



BUILDING A MULTI UNIT RESIDENTIAL PASSIVE HOUSE:

WITH PROVEN TECHNIQUES AND
AVAILABLE MATERIALS IN NORTH
AMERICA

- JOSIE COSTANTINI
- GREG LESKIEN



Schilthuis Construction Inc.

- General Contractors
- Construction Managers
- Commercial, Multi Unit Residential, Industrial



Zon Engineering Inc.

- Passive House and Net-Zero Consulting
- Mechanical Design Services
- Solar PV and BESS Design Services



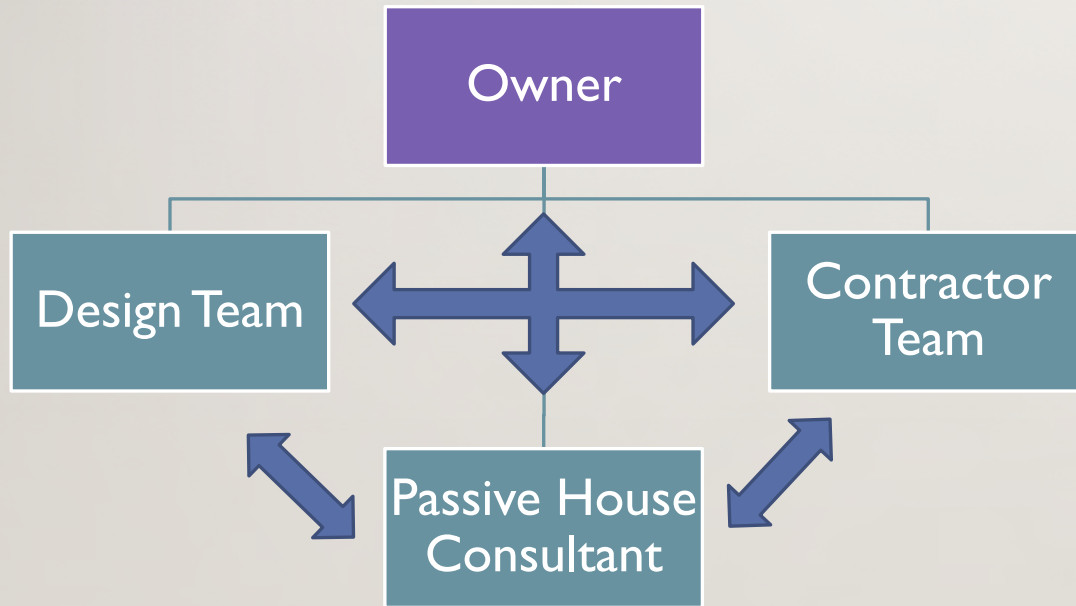
OUR JOURNEY SO FAR ...

SCHILTHUIS
CONSTRUCTION INC.

ZON
zon engineering inc



OUR JOURNEY SO FAR ...



OUTLINE OF PRESENTATION

Materials

Installation Details

Air Tightness



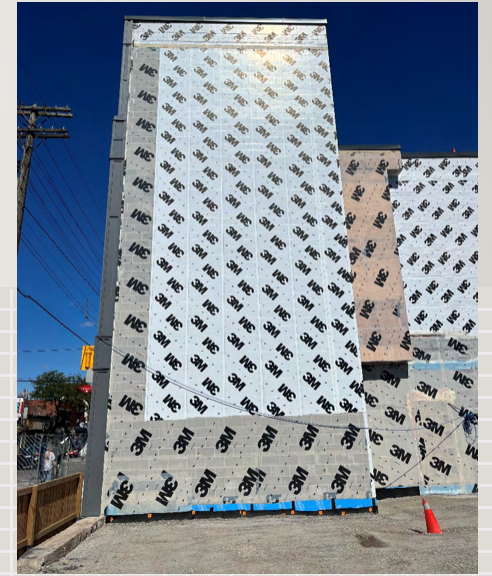
MATERIALS

TAPES

Experience Tip:
Double split backers,
double sided have
advantages.
Tapes that don't require
primer save time.



MEMBRANES



Experience Tip:
Consider the need for primers, application temperature and UV exposure duration ... not all membranes are equal

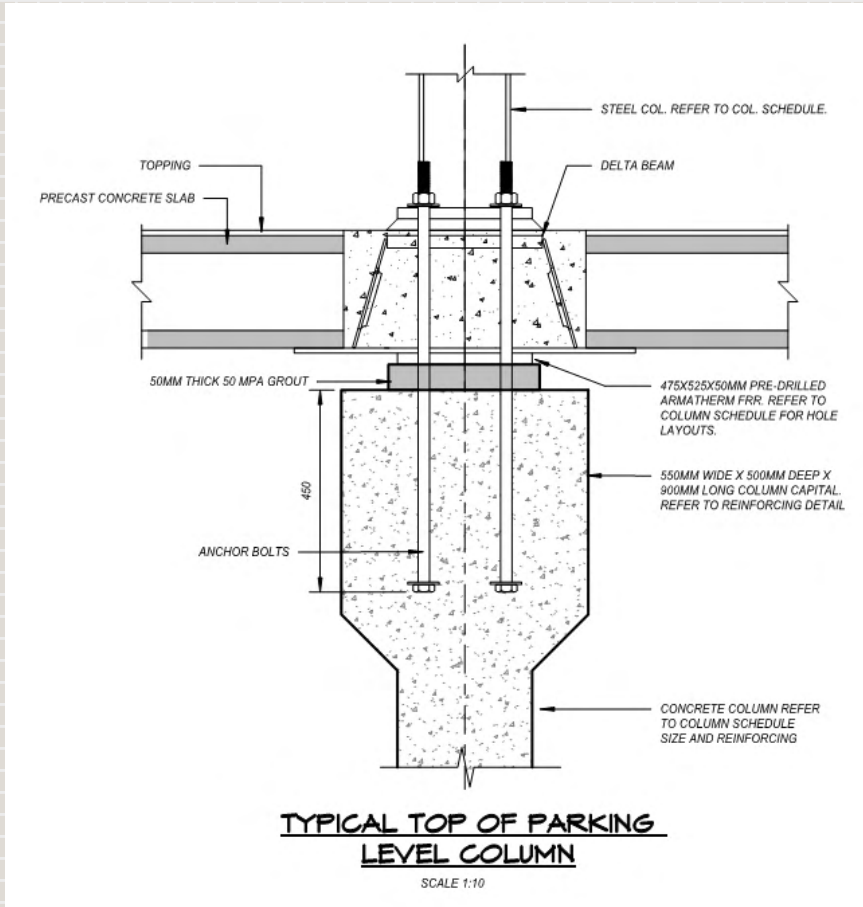


THERMAL BREAKS

Experience Tip:
Order in bulk, pre-drill holes
and review structural
capabilities.



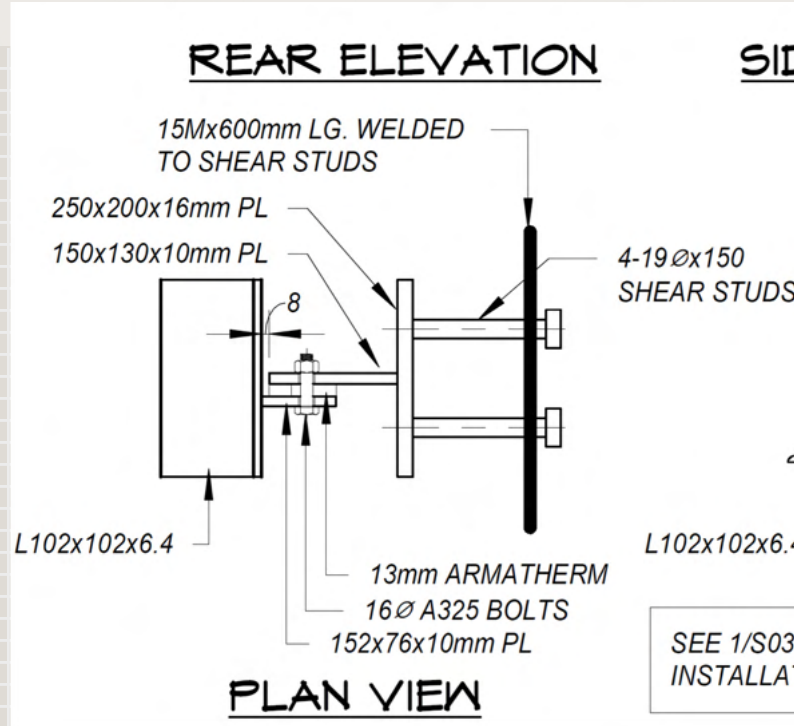
THERMAL BREAKS



THERMAL BREAKS



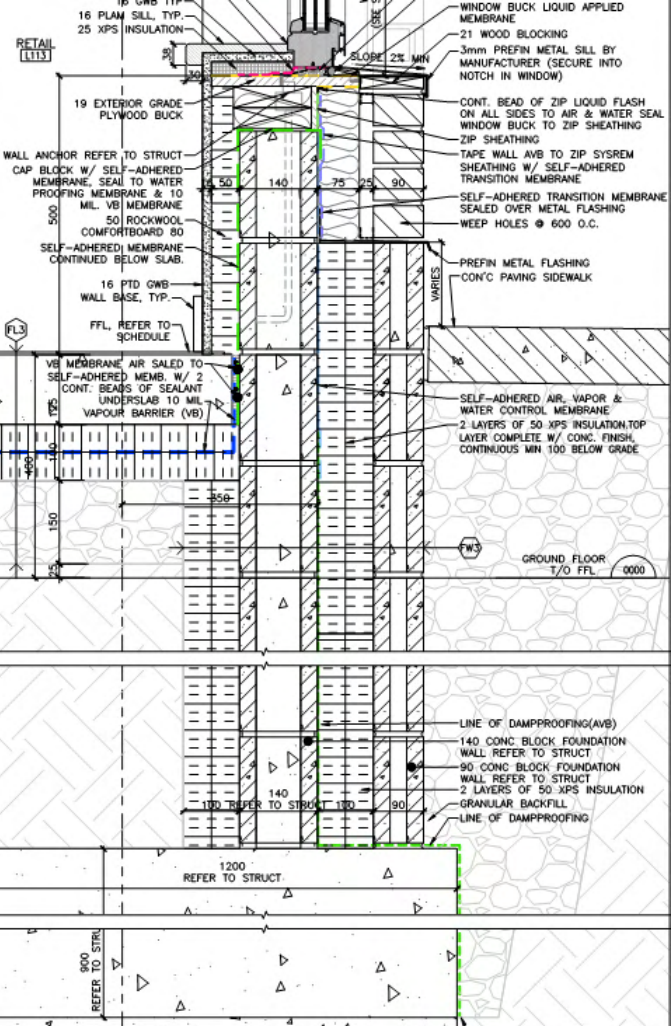
FERO BRACKETS VS BRICK LEDGE



Experience Tip:
Need to consider the best sequencing of installation for air sealing and water control.

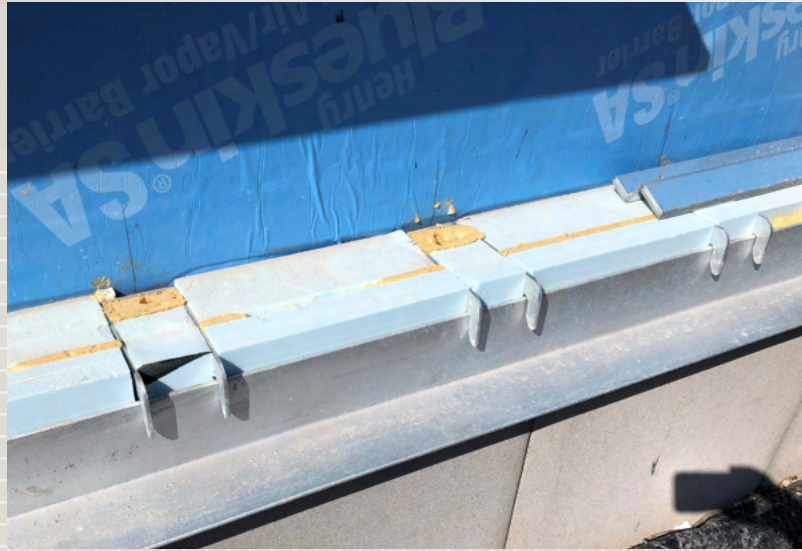


FERO BRACKETS VS BRICK LEDGE



Building a Multi Unit Residential Passive House:
With Proven Techniques and Available Materials in North America

FERO BRACKETS VS BRICK LEDGE



Experience Tip:
Labour costs high, foundation costs low.

WALL TYPE FW1 – FOUNDATION (25.4)

SECTIONS MORE THAN 150 ABOVE GRADE

- 90 MASONRY VENEER (FACE BRICK)
- 19 AIR SPACE
- 127 XPS INSULATION – R25.4
- AVB
- 240 PTD CAST-IN-PLACE REINFORCED CONCRETE FOUNDATION. REFER TO STRUCTURAL

SECTIONS FROM 150 ABOVE GRADE TO T/O FOOTING:

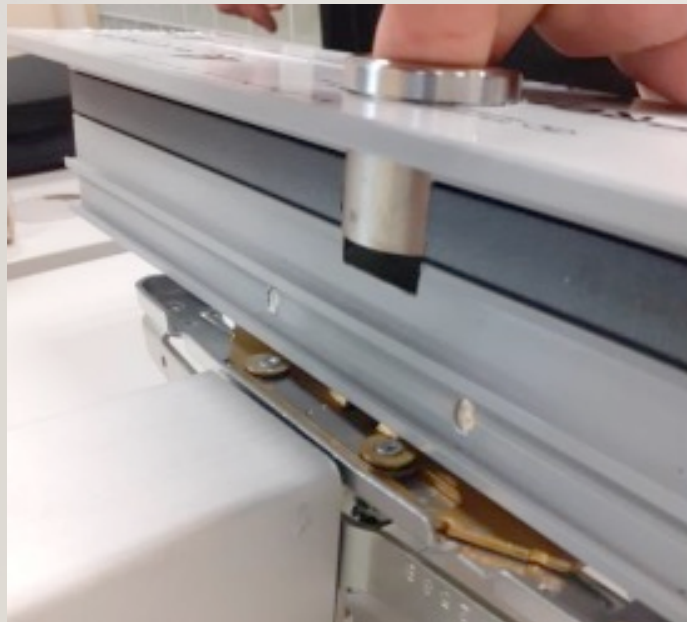
- 140 POLISHED CONC BLOCK
- 100 XPS- R20 TO T/O OF FOOTING BOTH SIDES OF FOUNDATION AND CONNECTED TO UNDERSLAB INSULATION FOR SLAB-ON-GRADE AREAS ONLY.
- WATERPROOFING MEMBRANE
- 240 CAST-IN-PLACE REINFORCED CONCRETE FOUNDATION. REFER TO STRUCTURAL

PASSIVE HOUSE CERTIFIED DOORS VS ALUMINUM



Experience Tip:

Commercial/multi unit residential buildings have heavy wear and tear/use on the main doors.



PASSIVE HOUSE CERTIFIED DOORS **VS** ALUMINUM

Experience Tip:

Canadian approved hardware that adapt to European certified doors are few and far between.

European replacement parts have long wait times. Difficult adjustments often done by manufacturer technicians.

PhiusCon 2022

WINDOW SUPPLIERS

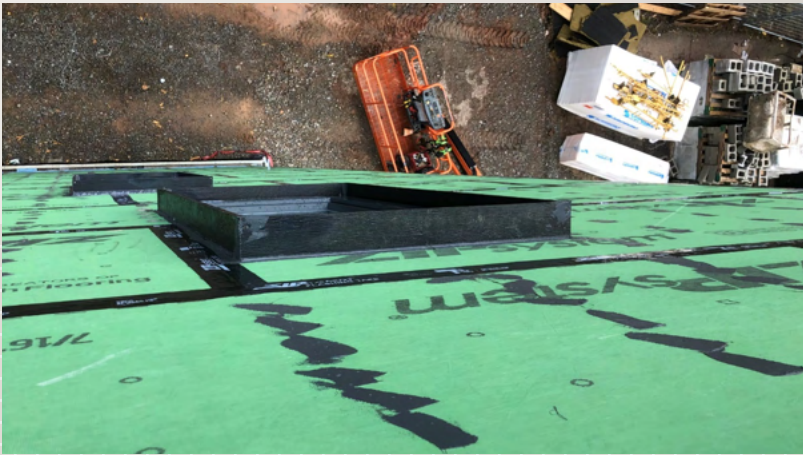
Vetta – Warehouse in Toronto, Made in Poland

Inline – Made and Distributed from Mississauga

Aluprof – Distribution Calgary, Made in Poland

Energisign - Distribution Calgary, Made in Germany

WINDOW DETAILS



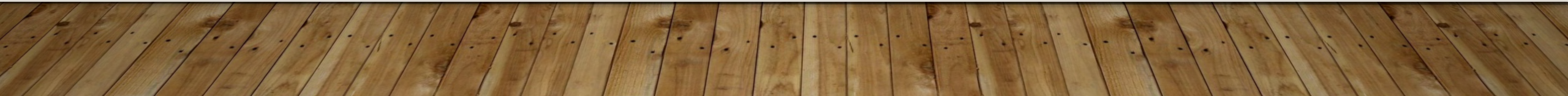
Experience Tip:
Pay close attention to the joints of the window buck and getting full coverage.



WINDOWS FRAME INSULATION

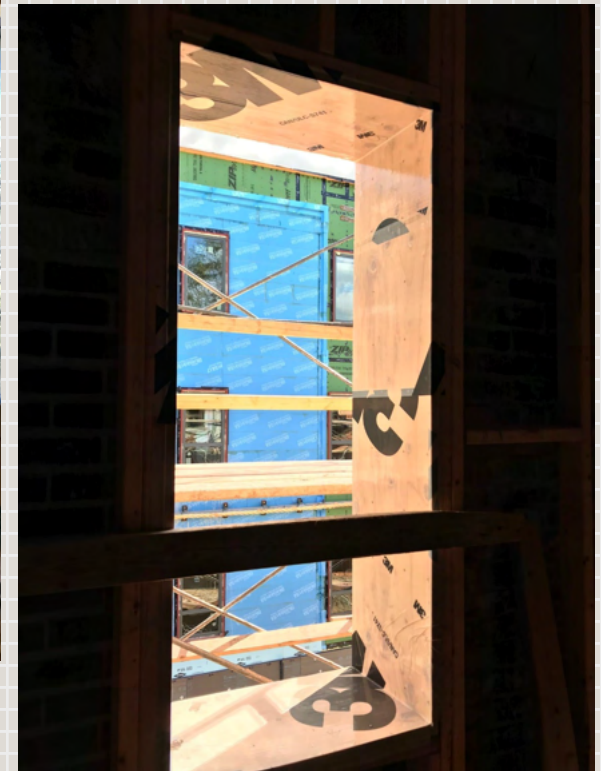
Experience Tip:

Wool and spray foam allows for more flexibility and easier install.



WINDOW OPENING MEMBRANES

Experience Tip:
Coverage and continuity is key.



Experience Tip:

Taping interior vs exterior will protect the product.



WINDOW FINISHING DETAILS

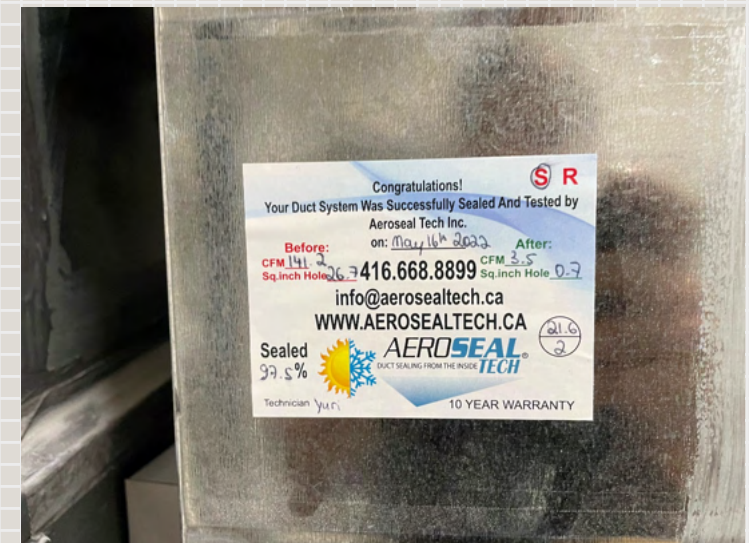
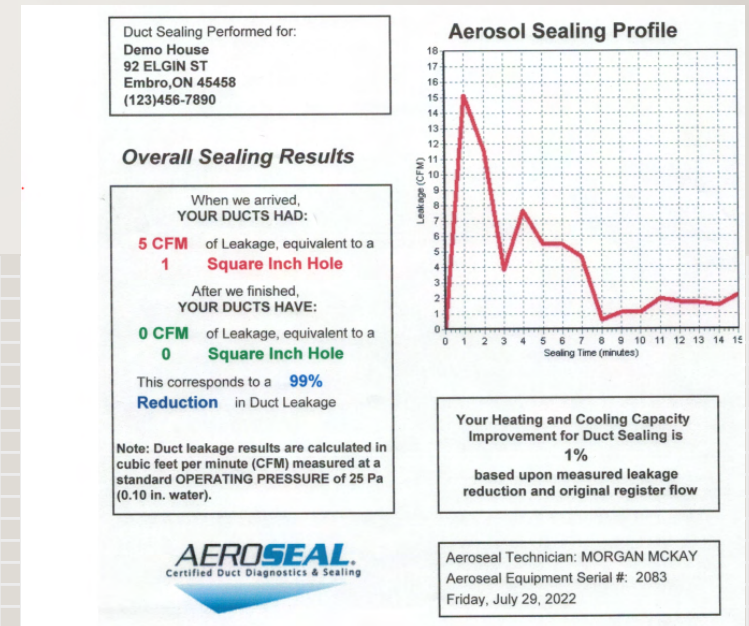


DUCT MASTIC VS. AEROSOL SEALANT



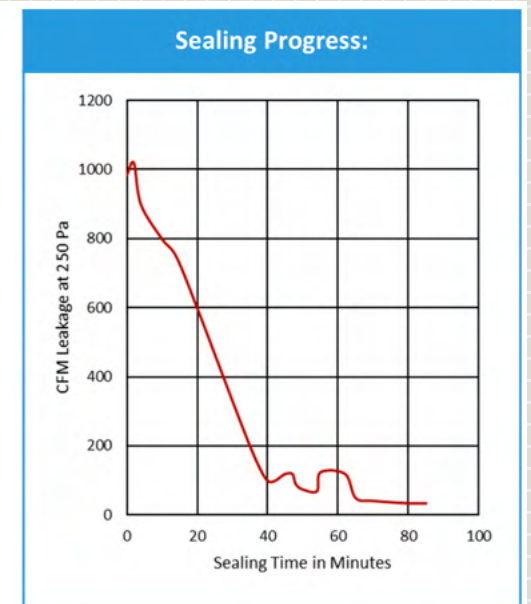
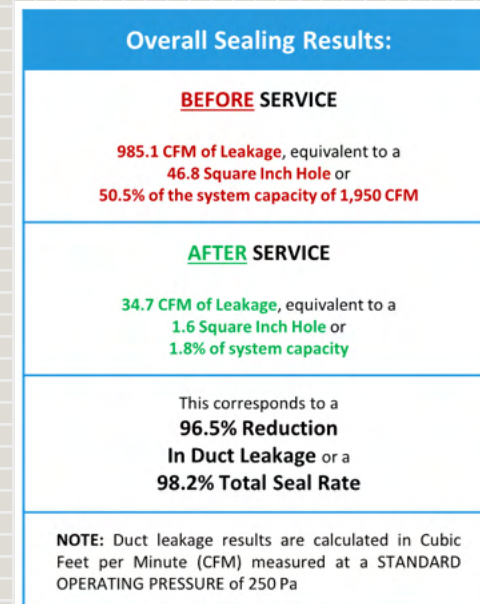
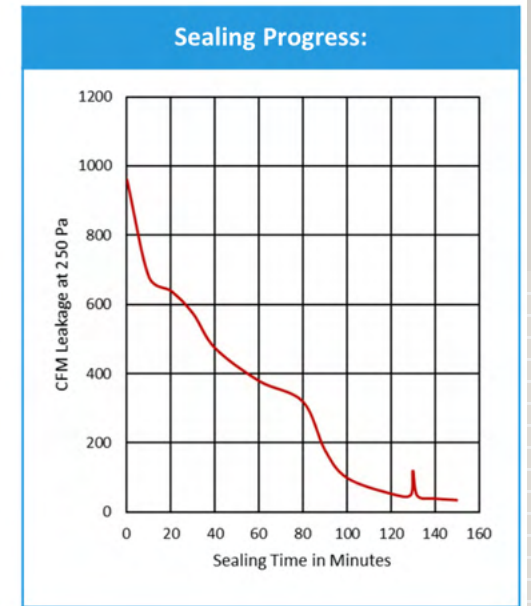
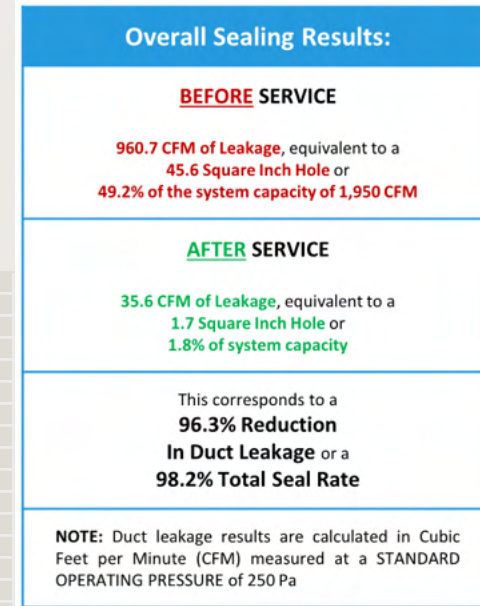
DUCT MASTIC VS. AEROSOL SEALANT

- Case #1 – 6 Unit Townhouse Development (2022)
 - Forced Air Heating & Cooling (1 ducted ASHP per townhouse)
 - Aerosol sealant needed to pass on 1 of 6 units
 - Ventilation System
 - One (1) Zehnder ventilation system per townhouse
 - Aerosol sealant needed for all 6 townhouses
 - \$1,500 per townhouse
 - Equivalent to: 20 hours (2.5 days) @ \$50/hour for a labourer
- Case #2 – Single Family Residence (2022)
 - Ventilation System
 - One (1) ventilation for home
 - Aerosol sealant needed for address leakage
 - \$4,600 for all ventilation ducts
 - Equivalent to: 92 hours (11.5 days) @ \$50/hour for a labourer



DUCT MASTIC VS. AEROSOL SEALANT

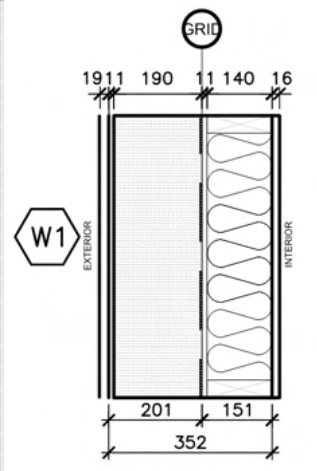
- Case #3 – 50 Unit, 4 Storey Apartment Building (2020)
 - Central Ventilation
 - Two (2) roof mounted ERVs
 - \$8,000 for all ducts up to smoke dampers; no sealing in apartments
 - Equivalent to: 160 hours (or 20 days) @ \$50/hour for a labourer
- Case #4 – 40 Unit, 6 Storey Apartment Building (2022)
 - Central Ventilation system (1 ERV), 6 individual ventilation systems (6 ERVs) + VRF with ducted fan coils
 - \$152,800
 - Equivalent to: 3,056 hours (or 382 days) @ \$50/hour for a labourer



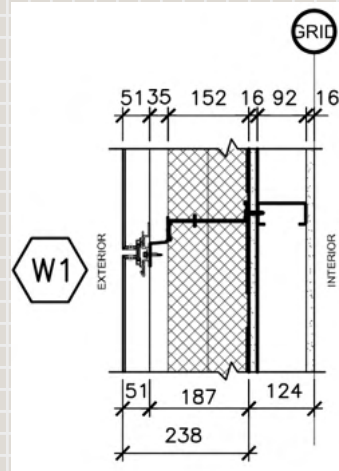


INSTALLATION DETAILS

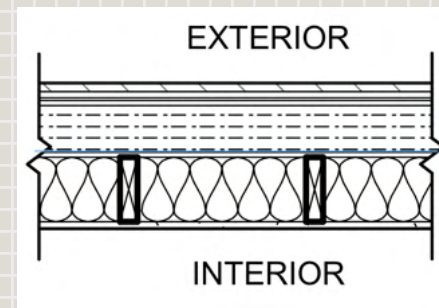
Simplifying the details



(1) Project



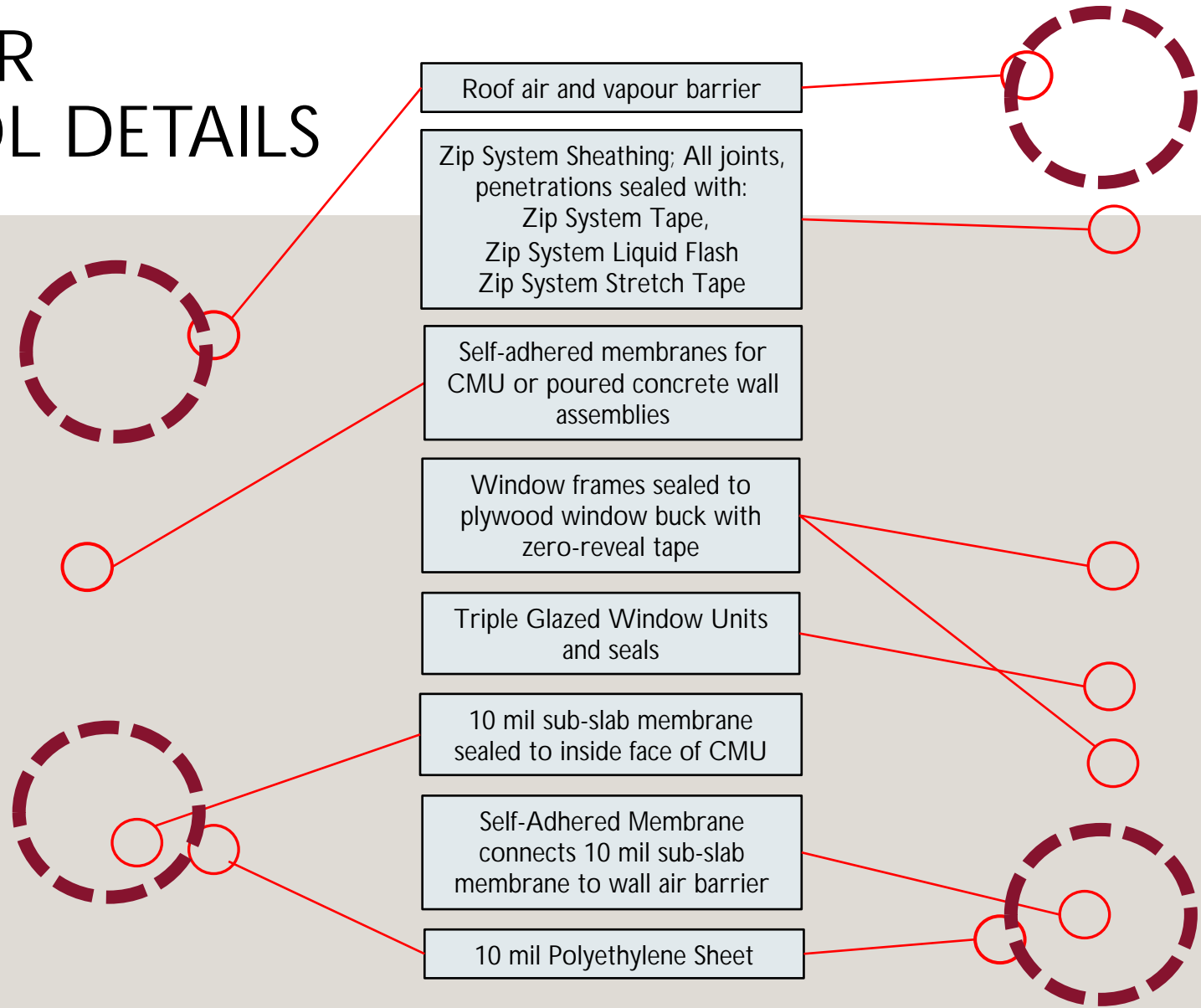
(1) Project



(9) Projects

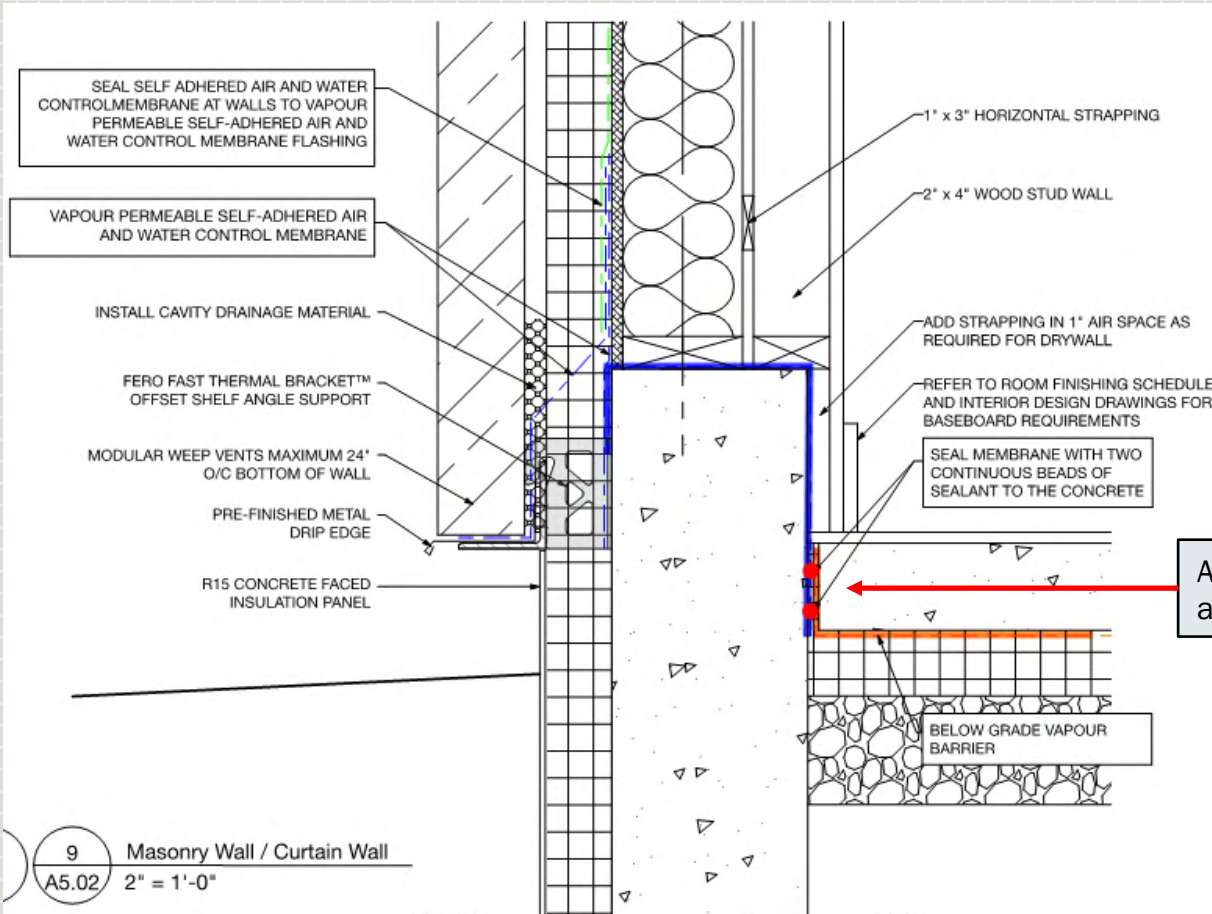
Moving to fully adhered
air/ water control
membrane on sheathing

SIMPLE AIR CONTROL DETAILS



FLOOR-TO-WALL CONNECTION

Top Edge Needs to be "terminated" per installation instructions from Henry



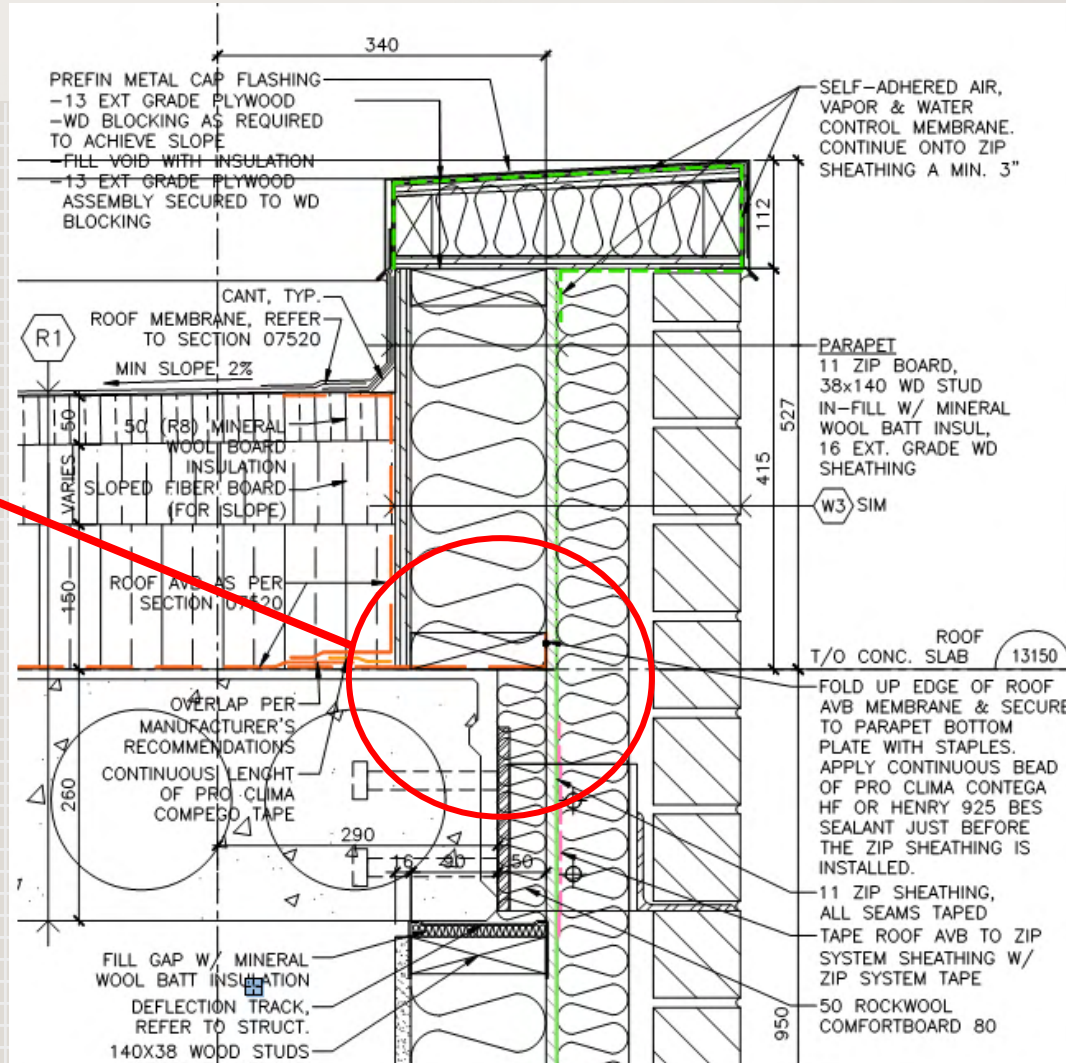
FLOOR-TO-WALL CONNECTION



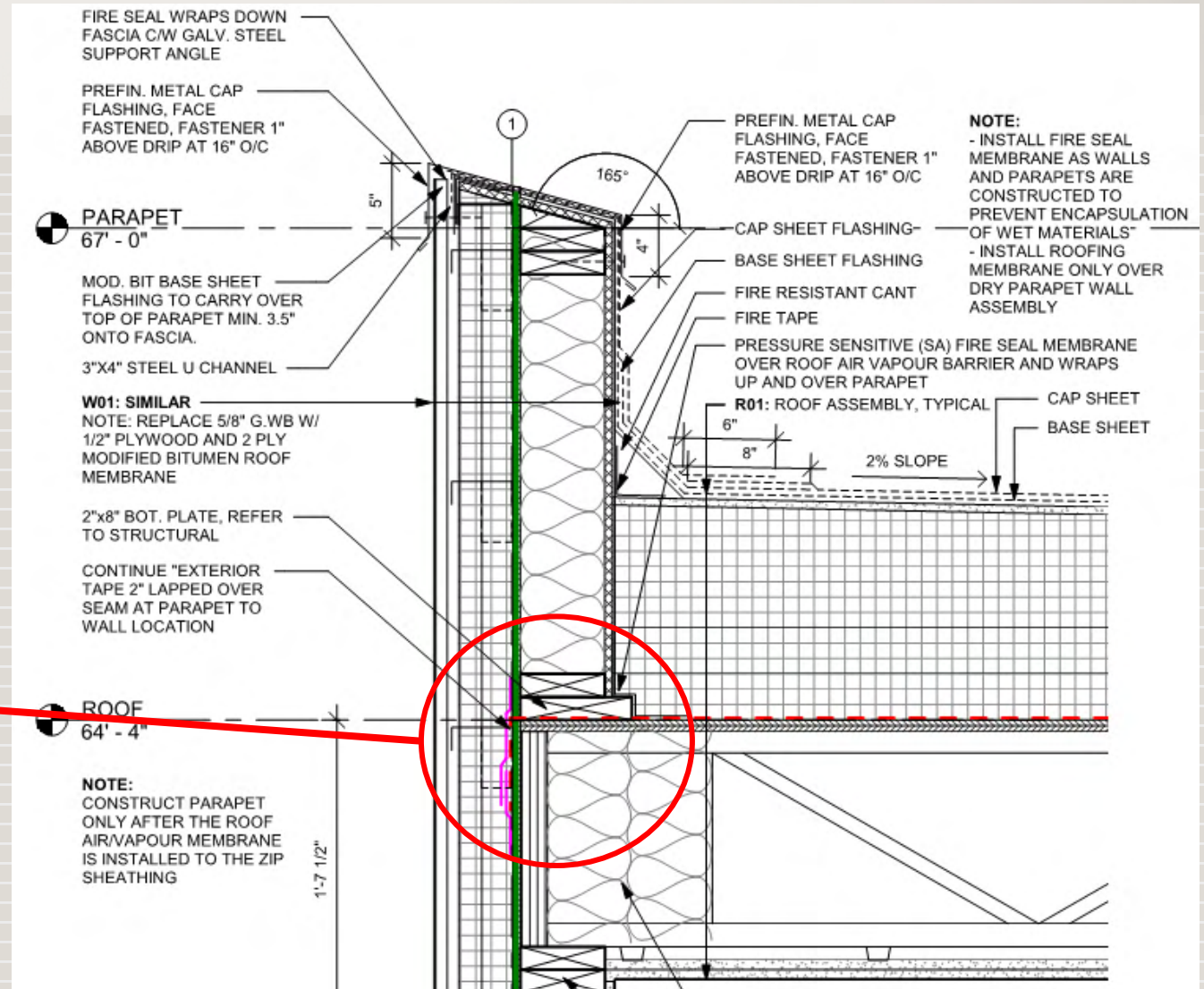
Photo Credits: Zon Engineering Inc.



WALL-TO-ROOF CONNECTION



WALL-TO-ROOF CONNECTION



Joints and Penetrations

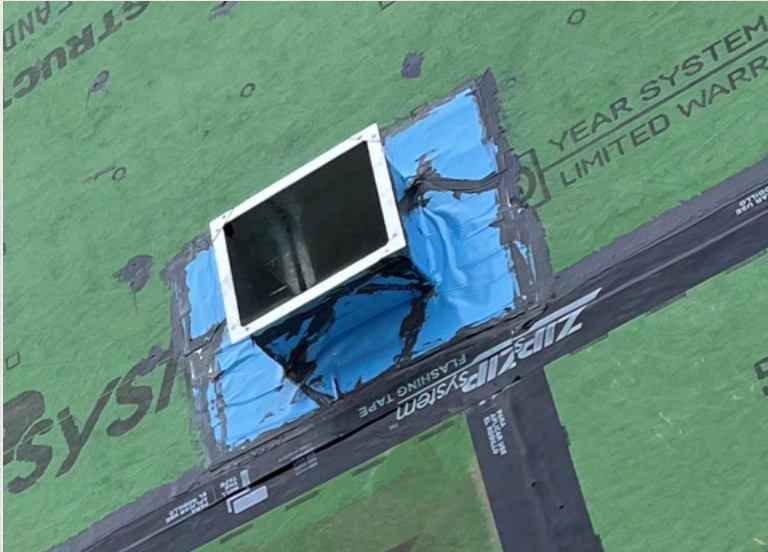
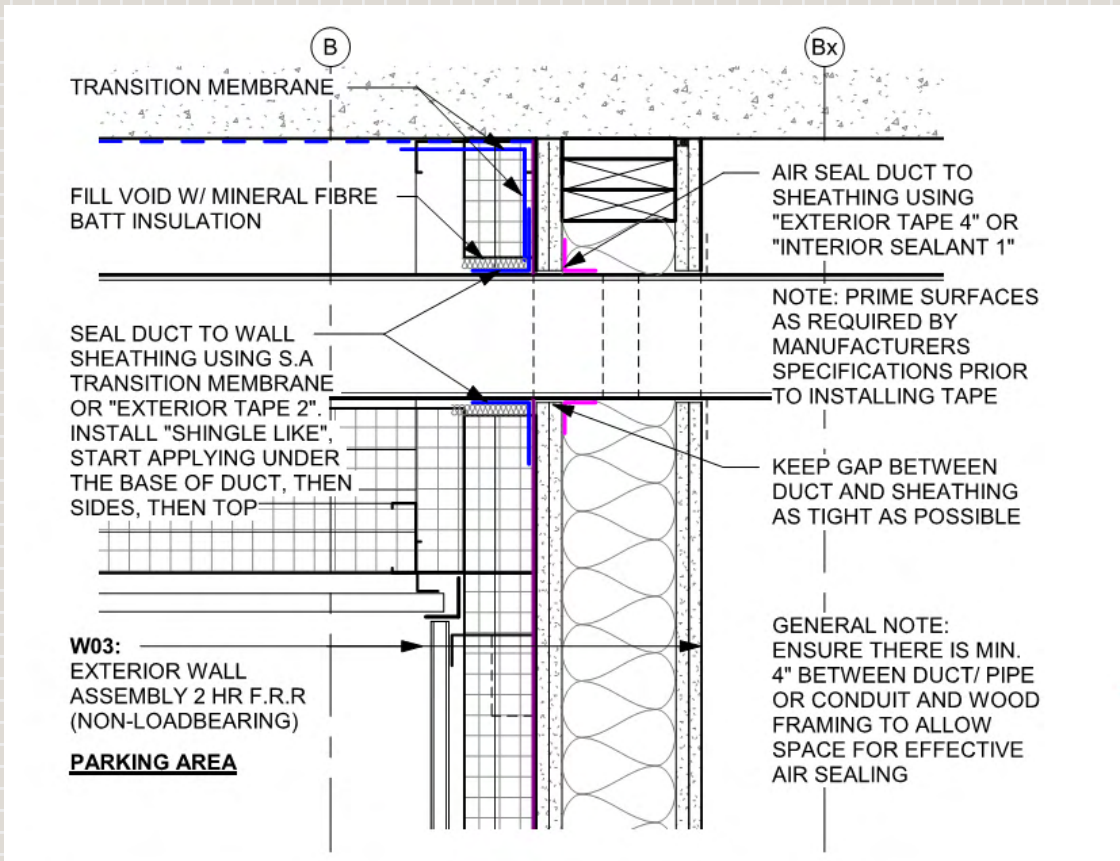
SLAB PENETRATIONS

Experience Tip:
Tape from membrane
manufacturers perform
well enough and cost less



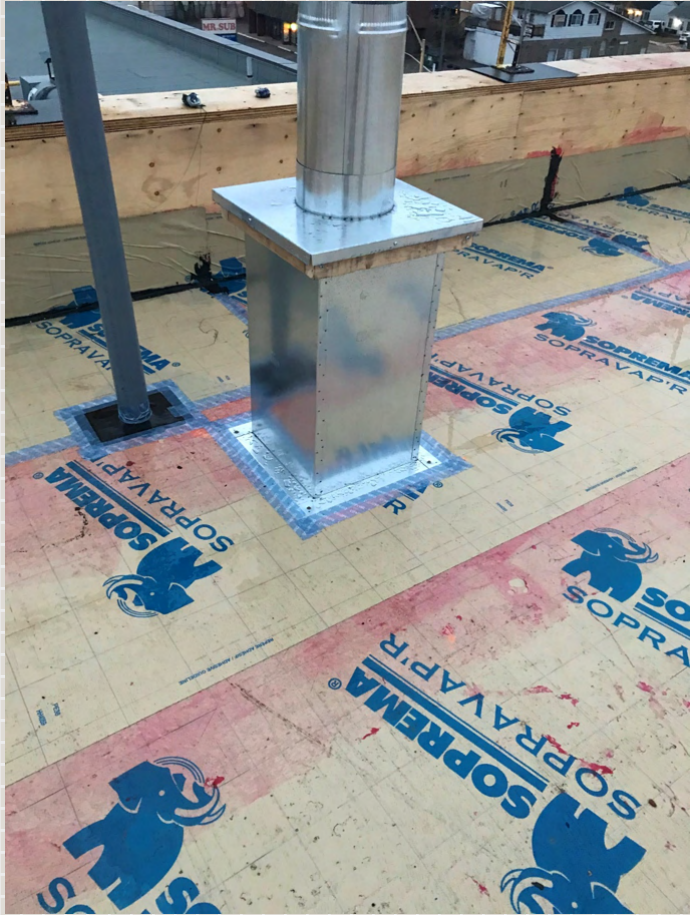
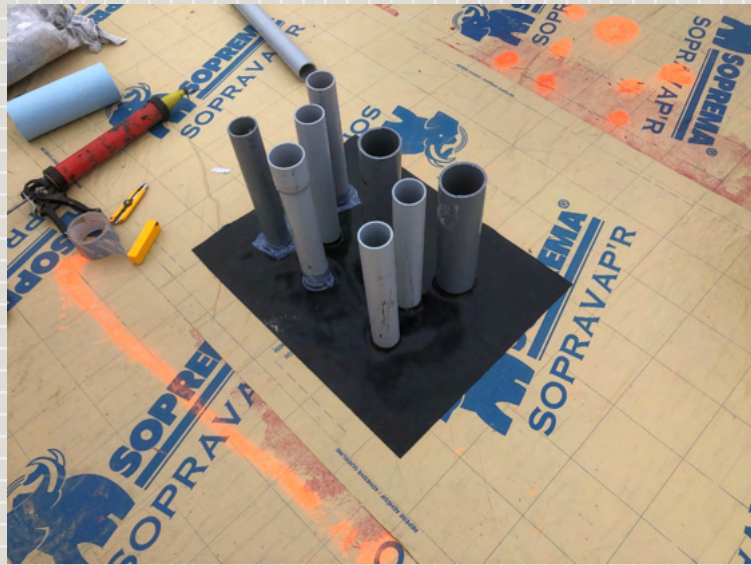
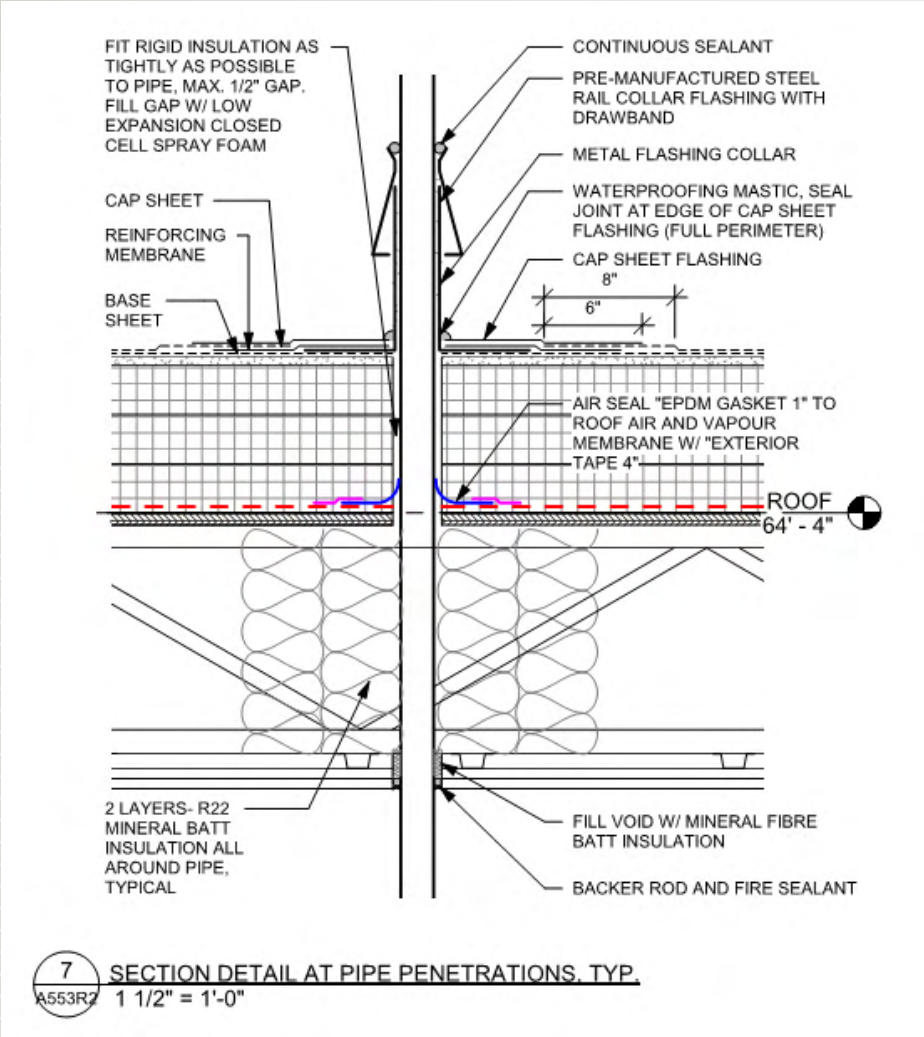
WALL PENETRATIONS

Experience Tip:
Tape from membrane manufacturers perform well enough and cost less



ROOF PENETRATIONS

Experience Tip:
Buy EPDM roll roofing to make custom roof gaskets



WALL-TO-ROOF CONNECTION

Experience Tip:
Spending more \$ on an
air barrier tape can save
time and labour costs



WHOLE BUILDING AIR TIGHTNESS

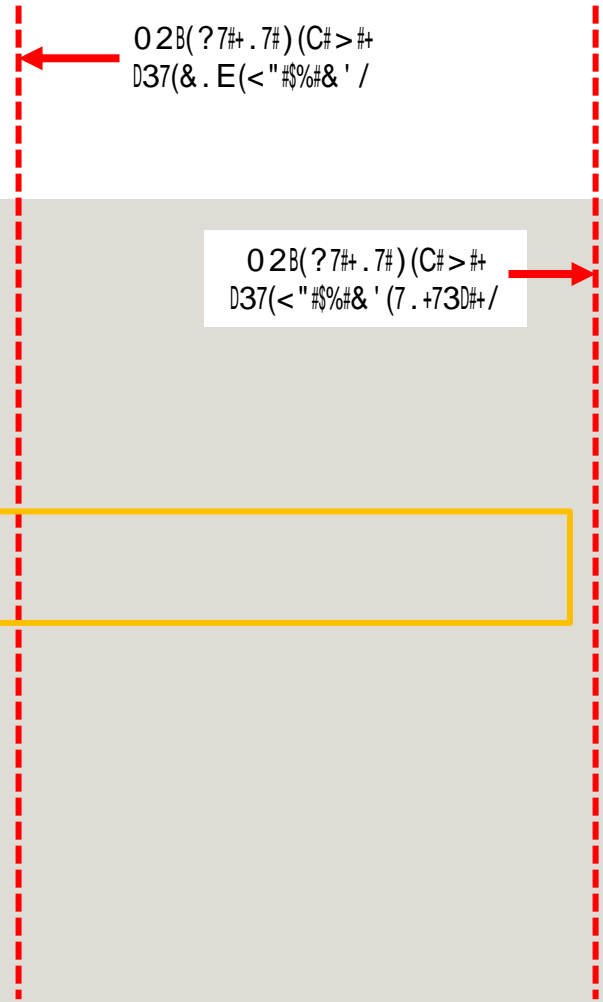
- ... THE RESULTS



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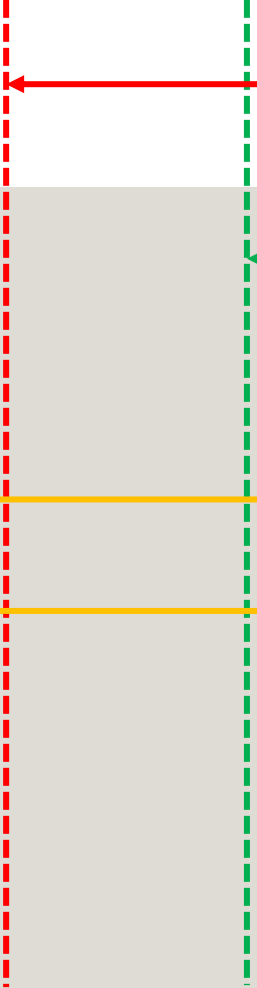
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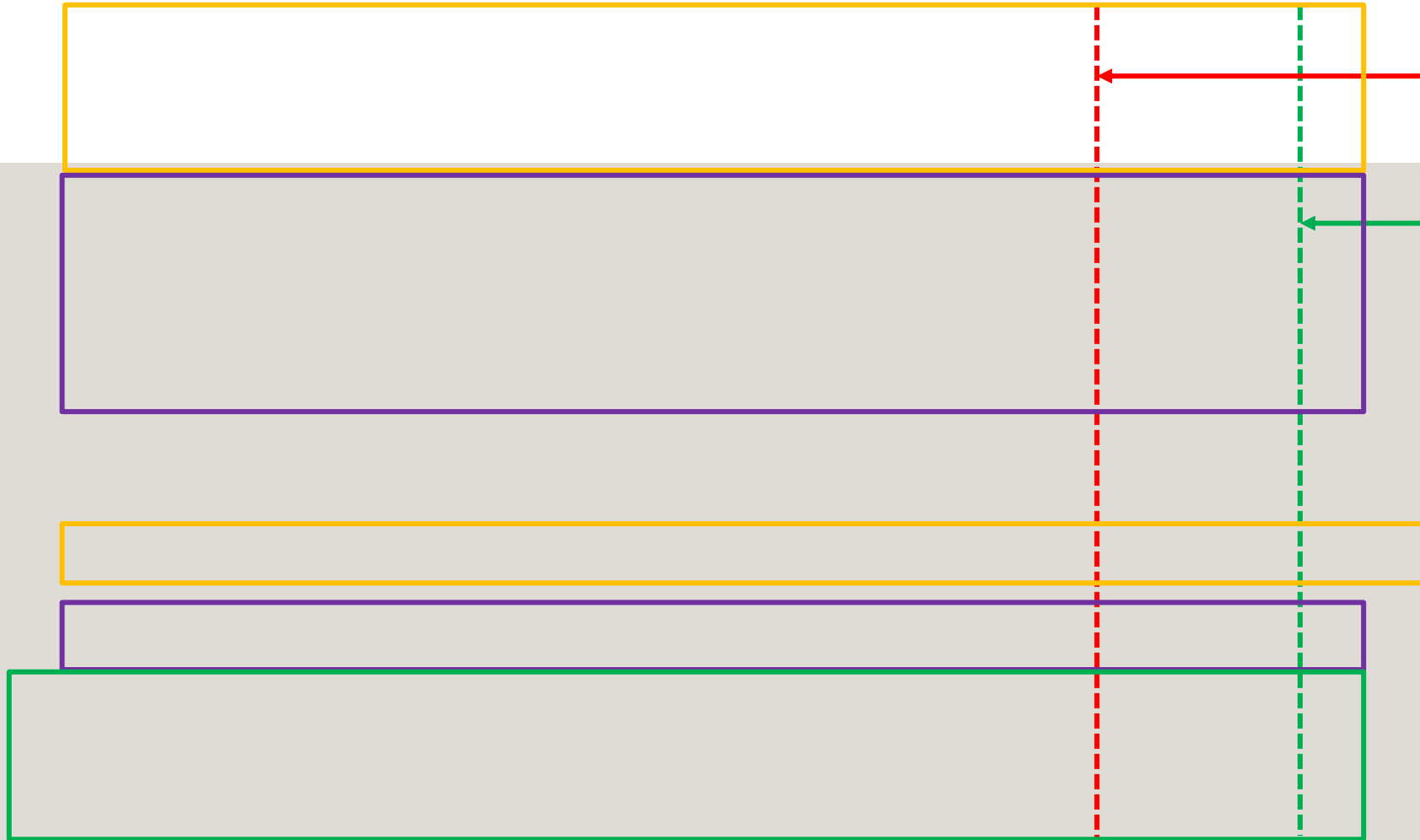
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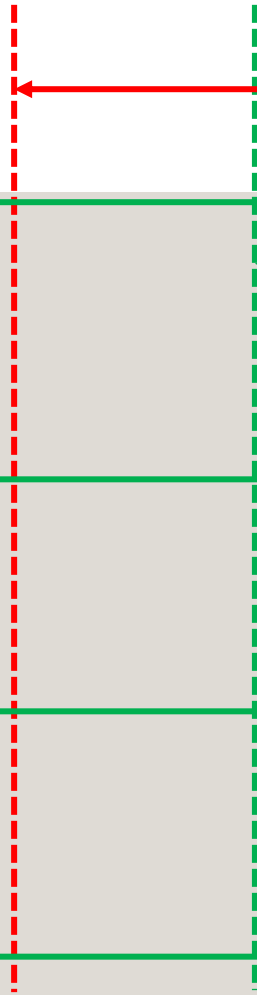
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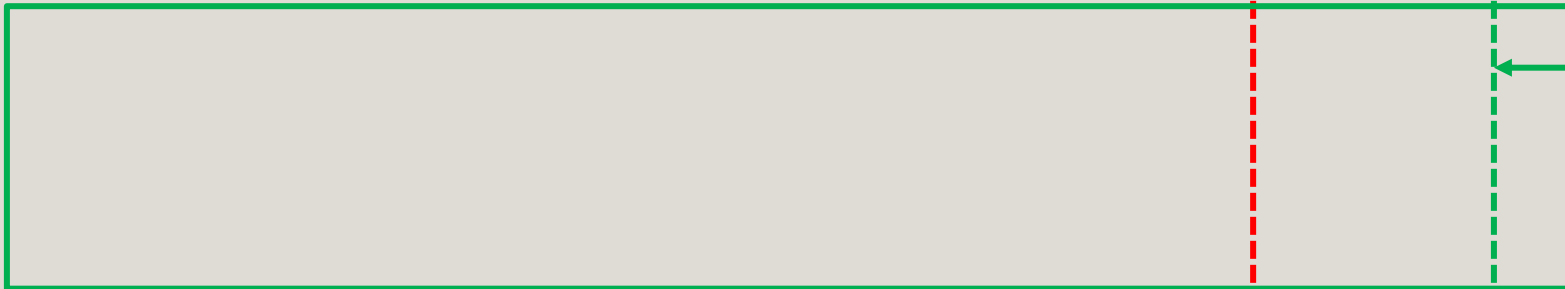
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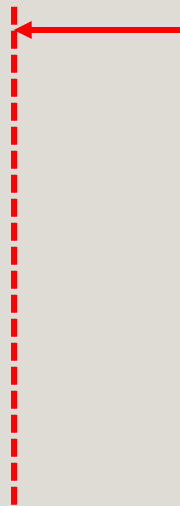


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Experience Tip:
Allow a 50 to 100%
increase in air leakage
between the preliminary
and final tests

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Summary....



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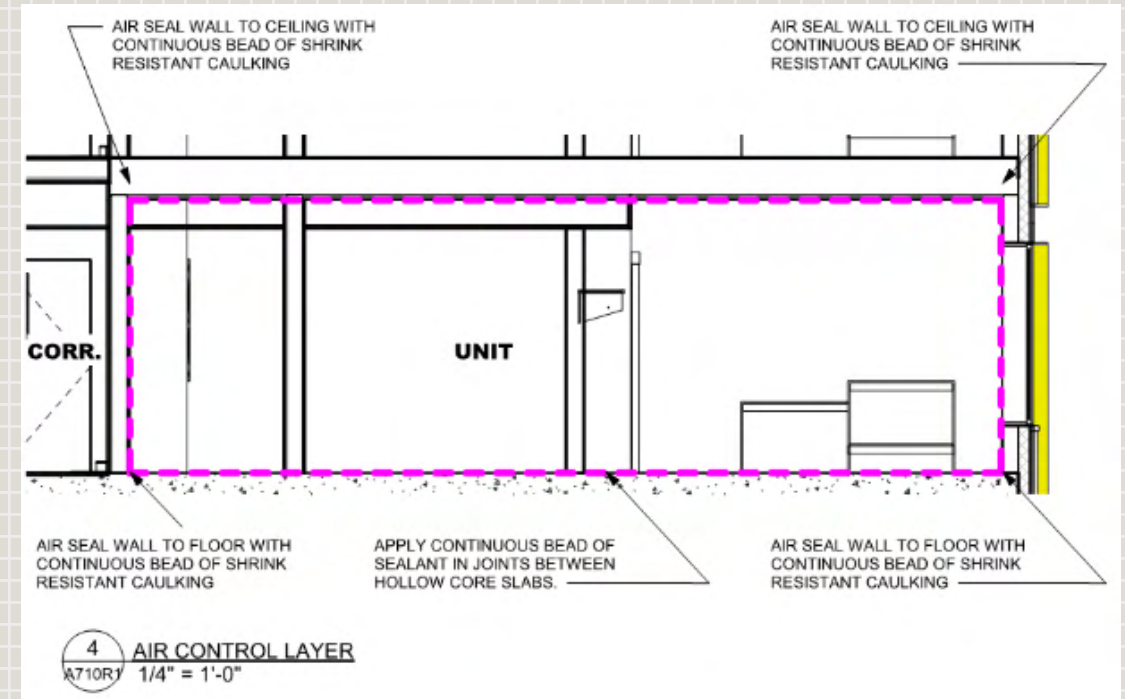
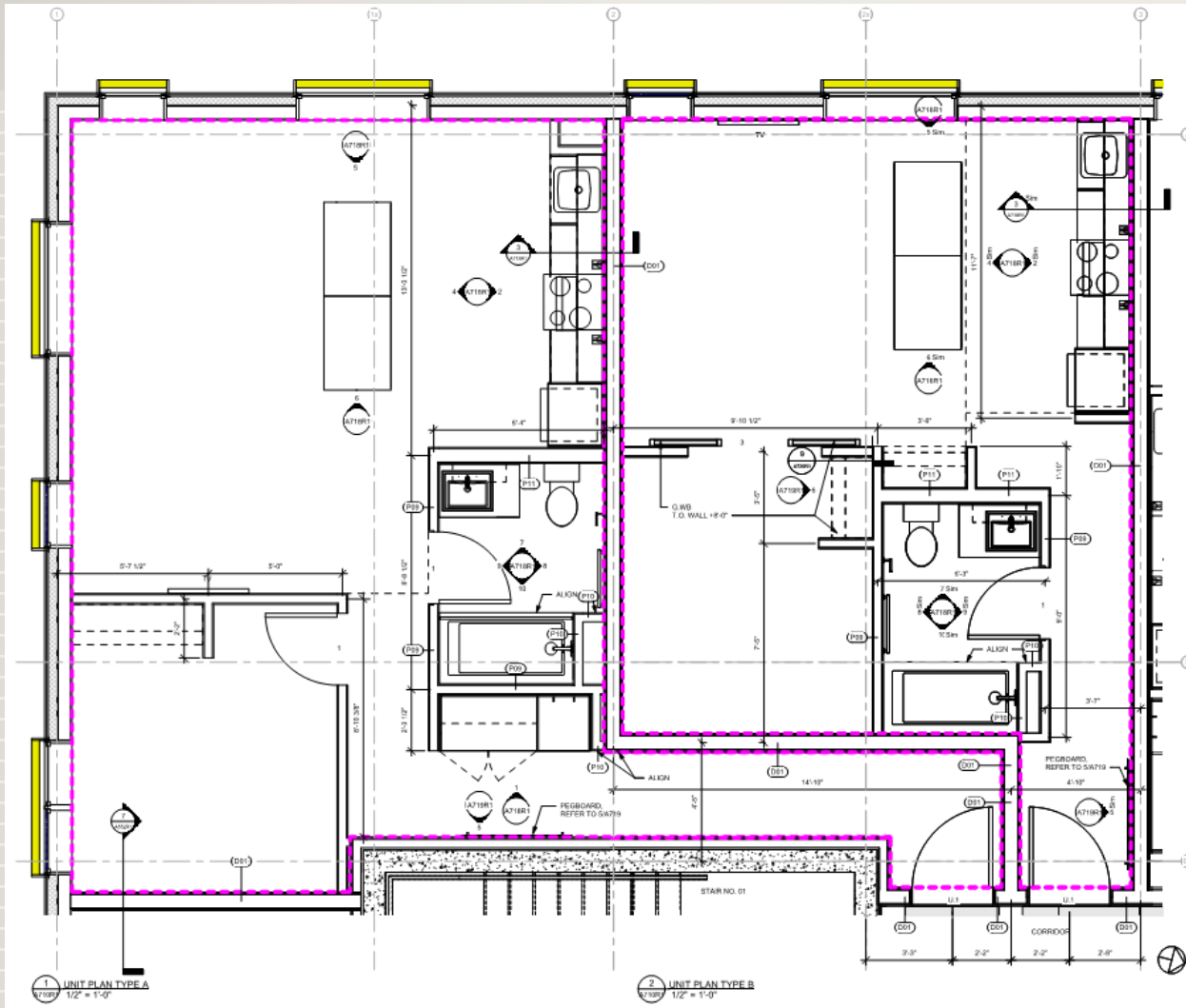
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APARTMENT AIR TIGHTNESS

APARTMENT AIR TIGHTNESS



APARTMENT AIR TIGHTNESS



APARTMENT AIR TIGHTNESS



APARTMENT AIR TIGHTNESS



APARTMENT AIR TIGHTNESS

PHIUS Requirement:
 ≤ 0.30 cfm @ 50 Pa per
 ft² of dwelling unit shell

Projects	Units Tested	Min. (cfm/ft ² @ 50 Pa)	Median (cfm/ft ² @ 50 Pa)	Average (cfm/ft ² @ 50 Pa)	Max. (cfm/ft ² @ 50 Pa)
Royal Oak Dairy	26	0.12	0.14	0.15	0.24
Embassy Commons	18	0.05	0.11	0.11	0.19
Dogwood Suites	16	0.16	0.33	0.32	0.55
Lakeshore	19	0.19	0.24	0.27	0.55
Royal Oak Stables	8	0.18	0.27	0.26	0.30

Air sealing to drywall not continuous in mechanical chases