phius

PRO FORUM

Hall of Shame - Game Time!
What's wrong with this picture?

Verification

- Plan Review:
  - Exterior details of air barrier transitions
  - Compartmentalization Details

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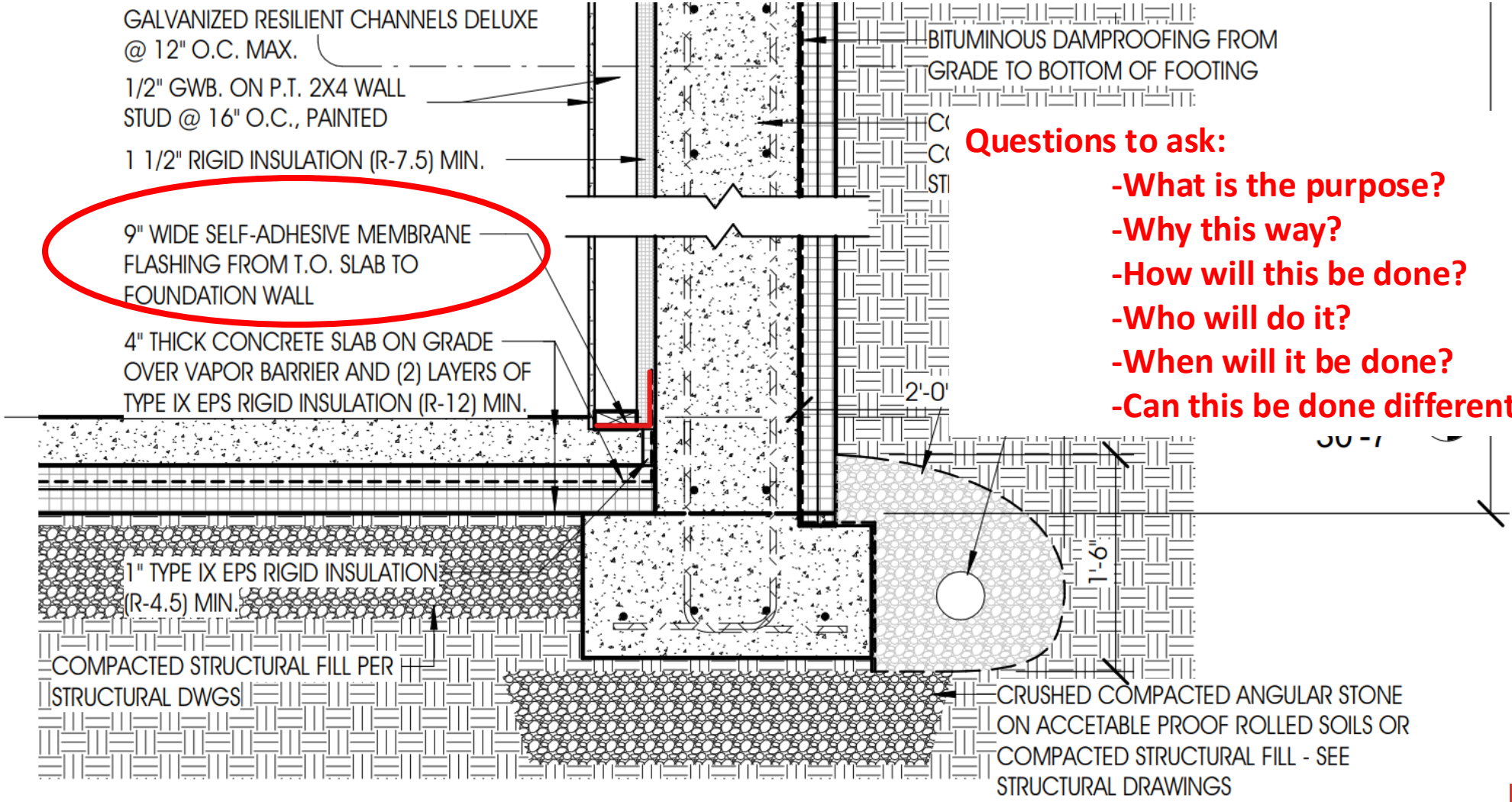
Exterior details of air barrier transitions



Questions to ask:

- -What is the purpose?
- -Why this way?
- -How will this be done?
- -Who will do it?
- -When will it be done?
- -Can this be done differently?

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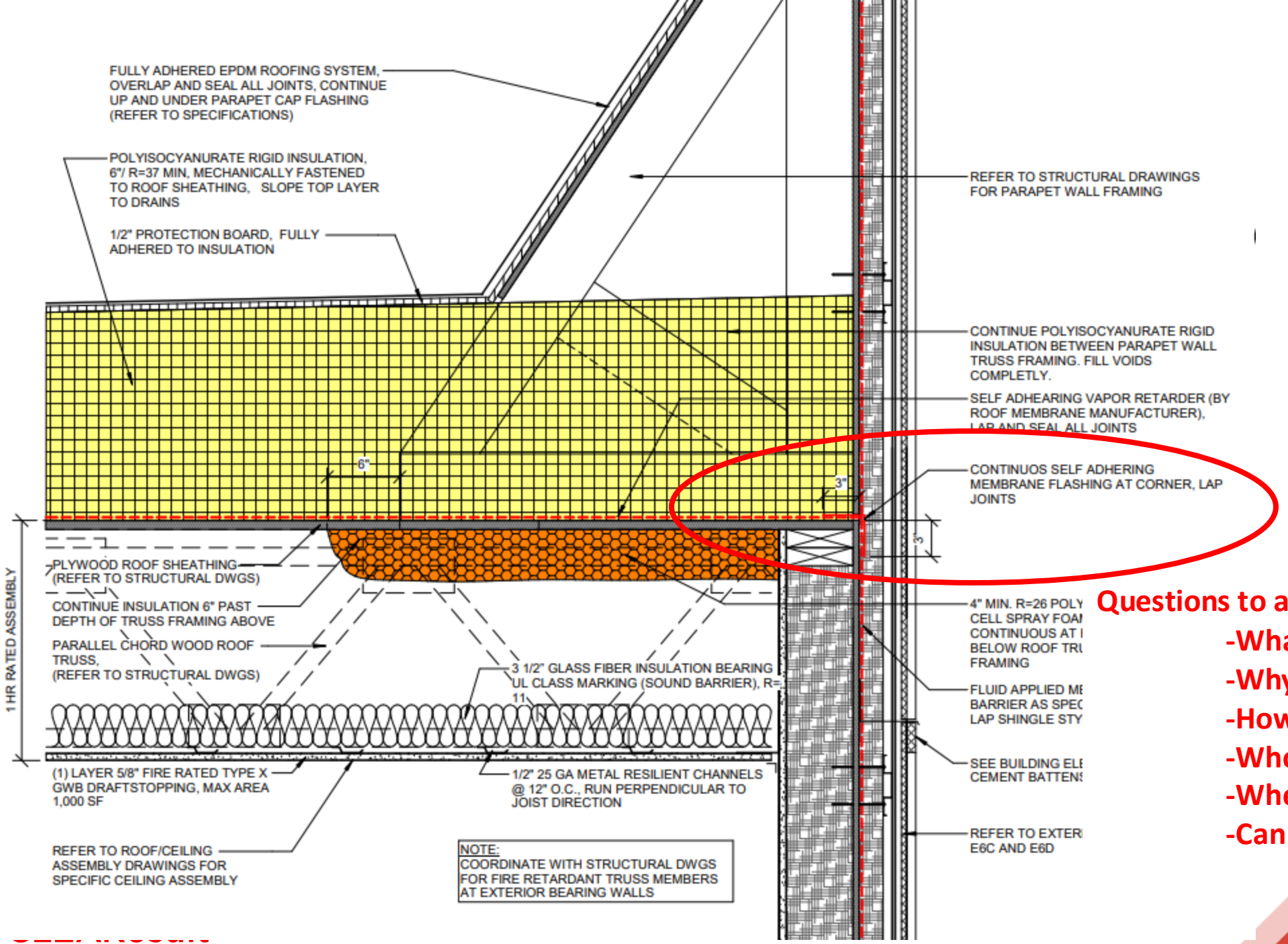
Exterior details of air barrier transitions

How it was Done:

CLEAResult®



Questions to ask:

- **-What is the purpose?**
- **-Why this way?**
- **-How will this be done?**
- **-Who will do it?**
- **-When will it be done?**
- **-Can this be done differently?**

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Exterior details of air barrier transitions

How it was Done:

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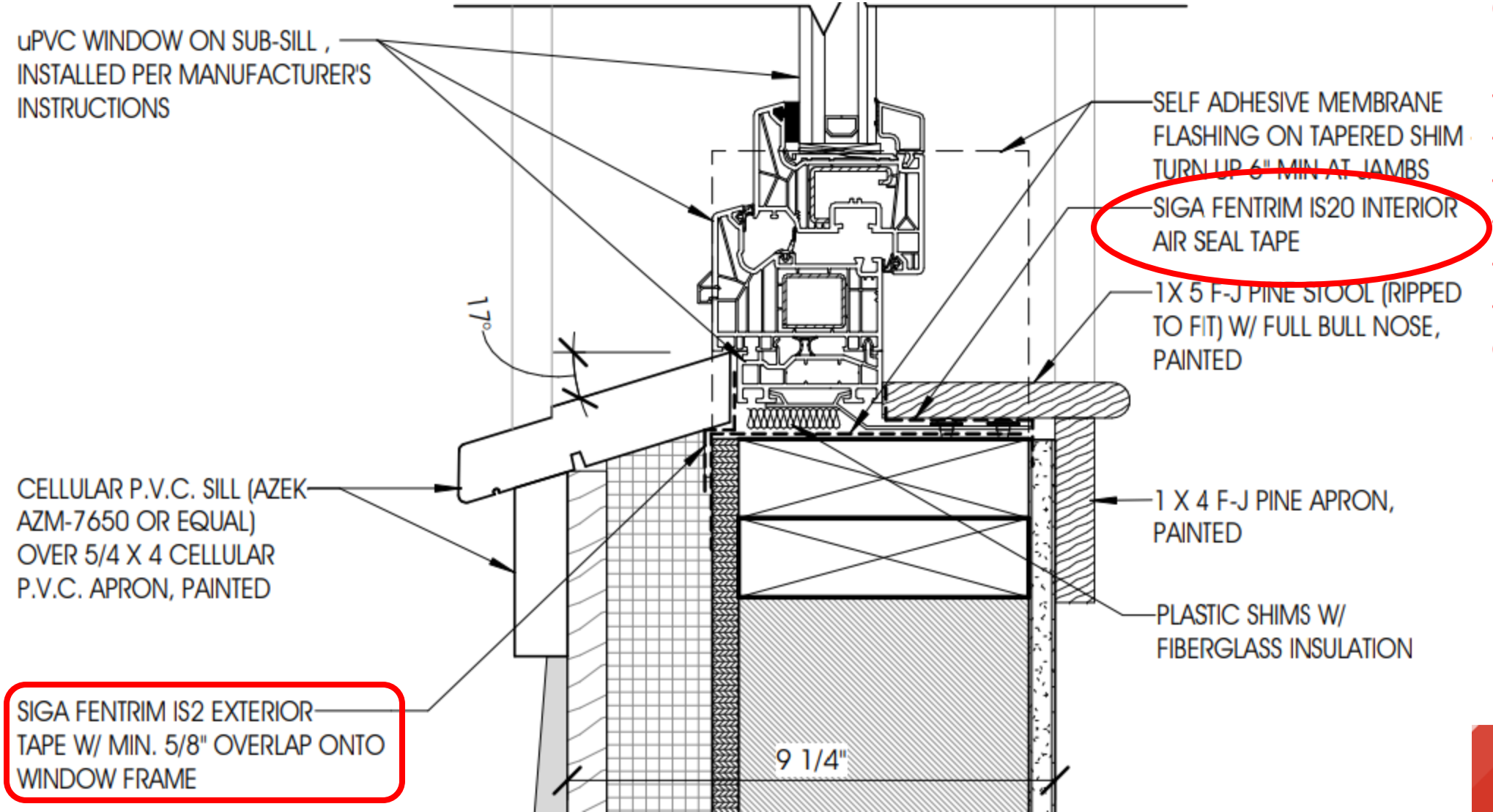
Exterior details of air barrier transitions



Questions to ask:

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Exterior de ansitions

Questions to ask:

-What is the purpose?
-Why this way?
-How will this be done?
-Who will do it?
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-Can this be done differently?

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Compartmentalization Details

Where are you defending your castle?

Inner Wall?

Outer Wall?

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Compartmentalization Details

Where are you defending your castle?

Inner Wall?– Air-tight drywall approach

Outer Wall?– Sheer walls

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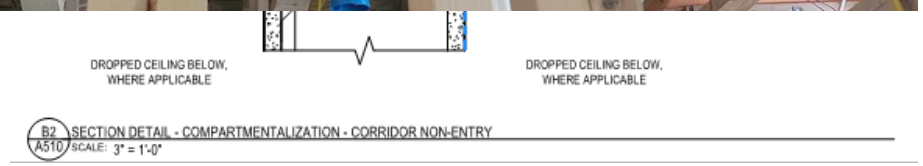
Compa : Inner Wall



Questions to ask:

-What is the purpose?
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Com Inner Wall

Questions to ask:

-What is the purpose?
-Why this way?
-How will this be done?
-Who will do it?
-When will it be done?
-Can this be done differently?

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Com Wall

to ask:

he purpose?
way?
this be done?
do it?
ll it be done?
be done differently?

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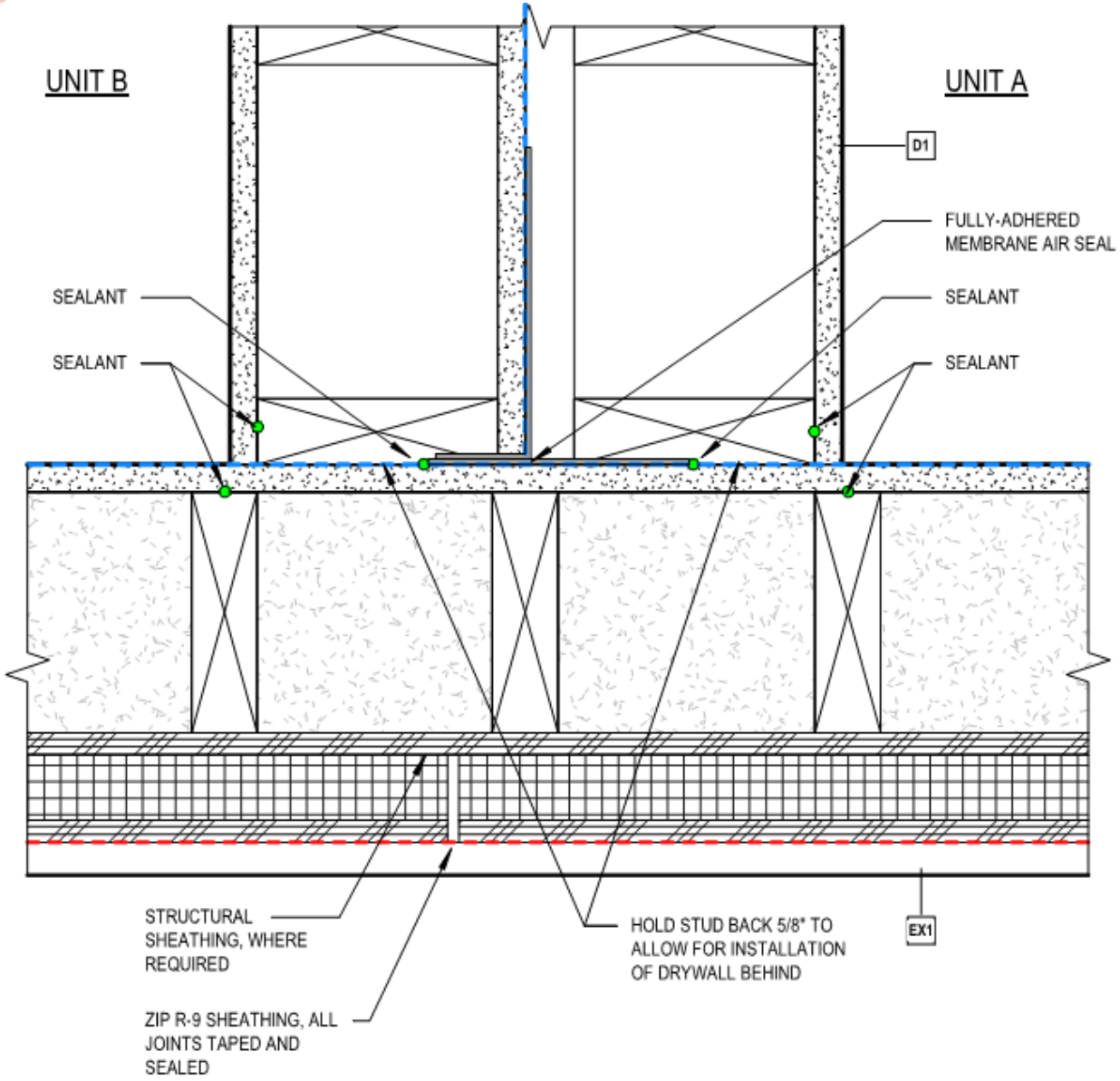
Con uter Wall



A4/A509 PLAN DETAIL - UNIT DEMISING WALL @ EXTERIOR WALL
SCALE: 3" = 1'-0"

Questions to ask:

-What is the purpose?
-Why this way?
-How will this be done?
-Who will do it?
-When will it be done?
-Can this be done differently?

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Verification

- Whole Building Blower Door Testing Plan:
  - Slab on Grade buildings
  - Podium/pedestal buildings

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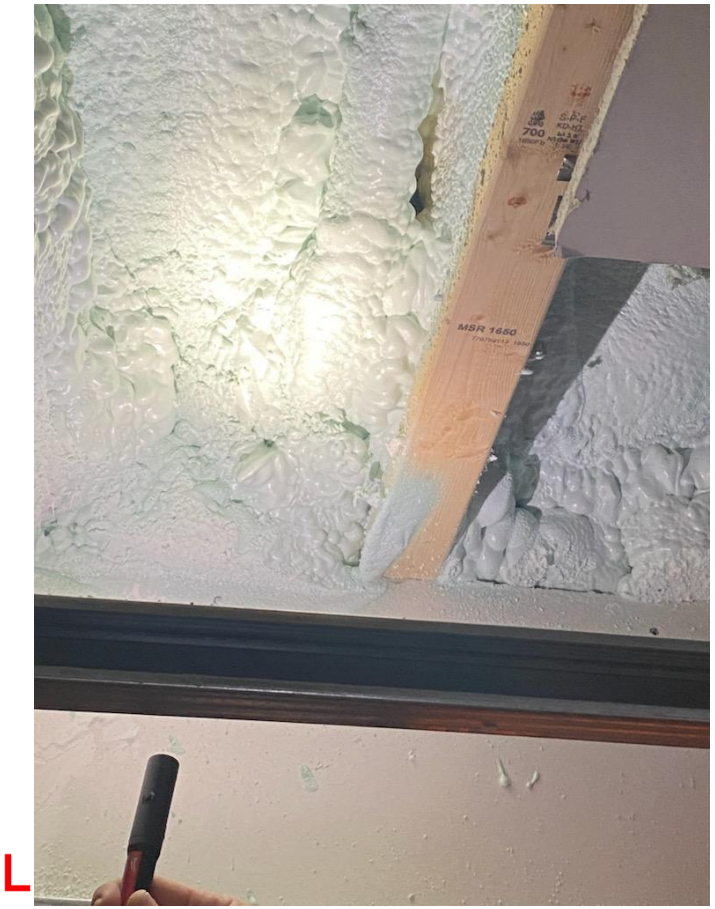
Verification

- Air Sealing: Mid Point Whole Building blower door tests
  - When the air barrier is complete/as soon as possible!



Result. All rights reserved.

Q&A/Discussion Break!

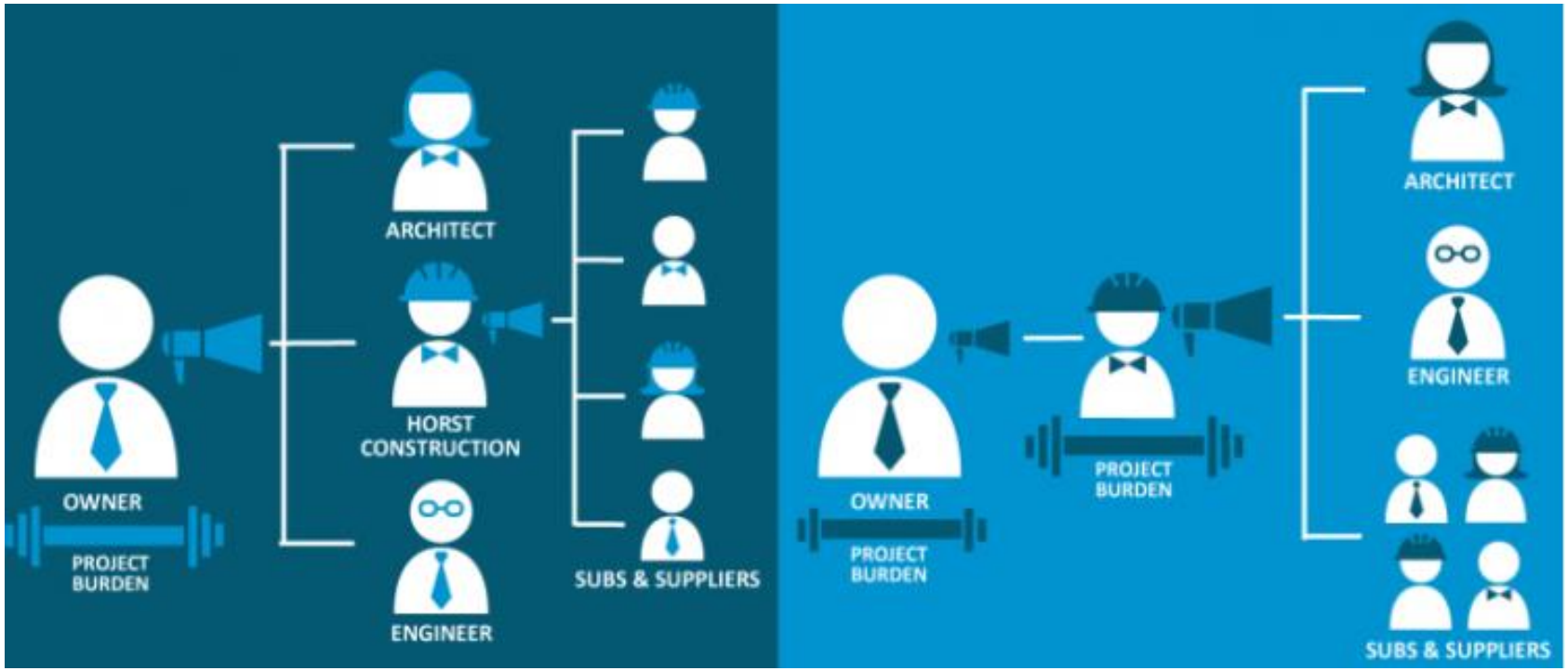
Design to Construction Transition

Pre-Bid meetings:

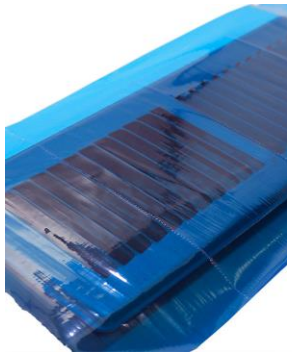
- Review what to look for (experience or training) in contractors
- Review certification scope and designate responsibilities
- Coach to Umpire role of Verifier

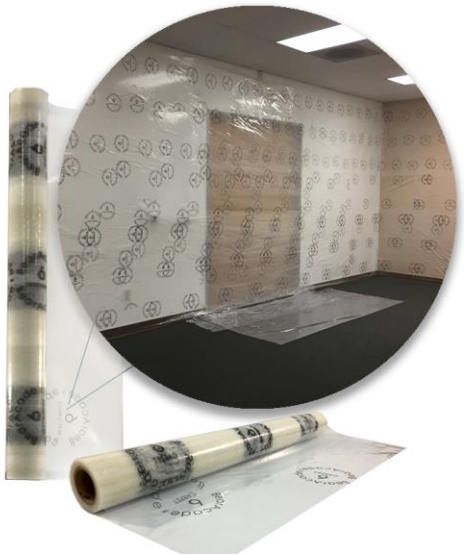
Preliminary testing:

- Floor testing
- Guarded testing
- Zone testing
- Preliminary whole building
- Quantitative vs. Qualitative
- Smoke for visuals



Equipment/tools likes & dislikes?






DO NOT ENTER
¡NO ENTRE!
TESTING
IN
PROGRESS
DOOR
IS
SEALED

Passive House Construction Kick-Off Meeting: Trades Training

WHO should attend?

- General Contractor
- Owner
- Design team (architect, MEP)
- Subcontractor trades: insulation/air-sealing, framing, exterior/siding, mason, roofer, HVAC, plumbing, electrical

WHERE?

- On site at the job trailer (presentation) and preferably with a wall mock-up to review/demo air barrier application

WHEN?

- Early in construction (before major air barrier systems commence, typically after foundations)

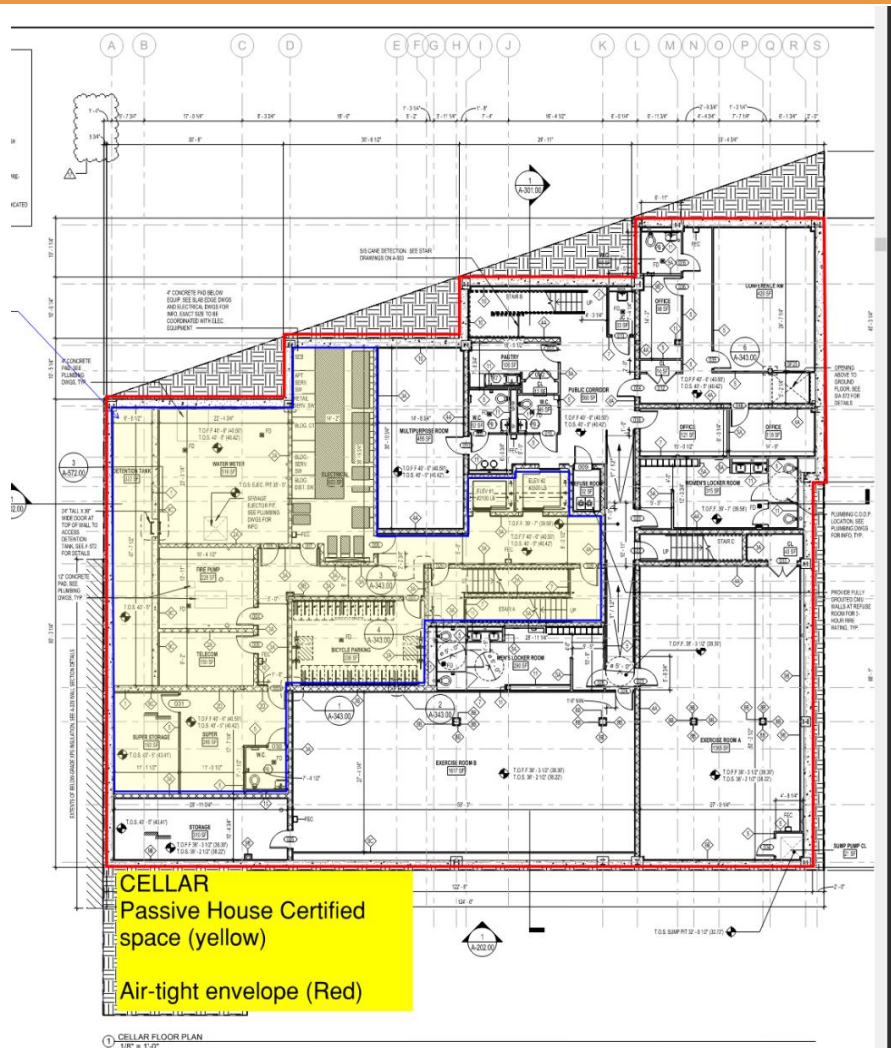
WHAT should be reviewed?

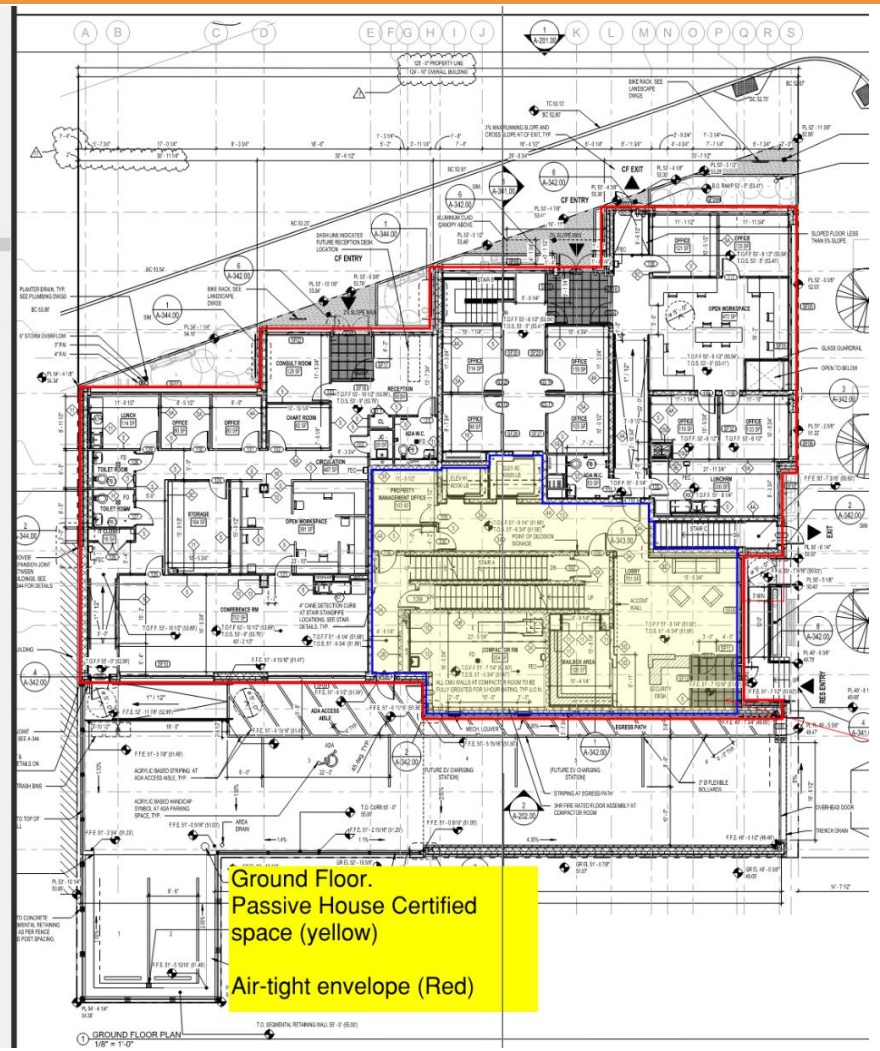
- Certification scopes/requirements
- Consequences (funding incentives, compliance, etc.)
- Roles & responsibilities
- Number of site visits on contract
- Minimum notice for scheduling inspections vs. testing
- Commissioning (Cx) and verification activities – site inspection and testing milestones
- Inspection reports will be provided after each visit; actions and follow-up required

Envelope Boundary - A Fine Line

Boundary Considerations:

- Thermal
- Air
- Program Use & Circulation
- MEP Equipment Service
- iCFA (& Targets)





BRIGHT POWER

Keys to High Performance Construction

Continuous Thermal Envelope

- Attention to detail at transition points
- Limiting thermal bridging; Thermal breaks are included where detailed
- Ensure all seams and overlaps of insulation layers are sealed and without gaps/voids

Airtight Envelope

- Proper installation of air barriers and membranes
- Sealing penetrations and transition points as noted in architectural details
- Air-sealing schedules

Airtight Envelope

Important Considerations for Exterior Walls:

- Applying at the proper thickness (fluid applications) according to product data (should be measured at regular intervals with a wet mil thickness gauge)
- Applying within the allowed temperature ranges specified in the product data
- Extending liquid flashing sufficiently into the interior side of window opening
- Address any holes, seams, or attachment points with tape or fluid-applied air barrier before applying full coat

Air-barrier applied to holes and seams before full coat

Liquid flashing at upper corner of window

Window and Door R.O Preparation

- The fluid applied membrane will act as the air barrier for the CMU.
- Ensure CMU wall is completely covered with fluid applied membrane at adequate thickness, as detailed in the architectural drawings.
- Address any holes, seams, or attachment points with fluid-applied membrane before applying “1st coat”.

Fluid-applied air barriers at exterior walls (GE Elemax, Henry Air-Bloc All-Weather STPE/31 MR/06 WB, Dryvit NTX and Liquid Flashing)

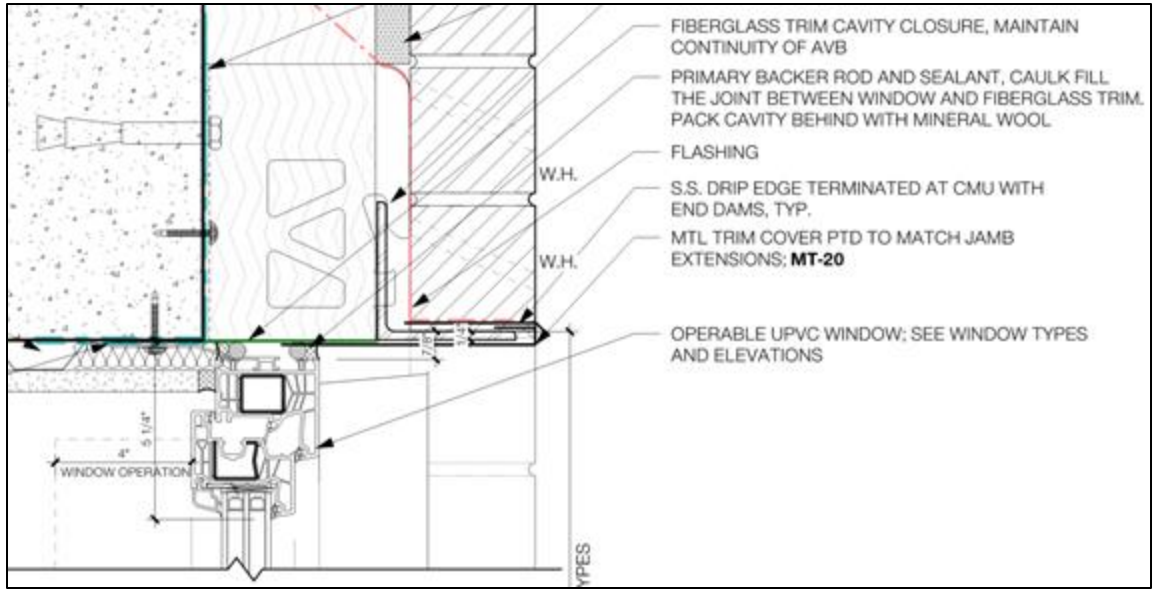
Airtight Envelope

Important Considerations for Windows:

- Flexible membrane at transition pressed into corner the depth of the sill for a clean fit
- Thorough sealant application around entire window frame, including corners, and covering window anchor
- Install backer rod continuously around window
- Window should have interior and exterior beads of sealant

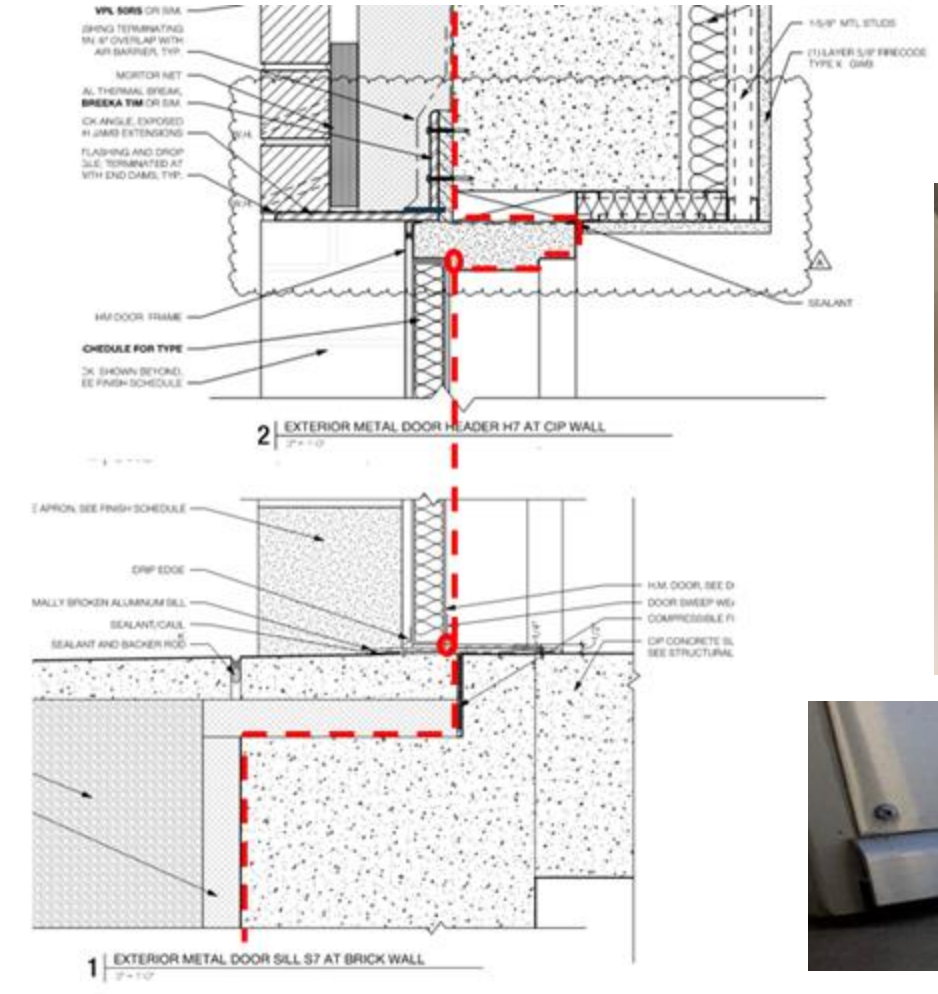
Liquid flashing at upper corner of window

Flexible membrane at sill to jamb transition



Detail shows exterior and interior beads of sealant, continuous backer rod and MW fill

Exterior Doors

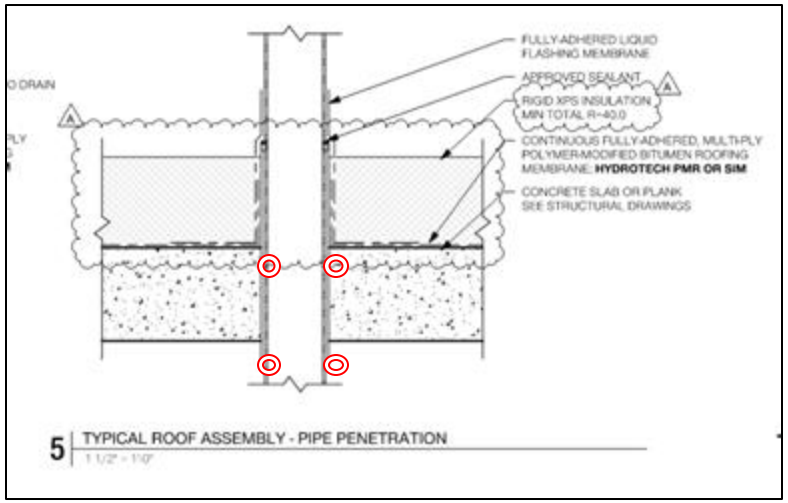


- Backer Rod and Caulk seal must not show gaps or tears after application.
- Doors must be installed plumb and leveled before sealing to R.O.
- Gasket installed around the entire frame
- Hard-fastened weather stripping (door sweep) installed at the bottom of the door

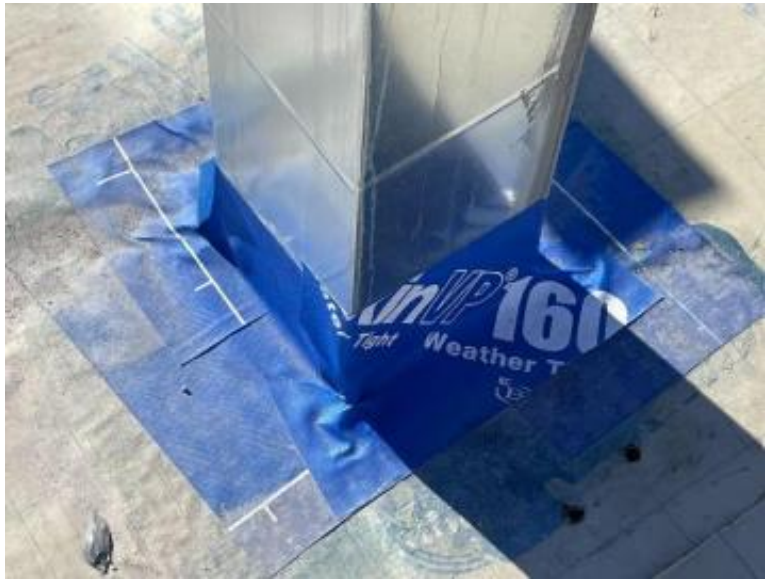
Airtight Envelope

Important Considerations for Roofs:

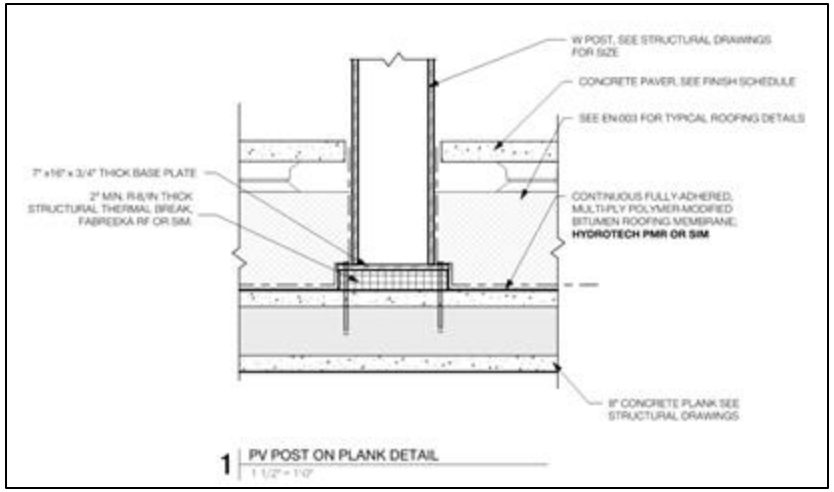
- Roof penetrations (ductwork, vent pipes, mechanical screening anchors, etc.) should be sealed above and below roof slab to guarantee waterproofing and airtightness



Typical Roof Pipe Penetration



Duct flashing over base ply roofing



Thermal break and continuous flashing/sealing

Interior Air-Sealing Details

Important Considerations for Interior Air-Sealing:

- In refuse rooms and compactor rooms, wall to floor/ceiling transitions should be sealed
- Strong gasket and hinge/closing mechanism on trash chute doors is important
- Gasket and door sweep should be installed at refuse room and compactor room entry doors

Trash chute gasket

Interior wall and ceiling joint sealing

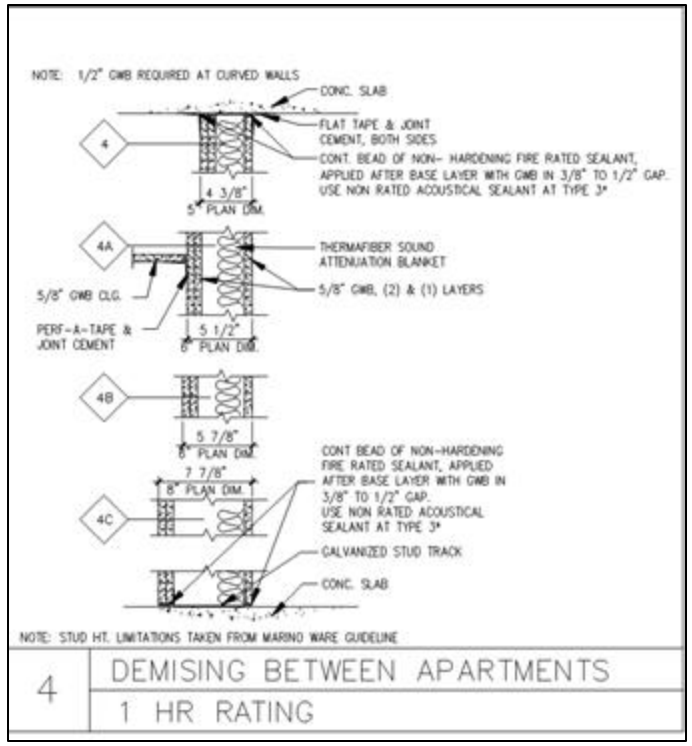
Interior Air-Sealing Details

Important Considerations for Interior Air-Sealing:

- While air-sealing between rooms within the building may stray from the topic of the building's envelope, the principles are the same and the benefits of interior and exterior air sealing are the same: occupant health and comfort
- Air-sealing in dwelling units at any penetrations and at demising walls
- Thorough firestopping provides these additional benefits

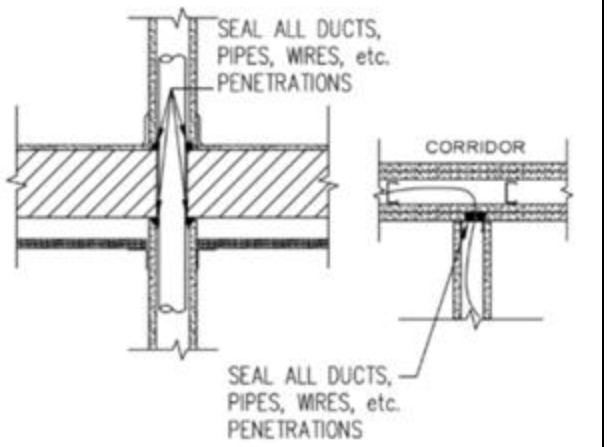
Partition wall firestopping

Firestopping at plumbing penetrations

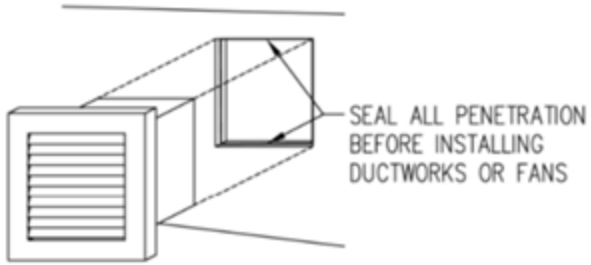


Detail from A-401 showing firestopping at ceiling and floors between apartments.

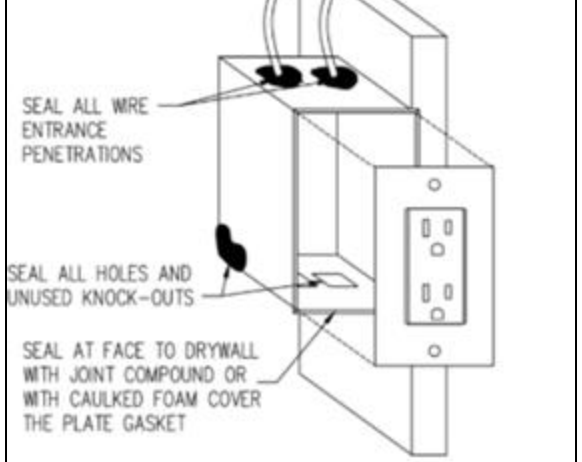
Interior Air-Sealing Details



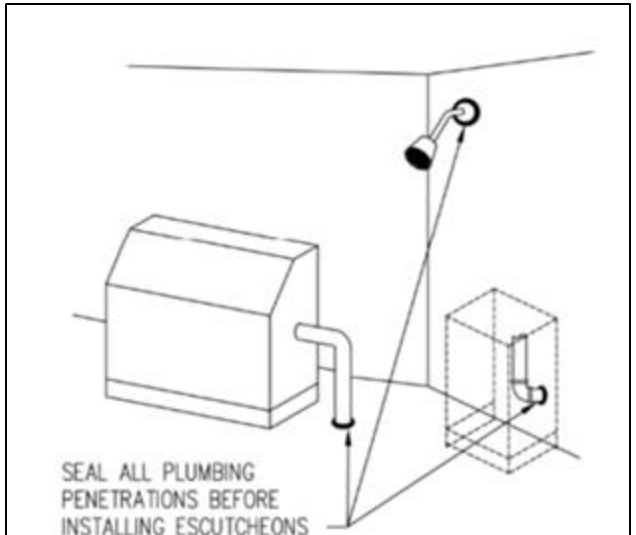
5 INTERIOR PARTITION WALLS
SCALE: NTS



10 DUCTWORK PENETRATIONS IN DEMISING PARITIONS/RATED SHAFTS
SCALE: NTS



14 ELECTRIC BOX PENETRATIONS IN DEMISING PARTITIONS
SCALE: NTS



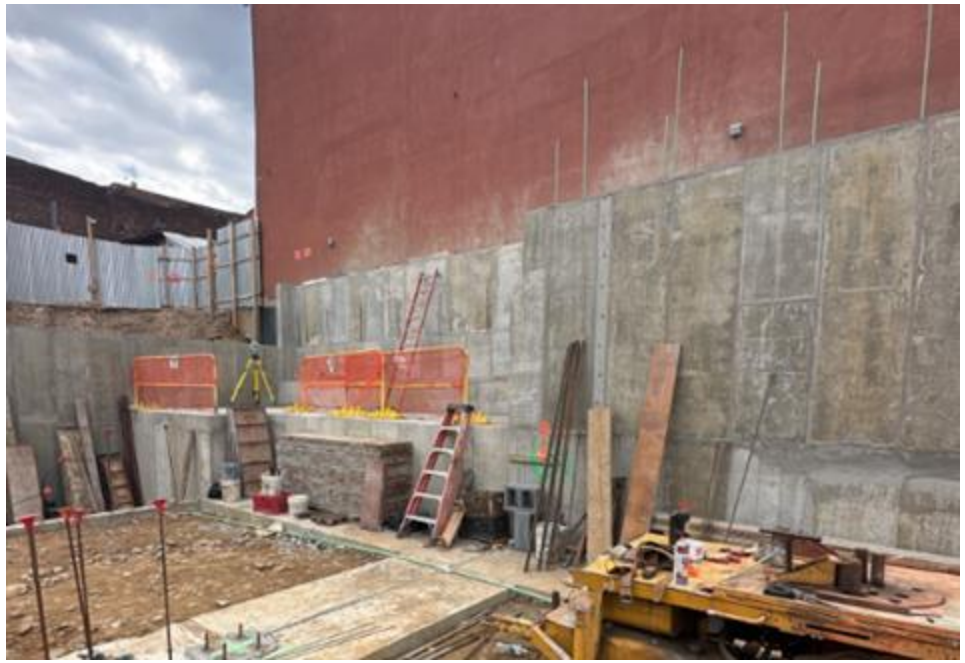
15 PLUMBING PENETRATIONS
SCALE: NTS

On-Site Verification & Testing

- Remember purpose: Test against passive house targets and update energy model for performance accuracy
- Visual inspections, measurements, testing

Lessons Learned

- Site constraints to consider for thermal envelope impacts, and leaving room for as-built buffers
- Demand submittals and wall mock-ups to be submitted/completed **early** and collaboratively, before any exterior walls are erected



Whole Building Blower Door Test Plan

BRIGHT POWER *Your Energy Management Partner*

To expedite preparation of the building for both airtightness tests, Bright Power has created the following list of building features which *may* be sealed during each test, it is recommended to seal these items where possible to reduce air leakage:

WHOLE BUILDING BLOWER DOOR TESTING – BUILDING PREPARATION					
#	Item	Sealing Location	Sealing Strategy	Seal during Envelope Integrity Test?	Seal During Airtightness -Energy Test?
RESIDENTIAL					
General Building Preparation - does not change for either test					
1	**Blower Door Location**	Exterior Door opening to locate blower door fan setup. Recommend shielded from wind and sun	Door opening must be part of the airtight envelope, and must provide a clean flat rough opening for sealing to the blower door	NA	NA
2	**Equipment & air tubing**	NA – located in interior	Please note, pressure gauges and air tubing will need to be run from the blower door to top floor through stairways. Coordination may be required.	NA	NA

Building Air-sealing preparation					
1	**Elevator Doors**	Interior, throughout	Tape leakage points around door openings	YES	NO
2	**Dryer Exhaust Fan (DXF-1)**	Exterior, Cellar, East Elevation, Drop off parking	Power off DXF-1, tape goosneck termination from building exterior	YES	NO
3	**Gas Meter Room Louver**	Exterior, 1st floor, south elevation, E 233rd St	Tape fresh air louver from building exterior	YES	NO
4	**Laundry Makeup Air Louver**	Exterior, 1st floor, North elevation, Rear Yard	Tape exhaust louver from building exterior	YES	NO
5	**ERV-1 – ERV-4**	Exterior, Main Roof	Power off ERVs, Wrap in self-adhesive poly sheeting (i.e. bearacade)	YES	YES
6	**Stair Smoke Vent Louver**	Exterior, Main Roof	Tape exhaust louver from building exterior	YES	NO (DAMPER CLOSED)
7	**Elevator Shaft Smoke Hatch**	Exterior, Bulkhead Roof	Tape at bulkhead roof exterior termination	YES	NO (DAMPER CLOSED)
8	**Trash Chute Vent**	Exterior, Bulkhead Roof	Tape at bulkhead roof exterior vent	YES	NO

Whole Building Blower Door Testing Prep

- Verifier will schedule a separate meeting closer to end of construction to review a blower door testing plan and a building plan markup
- A walkthrough of the building should be scheduled ~2 days prior to testing to confirm building preparation has been completed per plan
- Recommended that the Envelope Integrity Test be performed first, with all applicable intentional openings sealed with tape. Following this, tape will be removed and the Airtightness-Energy Test will be completed.

Interior doors propped open

Smoke vent louver temp. seal

Dryer exhaust temp. seal

Laundry chute temp. seal

Whole Building Blower Door Scheduling

Scheduling items to keep in mind:

- Building should be substantially completed upon scheduling
  - Corrective action items for improved air sealing after a failed test may be difficult/timely to do. Important to keep in mind best air sealing practices throughout the construction process, and regularly upload pictures to show progress/application
- People cannot be going in and out of the building while testing is occurring
  - Whole building blower door testing can take all day
  - Must be scheduled before TCO

  Bring and post laminated signs
- Test failure
  - Allow time between the initial test and TCO to allow time for corrective measures to be completed before rescheduling if necessary
- Weather
  - Wind Speed should be less than 13-15 mph
  - Temperature Sensitive - temperature differential should be limited (Rule of thumb for EN13928: height of building * delta T (F) < 85)

Envelope Leakage Test

Testing Company:

Name: CLEAResult
Address: 50 Washington St.
Westborough , MA 01581
www.clearesult.com

Technician:

Name: Jeremy Dagold
Credentials: HERS Rater #9866141
Email: jeremy.dagold@clearesult.com

Building Information:

Project ID: brewsterwoods 30
Address: 30
Brewster, MA
Geo-Tag Data: Latitude:
Longitude:
Timestamp:

Customer Information:

Name:
Address:

774.2/24242.4=

0.0319

Measured Leakage: 0.60 ACH50
Leakage Target: 3.00 ACH50
Compliance with Leakage Target: Pass

Test ID:	mid point pressurization	
Purpose of Test:	IECC 12/15 Env. Leakage	
Measured CFM50:	774.2 (+/- 0.7%)	Effective Leakage Area: 49.8 in²
Building Volume:	77,464.5 ft³	Enclosure Surface Area: 24,242.4 ft²
Coefficient (C):	77.8 (+/- 5.2%)	Exponent (n): 0.587 (+/- 0.014)
Correlation Coefficient:	0.99970	
Test Standard:	ASTM E779 (single mode)	Test Mode: Pressurize
Test Characteristics:	Pre Indoor Temp: 64 °F	Post Indoor Temp: 64 °F
	Pre Outdoor Temp: 44 °F	Post Outdoor Temp: 44 °F
	Altitude: 60.0 ft	Time Average Period: 30 seconds
Test Date and Time:	2022-03-03 10:12:13	

ngs

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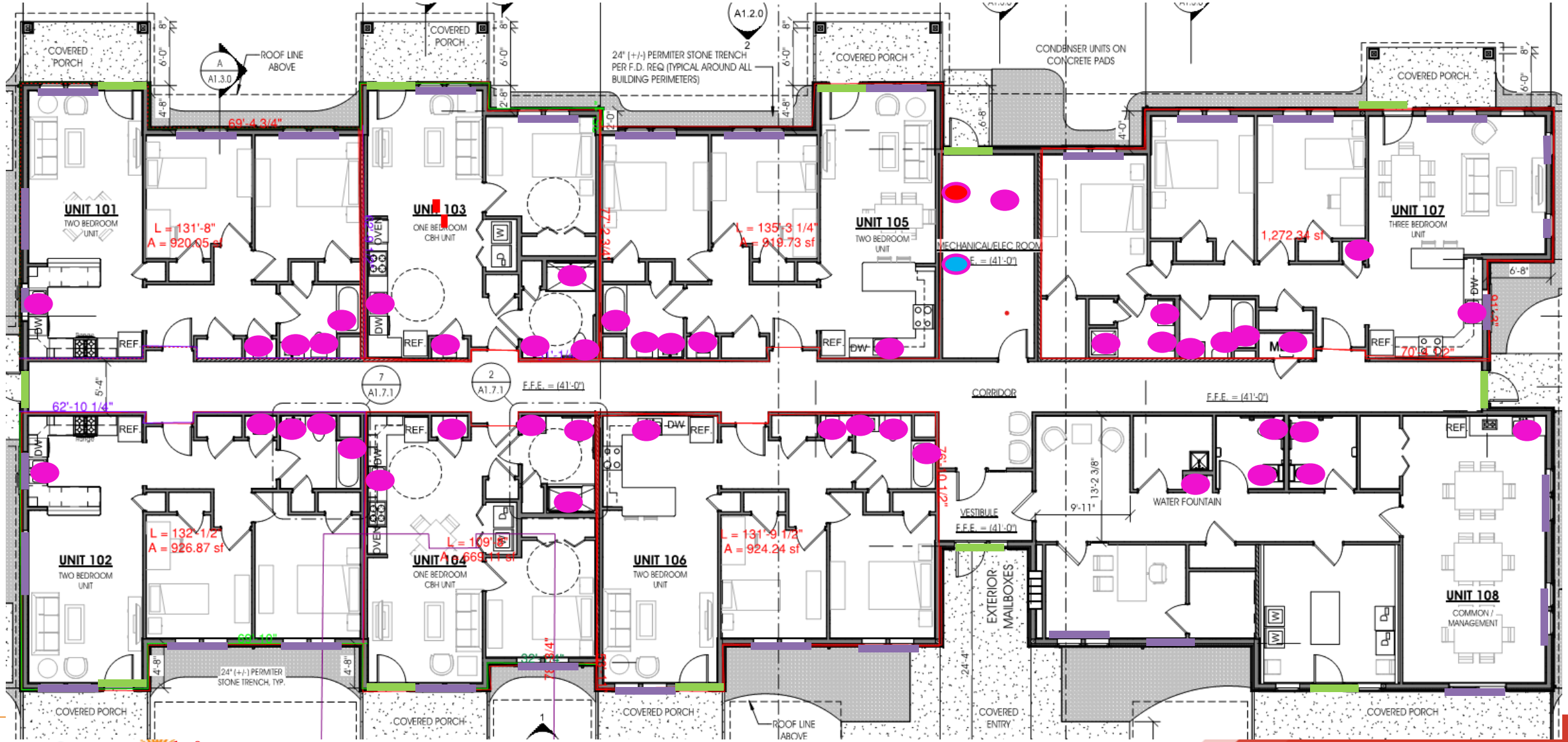
Issues to think about:

Intentional openings

-Windows -Doors-Conduit-Ventilation-Pipes-Drains



Podium/Pedestal buildings

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Podium/Pedestal buildings

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Failures

Failures: What now?

So the test didn't go well...

- How to deliver the news
- What remediation steps to recommend
  - What's the delta from target? Percentage and CFM
  - Process of elimination of known penetrations/openings
  - Iterative testing
  - Zoned testing against non-threatening spaces
  - Blower door guided air-sealing
  - Smoke/visuals/IR
  - Aerobarrier – LAST RESORT
- How to handle re-testing
- Impacts to model for operational test
- How to handle waivers with Phius

Q&A/Discussion Break!