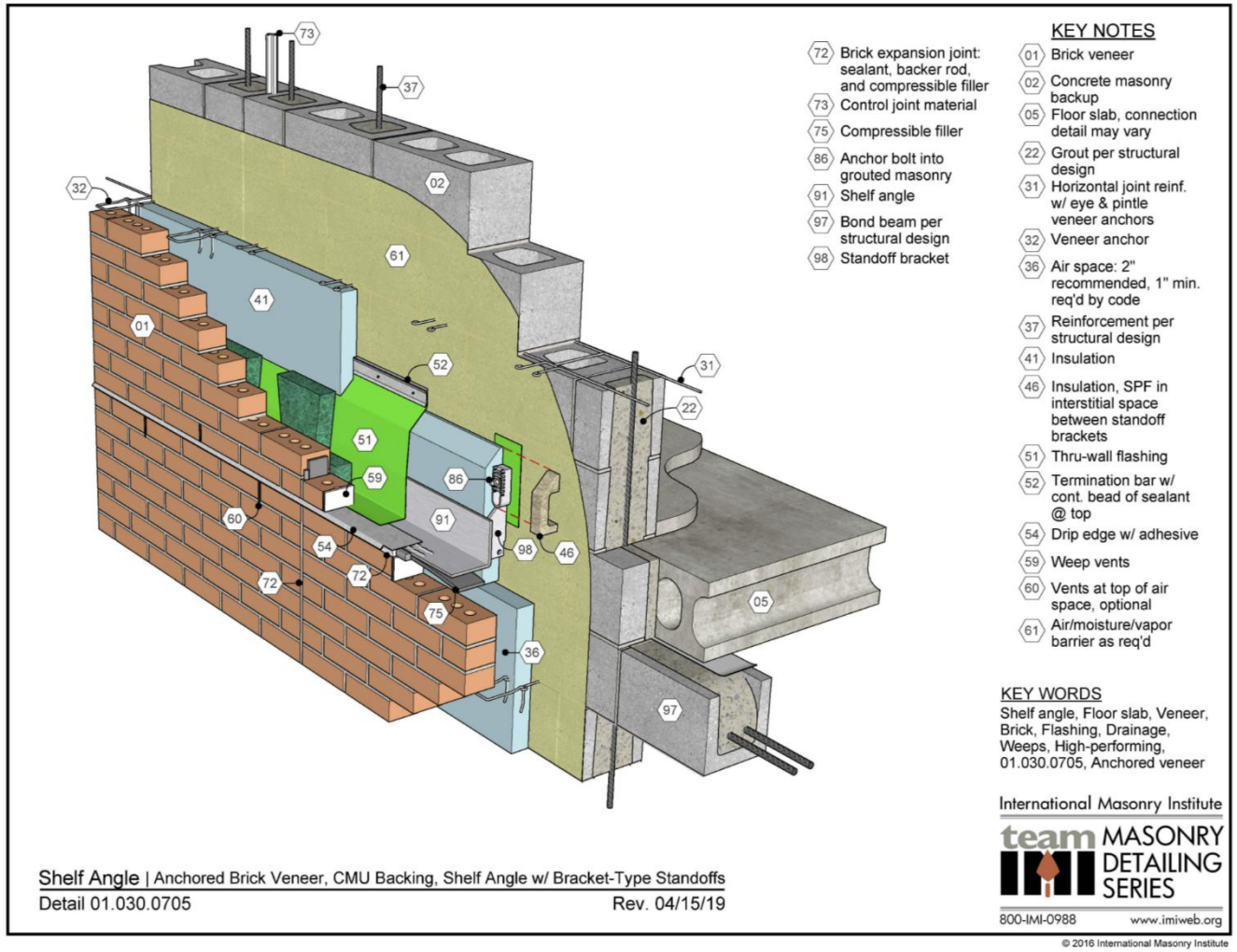
Masonry Clad Parapets



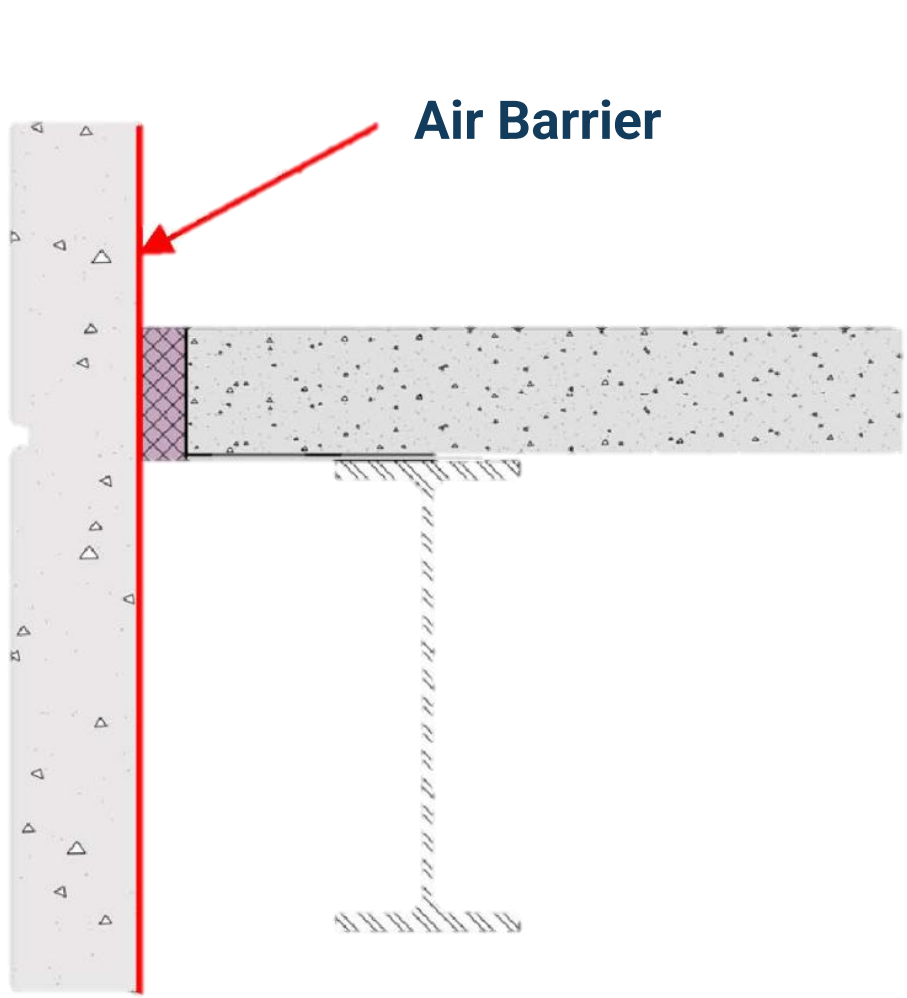


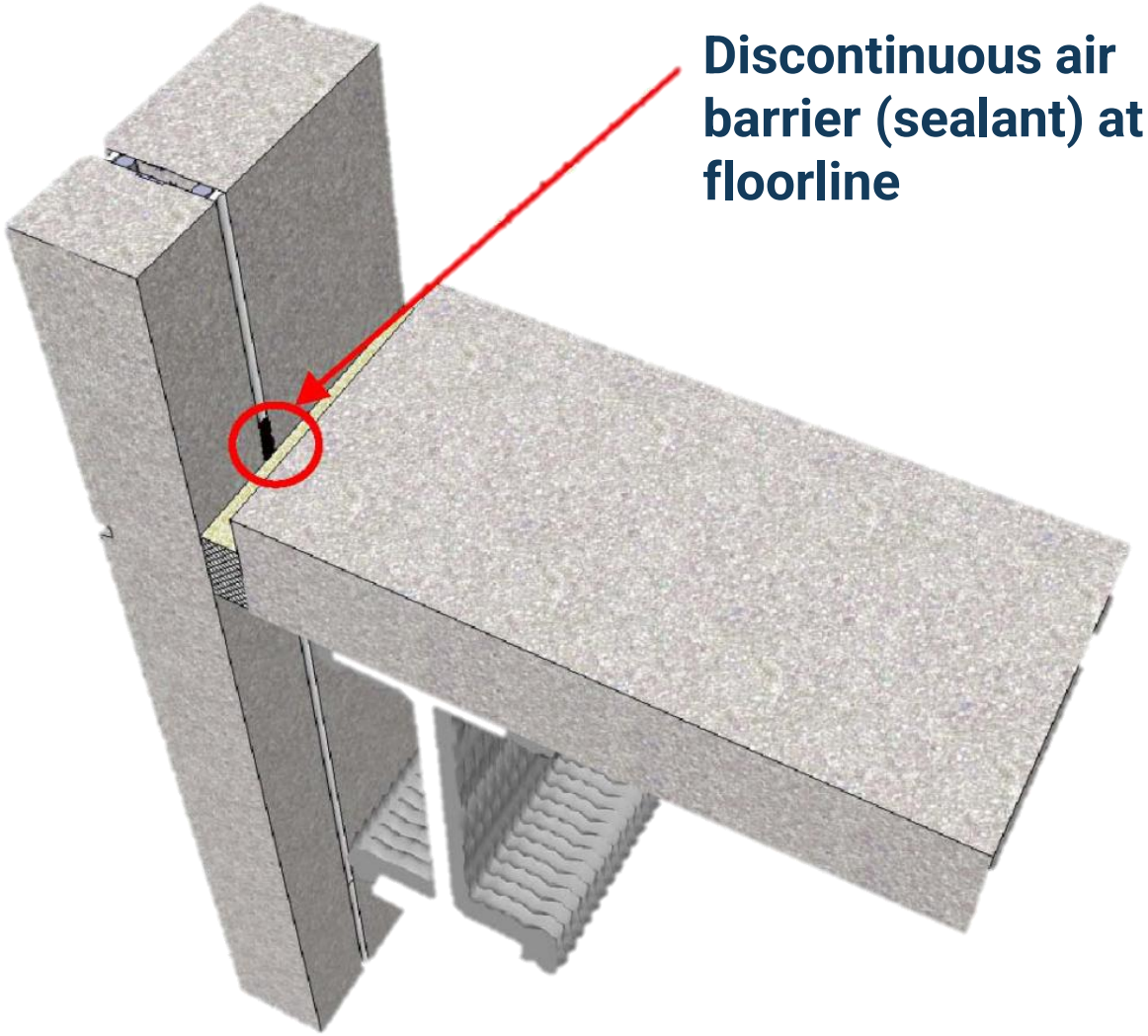
Masonry Clad Parapets





Precast Parapet



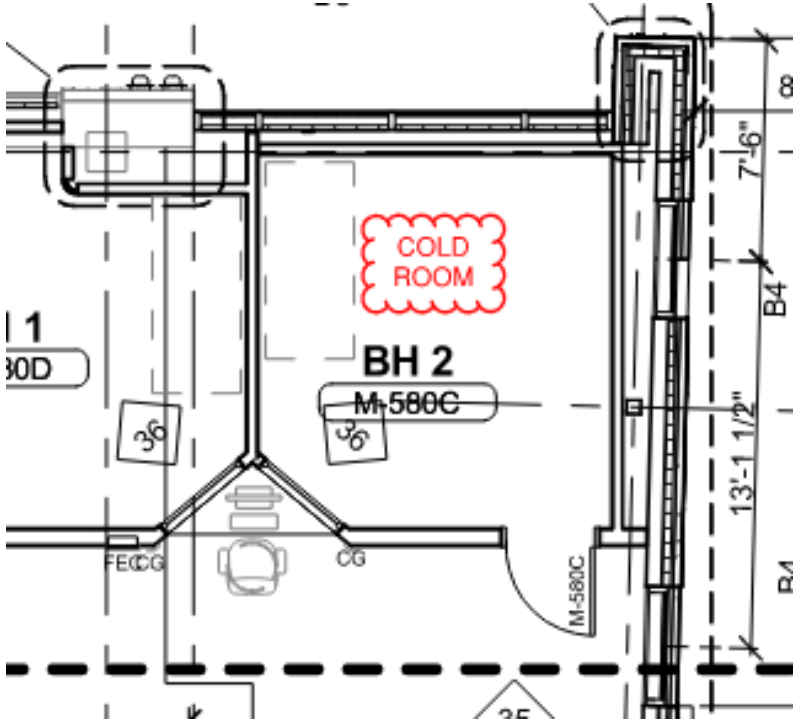


Precast Parapet

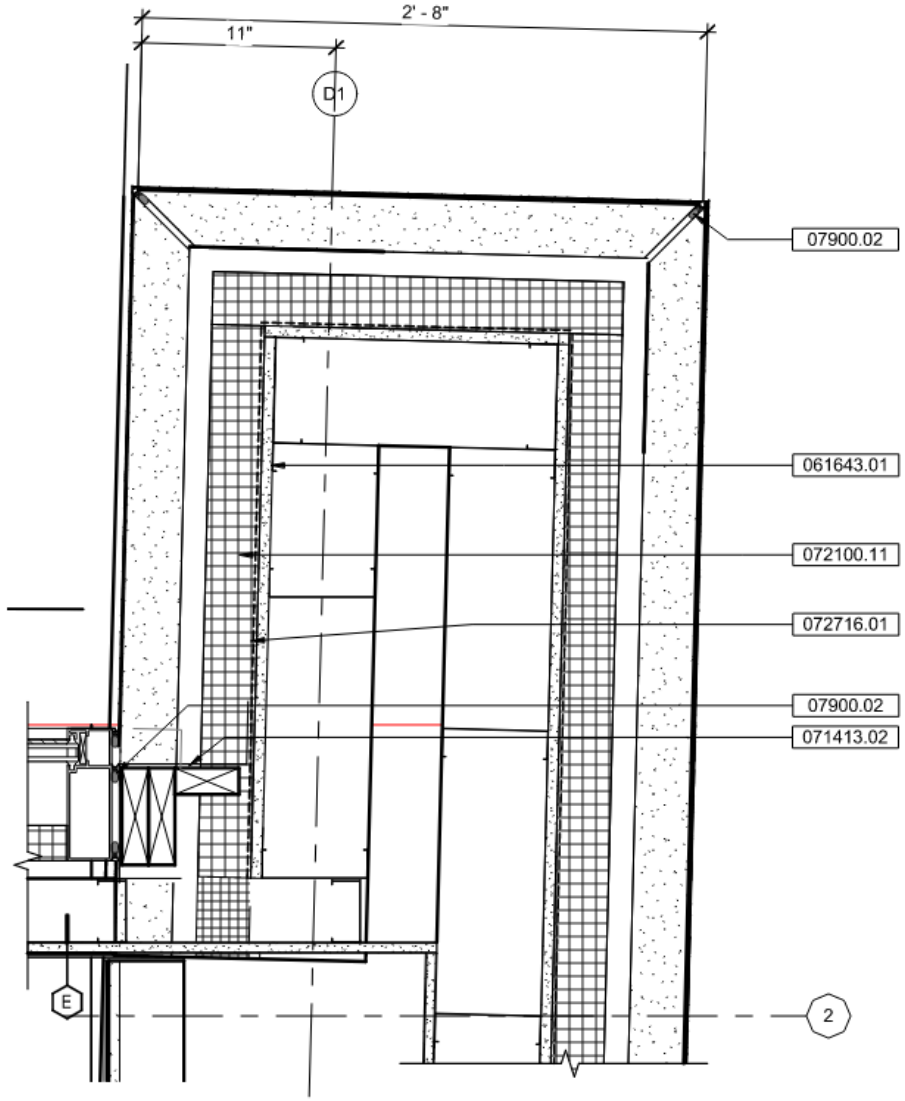
Outline

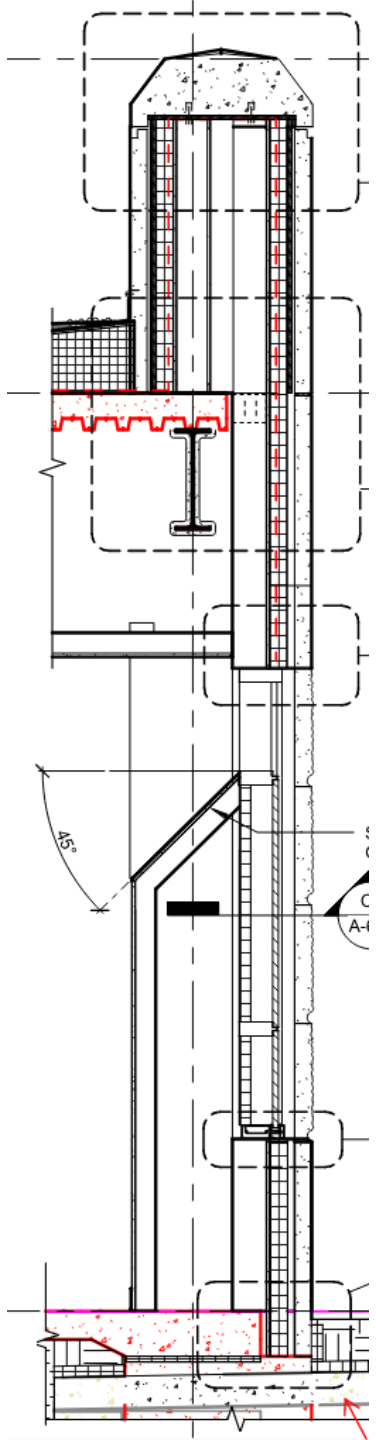
1. Legacy Concerns and Background
2. Parapets
3. **Wing Walls**
4. Overhangs

Wing Walls

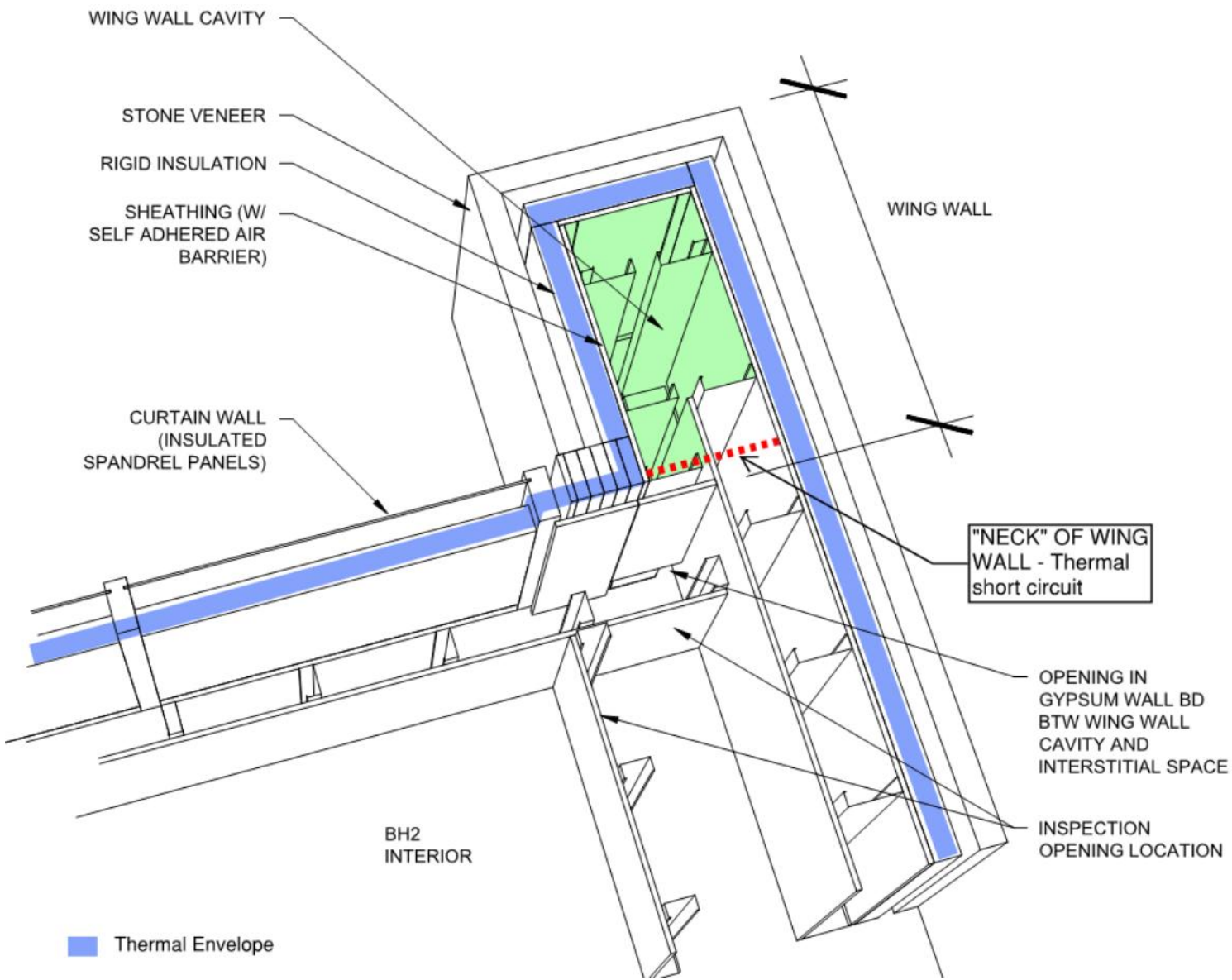


Wing Walls


2' - 8"
11"
D1
07900.02
061643.01
072100.11
072716.01
07900.02
071413.02
E
2

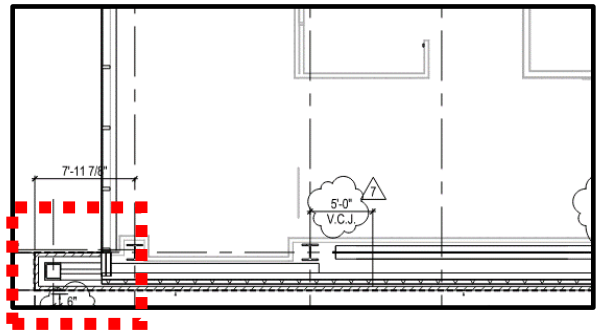

45°

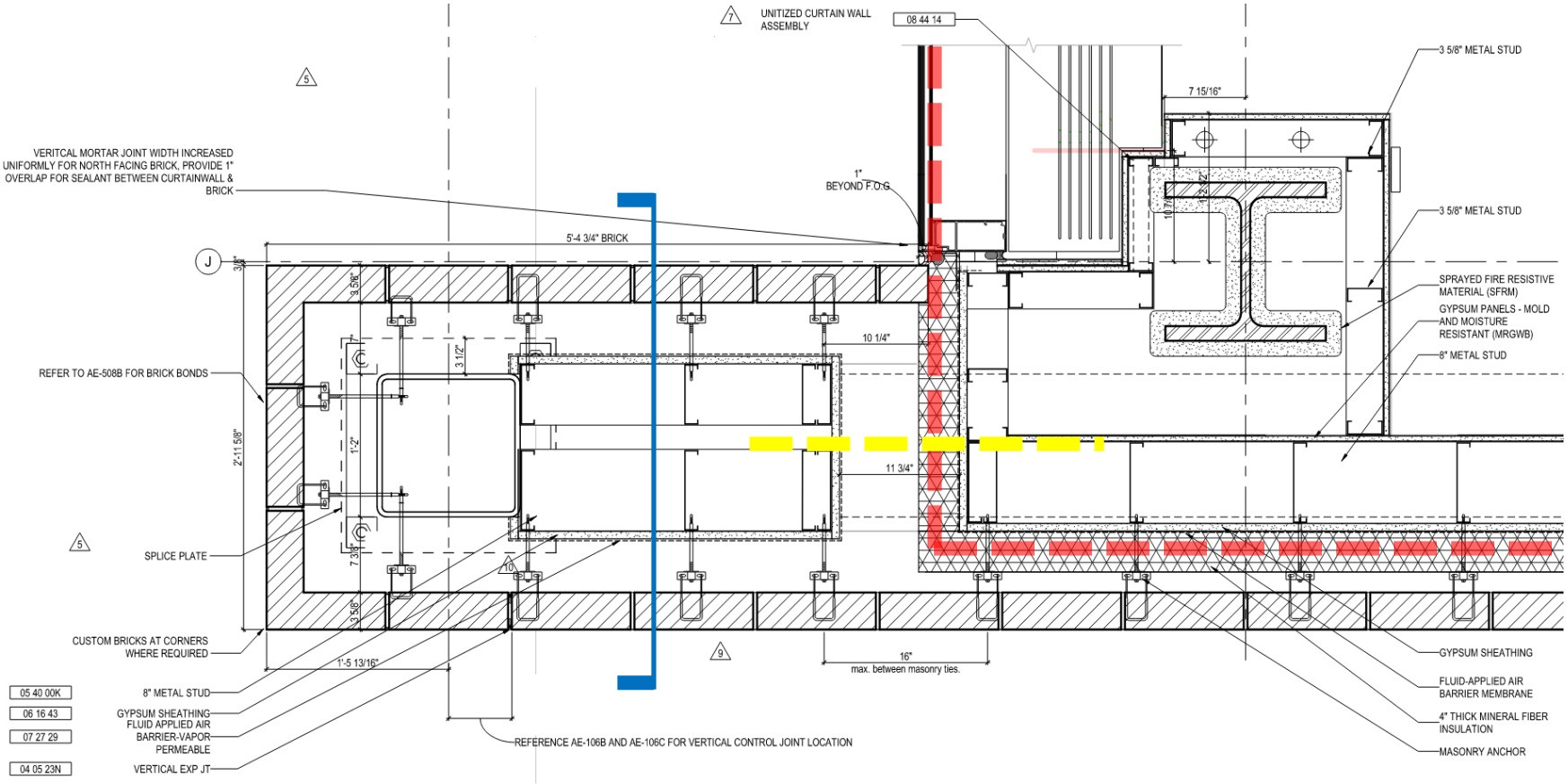
Wing Walls

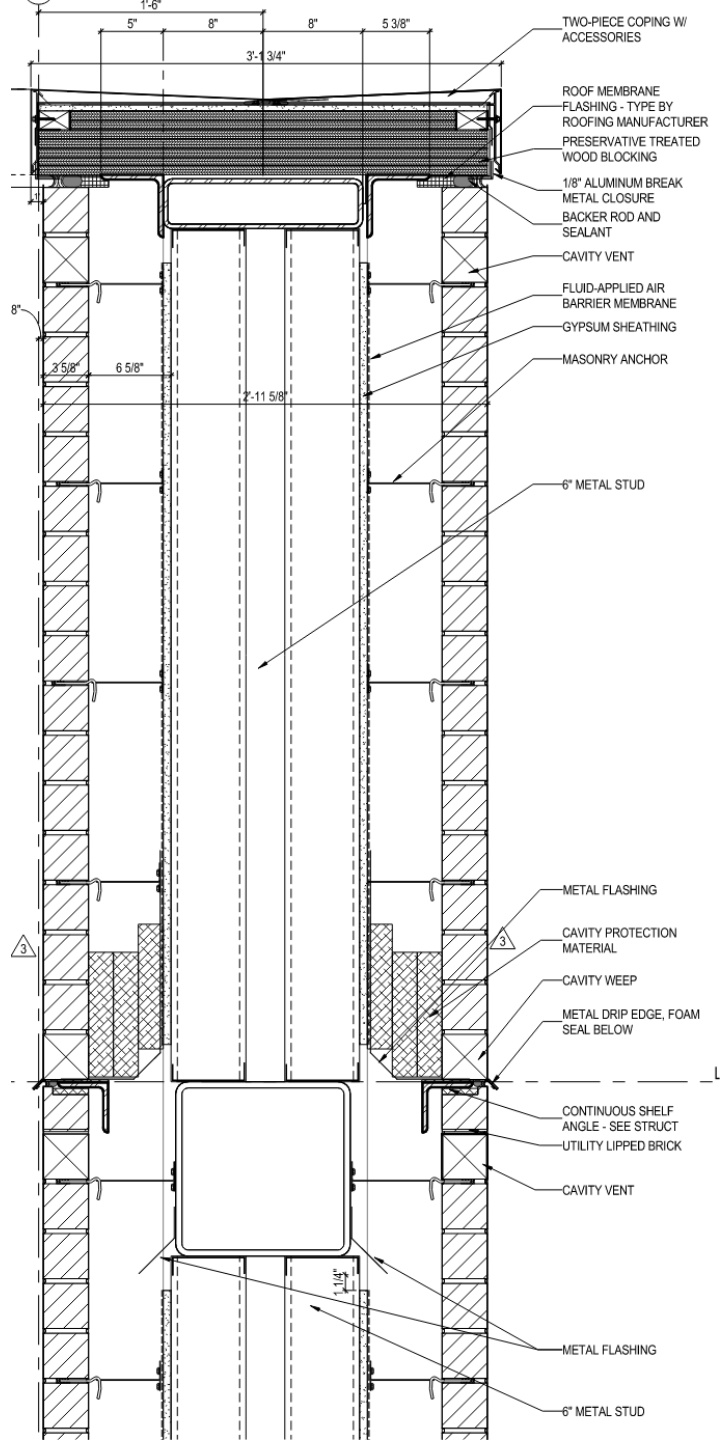

WING WALL CAVITY
STONE VENEER
RIGID INSULATION
SHEATHING (W/ SELF ADHERED AIR BARRIER)
CURTAIN WALL (INSULATED SPANDREL PANELS)
WING WALL
"NECK" OF WING WALL - Thermal short circuit
OPENING IN GYPSUM WALL BD BTW WING WALL CAVITY AND INTERSTITIAL SPACE
INSPECTION OPENING LOCATION
BH2
INTERIOR
Thermal Envelope

Wing Walls

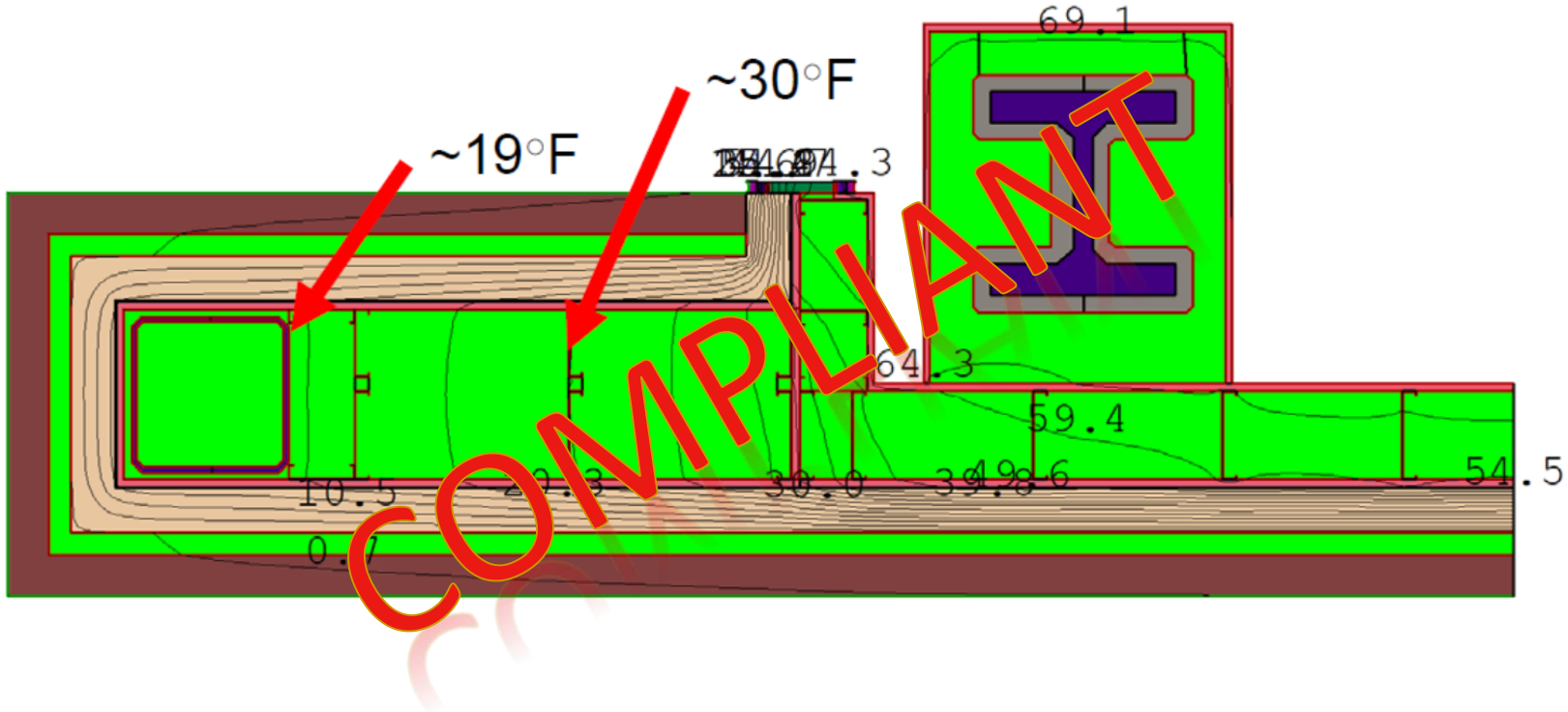
Masonry Wing Wall



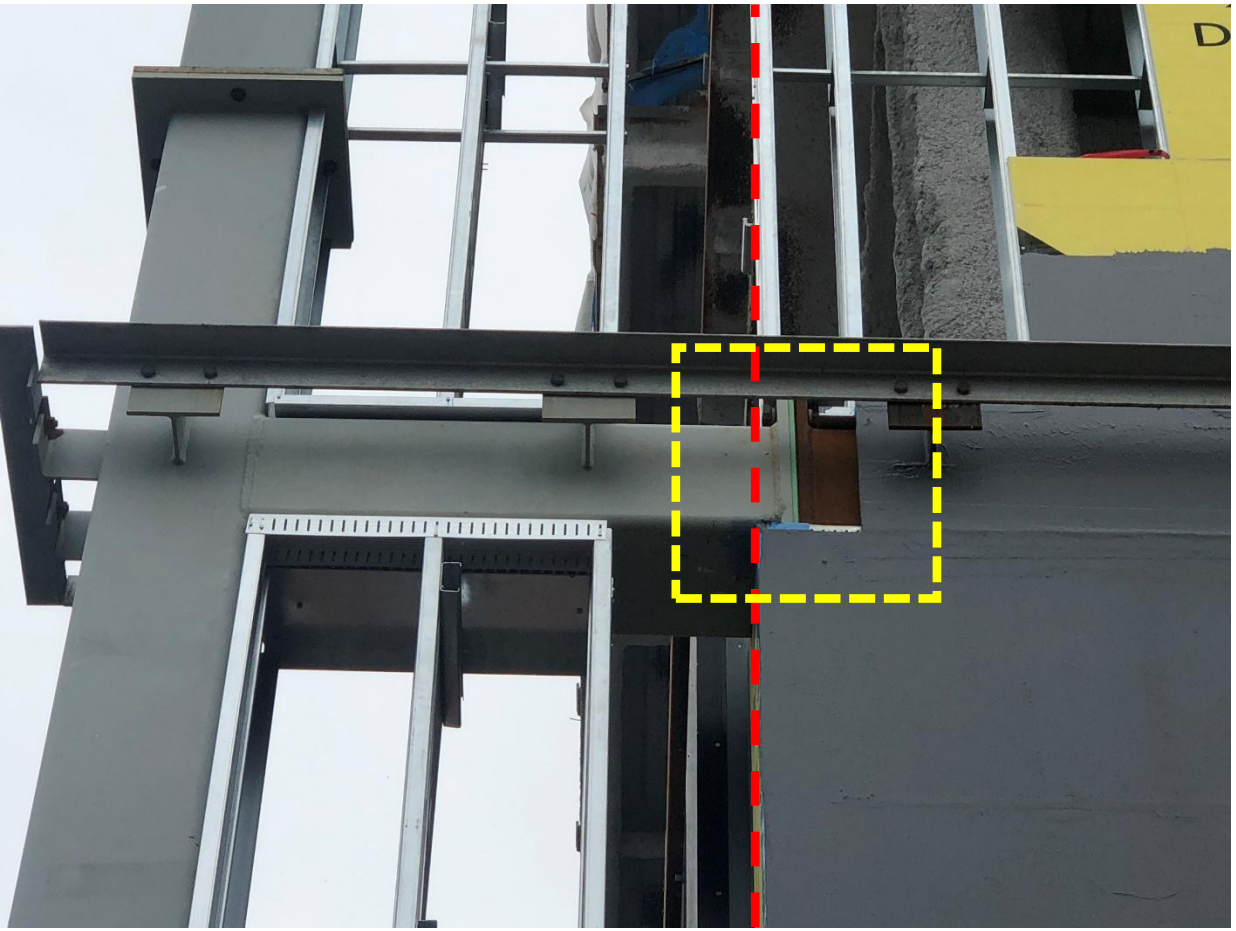




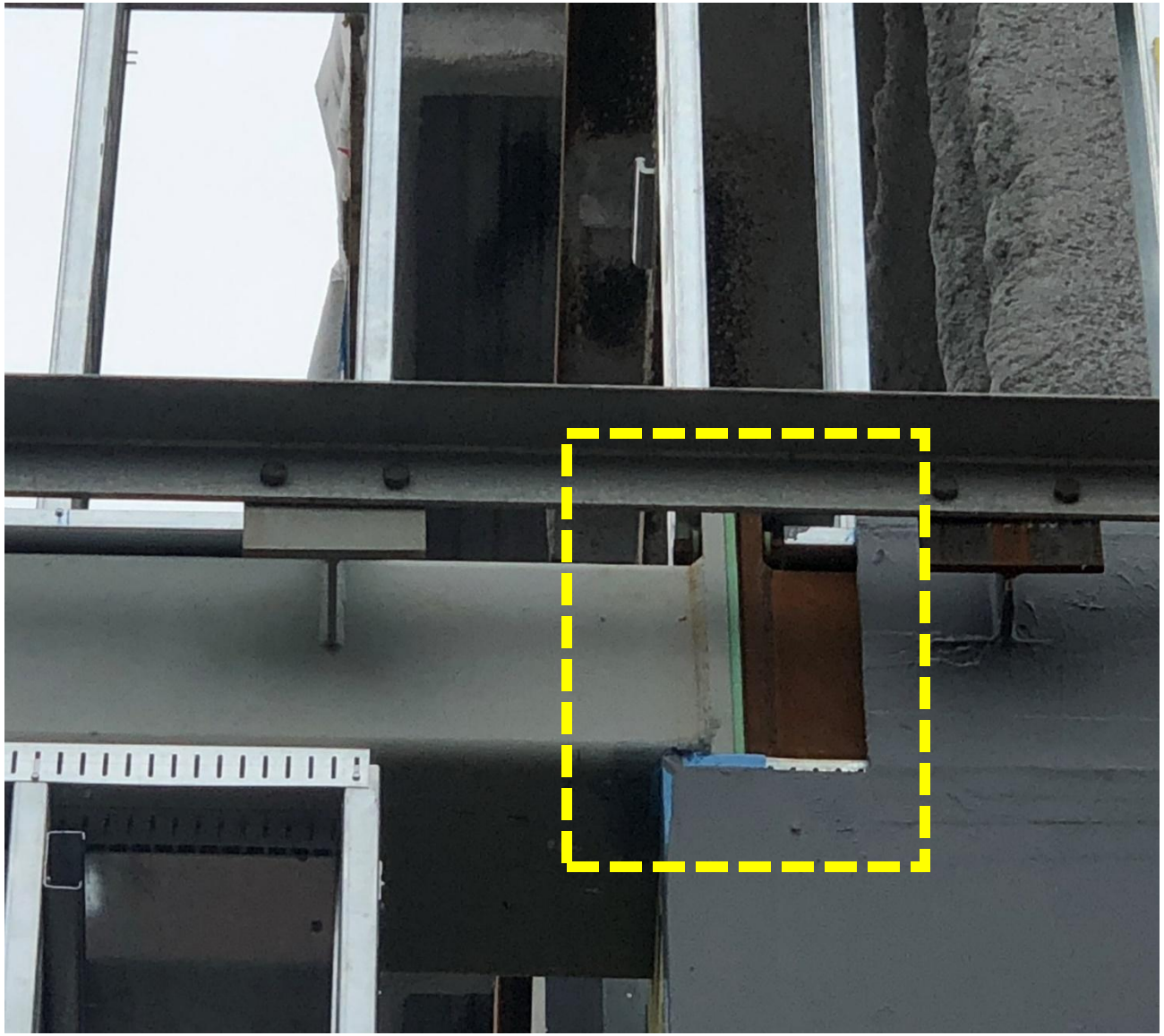
Masonry Wing Wall

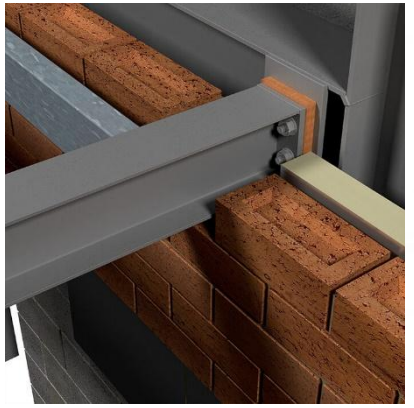


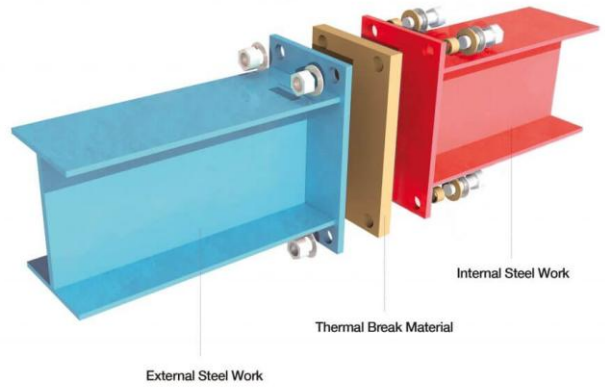
Masonry Wing Wall



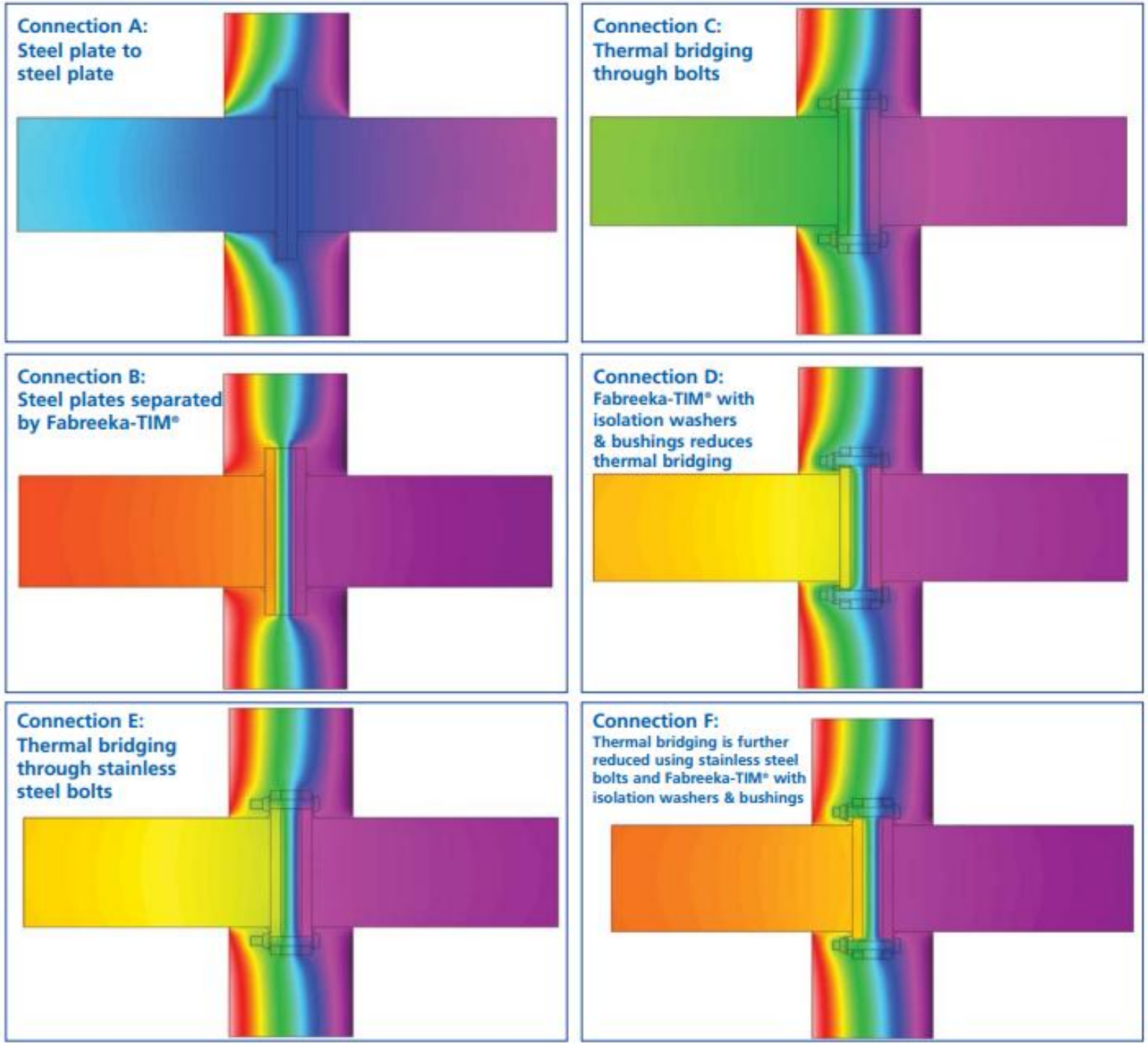
Masonry Wing Wall





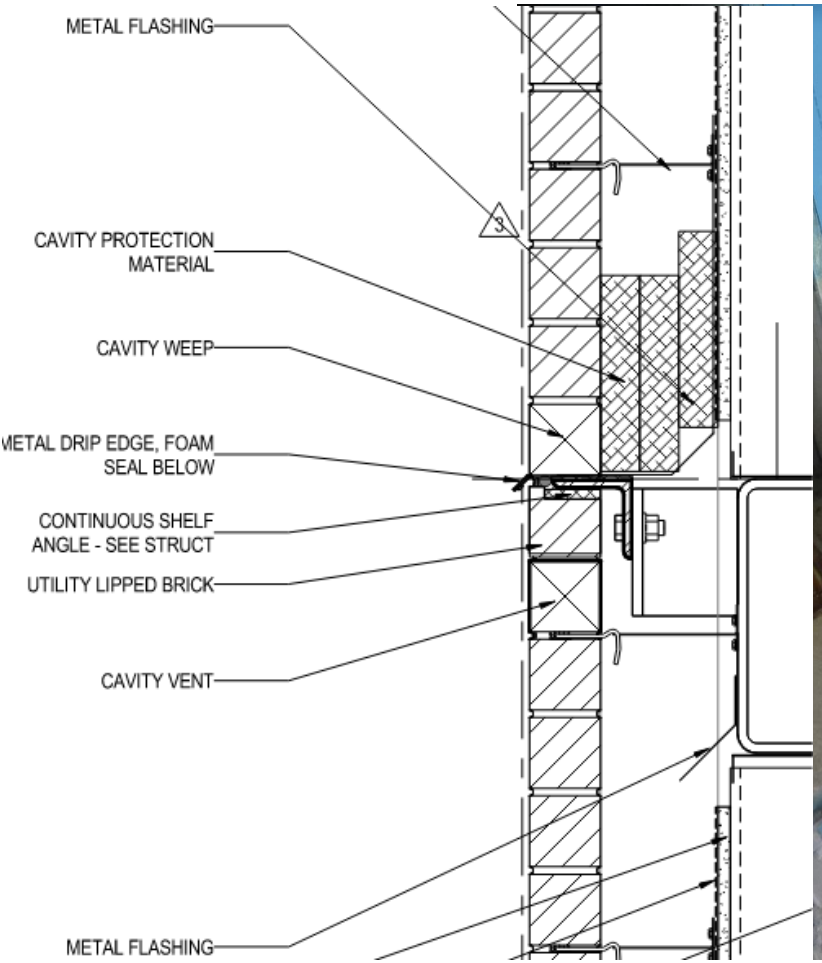


Thermal Breaks



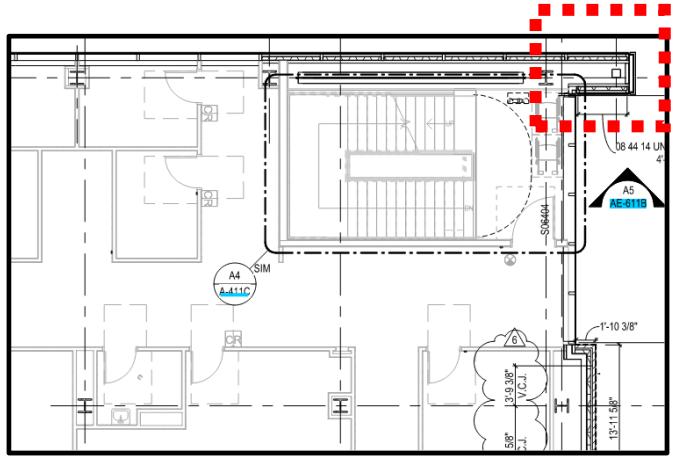
Masonry Wing Wall

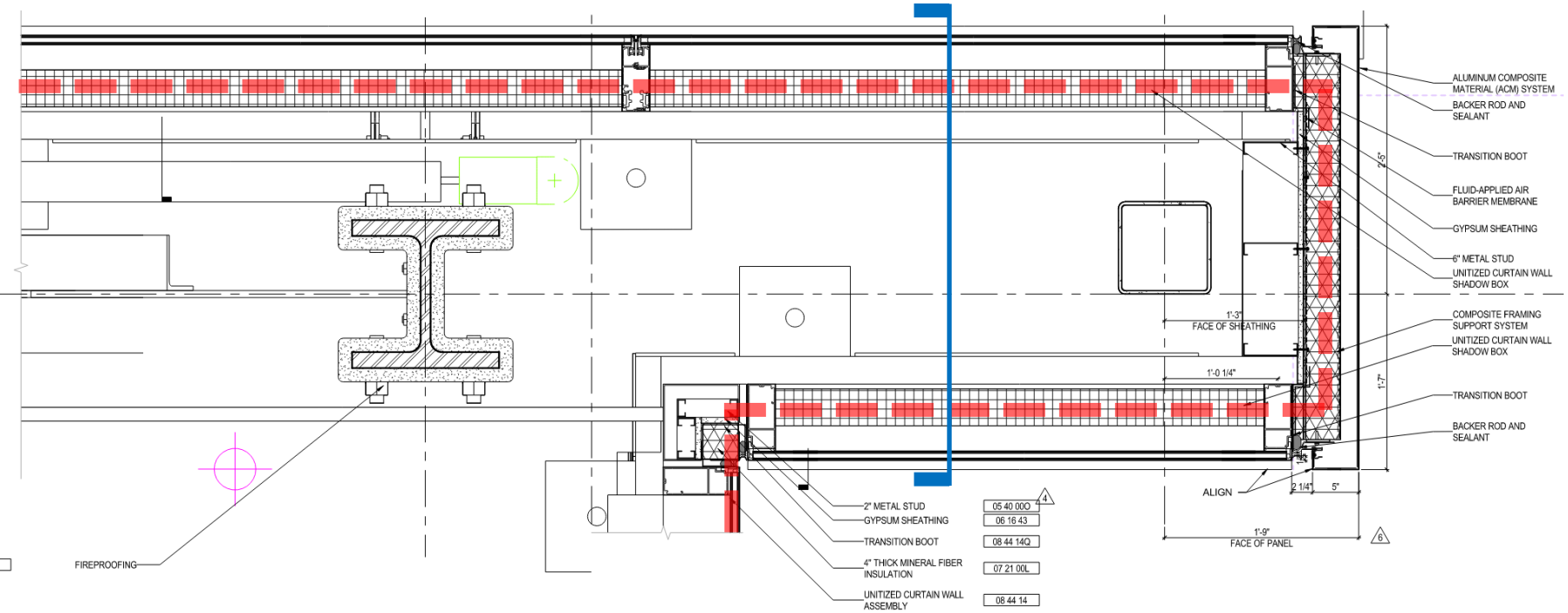
Masonry Wing Wall

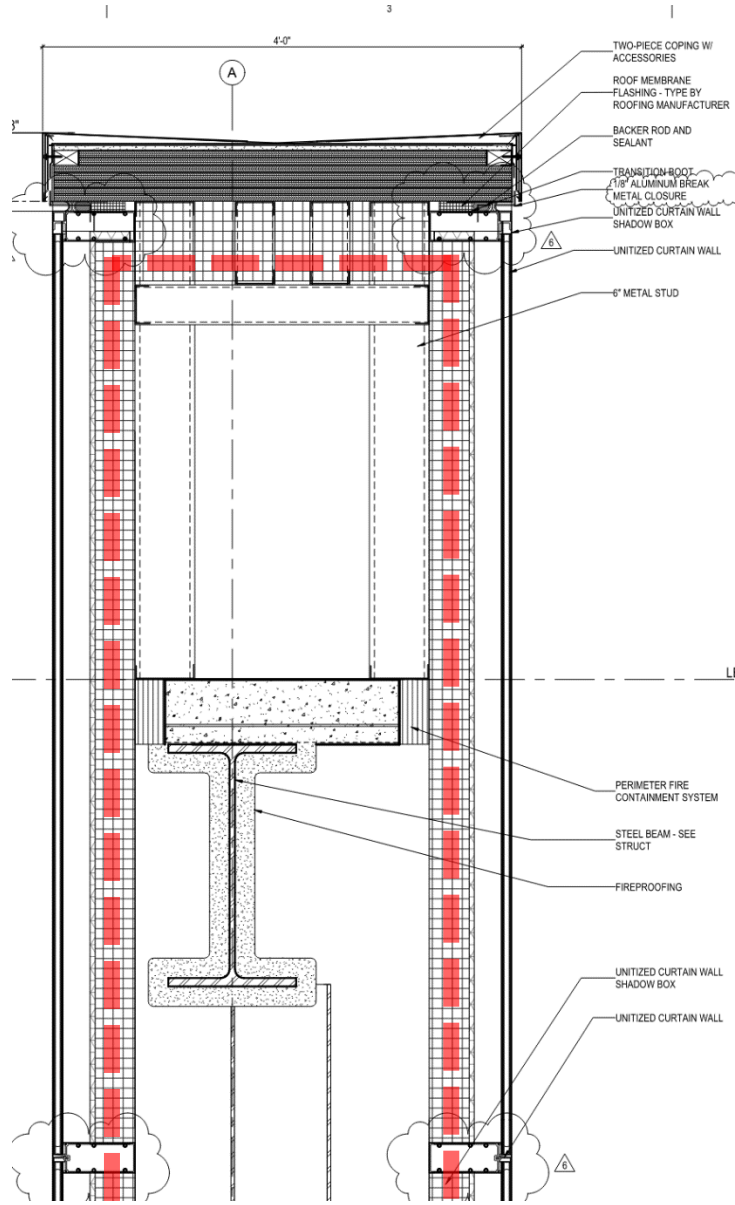


Masonry Wing Wall

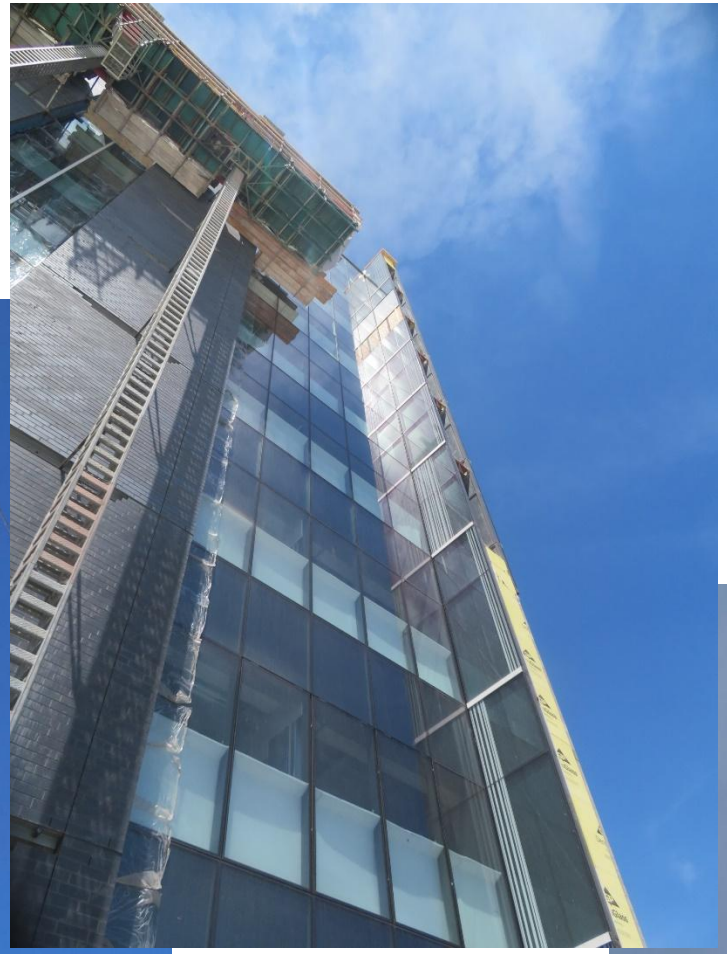
Curtain Wall Wing Wall

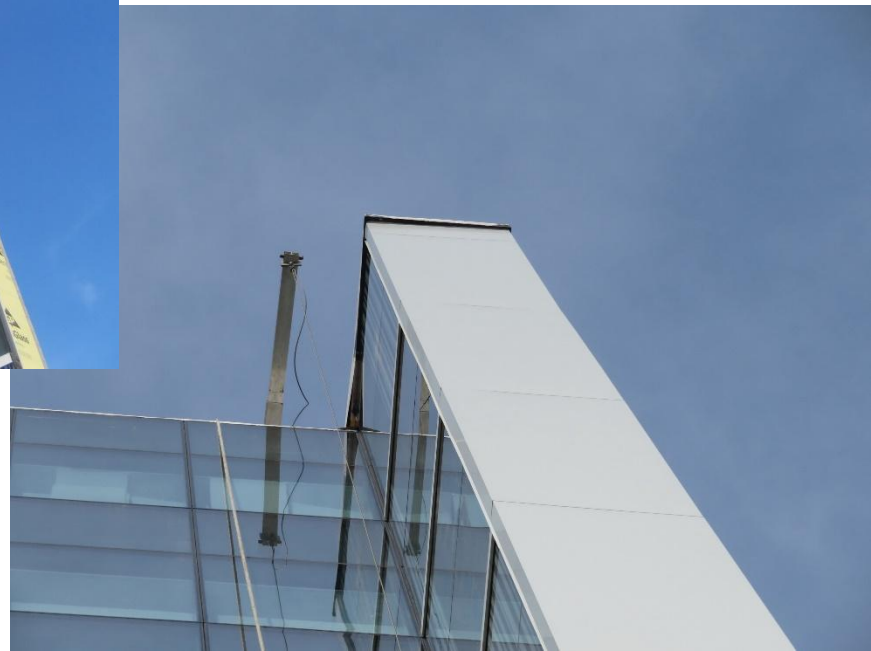






Curtain Wall Wing Wall

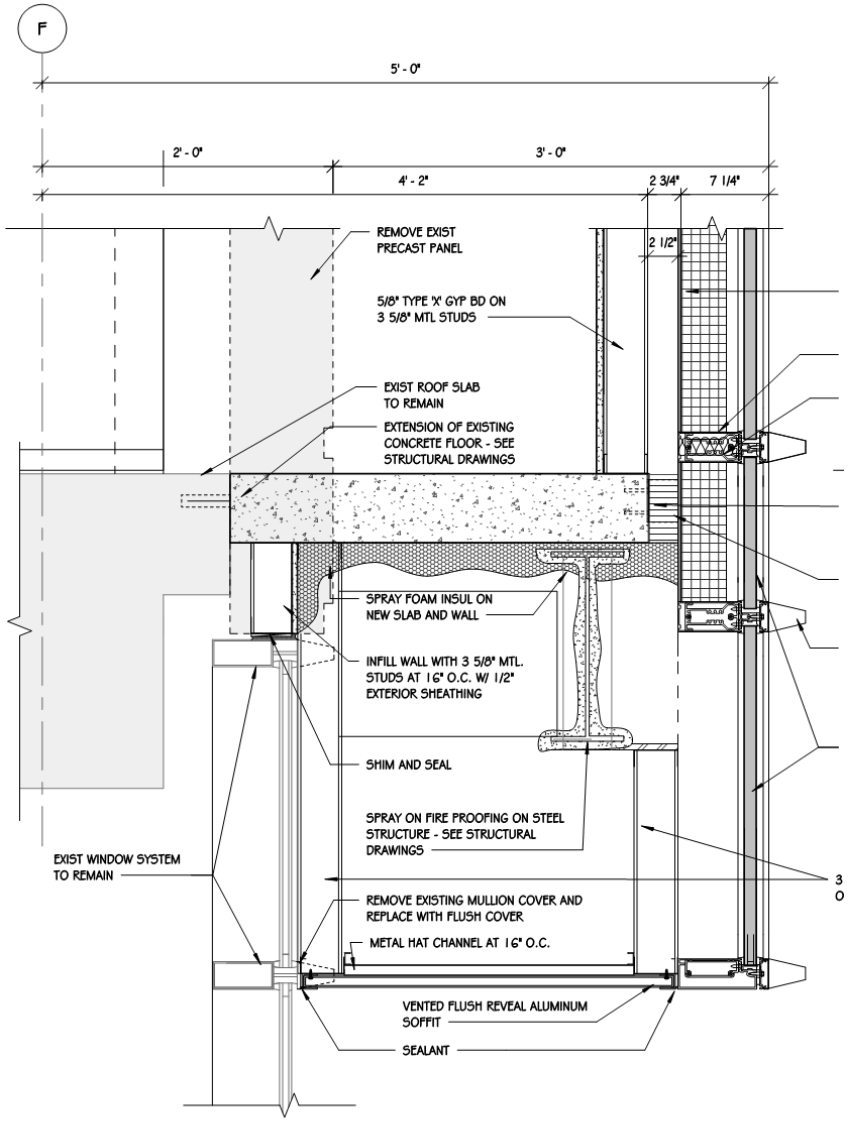




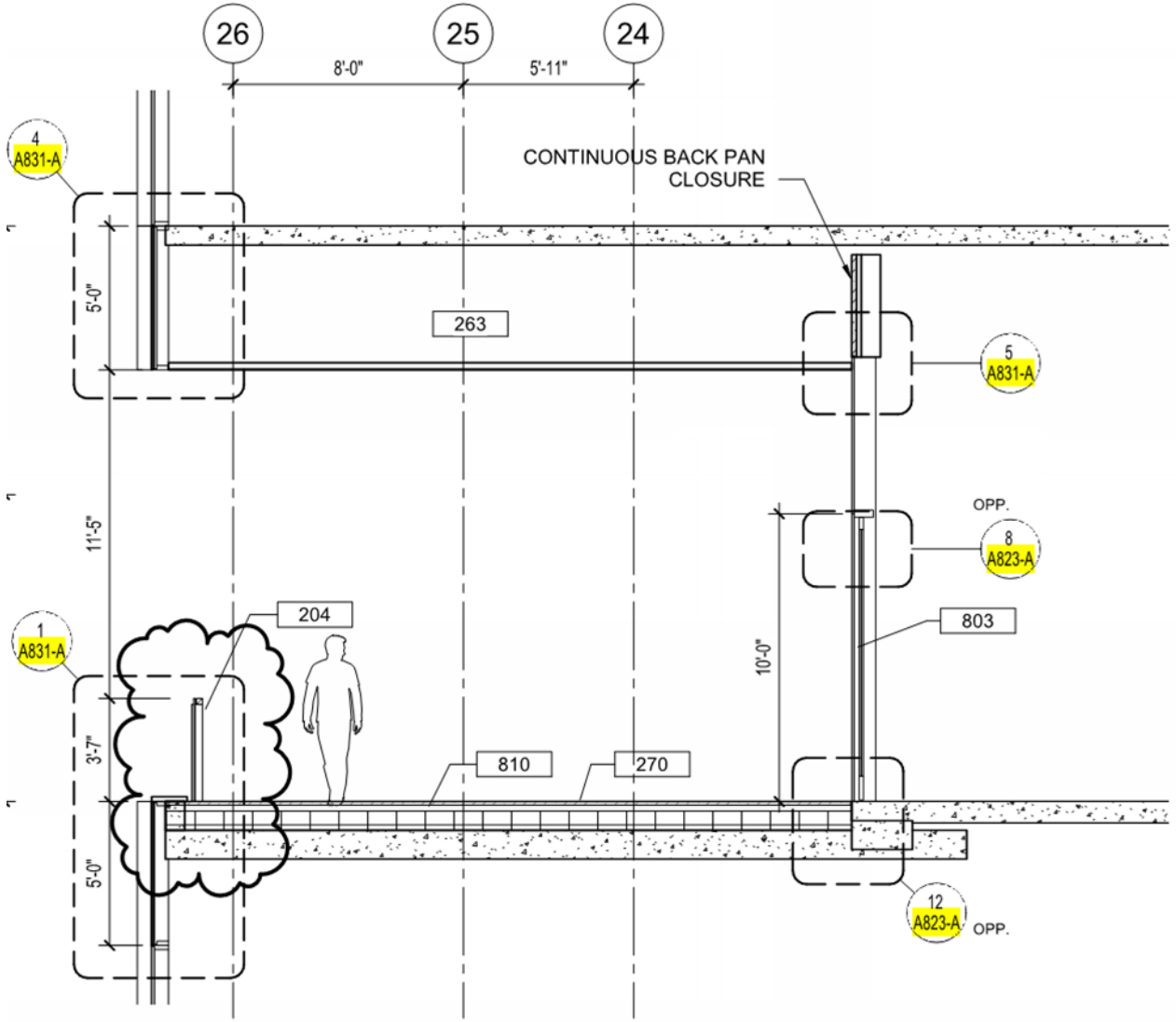
Outline

1. Legacy Concerns and Background
2. Parapets
3. Wing Walls
4. **Overhangs**

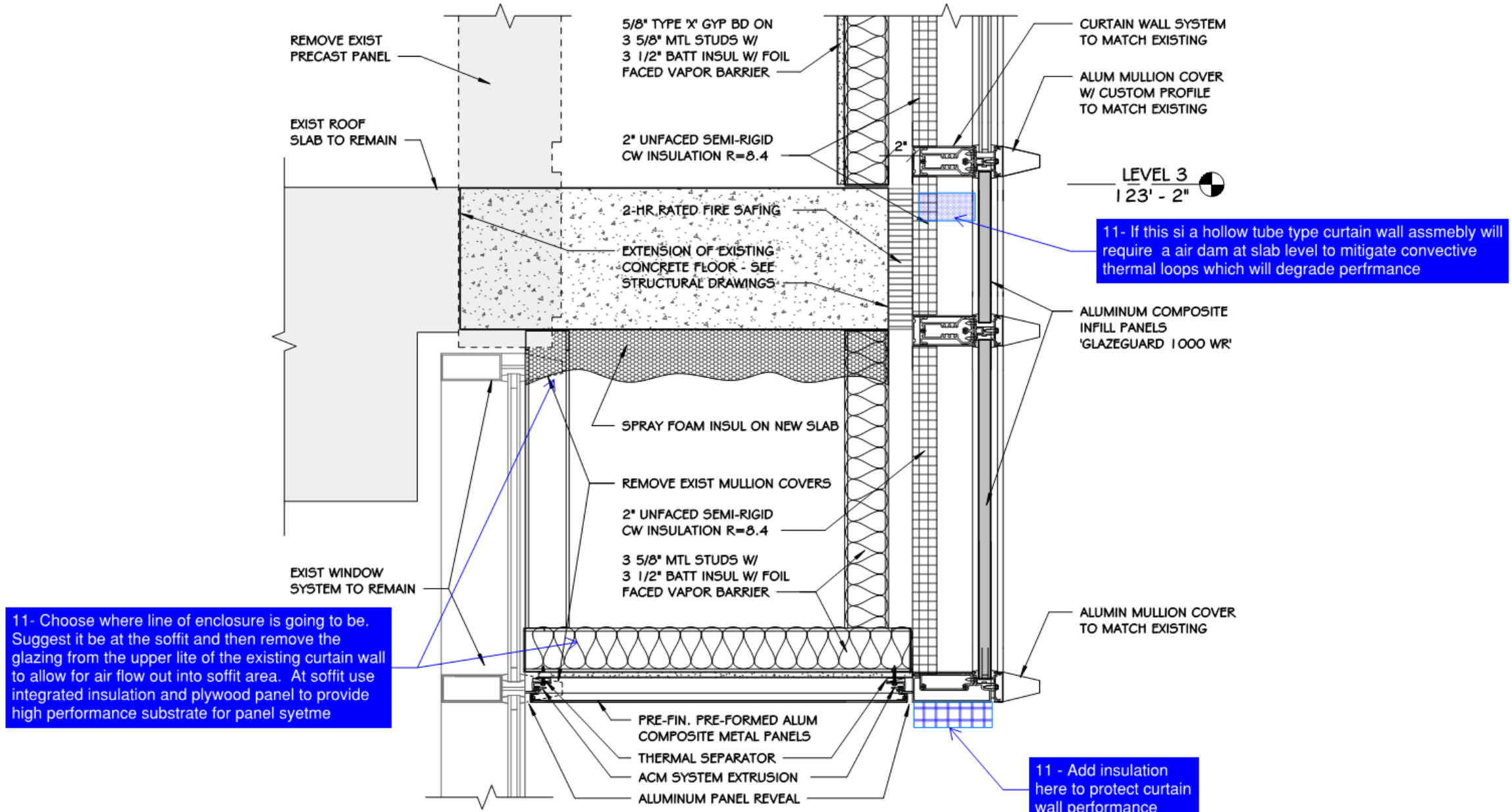
Case Study - Soffits

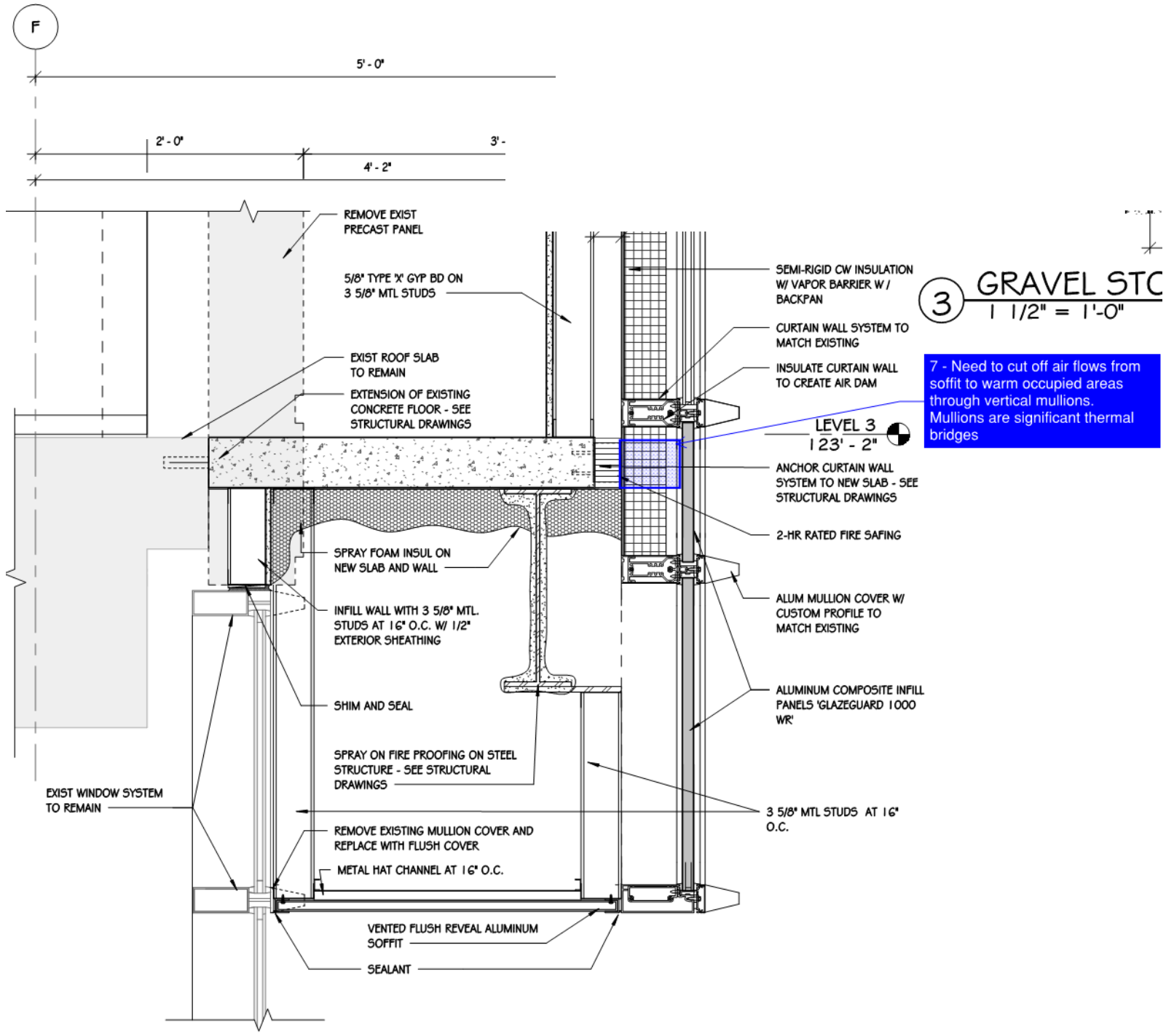


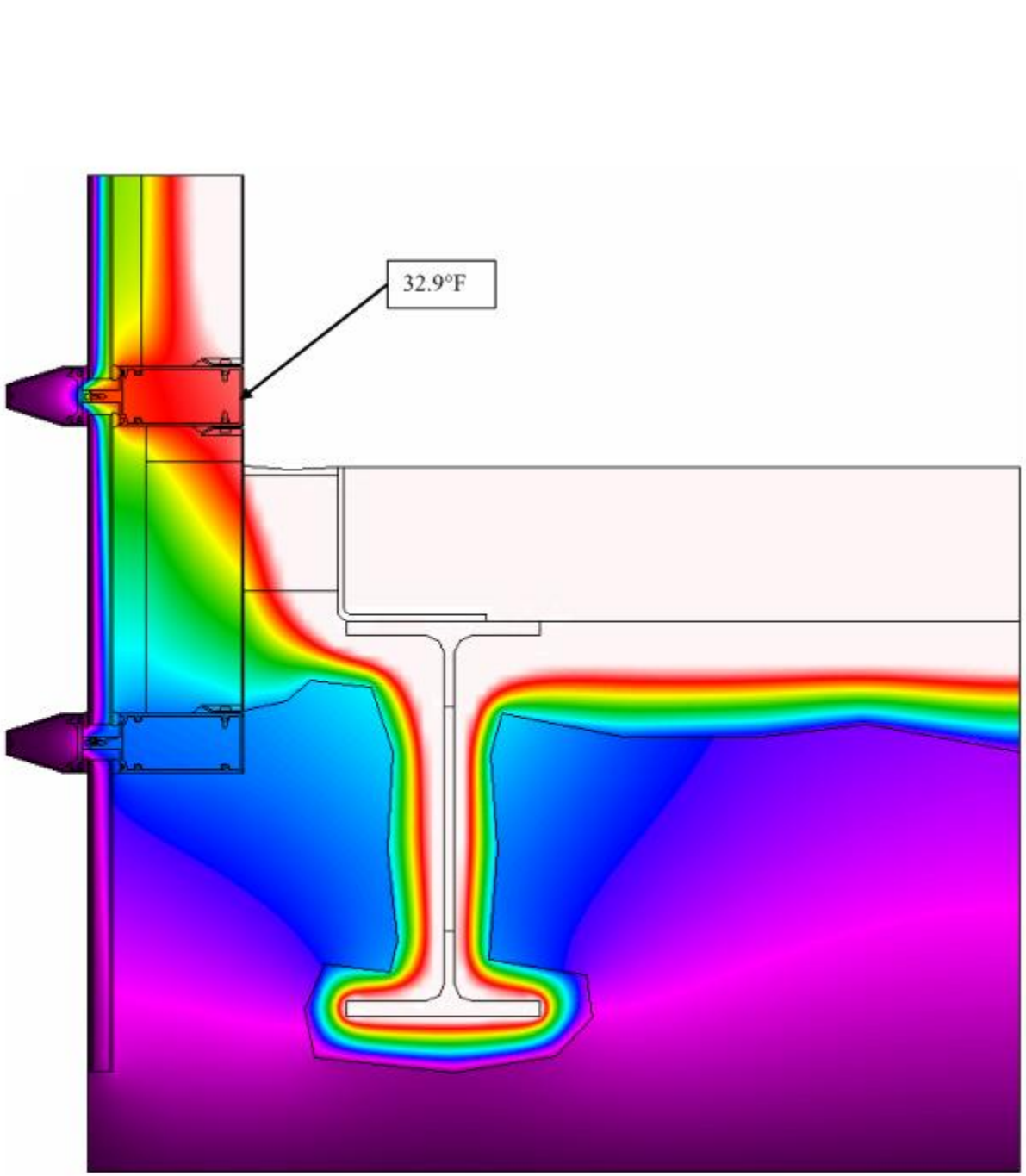
7 CANTILEVER DETAIL 1
1 1/2" = 1'-0"

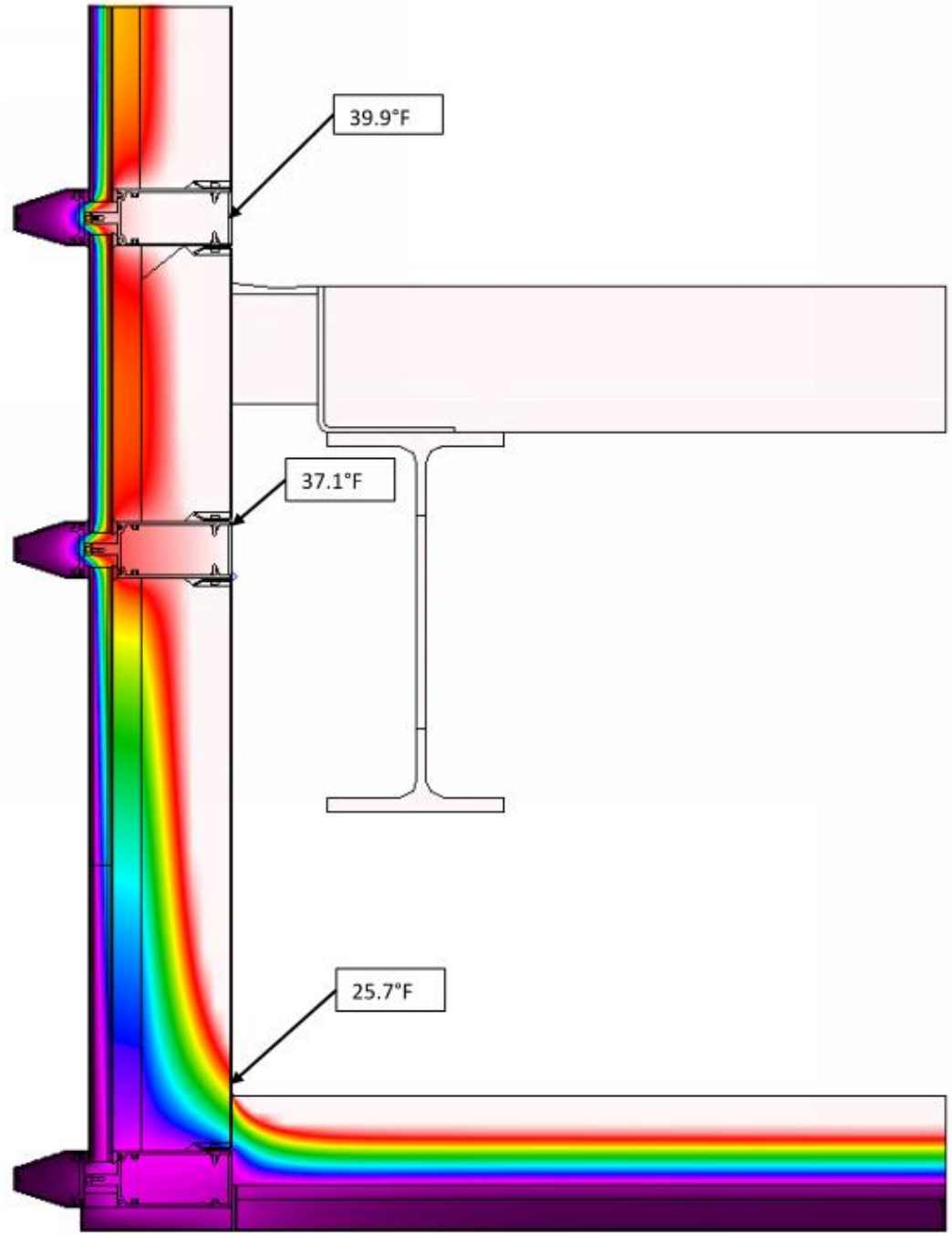


2 LEVEL 3 TERRACE FACADE SECTION 1
SCALE: 1/4" = 1'-0"

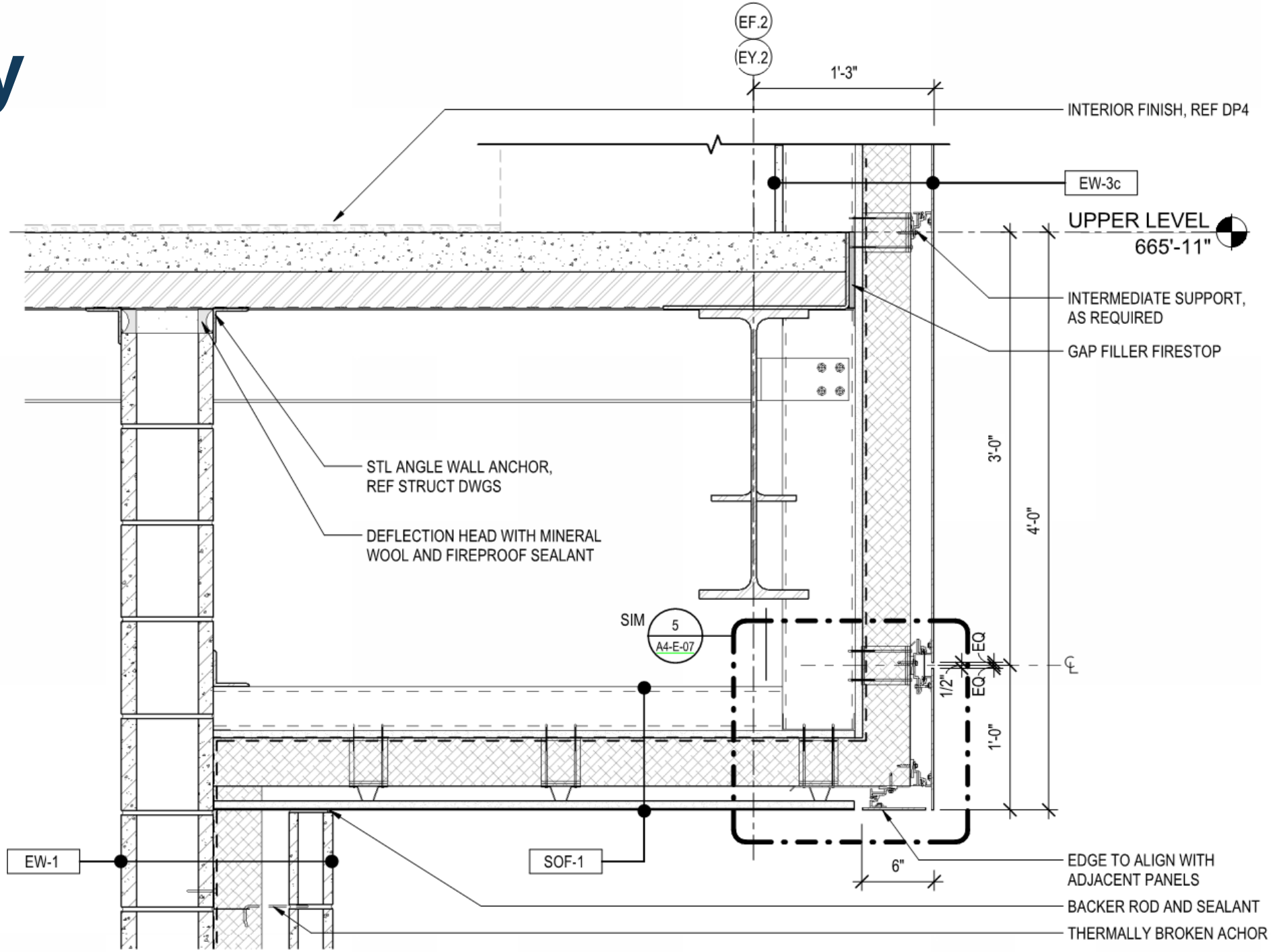

REMOVE EXIST
PRECAST PANEL
EXIST ROOF
SLAB TO REMAIN
5/8" TYPE 'X' GYP BD ON
3 5/8" MTL STUDS W/
3 1/2" BATT INSUL W/ FOIL
FACED VAPOR BARRIER
2" UNFACED SEMI-RIGID
CW INSULATION R=8.4
2"
2-HR RATED FIRE SAFING
EXTENSION OF EXISTING
CONCRETE FLOOR - SEE
STRUCTURAL DRAWINGS
SPRAY FOAM INSUL ON NEW SLAB
REMOVE EXIST MULLION COVERS
2" UNFACED SEMI-RIGID
CW INSULATION R=8.4
3 5/8" MTL STUDS W/
3 1/2" BATT INSUL W/ FOIL
FACED VAPOR BARRIER
EXIST WINDOW
SYSTEM TO REMAIN
PRE-FIN. PRE-FORMED ALUM
COMPOSITE METAL PANELS
THERMAL SEPARATOR
ACM SYSTEM EXTRUSION
ALUMINUM PANEL REVEAL
CURTAIN WALL SYSTEM
TO MATCH EXISTING
ALUM MULLION COVER
W/ CUSTOM PROFILE
TO MATCH EXISTING
LEVEL 3
123' - 2"
ALUMINUM COMPOSITE
INFILL PANELS
'GLAZEGUARD 1000 WR'
ALUMIN MULLION COVER
TO MATCH EXISTING
11- If this si a hollow tube type curtain wall assmebly will require a air dam at slab level to mitigate convective thermal loops which will degrade perfrmance
11- Choose where line of enclosure is going to be. Suggest it be at the soffit and then remove the glazing from the upper lite of the existing curtain wall to allow for air flow out into soffit area. At soffit use integrated insulation and plywood panel to provide high performance substrate for panel syetme
11 - Add insulation here to protect curtain wall performance


F
5' - 0"
2' - 0"
3' -
4' - 2"
REMOVE EXIST PRECAST PANEL
5/8" TYPE 'X' GYP BD ON 3 5/8" MTL STUDS
EXIST ROOF SLAB TO REMAIN
EXTENSION OF EXISTING CONCRETE FLOOR - SEE STRUCTURAL DRAWINGS
SPRAY FOAM INSUL ON NEW SLAB AND WALL
INFILL WALL WITH 3 5/8" MTL. STUDS AT 16" O.C. W/ 1/2" EXTERIOR SHEATHING
SHIM AND SEAL
SPRAY ON FIRE PROOFING ON STEEL STRUCTURE - SEE STRUCTURAL DRAWINGS
EXIST WINDOW SYSTEM TO REMAIN
REMOVE EXISTING MULLION COVER AND REPLACE WITH FLUSH COVER
METAL HAT CHANNEL AT 16" O.C.
VENTED FLUSH REVEAL ALUMINUM SOFFIT
SEALANT
SEMI-RIGID CW INSULATION W/ VAPOR BARRIER W / BACKPAN
CURTAIN WALL SYSTEM TO MATCH EXISTING
INSULATE CURTAIN WALL TO CREATE AIR DAM
LEVEL 3
123' - 2"
ANCHOR CURTAIN WALL SYSTEM TO NEW SLAB - SEE STRUCTURAL DRAWINGS
2-HR RATED FIRE SAFING
ALUM MULLION COVER W/ CUSTOM PROFILE TO MATCH EXISTING
ALUMINUM COMPOSITE INFILL PANELS 'GLAZEGUARD 1000 WR'
3 5/8" MTL STUDS AT 16" O.C.
3 GRAVEL STO
1 1/2" = 1'-0"
7 - Need to cut off air flows from soffit to warm occupied areas through vertical mullions. Mullions are significant thermal bridges

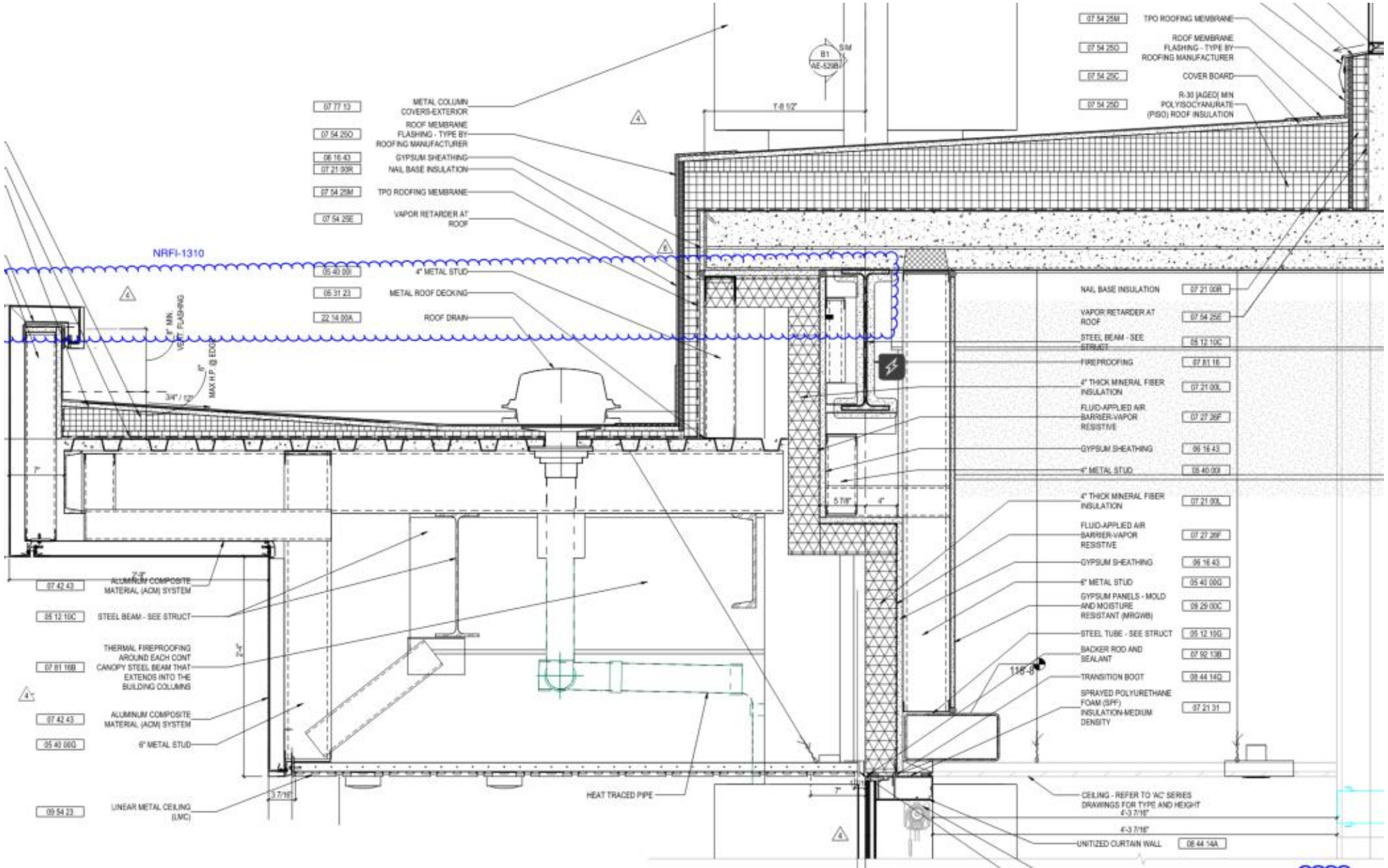

32.9°F


39.9°F
37.1°F
25.7°F

Case Study


EF.2
EY.2
1'-3"
INTERIOR FINISH, REF DP4
EW-3c
UPPER LEVEL
665'-11"
INTERMEDIATE SUPPORT, AS REQUIRED
GAP FILLER FIRESTOP
STL ANGLE WALL ANCHOR, REF STRUCT DWGS
DEFLECTION HEAD WITH MINERAL WOOL AND FIREPROOF SEALANT
SIM
5
A4-E-07
3'-0"
4'-0"
1/2"
EQ
EQ
1'-0"
EW-1
SOF-1
6"
EDGE TO ALIGN WITH ADJACENT PANELS
BACKER ROD AND SEALANT
THERMALLY BROKEN ACHOR

Overhangs


07 77 13 METAL COLUMN COVERS-EXTERIOR
07 54 25O ROOF MEMBRANE FLASHING - TYPE BY ROOFING MANUFACTURER
06 16 43 GYPSUM SHEATHING
07 21 00R NAIL BASE INSULATION
07 54 25M TPO ROOFING MEMBRANE
07 54 25E VAPOR RETARDER AT ROOF
NRFI-1310
05 40 00I 4" METAL STUD
05 31 23 METAL ROOF DECKING
22 14 00A ROOF DRAIN
07 54 25M TPO ROOFING MEMBRANE
07 54 25O ROOF MEMBRANE FLASHING - TYPE BY ROOFING MANUFACTURER
07 54 25C COVER BOARD
07 54 25D R-30 [AGED] MIN POLYISOCYANURATE (PISO) ROOF INSULATION
NAIL BASE INSULATION 07 21 00R
VAPOR RETARDER AT ROOF 07 54 25E
STEEL BEAM - SEE STRUCT 05 12 10C
FIREPROOFING 07 81 16
4" THICK MINERAL FIBER INSULATION 07 21 00L
FLUID-APPLIED AIR BARRIER-VAPOR RESISTIVE 07 27 26F
GYPSUM SHEATHING 06 16 43
6" METAL STUD 05 40 00I
4" THICK MINERAL FIBER INSULATION 07 21 00L
FLUID-APPLIED AIR BARRIER-VAPOR RESISTIVE 07 27 26F
GYPSUM SHEATHING 06 16 43
6" METAL STUD 05 40 00Q
GYPSUM PANELS - MOLD AND MOISTURE RESISTANT (MRGWB) 09 29 00C
STEEL TUBE - SEE STRUCT 05 12 10G
BACKER ROD AND SEALANT 07 92 13B
TRANSITION BOOT 08 44 14Q
SPRAYED POLYURETHANE FOAM (SPF) INSULATION-MEDIUM DENSITY 07 21 31
07 42 43 ALUMINUM COMPOSITE MATERIAL (ACM) SYSTEM
05 12 10C STEEL BEAM - SEE STRUCT
07 81 16B THERMAL FIREPROOFING AROUND EACH CONT CANOPY STEEL BEAM THAT EXTENDS INTO THE BUILDING COLUMNS
07 42 43 ALUMINUM COMPOSITE MATERIAL (ACM) SYSTEM
05 40 00Q 6" METAL STUD
09 54 23 LINEAR METAL CEILING (LMC)
HEAT TRACED PIPE
CEILING - REFER TO 'AC' SERIES DRAWINGS FOR TYPE AND HEIGHT
4'-3 7/16"
UNITIZED CURTAIN WALL 08 44 14A

WJE POWER CONSTRUCTION

Thank you!