

Introduction to Building Envelope Commissioning

Presented by:

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Takeaways

- Explain what is building envelope commissioning
- Describe some benefits of building envelope commissioning
- Point out common areas that are overlooked during construction
- Describe in detail how to functionally test a buildings envelope



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What is Commissioning?

When a building is initially commissioned it undergoes an intensive quality assurance process that begins during design and continues through construction, occupancy, and operations. Commissioning ensures that the new building operates initially as the owner intended and that building staff are prepared to operate and maintain its systems and equipment.

—Lawrence Berkley National Laboratory

Benefits of Commissioning

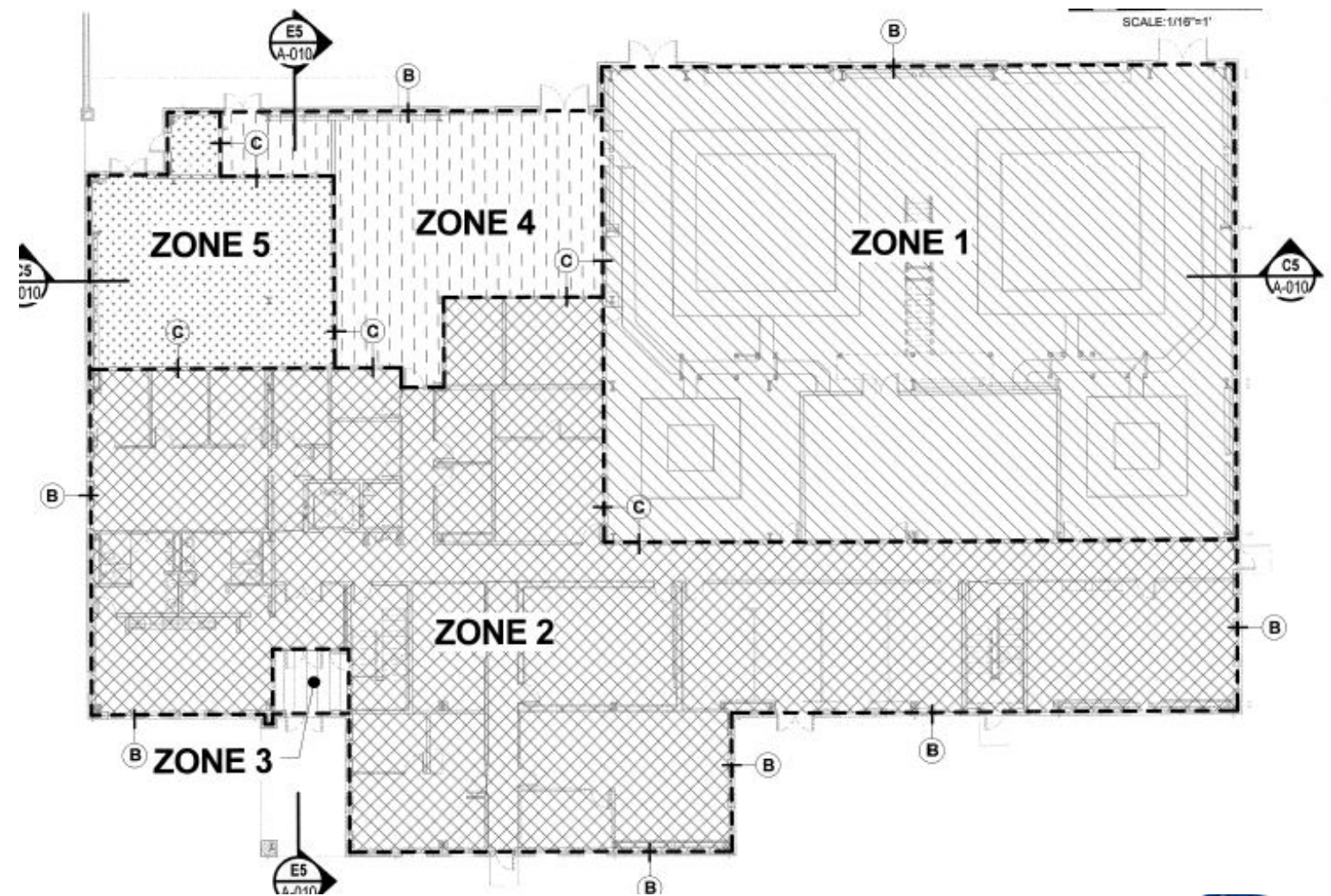


Building Envelope Commissioning

- United States Army Corps of Engineers (USACE)
- United State Green Building Council (USGBC)
- American Society for Testing and Materials (ASTM)
- International Energy Conservation Code (ICEE)
- Association of Architects (AIA)
- American Society of Heating, Air-Conditioning, and Refrigeration (ASHRAE)
- National Institute for Building Science (NIBS)

What is the Envelope?

- Building Envelope
 - Physical separator between conditioned and unconditioned spaces
 - Weather barrier
 - Air barrier
 - Thermal barrier
 - Vapor barrier

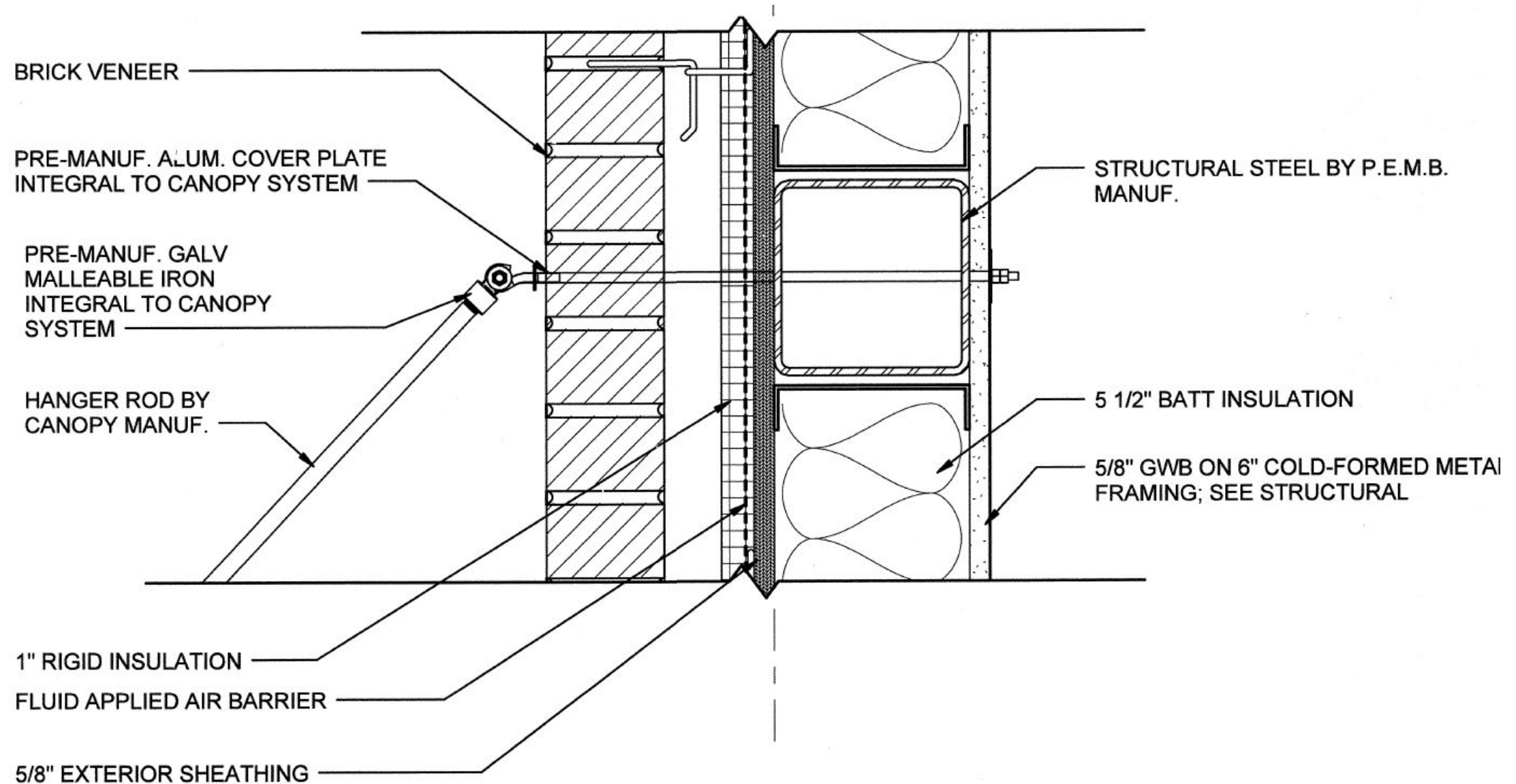


Stages of Envelope Commissioning

- Pre-Design
- Design
- Construction

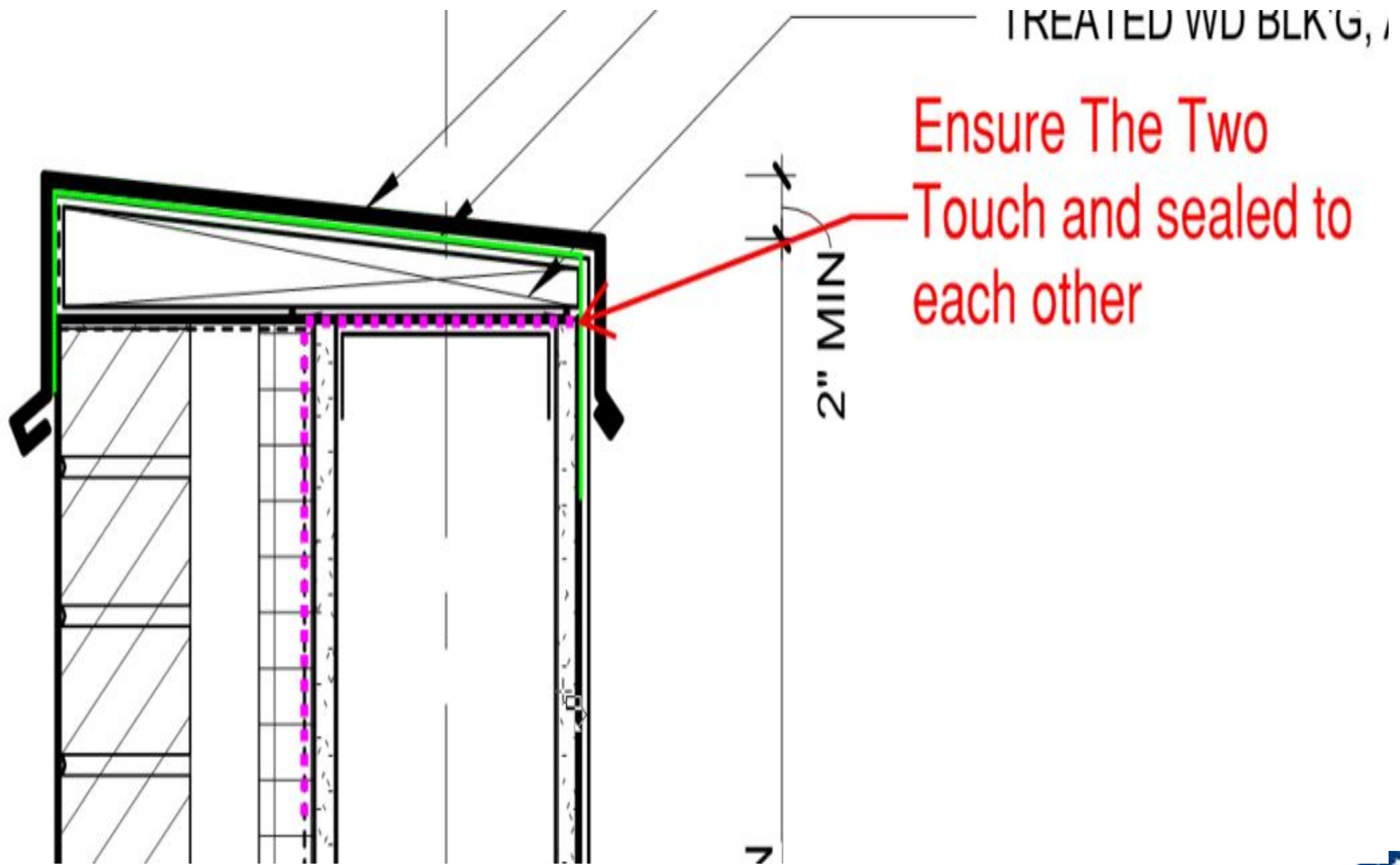
Design Review

Design Review

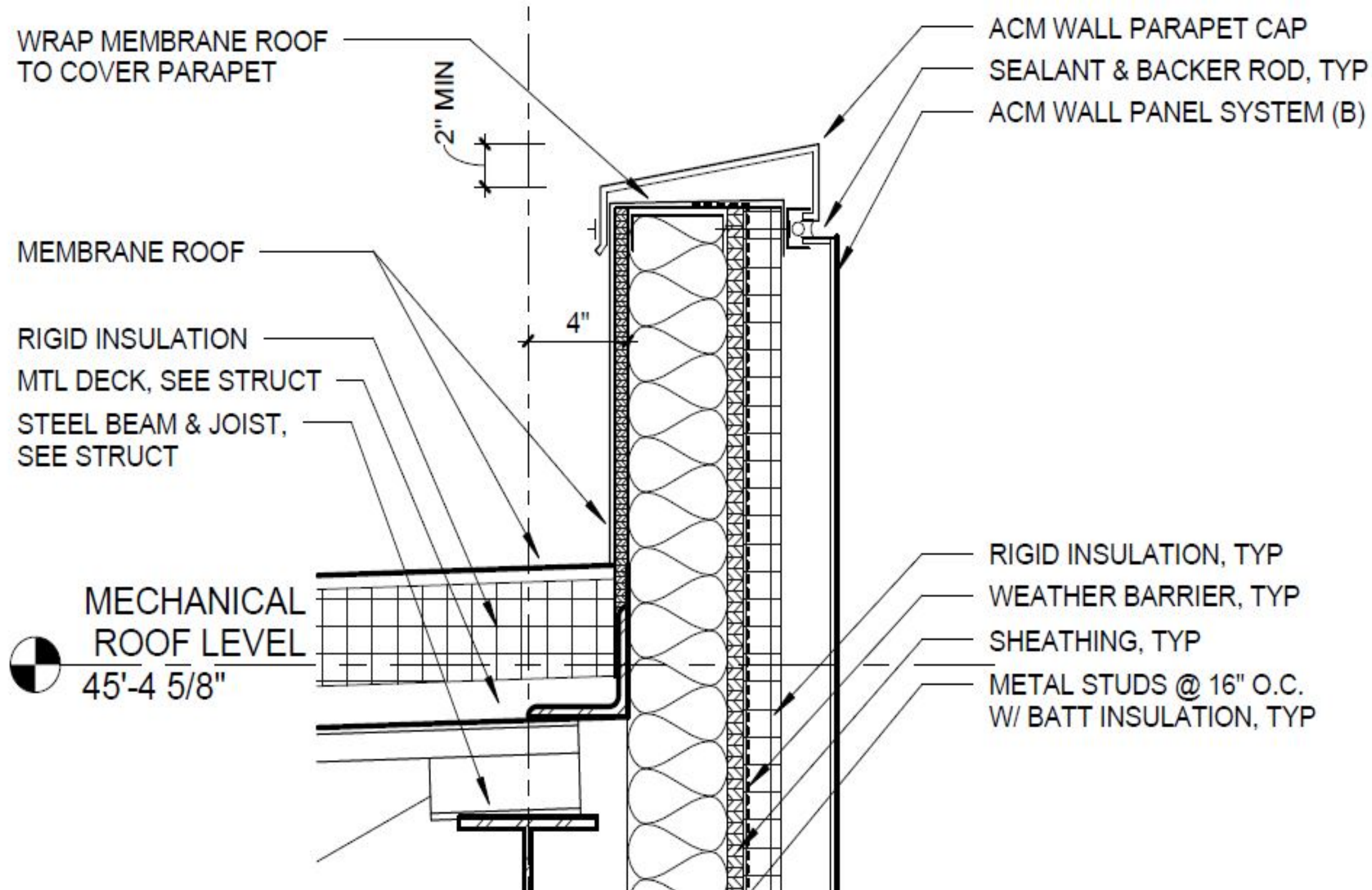


2 CANOPY DETAIL
A-324 SCALE: 3" = 1'-0"

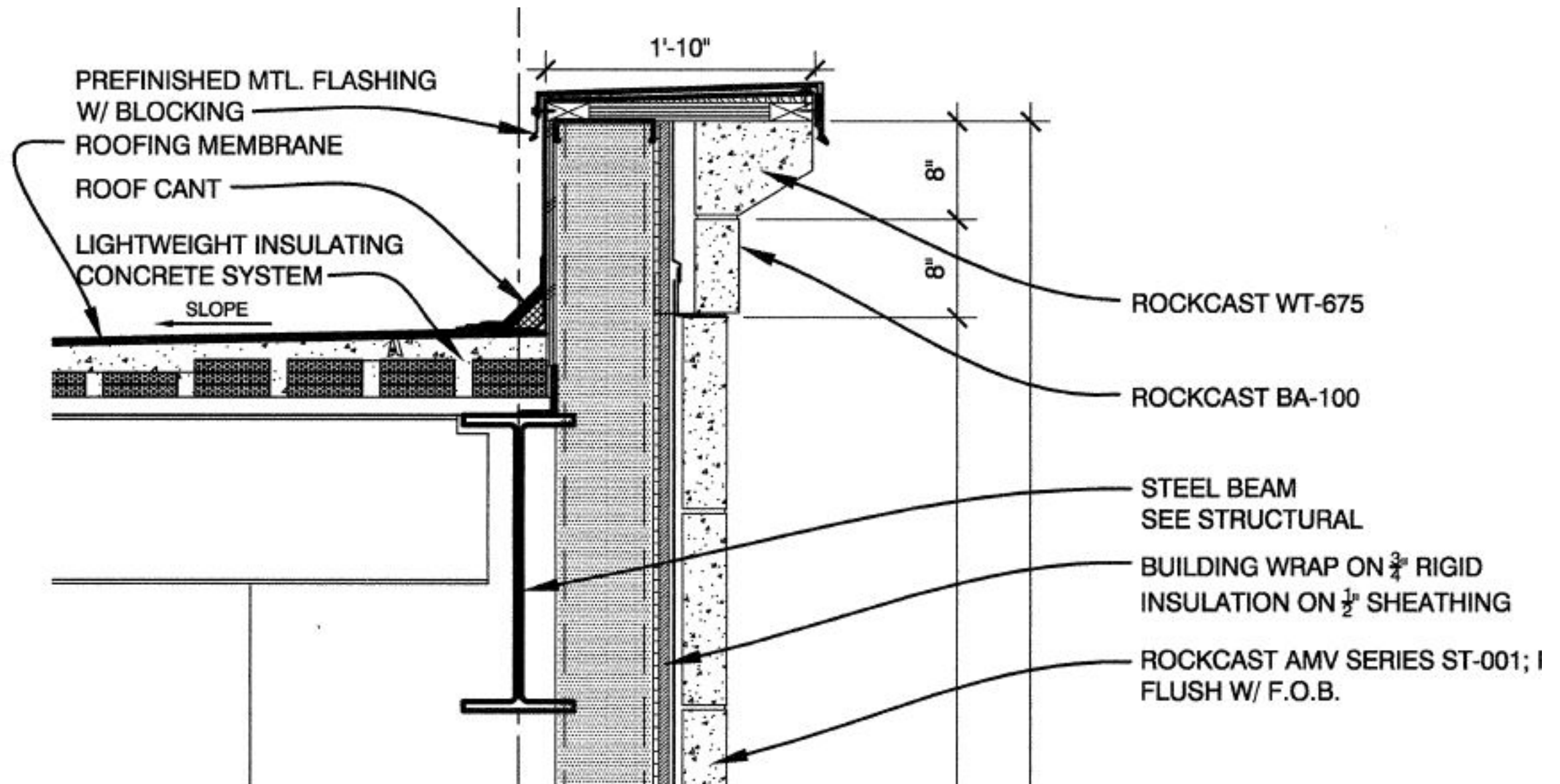
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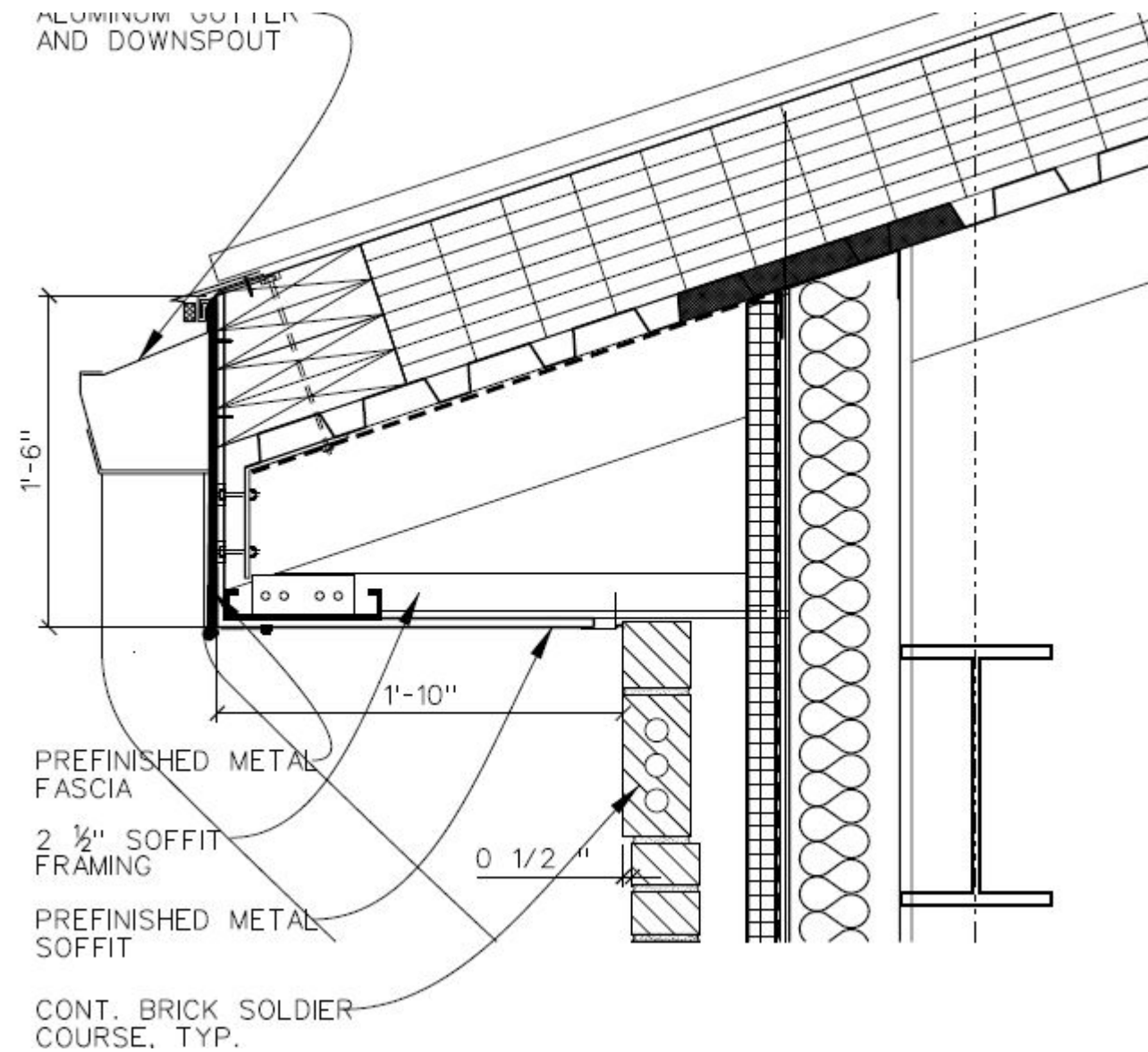
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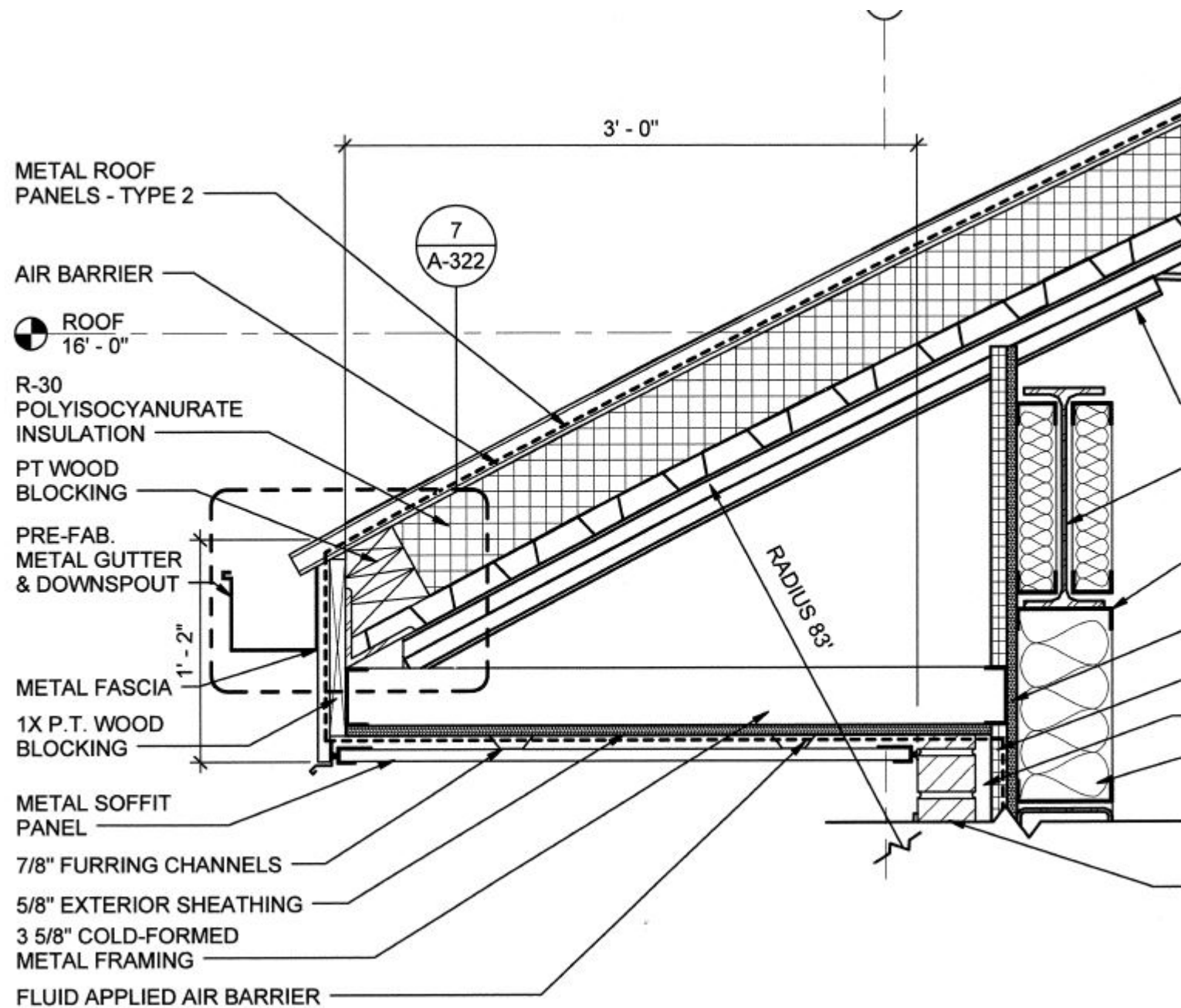
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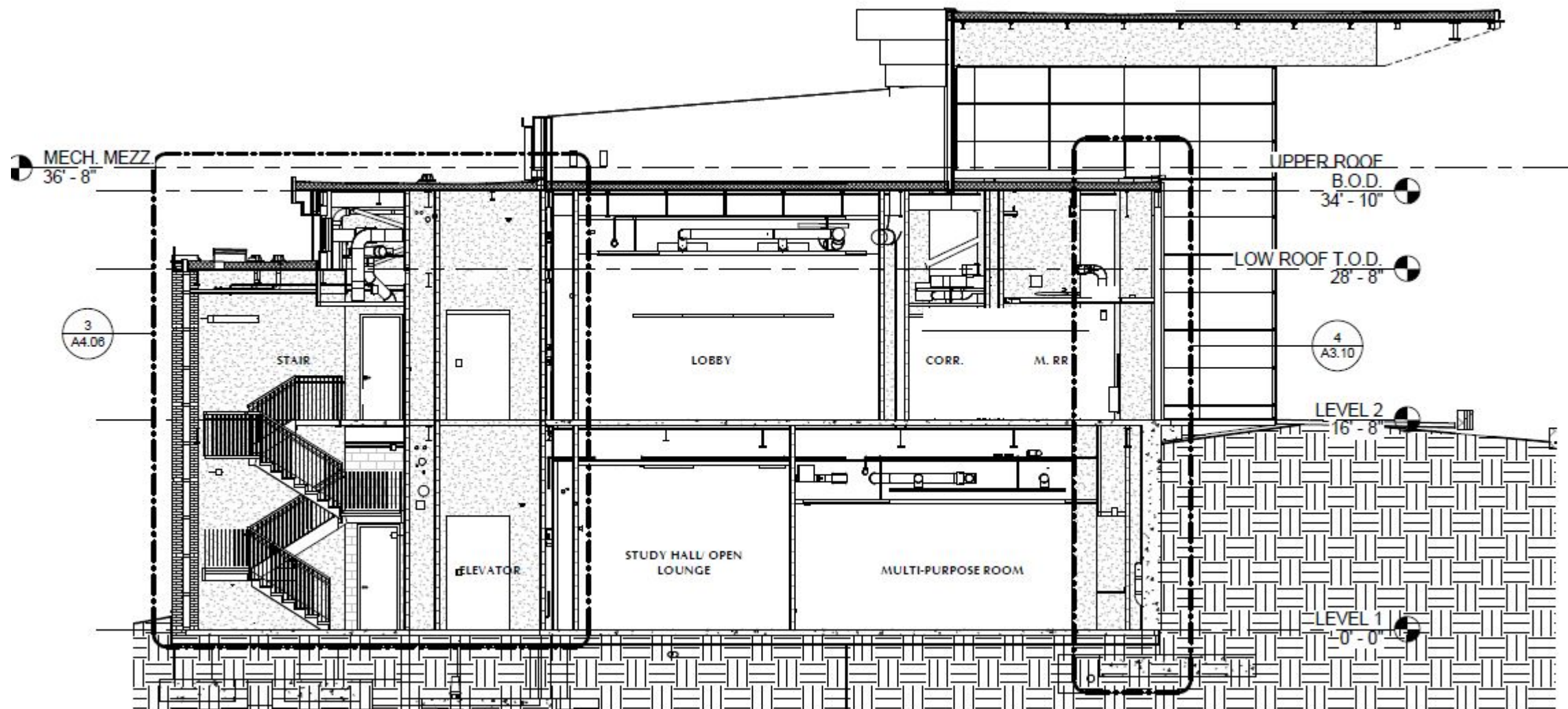
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Design Review

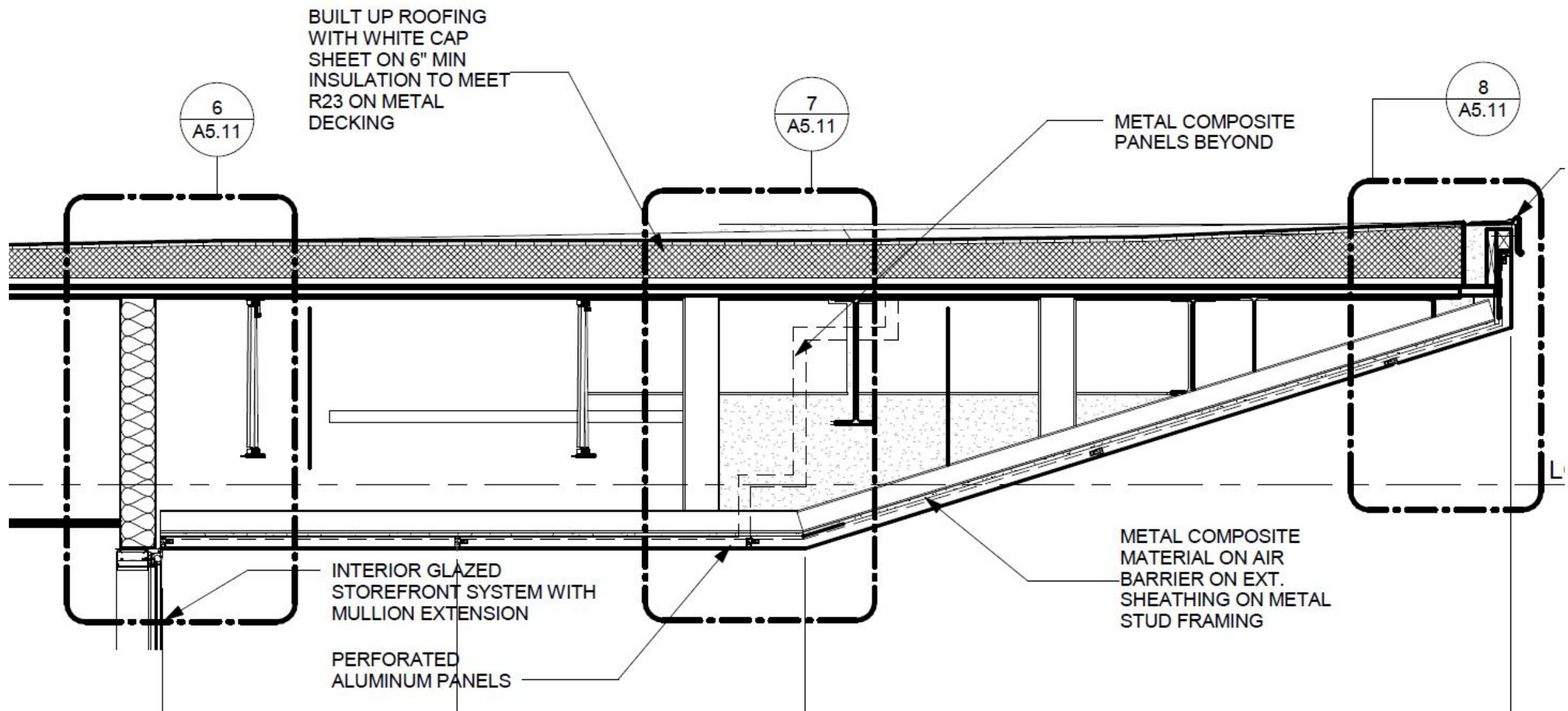


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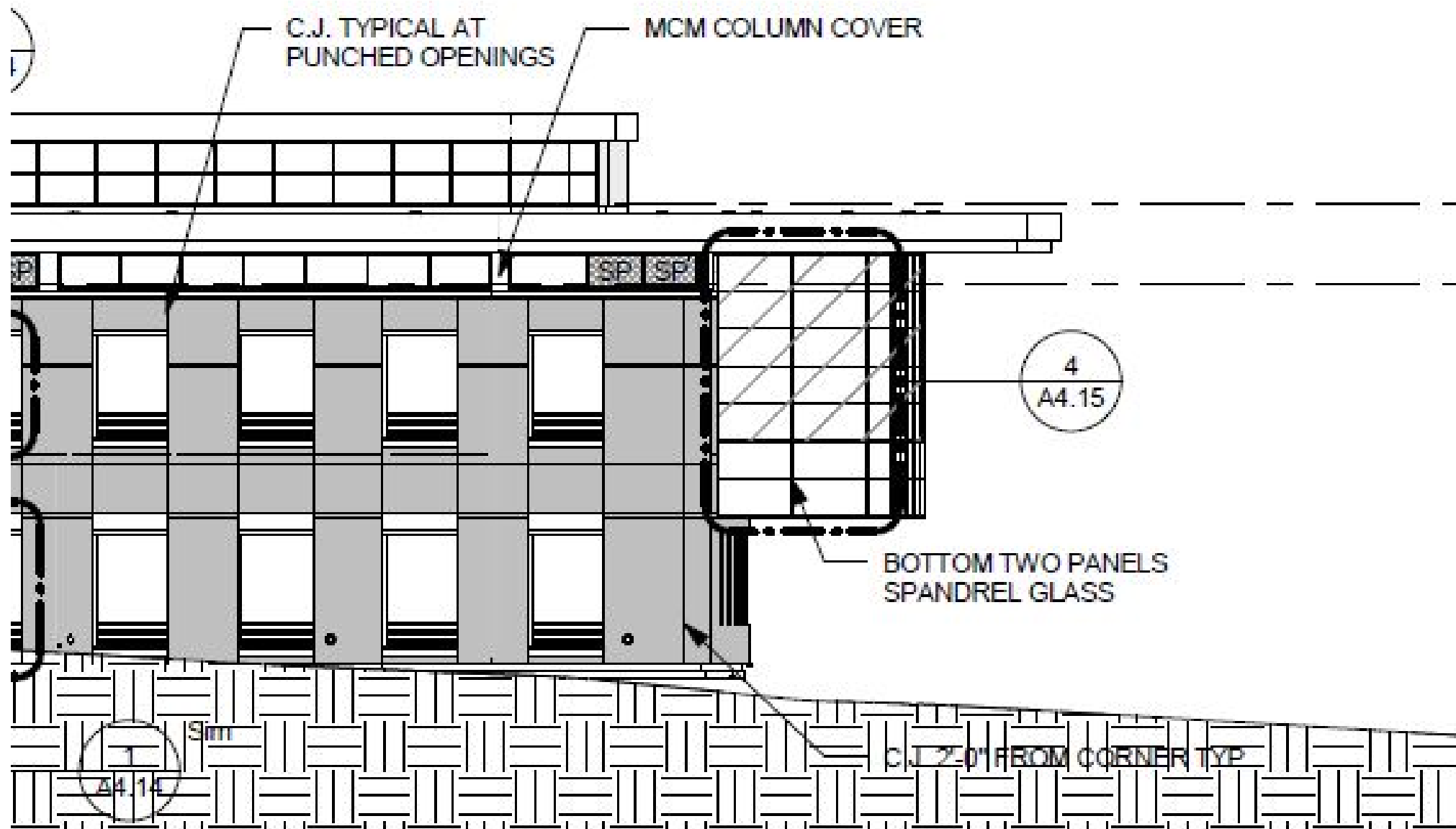


1 BUILDING SECTION
1/8" = 1'-0"

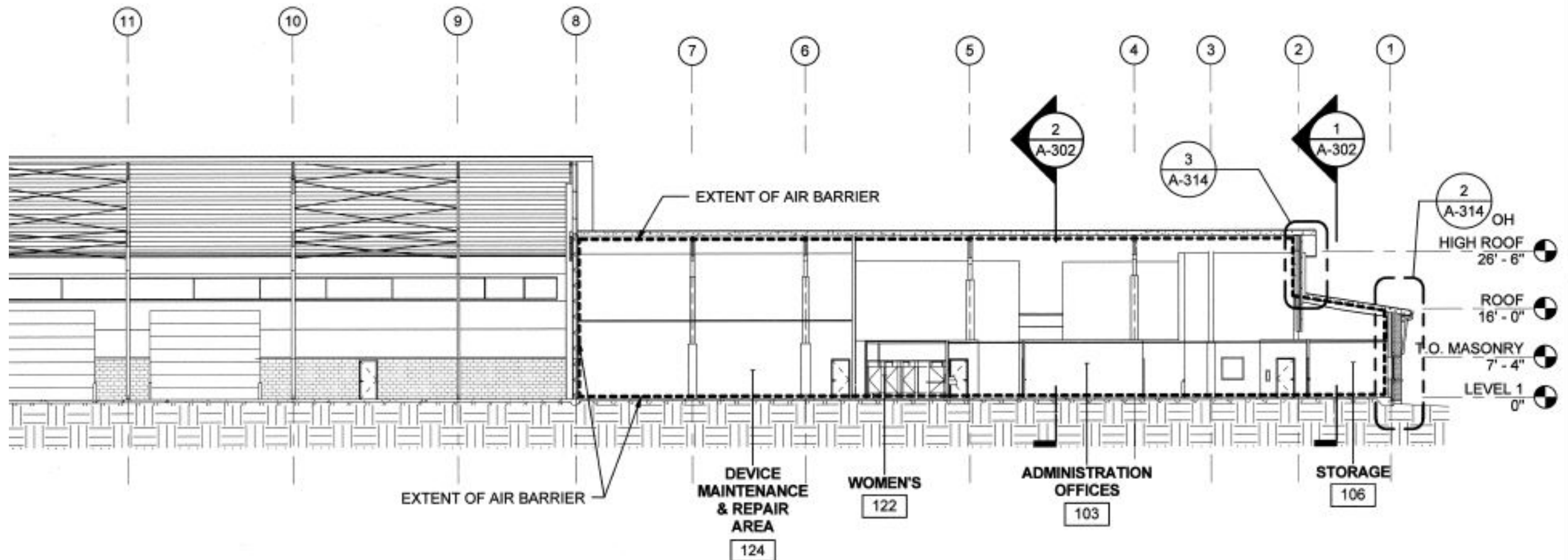
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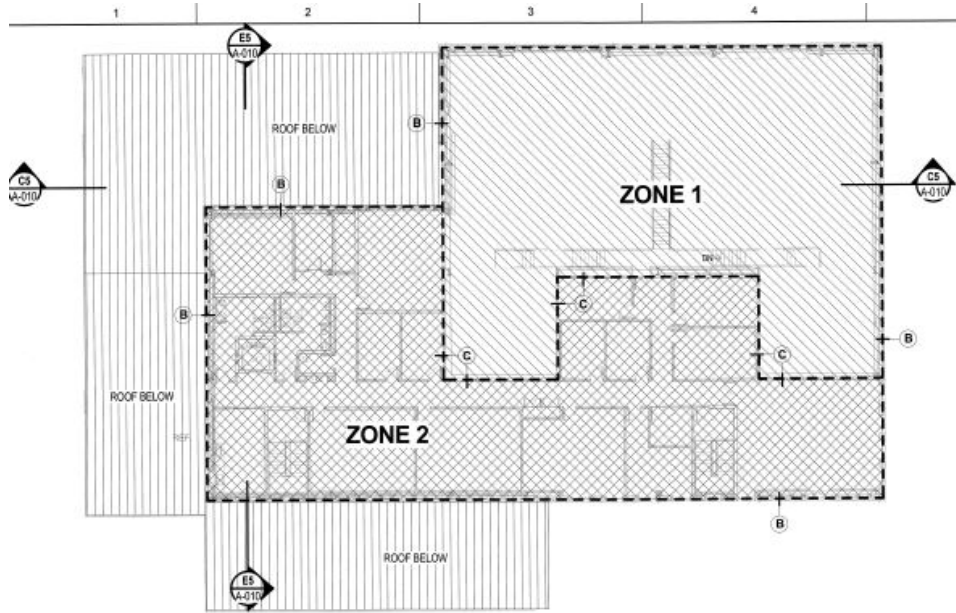
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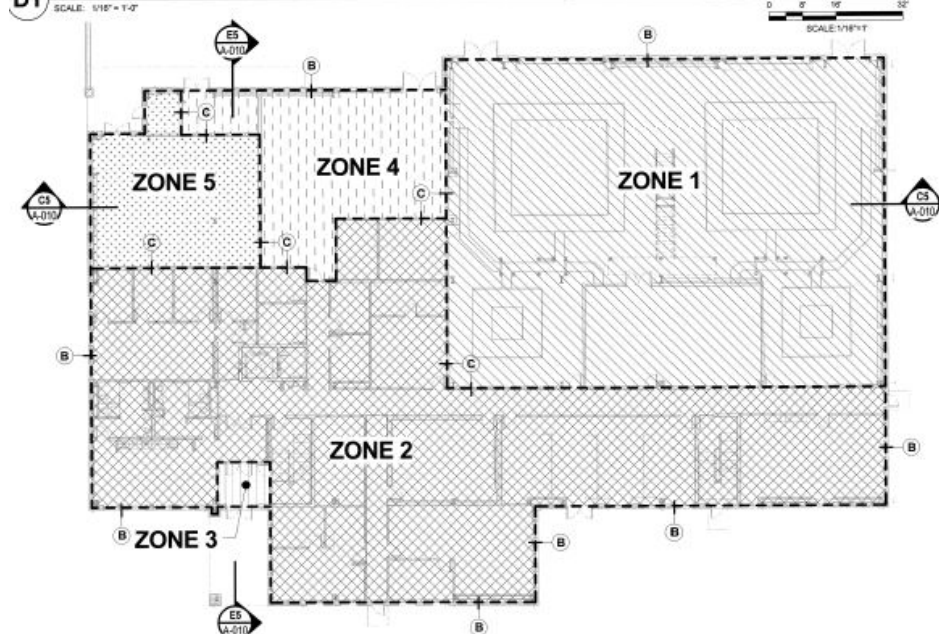
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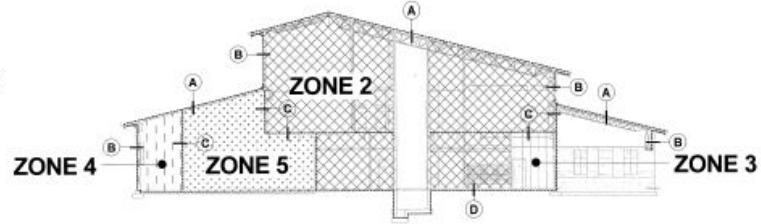
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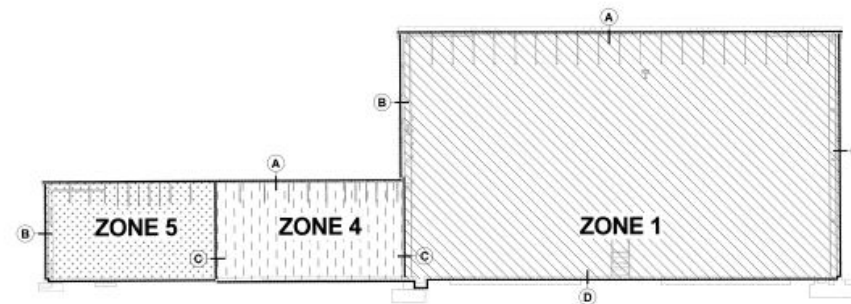
D1 AIR BARRIER PLAN - SECOND FLOOR



A1 AIR BARRIER PLAN - FIRST FLOOR








E5 AIR BARRIER - SECTION



C5 AIR BARRIER - SECTION



AIR BARRIER SUMMARY

-  ZONE 1
TOTAL SURFACE AREA - 37,166 SF
-  ZONE 2
TOTAL SURFACE AREA - 51,693 SF
-  ZONE 3
TOTAL SURFACE AREA - 944 SF
-  ZONE 4
TOTAL SURFACE AREA - 7,928 SF
-  ZONE 5
TOTAL SURFACE AREA - 6,701 SF

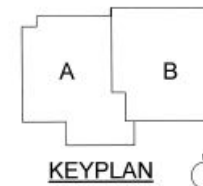
GENERAL NOTES - AIR BARRIER

1. ALL PENETRATIONS THRU THE AIR BARRIER MUST BE RE-SEALED
2. REFER TO DETAIL SHEETS FOR LOCATION OF AIR BARRIER

CONTINUOUS AIR BARRIER DEFINITION

(ALL AIR BARRIER SYSTEM ON WALLS ARE FROM FLOOR TO BOTTOM OF DECK)

- (A) SELF-ADHERED ROOFING UNDERLAYMENT
(B) FLUID APPLIED AIR AND VAPOR BARRIER ON EXTERIOR SHEATHING
(C) PAINTED GYPSUM WALL BOARD
(D) CAST IN PLACE CONCRETE



KEYPLAN

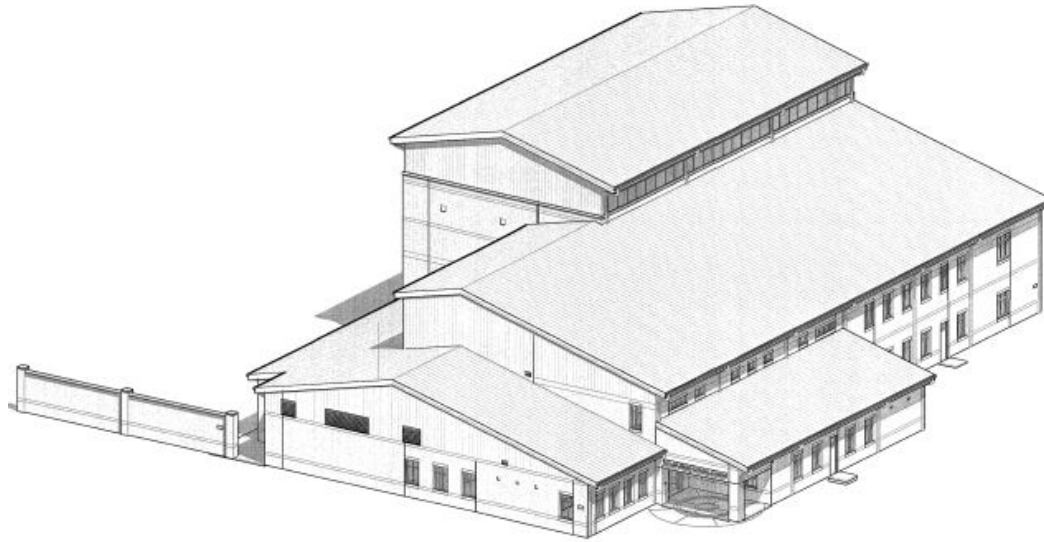


ALTUS AIR FORCE BASE, OKLAHOMA
PROJECT NO. AGN14330M FY-14
KC-46A FLIGHT TRAINING CENTER FACILITY

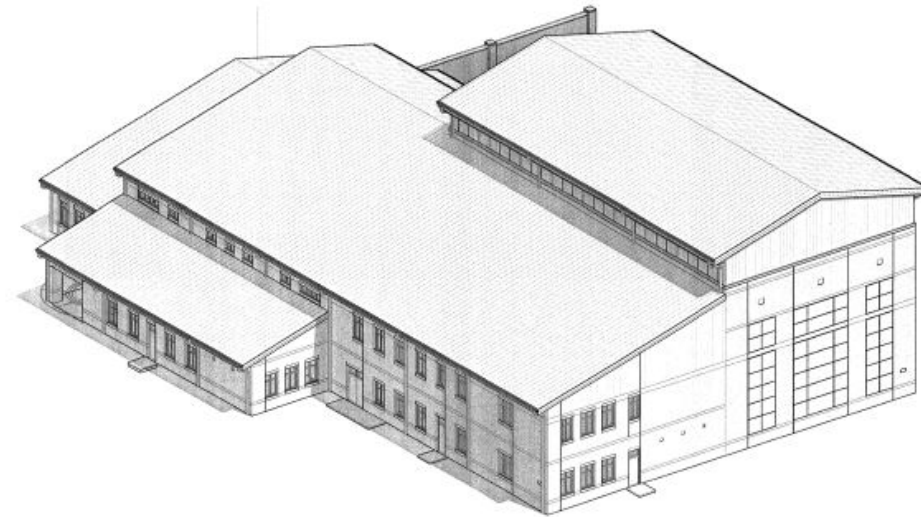
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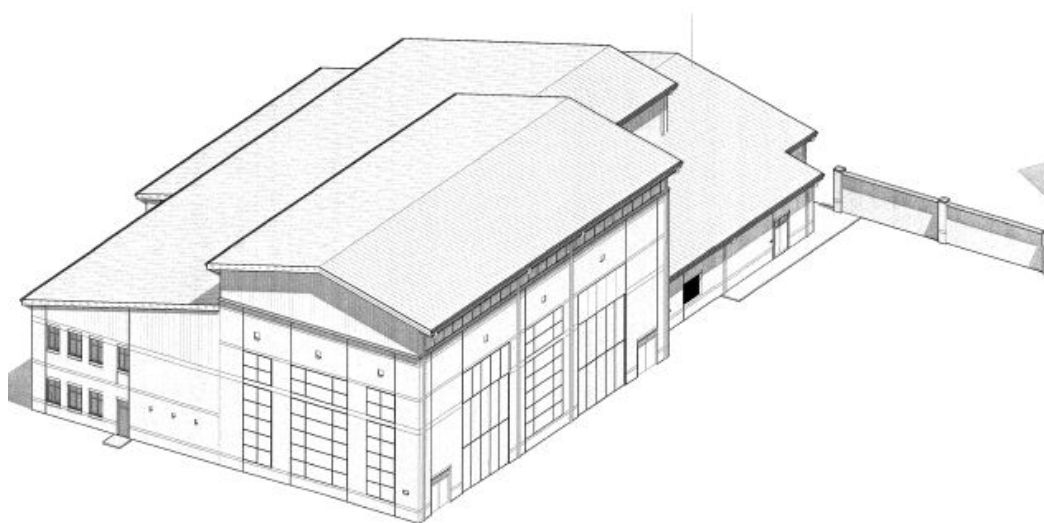
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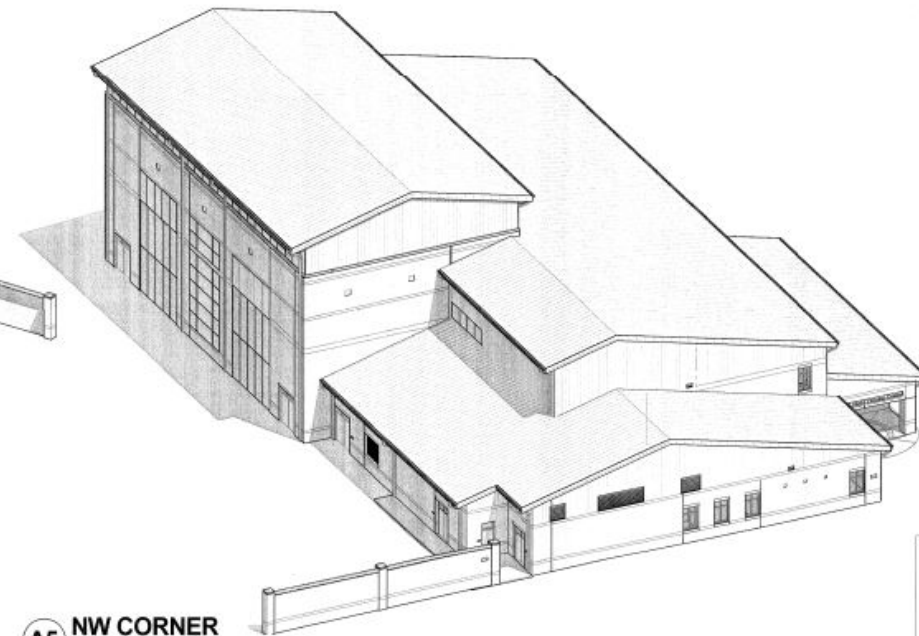
D1 SW CORNER
NOT TO SCALE



D5 SE CORNER
NOT TO SCALE



A1 NE CORNER
NOT TO SCALE



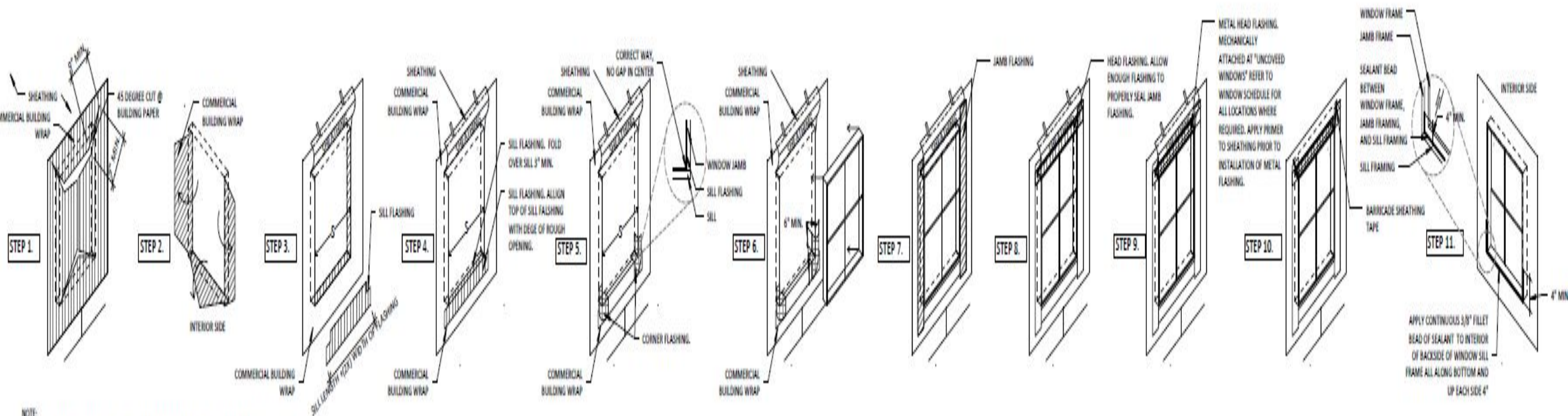
A5 NW CORNER
NOT TO SCALE



Design Review



Design Review



NOTE:

1. APPLY PRIMER TO SHEATHING ANYTIME PEEL AND STICK MEMBRANE IS APPLIED DIRECTLY TO SHEATHING.
2. WATERPROOFING FLASHING TO BE A MINIMUM OF 9" WIDE.
3. WHEN TEMPERATURES ARE BELOW 40 DEGREES F, USE APPROPRIATE FLASHING - SEE SPEC.

WINDOW FLASHING SEQUENCE

SCALE: N.T.S.

Contractor Training

- Envelope Commissioning
- Test plan
- Design review

Site Visits

- What to look for?
- How to address issues?
- Follow-up

Site Visits



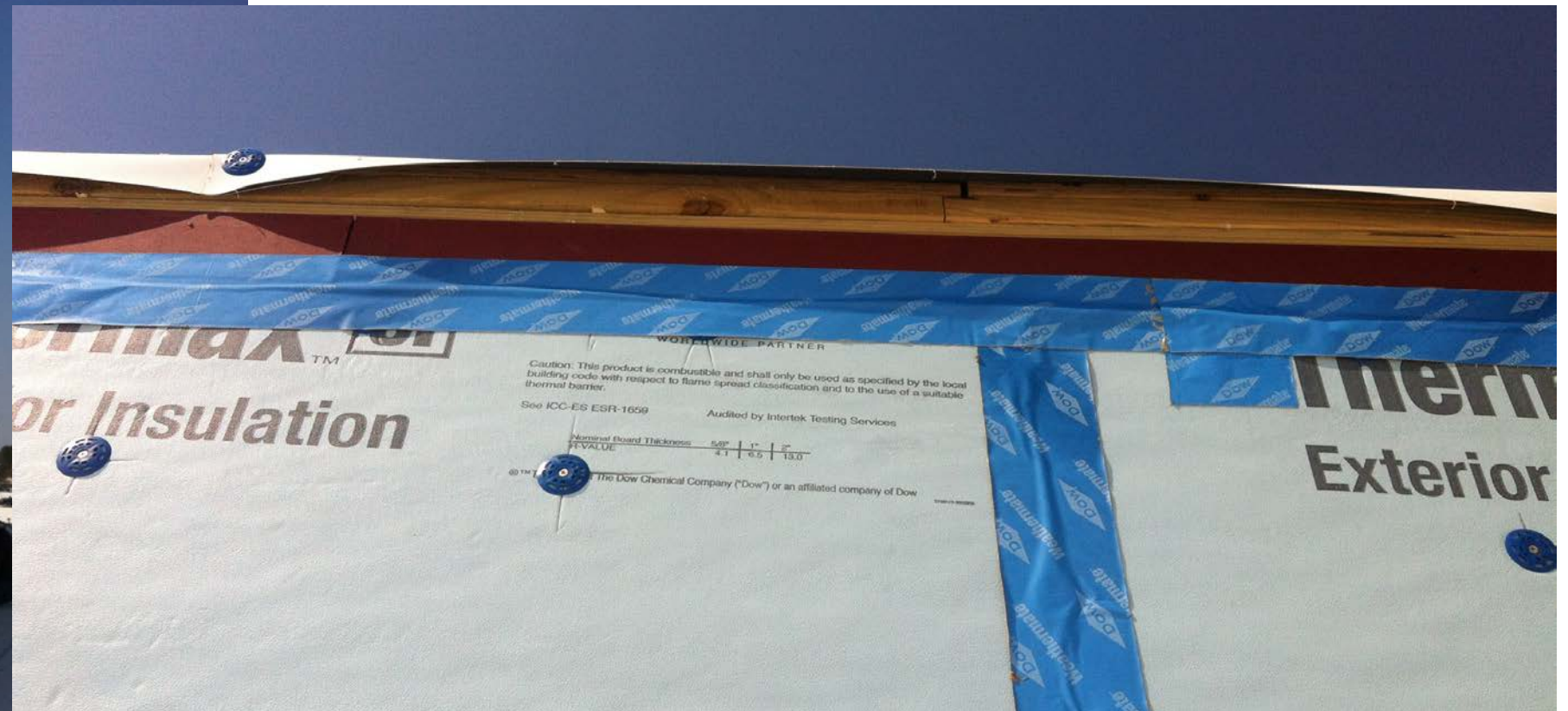
Site Visits



Site visits



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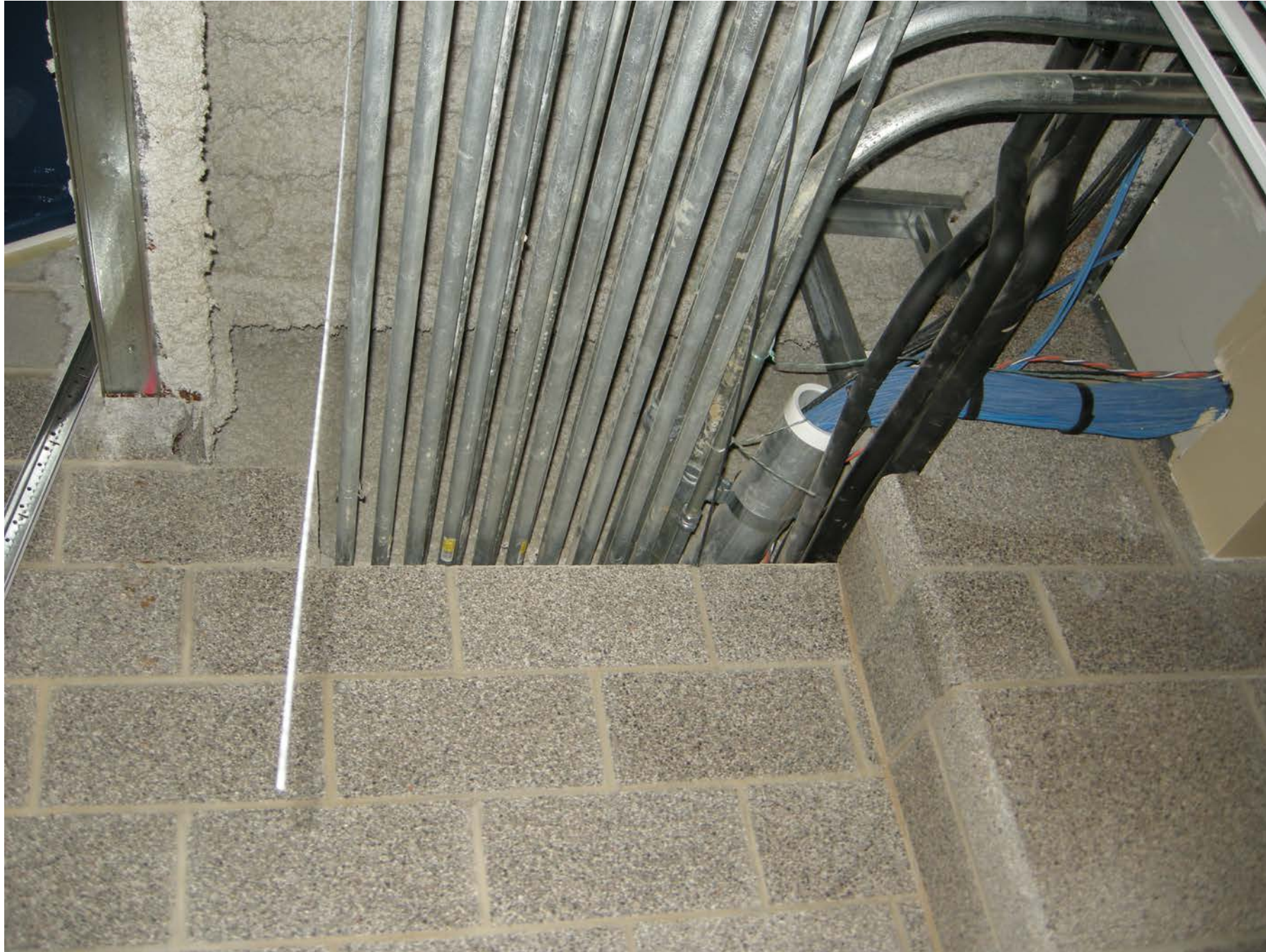


Site Visits

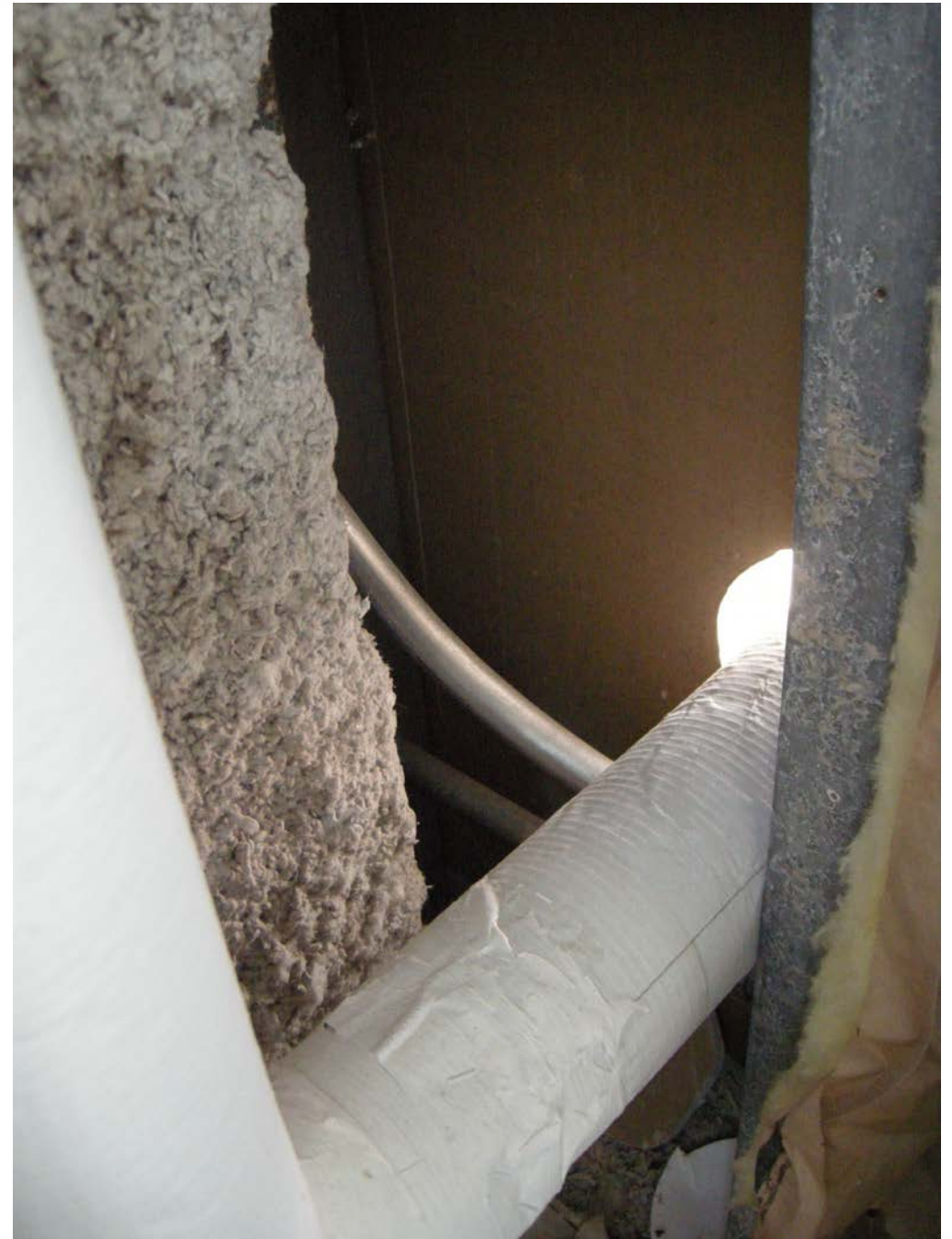


Site Visits





Site Visits



Functional Testing

- Building prep
 - Seal all “intentional” openings
 - Plumbing traps filled
 - HVAC shutdown
 - Combustion equipment turned off or pilot
 - Interior doors open, exterior doors closed
 - If ceiling tiles have been dropped, some will need to be removed
 - Weather conditions
 - Power requirements
 - Door Closer

Building Prep



Building Prep

Functional Testing

- Blower door
- Communication cables
- Pressure tubes
- Power
- Weather



Functional Testing

Functional Testing

- Pressurize
- Depressurization



Software

Depressurization set

Temperature, initial	indoors 68 °F	outdoors 73 °F
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Baseline, initial [Pa]	0.69	0.52	1.82	2.55	2.97	2.48	2.93	3.63	2.94	1.34	0.71	0.48
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Greatest Initial Baseline 3.63 Pa

Time per Baseline Pressure 0 s

#1 Induced (primary gauge) pressure [Pa]	-50.1	-52.1	-53.9	-57.1	-59.4	-61.7	-64.1	-66.6	-69.1	-71.2	-73.5	-76.4
#2 Induced pressure variation [%]	4.7%	4.2%	3.9%	2.2%	0.9%	1.1%	1.4%	1.3%	0.9%	0.9%	1.3%	0.2%
#3 Induced pressure variation [%]	5.8%	5.6%	5.7%	1.2%	0.7%	1.3%	1.7%	2.2%	0.2%	0.0%	0.7%	-0.9%

✕

Test Fan 2

▼ Open(22)

[Pa] 62.2 64 65.1 68.7 71.5 74.5 72.8 79.3 79.5

✕

Test Fan 3

▼ Open(22)

[Pa] 55.6 58.5 60.3 63.2 64.7 67 67.9 71.5 74.7

✕

Test Fan 3

▼ A

[Pa] 222.2 229.2 229.7

✕

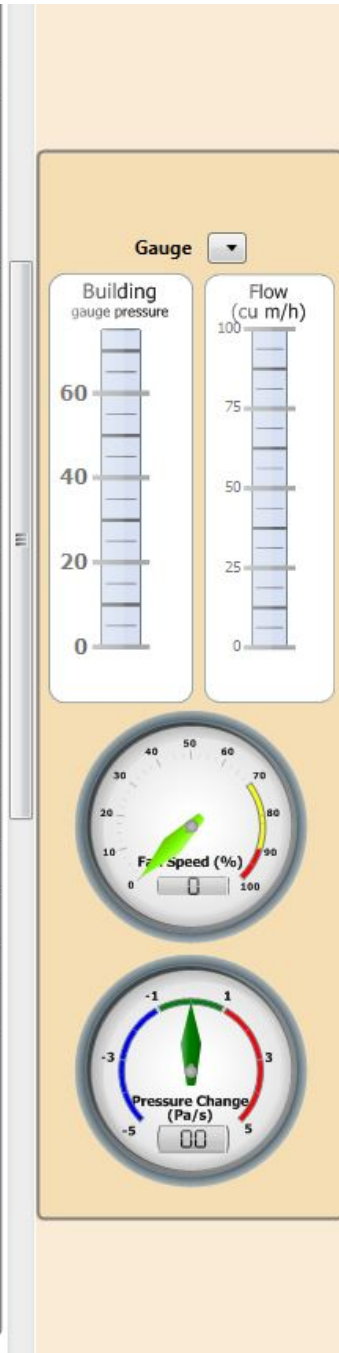
Test Fan 2

▼ A

[Pa] 246 259.5 274.4

✕

Test Fan 1



Functional Testing

Functional Testing

- Thermal Images

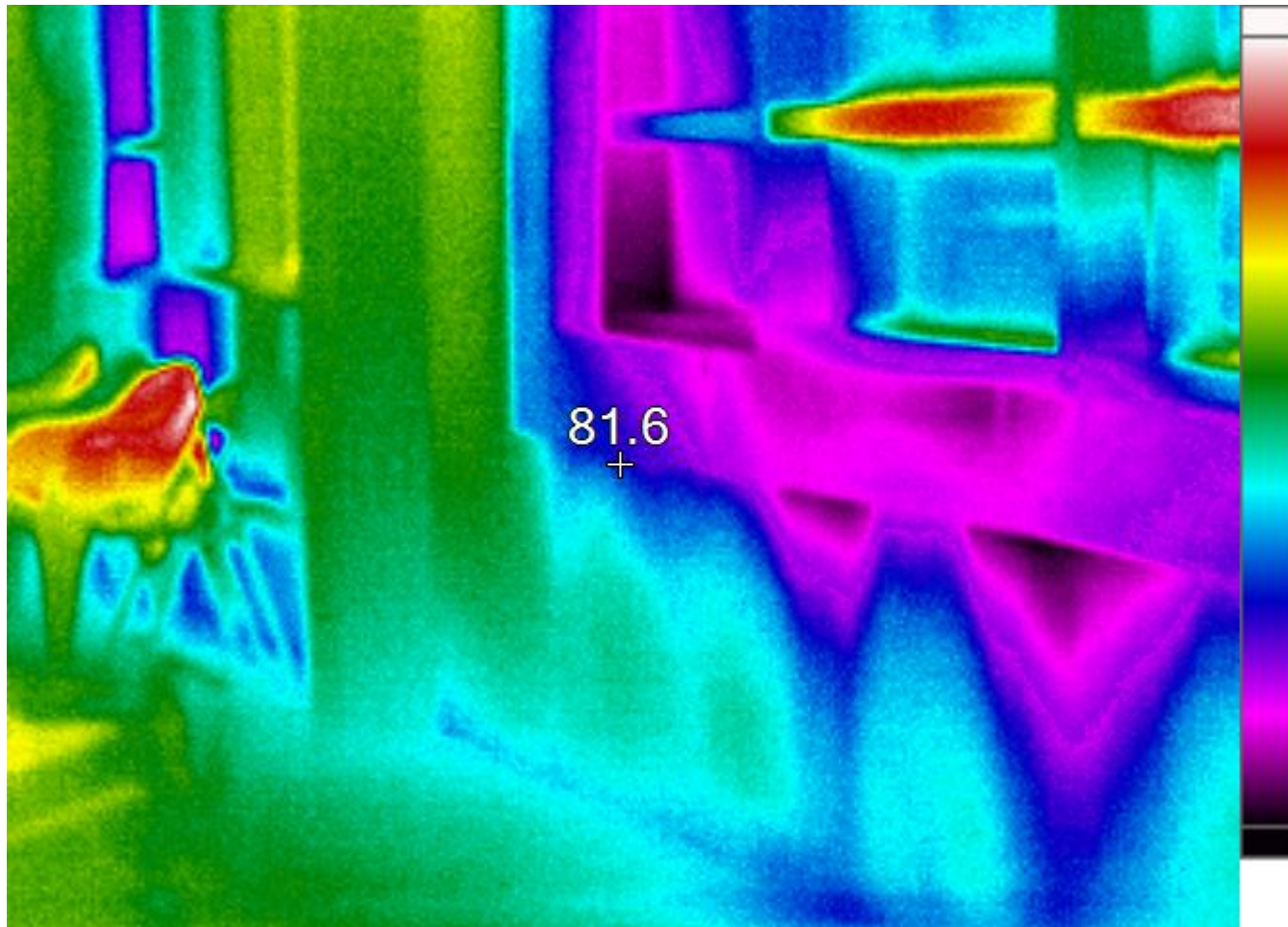


- Tracer Smoke

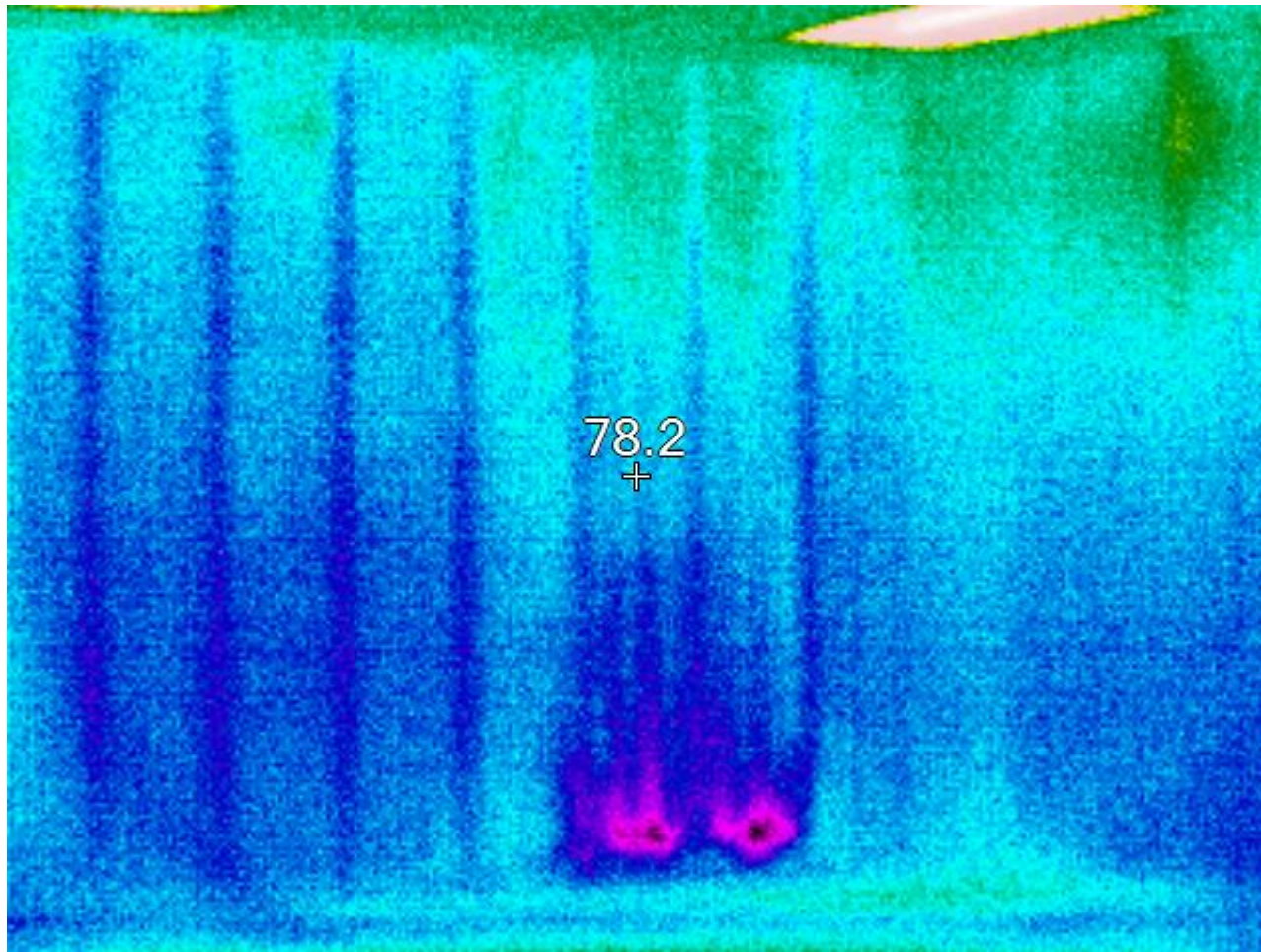


Smoke Testing

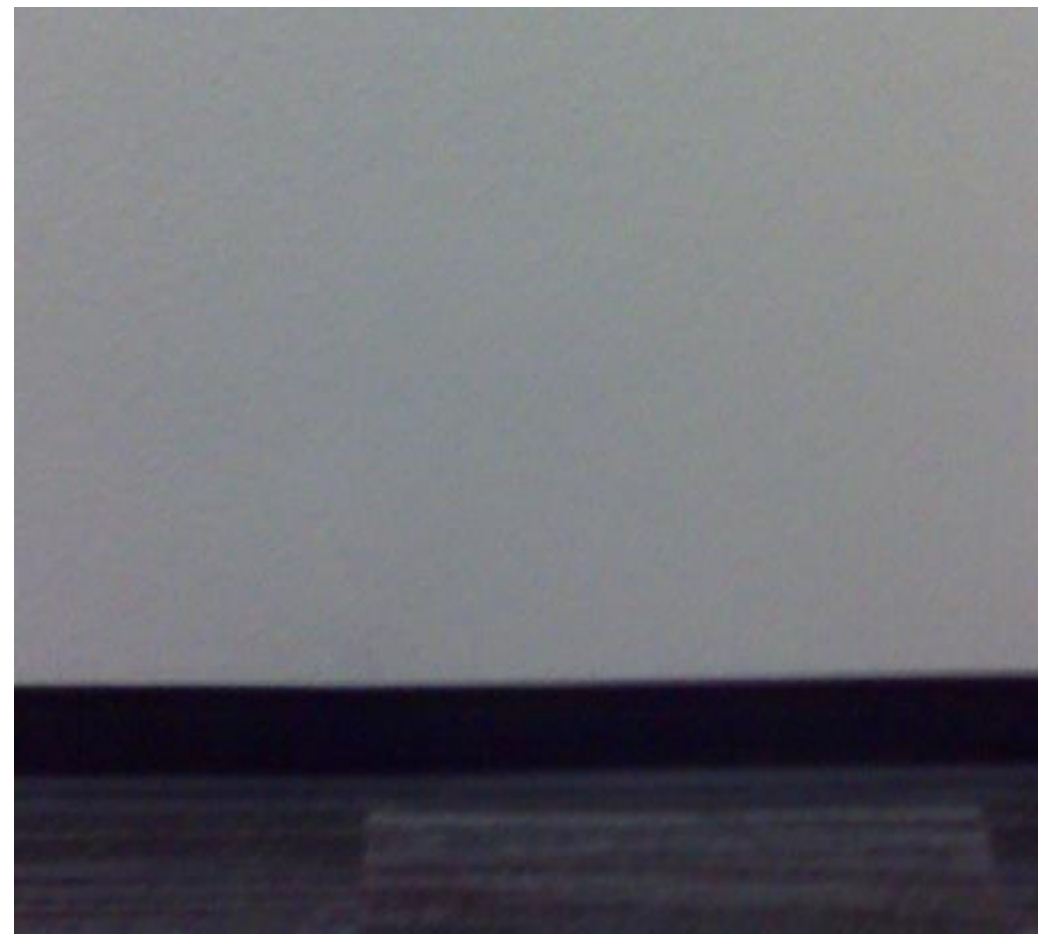
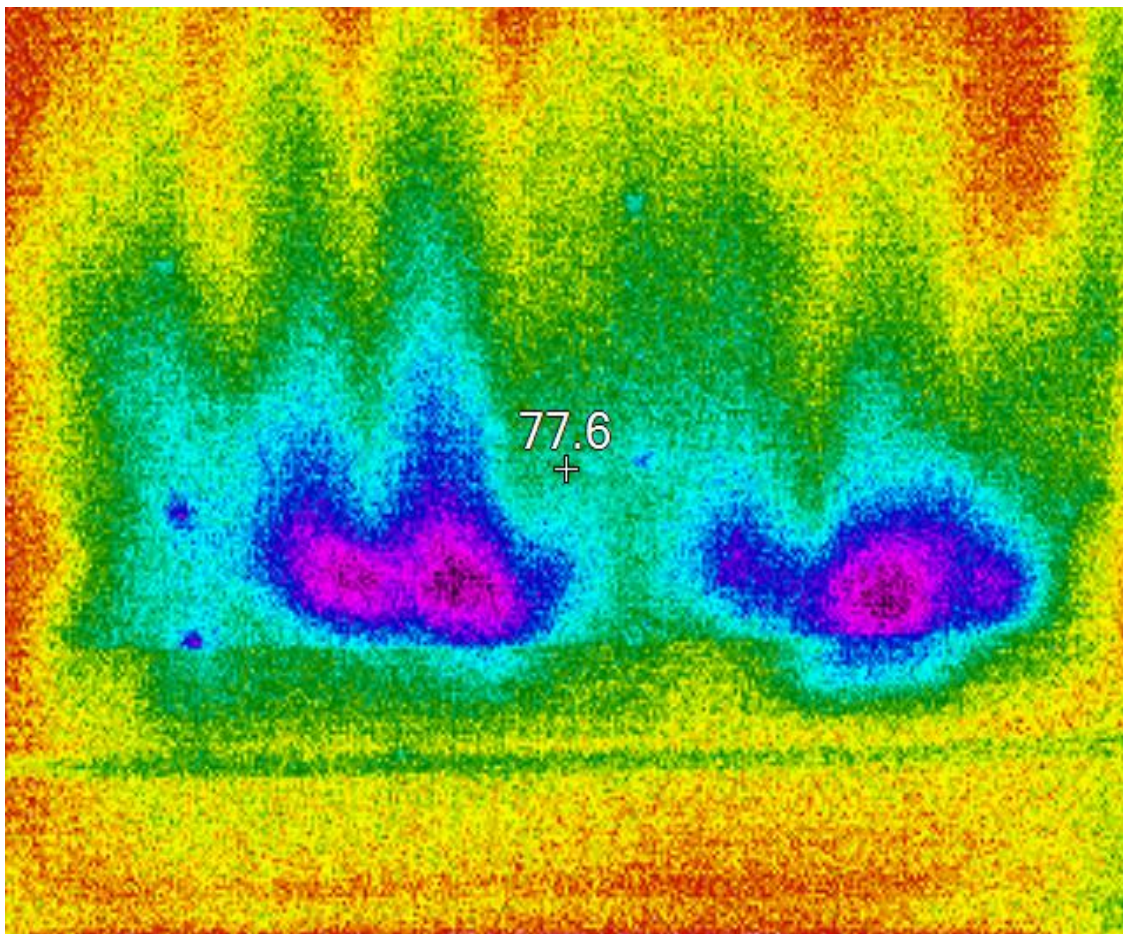
Thermal Images



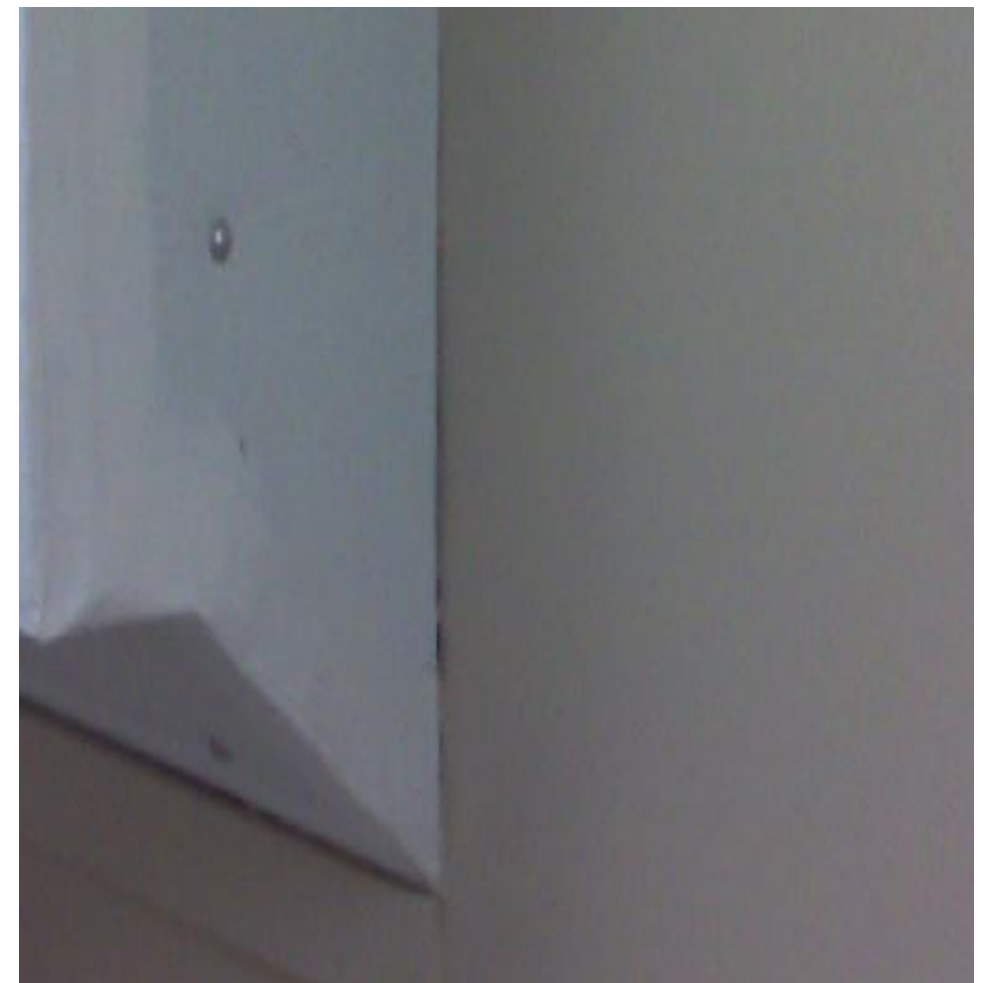
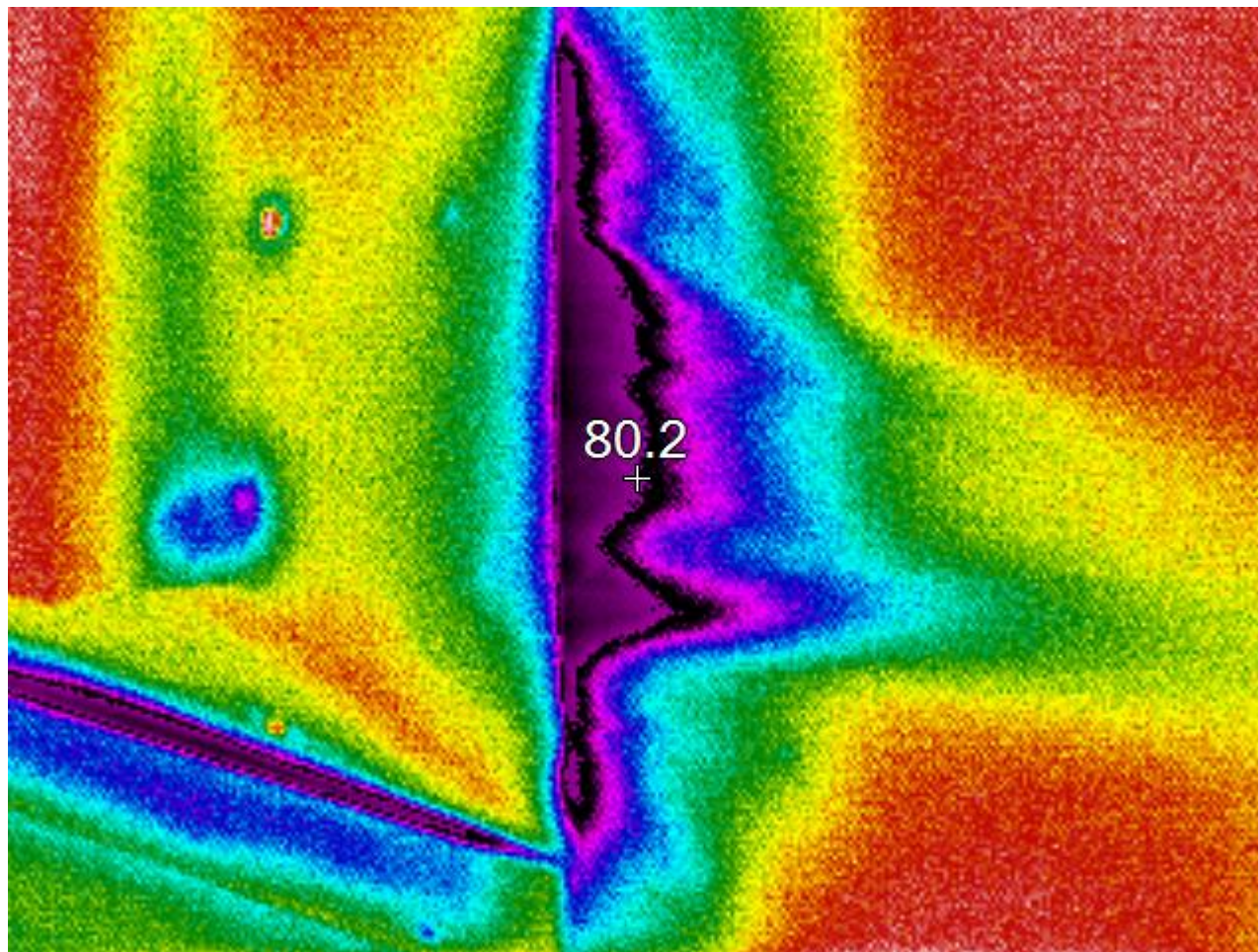
Thermal Images



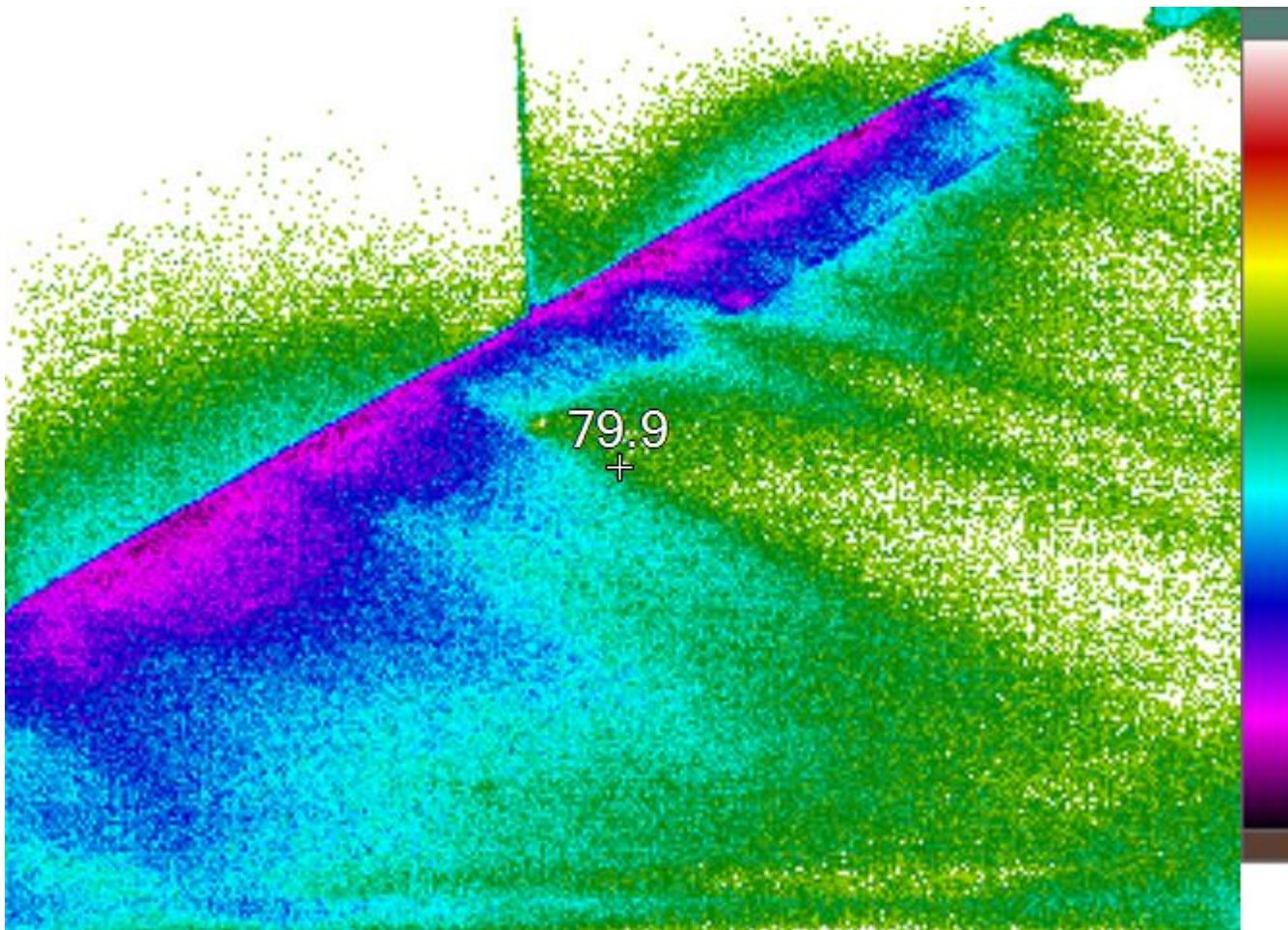
Thermal Images



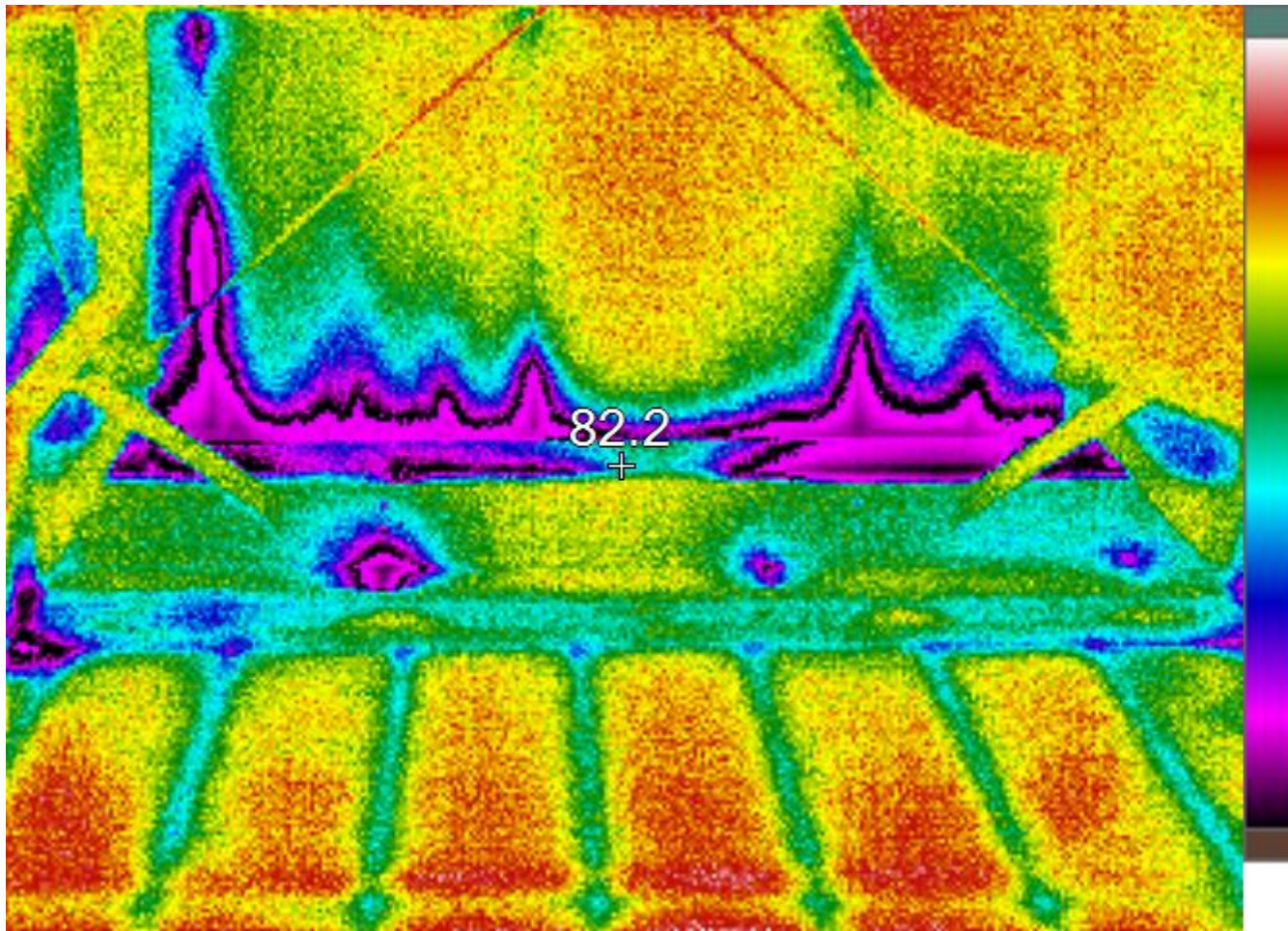
Thermal Images



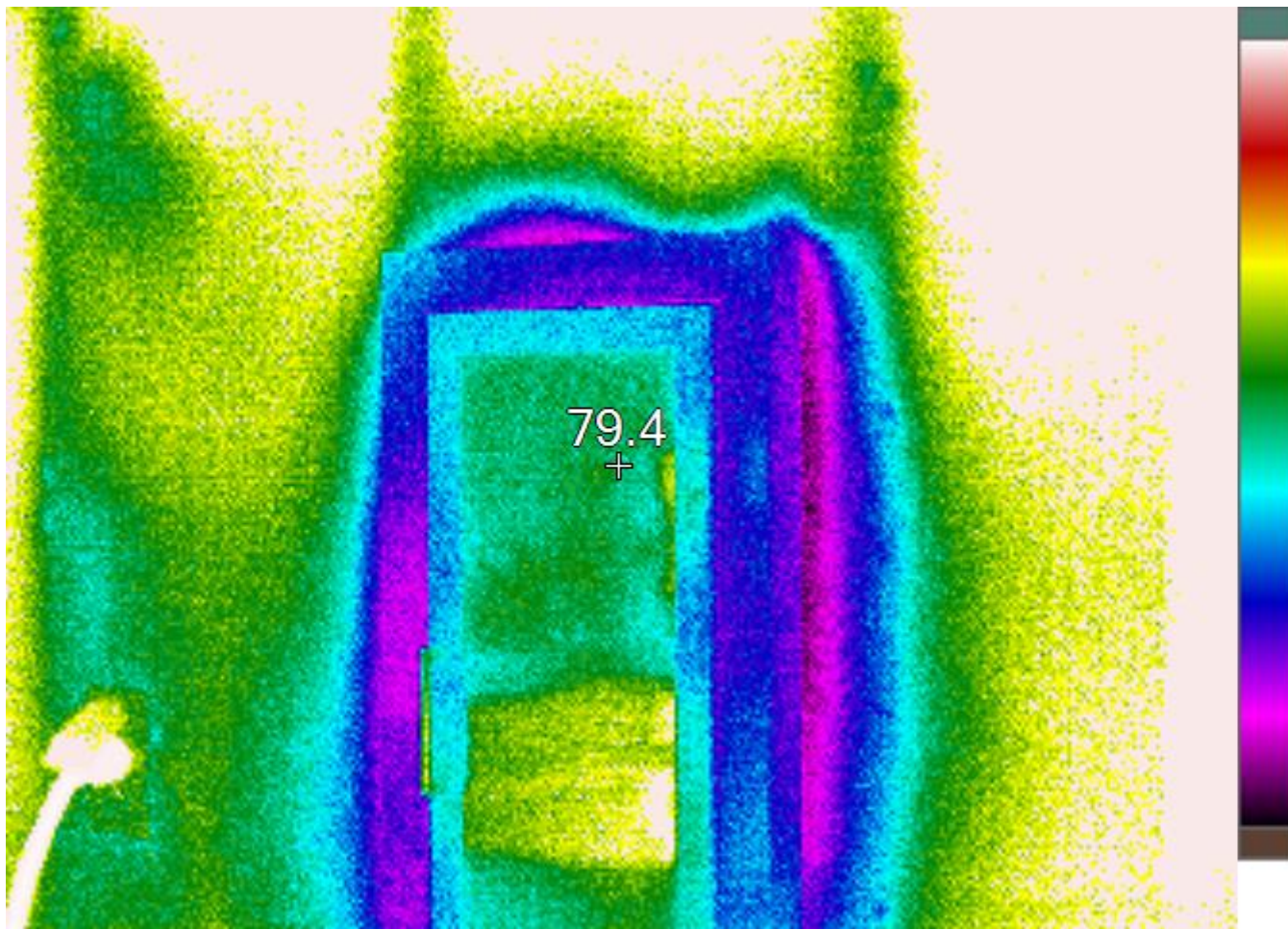
Thermal Images



Thermal Images



Thermal Images



Questions?



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