

BUILDINGENERGY BOSTON

Passive House Verification: Get It Done Right, and Early

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Engaging Passive House Verification Early: Get it done right the first time!

Presented By: Joe Bodine, Kellie Murphy & Rylee Noonan





Learning Objectives

- Identify the importance of engaging a PHIUS Verifier early
- Organize the construction timeline to ensure fast certification and turnover
- Communicate the on-site verification process and training to on-site personnel
- Discover lessons learned from on-site failures and successes

Parties in a Phius Project



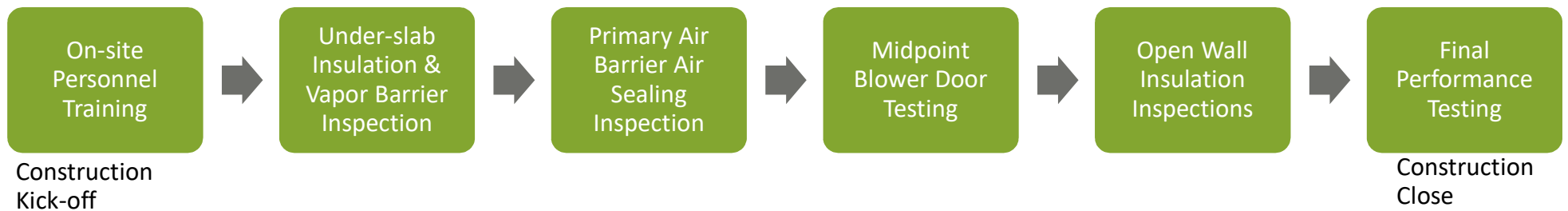
- Developer/Owner
- Architects
- Engineers
- Builder
- Installers
- Verifier
- Certified Passive House Consultant [CPHC]



Why is Verification Important?

- Third party quality assurance
- Ensures overall performance goals and requirements are met
- Confirms building is built according to plans, specifications and WUFI model
- Validates design decisions and construction execution
- Higher quality building

On-site verification process — Key Inspections & Tests



On-site Personnel Training

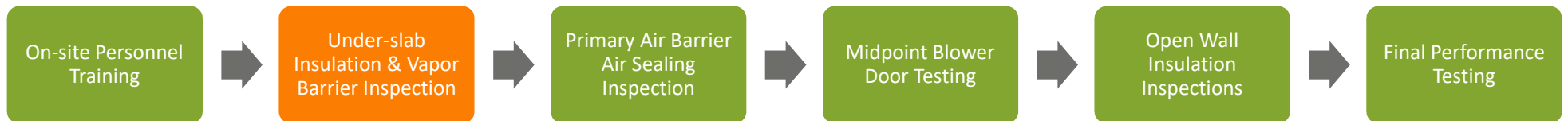
There is no 'normal' on Passive House jobs

- Inspection requirements communicated to GC & subcontractors
 - Air sealing and insulation details & responsible parties, pipe lengths
- Testing plan communicated
 - Performance testing – Air infiltration, ventilation, duct leakage, hot water, etc.
- Answer questions from each party on specifics
 - Ask teams to review plans and specs and bring specific questions



Early Construction

- Exterior slab edge wall insulation
- Extended foundation wall—how to install properly
- Under slab insulation & vapor barrier inspection
- Thermal bridge mitigation



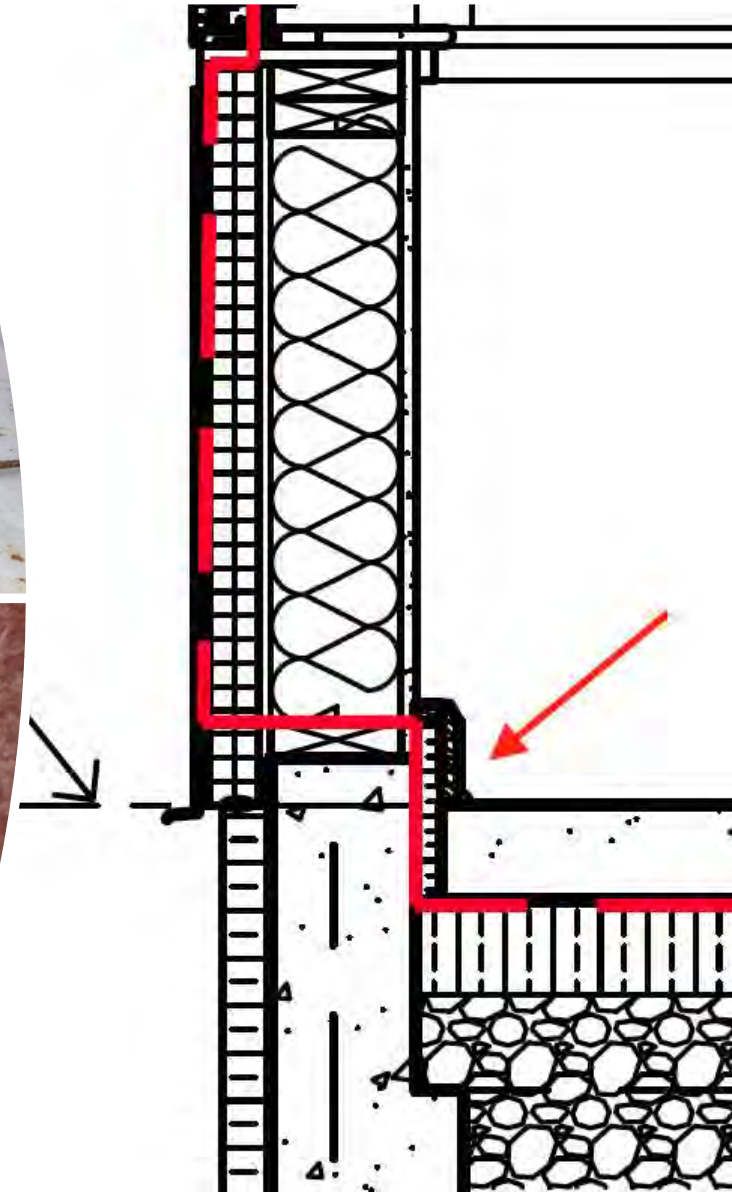


Exterior Wall Slab Insulation

- Why are install details and timeline so important?
- How will insulation not get damaged after install?
- If it does get damaged, who will be responsible to fix and when?

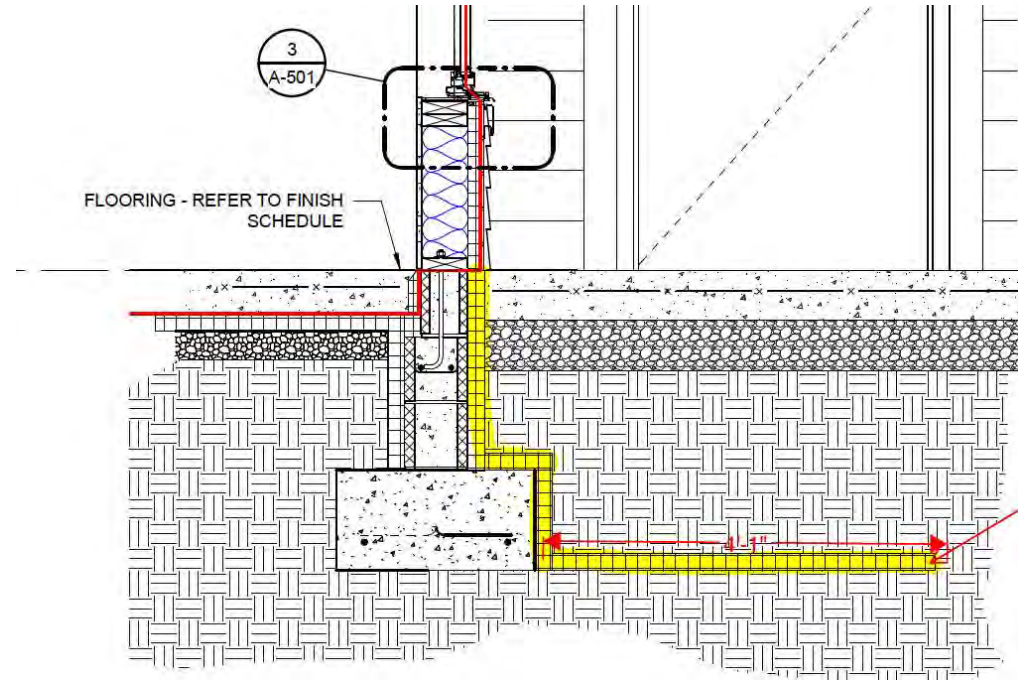
Extended Foundation Walls

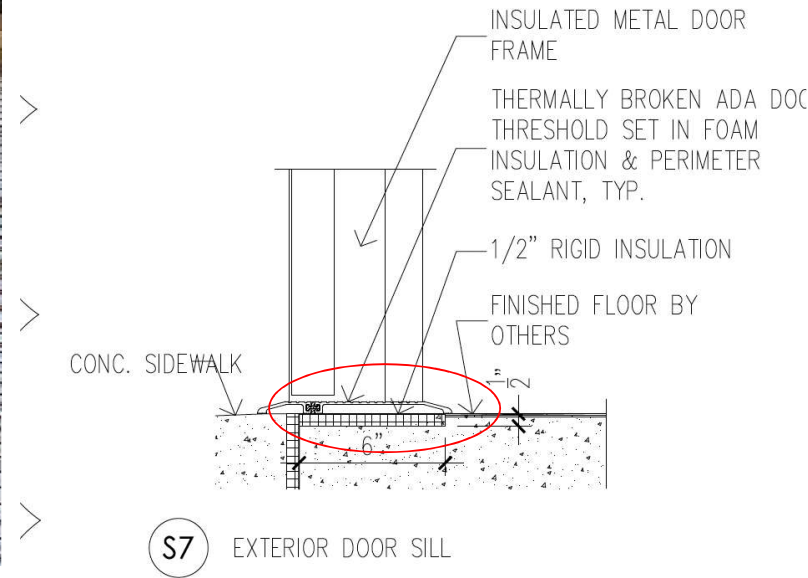
- Quality insulation installs
- Drywall to grade beam attachment.
- Grade beams or extended foundation walls present many challenges throughout construction.



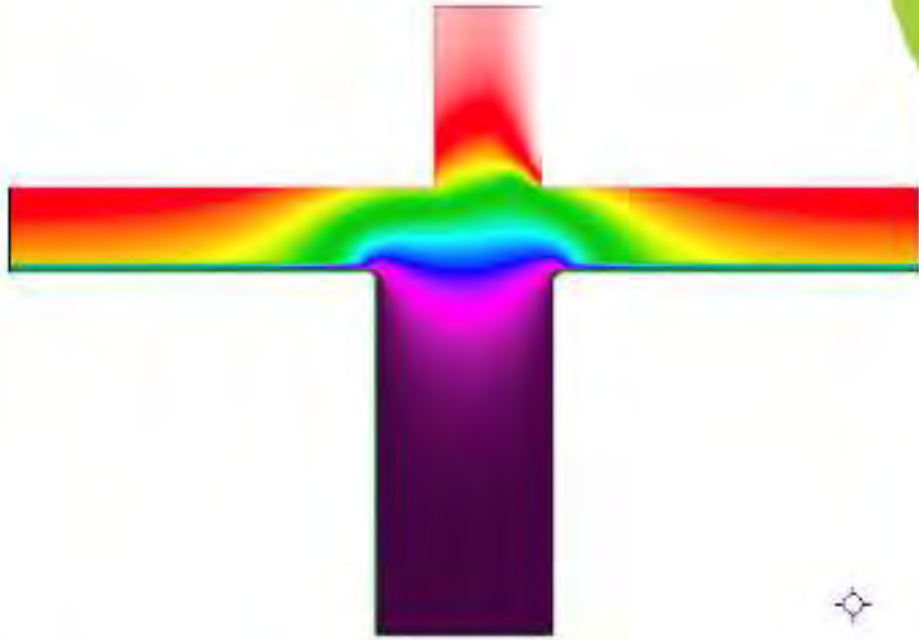
Thermal Bridging-Foundation Footers

- Mitigate thermal bridging at foundation footers



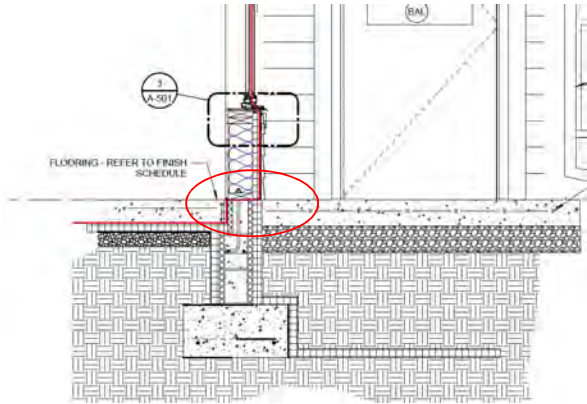


Thermal Bridges – Door Threshold



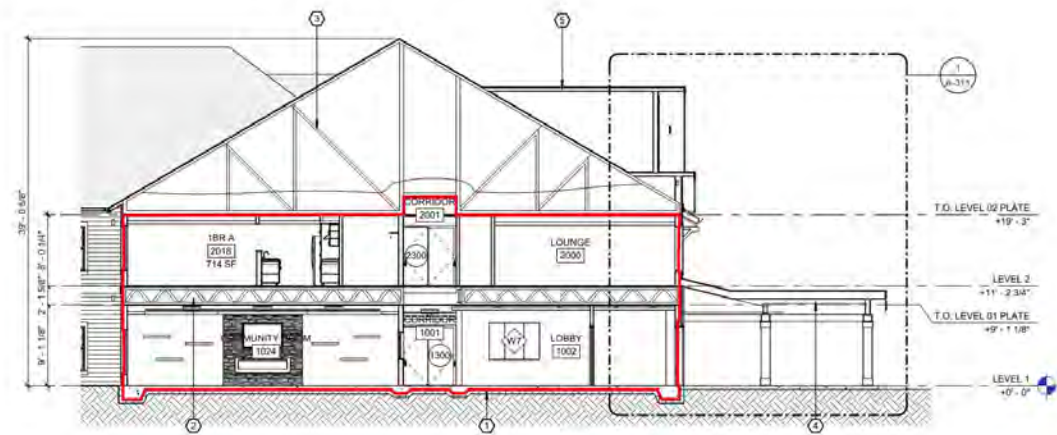
Thermal Bridge – Structural Beams

Critical Details at Intersections



Mid Construction — Primary Air Barriers

- Continuous (Follow the red line)
- Window Rough Opening
- Mechanical Systems Penetrations
- Wall-Foundation Intersection
- Roof-Wall Intersection



2 LATITUDINAL SECTION @ COMMON HALL
1/8" = 1'-0"





Primary Air Barrier - Above Grade Walls

- Understanding appropriate installation of liquid applied vs. tape.
- Manufacturers recommendations on install temps vs. proper usage on site.

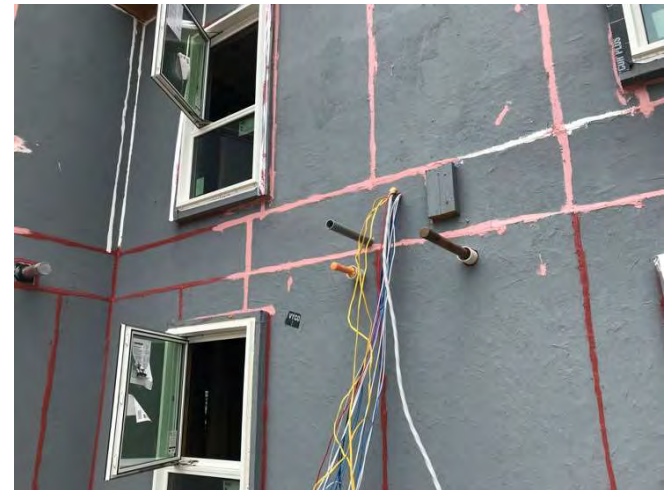
Primary Air Barrier - Fluid Applied



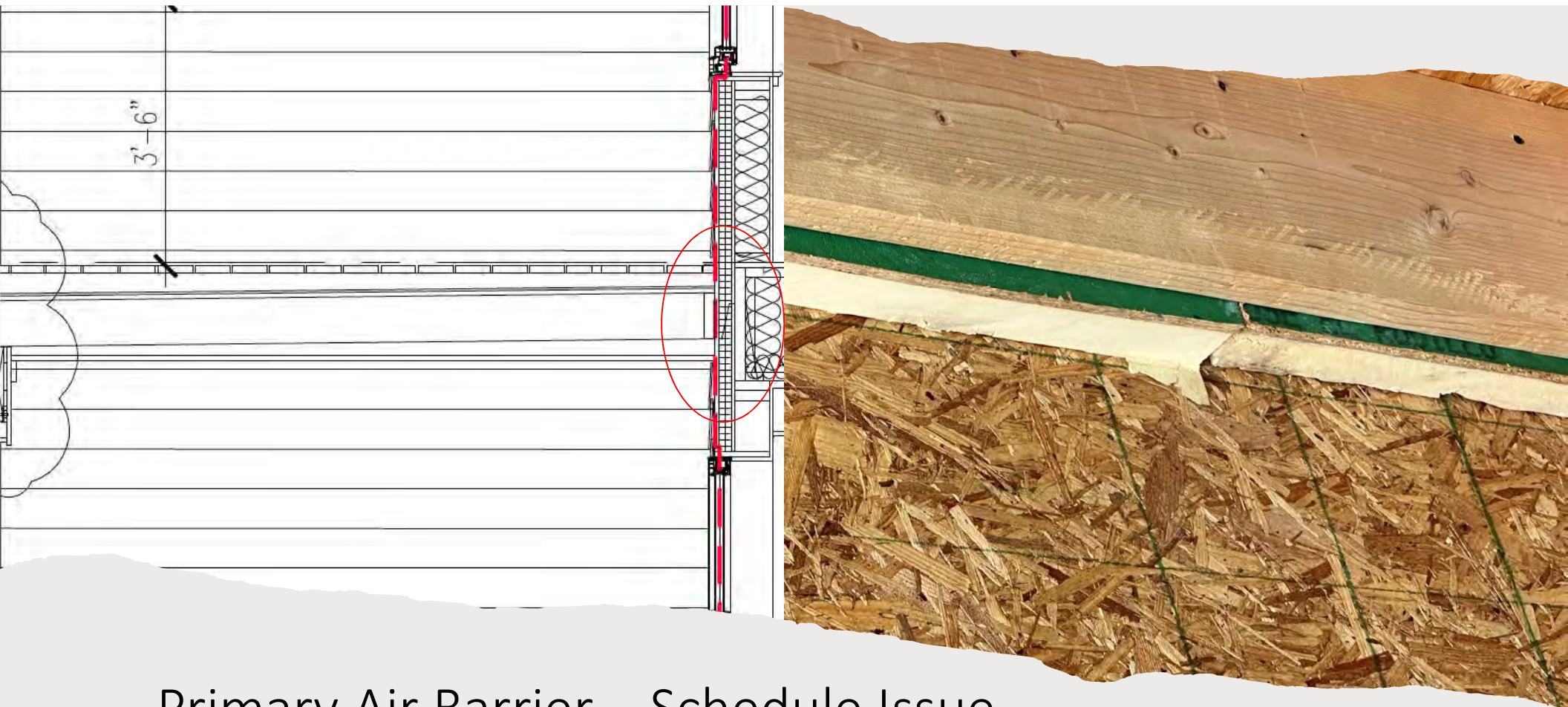
Concept



Reality



Result



Primary Air Barrier – Schedule Issue

Primary Air Barrier- Windows/Doors

- Integrate openings into the primary air barrier
- Complete continuity on the interior with foam and caulk



Primary Air Barrier -
Mechanical
Penetrations



Wall-Foundation Intersection

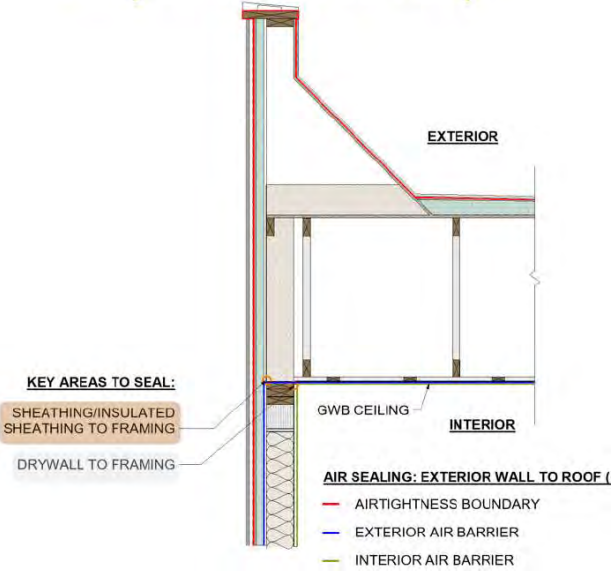
Seal at three locations:

- Sill plate to foundation
- Exterior material with tape or liquid flash
- Interior slab to bottom plate

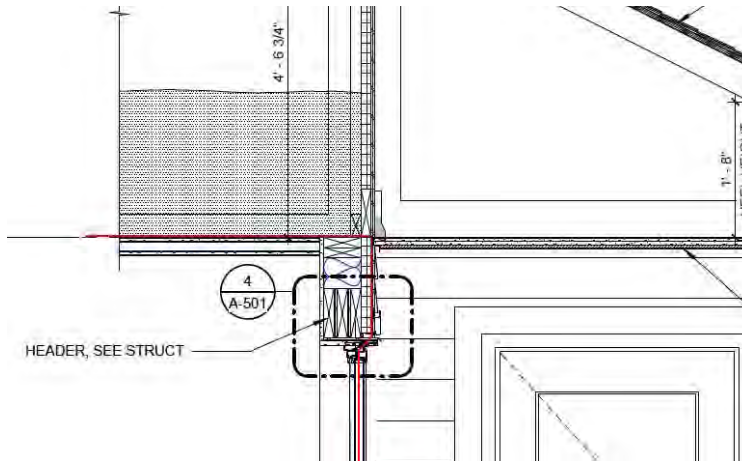


Continuous Roof Air Barrier-Flat Roof System

Roof to Wall: Flat Roof



Continuous Ceiling Air Barrier- Attic





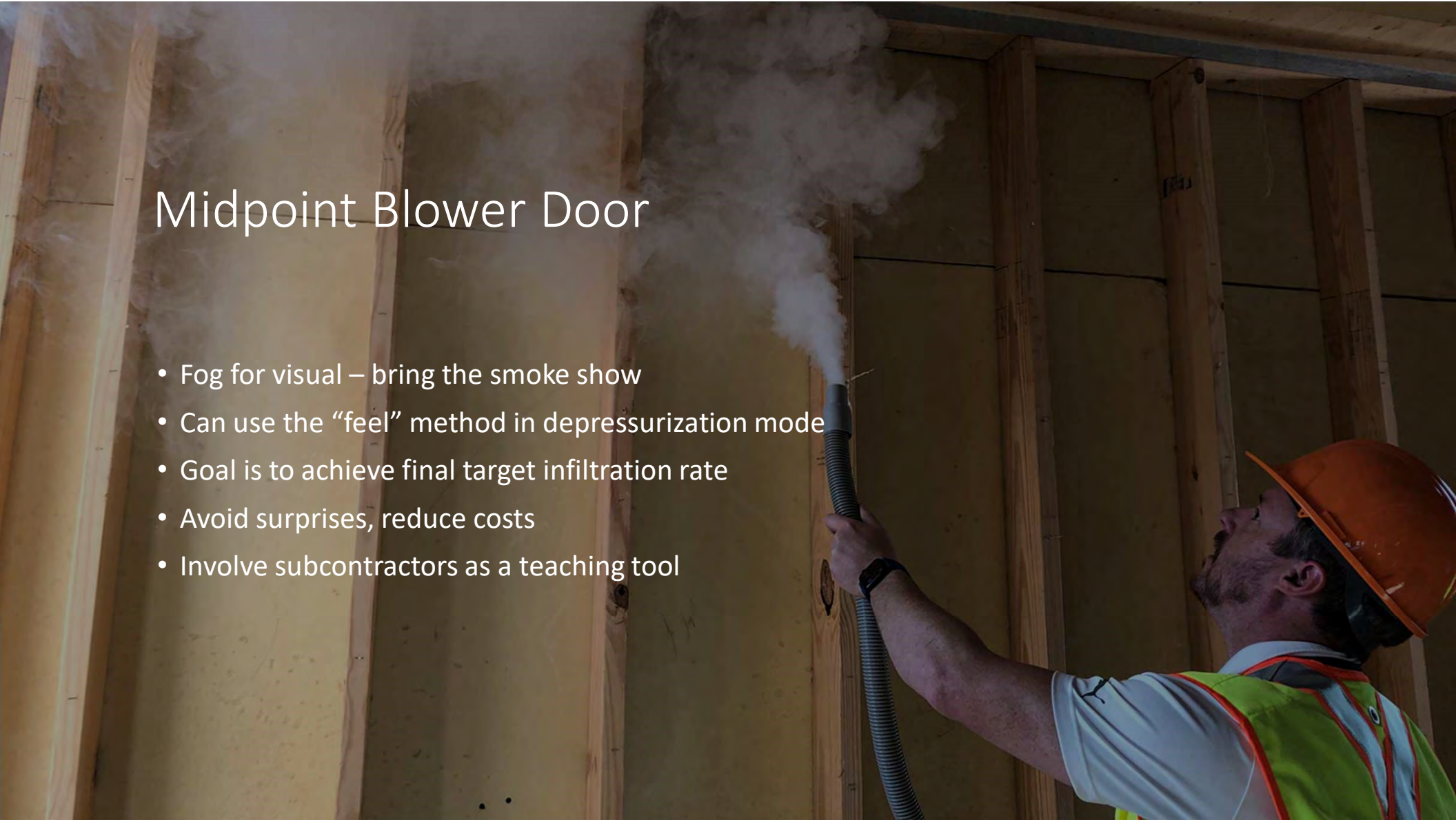
Midpoint Blower Door

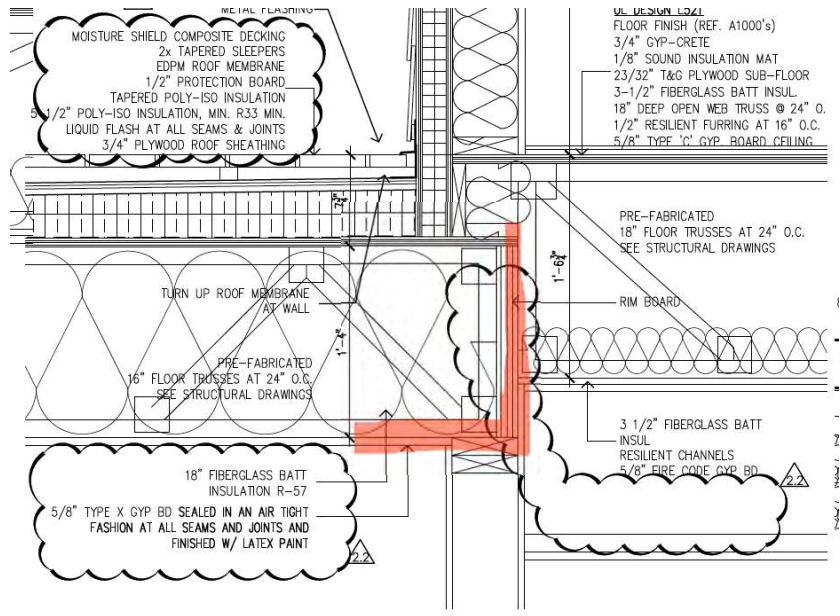
- Primary air barrier is complete [doors, windows, sheathing]
- Cavity insulation not yet installed
- Exterior assembly not yet complete
 - Air leakage can be identified at the source
- Lock building down for testing



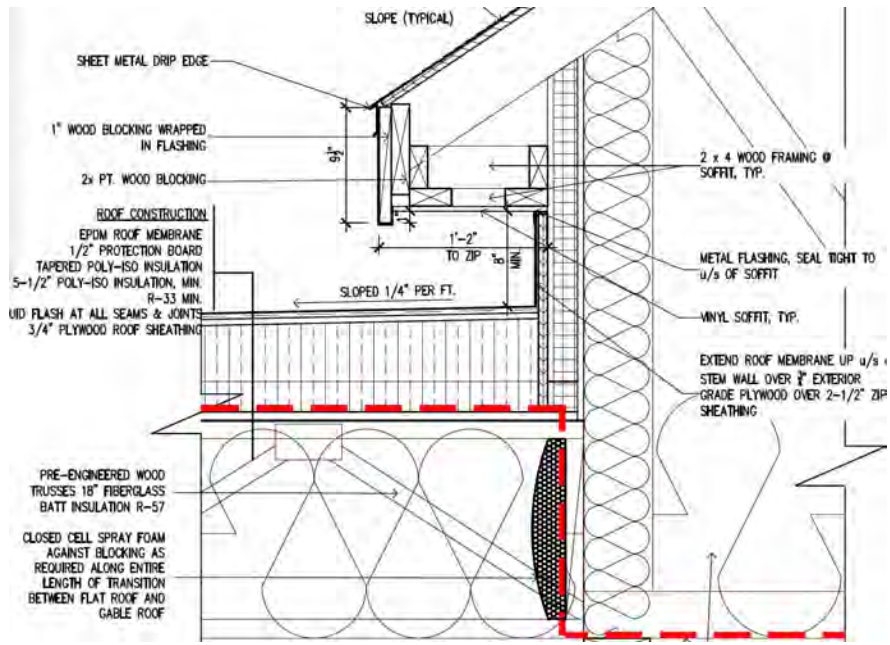
Midpoint Blower Door

- Fog for visual – bring the smoke show
- Can use the “feel” method in depressurization mode
- Goal is to achieve final target infiltration rate
- Avoid surprises, reduce costs
- Involve subcontractors as a teaching tool

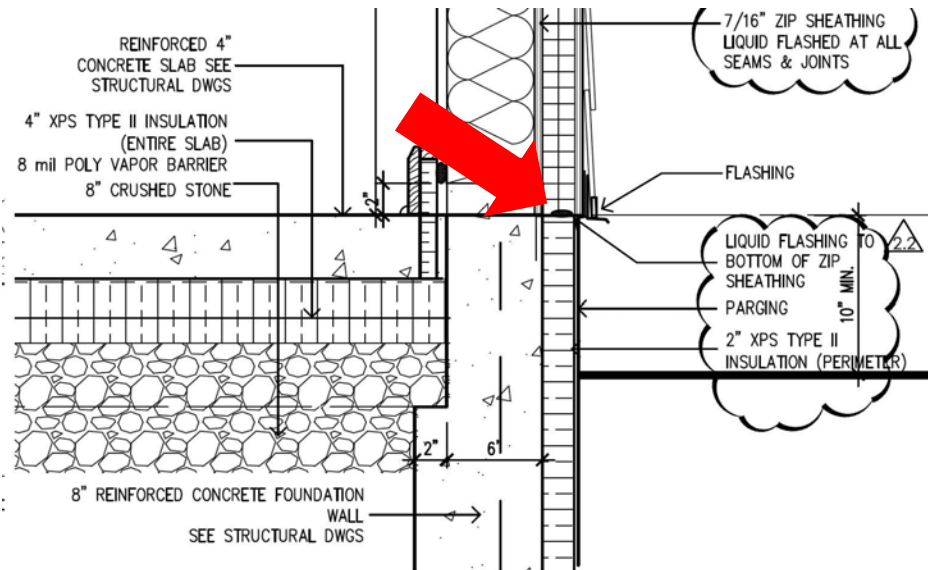




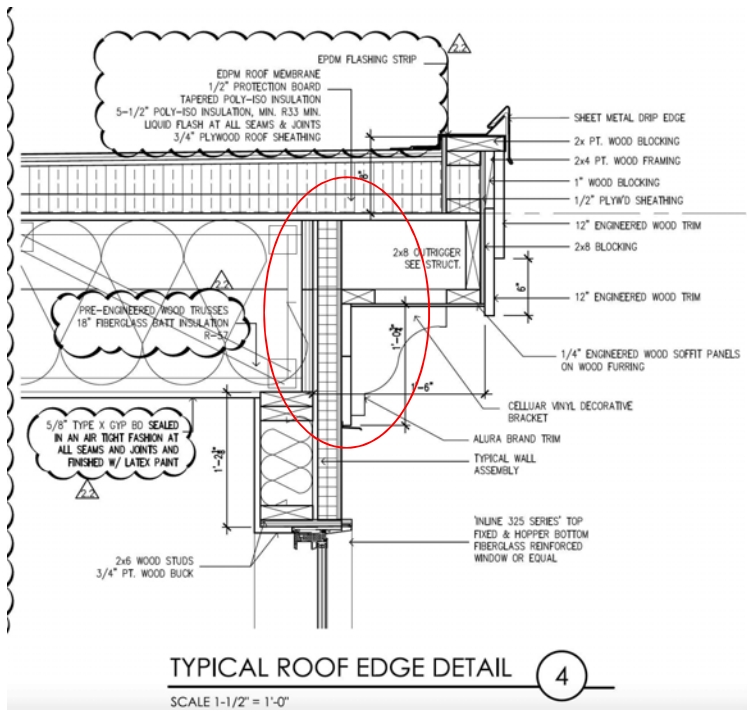
Structural Penetrations



Roof Connection



Foundation Wall-Sheathing Connection



Roof Sheathing to Framing

Mid Construction - Open Wall Insulation Inspections

- Achieve proper insulation grade
- Ductwork sealed at seams and openings covered from construction debris
- Low-VOC products



On-site Personnel Training



Under-slab Insulation & Vapor Barrier Inspection



Primary Air Barrier Air Sealing Inspection



Midpoint Blower Door Testing



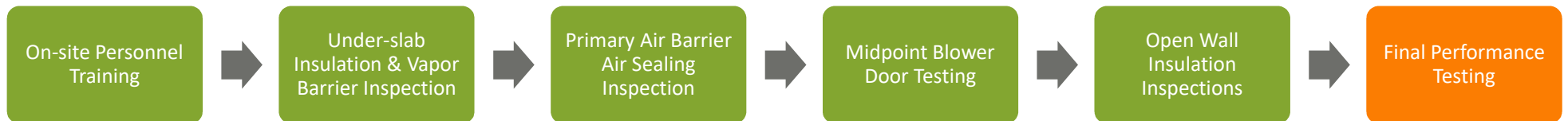
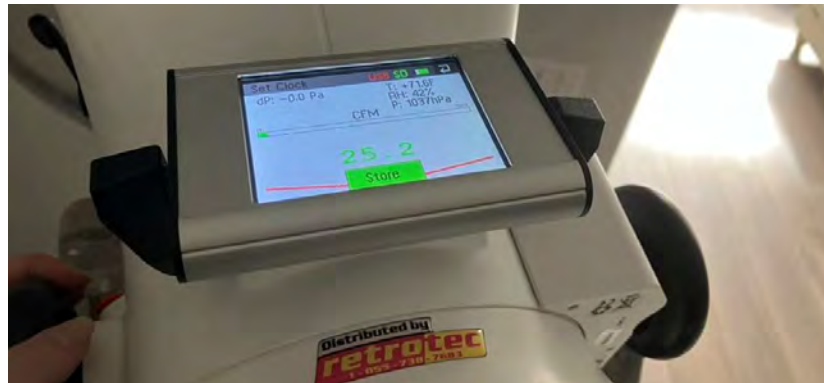
Open Wall Insulation Inspections



Final Performance Testing

Final Testing - Ventilation

- Testing & Balancing: Often performed by a third-party agent
 - Verifier still needs to verify a sample
- Ensure flow rates meet design and are balanced with little room for deviation
- Duct leakage testing



Final Testing — Heating & Cooling

- Flow rates meet design
- Duct leakage testing
- Room pressure balancing



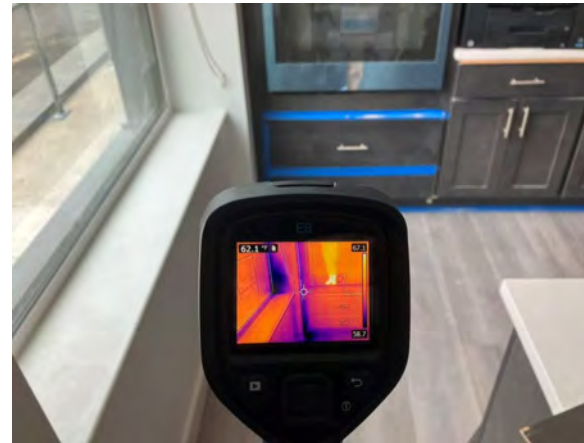
Final Testing — Hot Water Distribution

- Temperature rise test

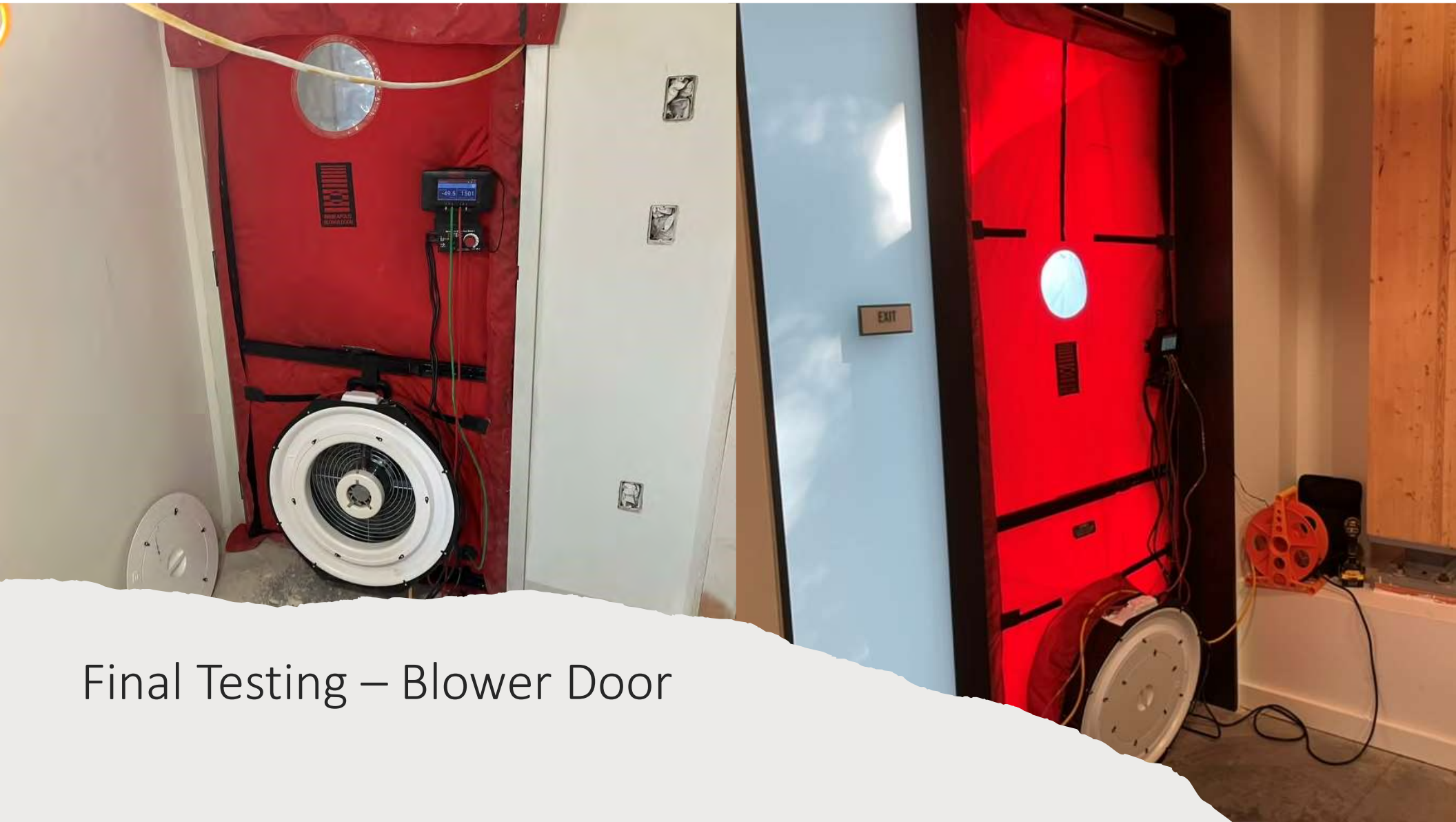




Final Testing — Photo Verification



Final Testing — Infrared Scanning



Final Testing – Blower Door

Engage Your Verifier Early

- Gain value from lessons learned in the field
- Review and implement prerequisite program requirements
- Reduce changes to the design
- Ensure bid sets include important inspection and testing requirements



Thank you!

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