BUILDINGENERGY BOSTON

At the Finish Line: How Two Affordable Passive Projects Crossed the Hardest Hurdles

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Thomas Chase (New Ecology)
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Chris Becker (Callahan Construction Managers)

Curated by Beverly Craig (MassCEC)

Northeast Sustainable Energy Association (NESEA)
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2017 Passive House Design Challenge

MASSACHUSETTS CLEAN ENERGY CENTER®

- Up to $4,000 per unit incentive
- 8 Affordable Projects: 540 Units
- 5 Occupied; 3 Under Construction

Incremental Cost of Achieving Passive House Standard: 2.4% average

Does not include final change orders for Kenzi and Mattapan Station; incentives not included

What are the biggest incremental costs?

- **Much better ventilation**
- **Windows and Doors**
- Efforts to reduce thermal bridging
- Higher level of construction verification

<u>Heating and Cooling Equipment Cost Decrease:</u>

- 6 out of 8 projects have **significantly lower size and cost for heating and cooling** equipment

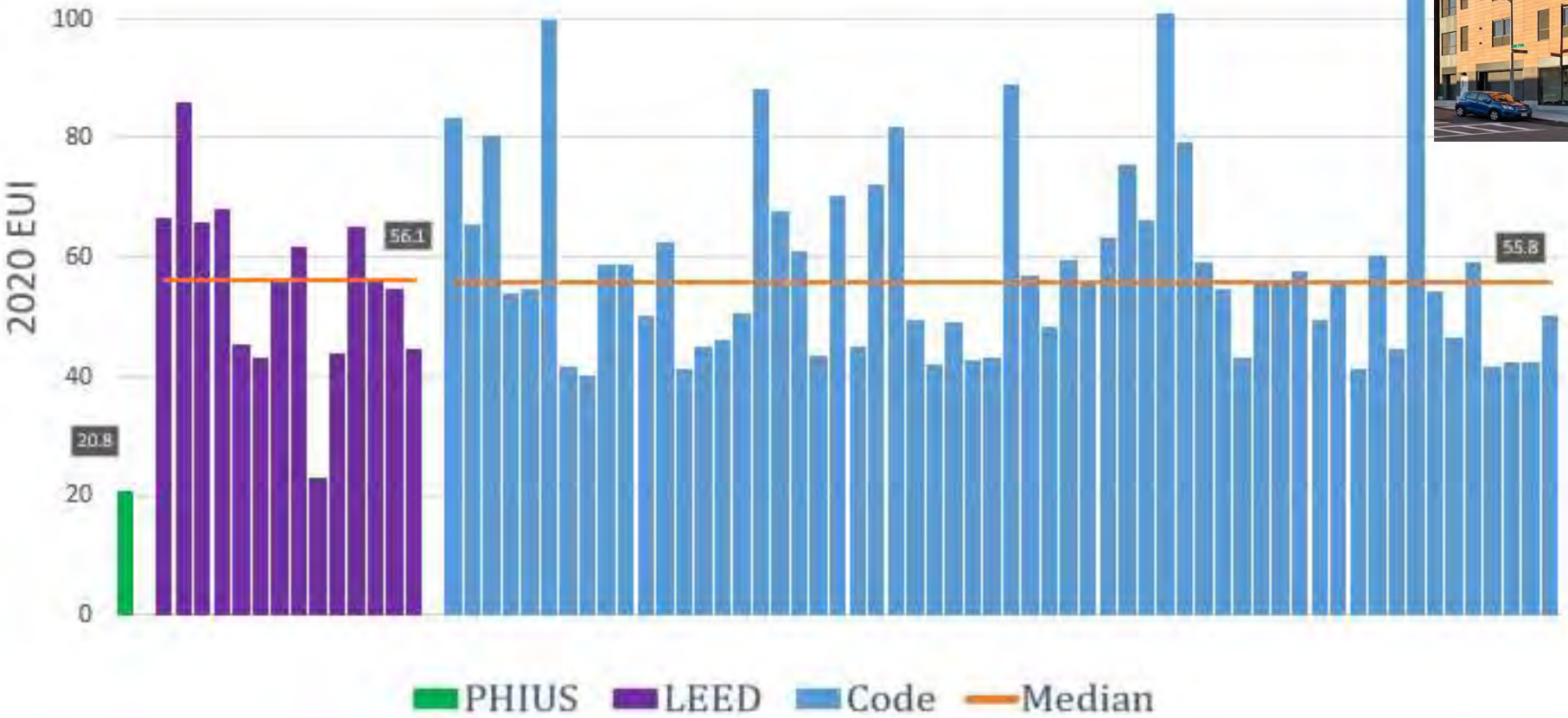
- Window premium is coming way down. In some cases, cost neutral

LESSONS

- Architects with more PH training and experience had lower cost; better outcomes
- Decide early if you are seeking PH certification- if whole team on board coming out of charrette, more will go more easily
- There is a large learning curve on first PH project – expect it
- Give yourself plenty of room in PH model for things to go wrong
- All 7 of 8 projects likely to get PH certification successfully, MassSave fallback incentives still reward trying and above code outcome
- More complex roofline= more expensive

Performance: Distillery, Boston 2020

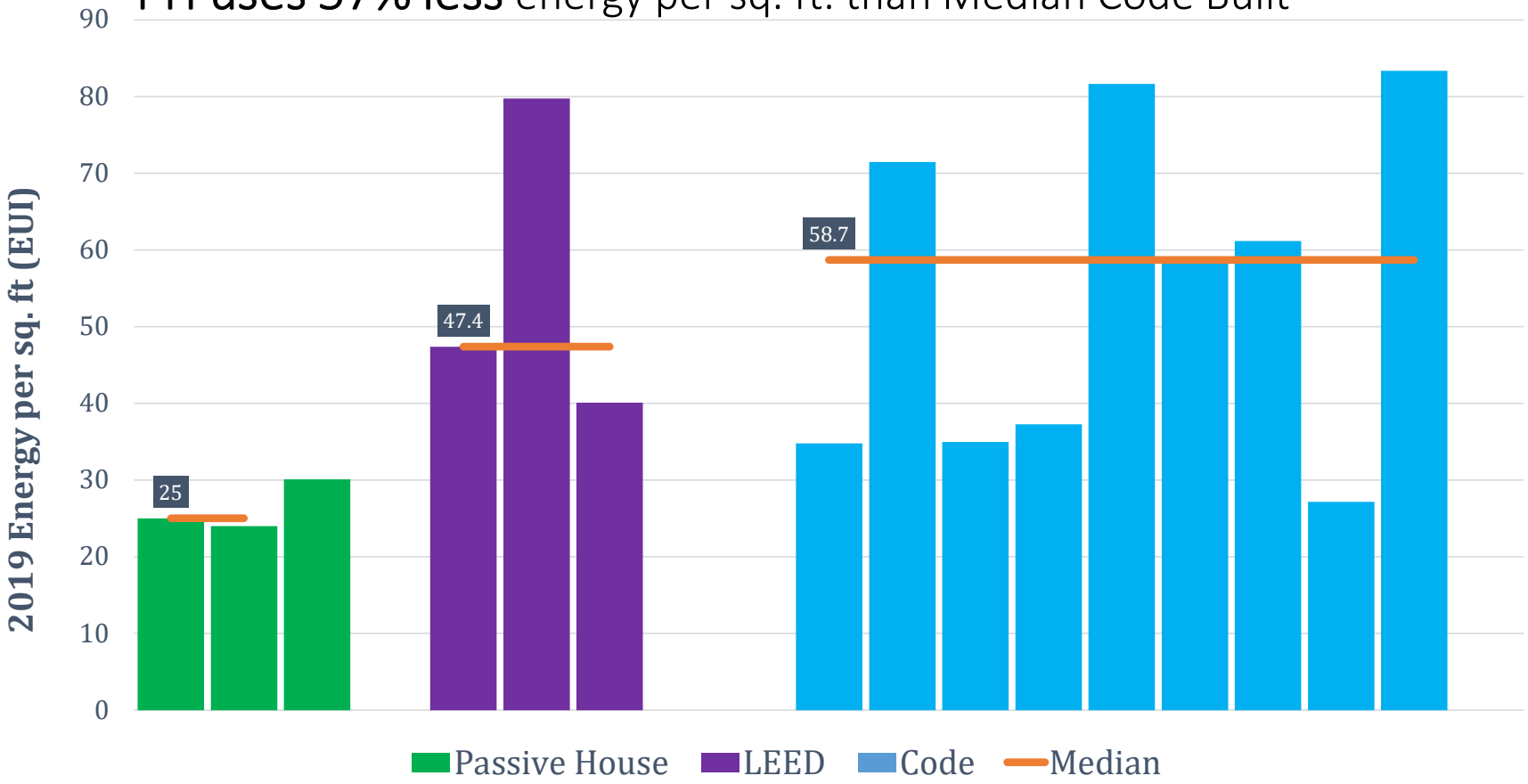
PH Uses **63% less** energy per sq. ft. than median new multifamily in Boston



Data from Boston Energy Disclosure 2020 sorted for new construction multifamily built since 2010; Cross checked for LEED certification; properties with suspected lack of full building energy report are removed.

Performance: Philadelphia 2019 Affordable

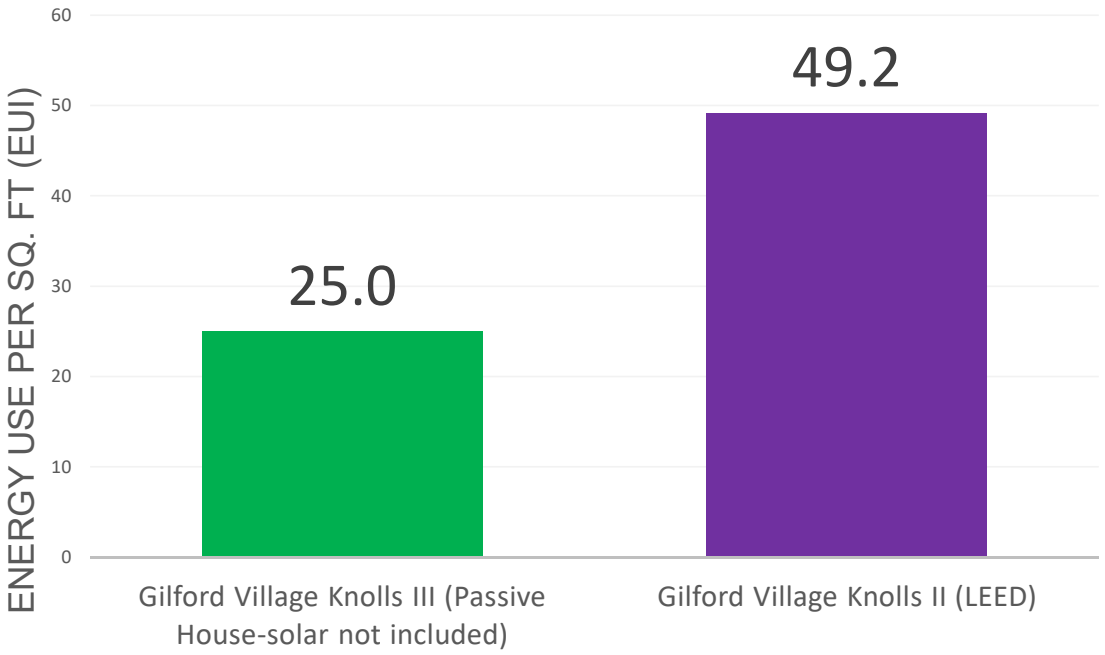
PH uses 57% less energy per sq. ft. than Median Code Built



Data from Philadelphia Energy Disclosure 2019 cross checked for LIHTC multifamily; Credit to Green Building United, Katie Bartolotta

PH Performance 2019: Gilford Village Knowles III, NH

PH uses 49% less energy per sq. ft. than Gilford Village Knowles II LEED built 2008
(same building, different standard)



Graphic representation of study by Resilient Building Group (2020 Report of average 3 year energy usage data ending in 2019)

mass save®
Savings through energy efficiency

Passive House Multifamily Incentives

- 100% of feasibility study cost up to $5,000
- 75% of PH modeling cost up to $20,000

- $3,000 per unit for PH certification

Current Enrollment Stats

- 116 buildings enrolled for PH incentives
- Represents 6,500+ units
- 70 buildings have completed PH feasibility studies

<u>Passive House Education</u>

- PH Lunch & Learns/Workshops: 59
- Total Attendees: 2,497
- PHIUS/PHI Accreditation Reimbursements: 107

- **See phmass.org video library**
- **See Passive House Accelerator videos for sessions like:**

“10 Easy Ways to Ruin Your Blower Door Score (& Remedies)

FREE TRAINING FOR MA EMPLOYERS <100

- Passive House Design Consultant
- Passive House Builder/Tradesperson
- LEED Green Associate Exam Prep
- Green Professional Training (GPRO)
- Intro to WELL
- Intro to Designing Net Zero Buildings
- Building Science Fundamentals

BUILT ENVIRONMENT PLUS

- https://builtenvironmentplus.org/workforce-training-grants/

Building Inherent Value:

Executing a Passive House

Presented by: Michelle Apigian AIA, LEED AP, AICP, CPHC

E-ICON ARCHITECTURE

PASSIVE HOUSE IN ACTION

Distillery North
Finch Cambridge
Harbor Village
The Lighthouses
Hawkins

Salem Heights
Simon C. Fireman
555 Merrimack
Rindge Commons
Riverdale

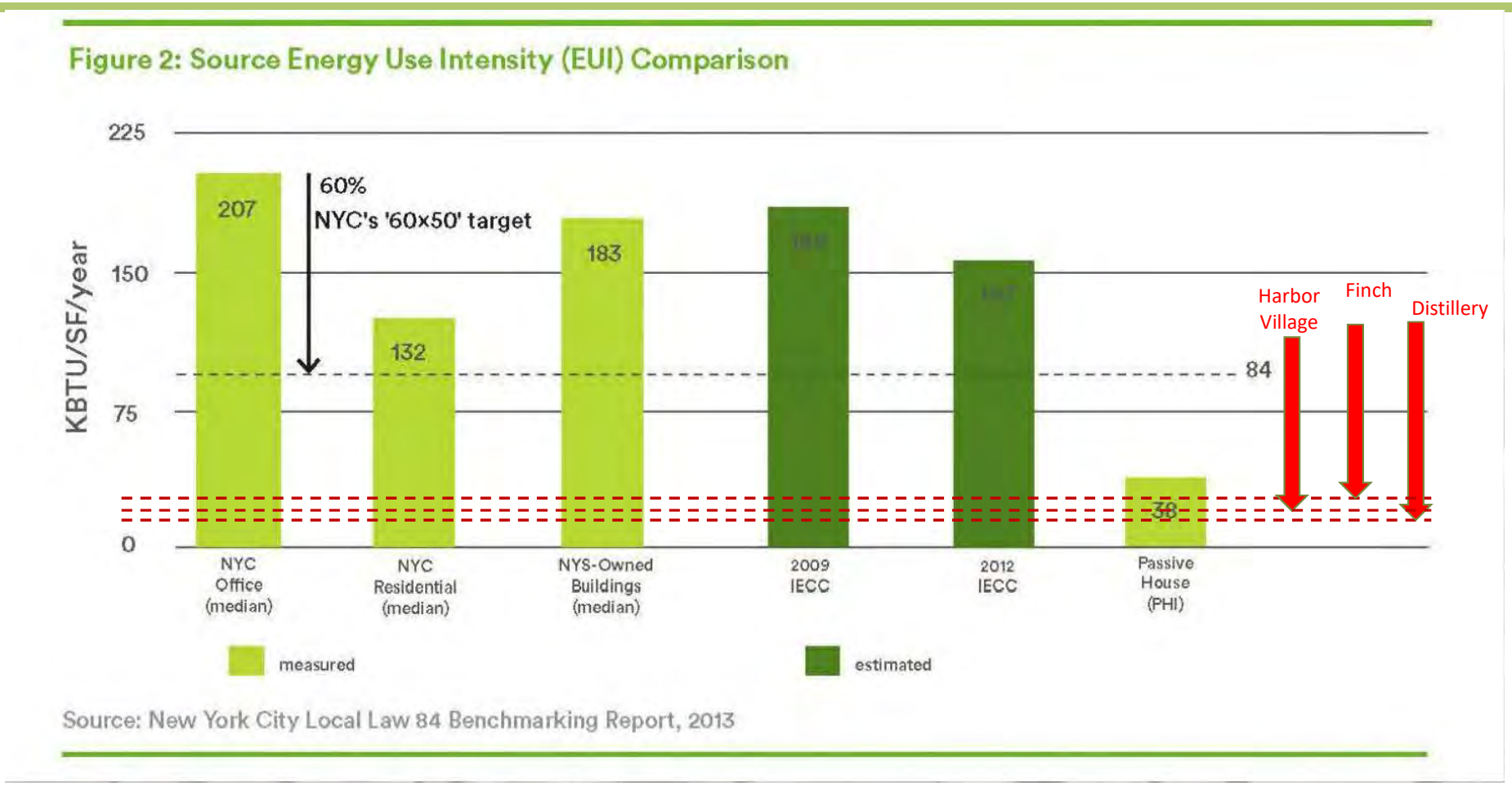
Cape View Way
108 Center
Leefort Terrace
Ingalls Court
Holyoke








PERFORMANCE– Building Inherent Value



PASSIVE HOUSE: Building Inherent Value

ICON ARCHITECTURE

INTENTION
TEAMWORK
INTEGRATED BUILDING SCIENCE
COMMUNICATION
CRAFT
CONFIRMATION

INTENTION

2015: MA Amendment to the IBC 2015
Accepted as Alternative Compliance path

2018: Mass CEC Passive House Design Incentives
Targeting Affordable Housing Developers

2019: Mass Save Incentives
Targets all Multifamily Developers
Builds Market-Rate attention

2020: DHCD QAP
Incents Passive House above other green building standards
Catalyzes Affordable commitment to Passive House

2022: Draft Net Zero Stretch Code
Considers Passive House as a Compliance Path

Ongoing…. Community Advocacy - Municipal Policy – Future Codes?

TEAMWORK

Owner
Architect
Mechanical Engineer
Structural Engineer
Energy Modeler/CPHC
Rater/Verifier
Envelope Consultant
Commissioning Agent
General Contractor
Trades

INTEGRATED BUILDING SCIENCE

Design to Drive Down Loads

Air Tightness

Continuity:
- Eliminate In/Ex-filtration
- Detail openings: windows/doors/penetrations
- Sequence Transitions

Thermal Control

Optimize
- Insulation
- Thermal bridging
- Solar heat gain

Mechanical Systems

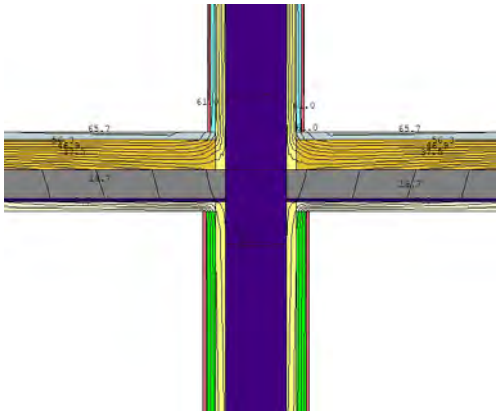
Balanced & Decoupled
- Right Sized
- Low-Maintenance

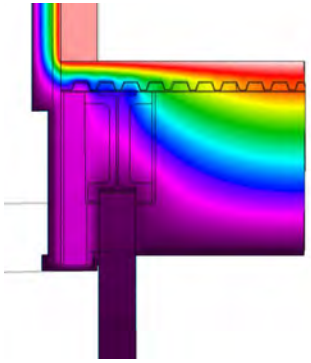
Lighting/Appliances/ Plug Loads

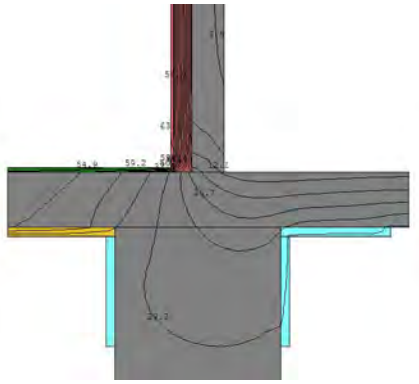
Fdafd
- **Efficient fixtures/appliances**
- **Plan for Renewables**

INTEGRATED BUILDING SCIENCE

Analyze Intersections







COMMINICATION

DESIGN INTENT

GRAPHIC
SPECIFICATIONS
ON SITE

ARTICULATE THE PRESSURIZED BOUNDARY

COMPARTMENTALIZATION LEGEND

NOTE: DRAWINGS A-119 THRU A-133 & A-303 SHOULD BE PRINTED IN COLOR

- COMPARTMENTALIZED SPACE. SEE SPEC SECTION 3.13 OF 092110
- CONTINUOUS AIR BARRIER
- CONTINUOUS THERMAL & AIR BARRIER
- UNCONDITIONED SPACE OUTSIDE PASSIVE HOUSE ENCLOSURE
- CONDITIONED SPACE OUTSIDE PASSIVE HOUSE ENCLOSURE
- INSULATION
  - SPRAY FOAM INSULATION
  - RIGID INSULATION
  - CONTINUOUS EXTERIOR INSULATION: MINERAL WOOL
  - FIBERGLASS INSULATION

COMPARTMENTALIZATION NOTES

1. PROVIDE SEALANT BETWEEN GWB AND TOP/SILL PLATES AS WELL AS BETWEEN STUD FRAMING AND GWB AT OPENINGS (DOORS, WINDOWS, HVAC UNITS, ETC.). SEAL PERIMETER OF ELECTRICAL/TELE-DATA BOXES (OUTLETS, LIGHTS, SWITCHES, ETC.) IN WALLS AND CEILINGS. ELECTRICAL BOXES ARE TO BE 'AIR SEALED' BOXES AND SEALING OF BOX PENETRATIONS SHALL BE AS SPECIFIED.
2. AT DEMISING WALLS (UNIT-TO-UNIT, UNIT-TO-CORRIDOR, AND UNIT-TO-COMMON AREA), PROVIDE INTERIOR AIR BARRIER (AIRSEALING). PROVIDE SEALANT AS SPECIFIED BETWEEN SILL PLATE/TOP PLATE AND GWB, TYPICAL.

AIRTIGHTNESS DETAILS LEGEND

NOTE: DRAWINGS A-119 THRU A-133 & A-303 SHOULD BE PRINTED IN COLOR

PEEL/STICK APPLIED CONT. AIR BARRIER

- AB-1A — BLUESKIN VP-160 (VAPOR OPEN)
- AB-1B — BLUESKIN SA (VAPOR CLOSED)

POLY AIR BARRIER

- AB-2A — VIPER II 10 MIL VAPOR BARRIER (VAPOR CLOSED)
- AB-2B — VIPER II PENETRATION BOOT (VAPOR CLOSED)
- AB-2C — UNDER SLAB OR ROOF VAPOR BARRIER (VAPOR CLOSED)
- AB-2D — ROOF VAPOR BARRIER (SMART BARRIER)

- AB-3 — FULLY GROUTED CMU OR CONC. AS AIR BARRIER. SEAL HOLES WITH BLUESKIN BES 925

CLOSED CELL SPRAY FOAM MIN R-30

- AB-4 — HIGH LIFT SPRAY FOAM WITH FLAME BLOCK (VAPOR CLOSE

CRYSTALLINE WATERPROOFING

- AB-5 — XYPEX (VAPOR CLOSED)

FLUID APPLIED AB

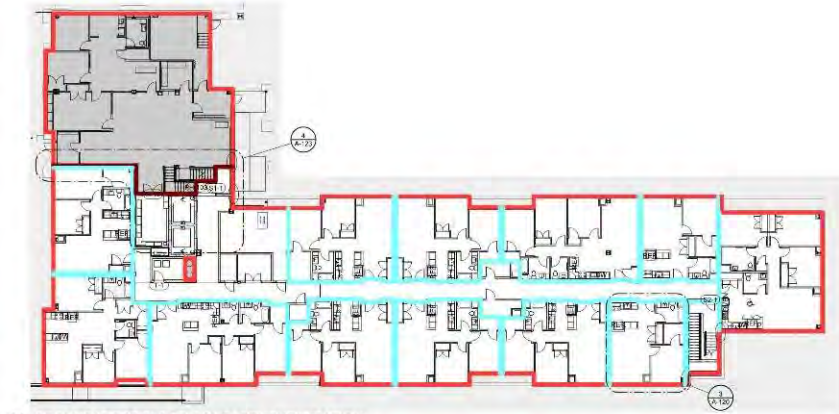
- AB-6A — BLUESKIN AIRBLOCK 17 (VAPOR OPEN)
- AB-6B — BLUESKIN CM-100 (VAPOR CLOSED)

FIRESTOPPING

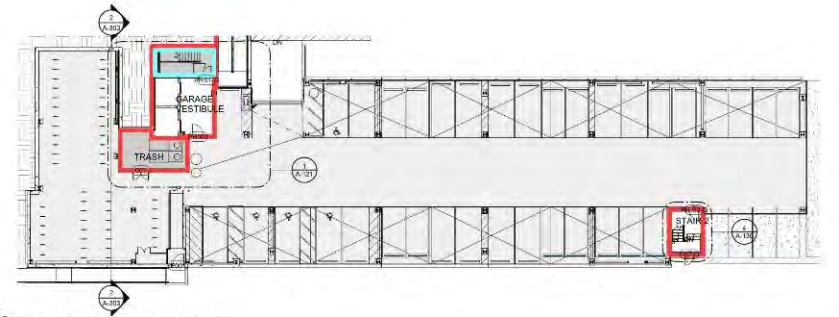
- AB-7 — HILTI FIRESTOP SYSTEMS

- C — SERVICE CHASE
- D — SHEATHING - PLYWOOD AT 3A CONSTRUCTION, DENSGLASS AT 1A CONSTRUCTION
- E-1 — AIRTIGHT DOORS
- E-2 — AIRTIGHT FIRE RATED DOORS
- F — PIECE IN SHEATHING/GWB FOR PROPER CONTINUITY & SEQUENCING

NUMBERS NOTATED INDICATE CONSTRUCTION SEQUENCE

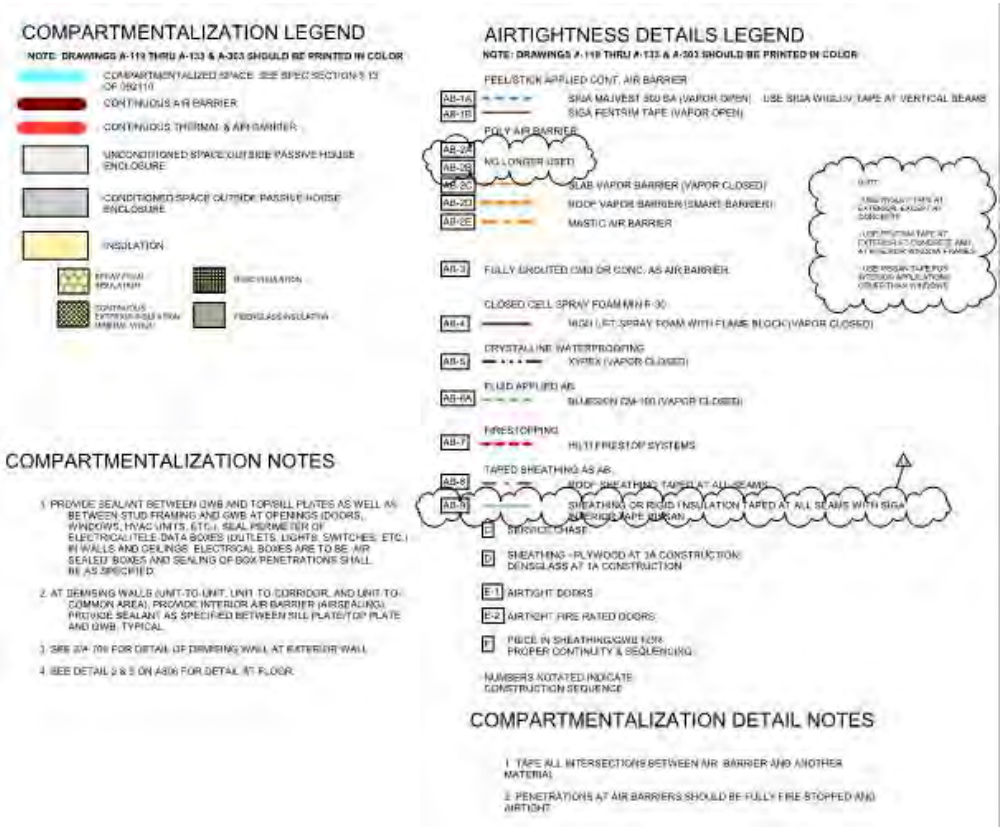


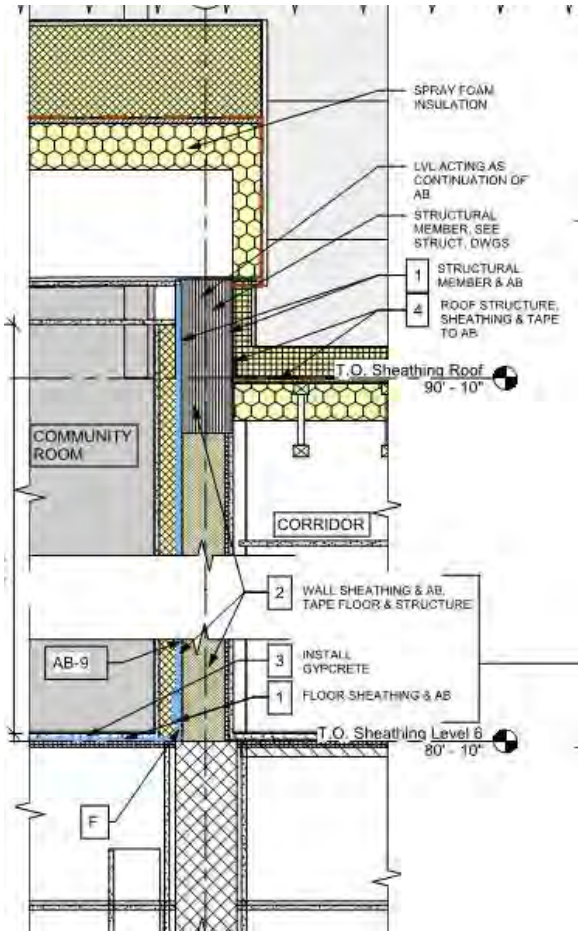
2 GROUND/ FIRST FLOOR COMPARTMENTALIZATION
1/16" = 1'-0"



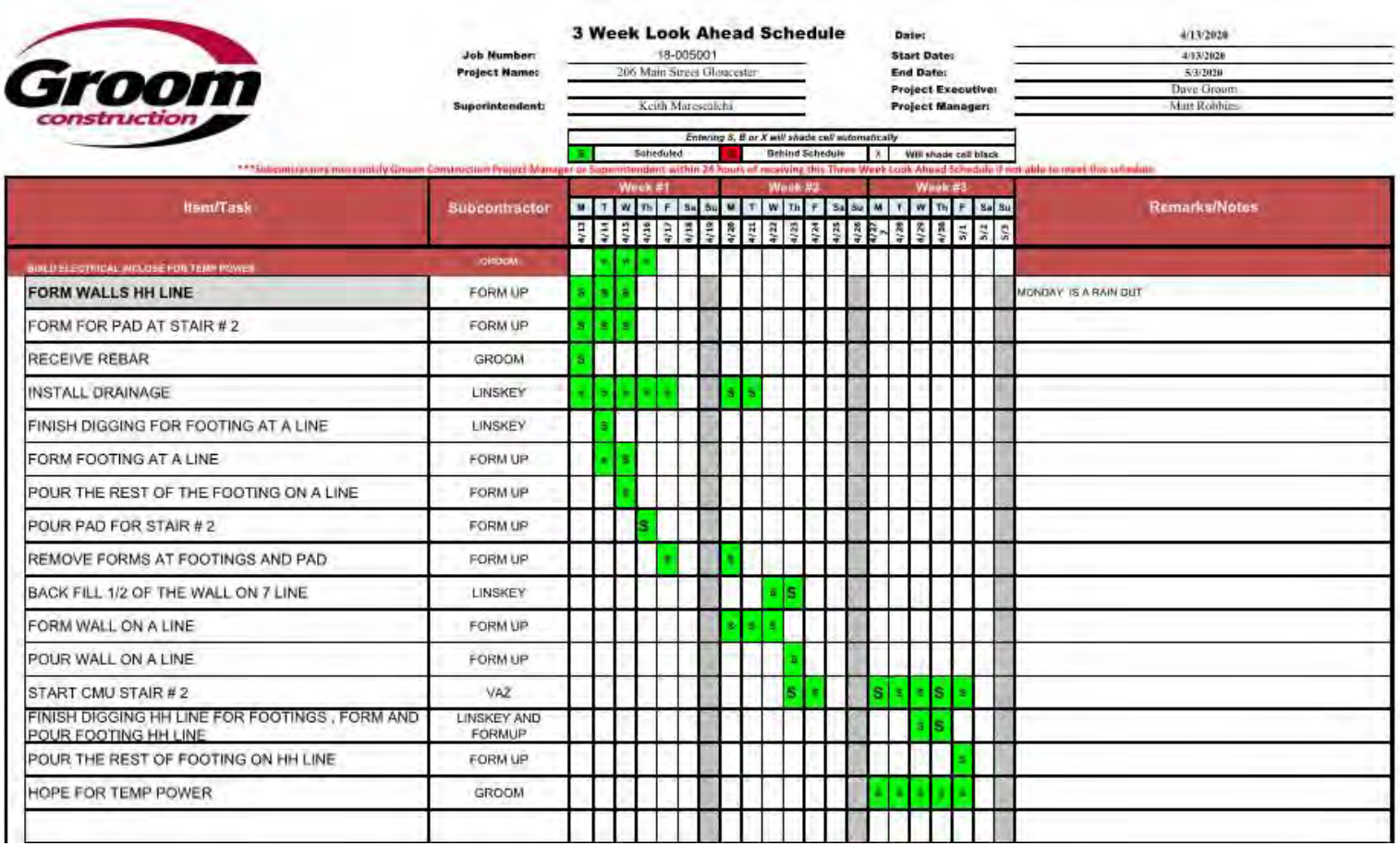
1 Garage Level Compartmentalization
1/16" = 1'-0"

ARTICULATE TRANSITIONS (including sequence)





COMMUNICATION – Speaking the same Language



Groom construction

3 Week Look Ahead Schedule

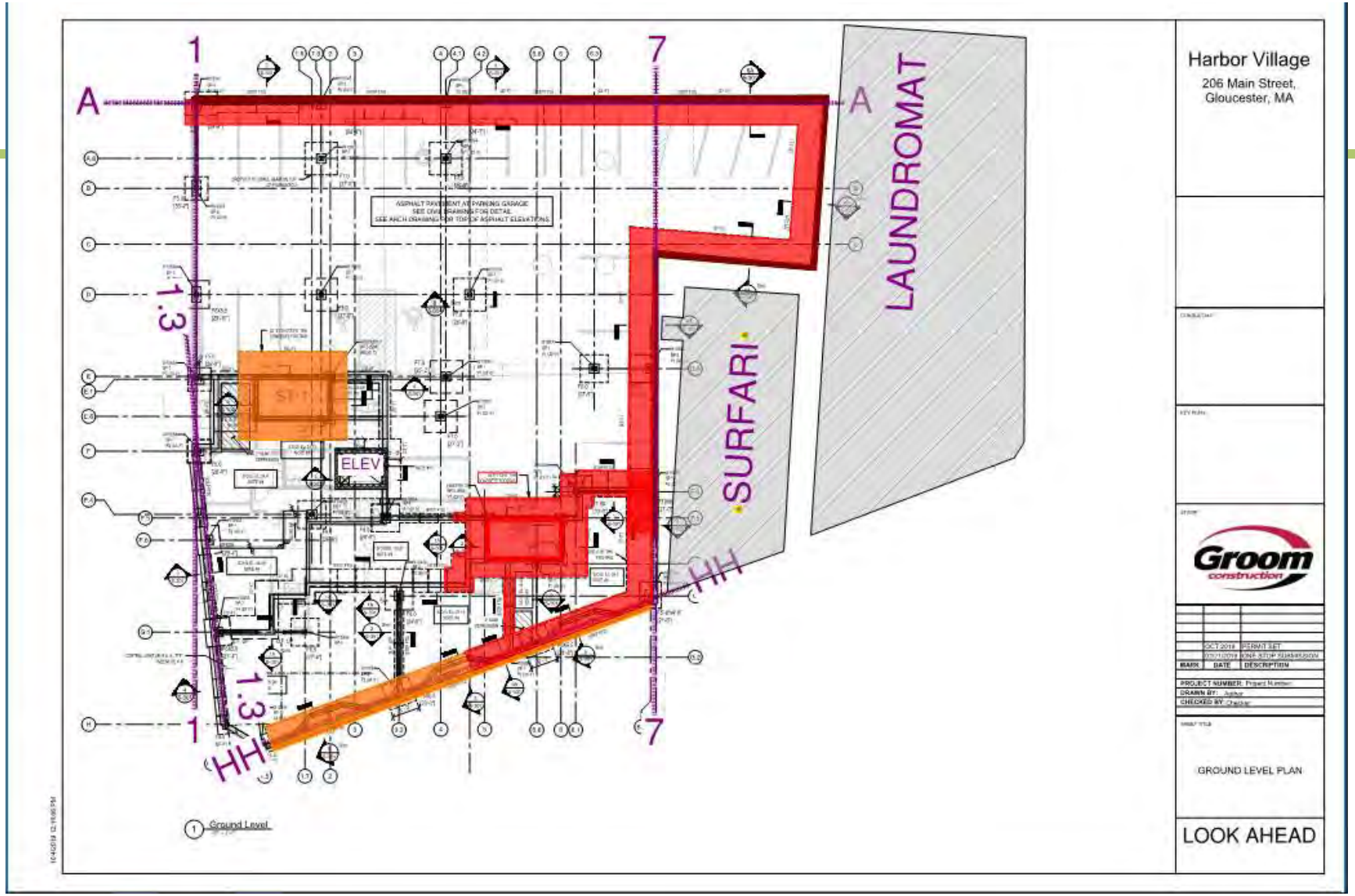
Job Number: 18-005001
Project Name: 206 Main Street Gloucester
Superintendent: Keith Maresalchi

Date: 4/13/2020
Start Date: 4/13/2020
End Date: 5/3/2020
Project Executive: Dave Groom
Project Manager: Matt Robbins

Entering S, B or X will shade cell automatically
S Scheduled | B Behind Schedule | X Will shade cell black

***Subcontractors must notify Groom Construction Project Manager or Superintendent within 24 hours of receiving this Three Week Look Ahead Schedule if not able to meet the schedule.

Item/Task	Subcontractor	Week #1 M 4/13	T 4/14	W 4/15	Th 4/16	F 4/17	Sa 4/18	Su 4/19	Week #2 M 4/20	T 4/21	W 4/22	Th 4/23	F 4/24	Sa 4/25	Su 4/26	Week #3 M 4/27	T 4/28	W 4/29	Th 4/30	F 5/1	Sa 5/2	Su 5/3	Remarks/Notes
BUILD ELECTRICAL INCLOSE FOR TEMP POWER	GROOM		S	S	S																		
FORM WALLS HH LINE	FORM UP	S	S	S																			MONDAY IS A RAIN OUT
FORM FOR PAD AT STAIR # 2	FORM UP	S	S	S																			
RECEIVE REBAR	GROOM	S																					
INSTALL DRAINAGE	LINSKEY	S	S	S	S	S			S	S													
FINISH DIGGING FOR FOOTING AT A LINE	LINSKEY		S																				
FORM FOOTING AT A LINE	FORM UP		S	S																			
POUR THE REST OF THE FOOTING ON A LINE	FORM UP			S																			
POUR PAD FOR STAIR # 2	FORM UP				S																		
REMOVE FORMS AT FOOTINGS AND PAD	FORM UP					S			S														
BACK FILL 1/2 OF THE WALL ON 7 LINE	LINSKEY										S	S											
FORM WALL ON A LINE	FORM UP								S	S	S												
POUR WALL ON A LINE	FORM UP											S											
START CMU STAIR # 2	VAZ											S	S			S	S	S	S	S			
FINISH DIGGING HH LINE FOR FOOTINGS , FORM AND POUR FOOTING HH LINE	LINSKEY AND FORMUP																	S	S				
POUR THE REST OF FOOTING ON HH LINE	FORM UP																			S			
HOPE FOR TEMP POWER	GROOM															S	S	S	S	S			


Harbor Village
206 Main Street,
Gloucester, MA
LAUNDROMAT
SURFARI
ELEV
ST
1
7
A
1.3
HH
Ground Level
Groom construction
OCT 2018 PERMIT SET
MARK DATE DESCRIPTION
PROJECT NUMBER: Project Number
DRAWN BY: Author
CHECKED BY: Checker
GROUND LEVEL PLAN
LOOK AHEAD

1. FOUNDATION: WATERPROOFING

2. STEEL POSTS

3. CMU WALLS

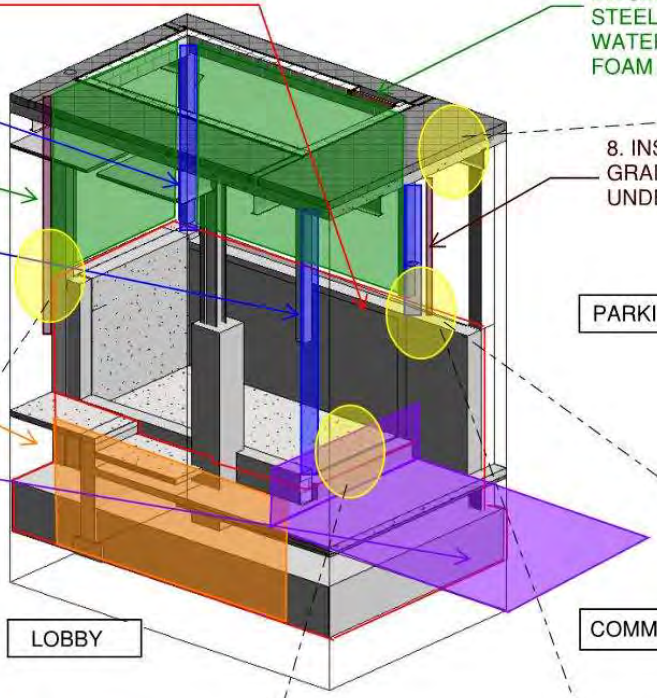
4. **INTUMESCENT** PAINT ON STEEL AS AIR BARRIER

5. SUB GRADE INSULATION MIN 48" BELOW GRADE

6. SUB SLAB INSULATION, VAPOR BARRIER, LAPS UP, SLAB POURED

7. AIR BARRIER ON CMU, LAP VAPOR BARRIER, INTUMESCENT PAINT ON STEEL & FOUNDATION WATERPROOFING & SPRAY FOAM UNDERSIDE OF DECK

8. INSULATION ABOVE GRADE, & SPRAY FOAM UNDERSIDE OF DECK

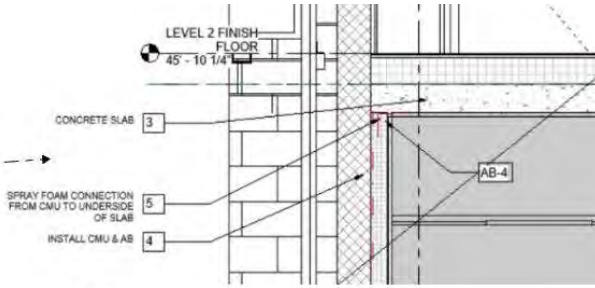


MECH

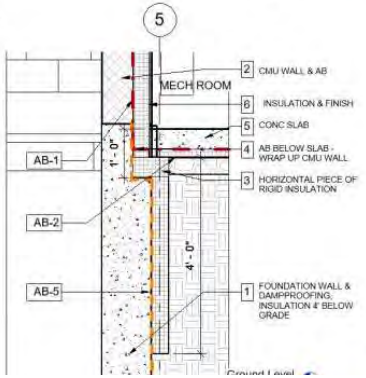
PARKING

LOBBY

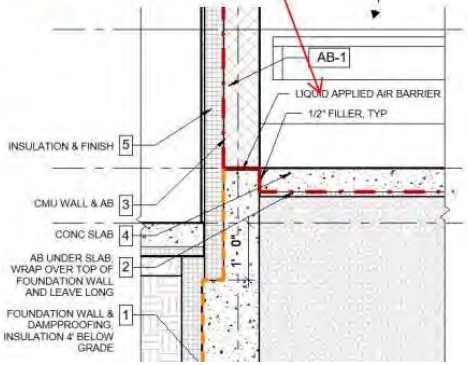
COMMERCIAL SPACE

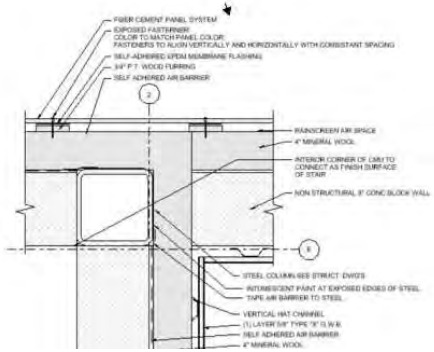


3/A116



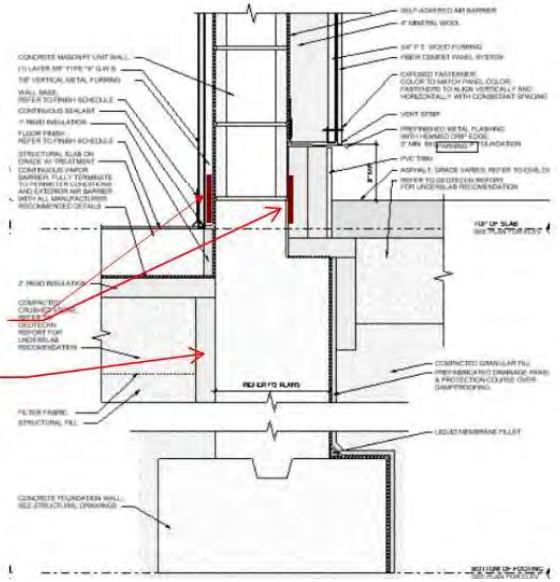
DO WE NEED?





TAPE TRANSITION

4' BELOW GRADE



LOBBY SEQUENCE

1. FOUNDATION: WATERPROOFING

2. STEEL POSTS

3. STRUCTURAL CMU WALLS

4. INTUMESCENT PAINT & STRUCTURAL THERMAL BREAKS

5. STRUCTURAL THERMAL BREAKS

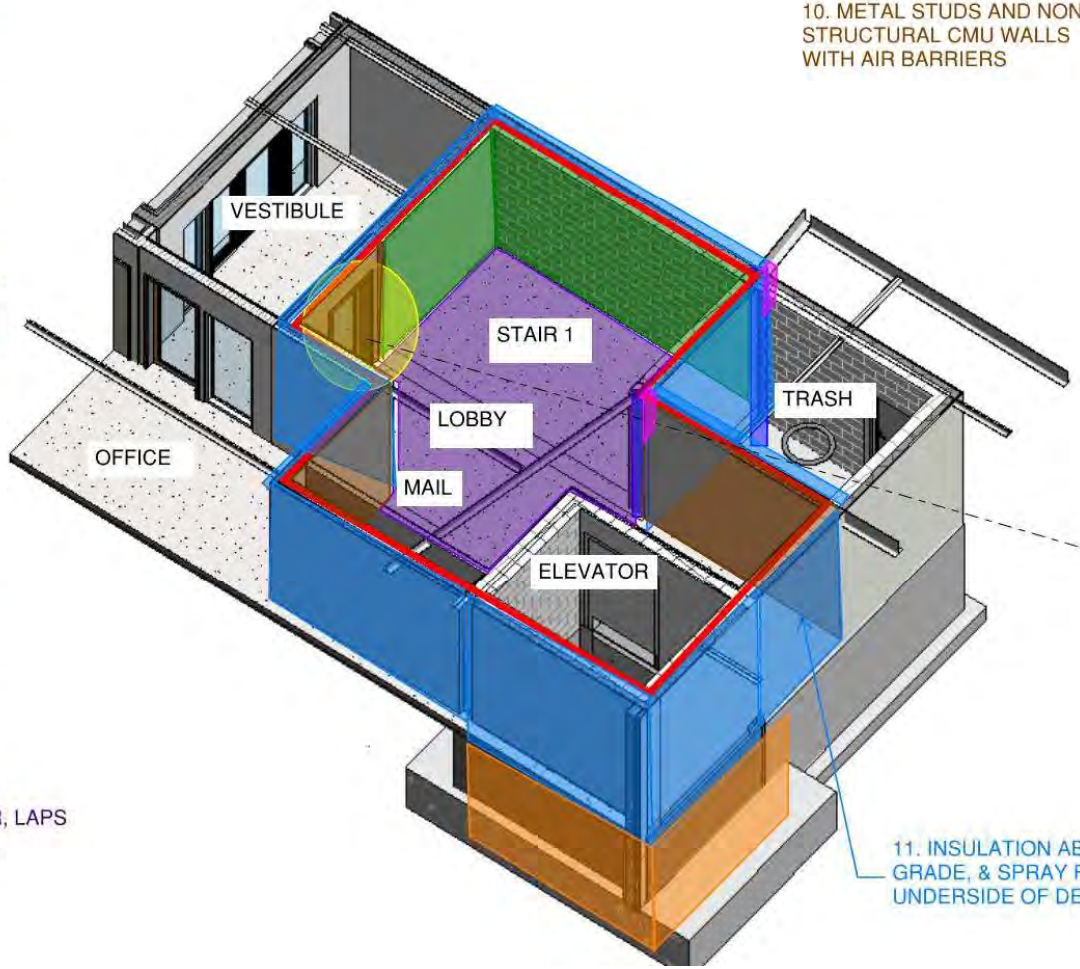
6. VERTICAL SUB GRADE

7. SUB SLAB INSULATION

8. VAPOR BARRIER, LAPS UP, SLAB POURED

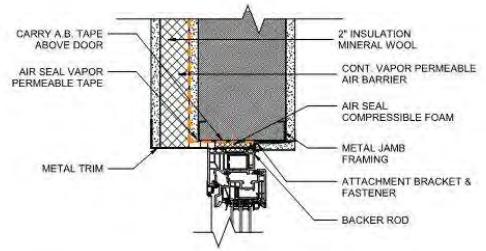
9. AIR BARRIER ON CMU

10. METAL STUDS AND NON STRUCTURAL CMU WALLS WITH AIR BARRIERS

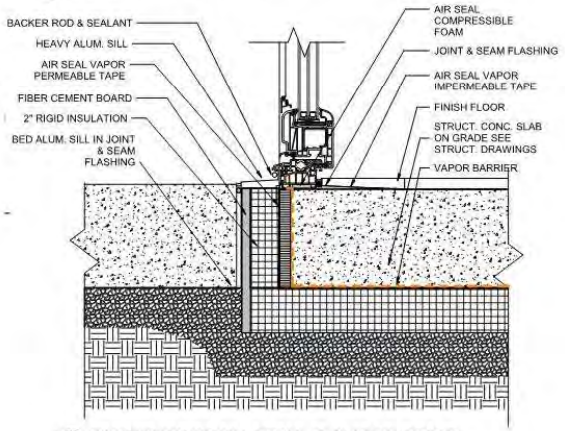


11. INSULATION ABOVE GRADE, & SPRAY FOAM UNDERSIDE OF DECK

DETAILS AT DOORS



2 PASSIVE HOUSE DOOR MTL JAMB DETAIL
3" = 1'-0"



1 PASSIVE HOUSE SILL DETAIL @ SLAB ON GRADE
3" = 1'-0"

INVEST IN CRAFT

ON SITE COMMUNICATION

SCHEDULE

SEQUENCE

TRADES

- Carpenters
- Insulators
- Plumbers
- HVAC Installers
- Electricians

Craft – Envelope Airtightness Continuity

Caio's Team rocking the Air Barrier

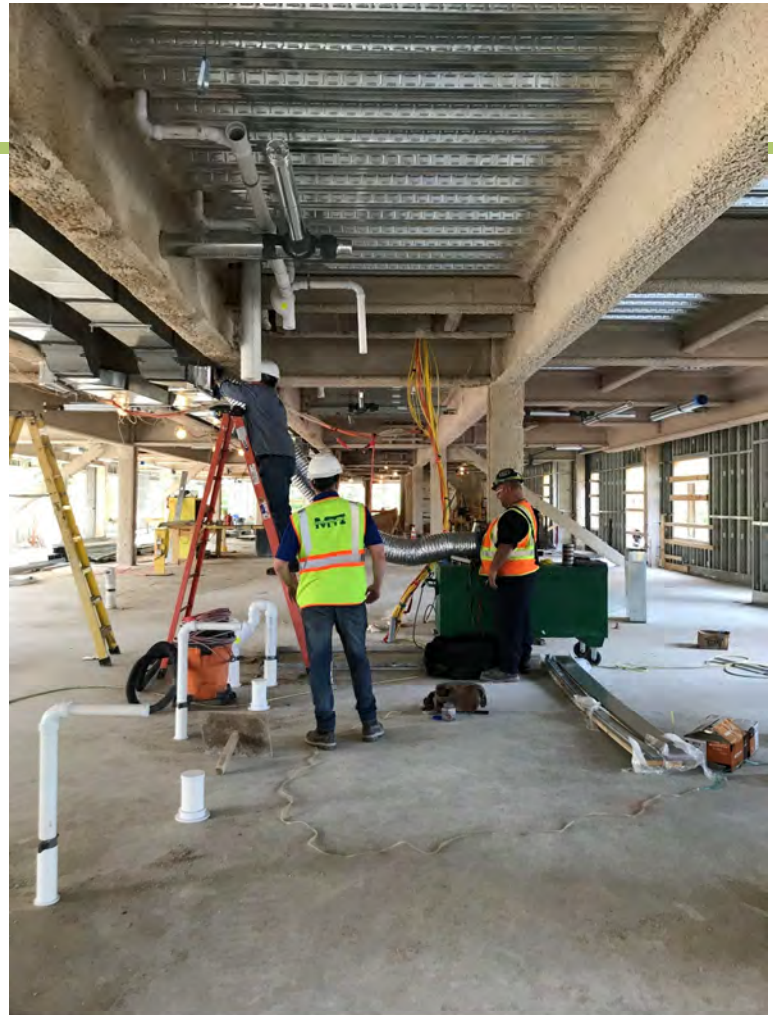
Craft: Pipe/Penetration Airtightness

First Try – Not Approved

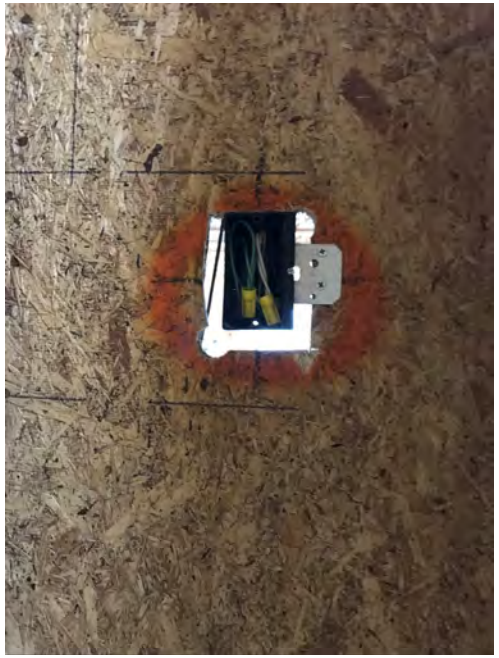
Ian Russell - Plumber

Second Try –Approved

CRAFT– HVAC



CRAFT– Electrician



Not Approved

Approved

Not Approved

Approved

CONFIRMATION: TESTING/VERIFICATION

REGULAR INSPECTIONS

INFRARED

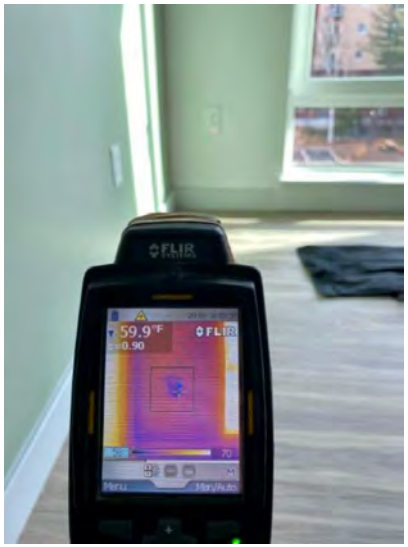
BLOWER DOOR TESTING & TROUBLESHOOTING

COMMISSIONING

TESTING/VERIFICATION

Windows
Airtightness
Duct Leakage
Thermal Bridging/Gaps

.6 ACH$_{50}$	2611 CFM$_{50}$
DUCLOS METHOD RECOMENDATIONS	
Stage #1 Test (envelope no windows & Doors)	652.75 CFM$_{50}$
Stage #2 Test (windows & doors)	1552.75 CFM$_{50}$
Stage #3 Test (MEP penetrations)	2219.35 CFM$_{50}$



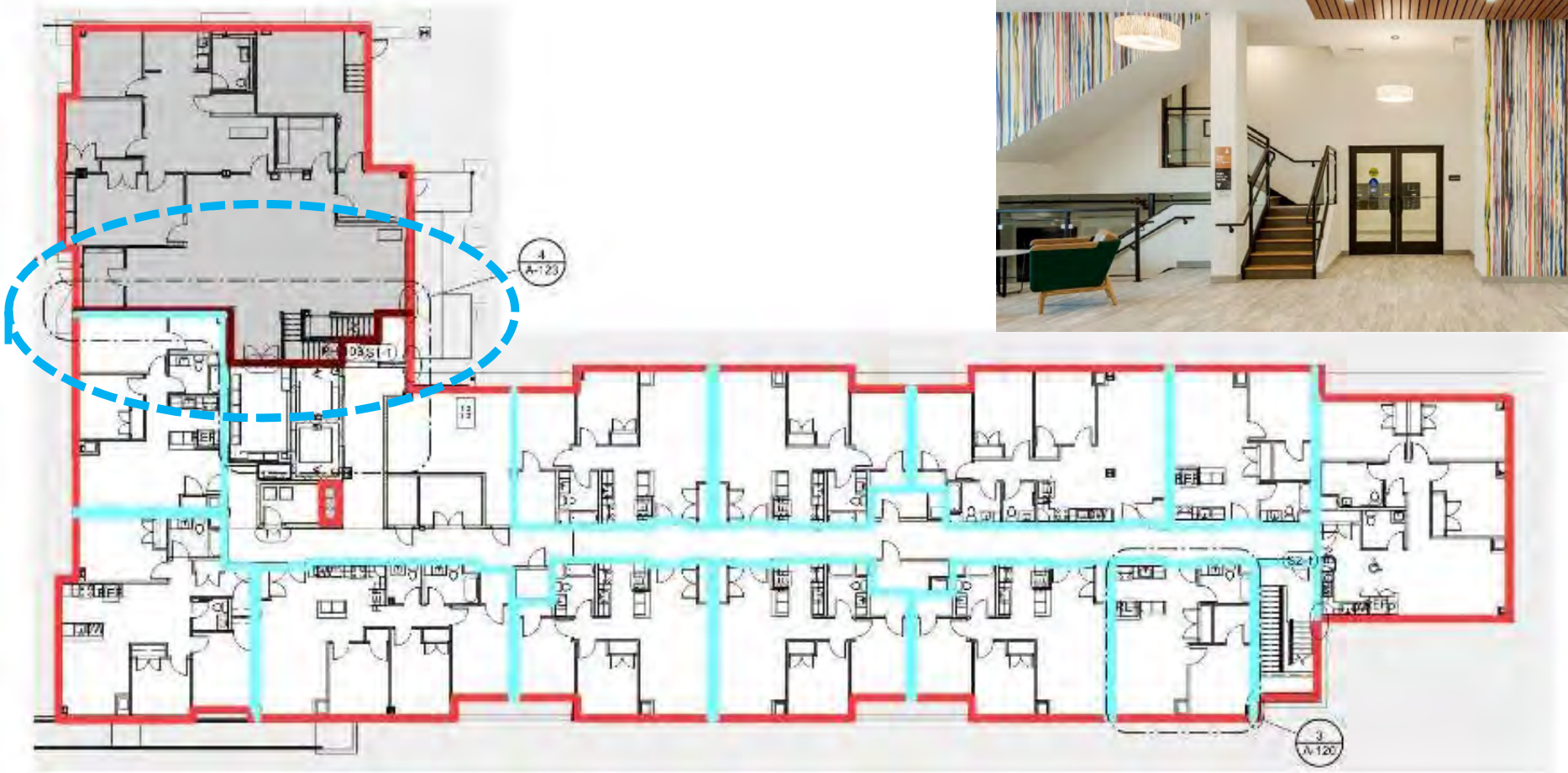
CONFIRMATION: TROUBLE SPOTS

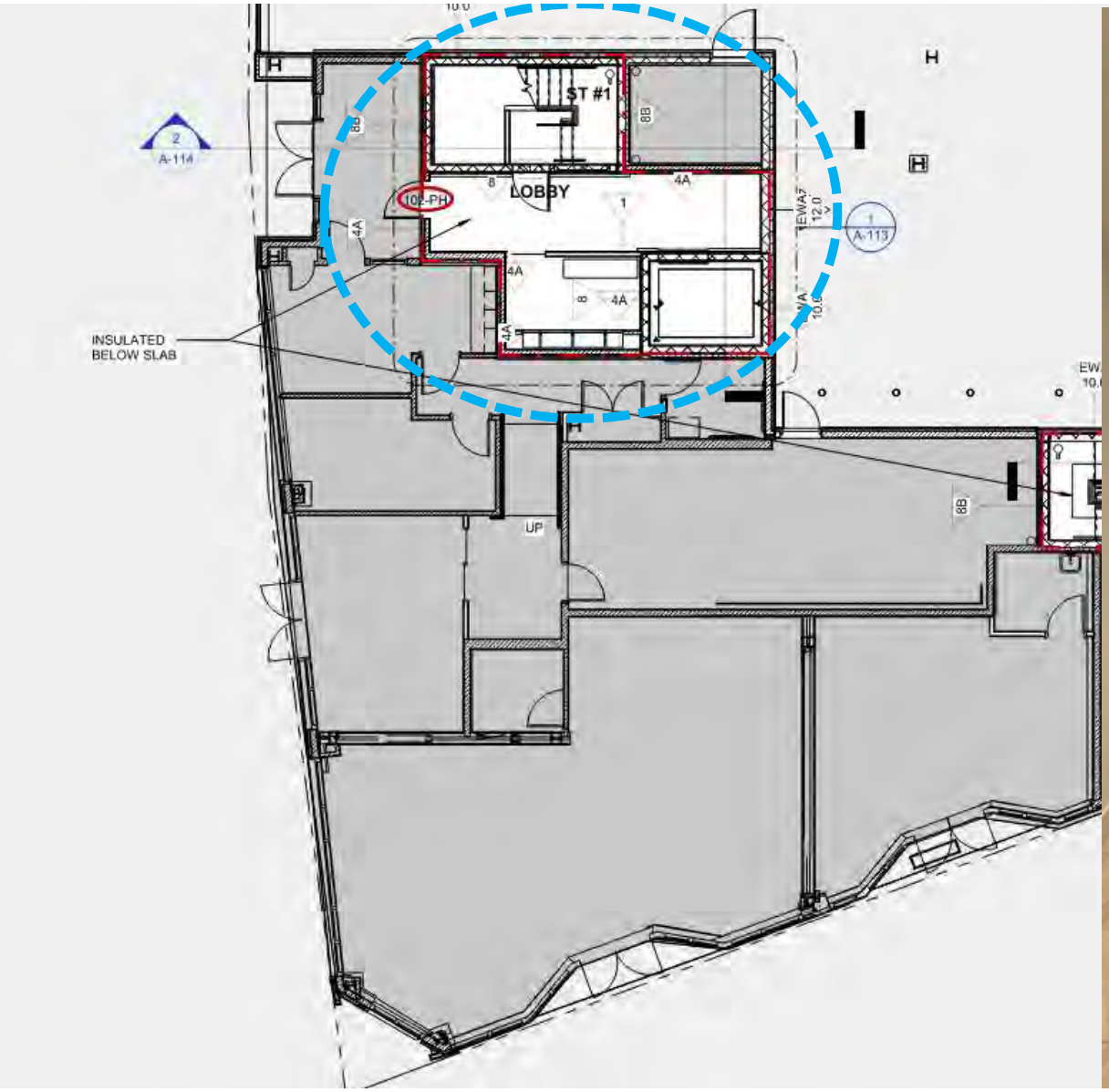
BLOWER DOOR TESTING

Adiabatic Transitions

Compartmentalization


675
FINCH
CAMBRIDGE


4
A-123
3
A-120


ST #1
LOBBY
102-PH
INSULATED
BELOW SLAB
UP
2
A-114
1
A-113


Welcome

TEAMWORK

Owner
Architect
Mechanical Engineer
Structural Engineer
Energy Modeler/CPHC
Rater/Verifier
Envelope Consultant
Commissioning Agent
General Contractor
Trades

Michelle Apigian
AIA, LEED AP, AICP, CPHC
Associate Principle, Practice + Sustainability Leader
mapigian@iconarch.com
627-939-0721

E-ICON ARCHITECTURE

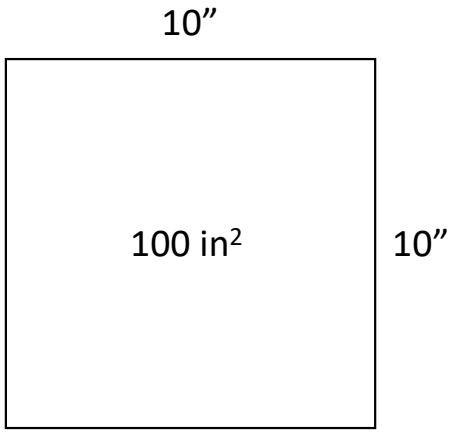
LESSONS LEARNED

Whole Building Air Tightness: Harbor Village

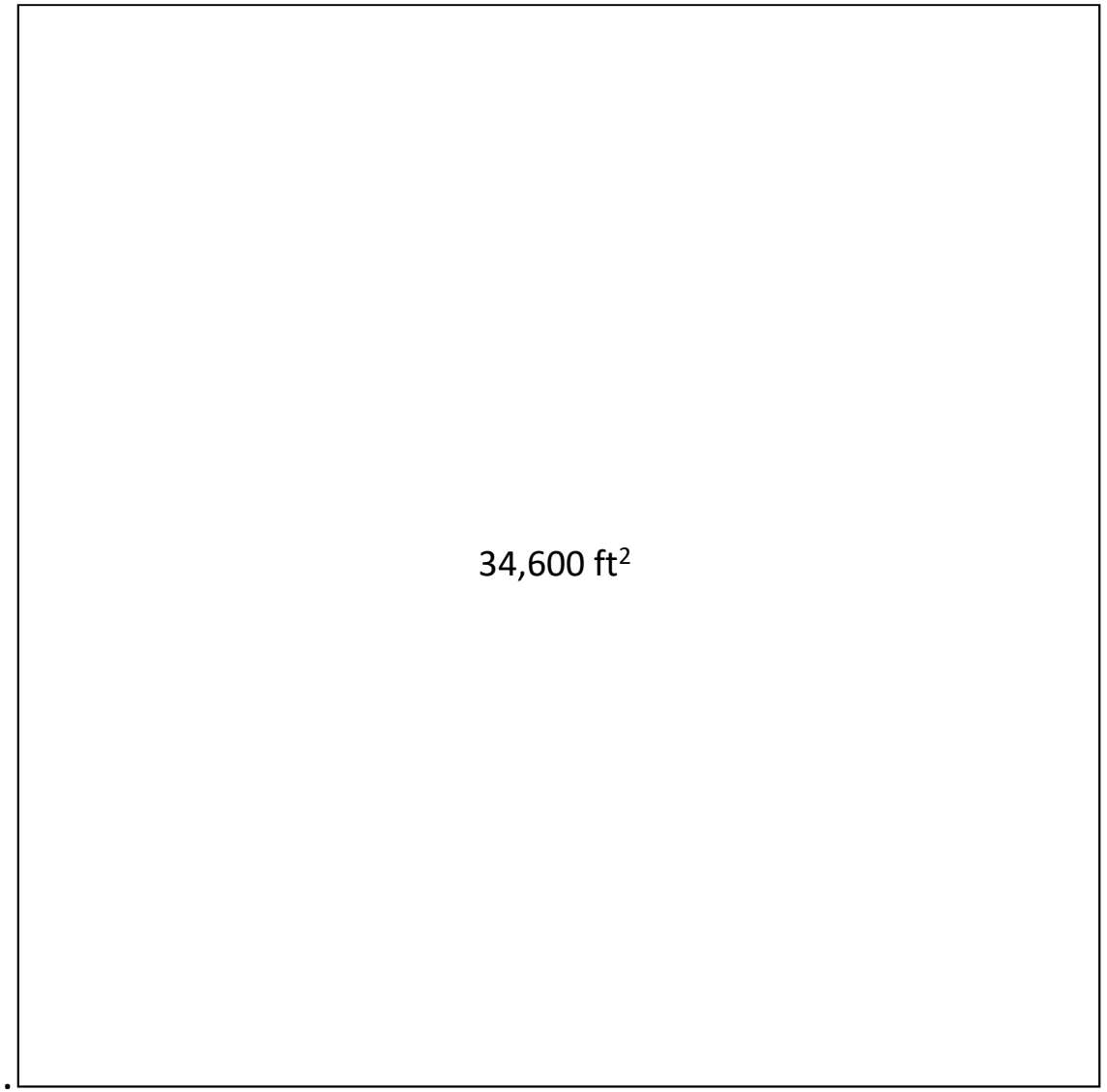
WBBD Test Protocol

- **Testing Standard**
  ASTM E779
- **Testing Preparation**
  Appendix F - ANSI/RESNET/ICC 380-2016: Procedure to Prepare the Building for Testing
  Phius Variance – Barometric/spring-loaded dampers to be sealed in the direction of the test for which they will be force-failed open. Fresh air intake dampers sealed during depressurization, exhaust dampers to be sealed during pressurization.
- **Results Reporting**
  Report both pressurization and depressurization testing, final result is average of the two.
  Pass-fail air infiltration target test.
  WUFI model test (can exceed pass-fail threshold, provided energy model results to not exceed threshold metrics).
- **Best Practices for Mid-Point and Final Testing**
  Test plan with: site information, testing and site staff contacts, building control plan, test type and targets, equipment list, building preparation protocol, temporary air sealing checklist, and schedule.

Allowable Effective Leakage Area



Effective Leakage Area vs. Total Enclosure Area

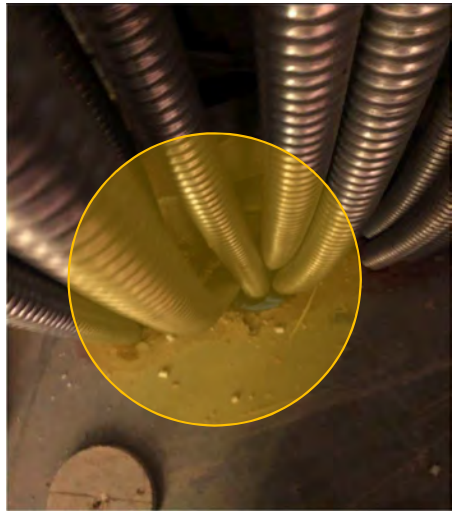


WBBD Results – Midpoint to Final

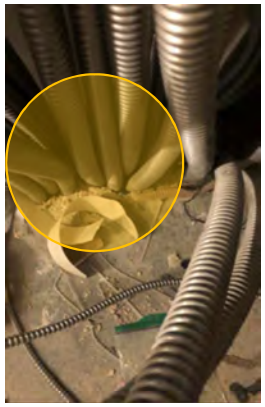
Date	CFM50 (depress.)	CFM50 (press.)	CFM50 (avg.)	ACH50
2/26/21	5,486	-	-	1.44
5/14/21	4,233	-	-	1.11
6/4/21	3,288	-	-	0.86
7/8/21	2,850	-	-	0.75
7/26/21	1,953	2,190	2,072	0.54

What Worked

2/26/2021 – Midpoint 1

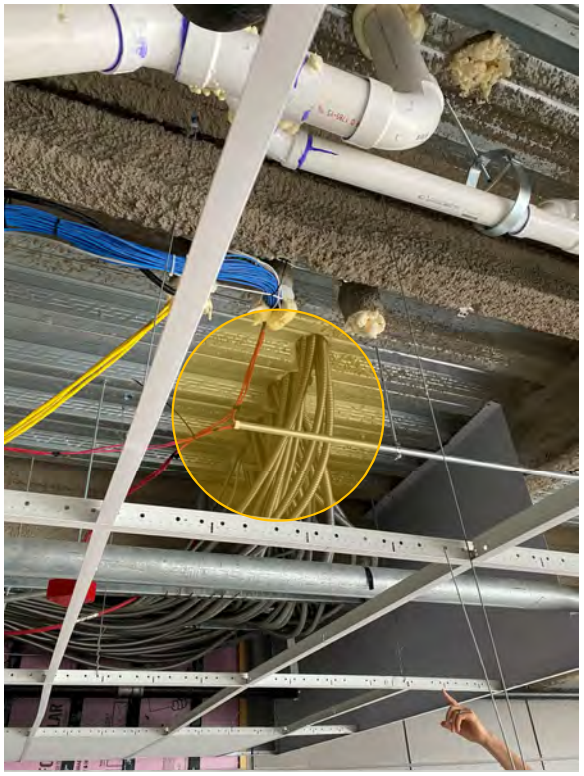


5/14/2021 – Midpoint 2



7/8/2021 – Midpoint 4

7/26/2021 - Final



Other Approaches to Try

Squirrelwood
Across the Finish Line – PH Lessons

NEW ECOLOGY
Community-Based Sustainable Development

CALLAHAN
CONSTRUCTION MANAGERS

Squirrelwood - Speakers and Team

Callahan training

Maciej Konieczny
CPHC/B, CEM, LEED AP BD+C, Homes
Senior Project Manager
konieczny@newecology.org
617-557-1700 x7024

NEW ECOLOGY
Community-Based Sustainable Development

Chris Becker
CPHB
Project Manager
cbecker@Callahan-inc.com
508-443-2381

CALLAHAN
CONSTRUCTION MANAGERS

Owner:	**Just-A-Start Corporation** Cambridge, MA
General Contractor	**Callahan Construction Managers** Bridgewater, MA
Architect:	**Davis Square Architects** Somerville, MA
Civil:	**Develllis Zrein, Inc.** Foxborough, MA
Structural:	**Dan Bonardi Consulting Engineers** Arlington, MA
MEP:	**BLW Engineers, Inc.** Littleton, MA
Sustainability:	**New Ecology, Inc.** Boston, MA
BECx	**Building Enclosure Associates** Boston, MA

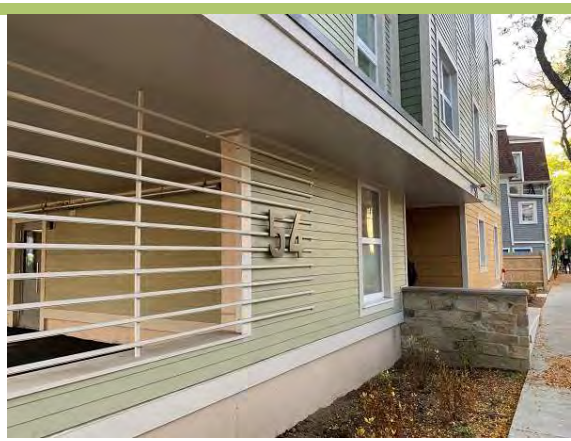
SQW – Objectives

Agenda:

- Project Summary
  - PHIUS targets
  - Envelope, Systems
- Process Review
  - Design and pre-construction services
  - Start of construction/training
  - Mock-up
  - Collaboration
- Construction
  - Challenges and Solutions - Examples
- Q+A

SQW – Project Summary

- Owner/Developer: Just-A-Start
- 14 affordable family units
- PHIUS+ 2015
- iCFA: 13,400 ft²
- Opening Fall 2021

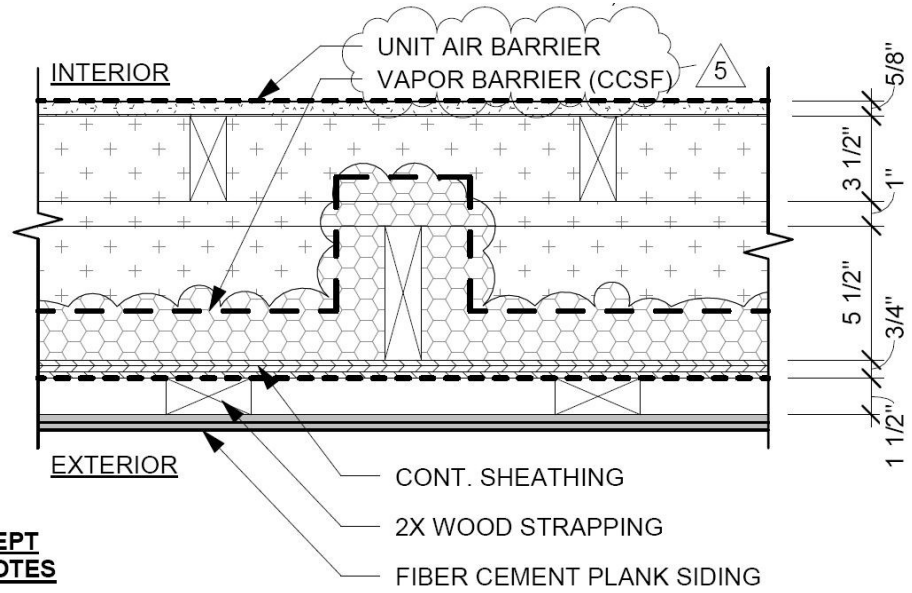


	Target	Modeled
Heating Demand; kBtu/ft²yr	5.3	3.11
Cooling Demand; kBtu/ft²yr	2.9	1.59
Heating Load; Btu/hr	4.4	3.21
Cooling Load; Btu/hr	4.2	2.49
Source Energy; kWh/yr	6,200	5,541
Air Tightness	0.05 cfm/ft² (971 cfm)	653 cfm (0.27 ACH50)

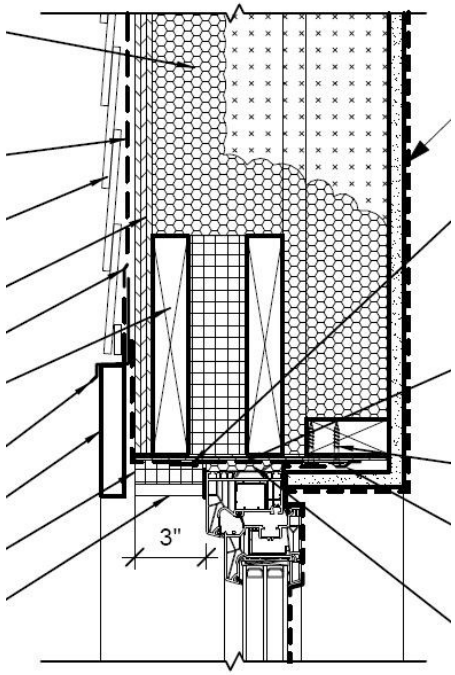
3rd tightest MF building in US, excluding THs

SQW – Envelope

- Double studded wall
  - 2x6 structure; 1” space; 2x4 interior wall
  - Staggered studs, 24” O.C. as allowed
  - 3” CCSF inc. studs + 7” Cellulose
  - Siga AWB



- Windows
  - Triple Pane; clips
  - Insulated Headers
  - Siga Wigluv flashing



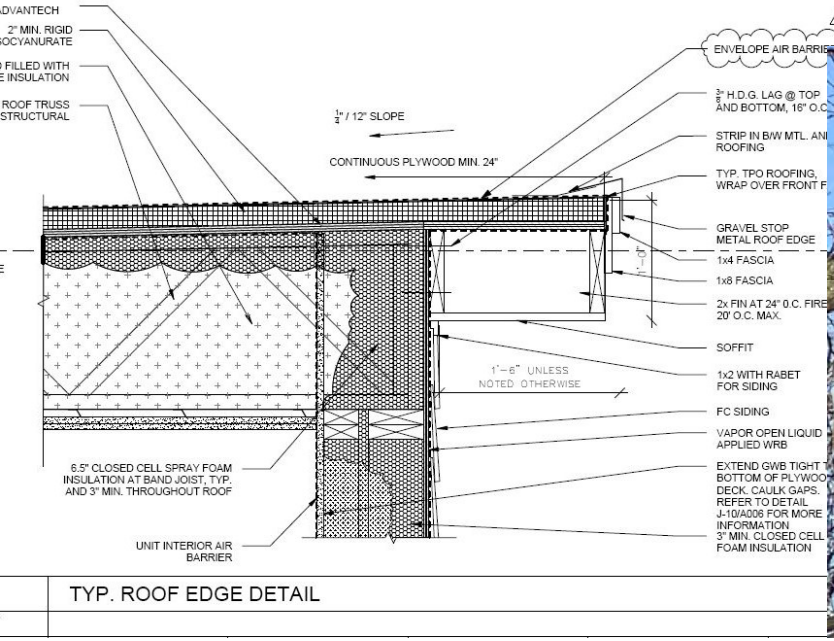
SQW – Envelope

Roof:

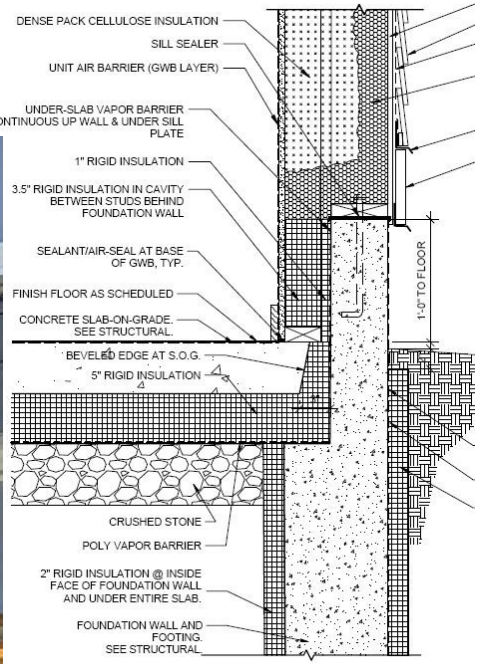
- 2” min Polyiso above roof deck
- 20” Truss depth with 4” of CCSF
- 16” cellulose

Foundation/Slab

- 5” EPS sub-slab insulation
- 15 mil Steggo Wrap VB taped to Siga WRB
- 2x2” EPS foundation



TYP. ROOF EDGE DETAIL



SQW – Systems

Ventilation:
- Ventacity VS1000;
- 82% Eff; 0.61 W/CFM
- 850 CFM

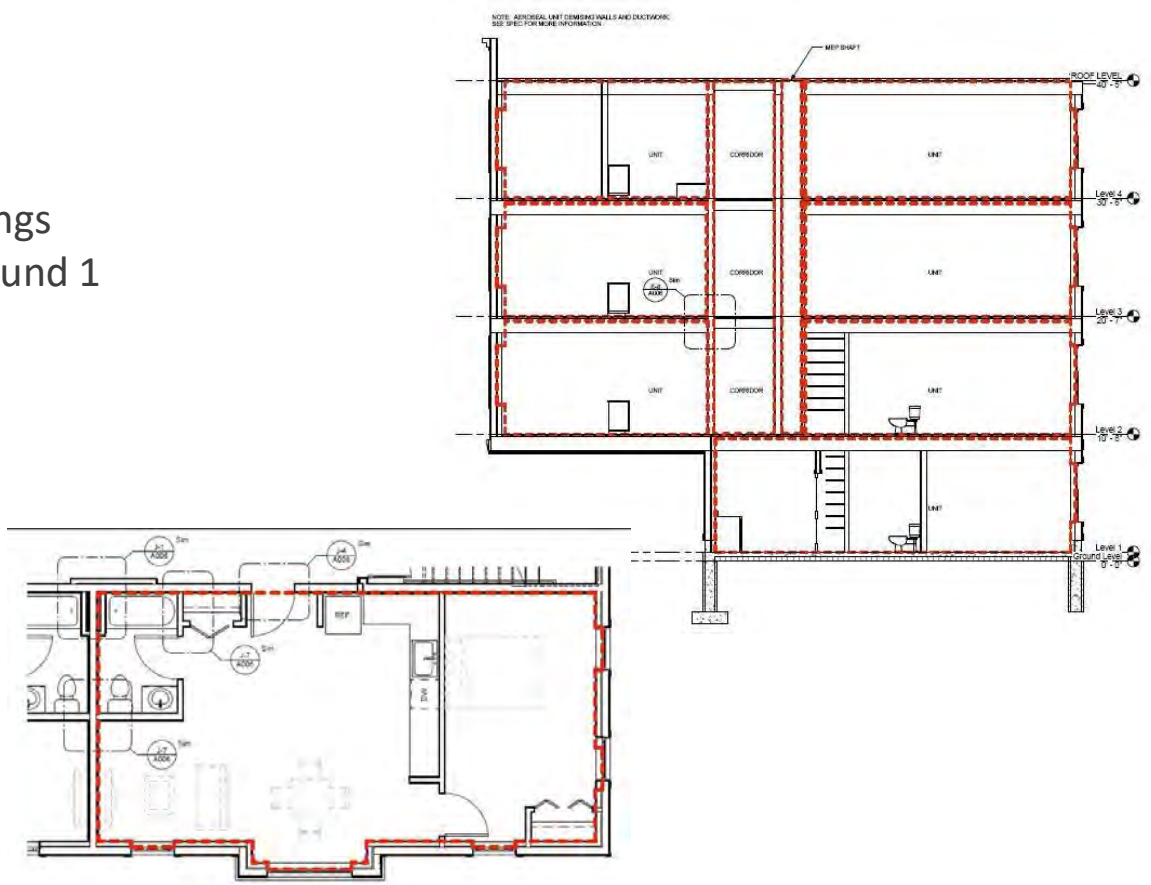
DHW:
- Instantaneous Electric
- Stiebel Eltron

Heating/Cooling
- Mitsubishi SUZ-KA HPs

SQW – Process

Design and pre-construction services

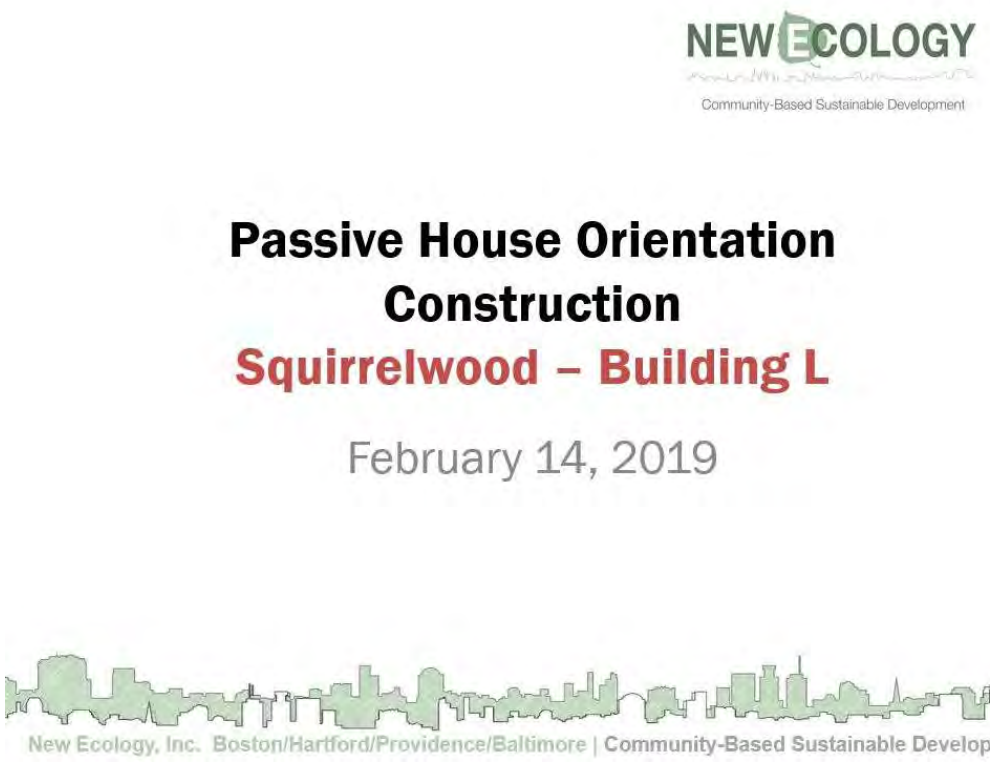
- Commit to PH early
- Include GC at DD or earlier
- Schedule multiple integrated design meetings
- Submit project to PHIUS at ~50% DD for Round 1 review
  - Experienced energy modeler is critical
- CPHC to participate in VE
- Use color in drawings



SQW – Process - Training

Start of construction/training
- Reach out to GC before kick off
- Include PHIUS verifier, BECx
- Foremen of each trade required
- Involve subs in motivation behind the PH goal
  - People like to understand what and why?
- Focus meeting on working through details
- **Collaborate** – NOT just a lecture

Collaboration
- Between design and construction teams
- Between GC and sub contractors
- GC and Subs are very knowledgeable even if this is their first PH
- Listen to constructability suggestions



SQW – Process – Mock-Up

Dedicated Mock-Up

- Most important stage of construction Assume multiple visits from CPHC and BECx
- Bring window and AWB manufacturer on site
- Identify critical details and transitions:
  - Foundation/slab/wall
  - Wall: AWB/insulation, inside/outside corners
  - Window flashing/install
  - Wall/Roof transition
  - MEP Penetrations
  - Doors –Leave up until building reaches the same level of completion
- COLLABORATE

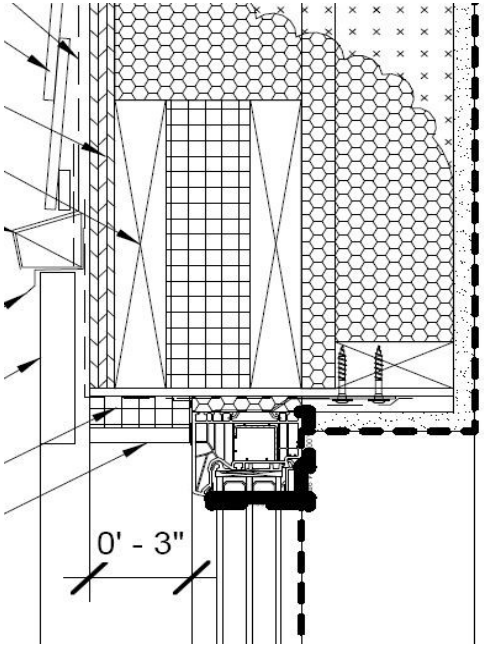
SQW – Process – Mock-Up

Require proper tools

Document each step

Involve all related subs

SQW – Process – Mock-Up



Pay attention to details and adjust as needed

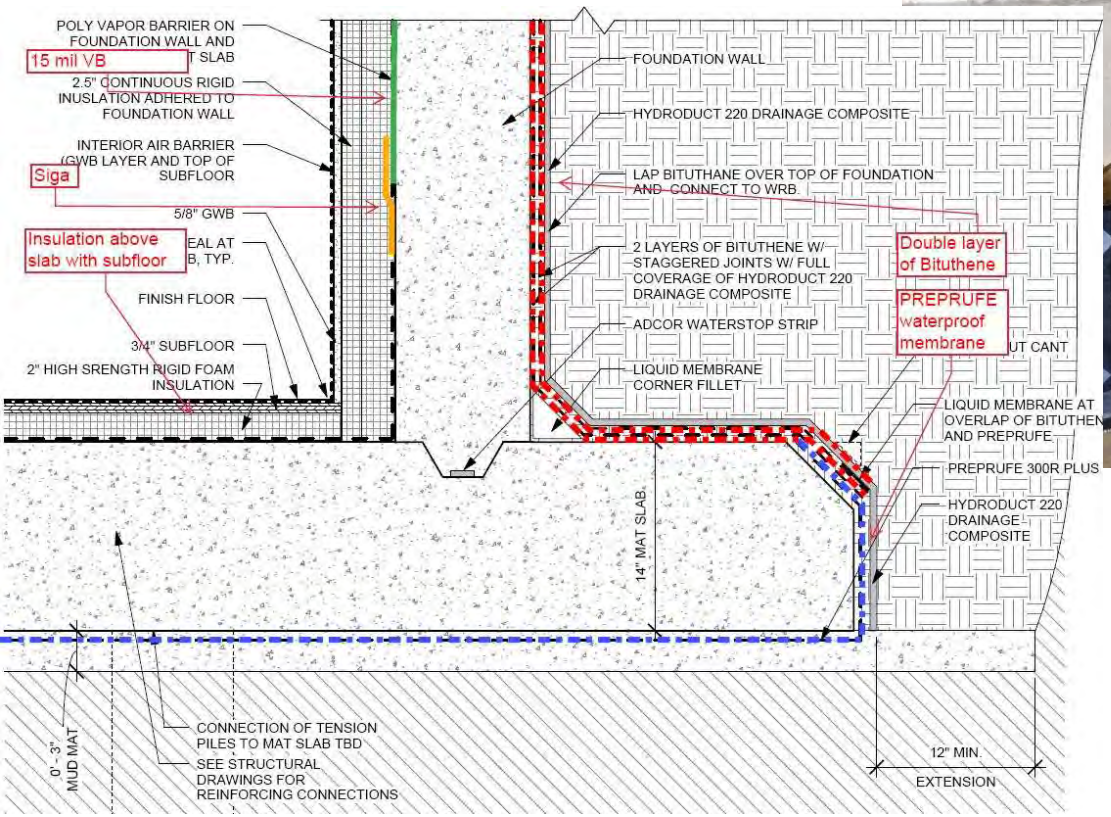
Track the details

Finalize and confirm approach

Leave up until installed in situ

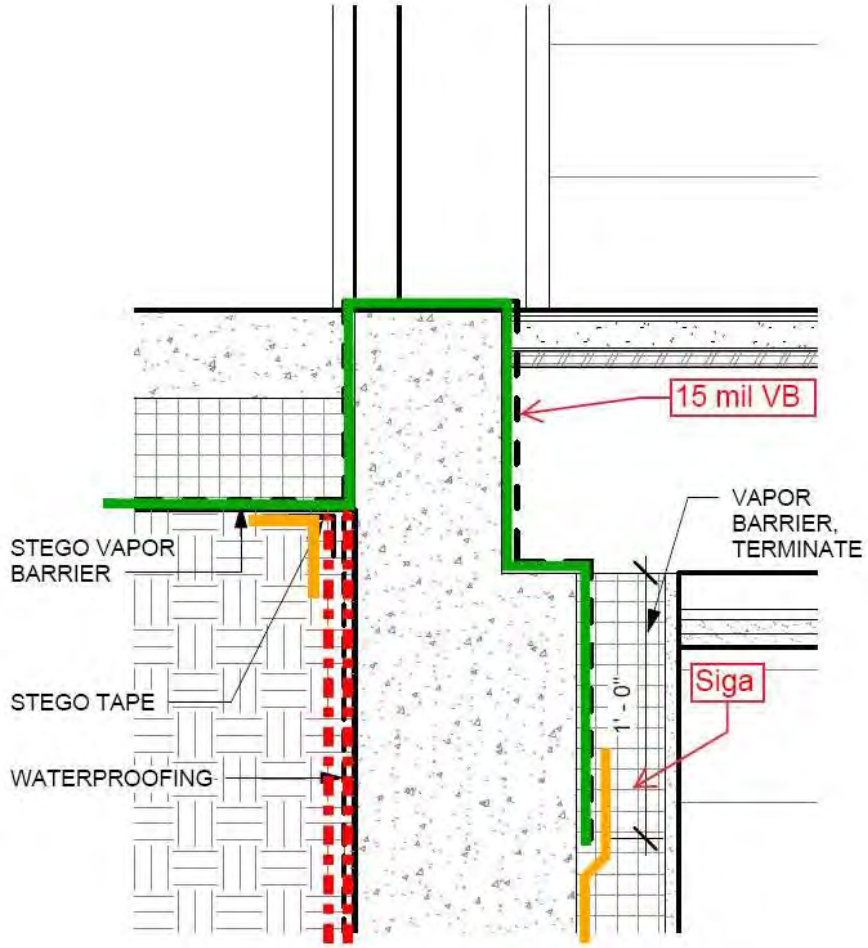
SQW – Challenges and Solutions

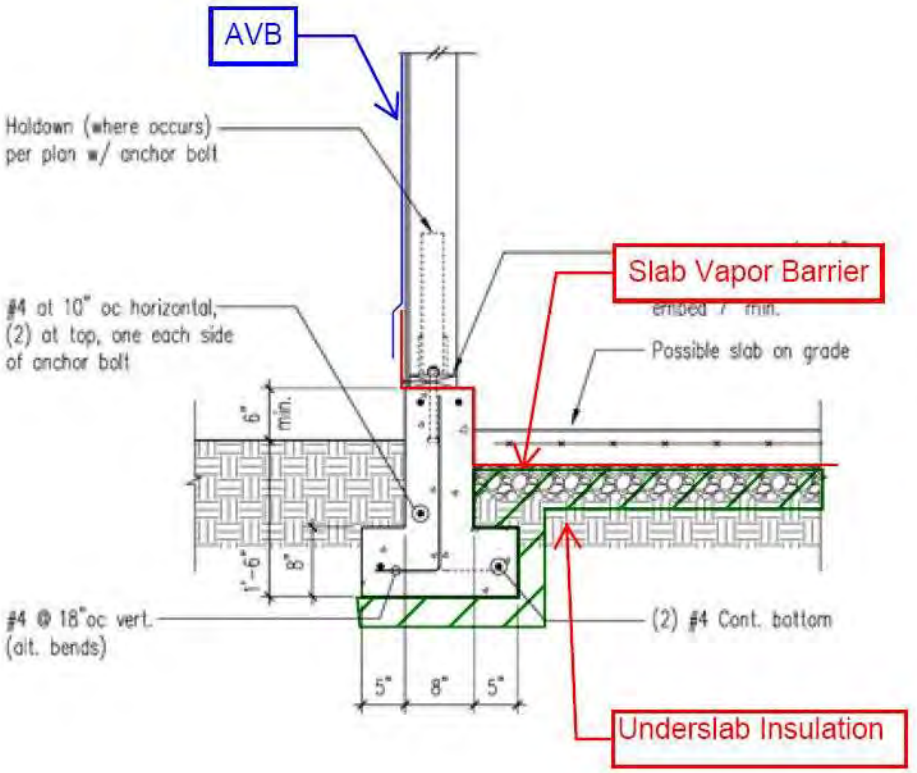
Detail created after design – PREPRUFE membrane and mat slab required due to high water table.



SQW – Challenges and Solutions

VB to AWB Continuity



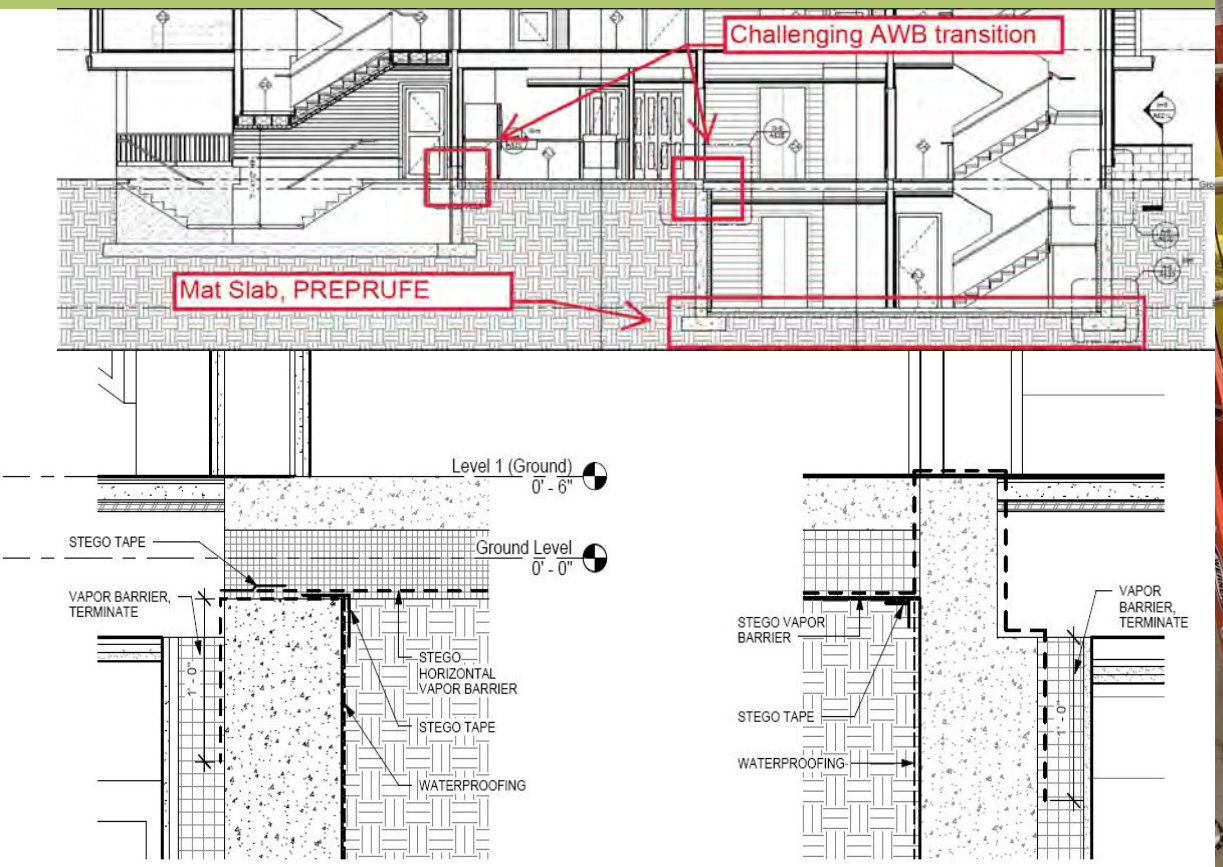


SQW – Challenges and Solutions

Awkward transition for AWB

SQW – Challenges and Solutions

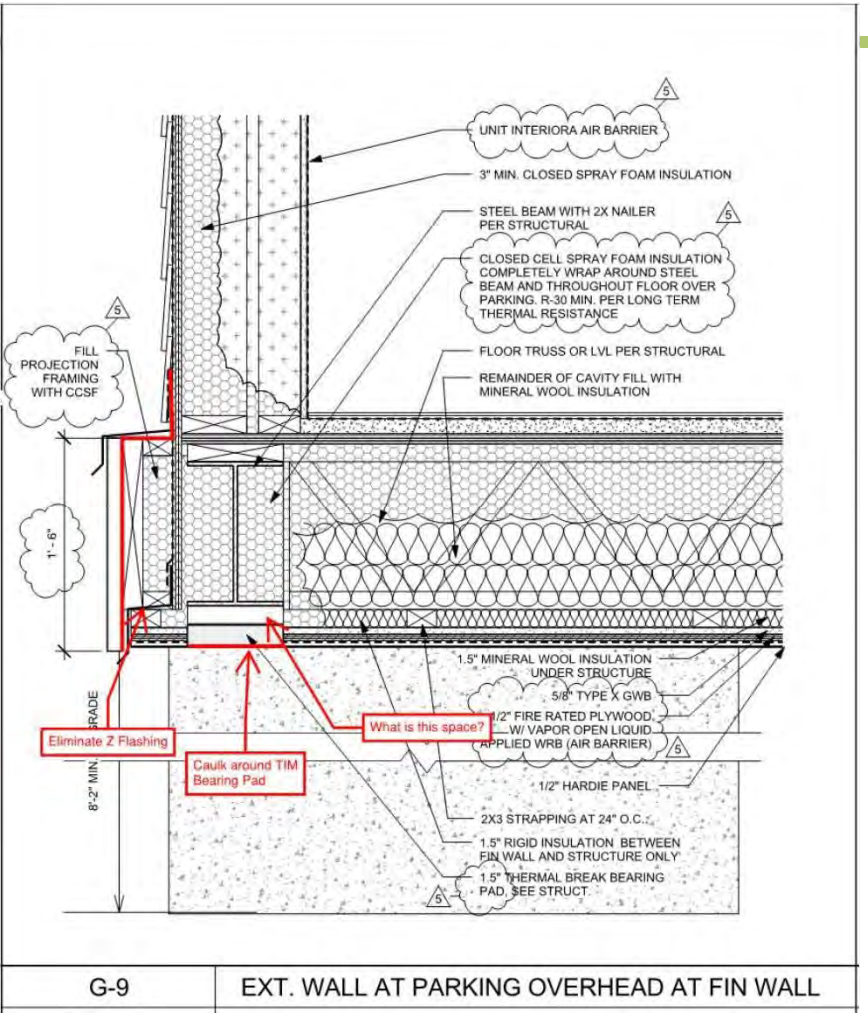
Challenging AWB transition



Vapor Barrier @ M - Slab on Grade at Wood

Vapor Barrier @ L - Slab on Grade at Wood

SQW – Challenges and Solutions

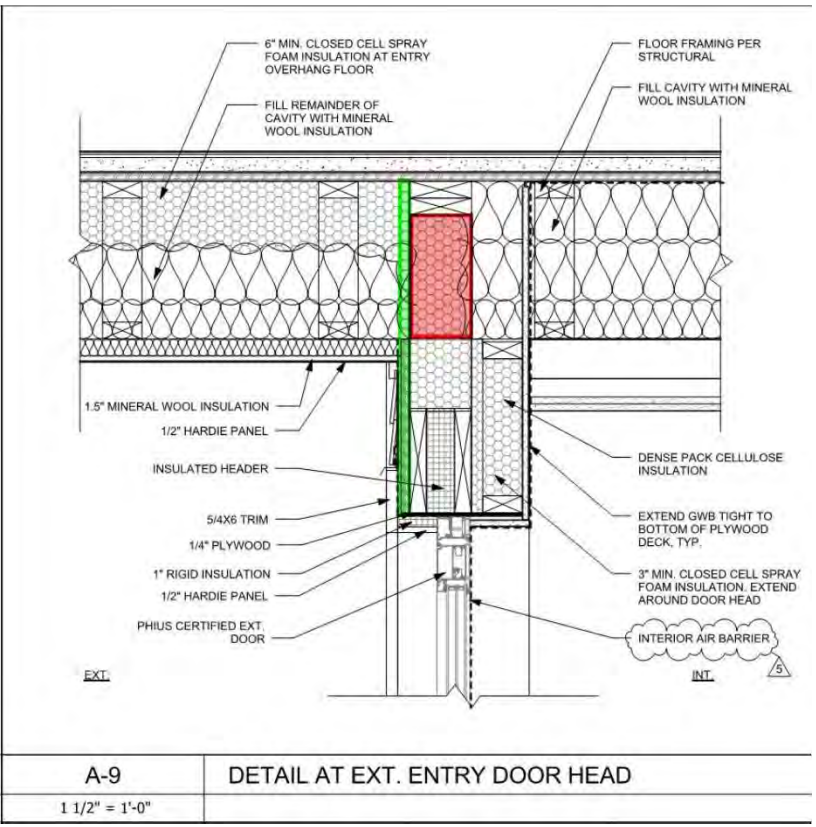


QUESTION

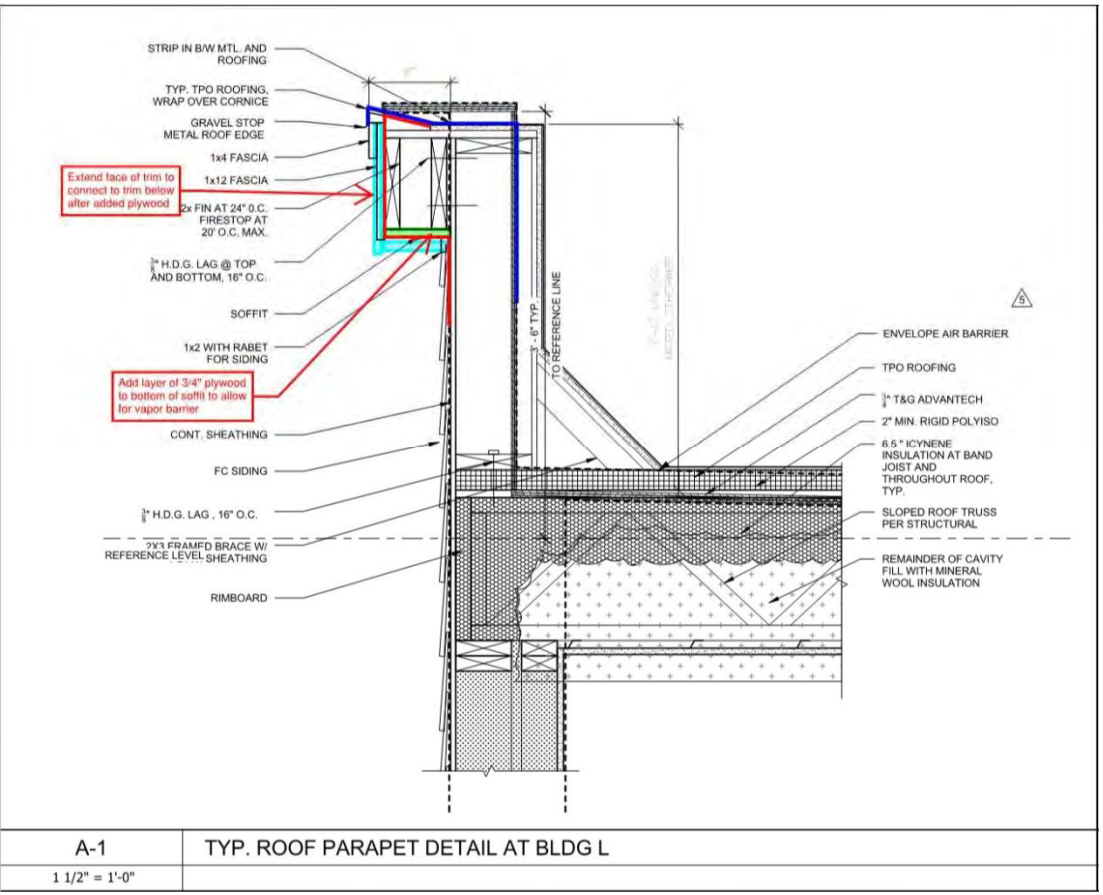
During our Passive House meeting on 12/4/19, we reviewed the TIM Bearing pad on detail G9/A530. There is a space above the bearing pad that is not marked. Please advise what this material is. Also, the vapor barrier was discussed and the TIM bearing pad's penetration through the vapor barrier in (4) locations. After review with New Ecology and Bridgeline we agreed the best way to maintain the vapor barrier in these locations is going to be by caulking the TIM bearing pad making it part of the vapor barrier. Please confirm this is acceptable in these (4) locations.

SQW – Challenges and Solutions

Maintain unit compartmentalization



SQW – Challenges and Solutions



QUESTION

During our Passive House meeting on 12/4/19, we reviewed the vapor barrier in detail A1/A540. Per our discussions, the way the vapor barrier is currently drawn would not be constructible. Reviewing with New Ecology, Bridgeline, and Max Sontz roofing, we propose to add plywood to the bottom of the soffit (green), and have the vapor barrier (red) run on the outside of the soffit as show in the attached. The trim on the exterior would need to be larger to account for the depth of the plywood and create the same profile as the original design. Please confirm this approach is acceptable.

SQW – Challenges and Solutions

QUESTION

...

SQW – Challenges and Solutions

QUESTION

…

SQW – Challenges and Solutions

Thermal Insulating Pads

SQW – Challenges and Solutions

Polyethylene Suspensi
work – insulation shou
– find correct photo
Find insulated pipe ha
like rain leaders

SQW – Challenges and Solutions

GC Quality Control – Punchlist by trade

#55 **General**

Status
Open

Type
Issue

Description
Patch and seal around on
Over cut electrical boxes

Created
Nov 18, 2020 2:07 PM
sbartley@callahan-inc.com

Last Updated
Nov 18, 2020 2:07 PM

Sheet
4 Punchlist Third Floor

Photos

20201118_104610_photo
Steve Bartley
Nov 18, 2020 10:46 AM

20201118_104559_photo
Steve Bartley
Nov 18, 2020 10:46 AM

#213 **General**

Status
Open

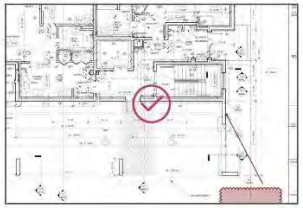
Type
Issue

Description
Seal all penetrations

Created
Nov 19, 2020 1:51 PM
sbartley@callahan-inc.com

Last Updated
Nov 19, 2020 1:51 PM

Sheet
2 Punchlist First Floor



Photos

20201119_114002_photo
Steve Bartley
Nov 19, 2020 11:40 AM

SQW – Challenges and Solutions

QUESTION

...

#210 Plumbing

Status
Open

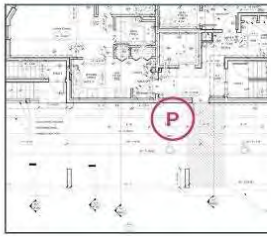
Type
Issue

Description
Seal all plumbing penetrations below

Created
Nov 19, 2020 1:50 PM
sbartley@callahan-inc.com

Last Updated
Nov 19, 2020 1:51 PM

Sheet
2 Punchlist First Floor



Photos

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Steve Bartley
Nov 19, 2020 11:37 AM

20201119_113716_photo
Steve Bartley
Nov 19, 2020 11:37 AM

#182 Duct Work

Status
Open

Type
Issue

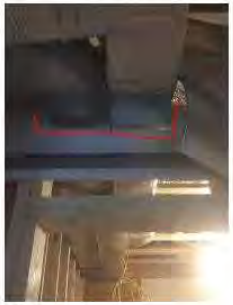
Description
Seal all ductwork

Created
Nov 19, 2020 1:45 PM
sbartley@callahan-inc.com

Last Updated
Nov 19, 2020 1:45 PM

Sheet
2 Punchlist First Floor

Photos



20201119_110314_photo
Steve Bartley
Nov 19, 2020 11:03 AM

20201119_110246_photo
Steve Bartley
Nov 19, 2020 11:03 AM

SQW – Challenges and Solutions

Ventilation testing … and failure.

Sqirrelwood Bldg L Ventilation

	SUPPLY			EXHAUST		
	Unit Design	Flow	Delta	Unit Design	Flow	Delta
TOTAL	850	724	15%	850	845	1%

724	845	14%
764	845	10%

CFM of Supply needed to get within 10%

40

CFM of Supply per unit need to get within 10%

3

SQW – Challenges and Solutions

AeroSeal –
- Saves time and hassle
- Include on every project

https://makeitright.ca/holmes-advice/home-renovation/aeroseal-the-new-way-to-duct-sealing/

AEROSEAL

DUCT SEALING REPORT

Duct Sealing Performed For:

Squirrelwood Apartments
261 Broadway St
Cambridge, MA 02139

DATE:
6/4/2021

AEROSEAL CASE ID: 3068
SYSTEM DESCRIPTION: Central Rooftop ERV
SEAL DESCRIPTION: Sealing Main, 1st, 2nd and Basement Exhaust
HARDWARE: Gen2
TECHNICIAN: R Gomez

Overall Sealing Results:

BEFORE SERVICE

774.7 CFM of Leakage, equivalent to a
36.8 Square Inch Hole or
0.00% of the system capacity of 0.0 CFM

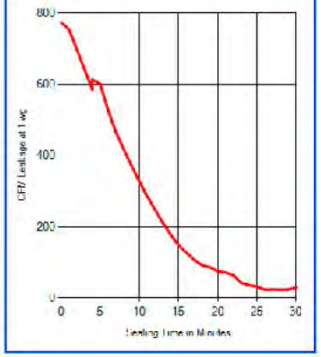
AFTER SERVICE

29.0 CFM of Leakage, equivalent to a
1.4 Square Inch Hole or
0.00% of system capacity

This corresponds to a
96% Reduction in Duct Leakage

NOTE: Duct leakage results are calculated in Cubic Feet per Minute (CFM) measured at a STANDARD OPERATING PRESSURE of 1 wg.

Aeroseal Sealing Progress:



Duct Sealing Performed By:

Aspen Air Duct Cleaning
270 Lawrence St.
Methuen, Ma. 01844
Phone: 978-681-5023

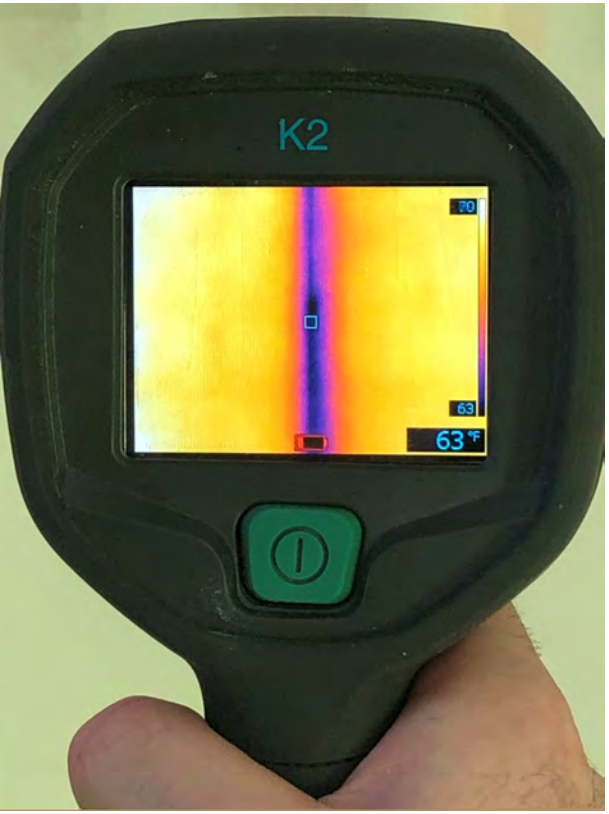
Aeroseal process uses DuctSeal sealant that is certified to meet requirements listed in UL 1181 standard-"Outline of Investigation for Aerosol Duct Sealant"
Please provide Aeroseal feedback at http://bit.ly/2021aeroseal and reference code TKQWGYJG.

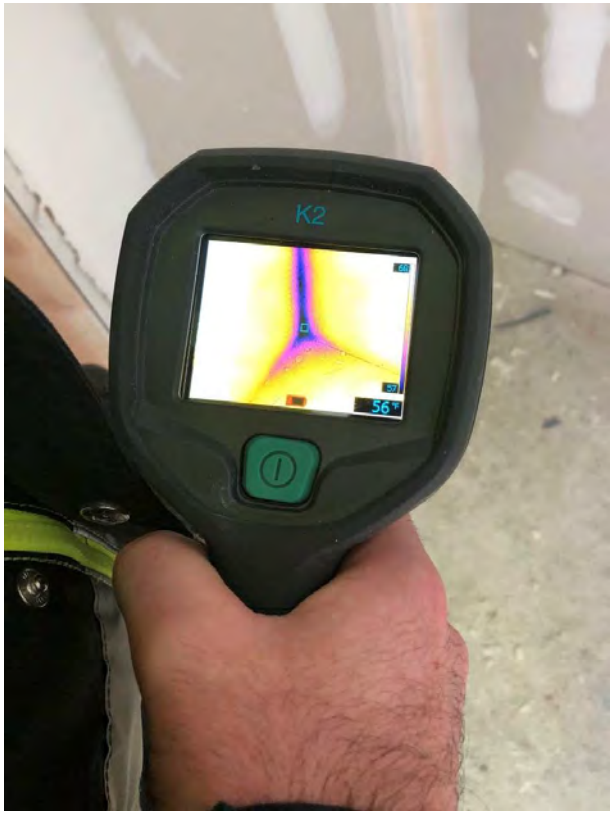
SmartSeal 4.3.2.8 (3068-303-477-596)

1 of 1

SQW – Challenges and Solutions

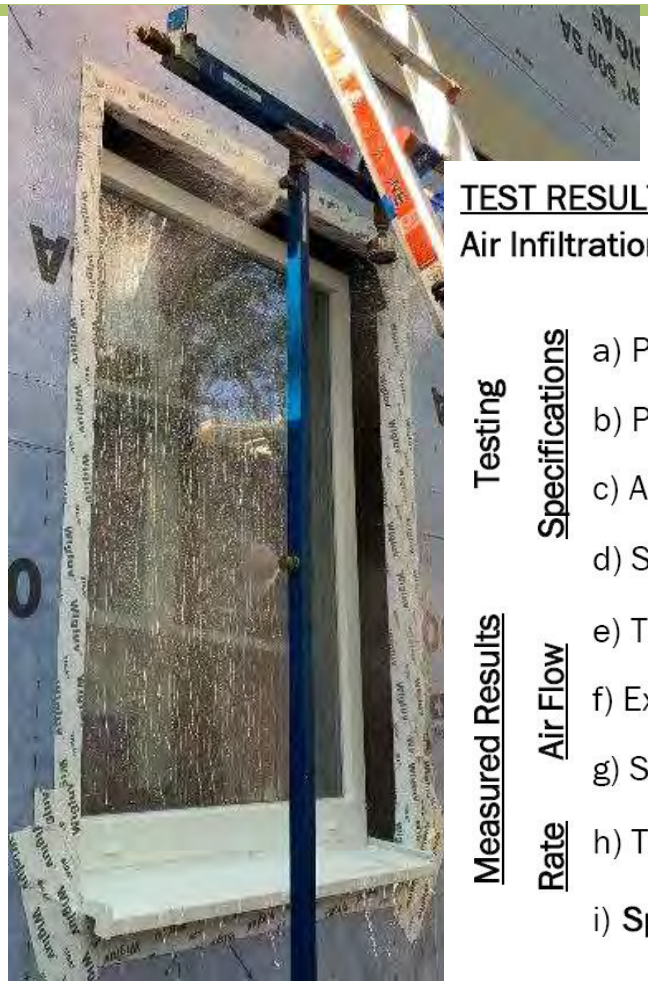
Even with open corner framing, insulation had to be fixed in some locations
- Continuous QC





SQW – Challenges and Solutions

Window testing – in situ and early
- Consider test on mock-up



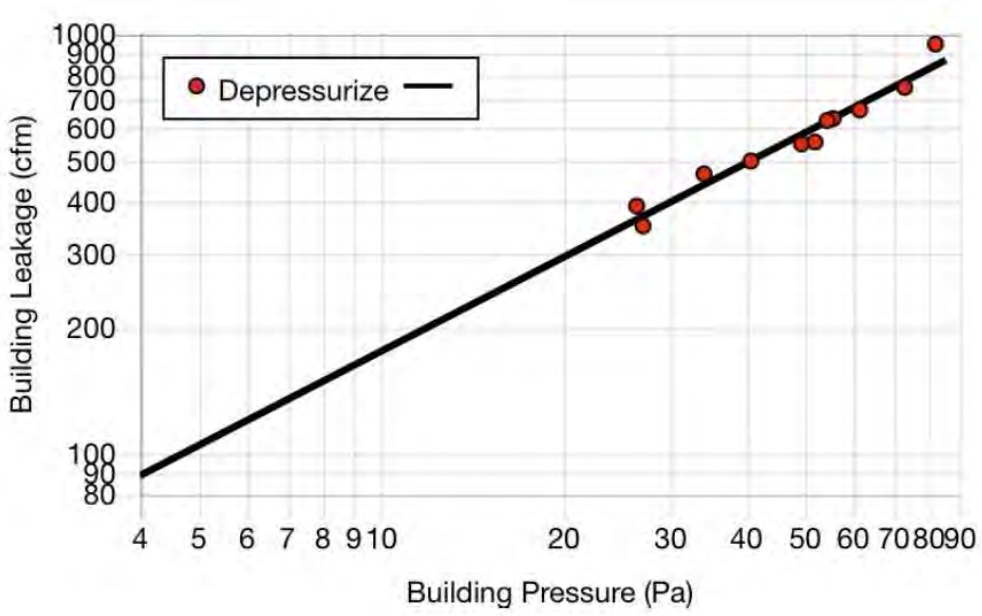
TEST RESULTS

Air Infiltration Tests, ASTM E783

			Specimen Number:	1	2	3
Testing	Specifications	a)	Pressure differential, psf:	6.24	6.24	6.24
		b)	Pressure differential, Pa:	298.7	298.7	298.7
		c)	Allow infiltration rate, cfm/sf:	0.15	0.15	0.15
		d)	Specimen, total square feet:	12.0	15.0	15.0
Measured Results	Air Flow	e)	Total, cfm:	12.75	9.0	7.0
		f)	Extraneous, cfm:	12.25	8.25	6.0
		g)	Specimen, cfm (g=e-f):	0.5	0.75	1.0
	Rate	h)	Total, cfm/sf (h=e/d):	1.06	0.60	0.46
		i)	**Specimen, cfm/sf** (i=g/d):	**0.04**	**0.05**	**0.07**

SQW – Challenges and Solutions

Envelope Testing – Passed – first attempt.



THANK YOU.

Maciej Konieczny
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NEW ECOLOGY
Community-Based Sustainable Development

Chris Becker
CPHB
Project Manager
cbecker@Callahan-inc.com
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CALLAHAN
CONSTRUCTION MANAGERS

Take Aways

- Make it a conversation, not a lecture.
- Learn from others.
- There is a big learning curve on the first one: expect it!
- Test and inspect early and often, especially on the first one.
- Invest in Craft – every trade is ready to execute, if empowered & given the tools