BUILDINGENERGY BOSTON

Through The Details: Lessons Learned from 50 Phius Design Certifications

John Loercher, Northeast Projects
Steve Scribner, Shape Architecture

Curated by Joe De Larauze and Brenda Lam

Northeast Sustainable Energy Association (NESEA) | March 23, 2026

Through the Details

Lessons from 50 Phius Design Certifications

Your Trusted Partner in High Performance Building

Celebrating **50 Phius certifications** since 2017

www.ne-projects.com
info@ne-projects.com
@ne_projects

phius certified consultant | phius certified trainer

John Loercher

Building Performance Consultant

CPHC Trainer,
Curriculum Developer
2017- Present

Chapter President
2022- Present
Secretary
2016-2020

Owner, Principal Consultant
2017- Present

Senior Lecturer
School of Architecture
2019 -Present

Agenda

10 mins	Practice statistics and info
30 mins	Throughline
20 mins	Drawing review / Questions

Your Trusted Partner in High Performance Building

Celebrating **50 Phius certifications** since 2017












shape
ARCHITECTURE

8 Architectural Staff
6 Licensed Architects
2 PHI CPHD / **2** Phius CPHC
Target: 100% CPHC by 2027




DE
MO

all-electric houses

GRAPHITE
STUDIO

INTEGRAL
BUILDING + DESIGN

phius alliance
NEW YORK

RPA

HUE
architecture

shape
ARCHITECTURE

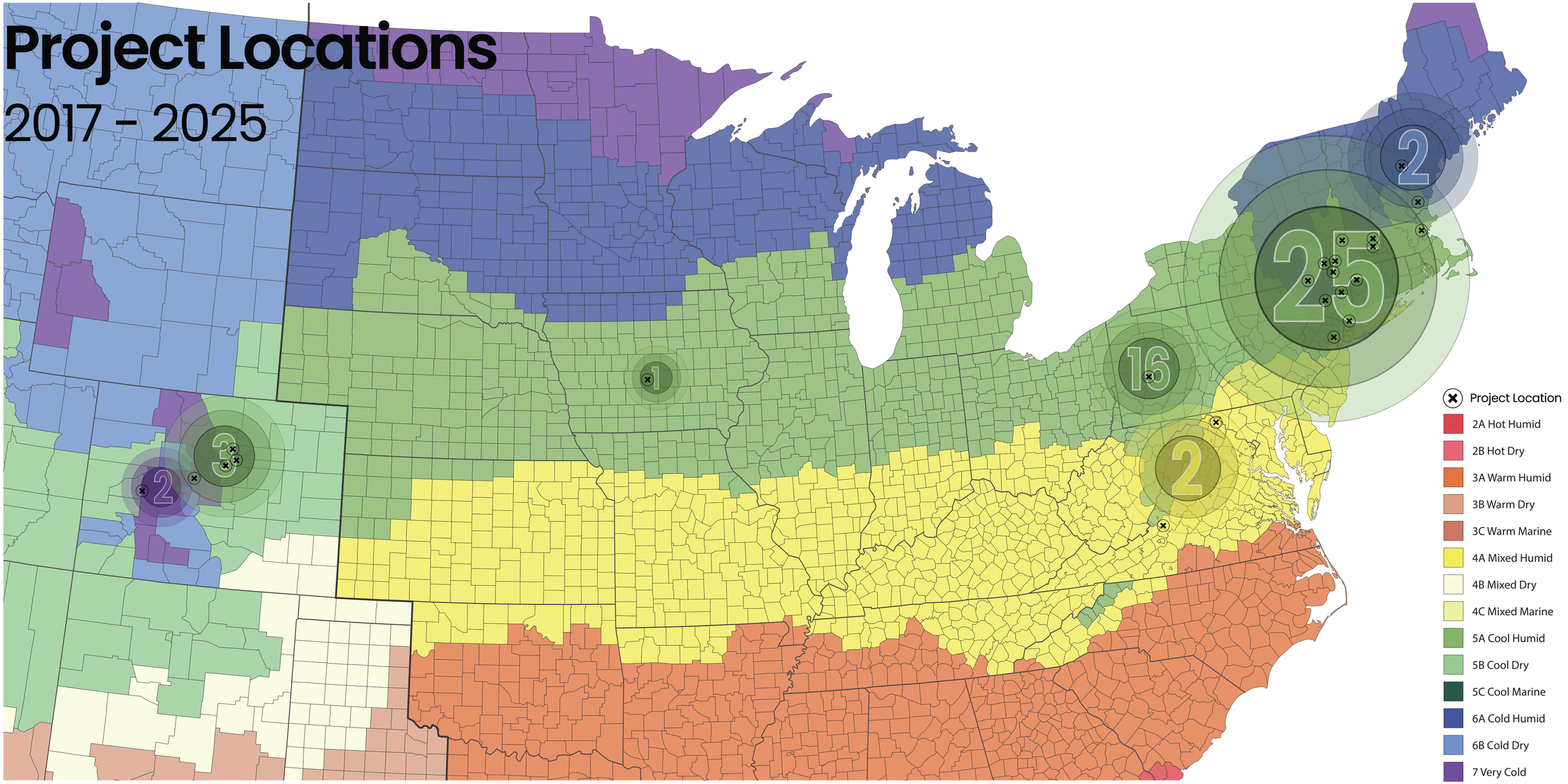
TAMA
ARCHITECTURE PC

Dig into the Details

Download 15+ wall sections right to your phone

Project Locations

2017 - 2025



Statistics

Design Certification

14.3 months

Avg. Time to Design Cert

03 Fastest

months

Design Cert

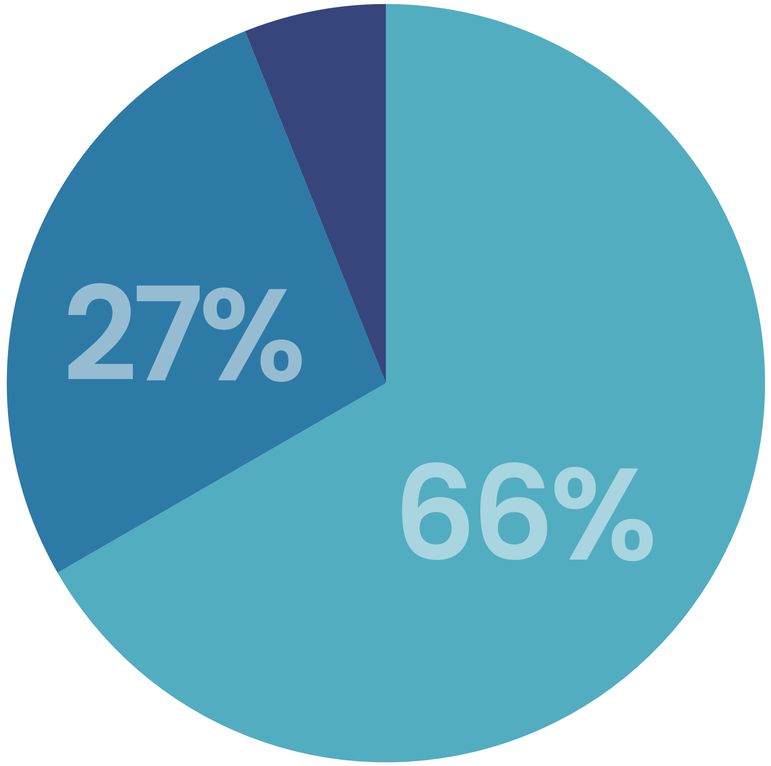
2 rounds

Statistics

Occupancy Type

3 Non-Res

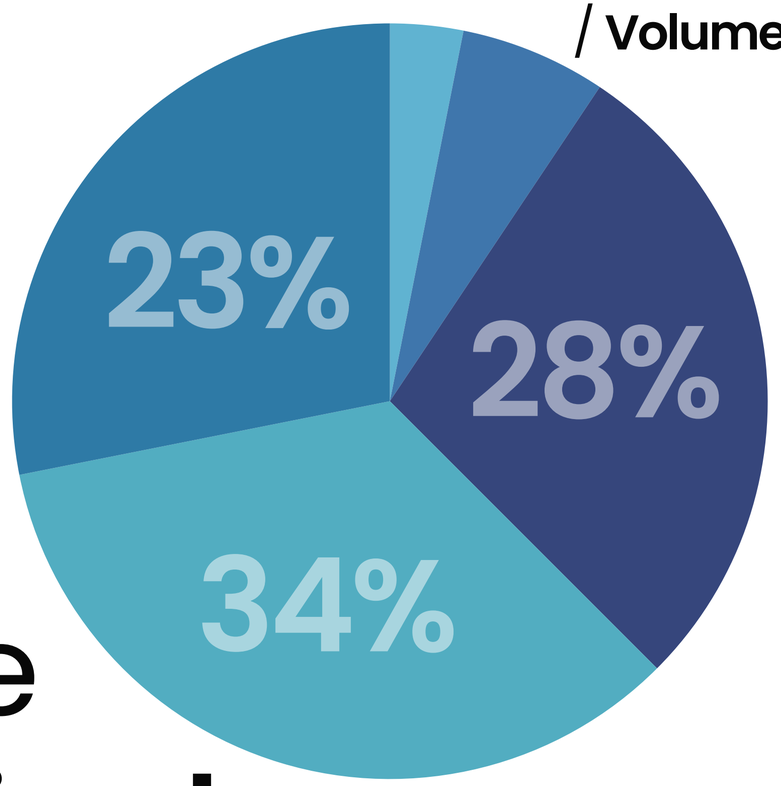
9 Multifamily*



38 Single Family

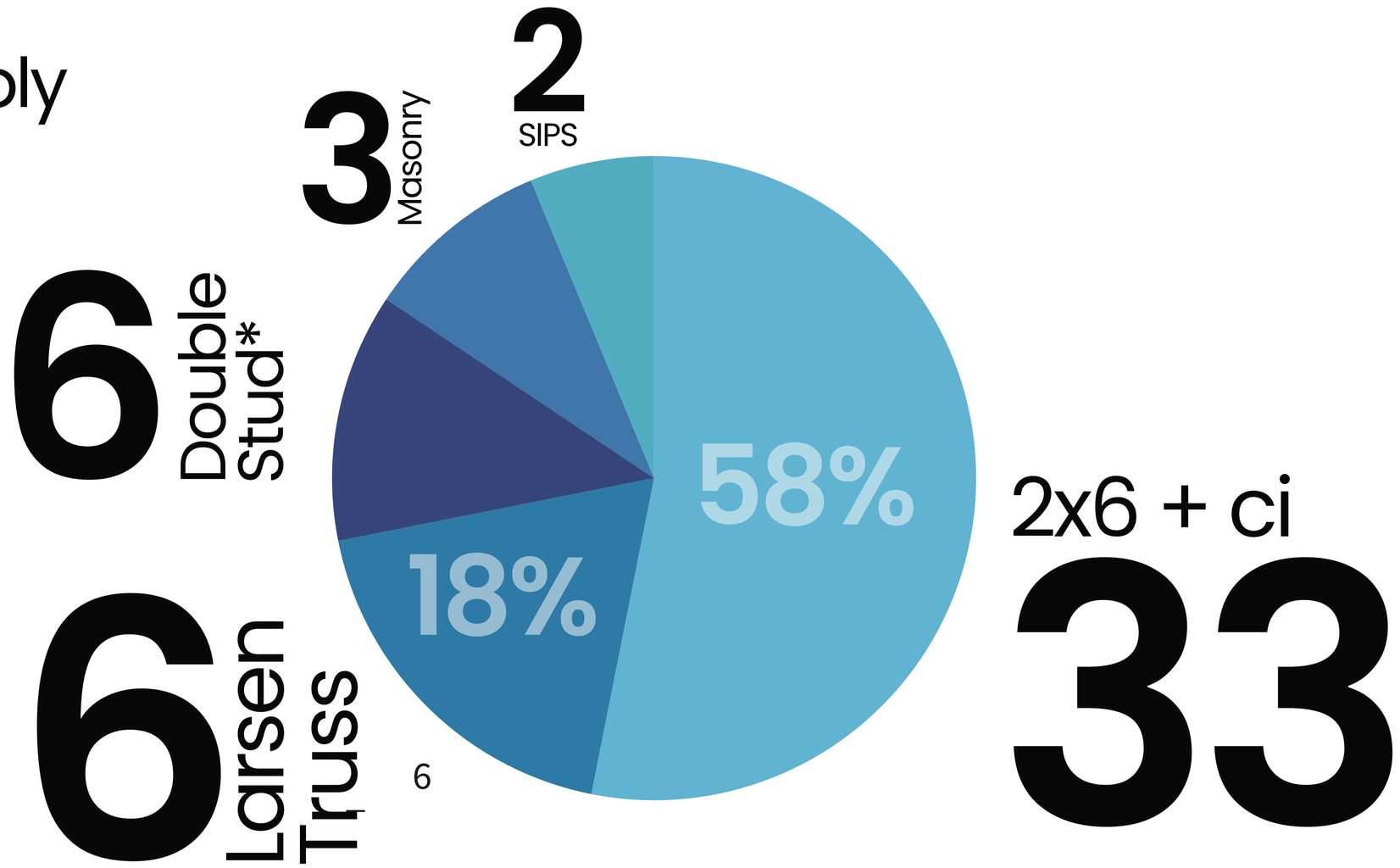
Statistics

Project Delivery



Statistics

Wall Assembly



Statistics

Airtightness

.033

cfm50/ft2

Avg. Airtightness

.007

cfm50/ft2

Best Airtightness

Shape / Bauen Build / Collective Carpentry - Arvada

Through the Details

WE CAN OBSERVE:

1 - The refinement of the Phius protocol to allow for **less restrictive** building designs and details

2 - The ability of **local design and construction ecosystems** to develop **region-specific best practices**

3 - A general trend towards **more affordable, accessible** Phius-certified projects **for All**

Context

2011 - 2015

- **2011 - Parsons Solar Decathlon**
  (EMPOWERHOUSE)

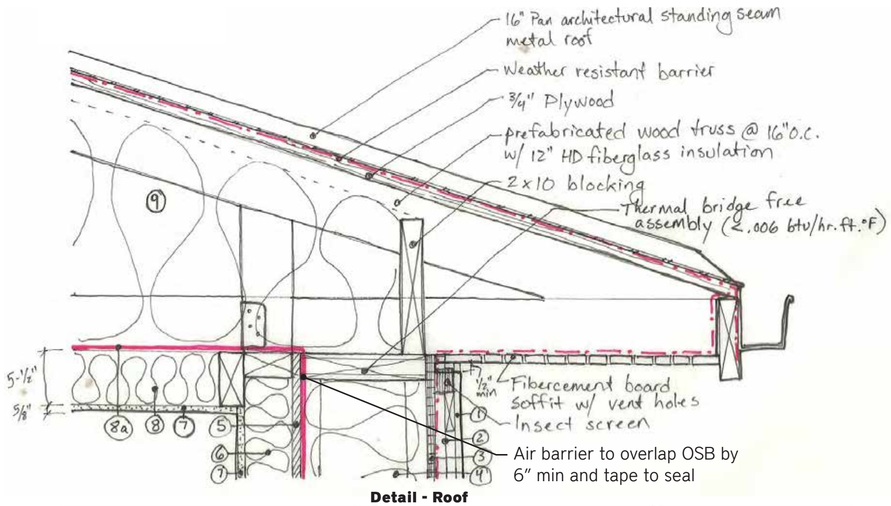
  Hudson Passive Project
  (Barlis Wedlick Architects)

- **2012 - Phius 2012**
  (Passive House Institute US established)

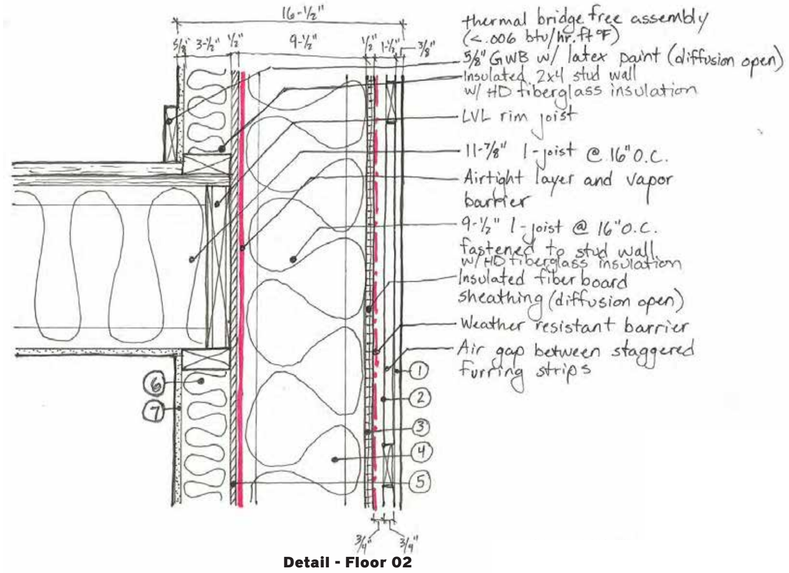
- **2015 - Yestermorrow Phius Training**
  (Kat Klingenberg, Ryan Abendroth)

- **2016 - River Architects**
  (Project Manager, Multiple Phius projects)

top/bottom: Competition & Final Arlington, VA rendering
middle: Competition build



Detail - Roof



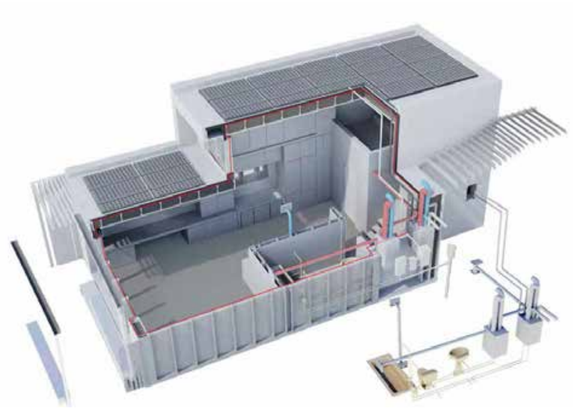
Detail - Floor 02

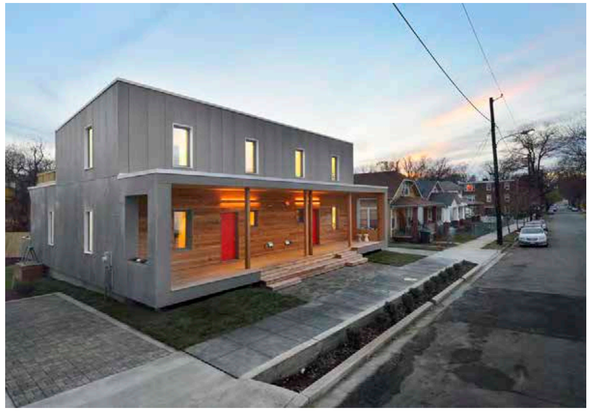
CPHC Design Exam - Yestermorrow January 2015

Context

2011 – 2026

- **2011 - Parsons Solar Decathlon**
  (EMPOWERHOUSE)
- **2017 - PHI training**
  (475 Offices - Brooklyn)
- **2018 - Joined Shape Architecture**
- **2021 - Littleton Passive House**
  (First completed certified project since 2011)
- **2026 - 12 Certified Projects**
  (9 Phius, 3 PHI)





PHIUS+ 2015

- Shift from PHI 'one-size-fits-all' metric

- World's **First Climate-Specific** Passive Building Standard

- Conversion from .6ACH airtightness metric to **.05 cfm/ft2**

- Cooling demand **included credit for natural ventilation**,
which reduced cooling targets compared to later standards.

- Source energy **based on 2,000W society**:
very stringent per-person kWh/yr proven difficult without PV

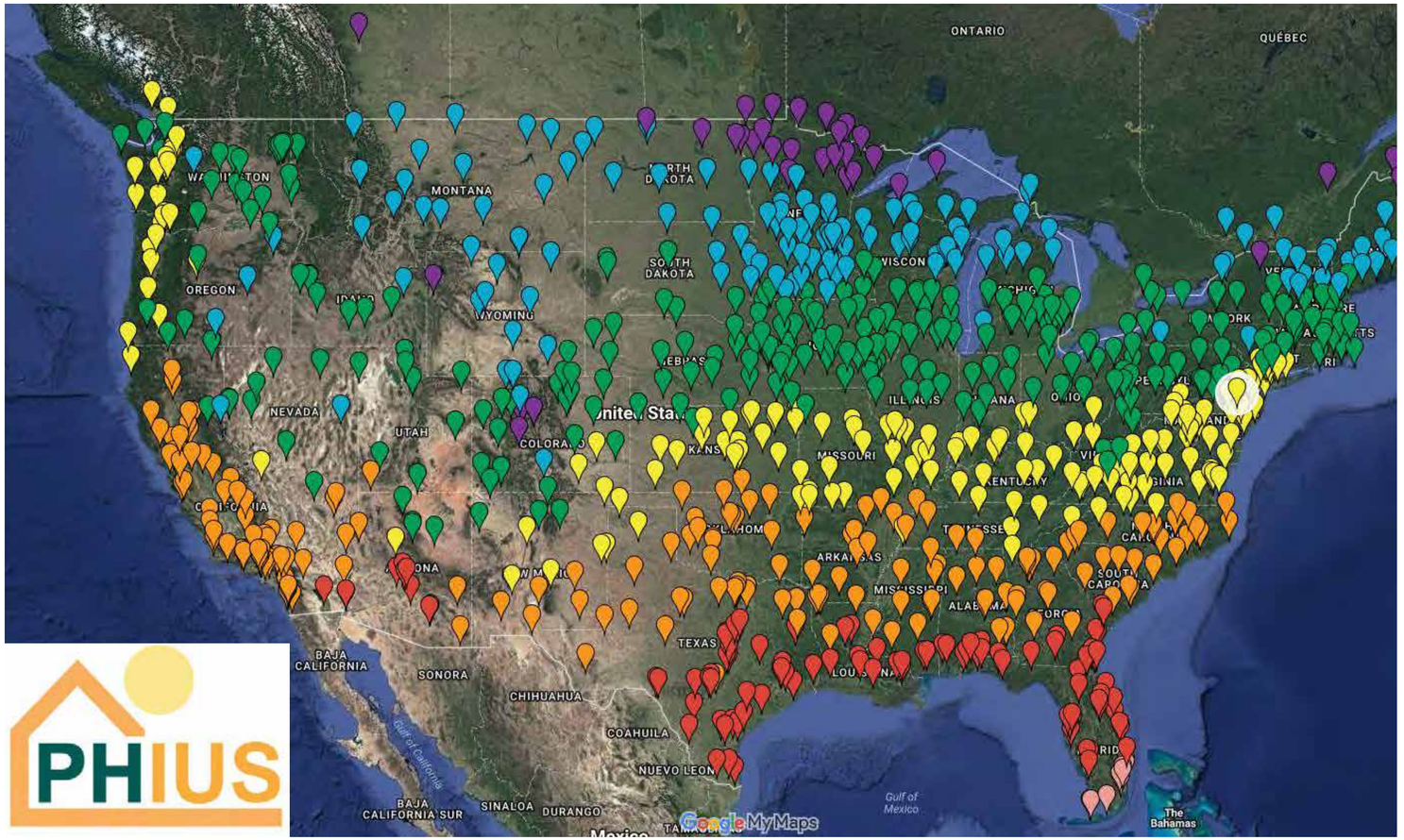
PHIUS+ 2015

TARGET OPTIMIZATION APPROACH:

BEopt runs **one single-family** building with **one occupant density** through simulations

the main variable studied was **climate**
- 300 climate locations (first pass)
- Curve-fitted for 1,000+ locations

Result: Targets represented as static climate map. (curve fits **not dependent on size/density/form factor)**



Design Risk Aversion

GATHERING MOMENTUM UNDER PHIUS 2015

- Restrictive target criteria lead to **simple, efficient geometry, thick assemblies** and a lot of over-engineering

- Local builders and raters unfamiliar with airsealing potential nor how to price the work

- Limited design and engineering industry experience results in a less sophisticated, short list of design solutions

01

#1456
Accord Passive House

Accord, NY
North River Architecture and Planning

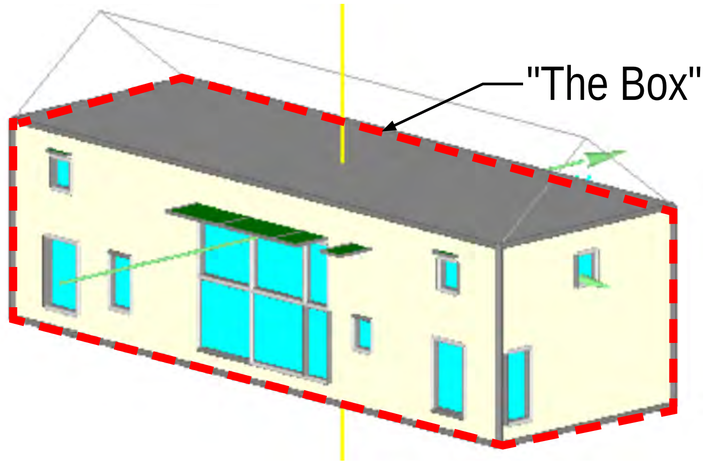
5a cool humid

R42 / R32

Continuous 3.5” foil faced Polyiso
2x6 @ 16” O.C. Dense Packed Cellulose

Airtightness: .036 cfm/ft²
Windows: Zola Thermo uPVC

Comparison of Phius 2015 and 2024 targets



Phius+ 2015	Phius 2024 New Construction* Performance Criteria Calculator v24.1		
6	Annual Heating Demand	9.7	kBtu/ft²yr
1.9	Annual Cooling Demand	6.8	kBtu/ft²yr
4.6	Peak Heating Load	6.6	Btu/ft²hr
3.9	Peak Cooling Load	3.0	Btu/ft²hr
	Source Energy Criteria		
6,200	Phius CORE	6550	kWh/person.yr

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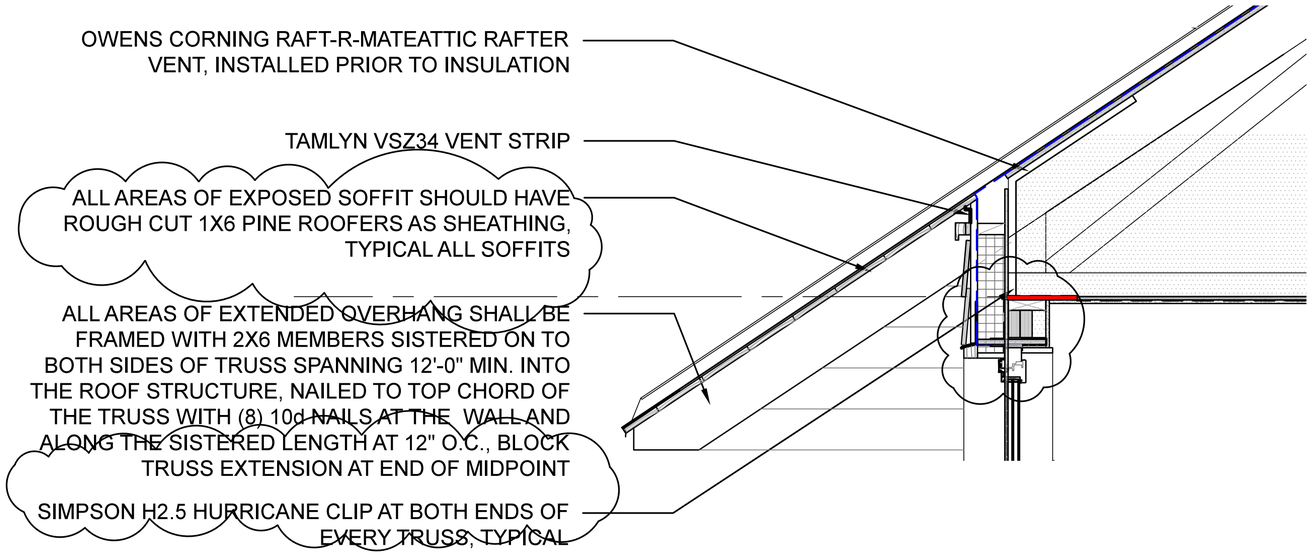

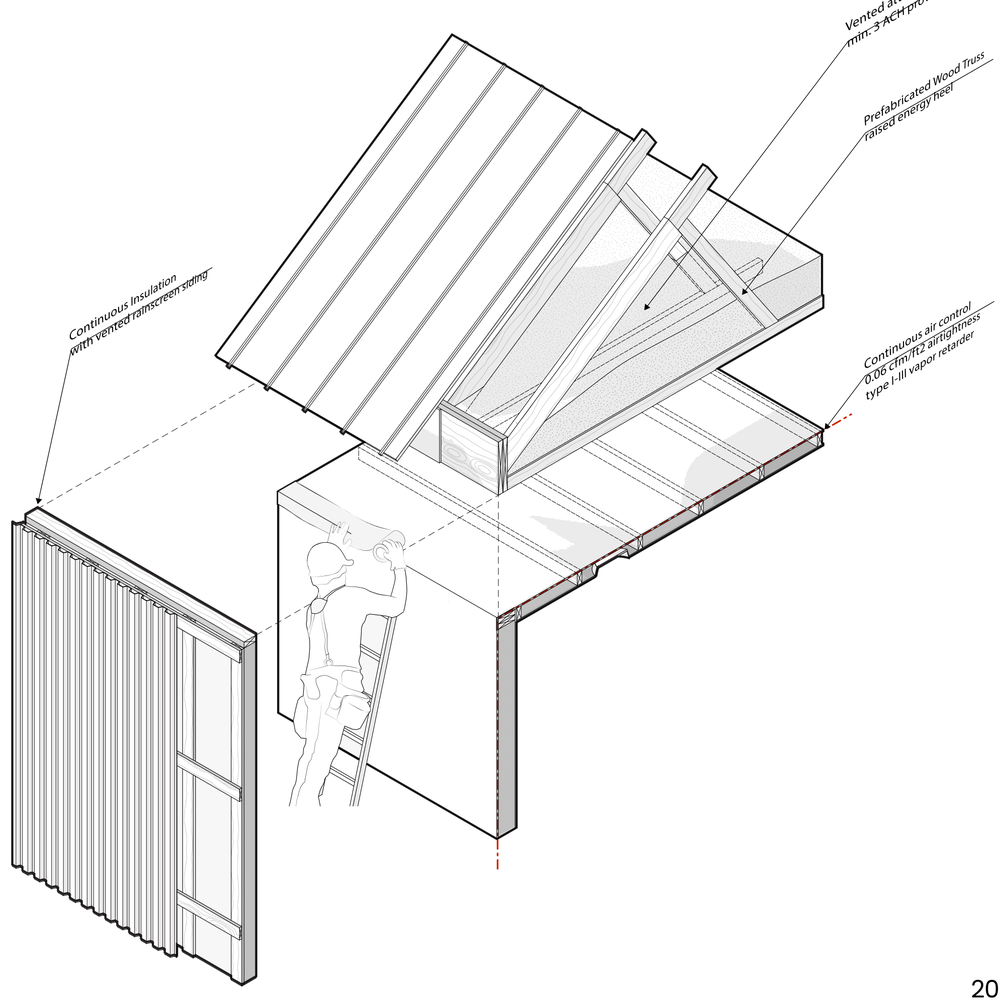

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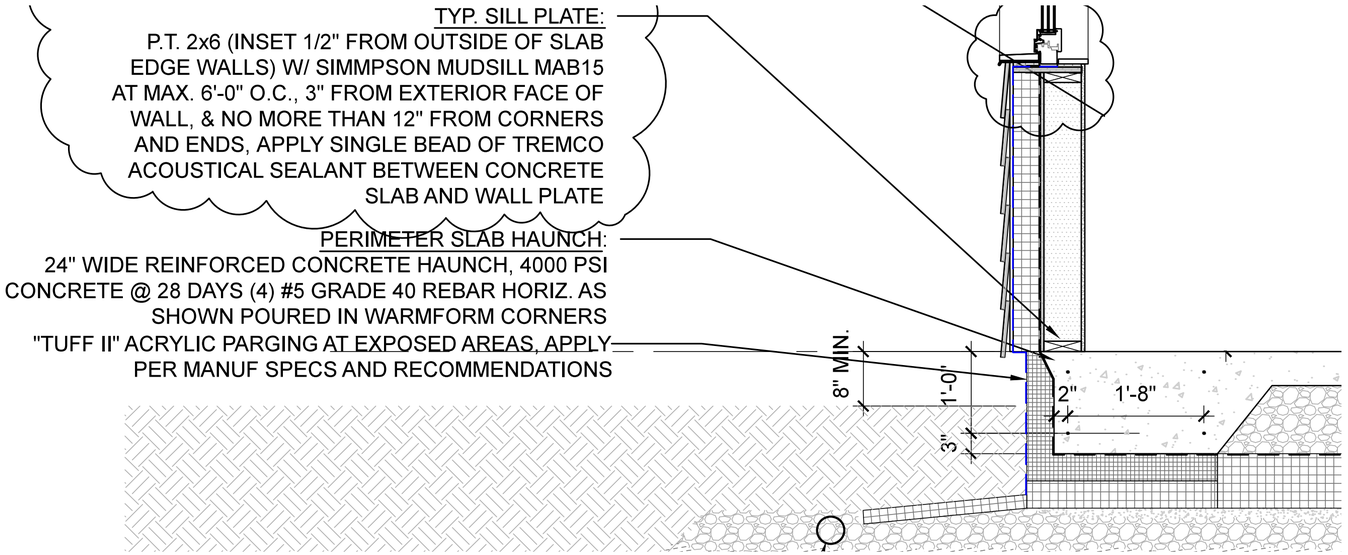
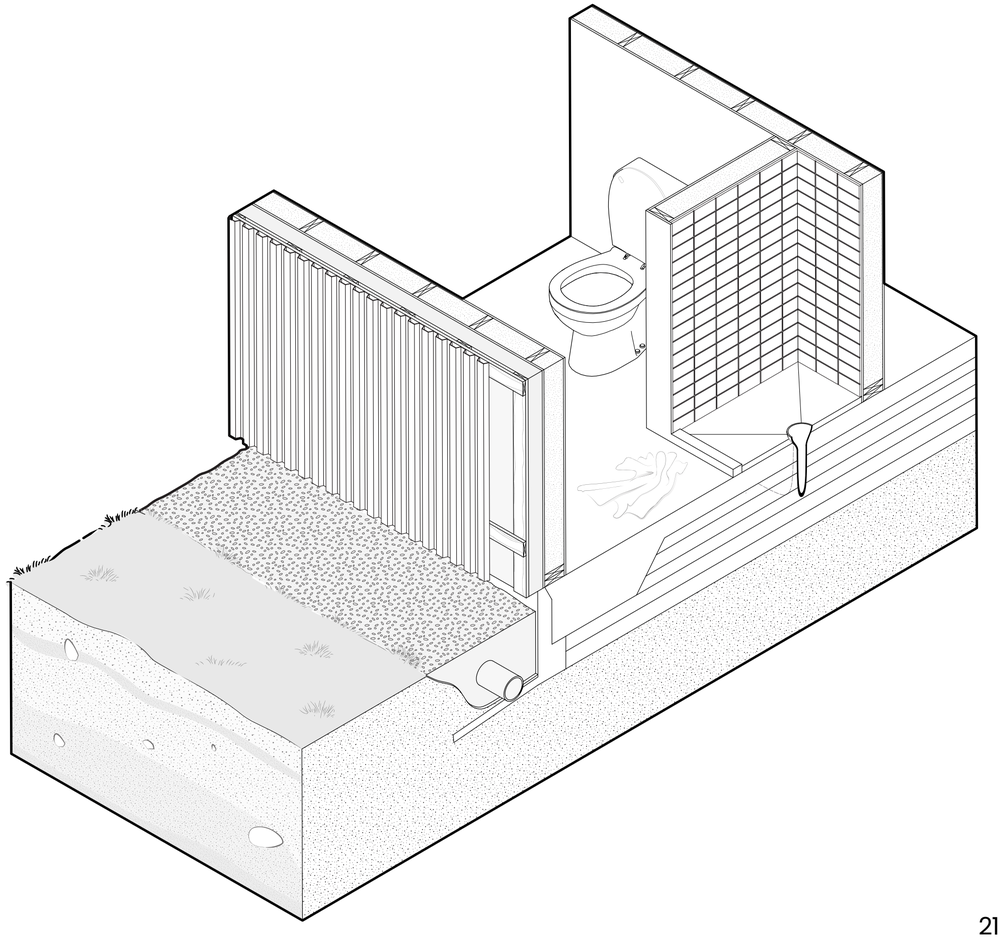




PHIUS+ 2018

- Selected **more cost-optimal point along BEopt curve** which generally relaxed some targets

- Removed credit for **natural ventilation / occupant window-opening**. As a result, **cooling targets became more realistic**, especially for multifamily projects

- Source energy structure **matured into tiers** (Plus/Core/Zero evolution)

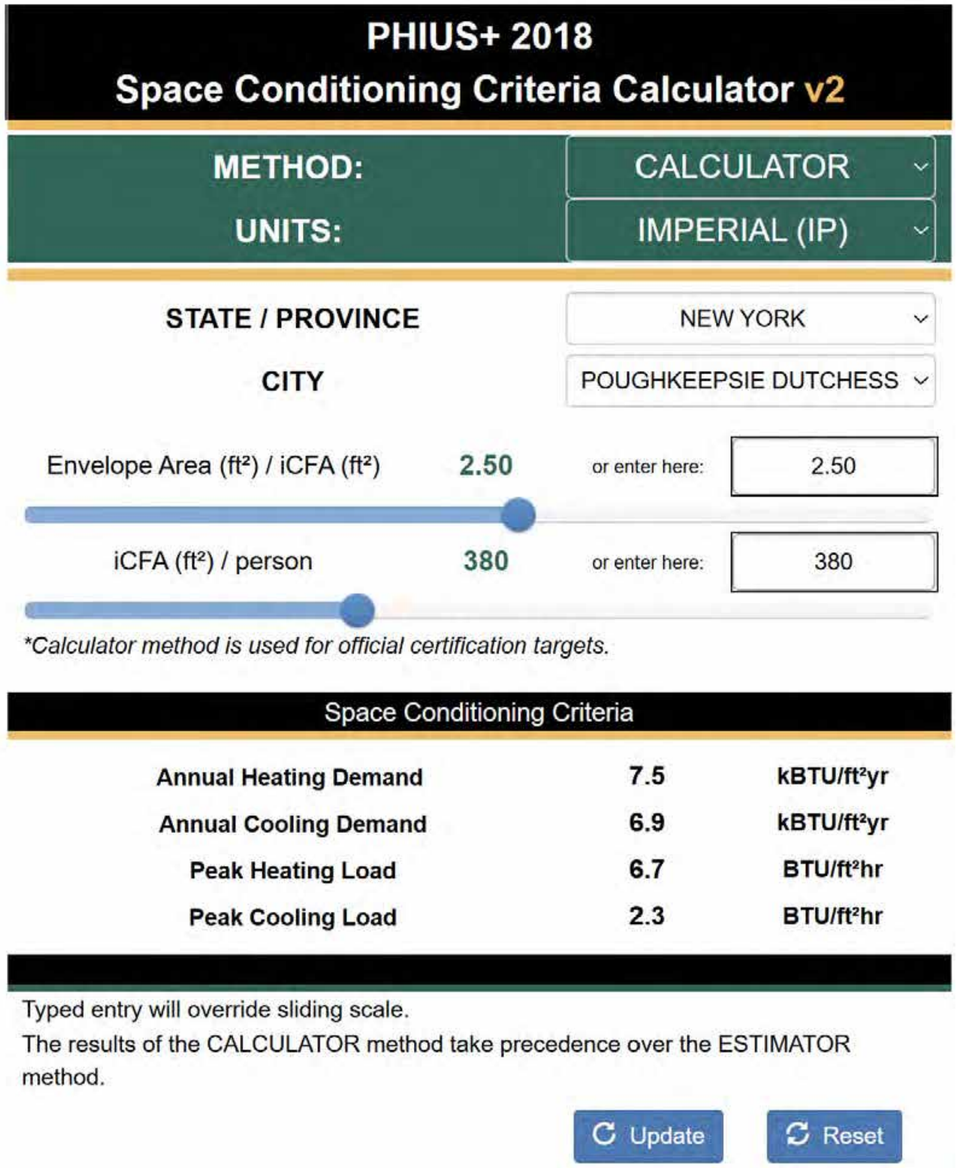
PHIUS+ 2018

TARGET OPTIMIZATION APPROACH:

Expansion from a single-family-only basis to include:

- small single-family
- larger single-family
- townhouse
- mid-rise (~4 stories)
- high-rise (~10 stories)

plus **multiple occupant/unit density variants** across those types (iCFA/person, Form factor)



Breaking 'Out Of The Box'

OUT FROM UNDER PHIUS+ 2015

· Appearance of **tradeoffs between building geometry efficiency and assembly R-values**

· Integration of **structural steel, geometric complexity and design flexibility** without sacrificing thermal continuity

· **Alternative compliance paths** provide bespoke solutions (ie. window comfort criteria)

05

#1718
Gallatin Passive House

Gallatin, NY
North River Architecture and Planning

5a cool humid

R43 / R34

Continuous 4” foil faced PolyIso
2x6 @ 16” O.C. Dense Packed Cellulose

Airtightness: .046 cfm/ft^2
Windows: MSora Ultima

05

#1718
Gallatin Passive House

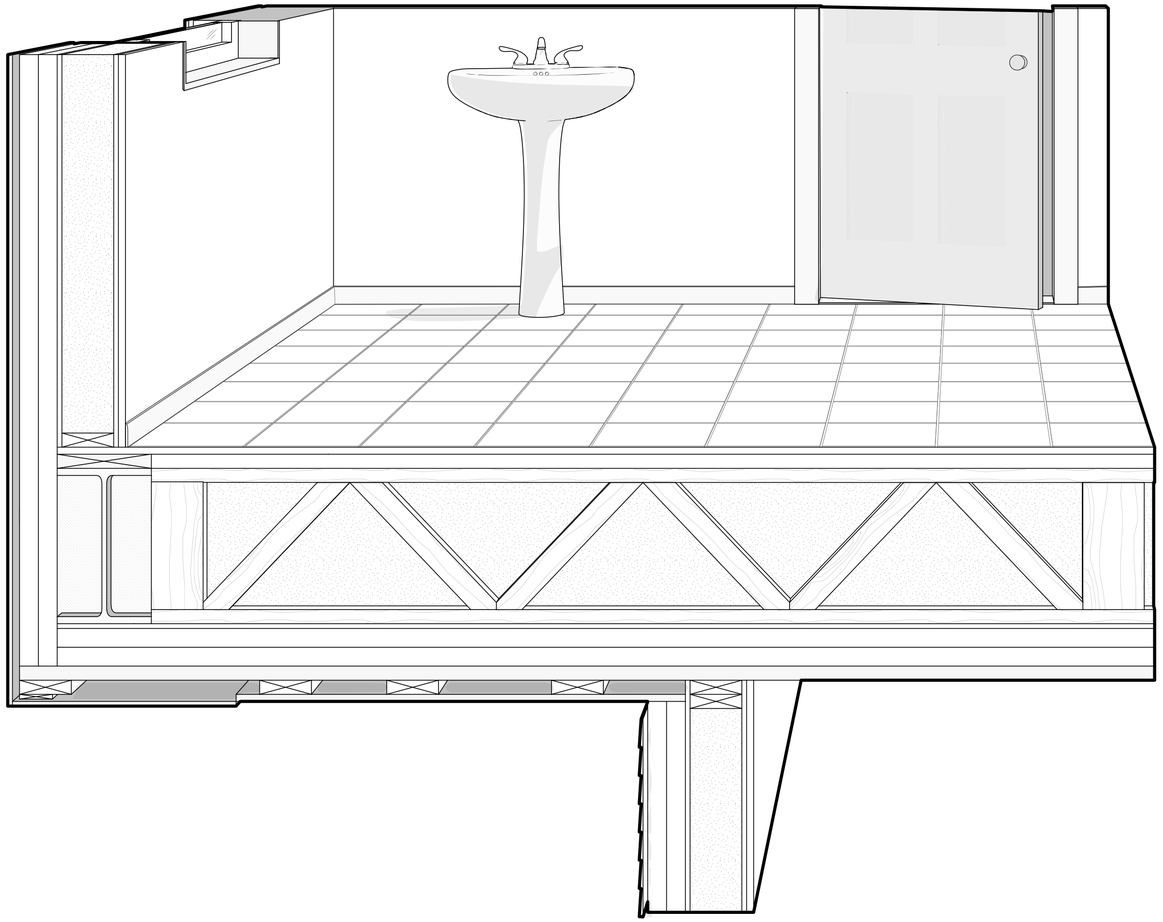
Gallatin, NY
North River Architecture and Planning

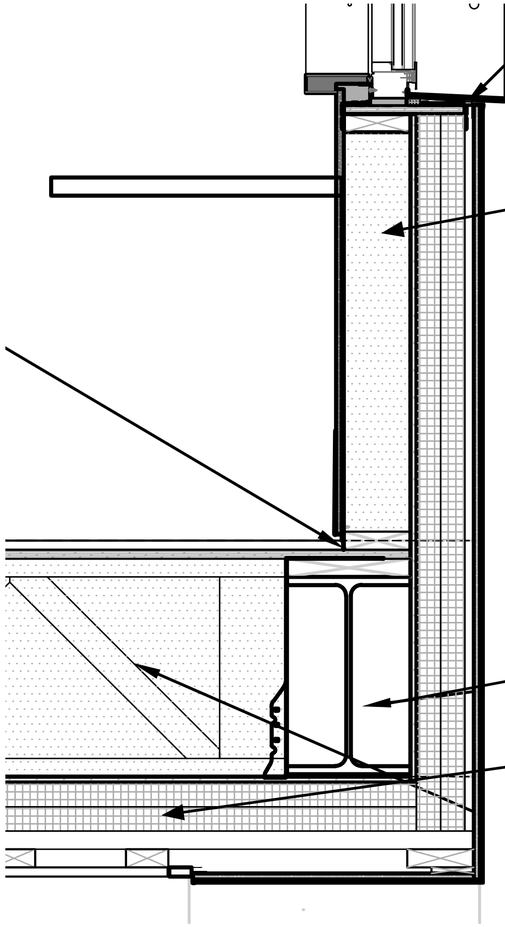
5a cool humid

R43 / R34

Continuous 4” foil faced PolyIso
2x6 @ 16” O.C. Dense Packed Cellulose

Airtightness: .046 cfm/ft²
Windows: MSora Ultima





ACRYLIC STUCCO FINISH OVER DENS-GLASS BOARD OVER 1X3 FURRING OVER POLYISO INSULATION. ZIP SHEATHING AND 2X6 FRAMED CAVITY FILLED WITH CELLU-LOSE INSULATION

W16x67 BEAM, BLOCK W/ PT 2X10

SCHEDULED FLOOR FRAMING W/ DENSE PACK CELLULOSE, ZIP WALL SHEATHING, POLYISO INSULATION

14

#1954
Meadow View Passive House

Hillsdale, NY
Ryan Enschede Architect

5a cool humid

R42 / R32

Continuous 3.5” PolyIso
2x6 @ 16” O.C. Dense Packed Cellulose

Airtightness: .029 cfm/ft²
Windows: Ikon

Aerial photography of Meadow View Passive

14

#1954
Meadow View Passive House

Hillsdale, NY
Ryan Enschede Architect

5a cool humid

R42 / R32

Continuous 3.5” PolyIso
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Airtightness: .029 cfm/ft²
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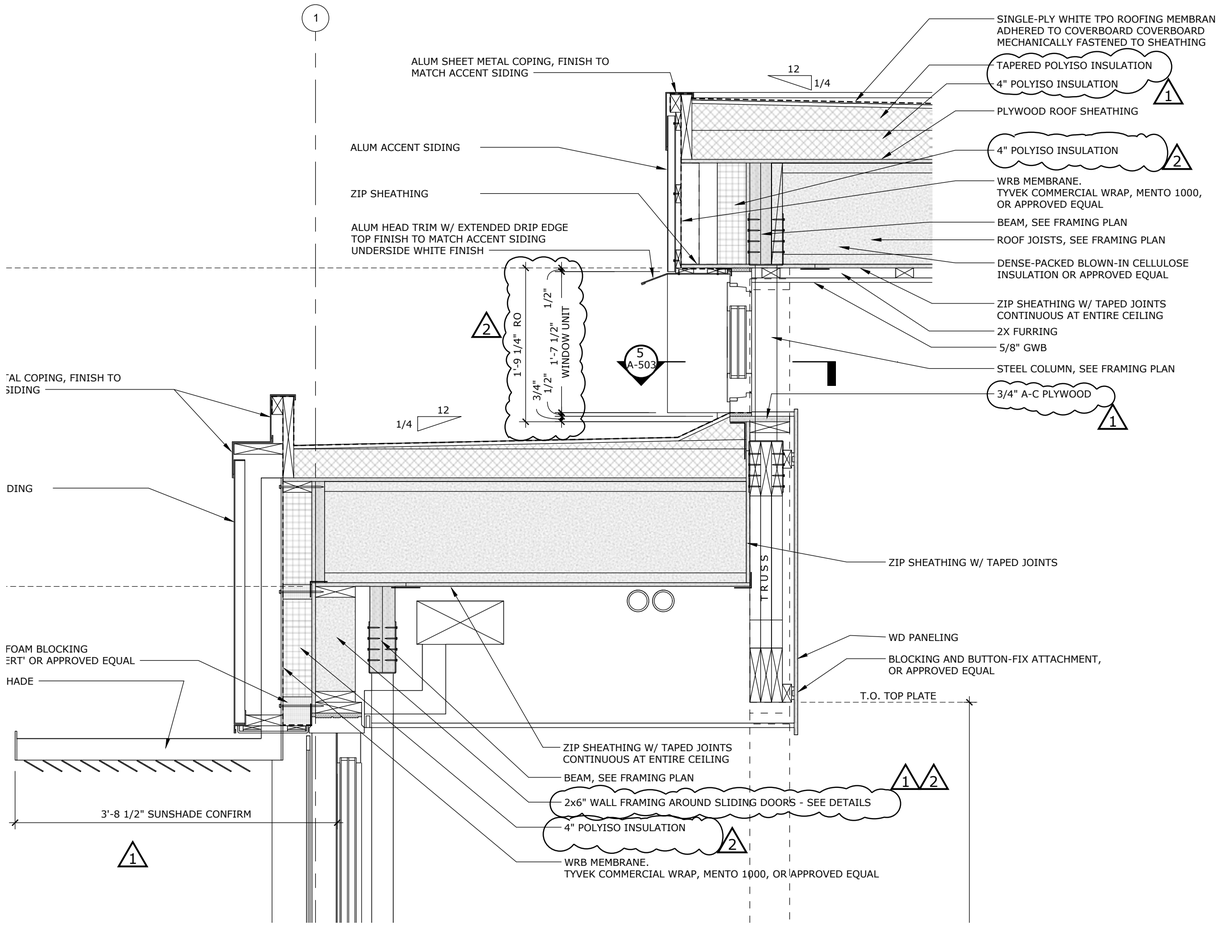

14

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Meadow View Passive House

Hillsdale, NY
Ryan Enschede Architect

5a cool humid

R42 / R32

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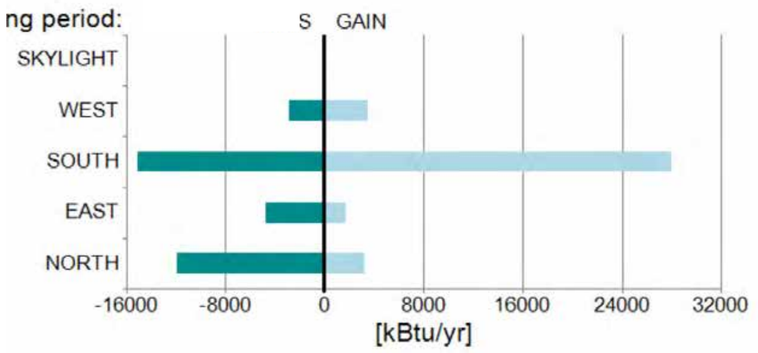
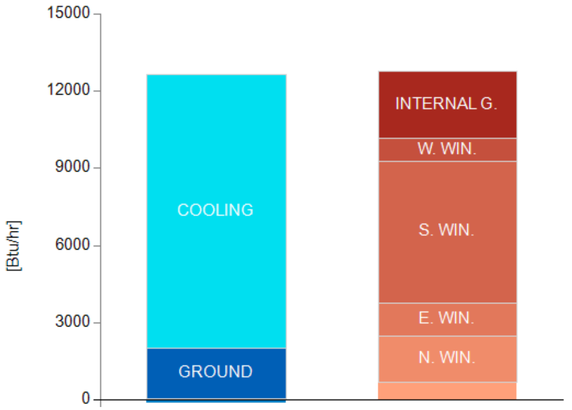
Airtightness: .029 cfm/ft²
Windows: Ikon



Window energy balance



Peak summer energy balance

Phius CORE / ZERO 2021

Big structural change: introduction of Performance Path vs Prescriptive Path

Added a tiny-house / very small building type to the optimization set to address ADUs/small projects struggling under 2018 **(high envelope-to-floor ratio)**

Source energy overhaul: Updated source energy factor to a future-looking value (1.8) to align with grid trajectory

Shifted source-energy targets from a single static “macro” number to targets derived from optimization curve fits, with key drivers becoming occupant density and unit density (rather than one flat value for everyone).

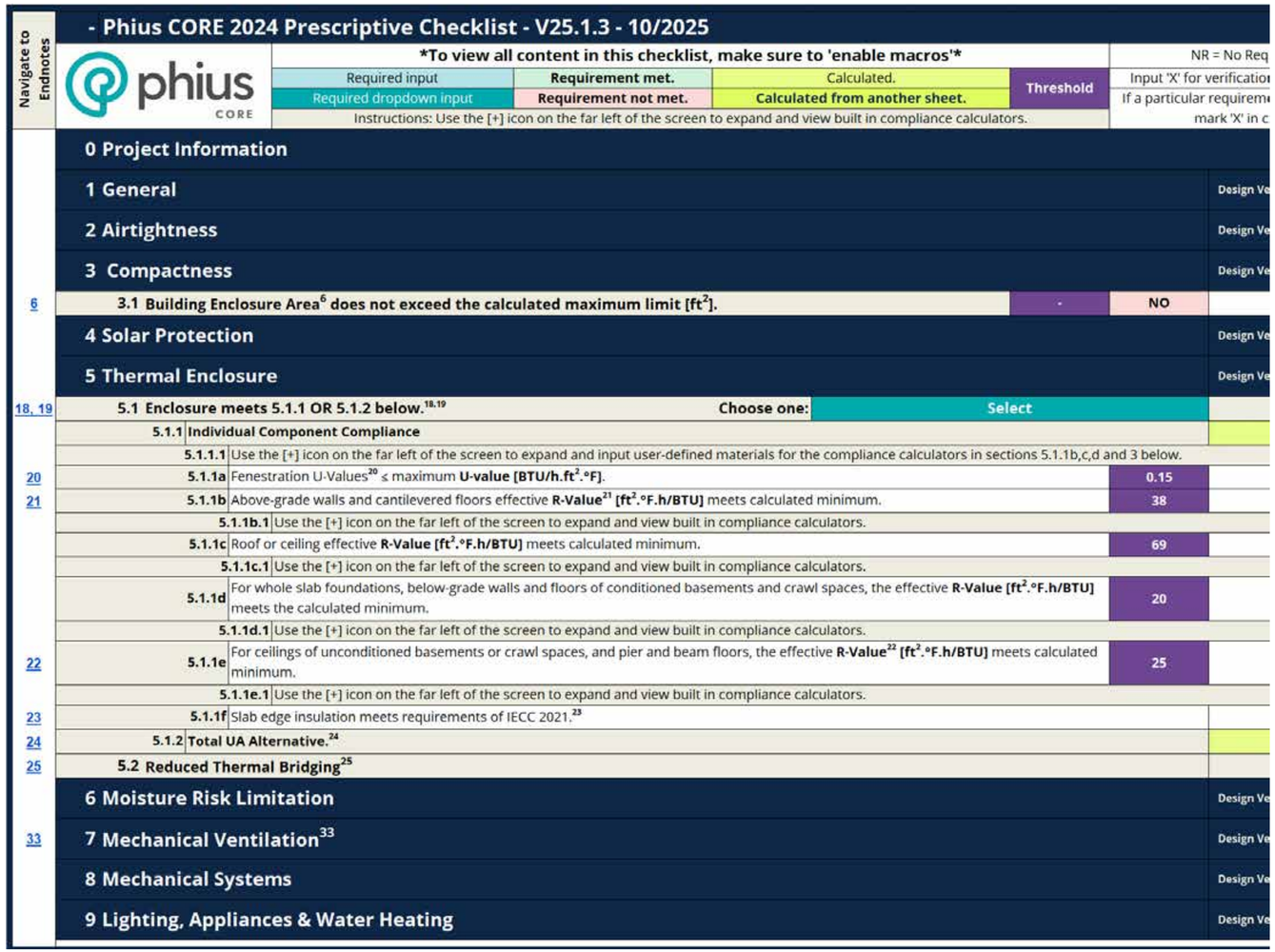
Phius CORE / ZERO 2021

PRESCRIPTIVE PATH:

Eliminates WUFI Passive as a compliance tool

.04 cfm/ft2 airtightness

Simplified project review process:
reduced project review timeline



- Phius CORE 2024 Prescriptive Checklist - V25.1.3 - 10/2025

To view all content in this checklist, make sure to 'enable macros'

Navigate to Endnotes

Required input | Required dropdown input | Requirement met. | Requirement not met. | Calculated. | Calculated from another sheet. | Threshold

Instructions: Use the [+] icon on the far left of the screen to expand and view built in compliance calculators.

NR = No Req
Input 'X' for verificatio
If a particular requirem
mark 'X' in c

	0 Project Information			
	1 General			Design Ve
	2 Airtightness			Design Ve
	3 Compactness			Design Ve
6	3.1 Building Enclosure Area[6] does not exceed the calculated maximum limit [ft²].		NO	
	4 Solar Protection			Design Ve
	5 Thermal Enclosure			Design Ve
18, 19	5.1 Enclosure meets 5.1.1 OR 5.1.2 below.[18,19]	Choose one:	Select	
	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.			
20	5.1.1a Fenestration U-Values[20] ≤ maximum **U-value [BTU/h.ft².°F]**.		0.15	
21	5.1.1b Above-grade walls and cantilevered floors effective **R-Value[21] [ft².°F.h/BTU]** meets calculated minimum.		38	
	5.1.1b.1 Use the [+] icon on the far left of the screen to expand and view built in compliance calculators.			
	5.1.1c Roof or ceiling effective **R-Value [ft².°F.h/BTU]** meets calculated minimum.		69	
	5.1.1c.1 Use the [+] icon on the far left of the screen to expand and view built in compliance calculators.			
	5.1.1d For whole slab foundations, below-grade walls and floors of conditioned basements and crawl spaces, the effective **R-Value [ft².°F.h/BTU]** meets the calculated minimum.		20	
	5.1.1d.1 Use the [+] icon on the far left of the screen to expand and view built in compliance calculators.			
22	5.1.1e For ceilings of unconditioned basements or crawl spaces, and pier and beam floors, the effective **R-Value[22] [ft².°F.h/BTU]** meets calculated minimum.		25	
	5.1.1e.1 Use the [+] icon on the far left of the screen to expand and view built in compliance calculators.			
23	5.1.1f Slab edge insulation meets requirements of IECC 2021.[23]			
24	5.1.2 **Total UA Alternative.**[24]			
25	5.2 **Reduced Thermal Bridging**[25]			
	6 Moisture Risk Limitation			Design Ve
33	7 Mechanical Ventilation[33]			Design Ve
	8 Mechanical Systems			Design Ve
	9 Lighting, Appliances & Water Heating			Design Ve

Hitting a Stride

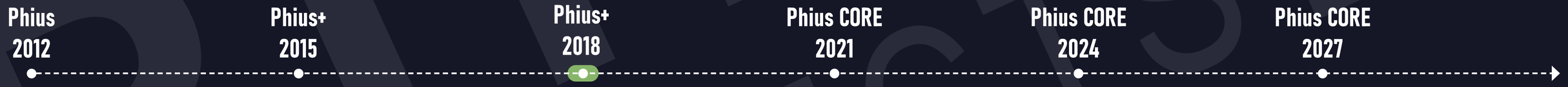
DESIGN FLEXIBILITY AND A CONSERVATIVE FASTTRACK

- **All ships rise with the tide**: power in building a passive house community

- **Mature design processes** and consultants know how to work within the Phius system & **Phius reciprocates**

- State, Federal and Utility incentive programs and policy **drive adoption**

- **Projects push limits:** experimenting with biogenic materials, economies of scale and prefabrication



10-13

#1894 / #1895 / #1960 / #2391
Flex House Series

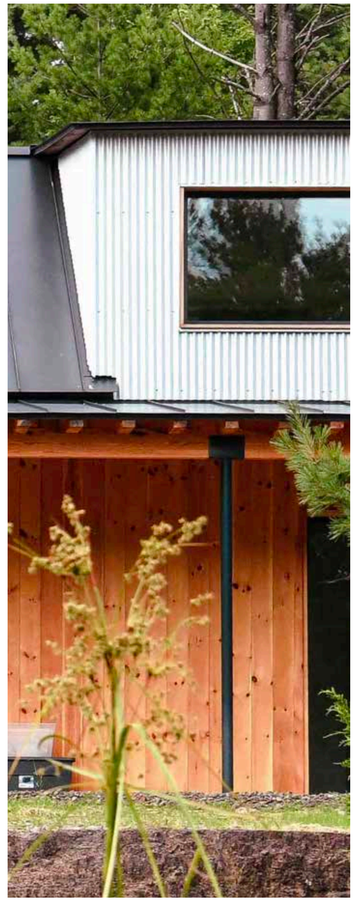
Various Sites, NY
North River Architecture and Planning

5a cool humid

R43 / R34

Continuous 4” foil faced PolyIso
2x6 @ 16” O.C. Dense Packed Cellulose

Airtightness: .012 cfm/ft²
Windows: MSora Ultima



10-13

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Flex House Series

Various Sites, NY
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R43 / R34

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2x6 @ 16" O.C. Dense Packed Cellulose

Airtightness: .012 cfm/ft²
Windows: MSora Ultima

escriptive 2021 Snapshot

Input or select data in teal cells

State	NEW YORK
City	STEWART FIELD
ASHRAE (169-2021) Climate Zone	5A
iCFA* (ft²)	2200
Number of Bedrooms*	3
Number of Stories	2

**per dwelling unit*

General

iCFA divided by Number of	Maximum Limit	900	ft²
(Calculated Value based	*OK, Meets Limit*	733	ft²

Compactness

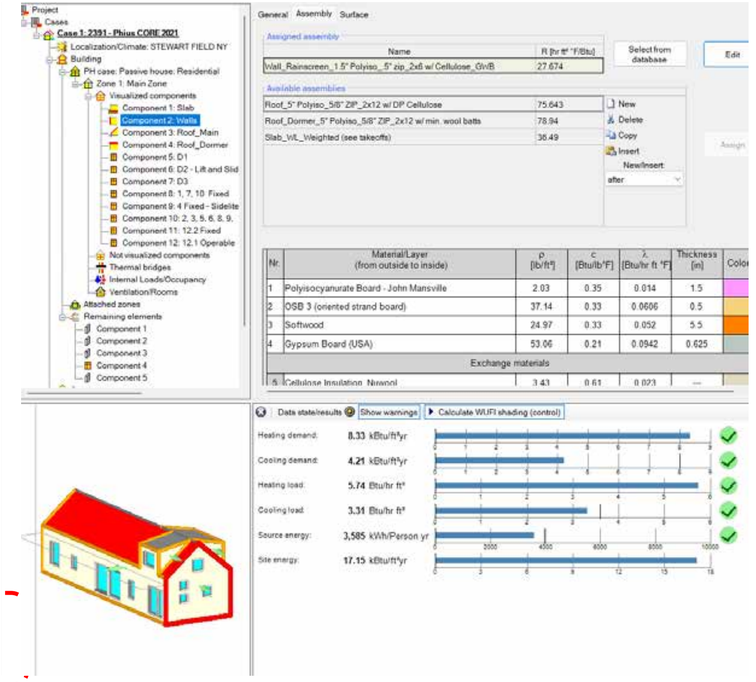
Envelope Area	Maximum	6383	ft²
(Maximum Envelope to		2.90	

#1960 Flex House II

	uiation value outside of the framing or		
	aming Type	R/in	Effective R-Value
	-	6.5	26.0
	-	1.4	0.7
	od Frame (16" o.c.)	3.8	16.0
	-	0.9	0.6
		0.0	0.0
	-	0.0	0.0
	-	0.0	0.0
≥0.35	Required Ratio		Calculated Ratio
YES	0.35		1.17
≥44	Required R-value		Calculated R-value
NO	44		43.2

Continuous 4" unfaced Polyiso (R24)
2x6 @ 16" O.C. Dense Packed Cellulose
airtightness: .04 cfm/ft2

#2391 Olivebridge Quarry



Continuous ***1.5"*** unfaced Polyiso (R12)
2x6 @ 16" O.C. Dense Packed Cellulose
airtightness: ***.02 cfm/ft2***

35

#2346
Birchfell Passive House

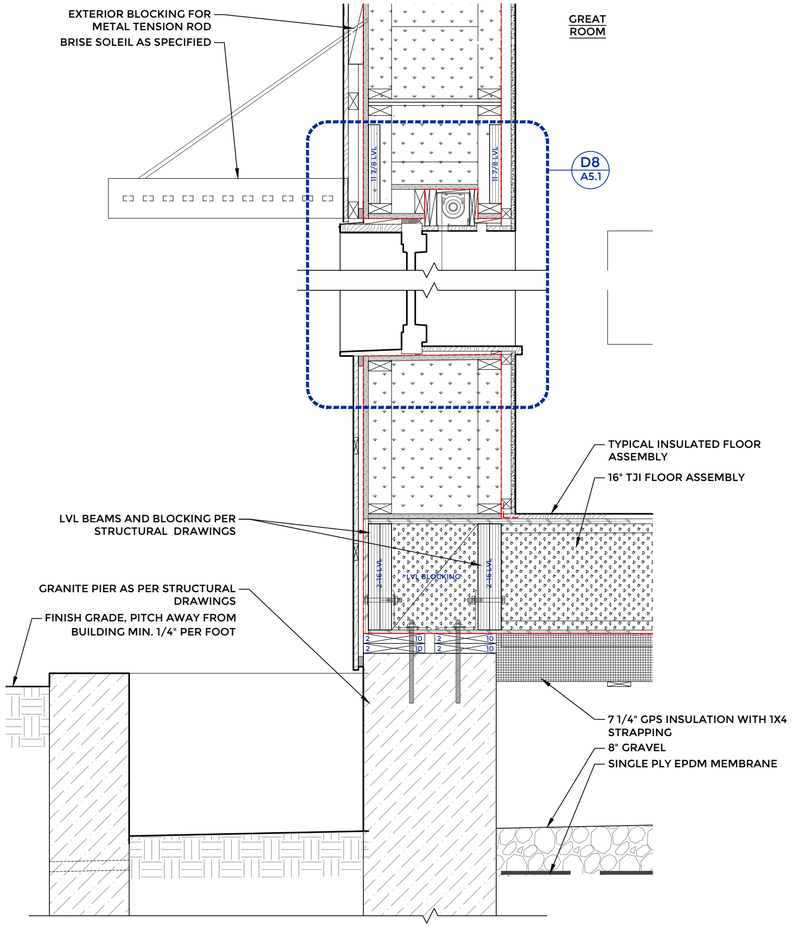
Sharon, CT
TAMA Architecture

5a cool humid

R63 / R56

2x4 double stud w/ DP straw
prefabricated

Airtightness: .024 cfm /ft2
Windows: Unilux Modern



40

#2609
Arvada Passivehouse

Arvada , CO
Shape Architects

5b cool dry

R44 | Panelized Larsen Truss (Collective Carpentry) w/ DP cellulose | **Airtightness:** .007 cfm/ft2 **Windows:** Pivot Alu-7

Prefab. Collective Carpentry. Dried in in 1.5 days!
Contractor has completed several certified passivehouses
'Core House' plumbing & mechanical design

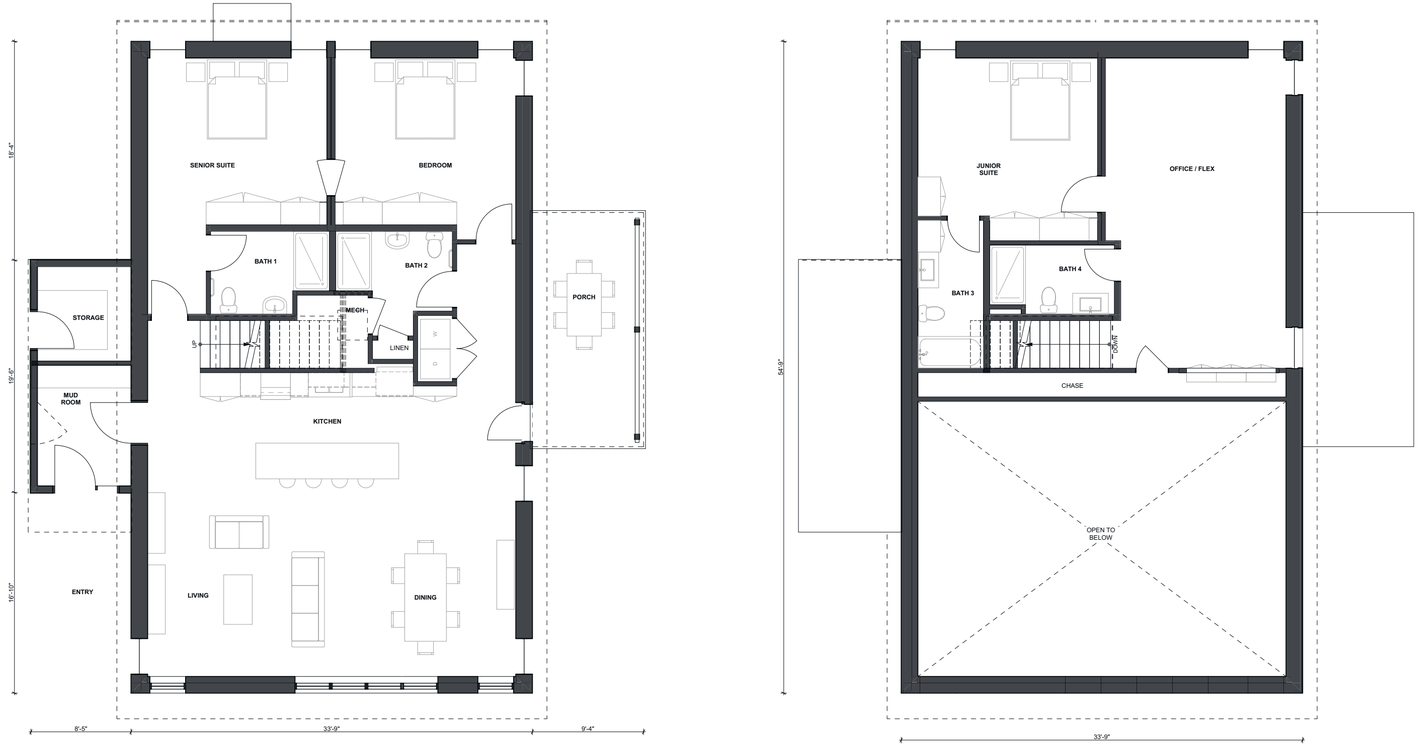
40

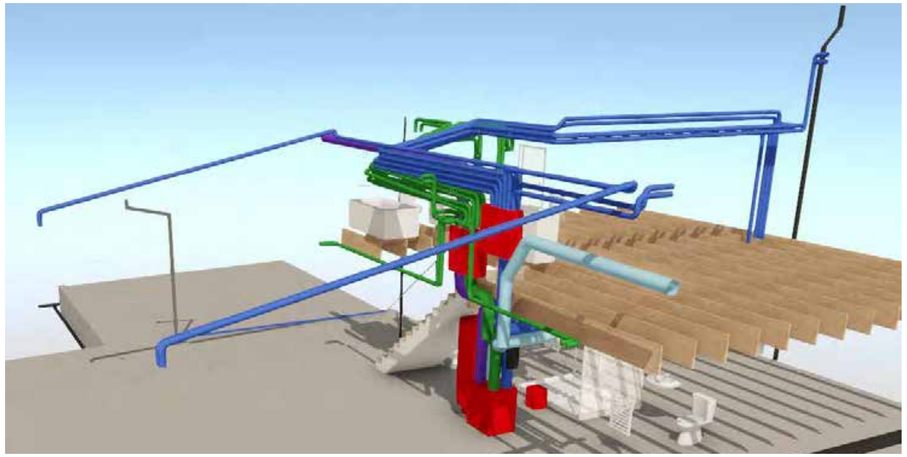
#2609
Arvada Passivehouse

Arvada , CO
Shape Architects

5b cool dry

R44 | 2x6, 2x4 double stud w/ DP cellulose | Airtightness: .TBD | Windows: Pivot Alu-7





Challenges: Expansive Soils required difficult thermal detailing around pier & grade beam foundations
Accessibility is paramount - filter and MEP access was a challenge.
Late change to Air-to-air heat pumps caused routing challenges

42

#2750
Pattern House

Paonia, CO
Shape Architects

5b cool dry

R52 / R54

I-joist larsen Truss + 2x6 @ 16" o.c.
w/ DP cellulose, prefabricated

Airtightness: .028 cfm /ft2
Windows: Pivot MB-79

Challenges: Horrible Soils required difficult thermal detailing around pier & grade beam foundations

First passivehouse for local contractor
VERY limited experienced subs in rural area

Tight budget & owner self performing much work (smart& passionate pilot)

42

#2750
Pattern House

Paonia, CO
Shape Architects

5b cool dry

R52 / R54

I-joist larsen Truss + 2x6 @ 16" o.c.
w/ DP cellulose, prefabricated

Airtightness: .028 cfm /ft2
Windows: Pivot MB-79

42

#2750
Pattern House

Paonia, CO
Shape Architects

5b cool dry

R52 / R54

I-joist larsen Truss + 2x6 @ 16" o.c.
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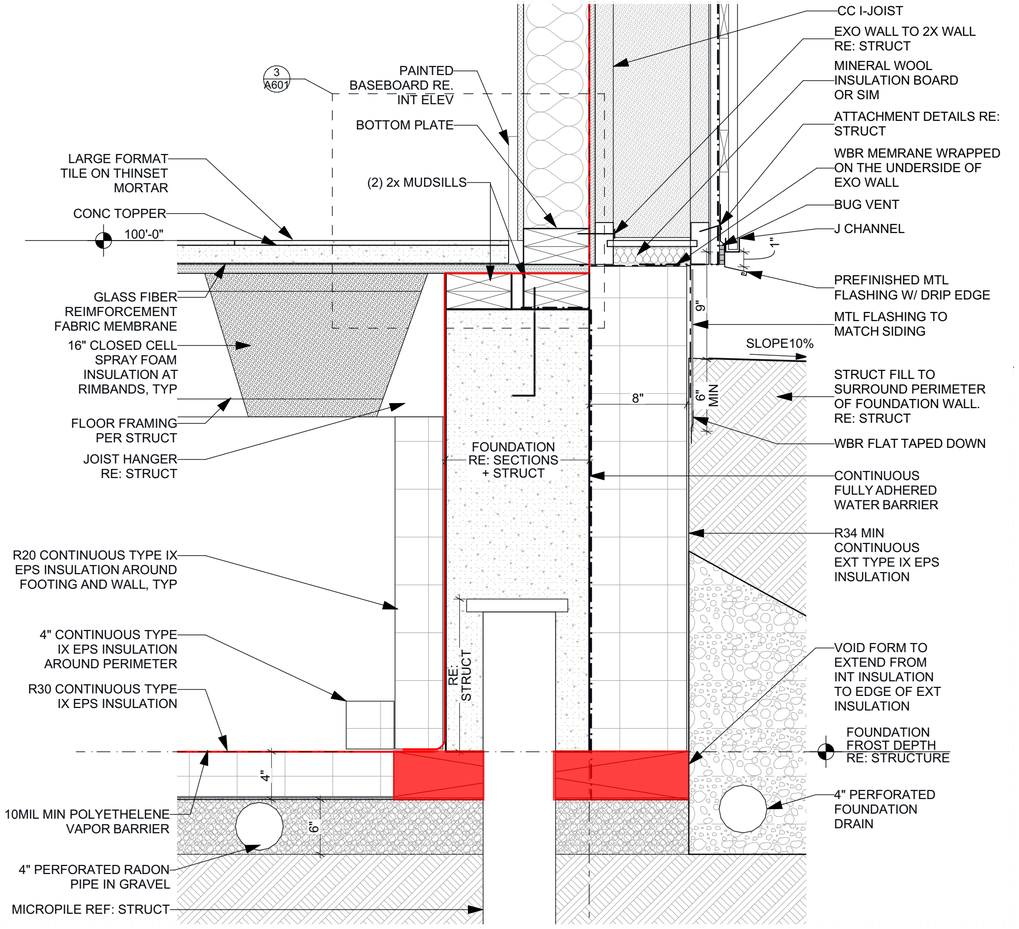
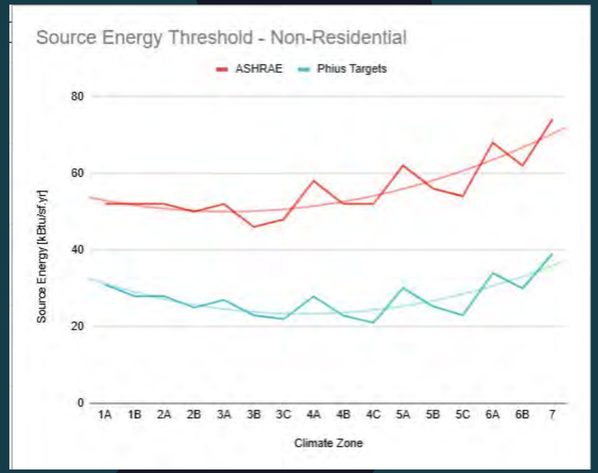


Prefab - Collective Carpentry. Extremely professional and air-tight install. Windows: Plvot Aluminum

Phius CORE / ZERO 2024

Updated source energy targets to match **ASHRAE 100 curve fit**



Re-optimized high-rise curve(s) to correct issues stemming from how high-rise modeling had been “forced” through BEopt limitations

Ventilation alignment update: incorporated assumptions aligned with IMC 2021-era ventilation rate increases (notably higher kitchen/bath exhaust), anticipating adoption

Continued incremental corrections of “occupant-dependent” internal load items (refrigeration/appliance counts) where earlier high-rise workaround modeling produced undercounts.

Phius 2012 — Phius+ 2015 — Phius+ 2018 — Phius CORE 2021 — Phius CORE 2024 — Phius CORE 2027

46

#2108
Overlook Mountain House

Woodstock, NY
North River Architecture and Planning

7 Very cold

R42 / R27

2x6, 2x4 double stud
w/ DP cellulose

Airtightness: .03 cfm /ft2
Windows: Pivot Alu-7

46

#2108
Overlook Mountain House

Woodstock, NY
North River Architecture and Planning

7 Very cold

R42 / R27

2x6, 2x4 double stud
w/ DP cellulose

Airtightness: .03 cfm /ft2
Windows: Pivot Alu-7

47

#2795
Silverthorne Passive Hosue

Twin Lakes , CO
Shape Architects

7 Very cold

R29 | 2x6 w/ DP cellulose
+ 4" min wool CEI

Airtightness: .TBD
Windows: Viking SW-17

Challenges: High Altitude: approx 9,000ft above sea level
Very skilled but first time PH builder
Energy rater being 2 hrs from site was challenging
Attempted to include a skylight but no PH skylight that could handle altitude could be procured in US

48

#2906
Ecomod Chalet

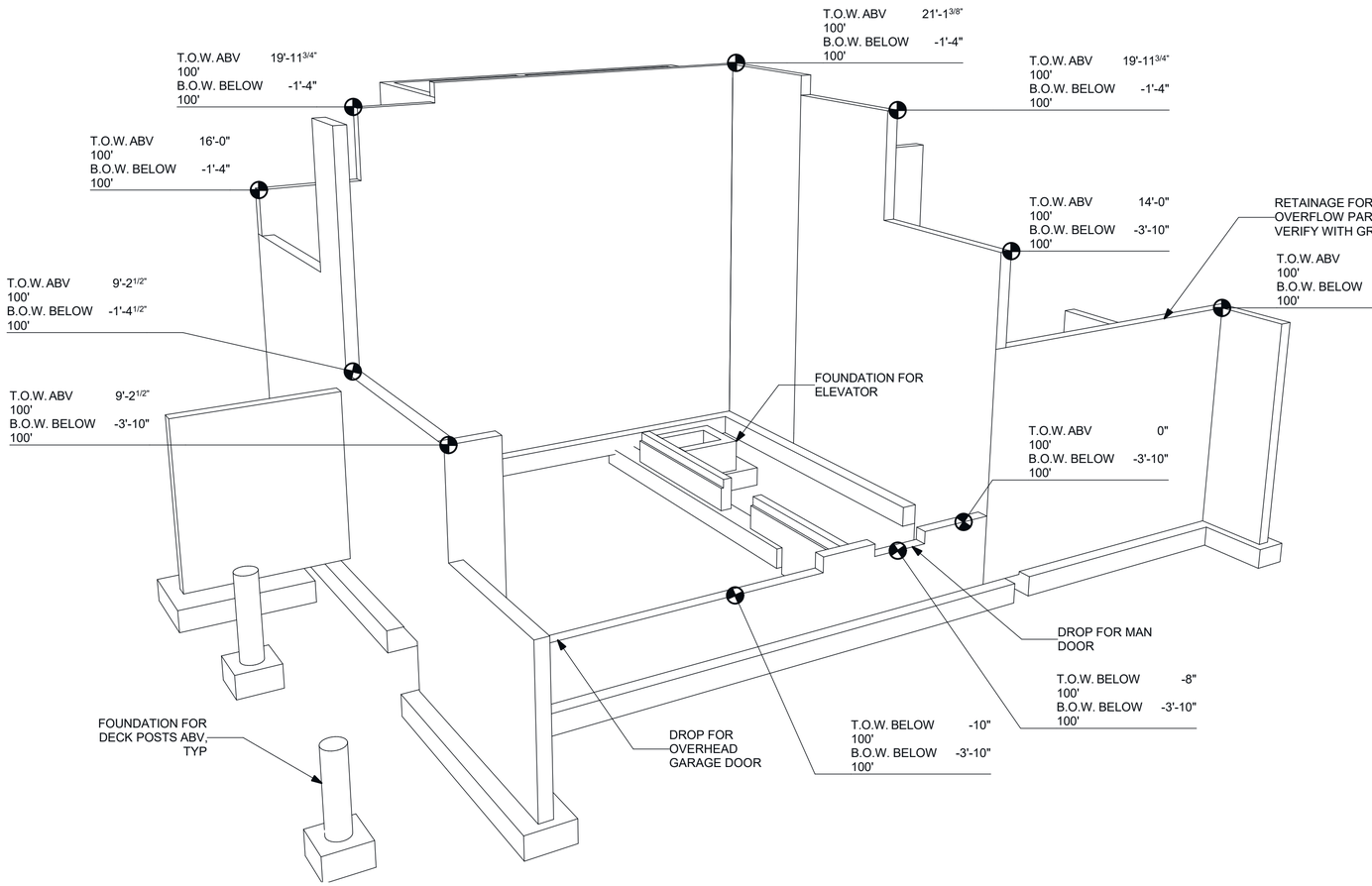
Twin Lakes , CO
Shape Architects

7 Very cold

R42 / R27

2x6, 2x4 double stud
w/ DP cellulose

Airtightness: .TBD
Windows: Pivot Alu-7



48

#2906
Ecomod Chalet

Twin Lakes , CO
Shape Architects

7 Very cold

R42 / R27

2x6, 2x4 double stud
w/ DP cellulose

Airtightness: .TBD
Windows: Pivot Alu-7

50

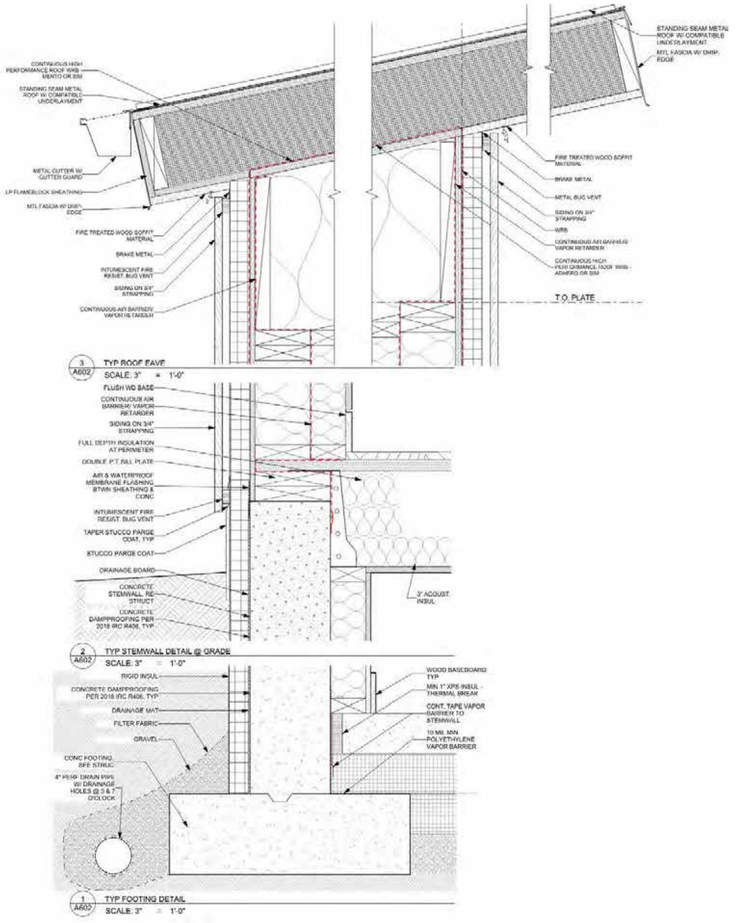
#2956
Flatirons Passive House

Boulder, CO
Shape Architects

7 Very cold

R34 | 2x6, 2x4 double stud w/ DP cellulose

Airtightness: .TBD
Windows: Pivot Alu-7



Challenges: Existing trees on site that Boulder not allowing be removed. Makes solar gain difficult to achieve, and active solar will most likely underperform so city Net-0 target may not be achieved.

Dream team. Very experience builder already wanted to do the assembly that worked for PH. Very low added cost.

Phius CORE / ZERO 2027

· Continued **updates to source energy targets** (specifically analyzing by climate in addition to density/occupancy.

· Update setpoint temperatures to **70°F heating / 75°F cooling** (aligns better with monitored data)

· Simplifying prescriptive path toward a **checklist + prescribed assemblies** (instead of minimum R-value components approach)

Key Takeaways:

- Phius certification **continuously adjusts** to **lessons learned** in the field and **refines** its climate / building specific targets.

- Phius certification **no longer** requires a simple box shape, 2' thick walls and specialized materials

- **There is no one-size-fits-all solution**. Develop your **regional passive building ecosystem** of details, means, methods and materials.

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