BUILDINGENERGY NYC

Prescription for Better Buildings: Phius Prescriptive Path from Start to Plaque

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Northeast Sustainable Energy Association (NESEA)
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Prescription for Better Buildings, Faster

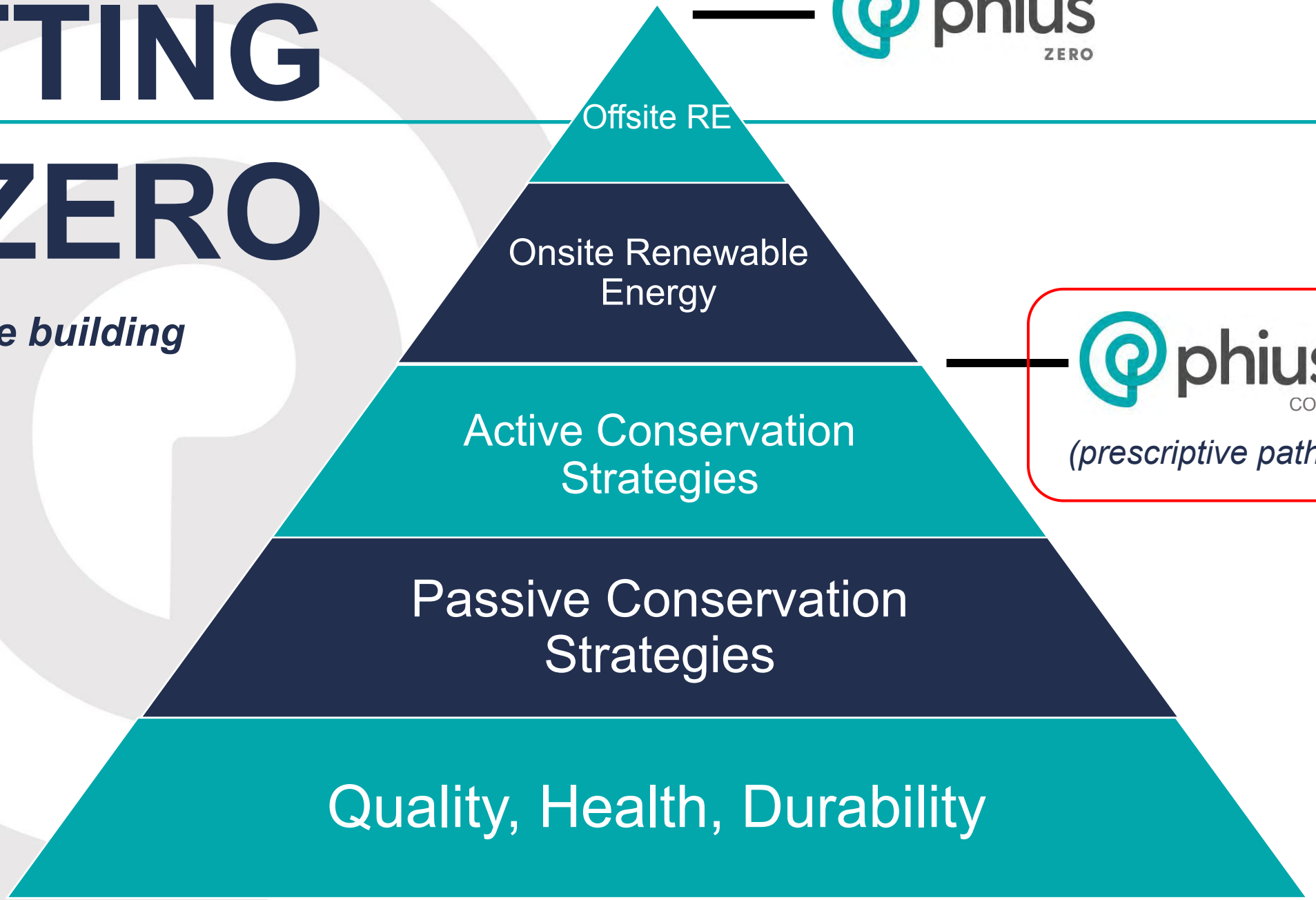
(Phius 2021 CORE Prescriptive path from start to plaque)

Overview

- Goals of the new protocol
- Prescriptive Criteria
- Getting started
- Case studies

GETTING TO ZERO

with a passive building baseline



phius ZERO

phius CORE

(prescriptive path)

Design: *based on a decade of data*

Design: Reduce barriers

Goals:

- **Accessibility for more CPHCs**
  - Many CPHCs outsource Energy modeling
  - Every single CPHC can fill out a spreadsheet
- **Remove investment in Energy modeling**
  - Time, training, resources associated with WUFI Passive and THERM
  - Feedback loop increases design timeline
- **Reduce certification timeline**
  - Less to check = less rounds of review
- **Allows all Phius professionals to submit for pre-cert**
- **Support rapid development of single family homes**
  - Climate-specific standard has been successful in SF homes
- **Cost-effective solution for large-scale community development**
  - Time, training, resources associated with WUFI Passive and THERM
  - Feedback loop increases design timeline

Design: *Access to Certification*

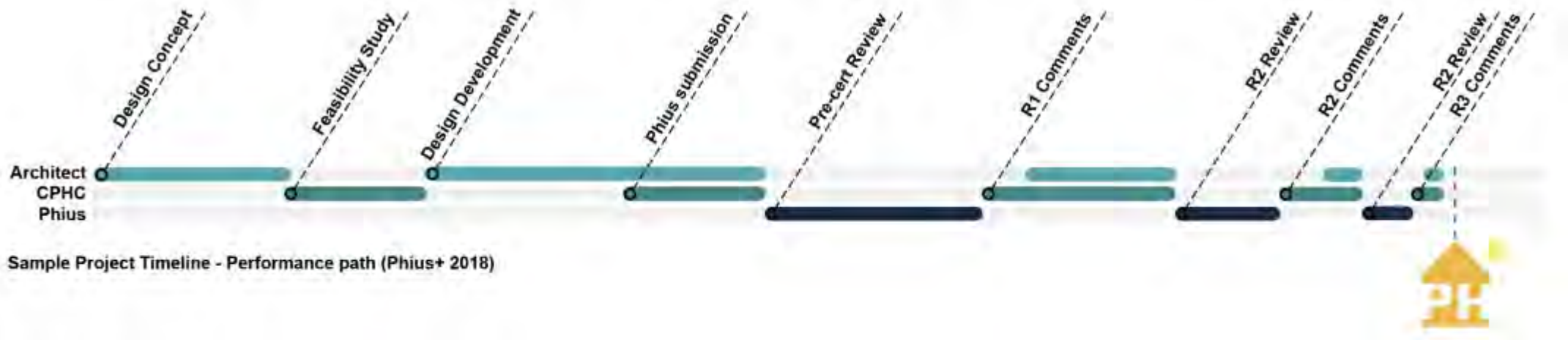
Reduce pre-certification timeline and effort

Allow certified builders, raters and verifiers to submit for precertification

To scale up the Phius standard

we need the help of all our certified professionals

Design: *Expedite Certification*



Sample Project Timeline - Performance path (Phius+ 2018)

Project Timeline: Case 01, GC Residence - Prescriptive path (2021 Phius CORE)

Prescriptive Criteria

Criteria: *Overview*

Eliminates the need for WUFI
- Replaced with a prescriptive checklist based on project location

Prescriptive path requirements

Criteria: *Single Family*

Applicable to:

- Single family detached
- Side-by-side duplexes

Habitat for Humanity – Columbia County, NY
Barlis Wedlick Architects

Criteria: *Limitations*

No fossil fuel combustion equipment

No jetted tubs / indoor pools

No natural draft fireplaces

Criteria: *Airtightness*

Increased airtightness

- .04 cfm/ft2
  (performance =.06 cfm/ft2)

Preliminary blower door

- Required
- Catch durability issues early

Mitigate risks

- Resiliency of assemblies

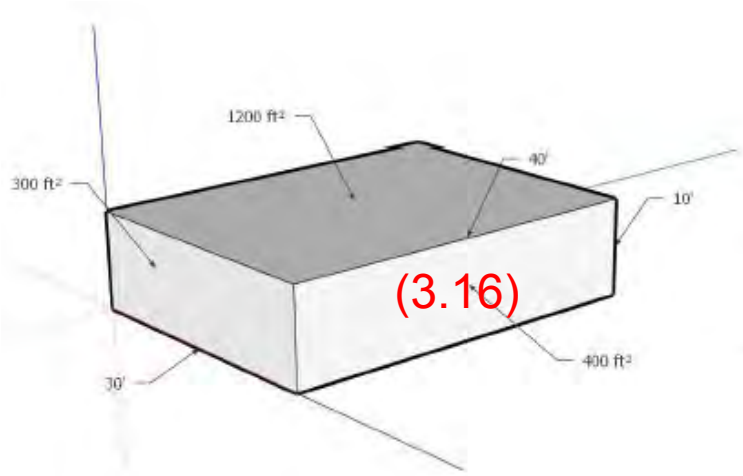
Criteria: *Compactness*

Building ‘compactness’ (Form factor) is limited

- Based on iCFA

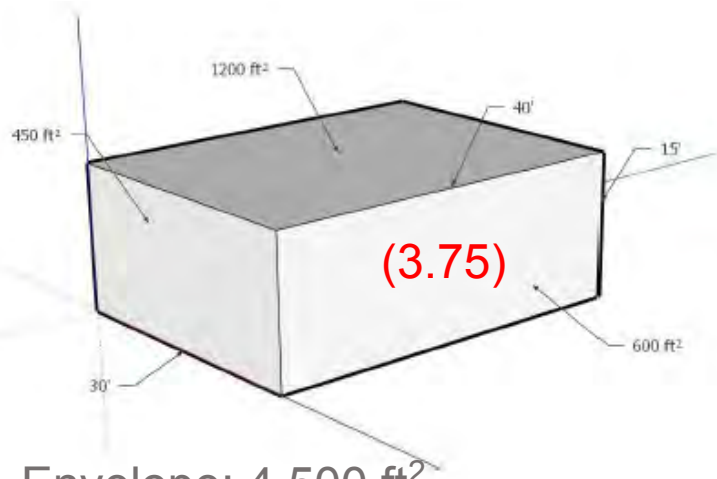
iCFA/bedroom < 900 ft2

- Controls building occupant density

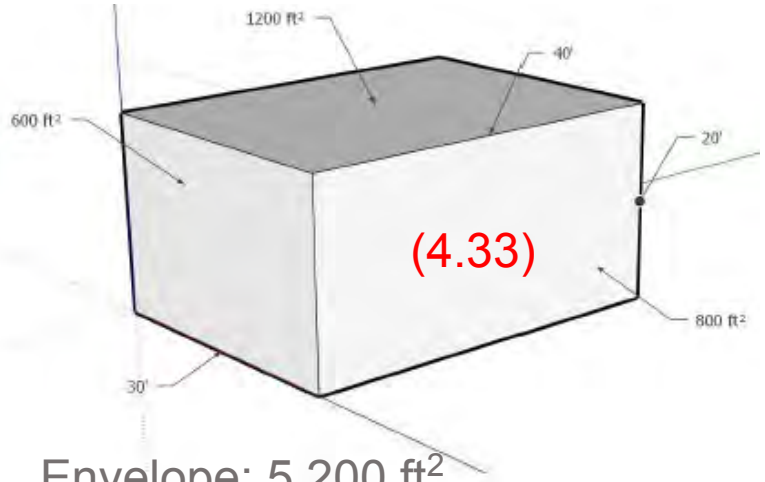


Envelope: 3,800 ft^2

iCFA: 1,200 ft^2

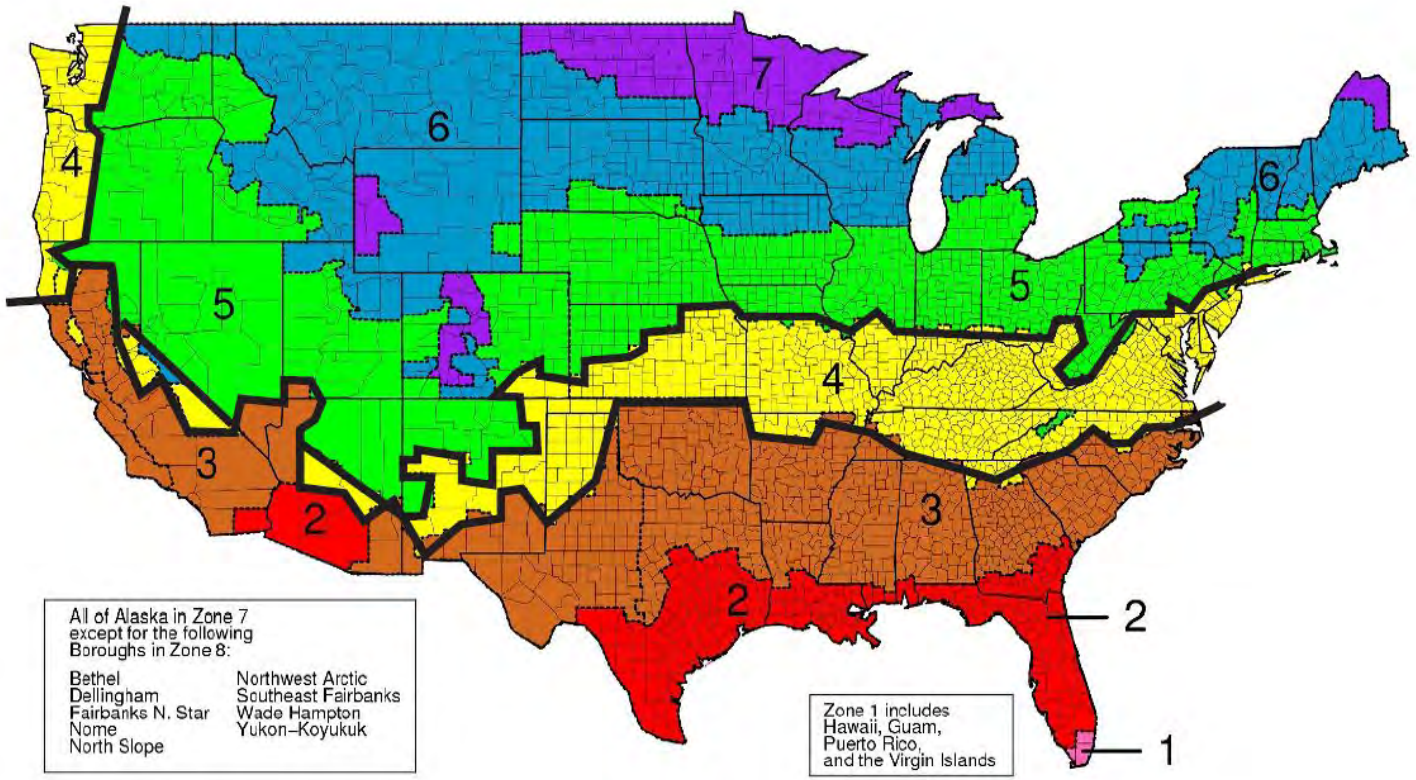


Envelope: 4,500 ft^2



Envelope: 5,200 ft^2

Criteria: *Solar protection*



Zone 5 - 7

- Net Gain score (4.5)

Zone 4

- Max SHGC (4.1)

- Net Gain score (4.5)

Zones 0-3

- Max SHGC (4.1)

- Fixed overhangs required (4.4)

Criteria: Efficient Systems

7 Mechanical Ventilation[33]			Designer Verified	Rater Verified	N/A	Submittal
7.1 Balanced Ventilation						
7.1.1	Ventilation is balanced according to phius Certification Guidebook Section 3.				-	
7.2 Mechanical Ventilation Efficiency						
7.2.1	**The sensible recovery efficiency[34,35,36] in heating mode ≥ calculated minimum required value.**	**80%**			-	
7.2.2	**The total recovery efficiency[37] in cooling mode is greater than or equal to the calculated minimum required value.**	**NR**			-	
7.2.3	The electrical efficiency of the fresh air ventilation system meets 7.2.3.1 **or** follows the performance tradeoff path in 9.7.2.				-	
7.2.3.1	Limit of 0.63 [W/cfm] (1.2 [cfm/W]) on mechanical fresh air ventilation systems.[38]				-	
7.2.3.2	*For tradeoff path allowed for fresh air ventilation system electric efficiency, use [+] to the left to reveal table below.*				-	
7.2.4	The ventilation ducts between the recovery device and the enclosure are insulated to at least R-8. Air-sealed, Class I vapor retarder shall be installed over all air-permeable insulation (such as fiberglass duct wrap) on ventilation ducts connected to the outside.				-	
7.2.5	**The total length of the fresh air ventilation (supply and exhaust) ducts between the recovery device and the enclosure is less than or equal to the project-specific calculated maximum [ft].**	**25**			-	
7.2.6	Ventilator defrost is provided as required.[39]				-	
7.2.7	Direct exhaust range hood rated airflow does not exceed 385 [cfm].				-	

8 Mechanical Systems					Designer Verified	Rater Verified	N/A	Submittal
8.1 The space heating system does not rely primarily[40] on electric resistance.							-	
8.2 Minimum required heating/cooling equipment efficiency is met based on climate zone and system type as calculated.							-	
8.2.1	*Choose System:*	Air Source Heat Pump	Minimum COP @ 5°F:	1.8			-	
			Minimum SEER:	15.0				
8.3 Ventilation Fans meet ENERGY STAR Most Efficient 2020.[41]							-	
8.4 Dehumidifiers meet ENERGY STAR Most Efficient 2020.[42]							-	

Process:

Getting Started

phius CORE Prescriptive 2021 Snapshot

Input or select data in orange cells

State	ALABAMA
City	ANNISTON METROPOLITAN A
ASHRAE Climate Zone	3A
iCFA* (ft^2)	1500
Number of Bedrooms*	4
Number of Stories	2

**per dwelling unit*

1. GENERAL

1.1.2 iCFA divided by Number of Bedrooms	Maximum Limit	900	ft^2
(Calculated Value based on Inputs)	*OK, Meets Limit*	*375*	ft^2

3. COMPACTNESS

3.1 Maximum Envelope Area		4989	ft^2
(Maximum Envelope to Floor Area Ratio)		*3.33*	

4. SOLAR PROTECTION

4.1.1 Maximum Whole Window SHGC		0.25	
4.4.1 Projection Factor for Fixed Overhangs		0.66	

5. HEAT TRANSMISSION

5.1.1a Fenestration/Openings	Maximum Whole Component U-Value	0.23	(BTU/h.ft^2.°F)
5.1.1b Walls & Overhang Floors	Minimum Effective R-Value	30	(ft^2.°F.h/BTU)
5.1.1c Roofs, Ceilings	Minimum Effective R-Value	59	(ft^2.°F.h/BTU)
5.1.1d Whole Slab Foundations & Below-Grade Walls and Floors of Conditioned Basements and Crawl Spaces	Minimum Effective R-Value	12	(ft^2.°F.h/BTU)
5.1.1e Ceilings of Unconditioned Basements or Crawl Spaces, and Pier and Beam Floors	Minimum Effective R-Value	18	(ft^2.°F.h/BTU)

6. MOISTURE RISK LIMITATION

6.2.1 Minimum Fenestration Condensation Resistance		0.61	

7. MECHANICAL VENTILATION

7.2.1 Minimum Sensible Recovery Efficiency, Heating Mode		66%	
7.2.2 Minimum Total Recovery Efficiency, Cooling Mode		60%	
7.2.5 Maximum Total Length of Fresh Air Ducts to Outside		22	ft

8. MECHANICAL SYSTEMS

Select System Type: Air Source Heat Pump

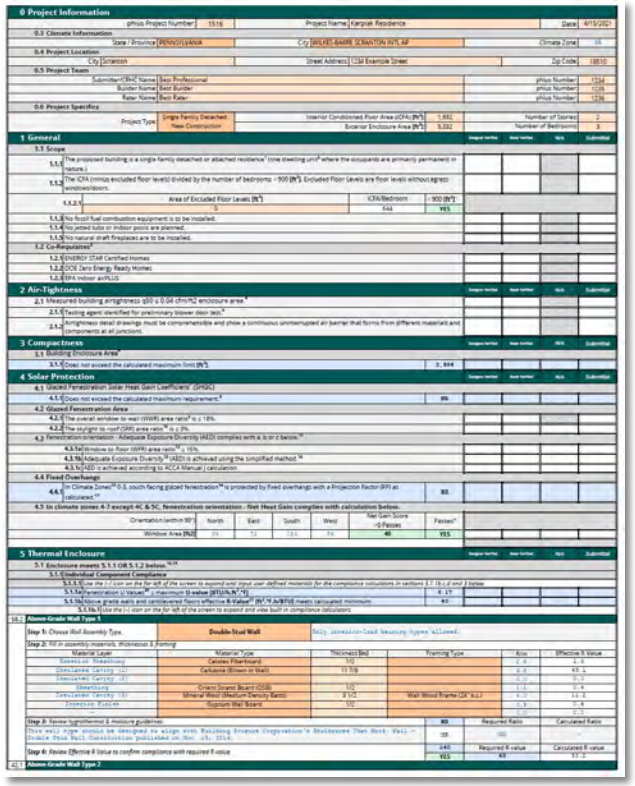
8.2 System Efficiency	Minimum HSPF	9.6	
	Minimum SEER	18.0	

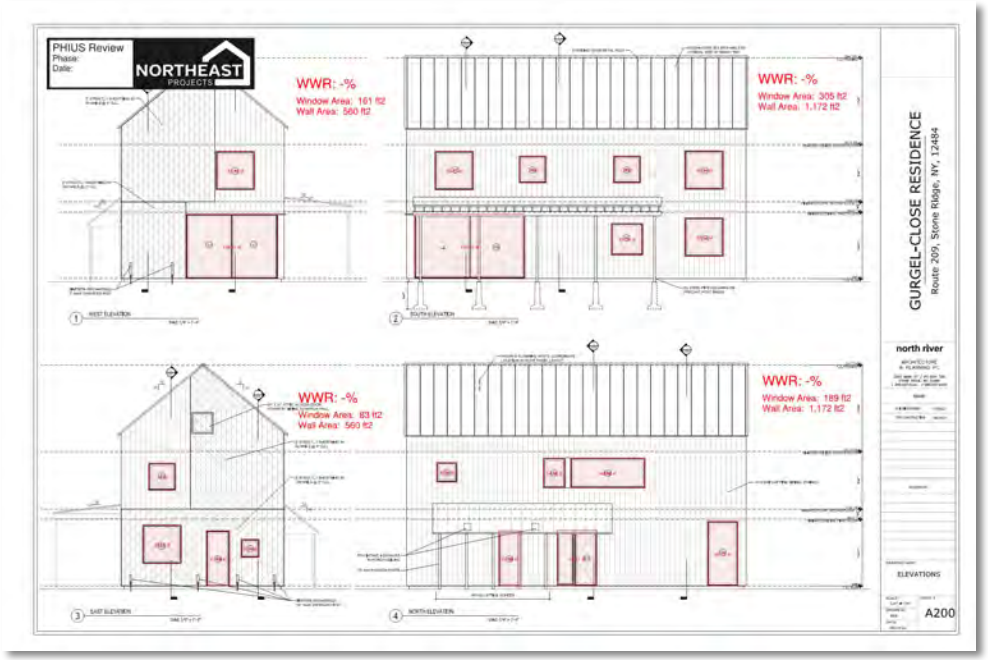
Phius CORE Prescriptive **Snapshot**

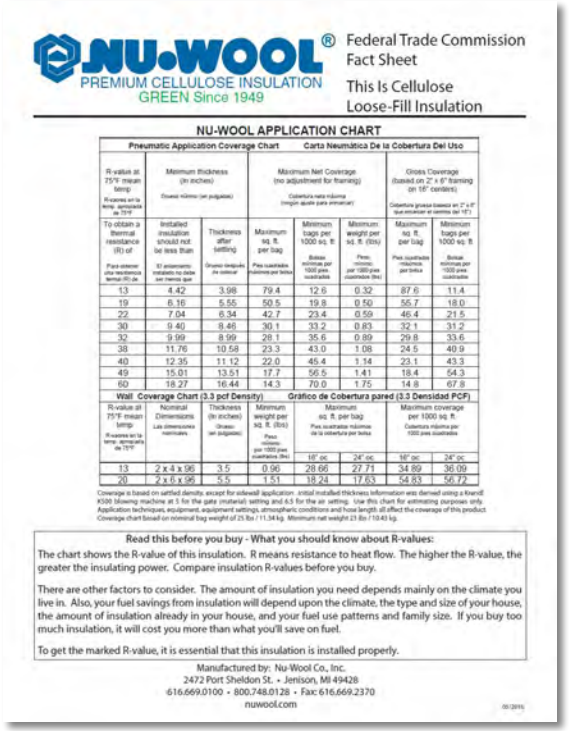
(www.phius.org)

phius

Precertification documents





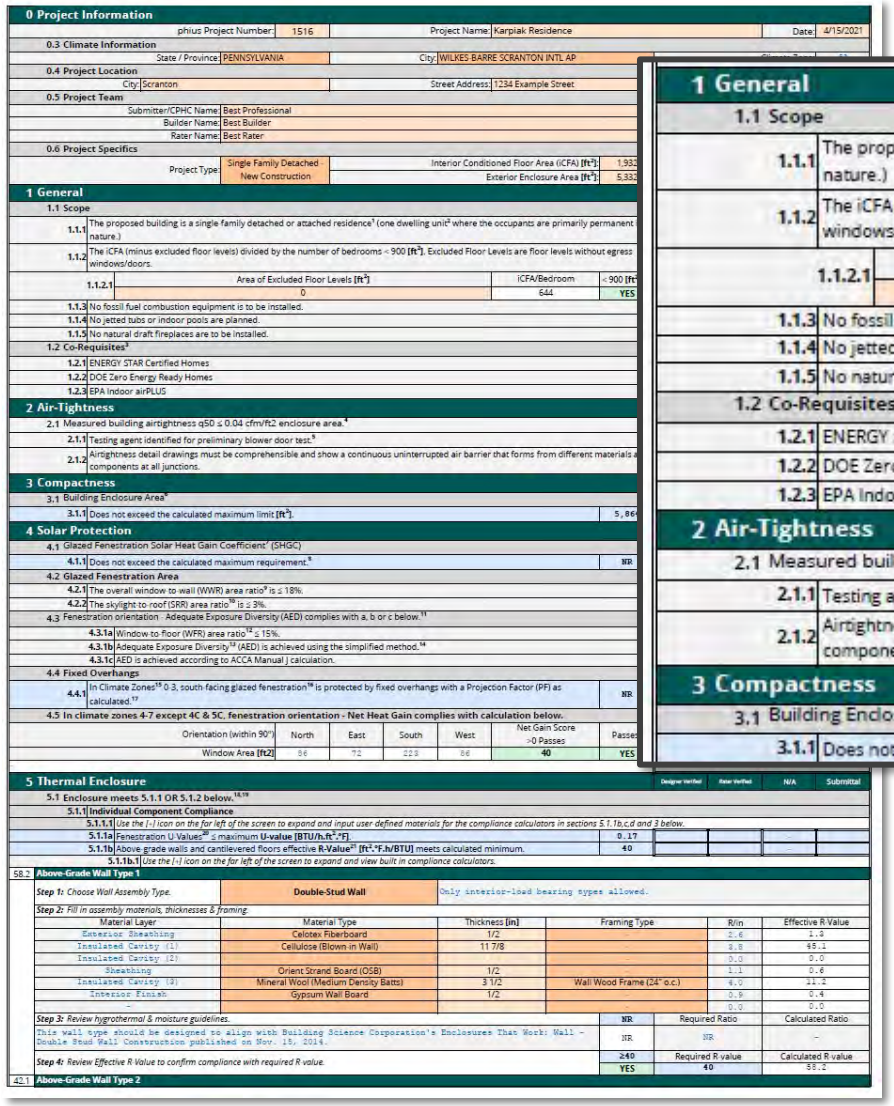


1. Prescriptive checklist

2. Construction drawings and takeoffs

3. Datasheets

Precertification documents



0 Project Information

phius Project Number:	1516	Project Name:	Karpiak Residence	Date:	4/15/2021
0.3 Climate Information					
State / Province:	PENNSYLVANIA	City:	WILKES BARRE SCRANTON INTL AP		
0.4 Project Location					
City:	Scranton	Street Address:	1234 Example Street		
0.5 Project Team					
Submitter/CPHC Name:	Best Professional				
Builder Name:	Best Builder				
Rater Name:	Best Rater				
0.6 Project Specifics					
Project Type:	Single Family Detached - New Construction	Interior Conditioned Floor Area (iCFA) [ft²]:	1,93		
		Exterior Enclosure Area [ft²]:	5,33		

1 General

1.1 Scope				
1.1.1	The proposed building is a single family detached or attached residence[1] (one dwelling unit[2] where the occupants are primarily permanent in nature.)			
1.1.2	The iCFA (minus excluded floor levels) divided by the number of bedrooms < 900 [ft²]. Excluded Floor Levels are floor levels without egress windows/doors.			
1.1.2.1	Area of Excluded Floor Levels [ft²]: 0	iCFA/Bedroom: 644	< 900 [ft²]: YES	
1.1.3	No fossil fuel combustion equipment is to be installed.			
1.1.4	No jetted tubs or indoor pools are planned.			
1.1.5	No natural draft fireplaces are to be installed.			
1.2 Co-Requisites[3]				
1.2.1	ENERGY STAR Certified Homes			
1.2.2	DOE Zero Energy Ready Homes			
1.2.3	EPA Indoor airPLUS			

2 Air-Tightness

2.1	Measured building airtightness q50 ≤ 0.04 cfm/ft2 enclosure area.[4]			
2.1.1	Testing agent identified for preliminary blower door test.[5]			
2.1.2	Airtightness detail drawings must be comprehensible and show a continuous uninterrupted air barrier that forms from different materials and components at all junctions.			

3 Compactness

3.1	Building Enclosure Area[6]			
3.1.1	Does not exceed the calculated maximum limit [ft²].	5,864		

4 Solar Protection

4.1	Glazed Fenestration Solar Heat Gain Coefficient[7] (SHGC)			
4.1.1	Does not exceed the calculated maximum requirement.[8]	NR		
4.2	Glazed Fenestration Area			
4.2.1	The overall window to wall (WWR) area ratio[9] is ≤ 18%.			
4.2.2	The skylight to roof (SRR) area ratio[10] is ≤ 3%.			
4.3	Fenestration orientation - Adequate Exposure Diversity (AED) complies with a, b or c below.[11]			
4.3.1a	Window to floor (WFR) area ratio[12] ≤ 15%.			
4.3.1b	Adequate Exposure Diversity[13] (AED) is achieved using the simplified method.[14]			
4.3.1c	AED is achieved according to ACCA Manual J calculation.			
4.4	Fixed Overhangs			
4.4.1	In Climate Zones[15] 0-3, south-facing glazed fenestration[16] is protected by fixed overhangs with a Projection Factor (PF) as calculated.[17]	NR		
4.5	In climate zones 4-7 except 4C & 5C, fenestration orientation - Net Heat Gain complies with calculation below.			

Orientation (within 90°)	North	East	South	West	Net Gain Score >0 Passes	Passes
Window Area [ft2]	56	72	223	86	40	YES

5 Thermal Enclosure

5.1	Enclosure meets 5.1.1 OR 5.1.2 below.[18,19]			
5.1.1	Individual Component Compliance			
5.1.1.1	*Use the [-] icon on the far left of the screen to expand and input user defined materials for the compliance calculators in sections 5.1.1b,c,d and 3 below.*			
5.1.1a	Fenestration U-Values[20] ≤ maximum U-value [BTU/h.ft².°F]	0.17		
5.1.1b	Above grade walls and cantilevered floors effective R-Value[21] [ft².°F.h/BTU] meets calculated minimum.	40		
5.1.1b.1	*Use the [+] icon on the far left of the screen to expand and view built in compliance calculators.*			

58.2 Above-Grade Wall Type 1

Step 1: Choose Wall Assembly Type. **Double-Stud Wall** — Only interior-load bearing types allowed.

Step 2: Fill in assembly materials, thicknesses & framing.

Material Layer	Material Type	Thickness [in]	Framing Type	R/in	Effective R Value
Exterior Sheathing	Celotex Fiberboard	1/2	-	2.6	1.3
Insulated Cavity (1)	Cellulose (Blown in Wall)	11 7/8	-	3.8	45.1
Insulated Cavity (2)			-	0.0	0.0
Sheathing	Orient Strand Board (OSB)	1/2	-	1.1	0.4
Insulated Cavity (3)	Mineral Wool (Medium Density Batts)	3 1/2	Wall Wood Frame (24" o.c.)	4.0	14.2
Interior Finish	Gypsum Wall Board	1/2	-	0.9	0.4
-			-	0.0	0.0

Step 3: Review hygrothermal & moisture guidelines. NR — Required Ratio — Calculated Ratio

This wall type should be designed to align with Building Science Corporation's Enclosures That Work: Wall - Double Stud Wall Construction published on Nov. 15, 2014.

NR — NR — -

Step 4: Review Effective R Value to confirm compliance with required R value. ≥40 — Required R value — Calculated R value

YES — 40 — 58.2

42.1 Above-Grade Wall Type 2

Prescriptive checklist

- Organized in 9 sections
- Requirements automated based on general info

Case studies and principles

(Phius 2021 CORE Prescriptive path from start to plaque)

Northeast Case studies

First Phius Prescriptive path design certified project →

GC Residence
North River Design + Build
Stone Ridge, NY

R2 Pre-certification review →

RR Residence
North River Design + Build
Stone Ridge, NY

R2 Pre-certification review →

LT Residence
North River Design + Build
Kerhonkson, NY

03. Compactness

Wellfleet

Wellfleet, MA

R2 Pre-certification review →

Riley Residence

Falmouth, MA

03. Compactness

Pleasant Hill

Cornwall, NY

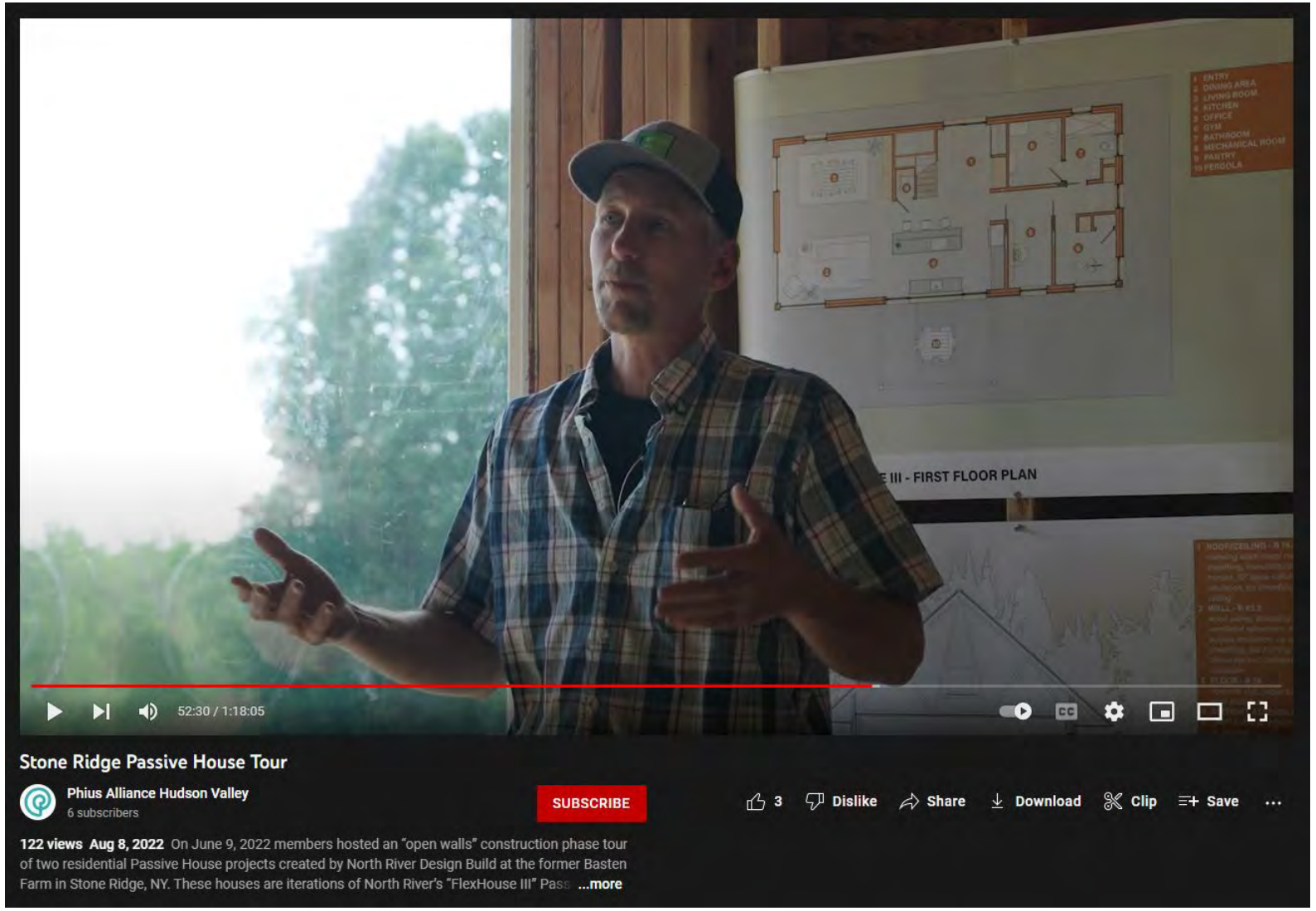
Opted for performance path (Phius ZERO) →

Wild Oak Passive House
R plus
Blacksburg, VA

Northeast Case studies

Stone Ridge Passive House Tour

Phius Alliance Hudson Valley Youtube



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Prescription for Better Buildings, Faster

(Phius 2021 CORE Prescriptive path from start to plaque)

PHIUS 2022 Core Prescriptive path – Case Study

Bronzeville Estates Milwaukee WI

KAKOON

Agenda

- Project background
- Project details
- Design decisions and opportunities
- Lessons learned

Project Background

Full project

LIHTC development
15 retrofit units
15 new construction

Passive house portion

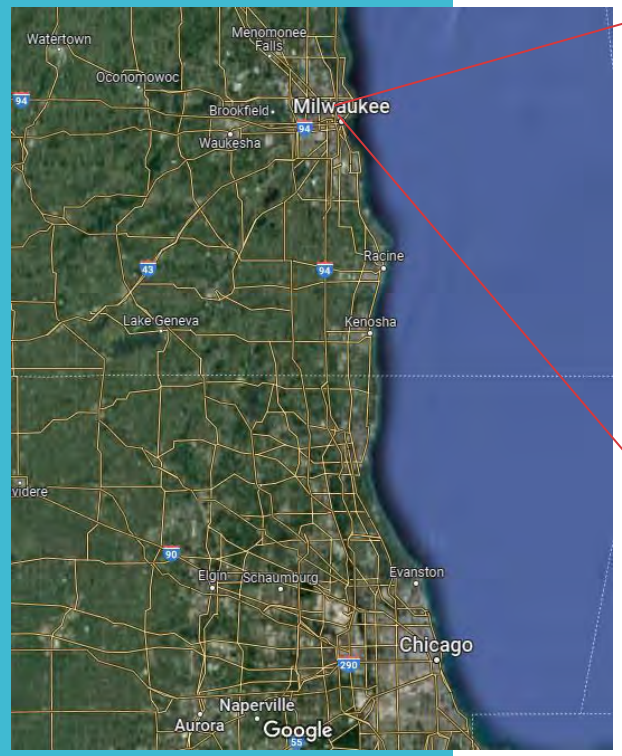
All new construction
3/3 Duplex
4/4 Duplex
Single family home

Developer: Maures Development

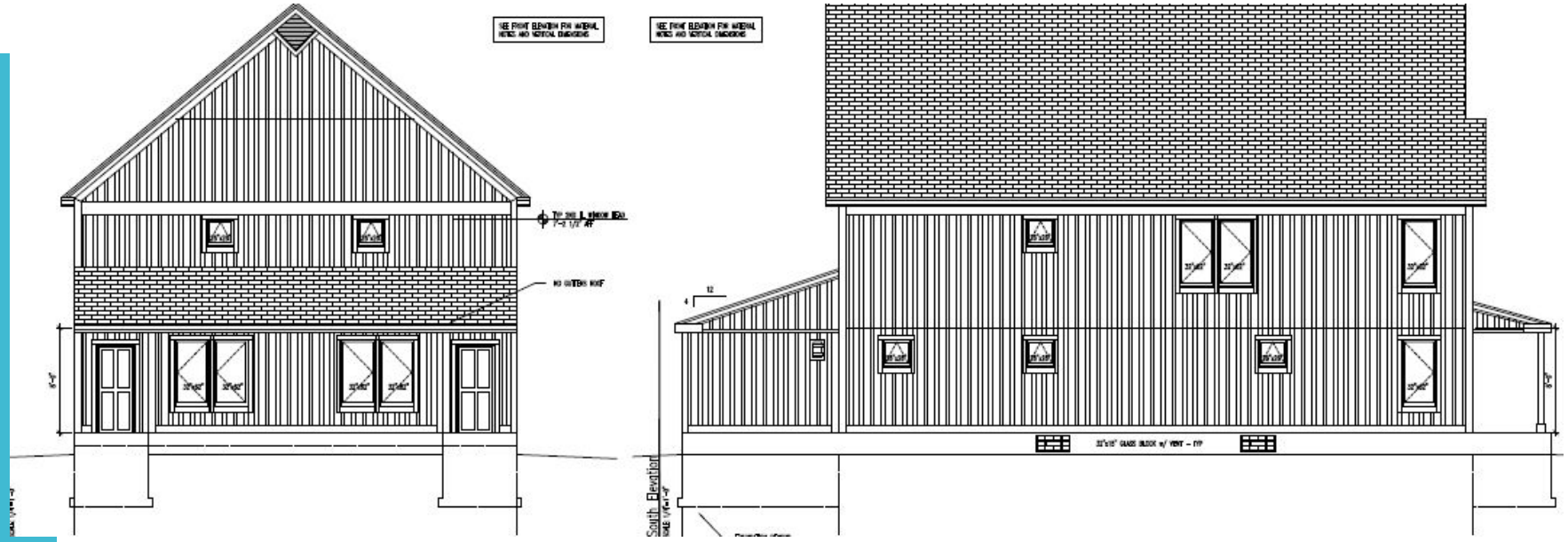
Architect: Engberg Anderson
Passive house Consultant: Kakoon Buildings

KAKOON

Bronzeville Scattered Sites- Passive House projects

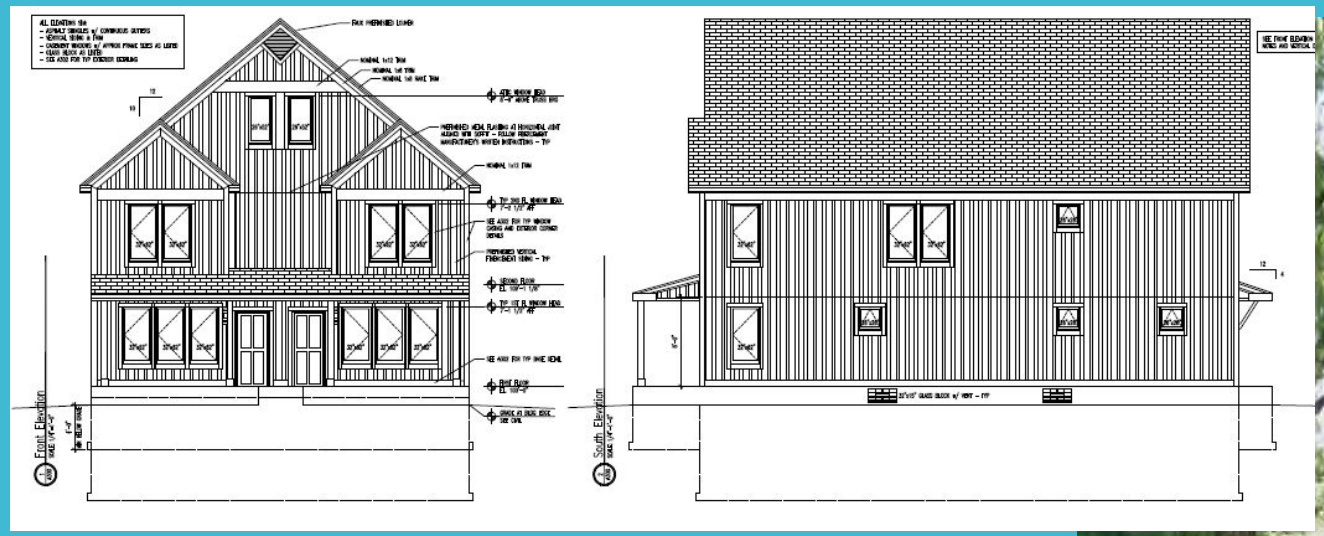


Original Design – Good candidate for prescriptive path



- Multiple units with the same construction method and builder
- Modular construction with BuildSmart panel
- Townhouse style units, compact design are perfect candidates for prescriptive path certification

KAKOON



3/3 duplex

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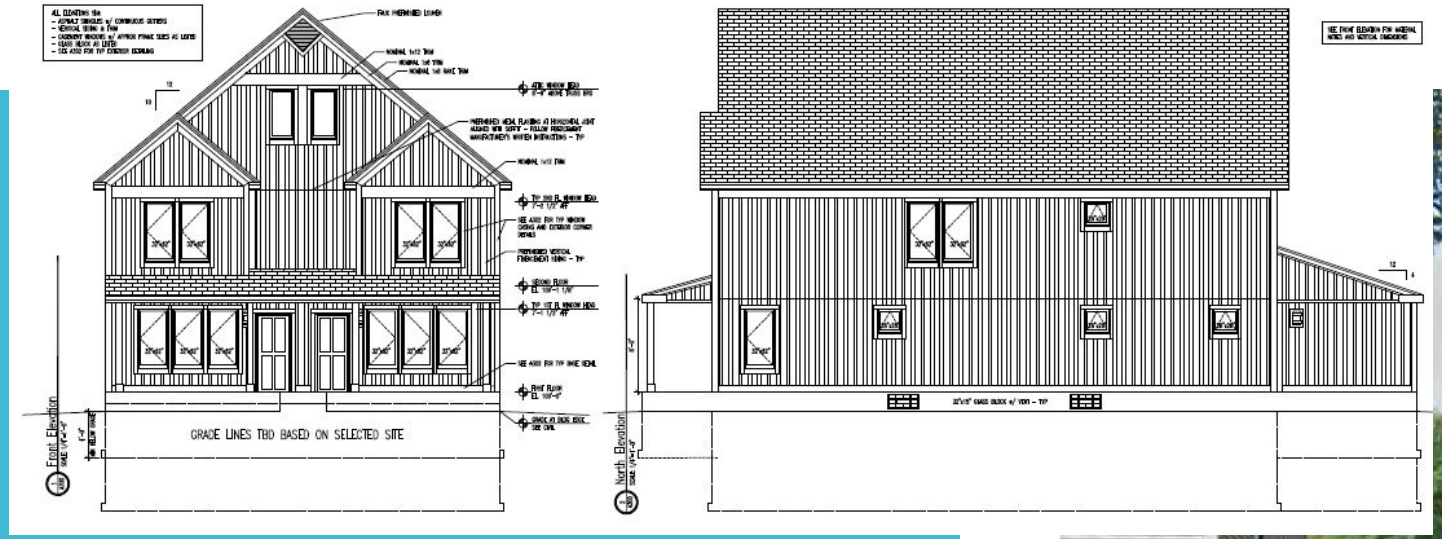

4/4 duplex

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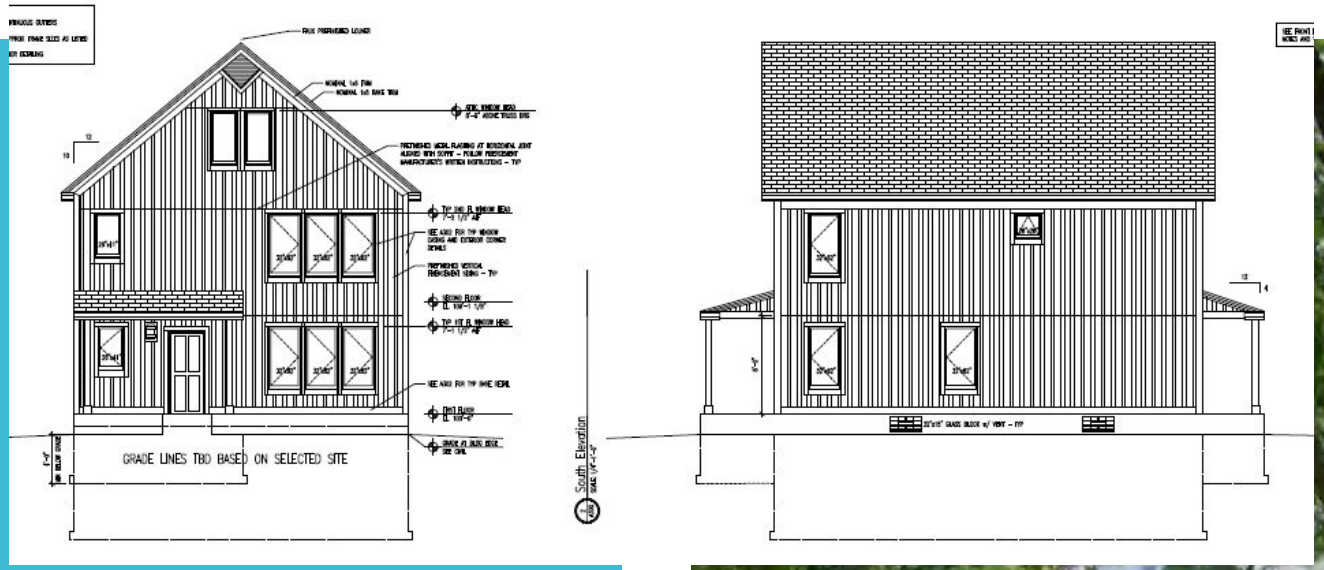
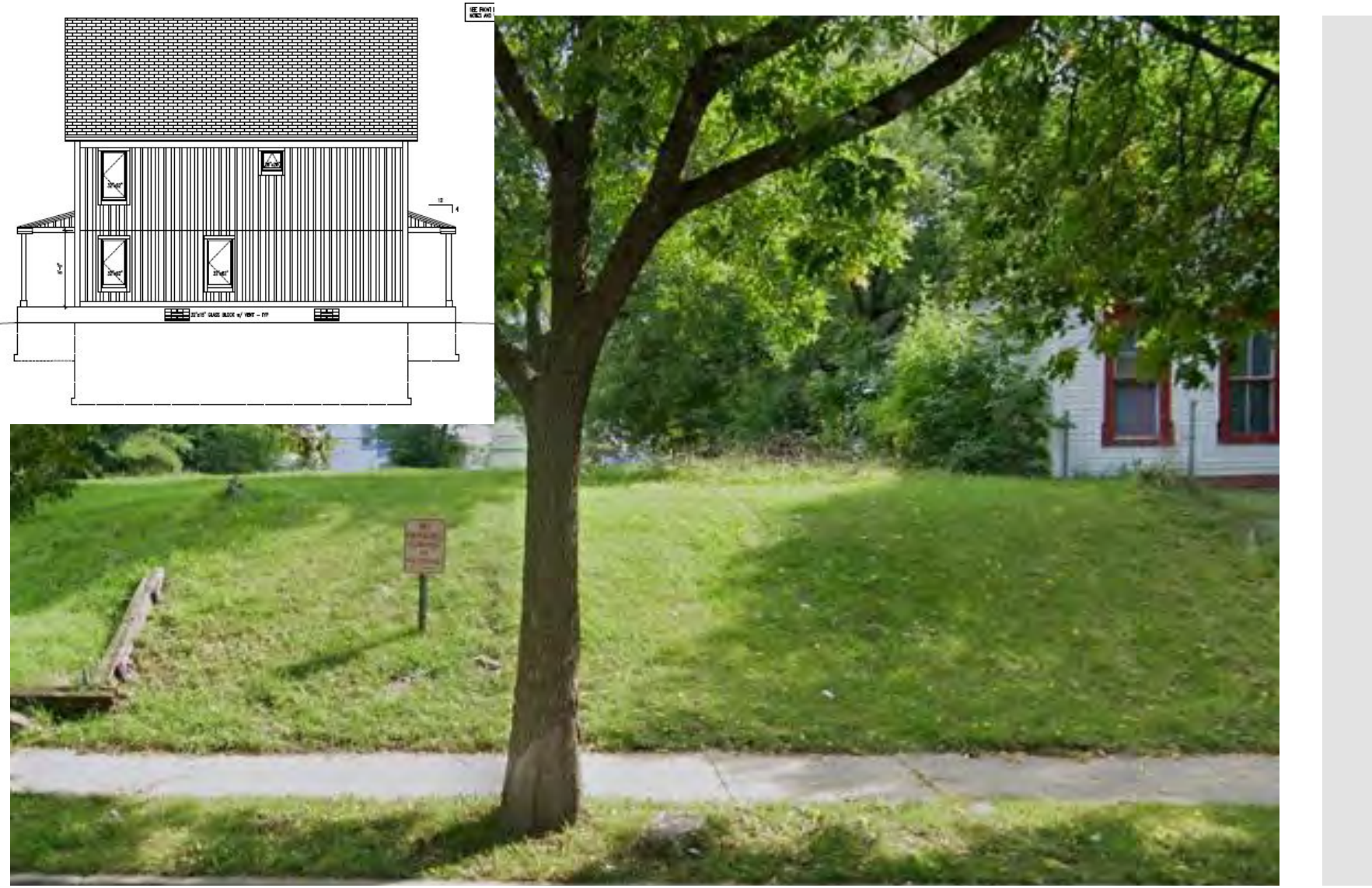
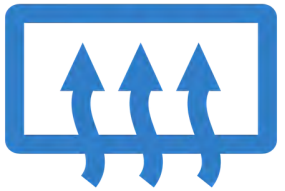


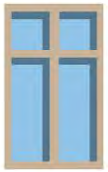


3 bed single family

KAKOON

- **Compactness**
  - no change from original design
- **Efficient mechanicals**
  - original design was for natural gas furnace
  - Replaced with ERV and multi-split heat pump system
  - Increase in duct work
- **Air-Tightness**
  - original design was standard 2x4 construction with spray foam
  - Redesign included build smart panel system with 10” continuous EPS
- **Windows**
  - Upgrade needed from standard U-value
  - Easy to arrange with Build Smart integration of Alpen windows
- **Other items**
  - EV chargers are required where parking is provided
  - No combustion





Current state

- Construction had been scheduled to start in August of 2022
- Pricing came back higher than expected
- Currently waiting on the Developer to secure funding for gap in financing

Keys for success

- Have integrated project meetings
- Find experienced PHIUS architect and builder
- Have rater involvement from the beginning of the design
- Identify additional funding for passive house portion of the project
- Educate the developer and project team about the process early and often
- Make sure the developer is involved in the entire process

Questions

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KAKOON

Extras