

How does resident-led design fit with deep sustainability goals?

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Learning Objectives

- Identify ways that the primary development goals for multi-family affordable housing align or conflict with deep sustainability goals.
- Use layman's terms to describe testing protocols for PHIUS certification to clients and residents with no design or construction background.
- Analyze building envelope air tightness testing strategy options for multi-family housing development that lacks connecting interior circulation or common spaces.
- Apply the case study's lessons to other nontraditional multi-family housing types to predict potential air tightness testing challenges.



Case Study Introduction & Affordable Housing in the U.S.

Case Study: Kindlewood Redevelopment



Project History

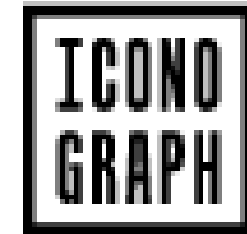
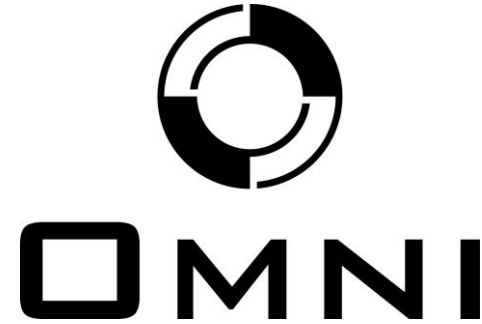


Pre-1970
Credit: Charlottesville Tomorrow
Rufus Holsinger



2022

Design Team



Resident Advisory Committee



Project History – Development Principles

- Elevate the health and safety of residents and the planet
- Zero displacement of existing residents
- Resident-lead design
- Community support spaces
- Ladder of affordability
- Break generational cycles of poverty



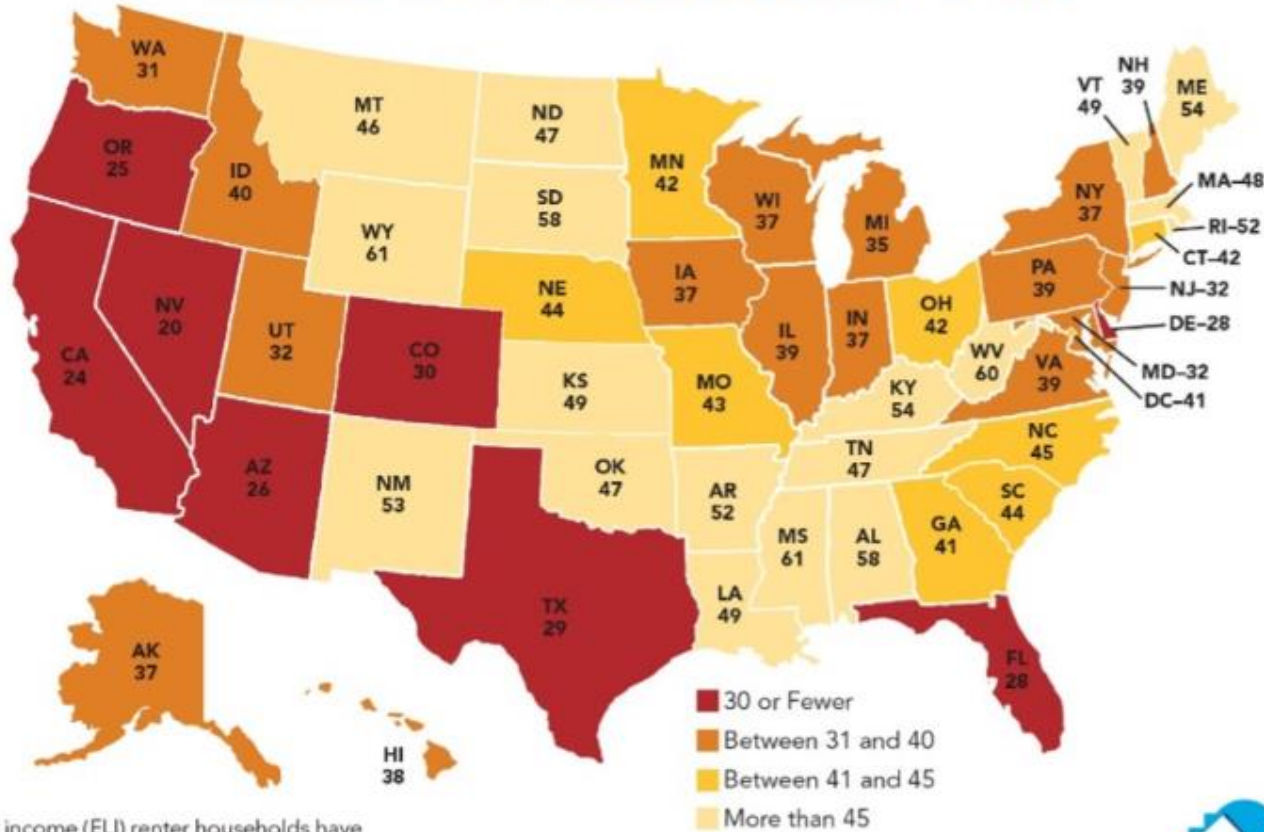
Project History



Affordable Housing in the US

THE GAP

RENTAL HOMES AFFORDABLE AND AVAILABLE PER 100 EXTREMELY LOW INCOME RENTER HOUSEHOLDS BY STATE



Note: Extremely low income (ELI) renter households have incomes at or below the poverty level or 30% of the area median income. Source: NLIHC tabulations of 2019 ACS PUMS Data. ©2021 National Low Income Housing Coalition

<https://nlihc.org/gap>



Affordable Housing & Sustainable Construction

**AFFORDABLE
HOUSING**



**SUSTAINABLE
CONSTRUCTION**





Resident-Led Design

Confusing & Misunderstood Terms

Mini-split

Heat pumps

Prescriptive vs.
Performance

Carbon neutral

ERV

Envelope

Low Flow

Passive House

Passive vs. Active
Ventilation

Air Quality

DOAS

“Smart” vs. “Dumb”

Electrification

Affordability vs. Sustainability: Alignments

- Lower Utility bills
- Compact & efficient floor plans
- Ecologically advantageous planting
- Central / semi-central systems
- Thermal comfort & improved indoor air quality
- Better moisture mitigation
- Equitable design & amenities
- Design of more resilient infrastructure & communities



Affordability vs. Sustainability: Conflicts

- Resident and staff education on advanced systems & appliances
- Higher first cost for systems
- More involved maintenance
- Resident desire for privacy & identity vs. jurisdictional desire for density & efficiency
- Perception of reduced safety in multi-family housing
- Gabled roofs



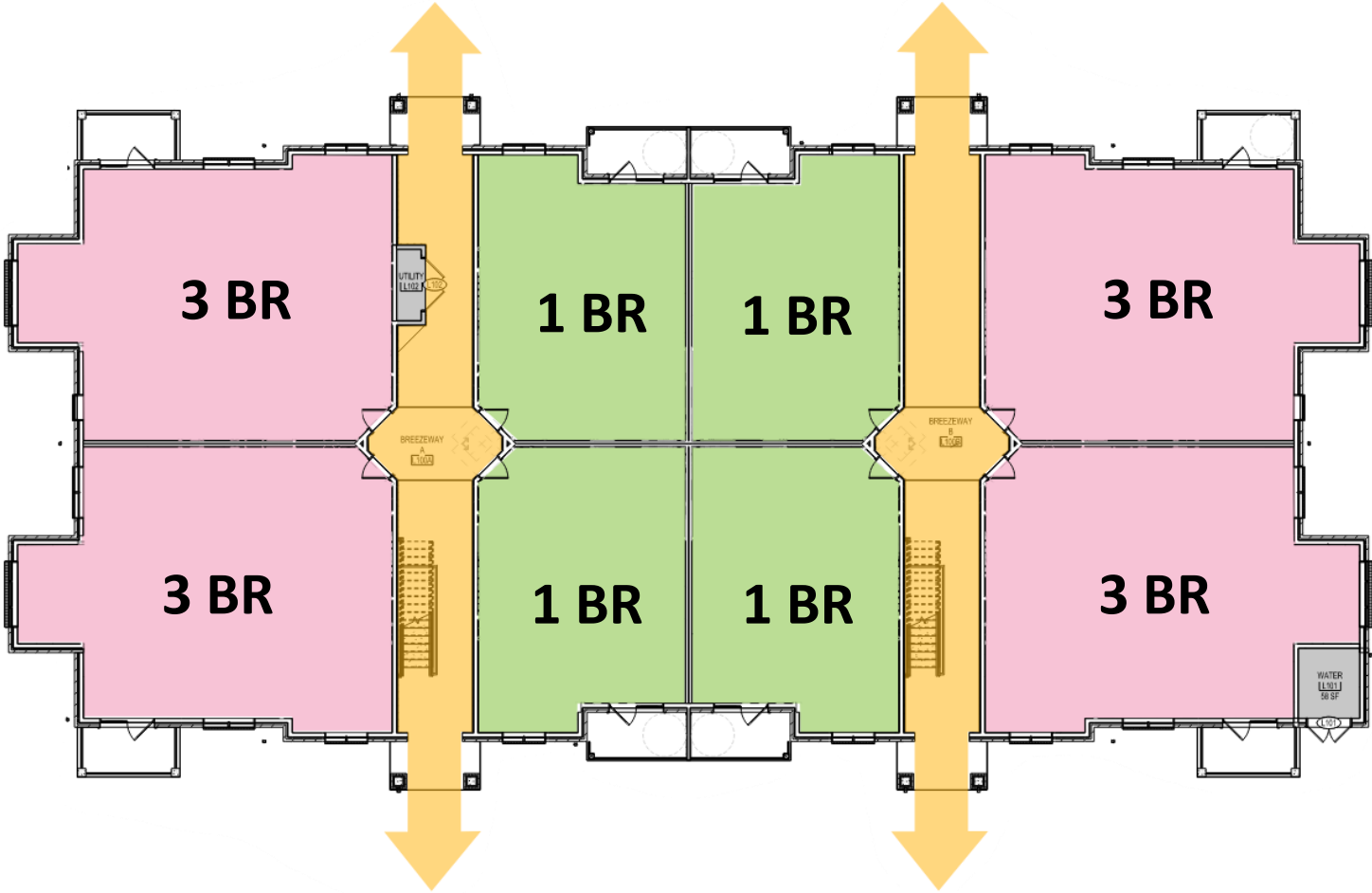


What is the “Missing Middle”?

Traditional Elevator Building



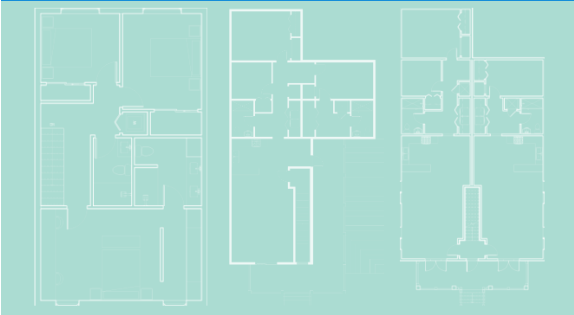
Garden Style Apartment Building



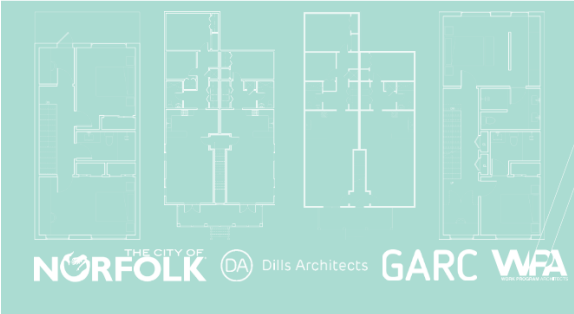
Stacked Townhome Building



Missing Middle Resources



Missing Middle
Pattern Book



<https://wparch.com/projects/urban-design-planning/missing-middle-pattern-book/>

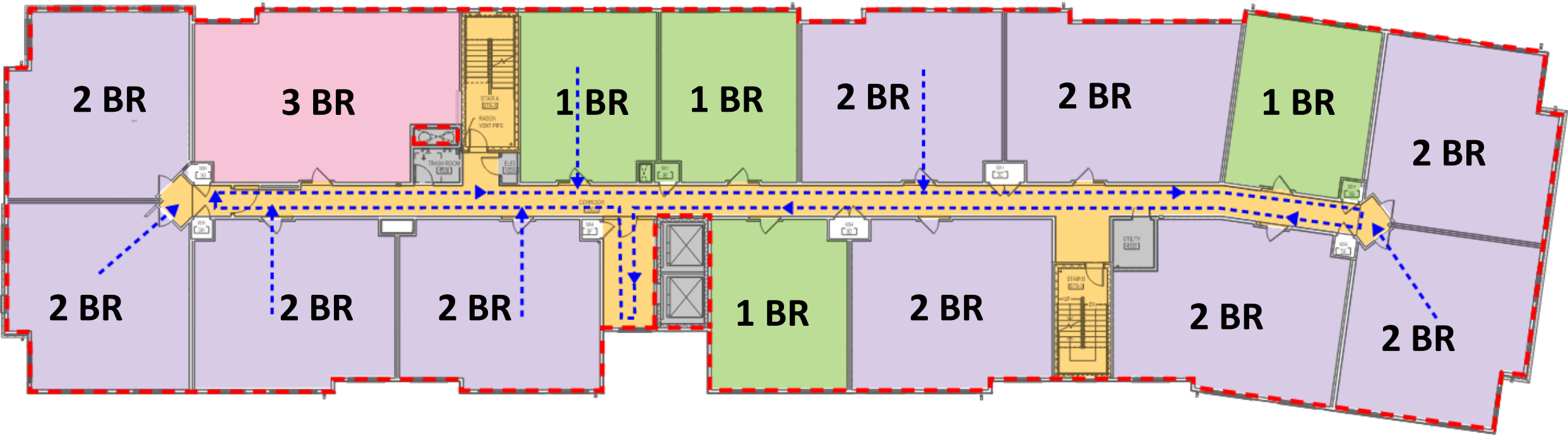


Missingmiddlehousing.com



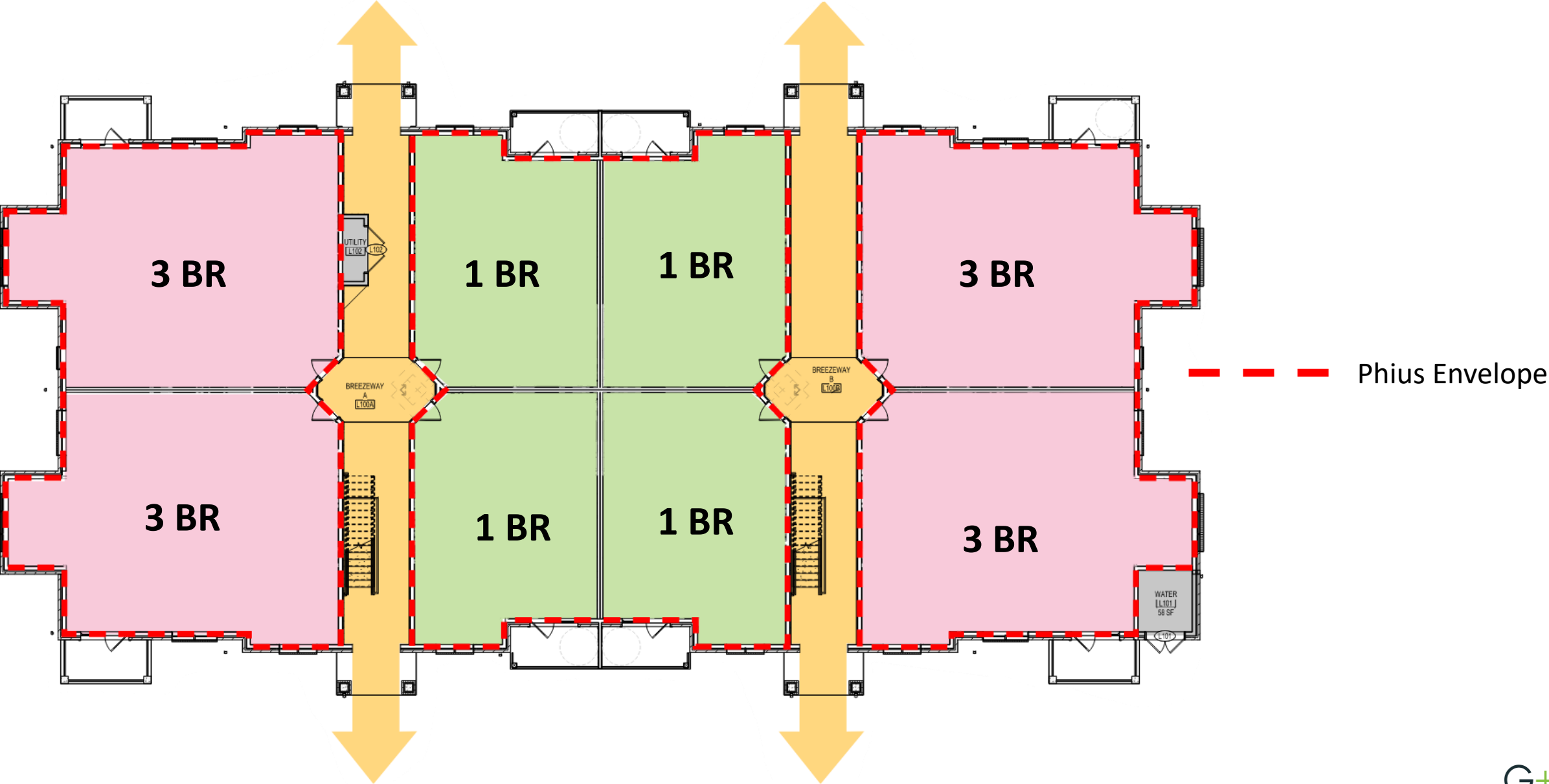
Phius Testing in “Missing Middle” Housing Types

Testing Traditional Elevator Buildings



- Phius Envelope
- Air Flow

Testing Non-Traditional Buildings



Case Study Testing – Guarded Units



- Fan procurement
- Power challenges
- Trained staffing shortage
- Air balancing guarded units
- **Results 26% above target**

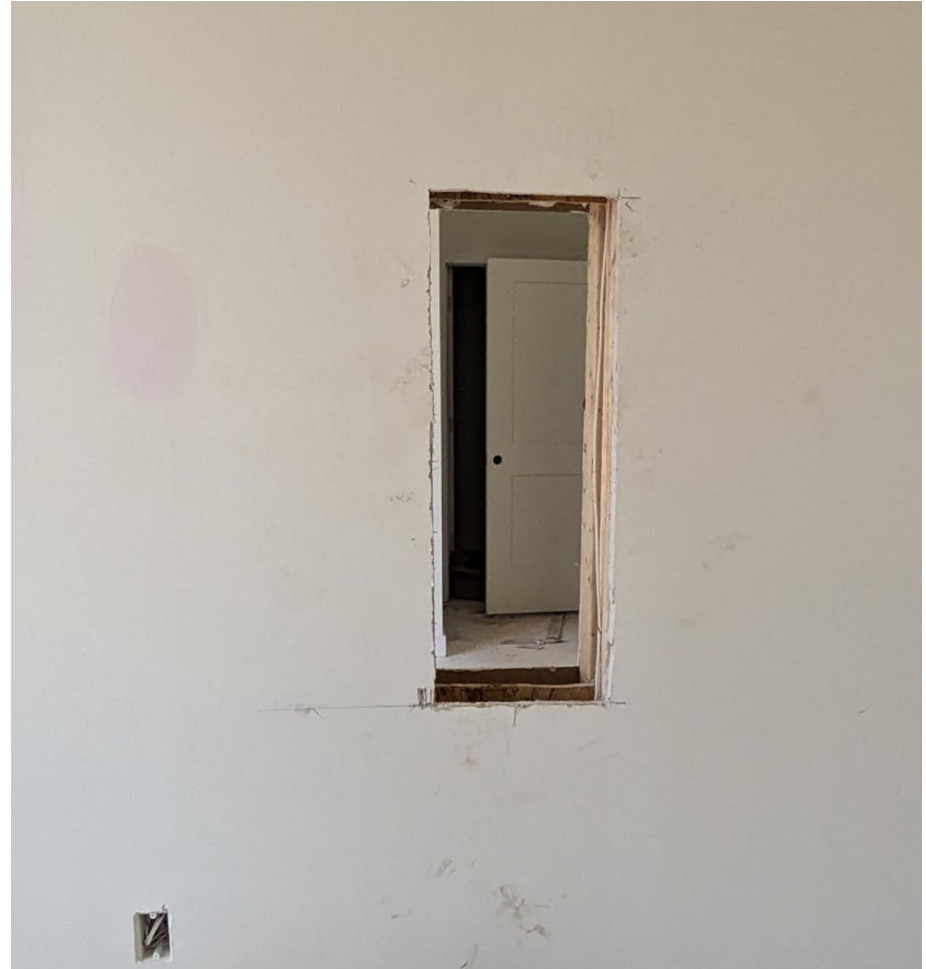
Cast Study Testing – Aerosol Envelope Sealing



- “Hail Mary” strategy
- Significant added cost
- Implemented too late in the project
- Enduring power challenges
- **Results 100% above target**

Case Study Testing – Communicating Openings

- Power challenges
- Communicating openings not sealed – new leak points?
- Testing eating into construction schedule
- Most air leakage observed at ceiling/attic (where detail not constructed as designed)
- **Results 9.5% above target**



Testing Non-Traditional Buildings

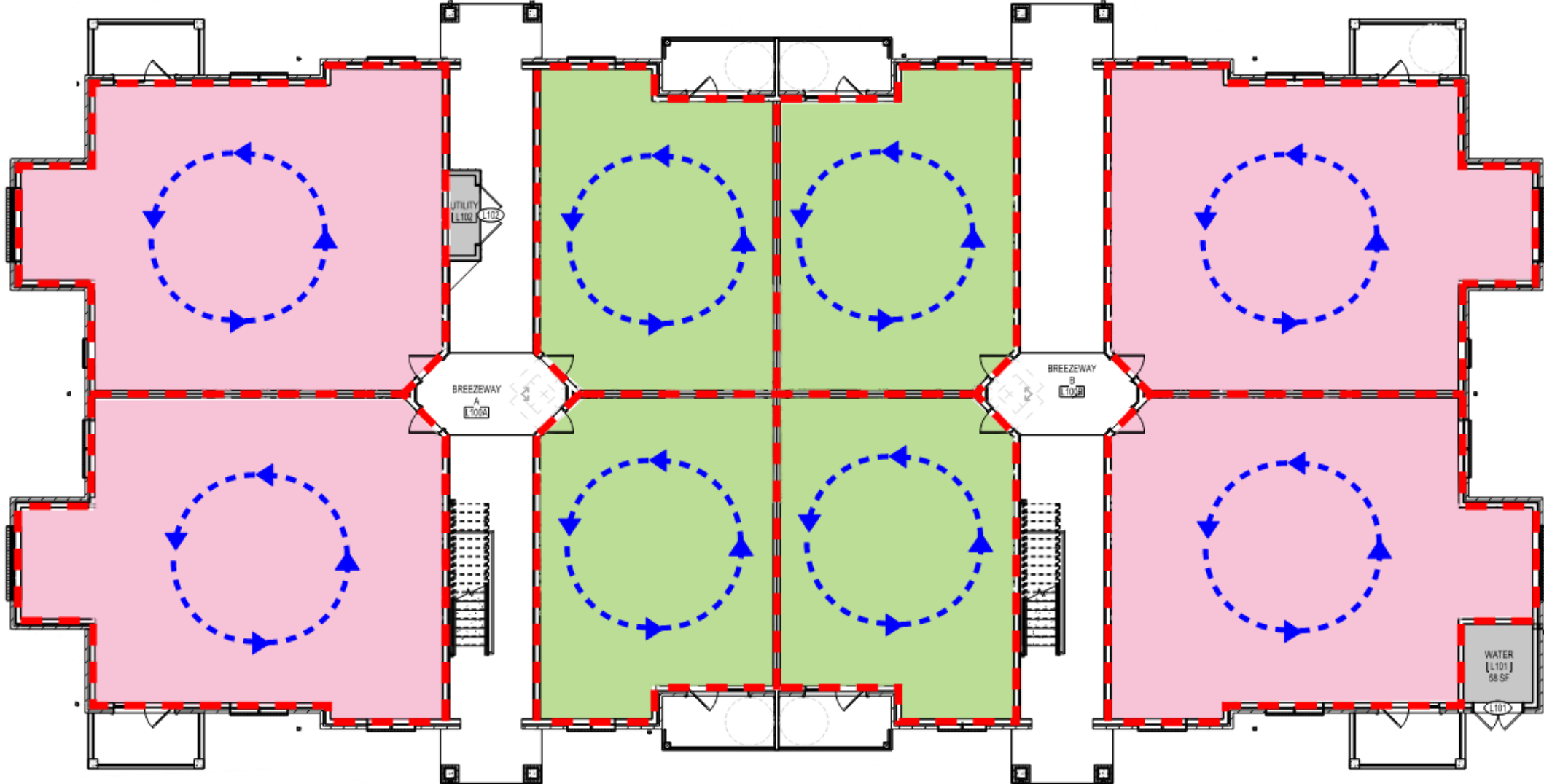


ID	Task Name	Duration	Start	Finish	Dependencies
1	CIVIL & SITE PLAN APPROVAL	67 days	Fri 10/23	Mon 10/9/23	
2	Comment Round 3 Response by Timmons	3 days	Fri 10/23	Thu 10/23/23	1
3	City Review - Site Plan Submission #4	15 days	Fri 10/23	Thu 10/23/23	1
4	Comment Round 4 Response by Timmons	10 days	Fri 10/23	Thu 10/23/23	3
5	City Review - Site Plan Submission #5	10 days	Fri 10/23	Thu 10/23/23	3
6	Final Site Plan Coordination with City	10 days	Fri 10/23	Thu 10/23/23	5
7	Site Plan Approval by City	1 day	Fri 10/23	Fri 10/23/23	6
8	VSP Coordination with City & Timmons	15 days	Mon 10/23	Fri 10/23/23	7
9	LDP Issued by VSP / City	1 day	Mon 10/23	Mon 10/23/23	8
10	Building Permit Process	86 days	Fri 10/23	Fri 10/13/24	9
11	G-P Complete Building Permit Plans	30 days	Fri 10/23	Thu 10/23/23	10
12	City Review - Building Plan Submission #1	30 days	Fri 10/23	Thu 10/23/23	11
13	G-P Review and Resubmit Building Plans	15 days	Fri 10/23	Thu 10/23/23	12
14	City Review - Building Plan Submission #2	15 days	Fri 10/23	Thu 10/23/23	13
15	Final Building Permit Set Coordination	10 days	Fri 10/23	Thu 10/23/23	14
16	Building Permit Issued	1 day	Fri 10/23	Fri 10/23/23	15
17	Energy Program	74 days	Fri 10/23	Wed 10/18/24	16
18	GRPP Determination Period	17 days	Fri 10/23	Mon 10/23/23	17
19	GRPP Application Review	10 days	Tue 10/23	Mon 10/23/23	18
20	GRPP Approval	1 day	Tue 10/23	Tue 10/23/23	19
21	GRPP Plan Revisions	30 days	Wed 10/23	Tue 10/23/23	20
22	GRPP Survey of Existing Buildings	10 days	Wed 10/23	Tue 10/23/23	21
23	Final GRPP Design Review	10 days	Wed 10/23	Tue 10/23/23	22
24	GRPP Drawing Revisions Complete & Issued	1 day	Wed 10/23	Wed 10/23/23	23
25	Pricing & Contracting	88 days	Fri 10/23	Fri 10/24	24
26	Permits - Price Building Permit Submission #1	30 days	Fri 10/23	Thu 10/23/23	25
27	Pricing Review & Quote Submitted to VM	10 days	Fri 10/23	Thu 10/23/23	26
28	VM Quote Review	5 days	Fri 10/23	Thu 10/23/23	27
29	VM Contract Negotiation & Finalization	10 days	Fri 10/23	Thu 10/23/23	28
30	Contract Closeout	10 days	Fri 10/23	Thu 10/23/23	29
31	Contract Closeout - RFP Issued	1 day	Fri 10/23	Fri 10/23/23	30



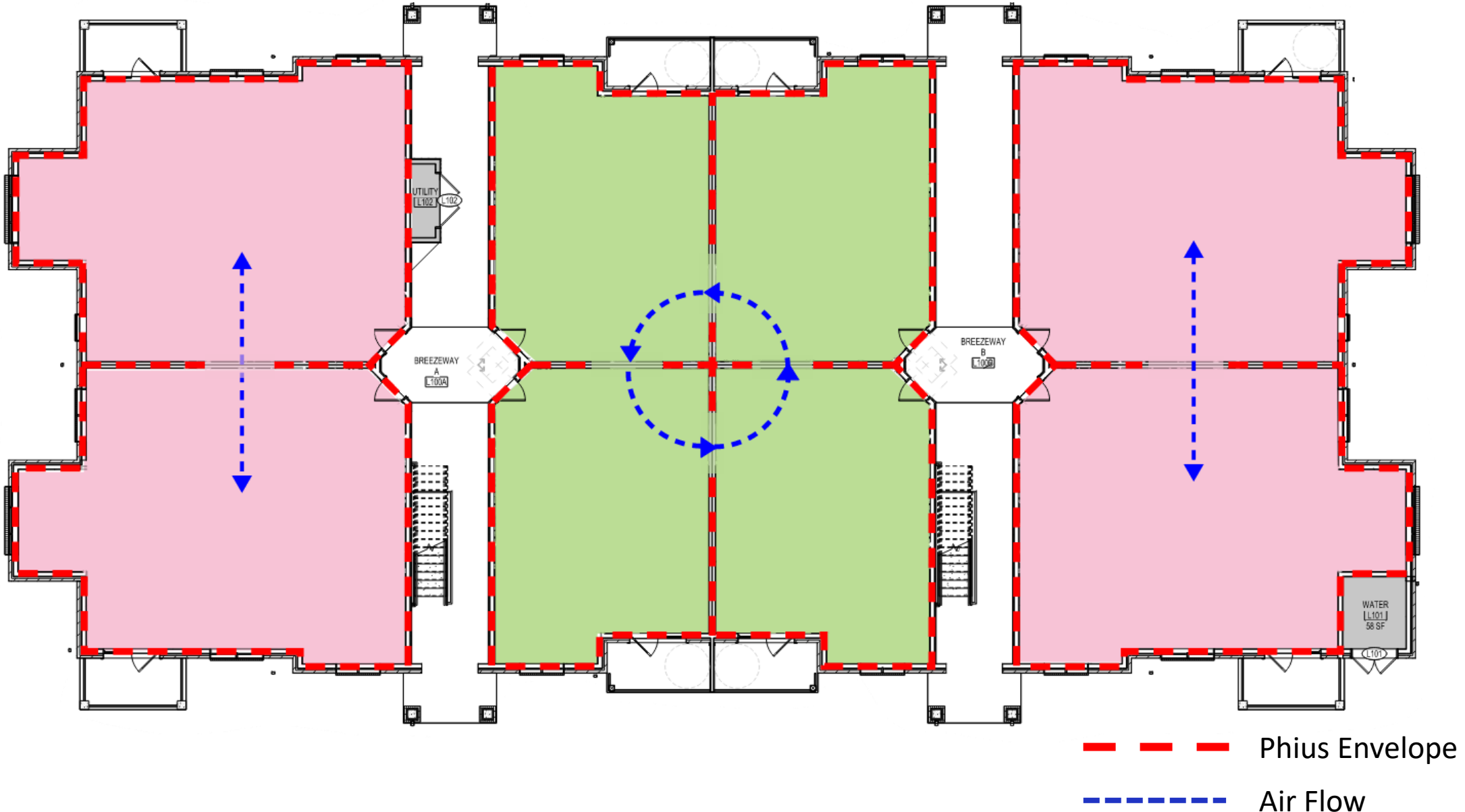
Lessons Learned

Strategy #1: Design it like a traditional townhouse



- Phius Envelope
- Air Flow

Strategy #2: Create temporary “doors” to connect units



Takeaways

- Review testing procedures in detail **BEFORE** construction
- Include testing & prep time in construction schedule
- Include testing **IN** your building design
- Communicate with your team



Thank You!