CLIMATE ACTION WEBINAR

Wednesday, September 27
12:00 P - 1:00 P
1 LU/HSW (pending approval)

Standard of Care: A Decade of Passive House Projects in California

AIA California

JENNIFER KRETSCHMER, AIA, NCARB, LEED GA
PRINCIPAL ARCHITECT & OWNER,
J. KRETSCHMER ARCHITECT

BRONWYN BARRY, RA, CPHD
PRINCIPAL, PASSIVEHOUSE BB

Learning Objectives

Standard of Care: A decade of Passive House projects in California

Review the Passive House Standard as it relates to energy efficiency and carbon reductions, Certifications, and Certification process.

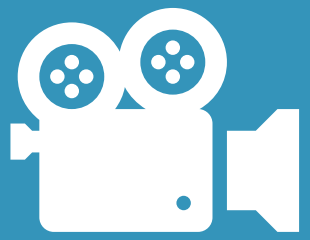
Walk through examples of outcomes from case studies to understand the value of post-occupancy monitoring.

Discuss Passive House Project Delivery structure and systems.

Discuss and expand upon the and 'Standard of Care' as it applies to outcomes beyond the current definition.

AIA Continuing Education Provider

Housekeeping Reminders



A recording of today's presentation will be made available on our website

Today's session qualifies for 1 AIA HSW/LU & 1hr of ZNCD

Please use the Q&A function to ask questions for today's presenters

Cultivate a positive learning environment

MODERATOR/ SPEAKER

JENNIFER KRETSCHMER, AIA, NCARB, LEED GA

PRINCIPAL ARCHITECT & OWNER,
J. KRETSCHMER ARCHITECT

SPEAKER

BRONWYN BARRY, RA, CPHD

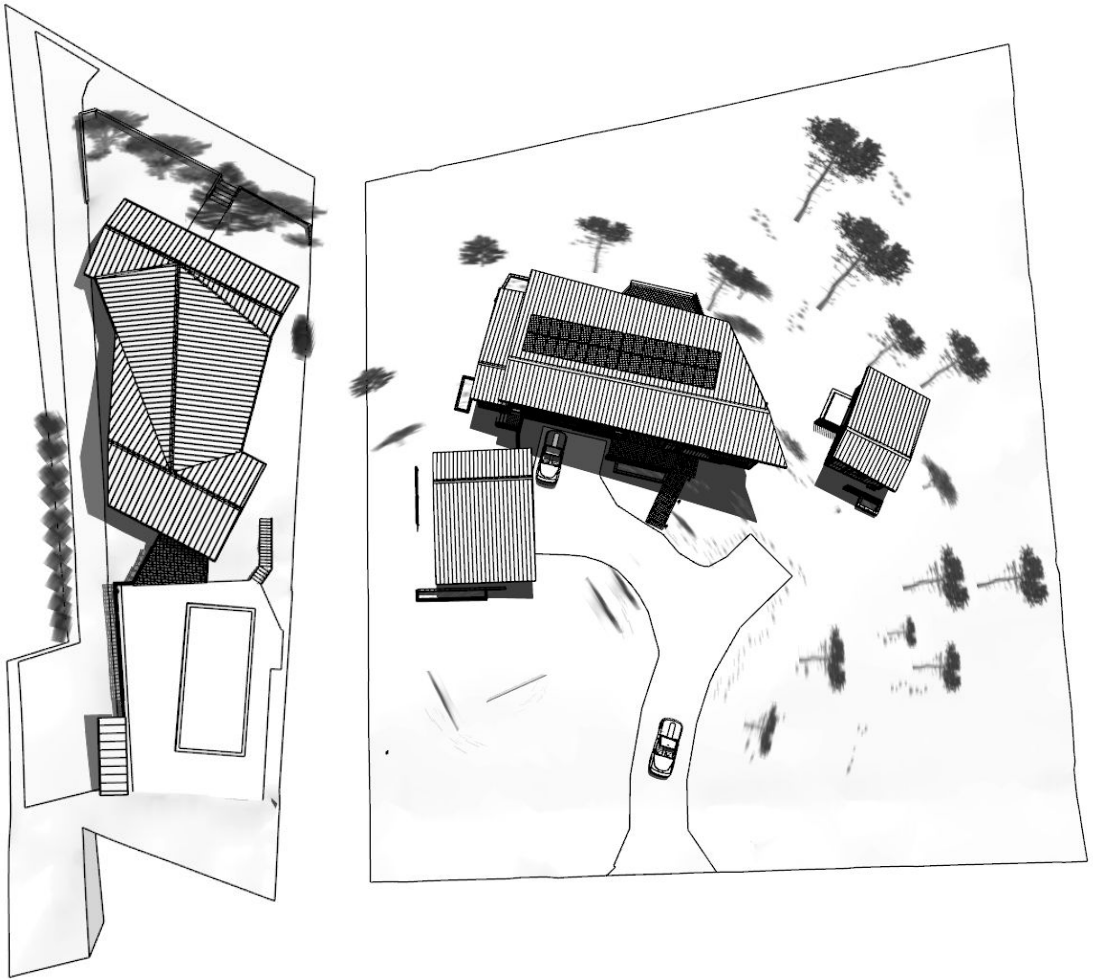
PRINCIPAL, PASSIVEHOUSE BB

Standard of Care

A Decade of Passive House Practice in California

Bronwyn Barry, RA, CPHD

Agenda



Projects & Performance

1. **The Early Years**
   a. **Sunnyvale I**
   b. **Alamo**
   c. **Sunnyvale II**
2. **Recent Work**
   a. **17 Mile Haus**
   b. **Clovis**
   c. **Sacramento**
   d. **Colorado Springs**
3. **Exploring Multifamily**
4. **A Practice of Passive House**
5. **Resources**

Timeline

Pre-Passivhaus

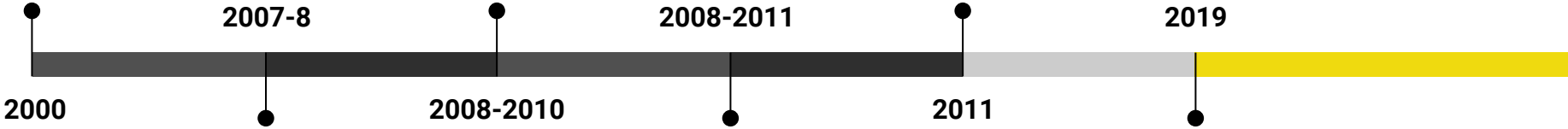
Opened my practice called 'Urban Structure' in Oakland. Worked on residential renovations across East Bay.

PASSIVE HOUSE CALIFORNIA

Founded by a group of us in the Living Room of Nabih Tahan in Berkeley, CA. Incorporated as 501c3 in 2010.

Passive House BB opens

Launched 'Passive House BB' and partnered with One Sky Homes as a 'design build' package.



Discovered Passive House

Traveled to Germany to attend the International PH Conference. Took CPHC training in Berkeley in early 2009 hosted by PHIUS

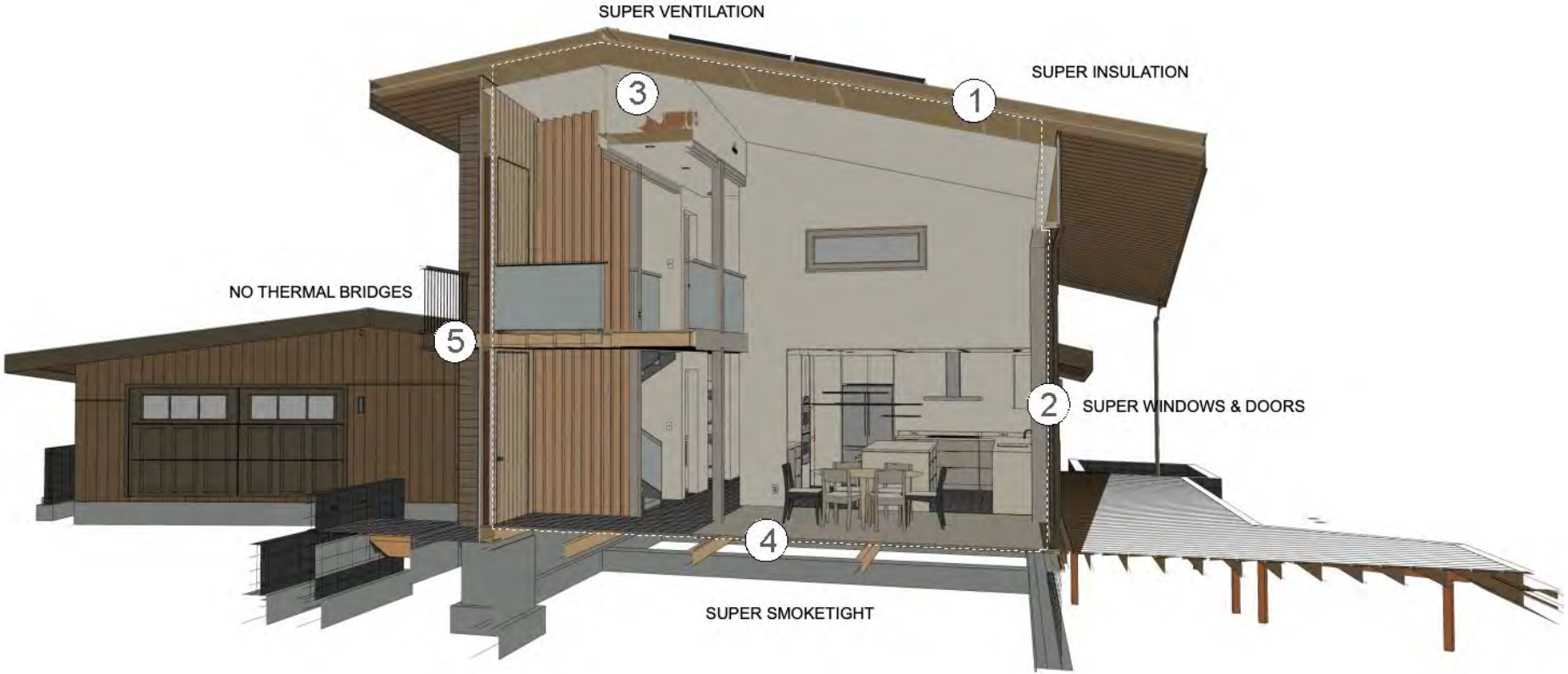
Quantum Builders

Worked as window sales rep for Quantum Builders during the recession. Sold Passive House windows across North America.

Allen Gilliland Retires

One Sky Homes closes. PHBB begins working across California & Colorado with multiple builders

Defining Passive House Essentials



THE EARLY YEARS

[collaborating with One Sky Homes]

SUNNYVALE 1

[SEARCHING FOR EXTERIOR INSULATION]

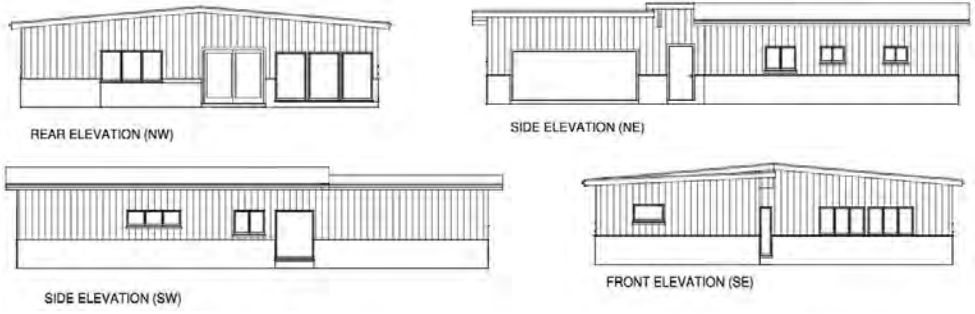
Image Credit: Treve Johnson Photography

passive house

SUNNYVALE I

2012

Sunnyvale I Retrofit



BEFORE

AFTER

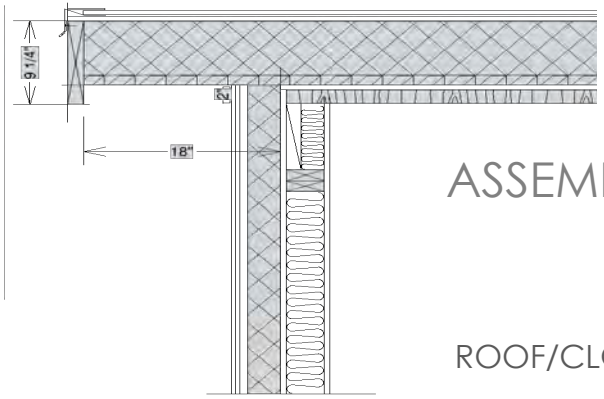
Image Credit: Treve Johnson Photography

Image Credit: Treve Johnson Photography

Image Credit: Treve Johnson Photography

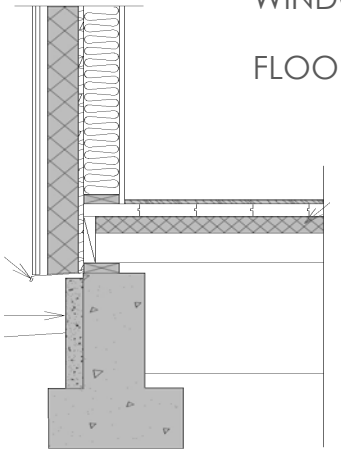
passive house

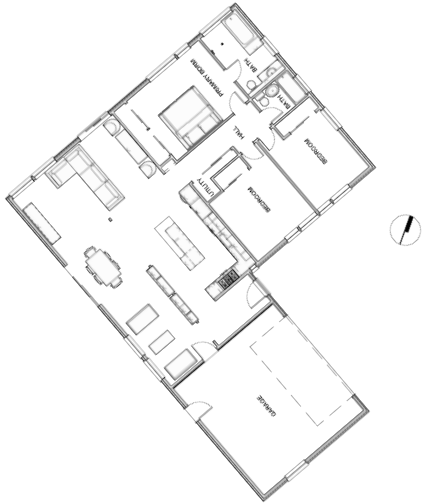
Performance



ASSEMBLIES (hr.ft^2.F/BTU)

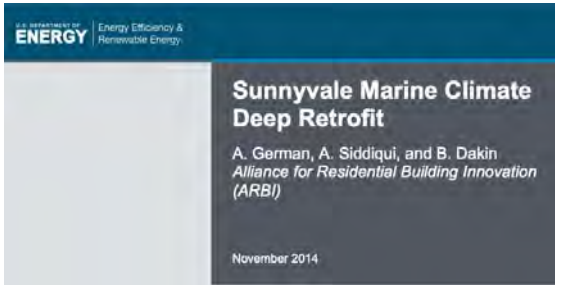
	T-24	VS.	AS-BUILT
ROOF/CLG:	R-38		**R-40**
WALLS:	R-25		**R-26**
WINDOWS:	U-0.38		**U-0.3**
FLOOR/SLAB:	R-0		**R-24**





Total area: **2,000 sf**
Treated Floor Area: 1,560 sf

Net Energy Use: 5,765 kWh/yr



Source: https://www.nrel.gov/docs/fy15osti/63085.pdf

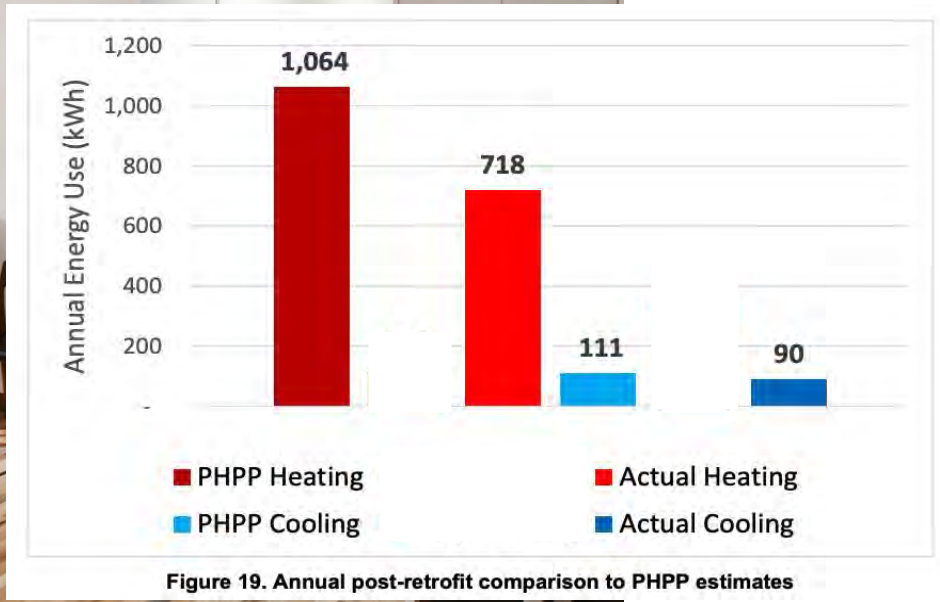


Figure 19. Annual post-retrofit comparison to PHPP estimates

Source: https://www.nrel.gov/docs/fy15osti/63085.pdf

Image Credit: Treve Johnson Photography

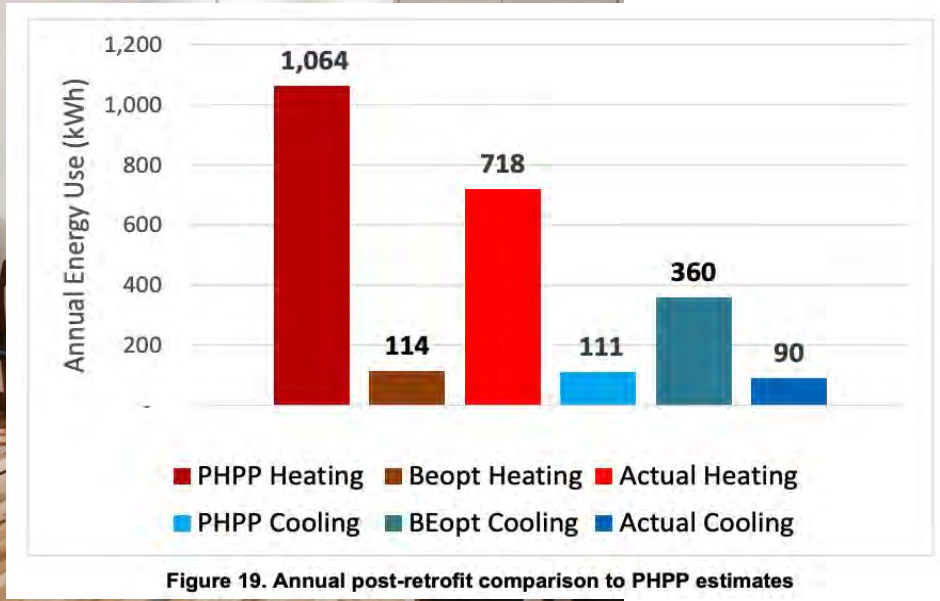


Figure 19. Annual post-retrofit comparison to PHPP estimates

Source: https://www.nrel.gov/docs/fy15osti/63085.pdf

Image Credit: Treve Johnson Photography

ALAMO

[A FIGHT FOR SIMPLE]

Image Credit: Allen Gilliland - One Sky Homes

passive house

ALAMO

2014

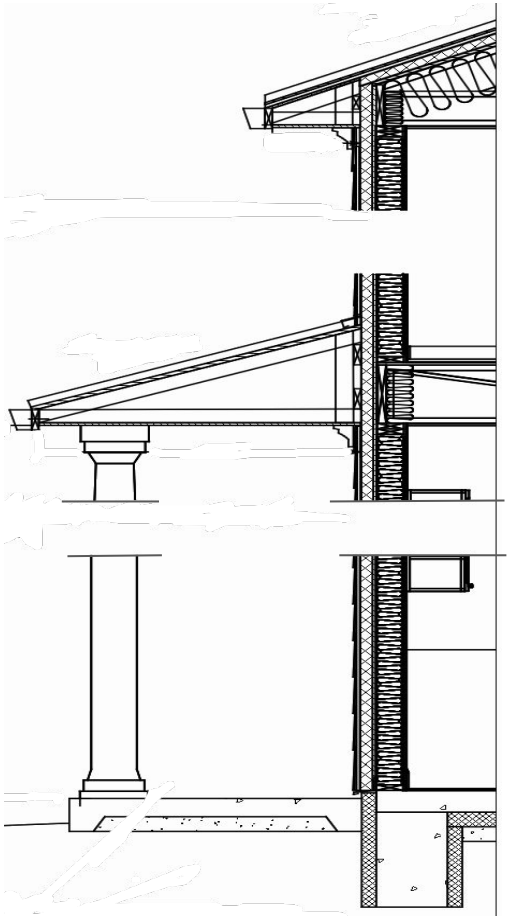

17
15
1337
1335
1333
1331

Image Credit: Treve Johnson Photography

Image Credit: Treve Johnson Photography

Image Credit: Treve Johnson Photography

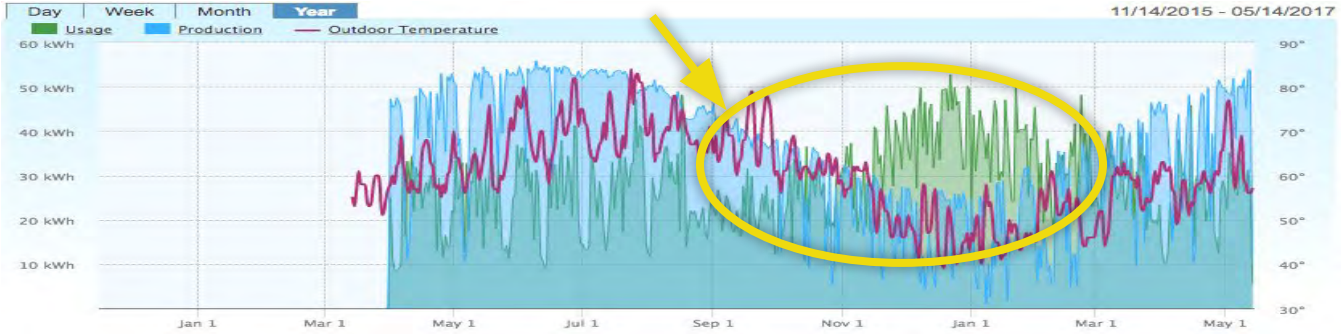
Modeling & Monitoring



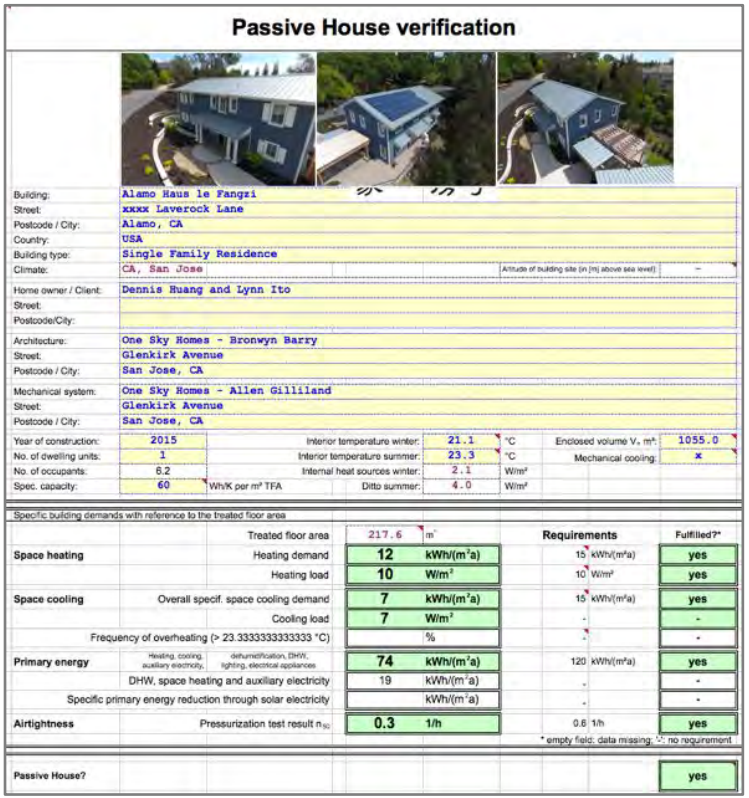
ASSEMBLIES (hr.ft².F/BTU)

	CODE REQ'D	AS BUILT
ROOF/CLG:	R-38	**R-46**
WALLS:	R-19	**R-28**
WINDOWS:	U-0.57	**U-0.3**
FLOOR/SLAB:	R-0	**R-14**
AIR TIGHTNESS:	3 ACH 50	**0.3 ACH**

Annual Energy Use vs Generation [NOT ZERO!]



Verifying our PHPP Model



Passive House verification

Building:	Alamo Haus le Fangzi
Street:	xxxx Laverock Lane
Postcode / City:	Alamo, CA
Country:	USA
Building type:	Single Family Residence
Climate:	CA, San Jose
Home owner / Client:	Dennis Huang and Lynn Ito
Architecture:	One Sky Homes - Bronwyn Barry
Mechanical system:	One Sky Homes - Allen Gilliland

Year of construction:	2015	Interior temperature winter:	21.1 °C	Enclosed volume V, m³:	1055.0
No. of dwelling units:	1	Interior temperature summer:	23.3 °C	Mechanical cooling:	x
No. of occupants:	6.2	Internal heat sources winter:	2.1 W/m²		
Spec. capacity:	60 Wh/K per m² TFA	Ditto summer:	4.0 W/m²		

Specific building demands with reference to the treated floor area

				Requirements	Fulfilled?*
	Treated floor area	217.6	m²		
Space heating	Heating demand	12	kWh/(m²a)	15 kWh/(m²a)	yes
	Heating load	10	W/m²	10 W/m²	yes
Space cooling	Overall specif. space cooling demand	7	kWh/(m²a)	15 kWh/(m²a)	yes
	Cooling load	7	W/m²	-	-
	Frequency of overheating (> 23.3333333333333 °C)		%	-	-
Primary energy	Heating, cooling, auxiliary electricity, dehumidification, DHW, lighting, electrical appliances	74	kWh/(m²a)	120 kWh/(m²a)	yes
	DHW, space heating and auxiliary electricity	19	kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}	0.3	1/h	0.6 1/h	yes

* empty field: data missing; -: no requirement

Passive House?	yes

Treated floor area	217.6	m²
Heating demand	12	kWh/(m²a)
Heating load	10	W/m²
ecif. space cooling demand	7	kWh/(m²a)
Cooling load	7	W/m²
; (> 23.3333333333333 °C)		%

NO PERFORMANCE GAP!

PHPP	kWh/a	HP COP	PHPP Estimate	Actual
HEAT	2,596	3	865	849
COOL	1,533	3	511	594

SUNNYVALE II

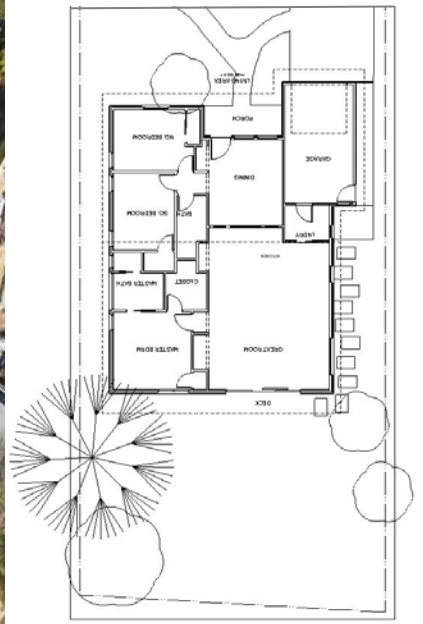
[OWNING VENTILATION DESIGN]

passive house

SUNNYVALE II

2015

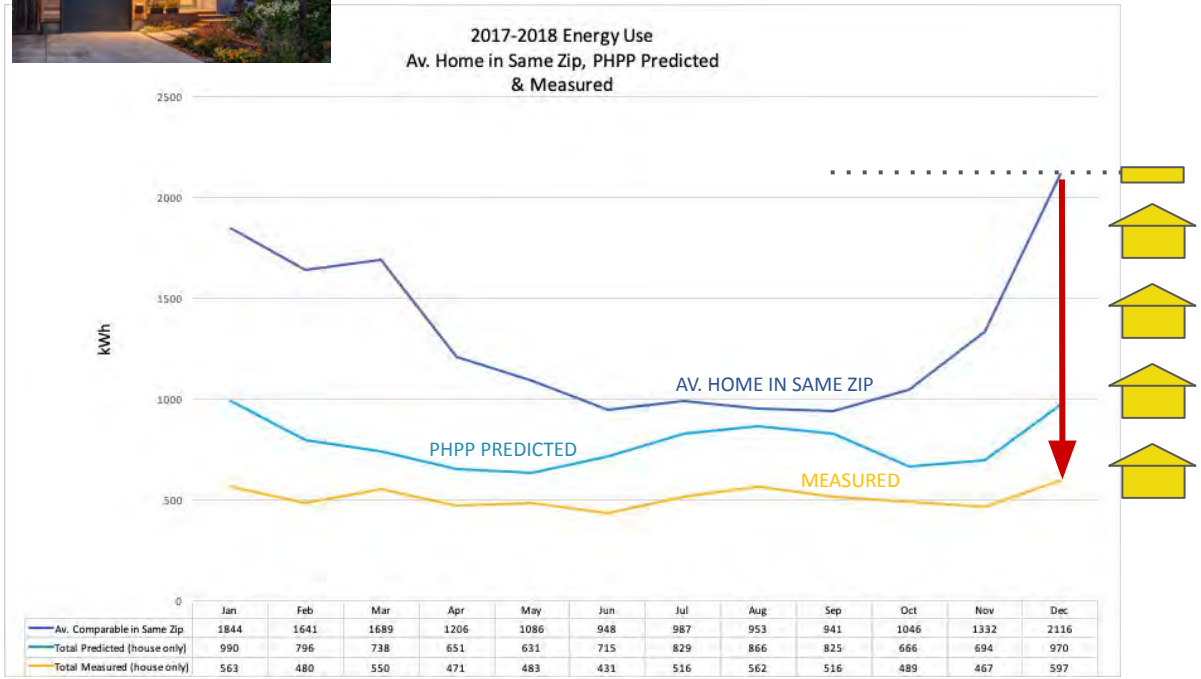
passive house



passive house

Image Credit: Treve Johnson Photography

Measured Performance



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Av. Comparable in Same Zip	1844	1641	1689	1206	1086	948	987	953	941	1046	1332	2116
Total Predicted (house only)	990	796	738	651	631	715	829	866	825	666	694	970
Total Measured (house only)	563	480	550	471	483	431	516	562	516	489	467	597

TOTAL ANNUAL ENERGY:
Av. Home in Same Zip:
15,788 kWh

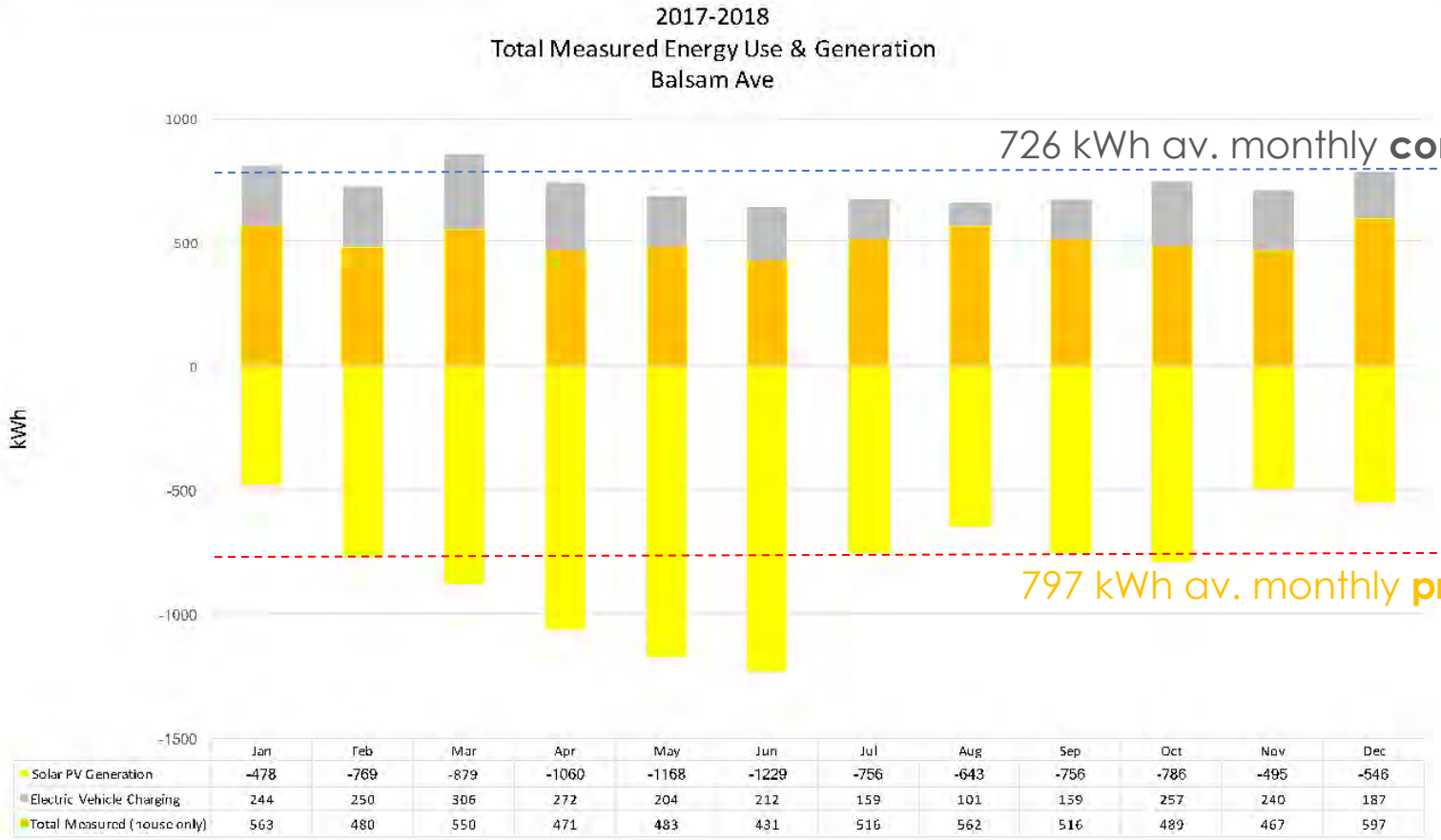
Passive House:
6,125 kWh

WINTER PEAK USE:
Av. Home in Same Zip:
2,516 kWh

Passive House:
597 kWh

= 4.3 x LESS!

Proper ‘Net Zero’ energy



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Solar PV Generation	-478	-769	-879	-1060	-1168	-1229	-756	-643	-756	-786	-495	-546
Electric Vehicle Charging	244	250	306	272	204	212	159	101	159	257	240	187
Total Measured (house only)	563	480	550	471	483	431	516	562	516	489	467	597

Passive House in CA compared to ZNE

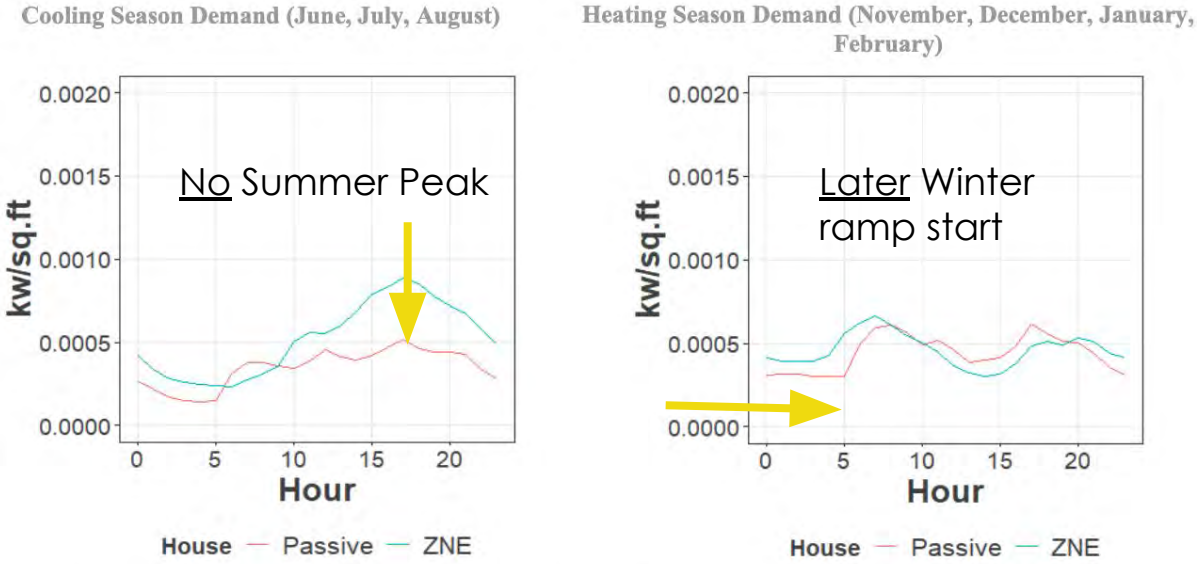


Figure 2. Passive House and ZNE Seasonal Load Comparisons

Hourly monitoring data:

- ❏ 5 ZNE homes vs.
- ❏ 2 Passive House homes

Source: https://aceee2022.conferencespot.org/event-data/pdf/catalyst_activity_32610/catalyst_activity_paper_20220810191639356_eee5e703_cea0_4aa3_8454_3e92c950ae91

Proving this is affordable

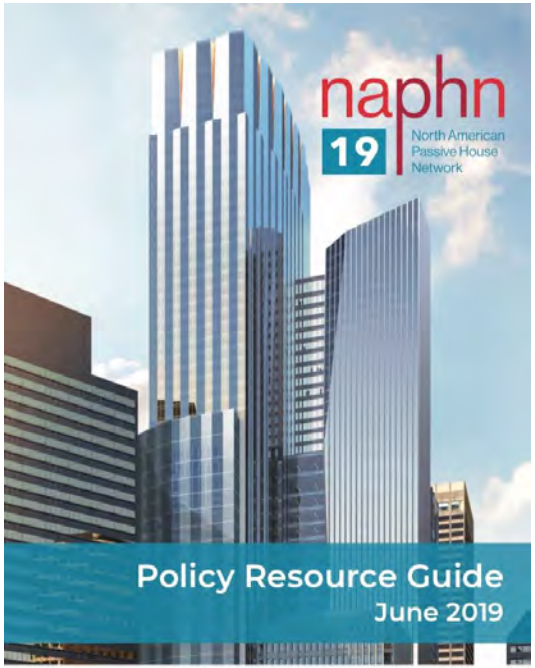
Location	Project	"Hard" Cost ($)	House (SF)	Garage (SF)	Total Area	House Only ($/SF)	Total $/SF
Alamo	Laverock Lane	$1,420,000.00	2,957	600	3,557	$399.21	$399.21
Sunnyvale	Balsam Ave	$758,000.00	1,488	238	1,726	$509.41	$439.17
Los Altos	Concord Ave	$1,675,000.00	3,098	495	3,593	$540.67	$466.18
San Carlos	Arroyo Ave	$2,760,000.00	4,201	472	4,673	$656.99	$590.63
San Jose	Cherry Garden	$1,800,000.00	3,150	457	3,607	$571.43	$499.03

ed garage included in SF cost
high foundation and drainage costs

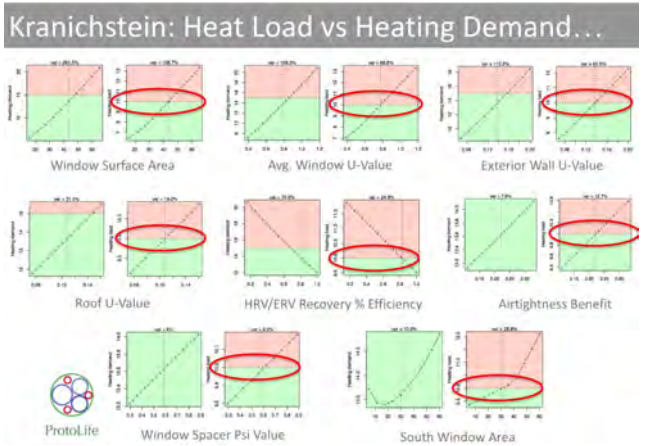
e family detached
projects with solar PV systems; 4 and 5 include batteries
assive House standard with European triple pane windows and ventilation systems

https://www.homebuilderdigest.com/how-much-does-it-cost-to-build-a-house-in-the-san-francisco-bay-area/

PH CA PASSIVE HOUSE CALIFORNIA



MP BOSTON · HIGH PERFORMANCE BUILDING SUPPLY · ROCKWOOL



PASSIVE + RENEWABLES

October 4-8,2017 | Oakland, California

naphn 17 North American Passive House Network CONFERENCE & EXPO

With thanks to Our partners and Collaborators

Passive House Institute · International Living Future Institute · City of Oakland · Berkeley Lab · PG&E

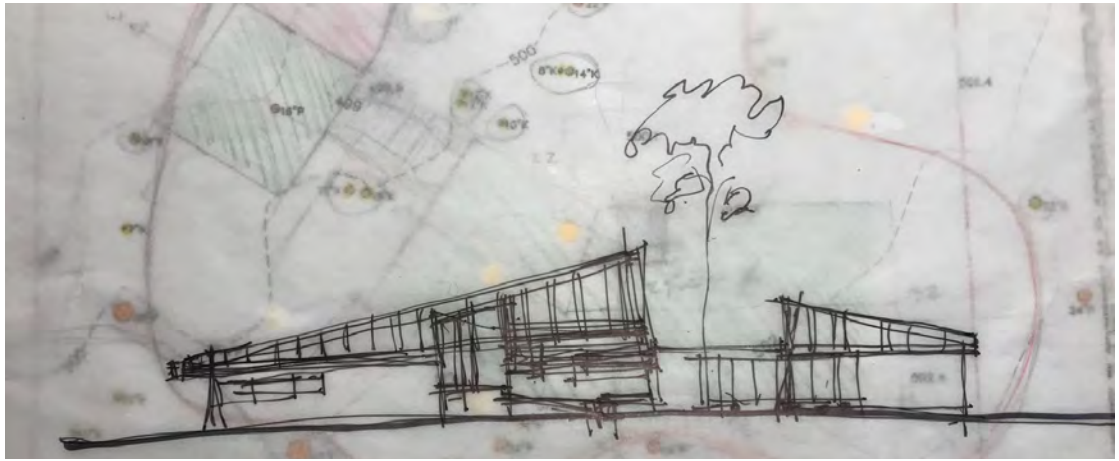
passive house

PANDEMIC YEARS

[FLYING SOLO]

17 MILE HAUS

[PLAYING WITH FORM]



passive house

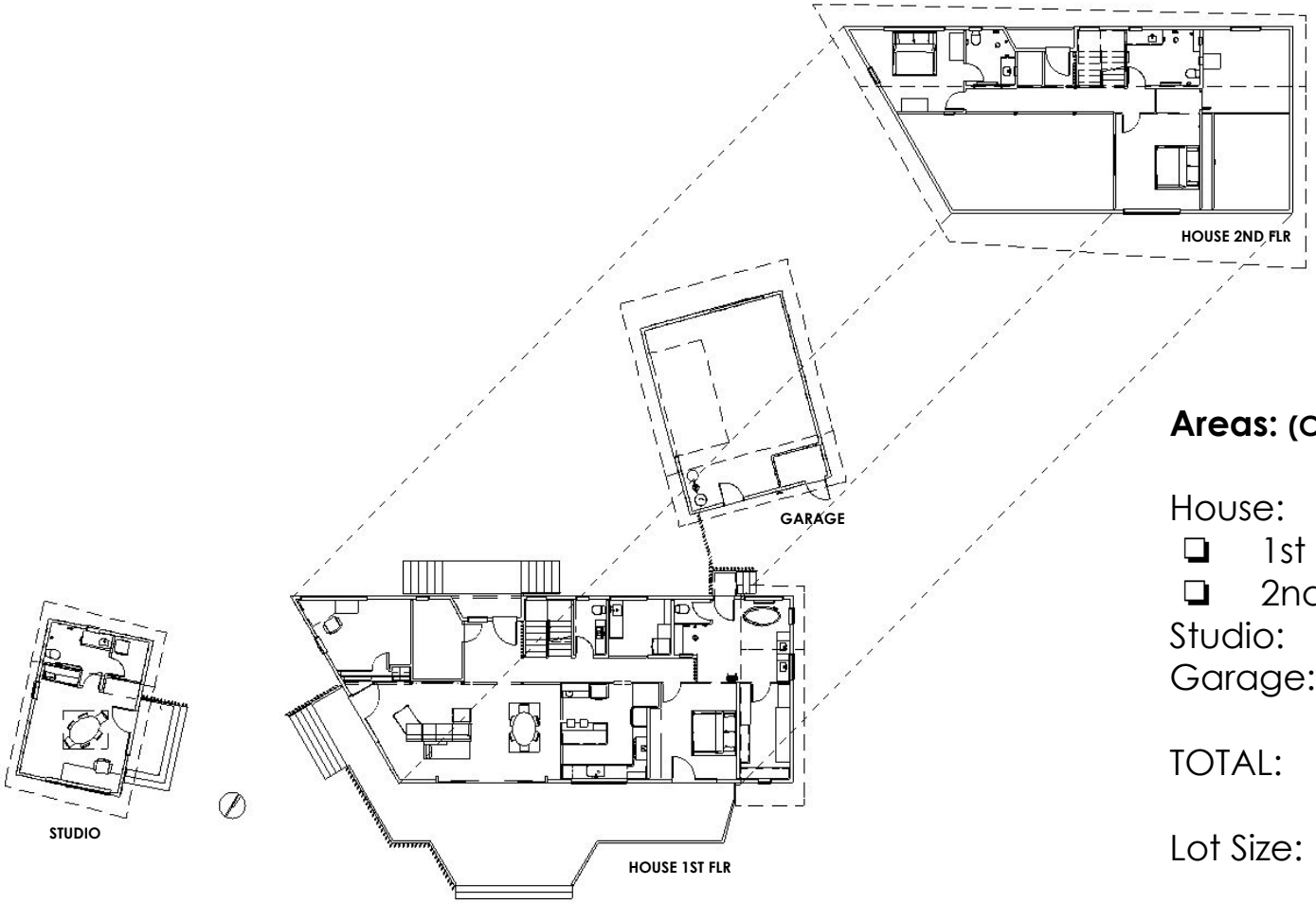
PEBBLE BEACH

2019

Street View

Rear View

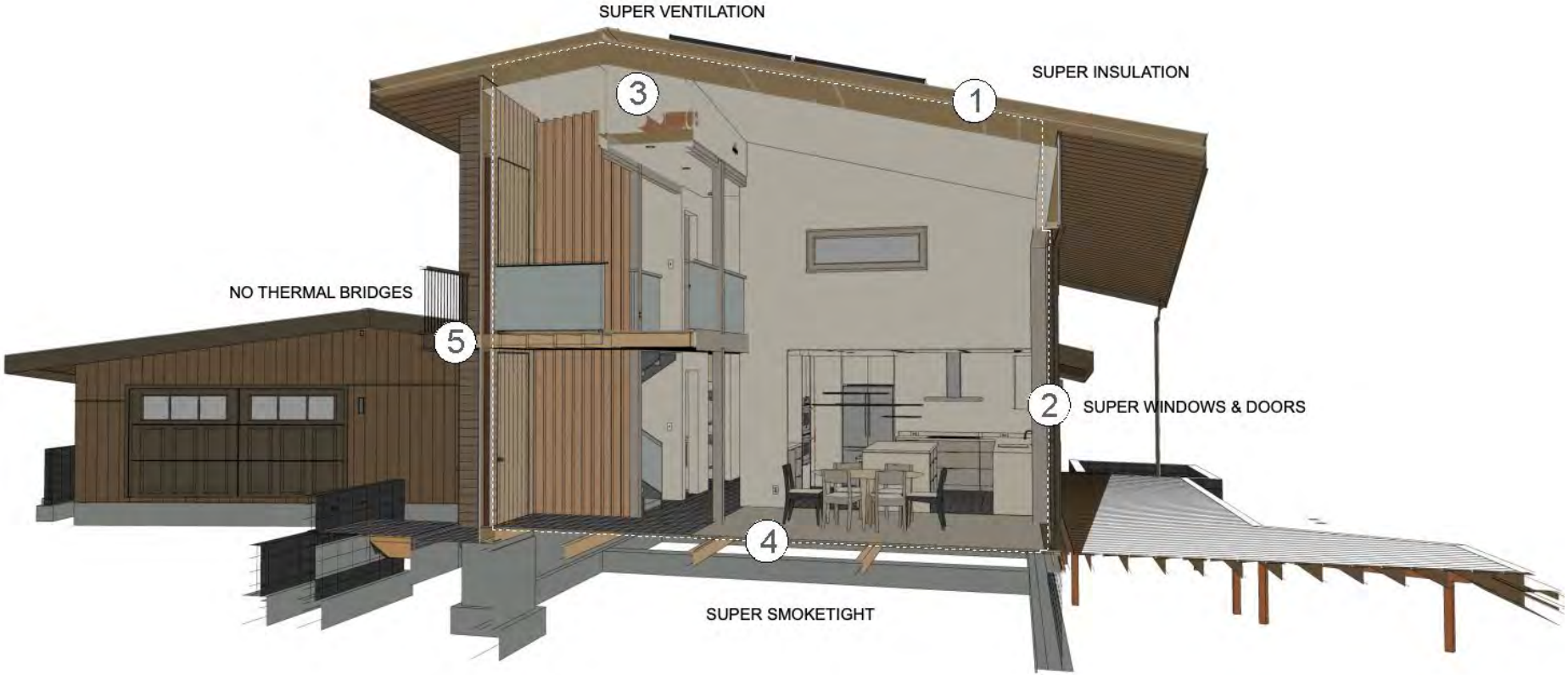
Plans



Areas: (Conventional)

House:	
❑ 1st Flr	1,887 sf
❑ 2nd Flr	1,051 sf
Studio:	396 sf
Garage:	646 sf
TOTAL:	**3,980 sf**
Lot Size:	33,912 sf

All the PH Essentials



Passive House

Passive House Verification

Building:	Asnis Residence		
Street:	Seventeen Mile Drive		
Postcode/City:	CA		
Province/Country:	California	US-United States of America	
Building type:	Single Family Dwelling Unit		
Climate data set:	ud---01-Monterey, CA		
Climate zone:	5: Warm	Altitude of location:	20 ft
Home owner / Client:	Asnis		
Street:			
Postcode/City:			
Province/Country:			
Architecture:	Passive House BB	Mechanical engineer:	
Street:		Street:	
Postcode/City:	CA 94110 San Francisco	Postcode/City:	
Province/Country:	California	Province/Country:	
Energy consultancy:	Hyperlocal Workshop	Certification:	Steve Mann
Street:		Street:	
Postcode/City:	80541 Masonville	Postcode/City:	
Province/Country:	Colorado US-United States of America	Province/Country:	

Year of construction:	2021	Interior temperature winter [°F]:	68.0	Interior temp. summer [°F]:	77.0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [BTU/(hr.ft²)]:	0.72	IHG cooling case [BTU/(hr.ft²)]:	0.72
No. of occupants:	2.0	Specific capacity [BTU/F per ft² TFA]:	10.6	Mechanical cooling:	x

Specific building characteristics with reference to the treated floor area

					Criteria	Alternative criteria	Fulfilled?[2]
	Treated floor area	ft²	2906				
Space heating	Heating demand	kBTU/(ft²yr)	1.10	≤	4.75	-	yes
	Heating load	BTU/(hr.ft²)	1.67	≤	-	3.17	
Space cooling	Cooling & dehum. demand	kBTU/(ft²yr)	0.97	≤	4.75	4.75	yes
	Cooling load	BTU/(hr.ft²)	1.28	≤	-	3.23	
Frequency of overheating (> 77 °F)		%	-	≤	-		-
Frequency of excessively high humidity (> 0.012 lb/lb)		%	0.0	≤	3.17		yes
Airtightness	Pressurization test result n_{50}	1/hr	0.6	≤	0.19		yes
Non-renewable Primary Energy (PE)	PE demand	kBTU/(ft²yr)	15.90	≤	-		-
Primary Energy Renewable (PER)	PER demand	kBTU/(ft²yr)	7.23	≤	19	19	yes
	Generation of renewable energy (in relation to pro-jected building footprint area)	kBTU/(ft²yr)	3.97	≥	-	-	

[2] Empty field: Data missing; "-": No requirement

I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification.

Passive House Classic? yes

Task: First name: Surname: Signature:

Issued on: City:

Assemblies: (Effective)

Walls: R-19
Roof: R-36
Floor: R-32

Windows: 3-pane U = 0.13 BTU/hr.ft².F

HVAC: (All electric)

- ❏ Heating load = 1.67 BTU/hr.ft²
- ❏ Cooling load = 1.28 BTU/hr.ft²
- ❏ Ventilation : Merv 13, balanced 91% eff. ERV (Brink)
- ❏ Mechanicals: (All electric)
  - ❏ Mitsubishi HP, ducted
  - ❏ Rheem HPWH
  - ❏ D'mand recirc pump

Frustration with Title 24

CERTIFICATE OF COMPLIANCE — **CF1R-PRF-01E**

Project Name: Asnis Residence — **Calculation Date/Time:** 2021-05-21T11:10:31-07:00 — **(Page 2 of 12)**

Calculation Description: Title 24 Analysis — **Input File Name:** 2821 17 MD House.ribd19x

ENERGY DESIGN RATING

	Energy Design Ratings		Compliance Margins	
	Efficiency[1] (EDR)	Total[2] (EDR)	Efficiency[1] (EDR)	Total[2] (EDR)
Standard Design	48.1	28.1		
Proposed Design	46.8	26.9	1.3	1.2

RESULT: [3] COMPLIES

1: Efficiency EDR includes improvements to the building envelope and more efficient equipment
2: Total EDR includes efficiency and demand response measures such as photovoltaic (PV) systems and batteries
3: Building complies when efficiency and total compliance margins are greater than or equal to zero

- Standard Design PV Capacity: 2.64 kWdc
- PV System resized to 2.64 kWdc (a factor of 2.639) to achieve 'Standard Design PV' PV scaling

ENERGY USE SUMMARY

Energy Use (kTDV/ft²-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	21.69	18.31	3.38	15.6
Space Cooling	1.78	4.35	-2.57	-144.4
IAQ Ventilation	3.08	3.08	0	0
Water Heating	13.42	12.07	1.35	10.1
Self Utilization/Flexibility Credit	n/a	0	0	n/a
Compliance Energy Total	**39.97**	**37.81**	**2.16**	**5.4**

REQUIRED PV SYSTEMS - SIMPLIFIED

01	02	03	04	05	06	07	08	09	10	11	12
DC System Size (kWdc)	Exception	Module Type	Array Type	Power Electronics	CFI	Azimuth (deg)	Tilt Input	Array Angle (deg)	Tilt: (x in 12)	Inverter Eff. (%)	Annual Solar Access (%)
2.64	NA	Standard	Fixed	none	false	155	Degrees	22	4.85	96	100

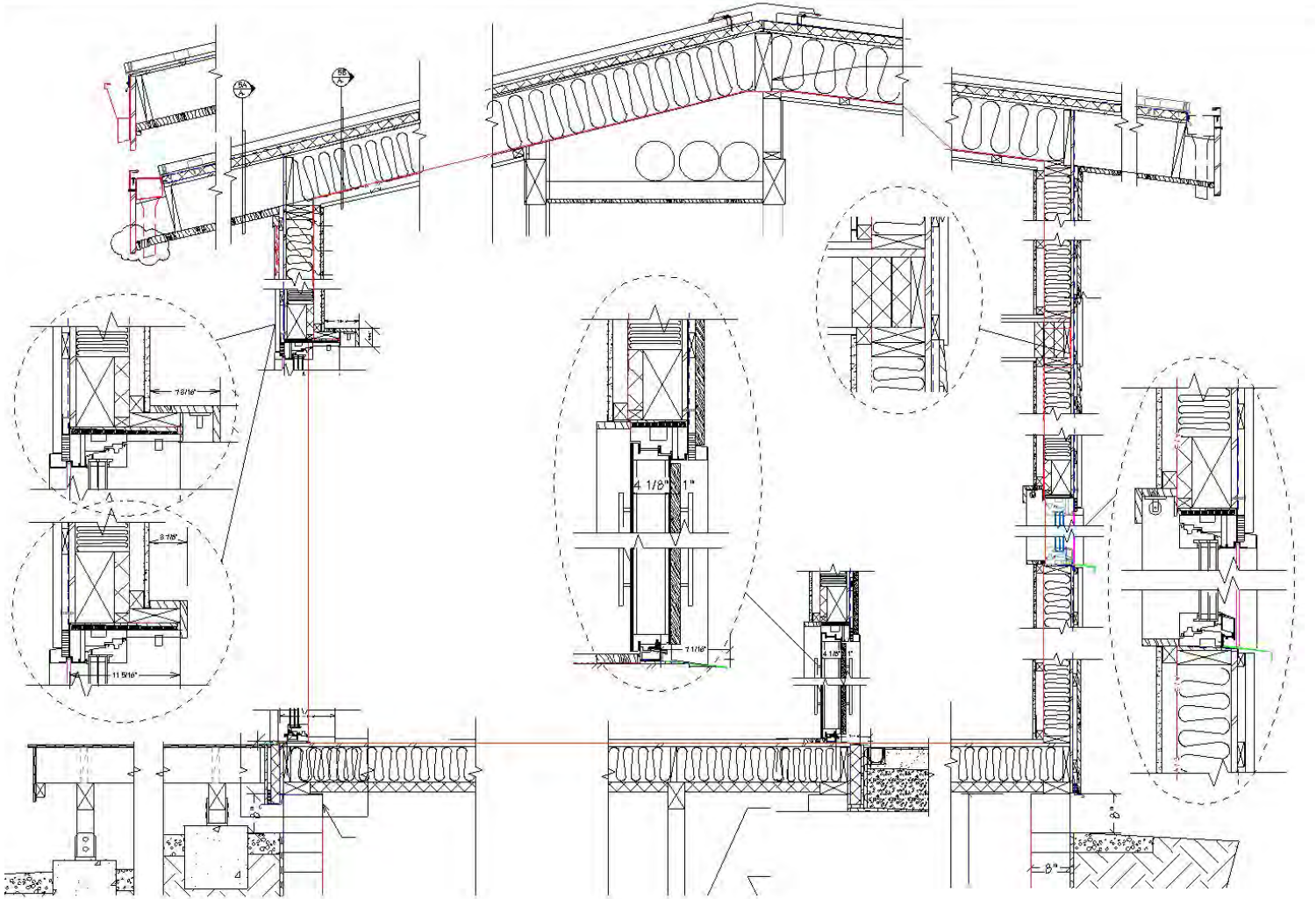
Results:

EDR: 1.2

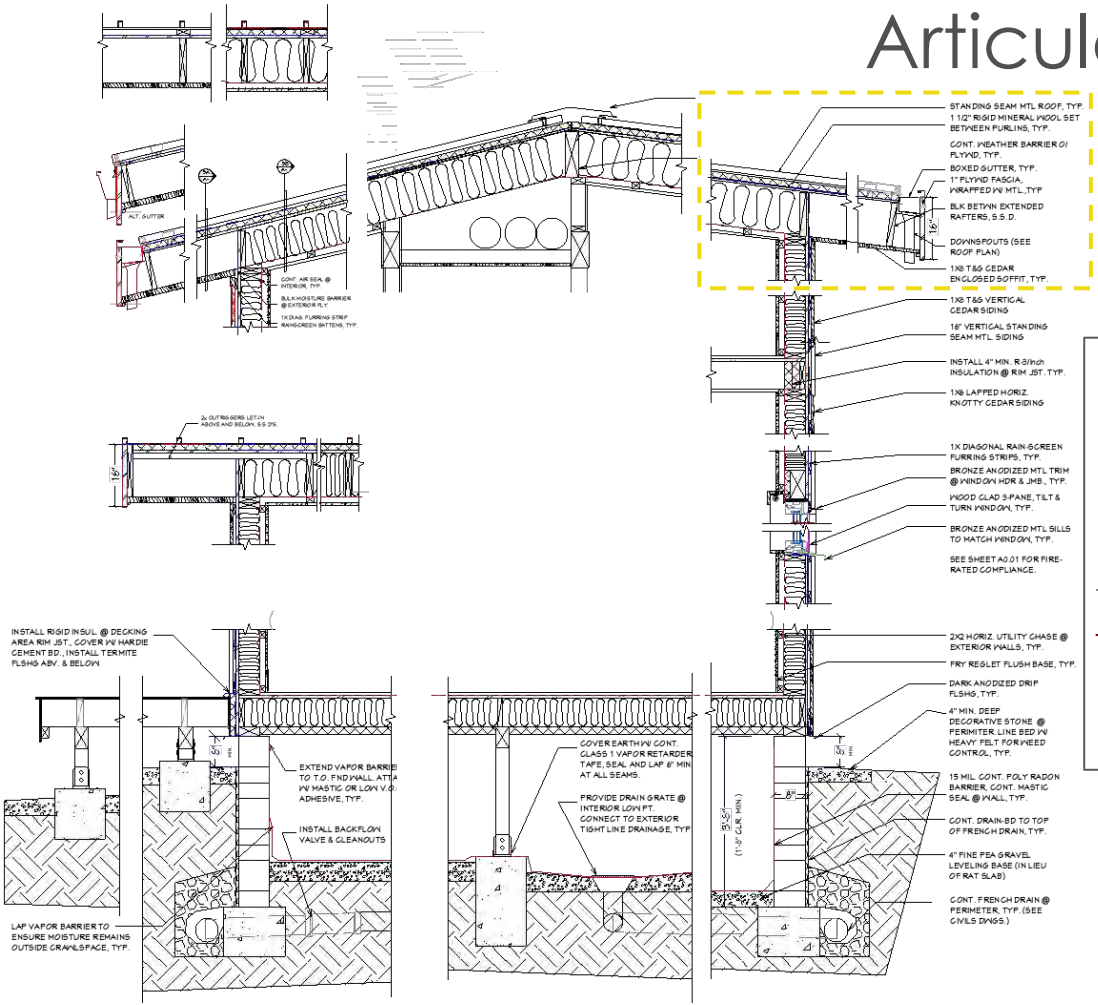
HVAC: (All electric)

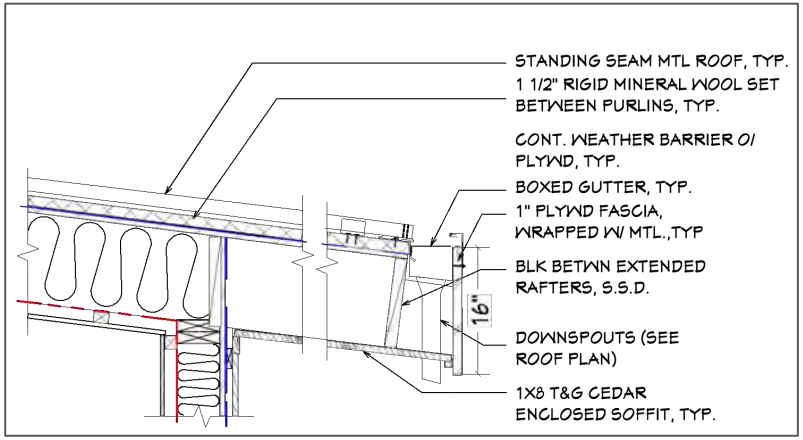
- ❏ Heating = 18.31 kTDV/ft^2.yr
- ❏ Cooling = 4.35 kTDV/ft^2.yr
- ❏ IAQ Ventilation : 3.08
- ❏ Mechanicals: (All electric)
  - ❏ Mitsubishi HP, ducted
  - ❏ Rheem HPWH
  - ❏ D'mand recirc pump

Smoke-Tight Details

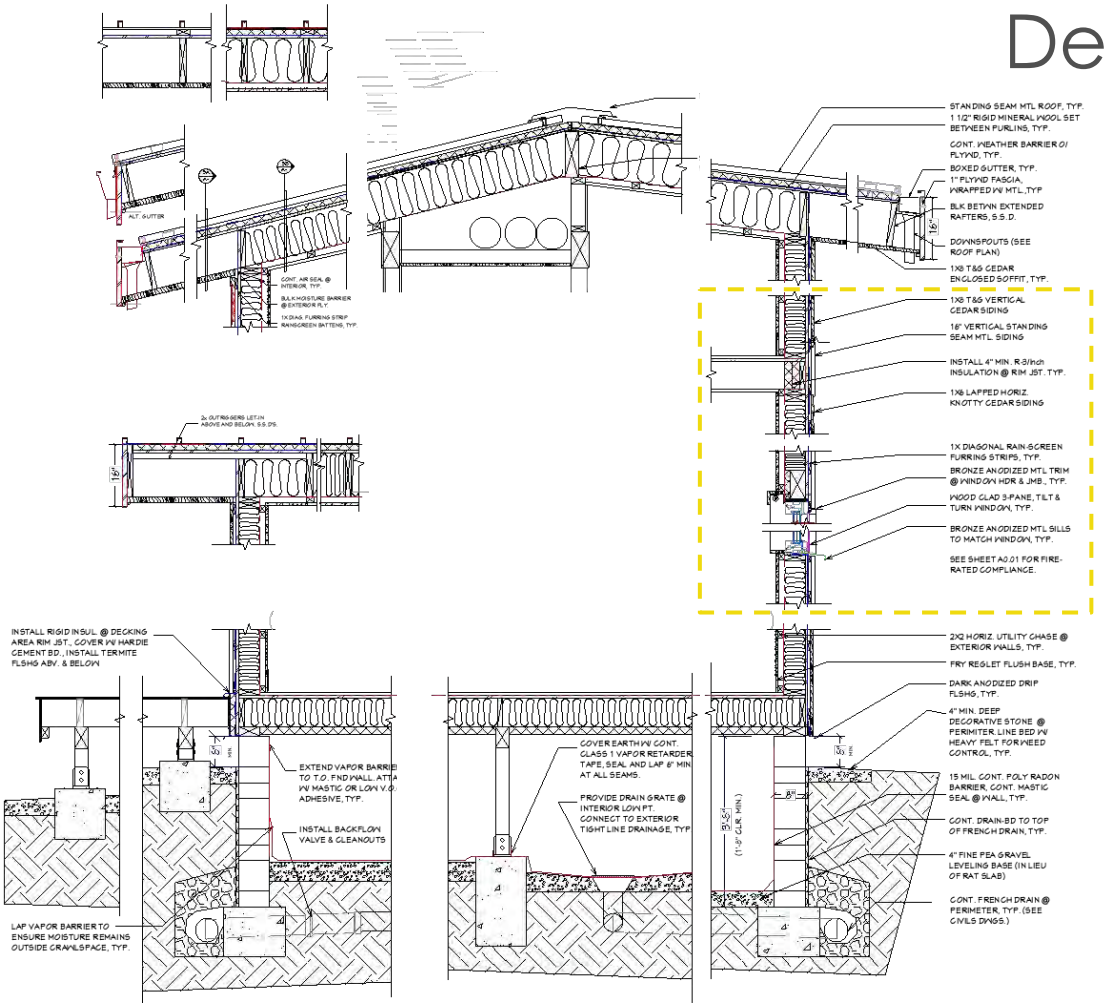


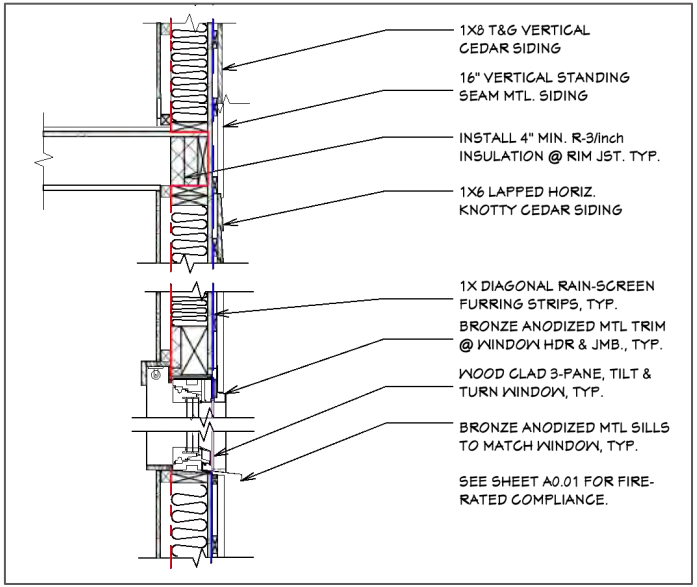
Articulated connections



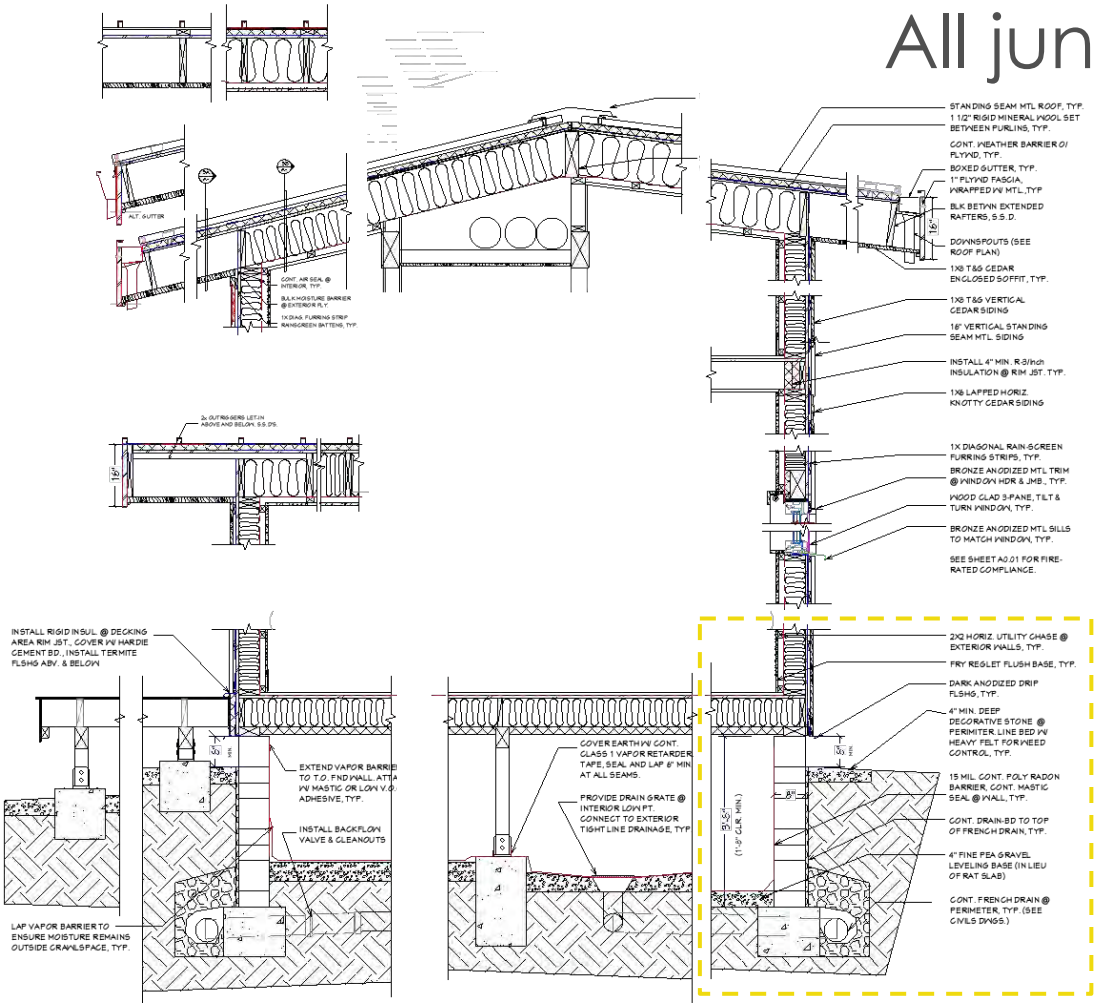


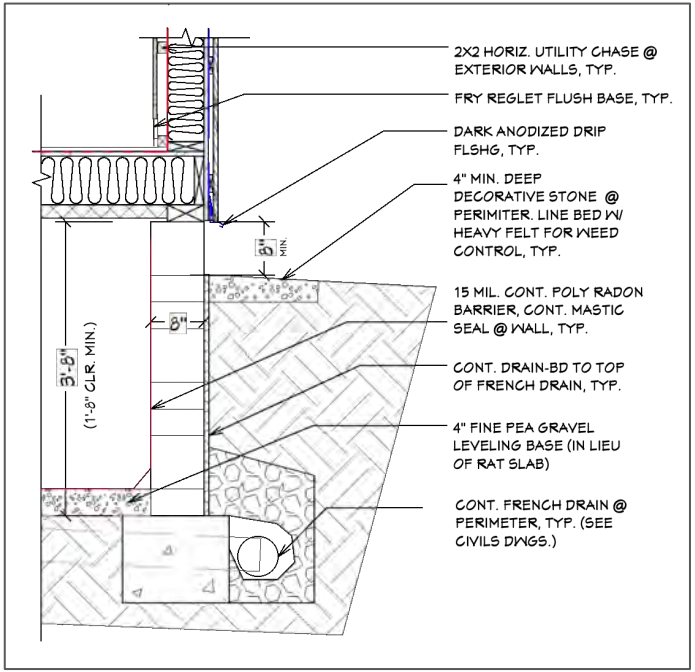
Defined Separations



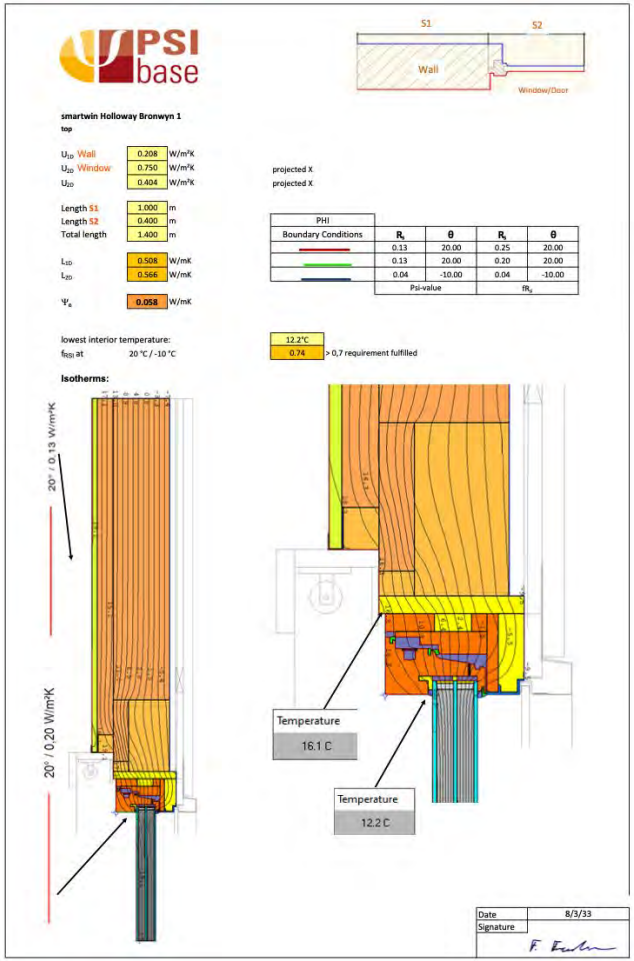


All junctions considered





Thermal Bridge free details



eMod Studio
V. Pezel, MSc M.Eng., CPHD
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Psi-Value

Wall at 2nd floor

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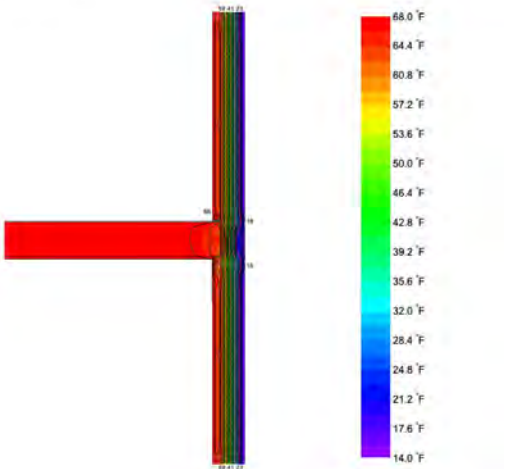
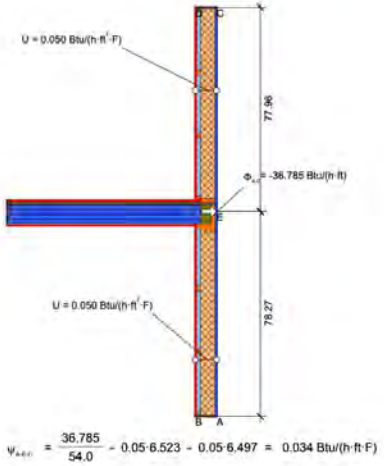
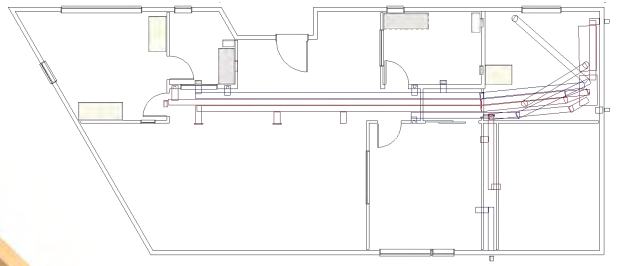
Wall at 2nd floor





$$\Psi_{e,e,i} = \frac{36.785}{54.0} - 0.05 \cdot 6.523 - 0.05 \cdot 6.497 = 0.034 \text{ Btu/(h·ft·F)}$$

Balanced (energy recovery) Ventilation



Careful SHADING

Embodied Carbon Analysis : PHribbon

Consultant:
Street:
Postcode/City:
Province/Country:

Client:
Street:
Postcode/City:
Province/Country:

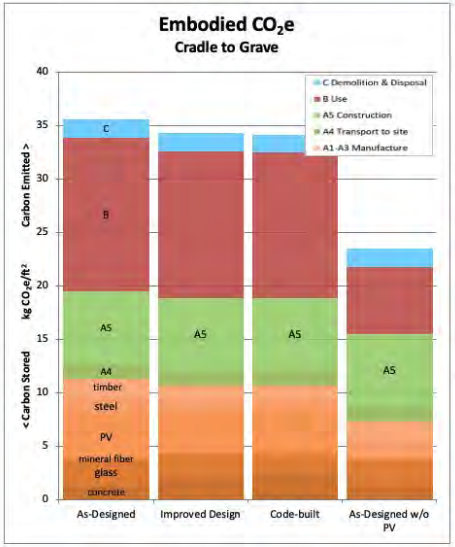
Building:
Street:
Postcode/City:
Province/Country:
Building type:

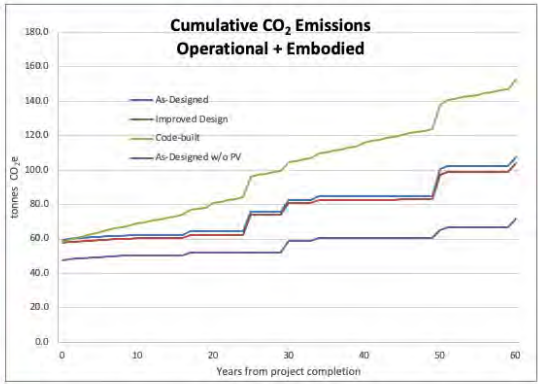
The Passive House Network

PHN Embodied Carbon Assessment

Year of construction:	2022
No. of dwelling units:	1
TFA:	2400
Building Life, yrs	60

For this Certificate Building life must be 60 yrs





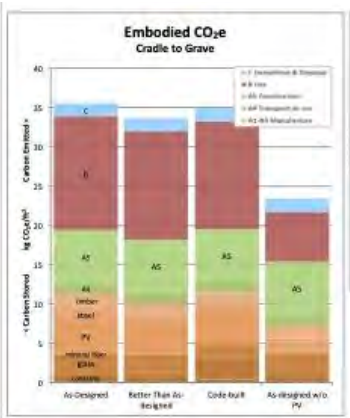
if Operational varies then adjust these cells

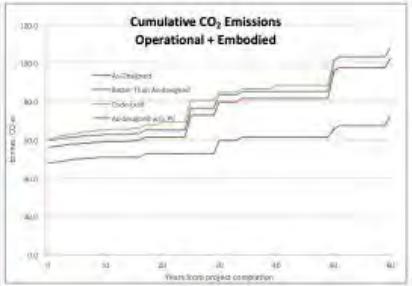
Operational CO_2	Scen 1	Scen 2	Scen 3	Scen 4
Heating Demandl kBTU/(ft^2yr)	0.9	0.9	1.2	0.9
Final Energy kBTU/(ft^2yr) (excl PV)	8.1	8.1	10.0	8.1
metric tonnes CO_2e (incl PV if any)	3.1	3.1	52.4	3.1
US tons CO_2e (incl PV if any)	3.5	3.5	57.8	3.5
kgCO2e/ft^2 (incl PV if any)	1.1	1.1	17.8	1.1

Embodied CO_2	Scen 1	Scen 2	Scen 3	Scen 4
metric tonnes CO_2e	104.4	100.7	100.3	68.8
US tons CO_2e	115.1	111.0	110.5	75.9
kgCO2e/ft^2	35.5	34.3	34.1	23.4

RIBA (UK) Embodied CO_2 targets 2030

New Build Offices	70 kgCO_2e/ft^2
New Build Schools	50 kgCO_2e/ft^2
domestic/residential	58 kgCO_2e/ft^2





if Operational varies then adjust these cells

Operational CO_2	Scen 1	Scen 2	Scen 3	Scen 4
Heating Demandl kBTU/(ft^2yr)	0.9	0.9	0.9	0.9
Final Energy kBTU/(ft^2yr) (excl PV)	8.1	8.1	8.1	8.1
metric tonnes CO_2e (incl PV if any)	3.6	3.6	6.1	3.6
US tons CO_2e (incl PV if any)	4.0	4.0	6.7	4.0
kgCO2e/ft^2 (incl PV if any)	1.2	1.2	2.1	1.2

Embodied CO_2	Scen 1	Scen 2	Scen 3	Scen 4
metric tonnes CO_2e	104.4	99.0	102.4	68.8
US tons CO_2e	115.1	109.1	112.8	75.9
kgCO2e/ft^2	35.5	33.7	34.8	23.4

RIBA (UK) Embodied CO_2 targets 2030

New Build Offices	70 kgCO_2e/ft^2
New Build Schools	50 kgCO_2e/ft^2
domestic/residential	58 kgCO_2e/ft^2

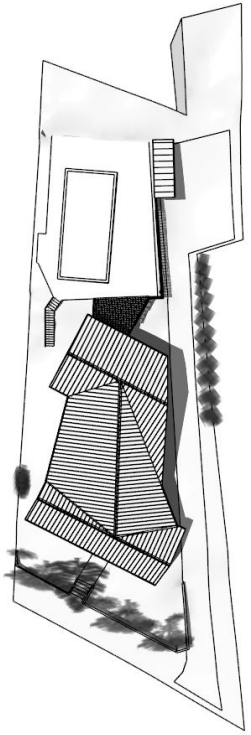
More Info: https://**passivehouseaccelerator.com**/articles/pebble-beach-passive

ORCHARD HAUS

[Sebastopol]

VROOM HAUS

[Redwood City]



STRETCHING

[EXPLORING MULTIFAMILY]

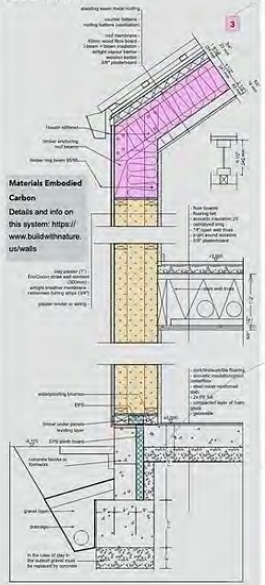
Puentes Visalia is a story

of building connections: for migrant farmworkers to transition to stable, permanent housing; for the site to reconnect to both its oak chaparral past and more recent agricultural land use; and for our design team to explore the challenges of unifying multiple disciplines and systems in order to develop a truly sustainable ecosystem. We chose Puentes - bridges - as a literal and metaphorical design motif.

The literal connectors at Puentes Visalia are easily spotted: short walkways at outside decks connect buildings and neighbors; footpath bridges cross small bio-swales that connect to the rapidly depleting aquifer beneath this site; and on-site bike-share docking station and a bus stop connect our site to local transit and the larger city and region.

Our metaphorical bridges focus on the energy and emissions brief of this competition. We explored an energy model not included in the resources list. We did this to see if alternate models and frameworks could better connect design professionals and building owners to the outcomes of their efforts. We designed our buildings to optimize efficiency first by setting the international Passive House Standard as our design target. We chose to go beyond the energy targets set by the Passive House Standard and chose prefabricated straw wall panels as our building system, to enable Puentes Visalia to extend its reach to a zero carbon materials future.

Assemblies



Materials Embedded Carbon

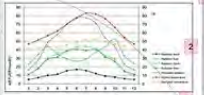
Details and info on this system: https://www.buildwithnature.us/walls

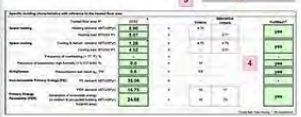
Our Energy Journey STARTED HERE:

1. We started by importing our building 3D model into DesignPH : the Passive House plugin for SketchUp.
2. We used climate data for Fresno as the closest major city with existing PHPP climate data.

Hourly vs Monthly Data Discussion

We include these graphs to meet the brief of this competition however, the Passive House Planning Package (PHPP) model - which has proven extremely accurate - uses monthly analysis, rather than hourly. PHPP's intent is to predict building performance and not grid impact. To comply with the brief's requirement, we've taken our total electric demands and averaged them across all hours of the day with PV generation averaged across 6 hours of the day. This is why our graphs are flat and don't reflect hourly simulation. We've found monthly data more useful to help design professionals to understand and connect to the performance of their buildings.

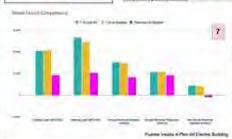




3 & 4. Once we'd input our assemblies, our heating and cooling load charts told us to pay close attention to cooling demands.

5. **This graph helped us connect our building design decisions to our energy model outputs.** Its also is where energy balancing got interesting: the slab connection to ground increased the heat load somewhat, but provided beneficial cooling.

6. Once code minimum PV was added, we easily offset the total electric demands.



7. Comparisons: we graphed outputs for the same building from Title-24's Energy Pro software & PHPP to see how they stacked up. We included outputs for a prescriptive T-24 model of our building. Results showed Energy Pro significantly overestimates both cooling and heating loads compared to PHPP. Energy production outputs were similar, but net annual electrical demand outputs from PHPP showed our design to be a net negative emissions building.

Para Llegar: until we are able to measure the real demand from this design against these predictive models, we will not know if we have made meaningful design decisions. We must bridge that gap.

Mechanical Systems

We selected readily available all-electric HVAC systems located and installed to optimized access from outside the building.

Hot Water: 80g Rheem Pro Terra Hybrid Electric - https://www.rheem.com/product/professional-prestige-proterra-hybrid-electric-water-heater-propt-60-2-rh375-15

Air Conditioning: Ephoca HPAC 2.0 - https://innova-usa.com/wp-content/uploads/2020/01/Brochure.pdf

Ventilation: Zehnder ComfoAir 200 - https://zehnderamerica.com/wp-content/uploads/2014/02/Specifications-CA-200.pdf

1 - Bed (501sf)

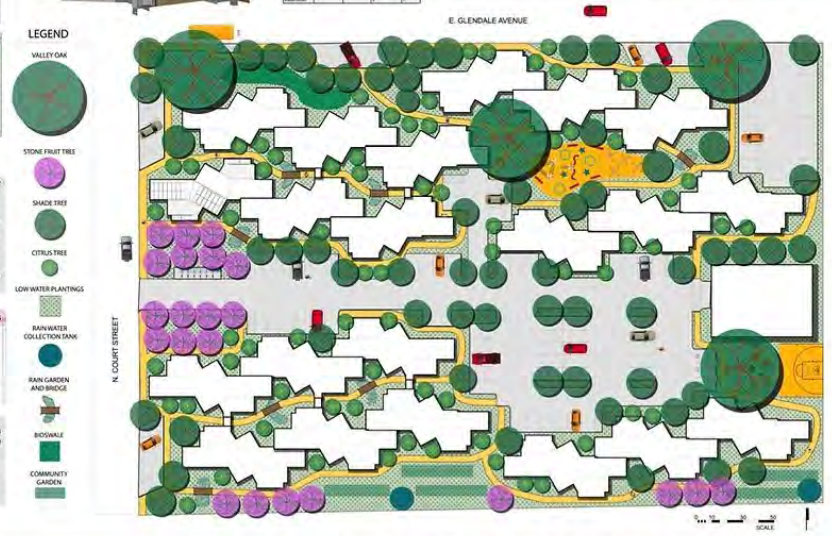
2 - Bed Plan (633sf)

3 - Bed Plan (769 sf)

Roof Plan

Generation & Storage

Our energy model assumes 11 - 360W PV panels. Our roof design shows room for 16 + 12 = 28 PV panels. Our model shows are are already a PLUS energy producer with only 11 (medium efficiency) PV panels. This means Puente Visalia could EASILY become a local community power plant, especially if battery storage capacity was added.



PUENTES VISALIA

ARCHITECTURE AT ZERO 2021

NARRATIVE

IT'S NOT OFTEN THAT ZONING TAKES A HIKE, SO WE'VE TAKEN FULL ADVANTAGE. WE'RE CELEBRATING FEATURES TYPICALLY PROHIBITED UPON BY PLANNERS AND FEARED BY CLIENTS: CURVES, ANGLES, SIMPLE SHAPES AND ORGANIC ROOFLINES.

WE DREW INSPIRATION FROM SACRAMENTO'S TREE-LINED STREETS, WITH THEIR UNEVEN, UNDULATING TREELINES, WHICH WE MIRRORED IN OUR ROOFLINES. WE SET A NUMBER OF VARIATIONS OF OUR BUILDING ALONG A ROW OF TYPICAL SINGLE FAMILY HOMES, TO DEMONSTRATE HOW THIS FOLLOWS THE NATURAL RISE AND FALL OF THE STREET TREES. WE THINK OUR THREE-STORY DESIGNS FIT BEAUTIFULLY INTO THIS NEIGHBORHOOD.

INSIDE OUR CURVED WALLS AND ROOFLINES, WE CRAFTED FIVE ELEGANT APARTMENTS OF VARYING SIZES: TWO (2) SINGLE - BEDROOM FLATS, TWO (2) TWO-BEDROOM FLATS, SIT BELOW A LUXURIOUS THREE-BEDROOM APARTMENT ON THE UPPER FLOOR. EACH FLOOR HAS 9-/9" CEILINGS, MAKING ALL THESE SPACES FEEL GRAND AND ROOMY.

WE PURPOSELY ELIMINATED CARS FROM OUR DESIGNS IN FAVOR OF BIKE STORAGE SHEDS AT THE REAR OF THESE BUILDINGS. WE DID INCLUDE ONE OPTION WITH A BIKE GARAGE UP FRONT, WHICH COULD SQUEEZE IN A SMART-CAR, IF REQUIRED. WE PREFER TO KEEP CARS OUTSIDE BUILDINGS SINCE, THEY ARE ALREADY DESIGNED TO FEND FOR THEMSELVES.

LASTLY, WE INCLUDED ONE BUILDING WITH ONLY TWO STOREYS, TO SHOW HOW EASY IT IS TO FIT FOUR UNITS IN THE SAME SPACE AS THE OTHER SINGLE FAMILY HOMES ON THIS STREET. WE WANT CALIFORNIANS TO SEE THAT THERE IS PLENTY ROOM FOR MORE AND THESE SPACES CAN BE LOVELY, LARGE AND LUXURIOUS!

PASSIVE HOUSE DESIGN FEATURES

FORM FACTOR: This design maintains a simple shape to enable easy detailing for both insulation and air-sealing. The shape allows for walls to be expanded, as needed, depending on what is needed for local climate adaptation.

SUPER WINDOWS: Punched openings keep the window and door package both cost-effective and easy to shade. Light walls allow for cross-ventilation and light access. The offset spacing of each building maintains privacy while providing shade for the neighboring building. Juliette balconies on the front and rear facades allow for more expansive views.

HEAT RECOVERY VENTILATION: Each floor has a mechanical room to accommodate an energy or heat recovery ventilation system for each apartment on the floor. These are essential for Passive House as they deliver a steady flow of filtered, fresh air to each room, ensuring that the Passive House comfort and hygiene criteria are met.

SUPER INSULATED: These units are designed with exterior insulation outside the framing to create an extra thermal blanket over this building. The roof and floors are also well insulated to ensure these apartments will maintain an even temperature all year long.

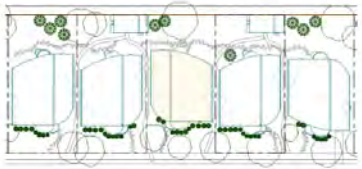
THERMAL BRIDGES: By keeping the shapes of these buildings relatively simple, we've reduced the chances of thermal bridging that could disrupt our great insulation and air-sealing benefits.

SITE PLAN & 1ST FLOOR
Scale: 1/8" = 1'-0"

2ND FLOOR PLAN
Scale: 1/8" = 1'-0"

3RD FLOOR PLAN
Scale: 1/8" = 1'-0"

SECTION VIEW
Scale: 1/8" = 1'-0"

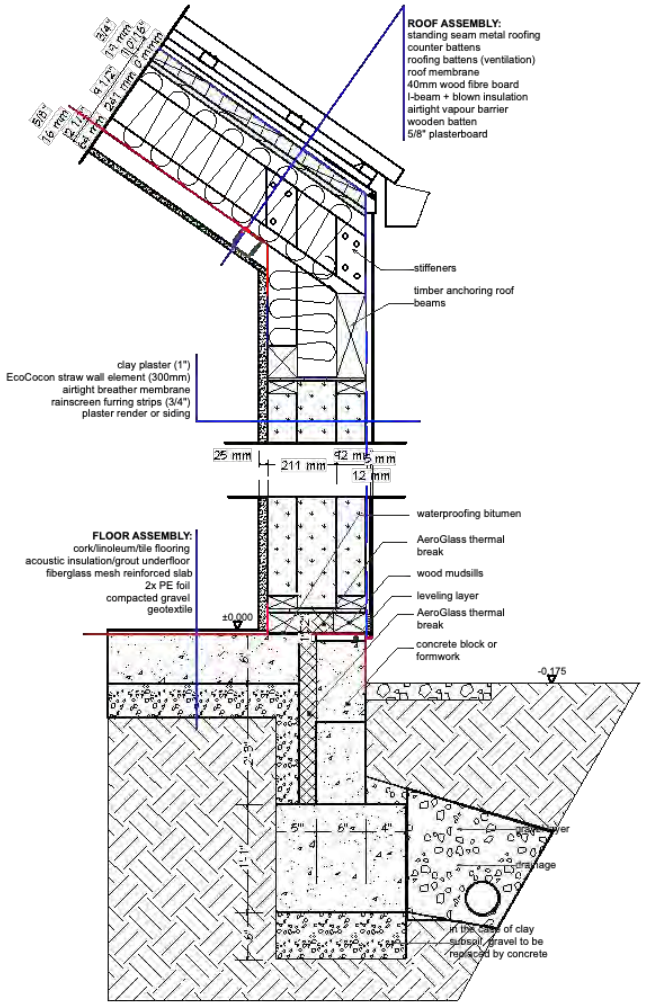


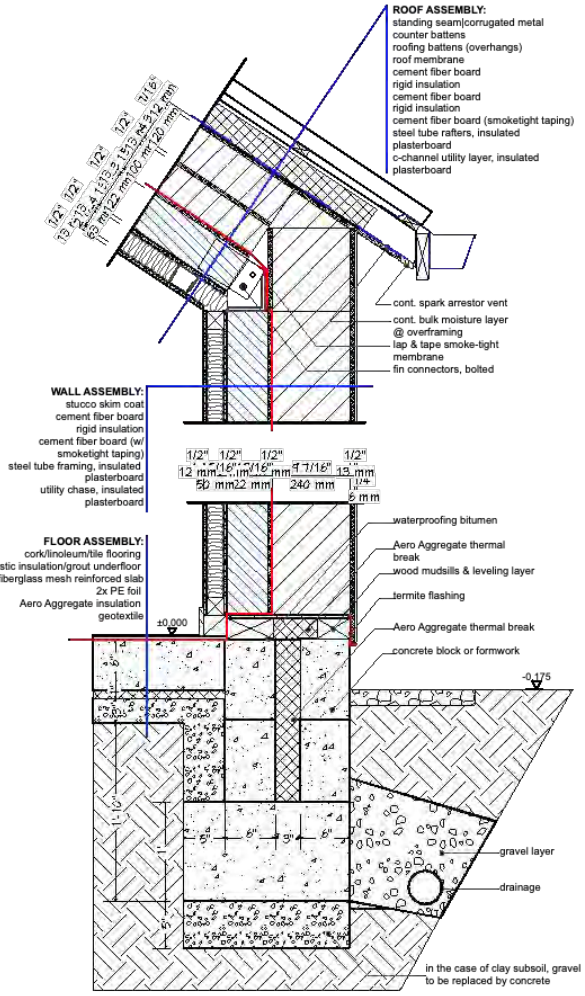
STREET PLAN

STREET RENDERING

ZONING HOLIDAY | TREELINES

Prefab


ROOF ASSEMBLY:
standing seam metal roofing
counter battens
roofing battens (ventilation)
roof membrane
40mm wood fibre board
I-beam + blown insulation
airtight vapour barrier
wooden batten
5/8" plasterboard
stiffeners
timber anchoring roof beams
clay plaster (1")
EcoCocon straw wall element (300mm)
airtight breather membrane
rainscreen furring strips (3/4")
plaster render or siding
25 mm
211 mm
42 mm
15 mm
12 mm
waterproofing bitumen
AeroGlass thermal break
wood mudsills
leveling layer
AeroGlass thermal break
concrete block or formwork
FLOOR ASSEMBLY:
cork/linoleum/tile flooring
acoustic insulation/grout underfloor
fiberglass mesh reinforced slab
2x PE foil
compacted gravel
geotextile
±0.000
-0.175
drainage
in the case of clay subsoil, gravel to be replaced by concrete


ROOF ASSEMBLY:
standing seam|corrugated metal
counter battens
roofing battens (overhangs)
roof membrane
cement fiber board
rigid insulation
cement fiber board
rigid insulation
cement fiber board (smoketight taping)
steel tube rafters, insulated
plasterboard
c-channel utility layer, insulated
plasterboard
cont. spark arrestor vent
cont. bulk moisture layer @ overframing
lap & tape smoke-tight membrane
fin connectors, bolted
WALL ASSEMBLY:
stucco skim coat
cement fiber board
rigid insulation
cement fiber board (w/ smoketight taping)
steel tube framing, insulated
plasterboard
utility chase, insulated
plasterboard
1/2"
12 mm
50 mm
22 mm
240 mm
15 mm
6 mm
waterproofing bitumen
Aero Aggregate thermal break
wood mudsills & leveling layer
termite flashing
Aero Aggregate thermal break
concrete block or formwork
FLOOR ASSEMBLY:
cork/linoleum/tile flooring
acoustic insulation/grout underfloor
fiberglass mesh reinforced slab
2x PE foil
Aero Aggregate insulation
geotextile
±0.000
-0.175
gravel layer
drainage
in the case of clay subsoil, gravel to be replaced by concrete

BEYOND THE BAY

[OUTSIDE THE COMFORT ZONE]

Sacramento Redux

AU RESIDENCE

[Colorado Springs]
With Hyperlocal Workshop

DECK HAUS

[CLOVIS]

PRACTICING PASSIVE

[DEFINING MY OWN STANDARD OF CARE]

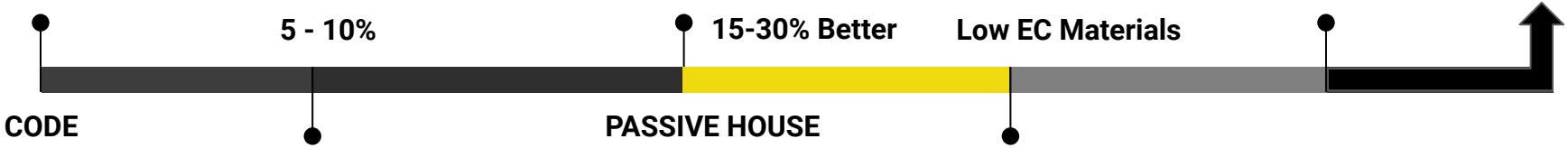
Shifted Baseline

BASELINE

Worst building *legally* allowed

PHBB's BASELINE

The starting point for our practice that sets a minimum target for all projects.



Marginally Better

A wee bit better, but not really good enough to avert a climate disaster

- ❏ Cooler
- ❏ Tighter
- ❏ More resilient

PHribbon

Exploring integrated decarbonization of energy + up front carbon of materials… (the new frontier)

Extended Team

CARMEL BUILDING &DESIGN

A better way to build.

GOODSPACE
HIGH PERFORMANCE BUILDERS

EARTH BOUND HOMES

CERTIFIED PASSIVE HOUSE TRADESPERSON

TRADESPERSON

Manage the Process

Certified PH Consultant/ Designer

designPH

PHPP

PHPP iterations, plus assembly & cost optimization

T-24 & PERMIT

Site testing, verification & documentation

Qualified Contractor

Pre-Construction Services Contract

Materials, assemblies and cost verification

Construction Contract

passive house

SD — DD — CD's — CA

Schematic Design

Concept designs developed and shared with clients to establish a general house shape, location, and design direction

Design Development

Assemblies, room interior layouts, structural systems, exterior finishes and materials selected. Prelim PHPP run to confirm certification viability.

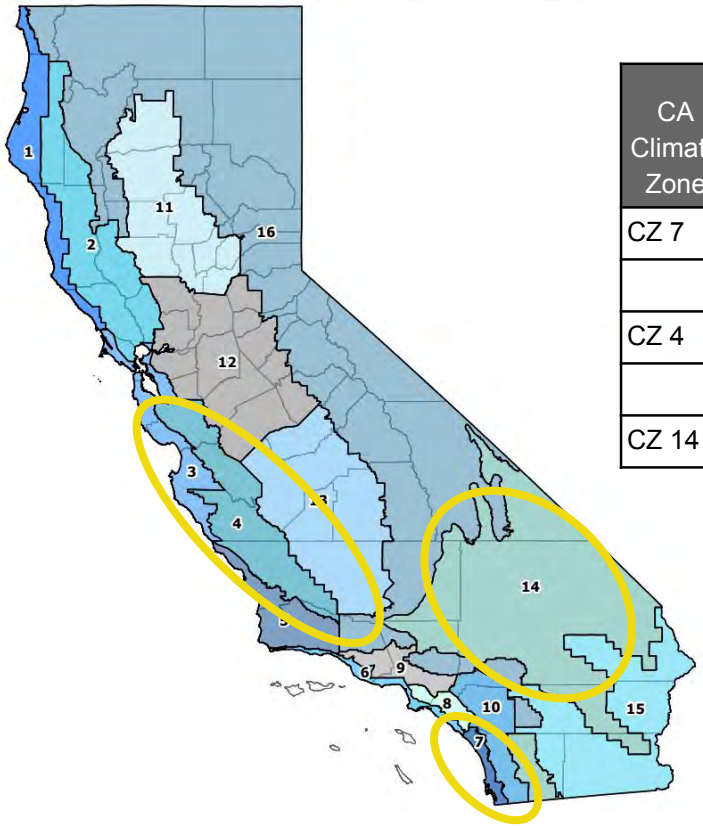
Construction Documents

Building Permit set developed, including full structural engineering and product specs and details.

Construction Admin

Construction oversight and shop drawings review by architect to support clients and contractor.

Passive House vs 2019 Title 24



2020 CA Building Climate Zones Map
Source: https://gis.data.ca.gov/documents/CAEnergy::building-climate-zones/explore

CA Climate Zone	Energy use per kWh				HVAC Energy use (kWh)		
	T24	PHI	% Reduction		T24	PHI	% Reduction
CZ 7	5,364	4,864	9%		3,053	2,553	16%
CZ 4	8,210	6,201	24%		5,899	3,890	34%
CZ 14	9,882	5,125	48%		7,570	2,814	**63%**

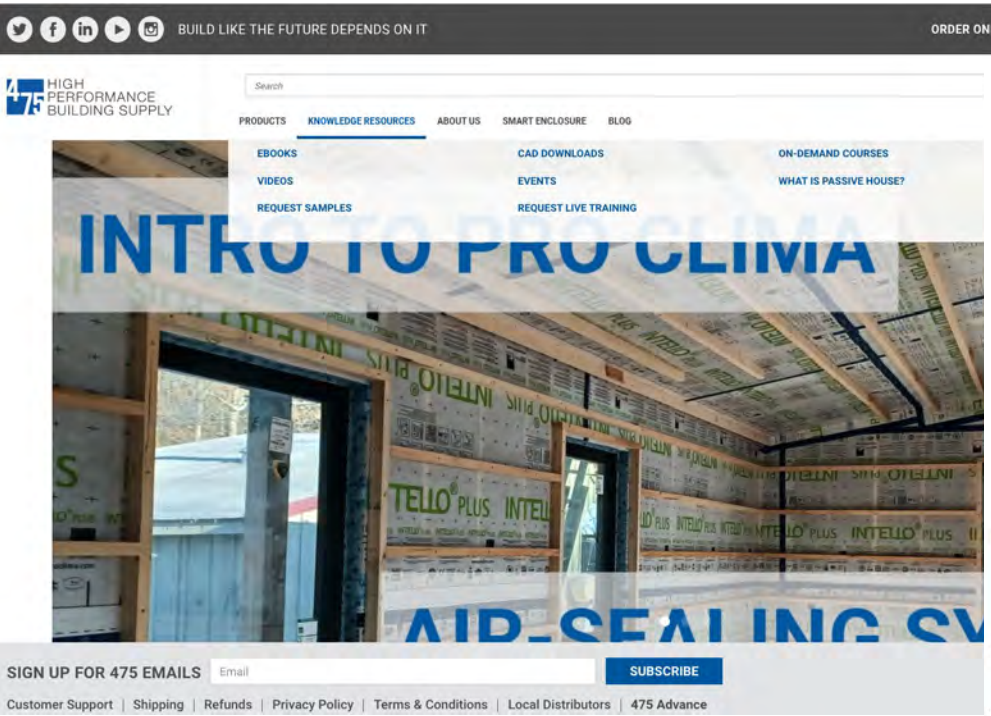
Source: PHN study for CPUC - April 2023

Passive House 'Classic' *still*
CRUSHING heating & cooling loads in California in 2023!

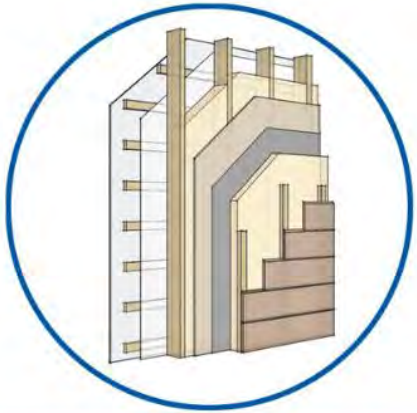
MY FAVE RESOURCES

[Plus a few good orgs]

Excellent Details



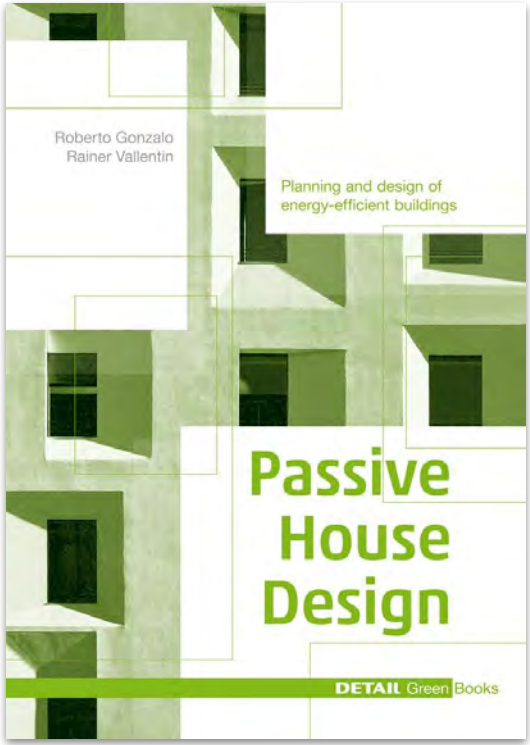
https://foursevenfive.com/smart-enclosure-downloads/



2x FRAMING

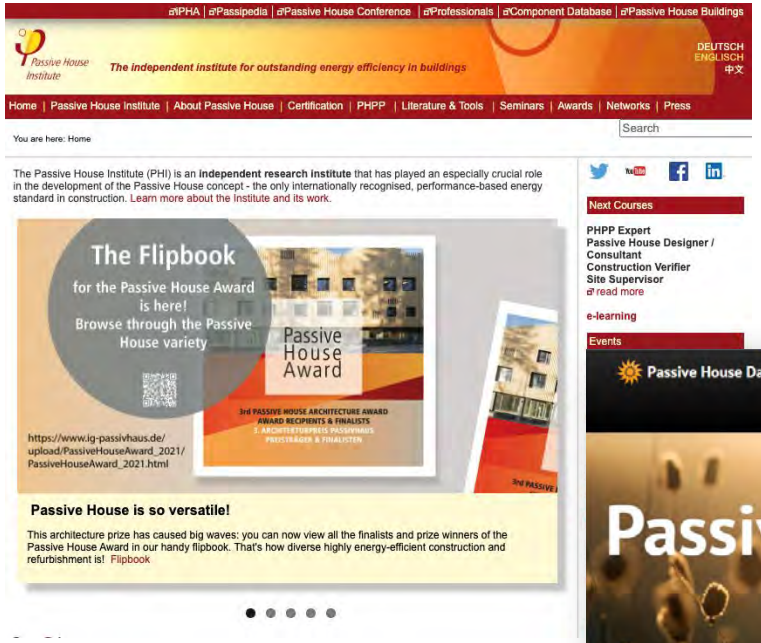
- 2x Framing ebook (PDF - Page Layout)
- 2x Framing ebook (PDF - Spread Layout)
- 2x Framing CAD file (dwg)
- Purchase a printed copy here

Essential Reference Books



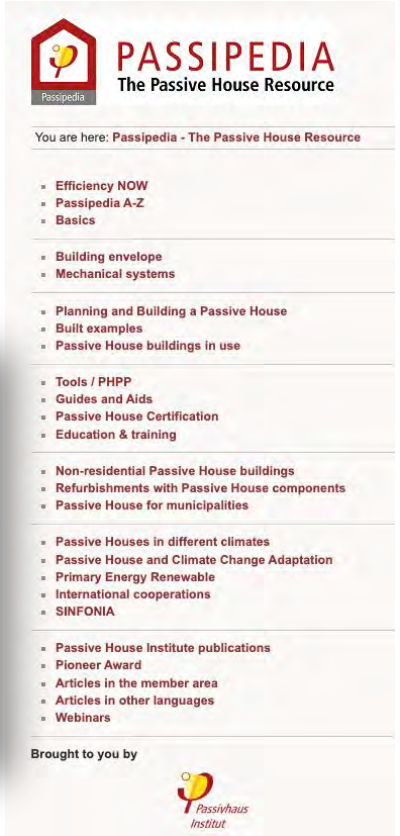
https://www.ibo.at/en/about-us

PASSIVE HOUSE INTERNATIONAL [passivehouse.com]



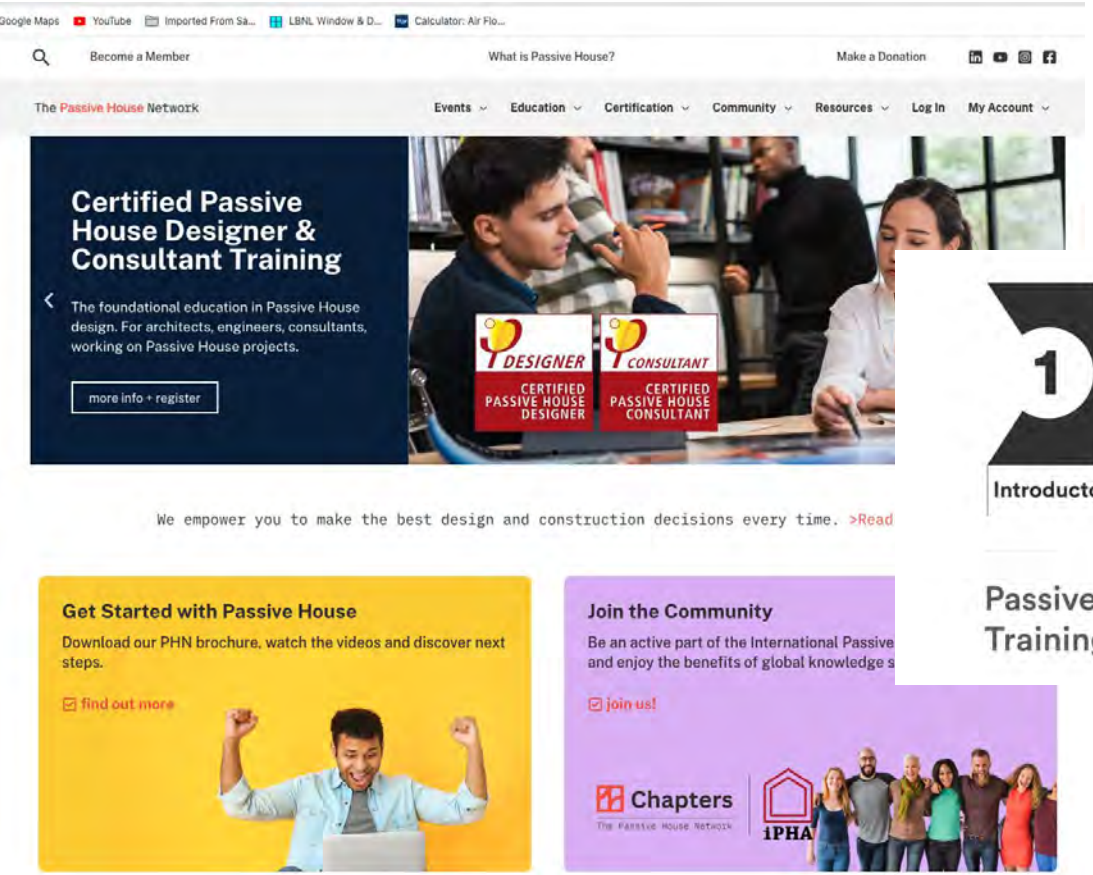
https://passivehouse.com

https://passivehouse-database.org



https://passipedia.org/

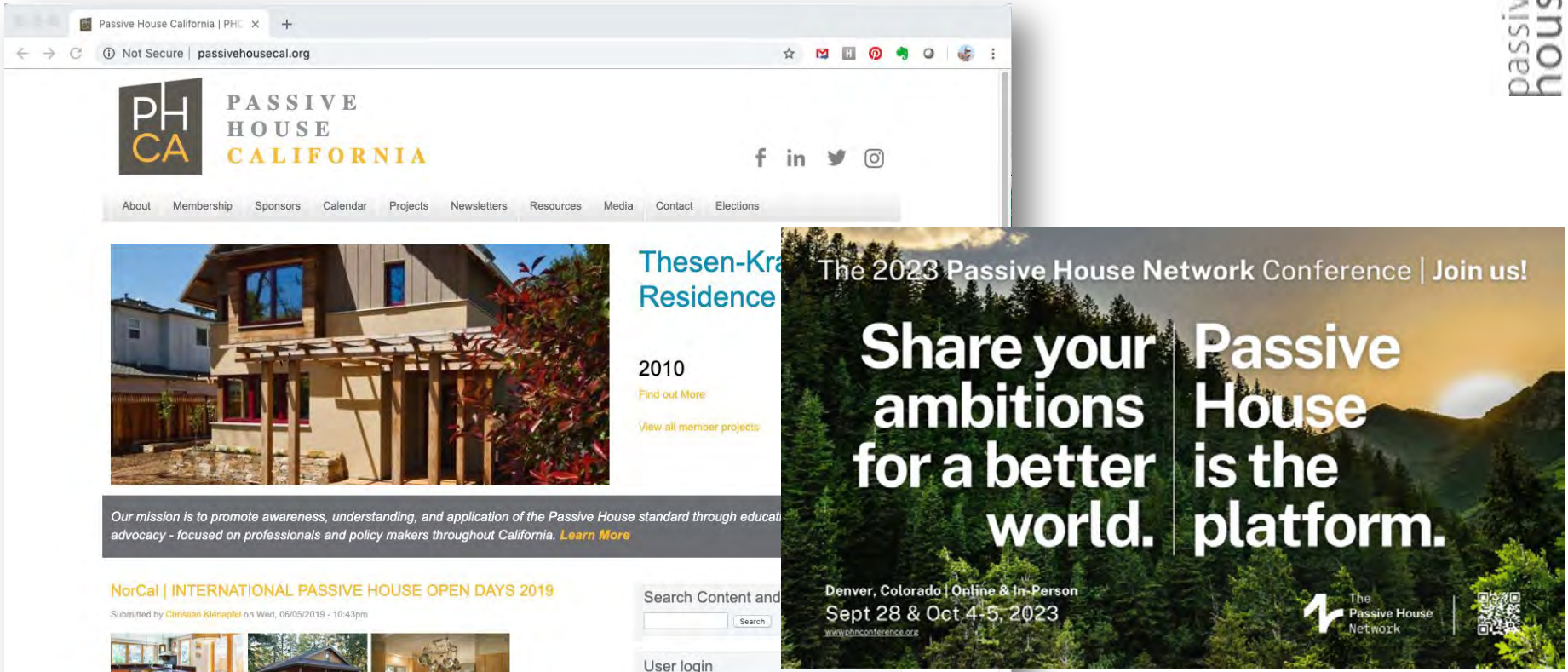
PASSIVE HOUSE NATIONAL [Passive House Network.org]



Passive House Training Pipeline

https://passivehousenetwork.org/designer-training/

PASSIVE HOUSE LOCAL [passivehousecal.org]



Design Connected Buildings!

Bronwyn Barry, RA, CPHD

[THANK YOU]