

Narara Ecovillage
27 August 2022
Andy Marlow

Passive House (passivhaus)

Health
Comfort
Quality



PROMOTE + SUPPORT + RESEARCH

www.passivehouseaustralia.org



AUSTRALIAN
PASSIVE HOUSE
ASSOCIATION





 **Envirotexture**

why

Comfort

- Temperatures
20-25°C
- Humidity control
30-70% RH
- No cold spots
- No hot spots



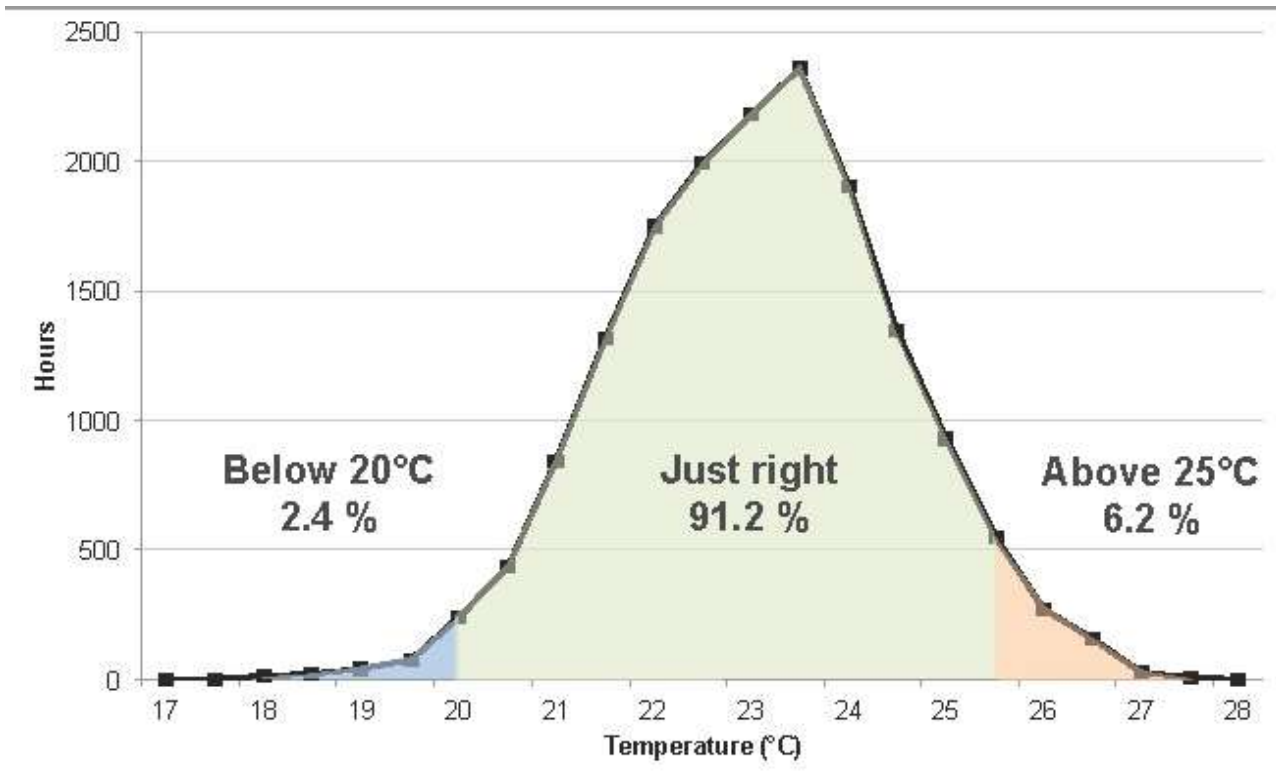
Health

- 100% fresh air, 24/7 (supply to living areas, extract from wet areas)
- No condensation
- No mould

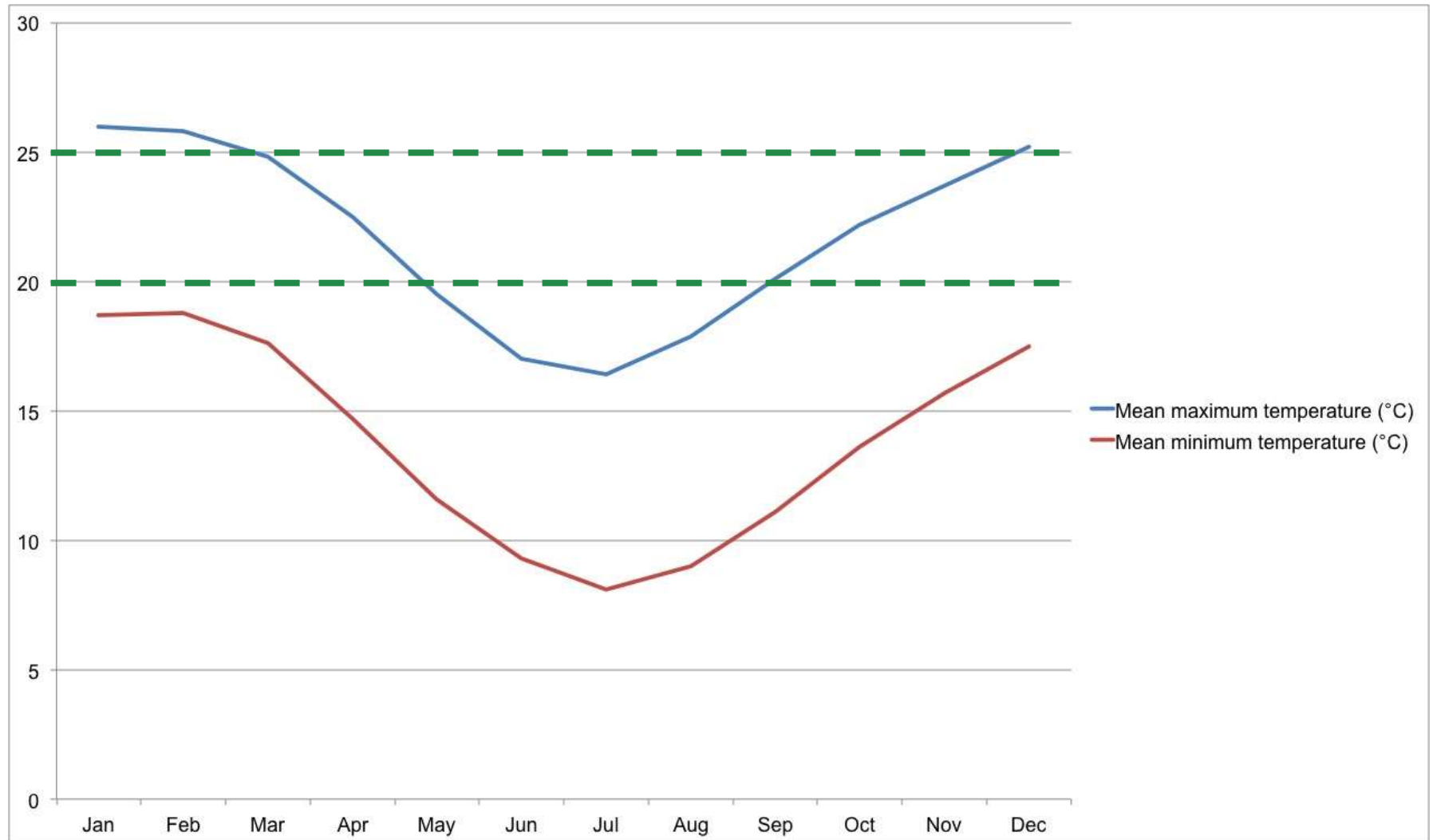


Quality

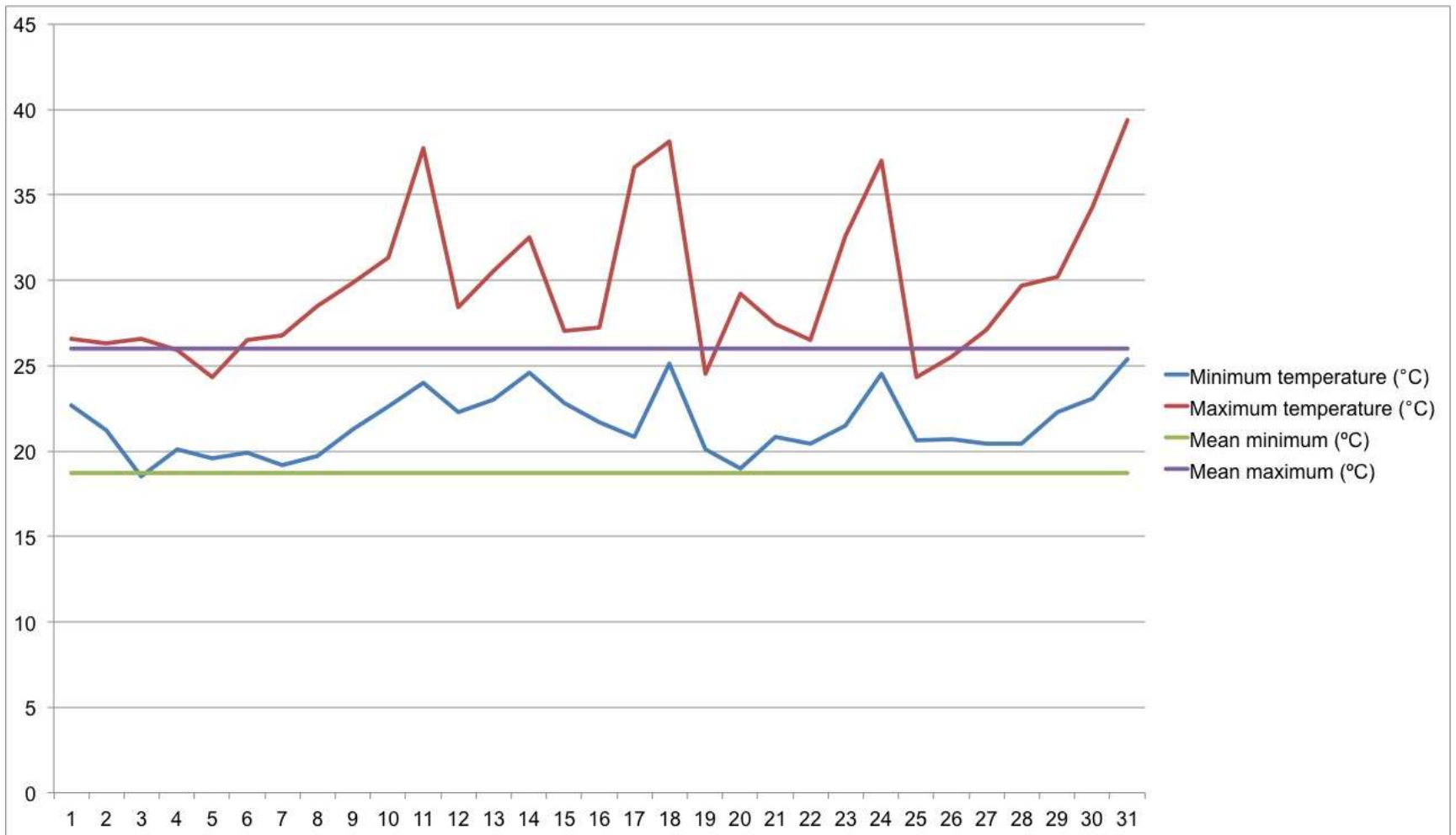
- Canberra
- No cooling installed
- Heating via towel rail



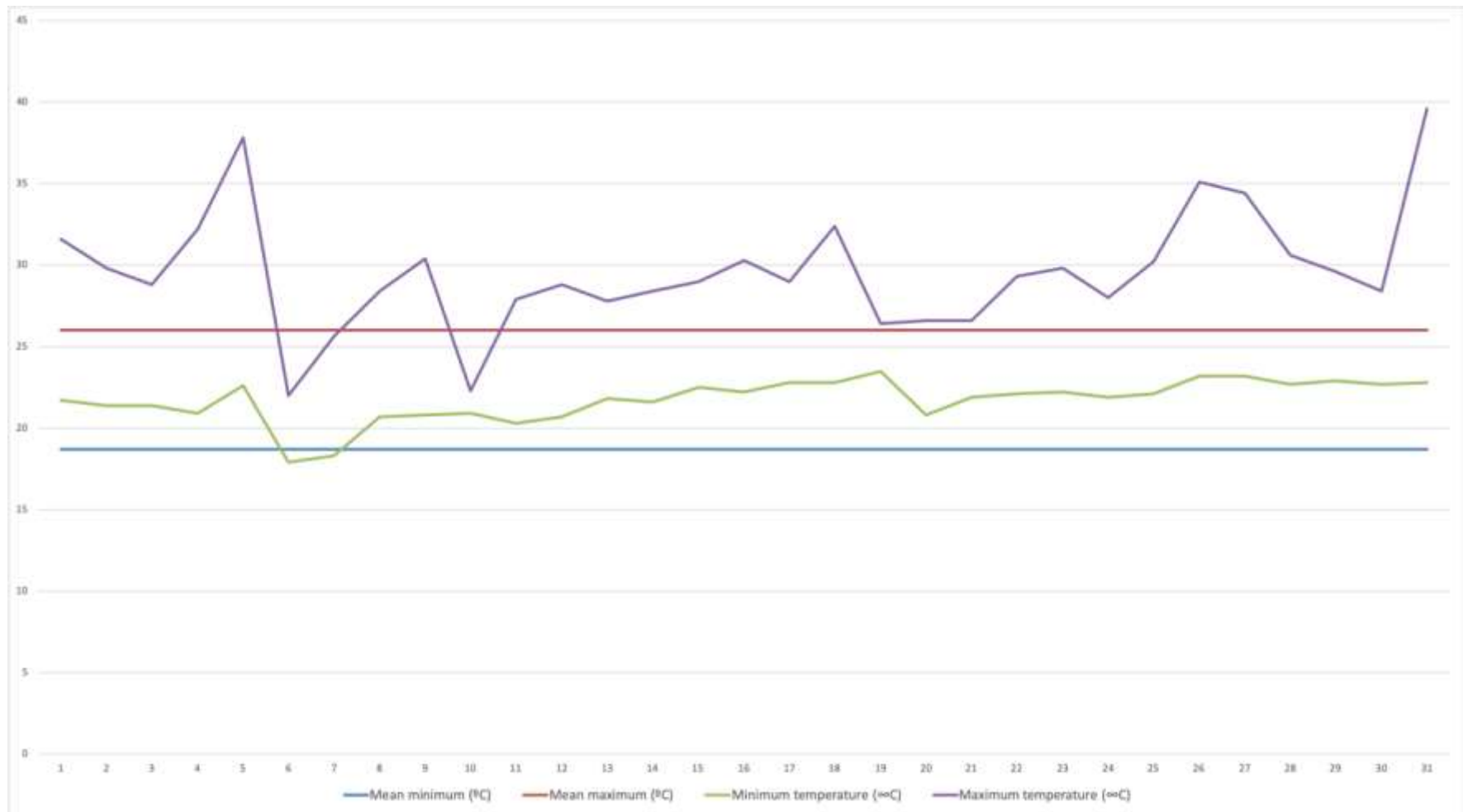
Sydney climate



Sydney January 2017



Sydney January 2019



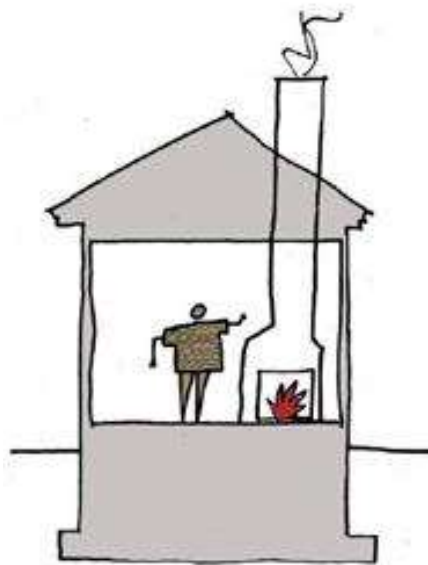
what

A 'FABRIC FIRST' approach

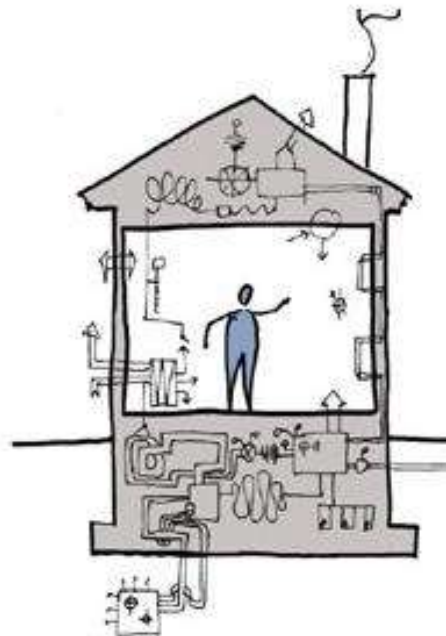
Isolate the indoor climate... ...from the outdoor climate



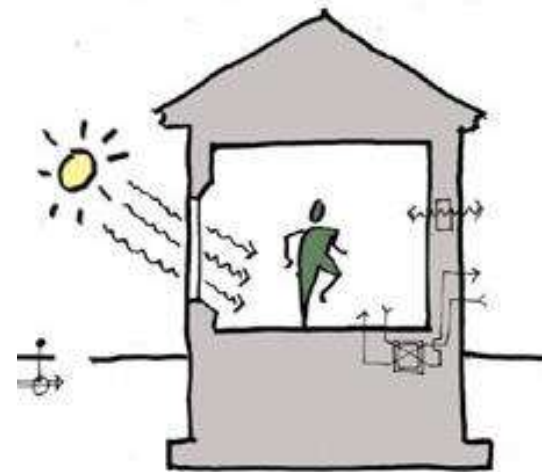
Designed to deliver an optimal indoor, energy efficient environment with minimal input from active systems



19th Century



20th Century



21st Century

image source: Albert, Righter and Tittmann Architects

Haus not House



Certified Passive Houses

60,000 + Certified Passive Houses Completed and
in Development in 34 countries



Passive House in Australia



Gaobeidian, China

Stage 1

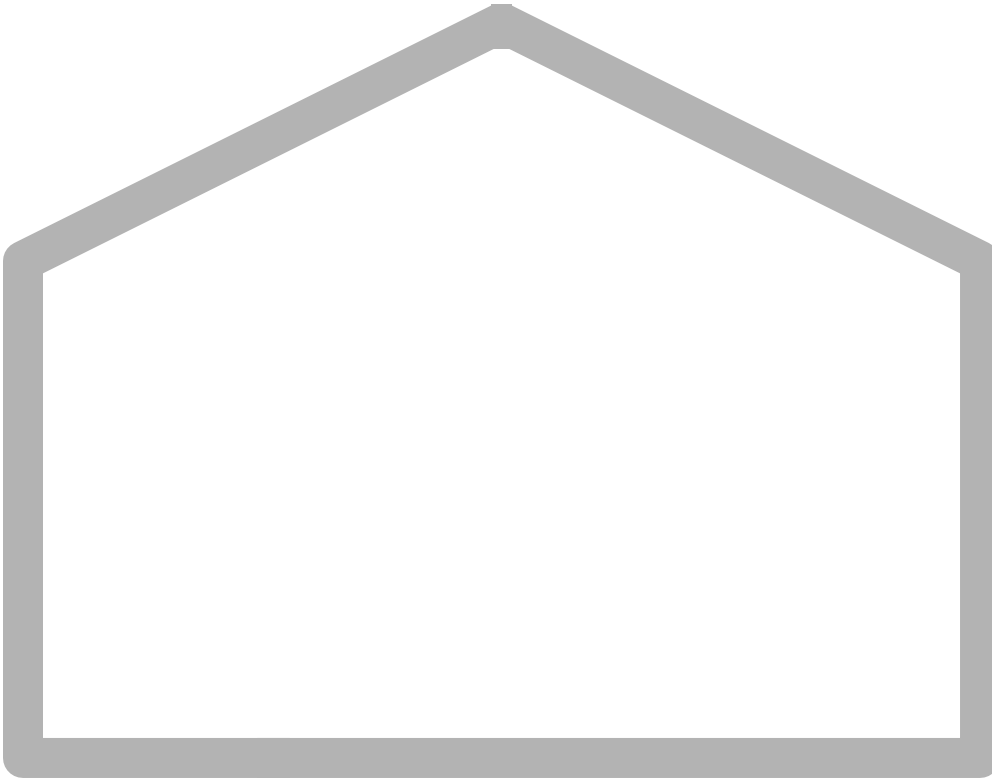
330,000m²



how

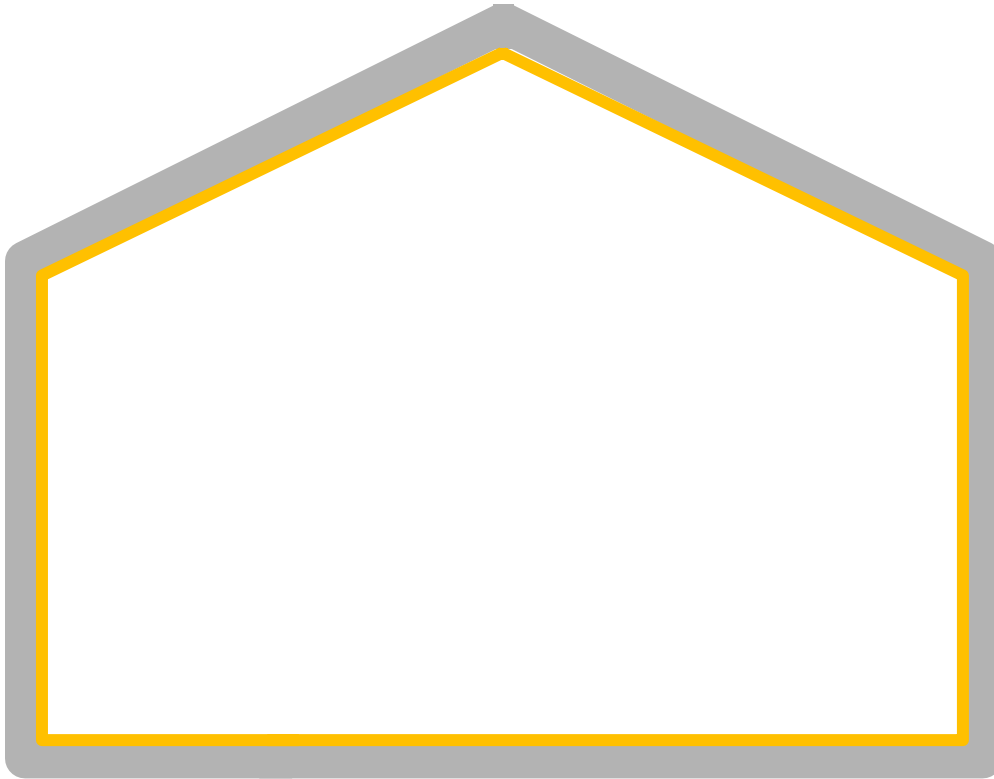
Five key principles

1. Appropriate level of continuous insulation

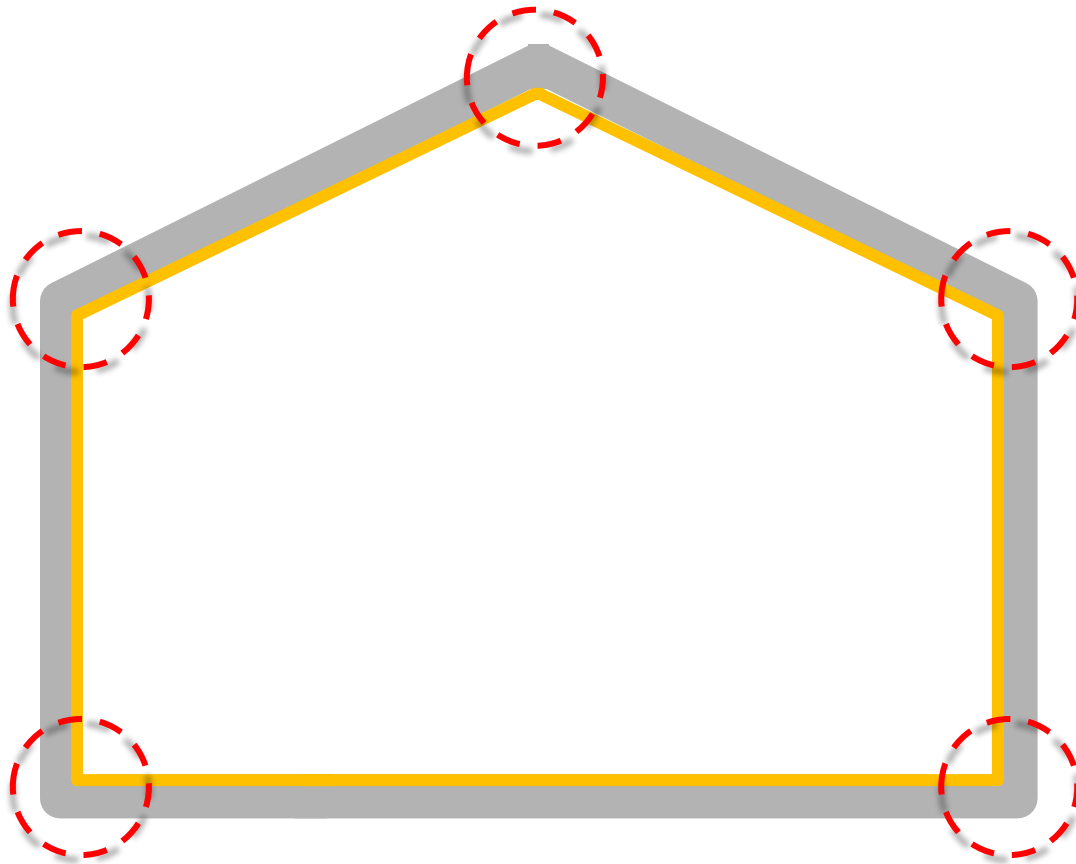


Five key principles

1. Appropriate level of continuous insulation
2. Air tight construction (0.6 ACH50)

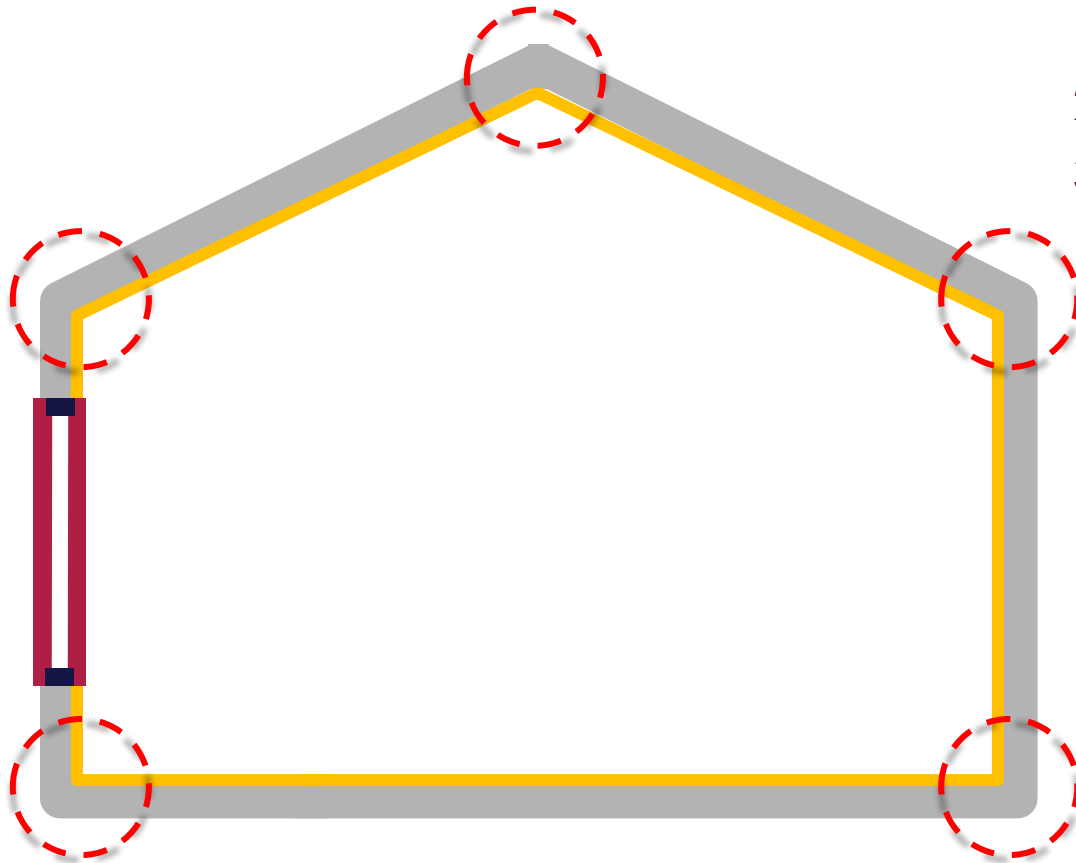


Five key principles



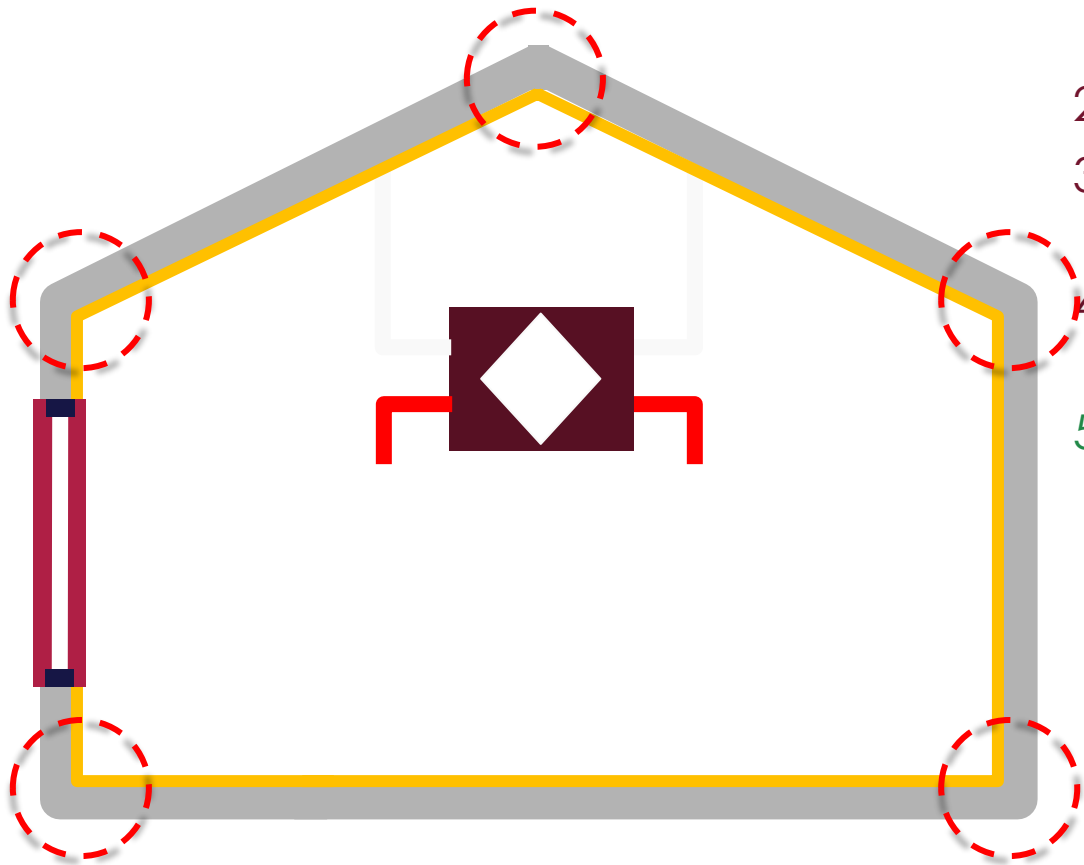
1. Appropriate level of continuous insulation
2. Air tight construction
3. Minimise thermal bridges

Five key principles



1. Appropriate level of continuous insulation
2. Air tight construction
3. Minimise thermal bridges
4. High performance glazing

Five key principles



1. Appropriate level of continuous insulation
2. Air tight construction
3. Minimise thermal bridges
4. High performance glazing
5. Mechanical ventilation with heat recovery

process

Certified Passive House professionals

- Designer & Tradesperson not required for a Certified Passive House
- BUT it helps with credibility
- ~200 Certified Tradespeople in NSW today
- ~200 Certified Designers in NSW today



Design your building



**CERTIFIED
PASSIVE HOUSE
DESIGNER**



PHPP

- You or Certified Designer/Consultant



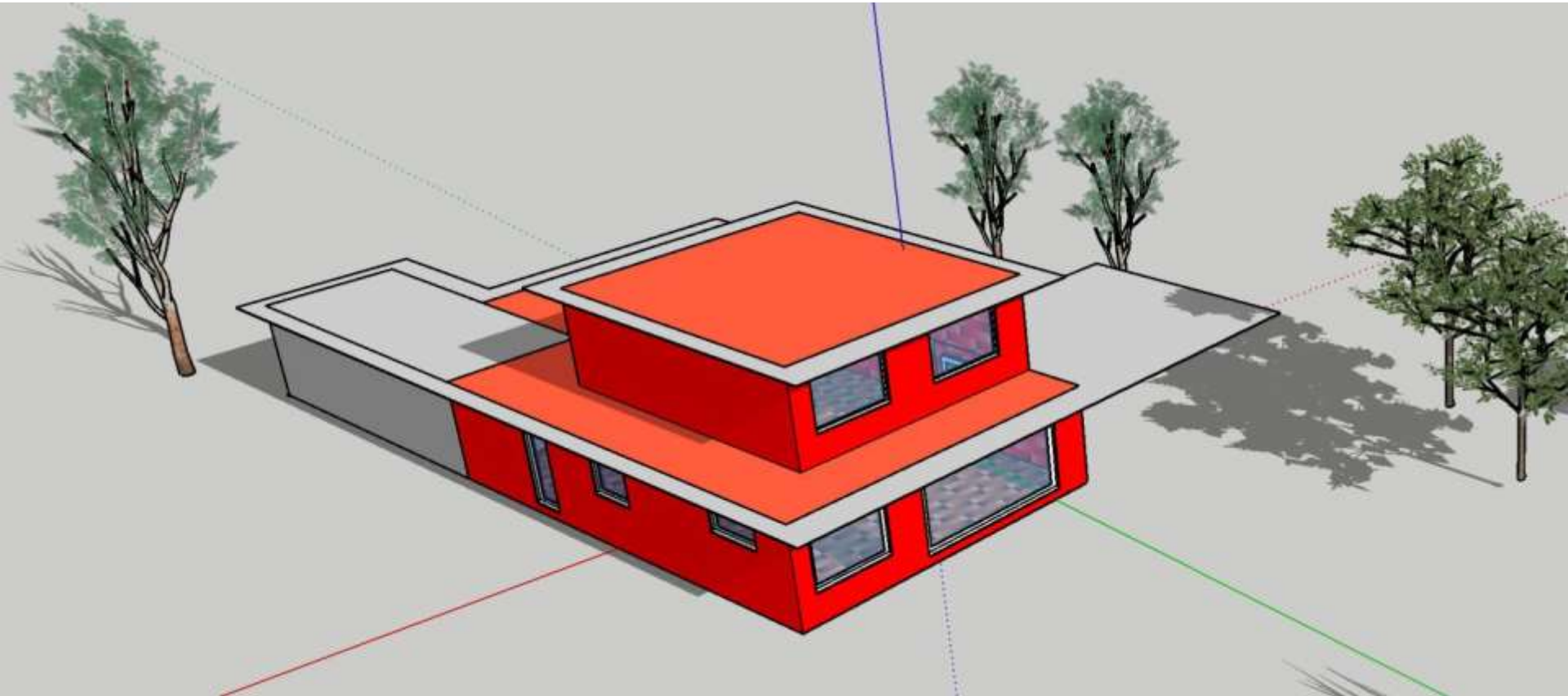
Passive House Verification					
		Building:	49		
		Street:	The Esplanade		
		Postcode/City:	Thornleigh		
		Province/Country:	NSW AU-Australia		
		Building type:	Single Family home		
		Climate data set:	ud---03-AU0010a-Terrey Hills		
		Climate zone:	5: Warm Altitude of location: 165 m		
		Home owner / Client:	Matthew Kosnik & Katherine Wilson		
		Street:	49 The Esplanade		
		Postcode/City:	2120 Thornleigh		
		Province/Country:	NSW AU-Australia		
Architecture: Envirotecture		Mechanical engineer:			
Street: 48 Kalang Road		Street:			
Postcode/City: 2101 Elanora Heights		Postcode/City:			
Province/Country: NSW AU-Australia		Province/Country:			
Energy consultancy: Envirotecture		Certification: Detail Green			
Street: 48 Kalang Road		Street: 18 Fletcher Rd			
Postcode/City: Elanora Heights		Postcode/City: 3747 Beechworth			
Province/Country: NSW AU-Australia		Province/Country: Victoria Australia			
Year of construction:	2019	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	2.4	IHG cooling case [W/m²]:	2.4
No. of occupants:	3.0	Specific capacity [Wh/K per m² TFA]:	72	Mechanical cooling:	x

Specific building characteristics with reference to the treated floor area						
				Criteria	Alternative criteria	Fulfilled? ²
Space heating	Treated floor area m²	179.3				
	Heating demand kWh/(m²a)	4	≤	15	-	yes
	Heating load W/m²	8	≤	-	10	yes
Space cooling	Cooling & dehum. demand kWh/(m²a)	13	≤	17	17	yes
	Cooling load W/m²	15	≤	-	10	yes
	Frequency of overheating (> 25 °C) %	-	≤	-	-	-
	Frequency of excessively high humidity (> 12 g/kg) %	0.00	≤	10	-	yes
Airtightness	Pressurization test result n ₅₀ 1/h	0.4	≤	0.6	-	yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	68	≤	-	-	-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	31	≤	45	31	yes
	Generation of renewable energy (in relation to pro-jected building footprint area) kWh/(m²a)	52	≥	60	39	

² Empty field: Data missing; ∅: No requirement

DesignPH

- You or Certified Designer/Consultant



Pre-Certification check

- You and Certified Designer/Consultant



▸ Dialogue bar

Progress: 3.6 %

- 🟡 1. Passive House Planning Package (PHPP)
- 🟡 2. Planning documents for architecture
- 🟡 3. Standard and connection details
- 🟡 4. Windows/doors
- 🟡 5. Ventilation
- 🟡 6. Heating/ Cooling + Plumbing
- 🟡 7. Electricity
- 🛑 8. Renewable energy
- 🛑 9. Construction phase

Submit

Build

- Builder, maybe certified tradesperson

CERTIFIED
PASSIVE HOUSE
TRADESPERSON



Certify



Certified
Passivhaus

Passivhaus Institut

Video interlude

design

Easier...



Easier...



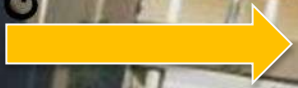
Garden St

Boundary St

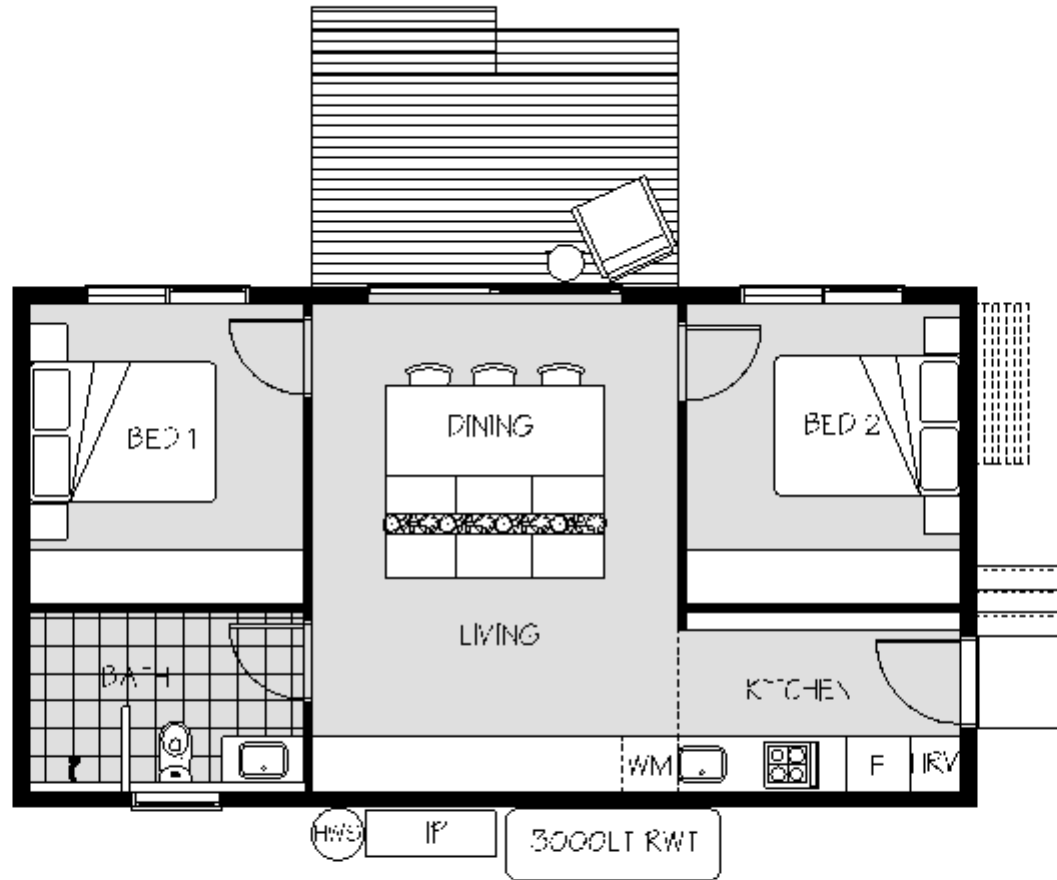
Gibson St

Boundary St

Wyndham St



Easier...



FLOOR PLAN
PASSIVGRANNY

Easier...



Harder...

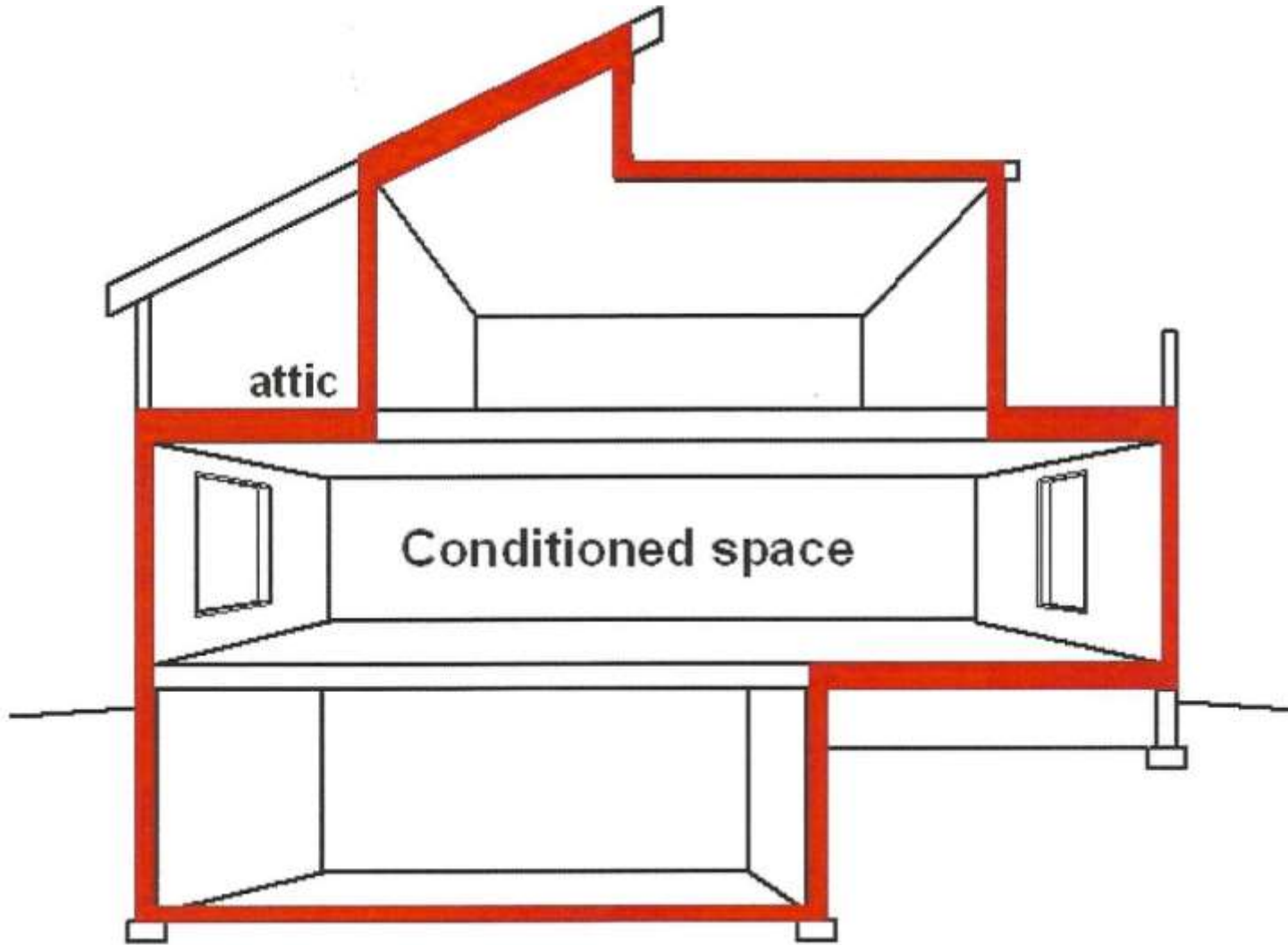
...if you make it...



...or keep it simple

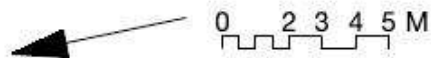
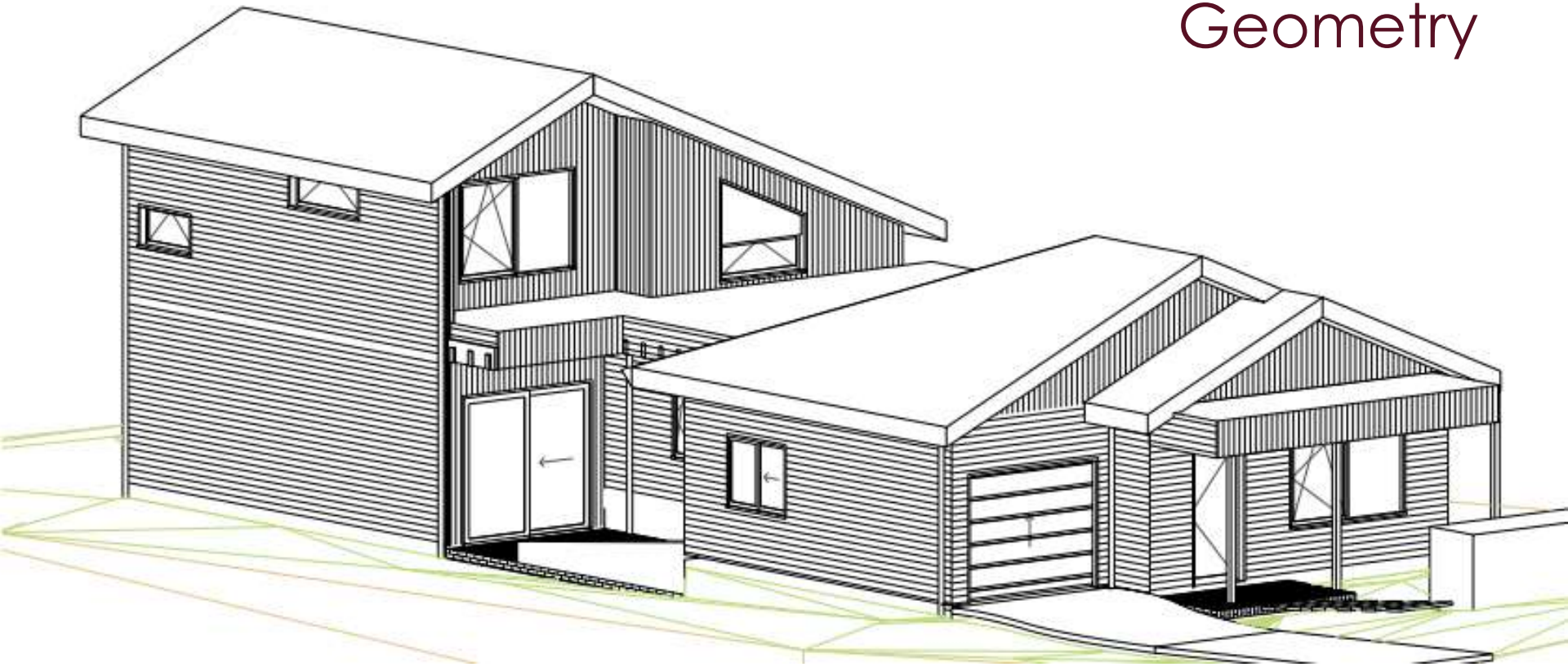


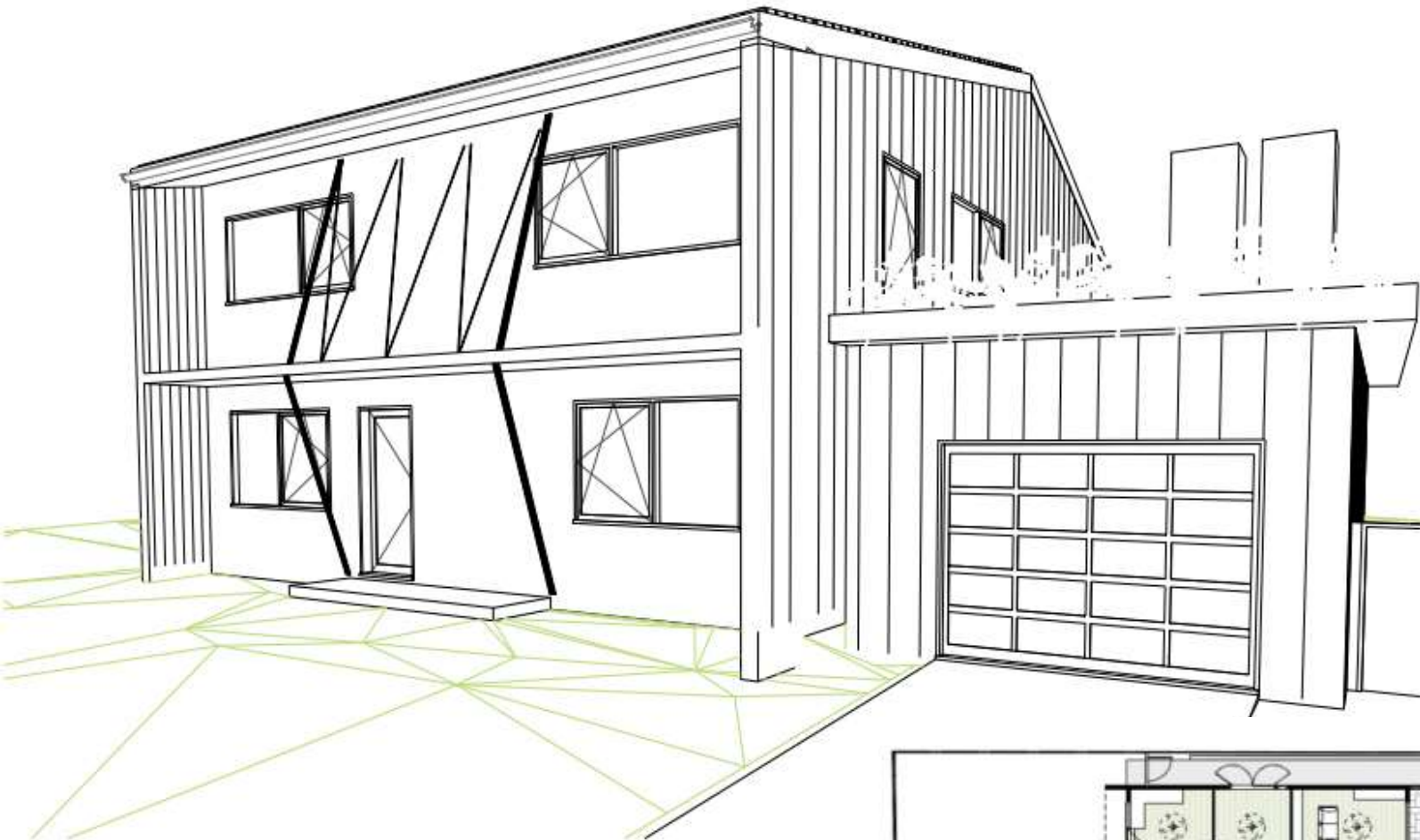
Harder





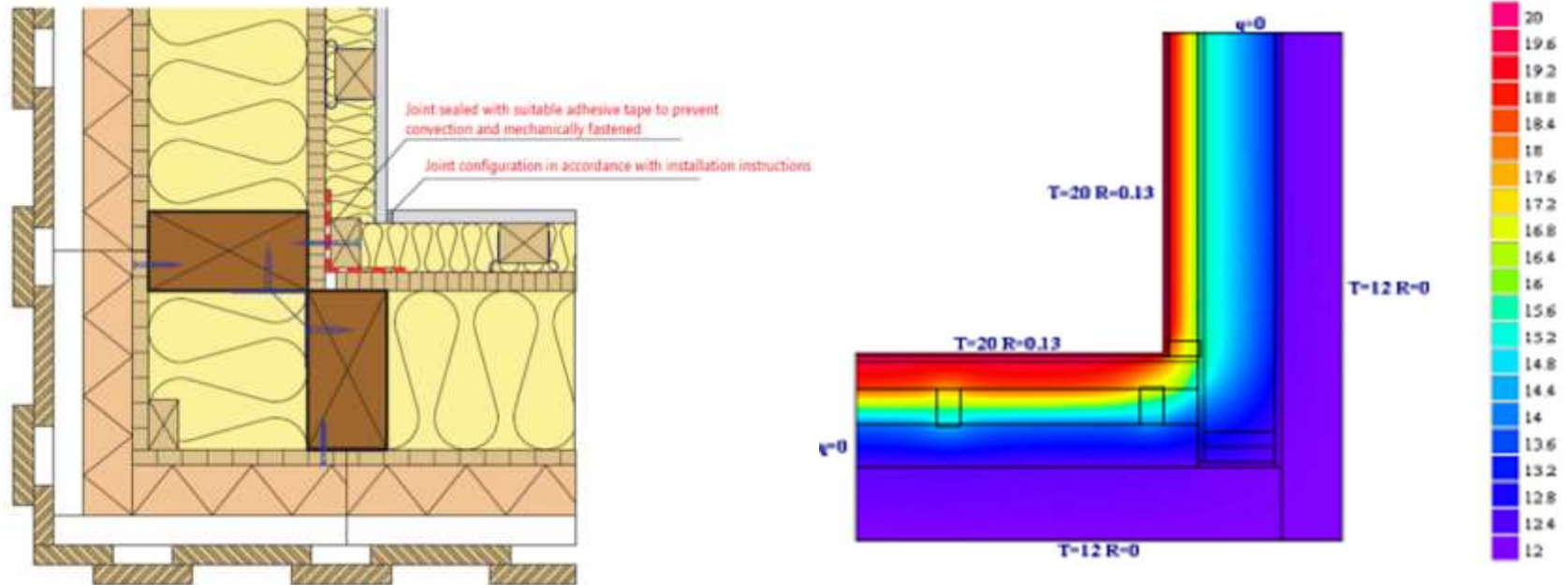
Geometry



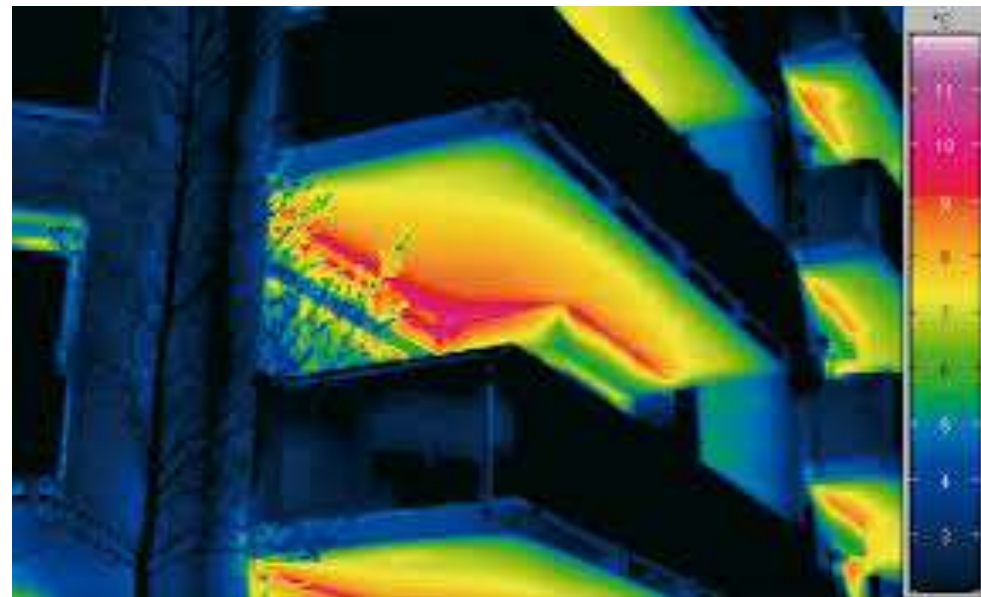
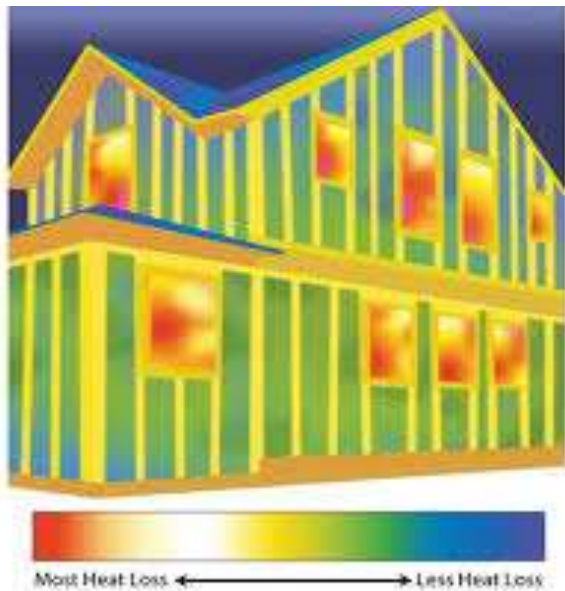


0 2 3 4 5M

Thermal bridges

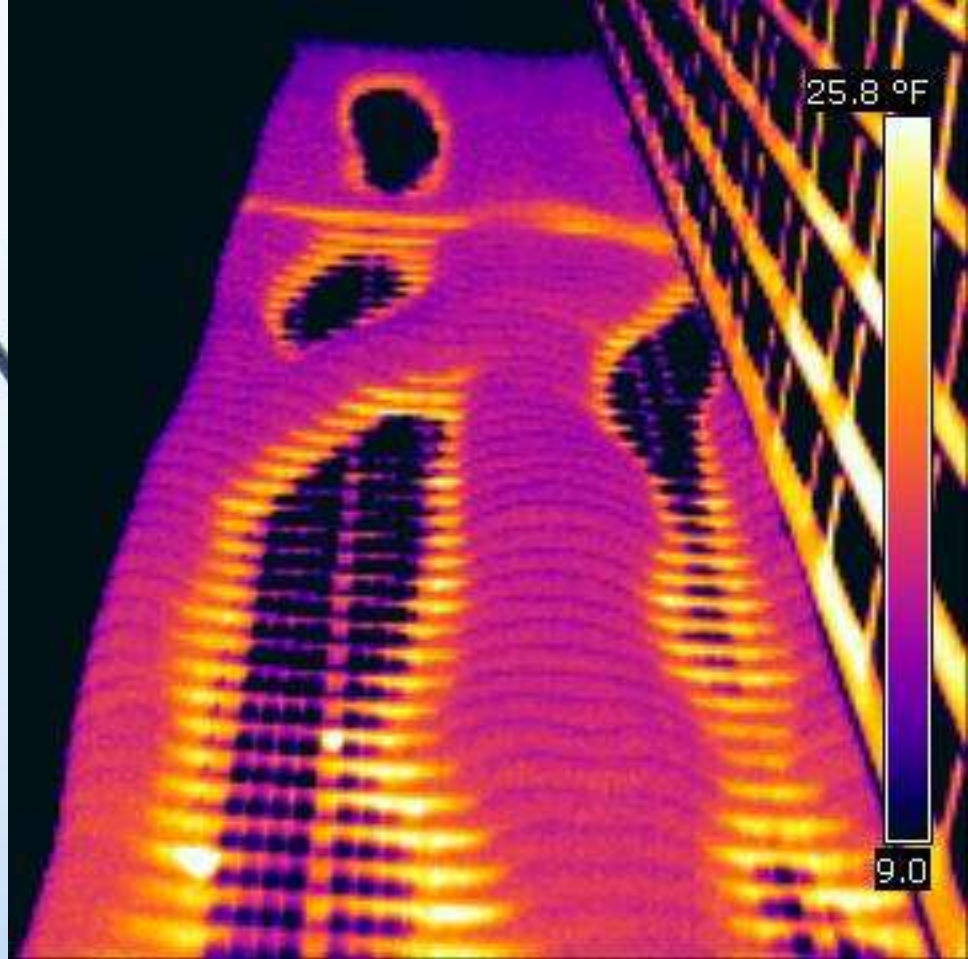


Thermal-bridges



Avoiding problems...

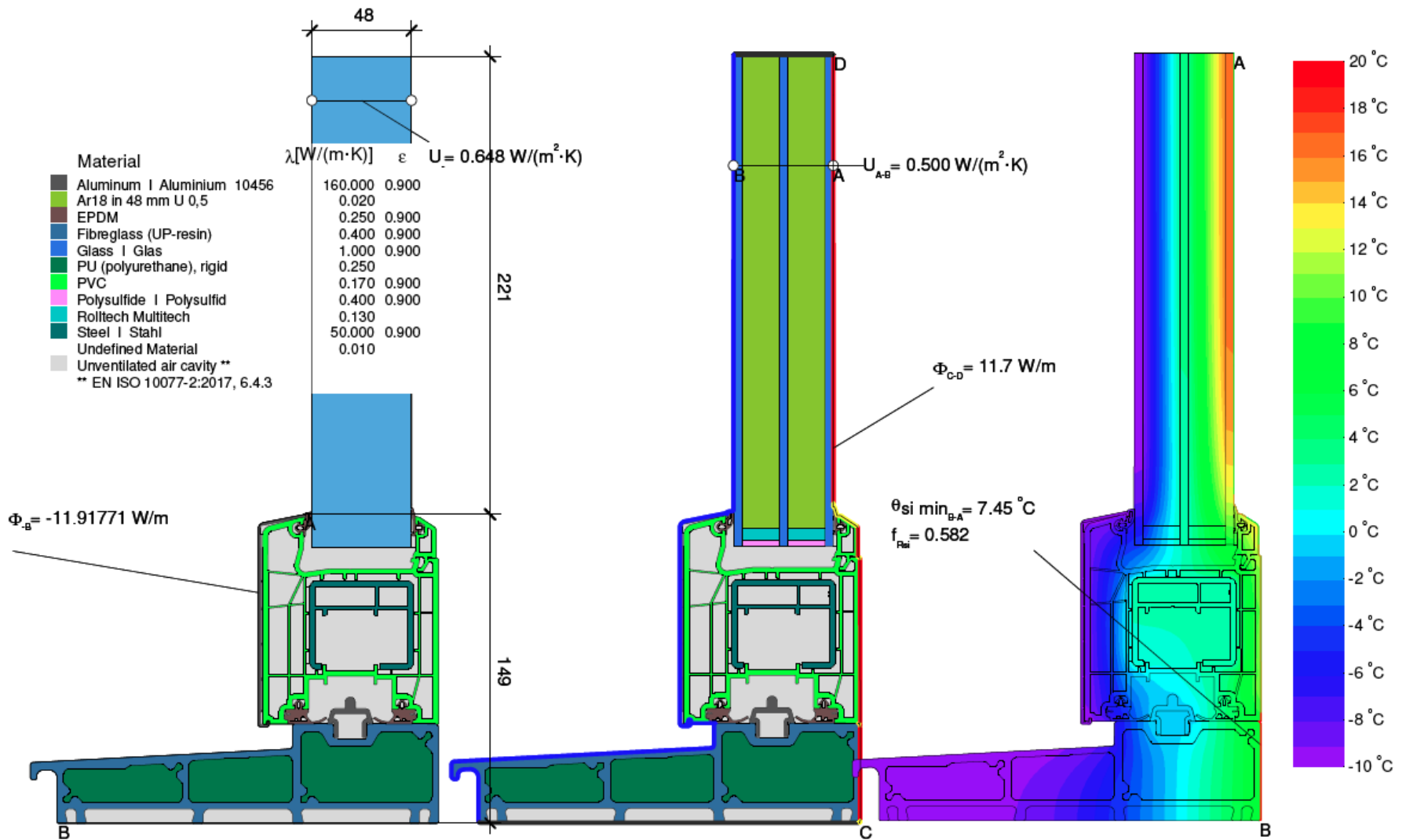




Windows

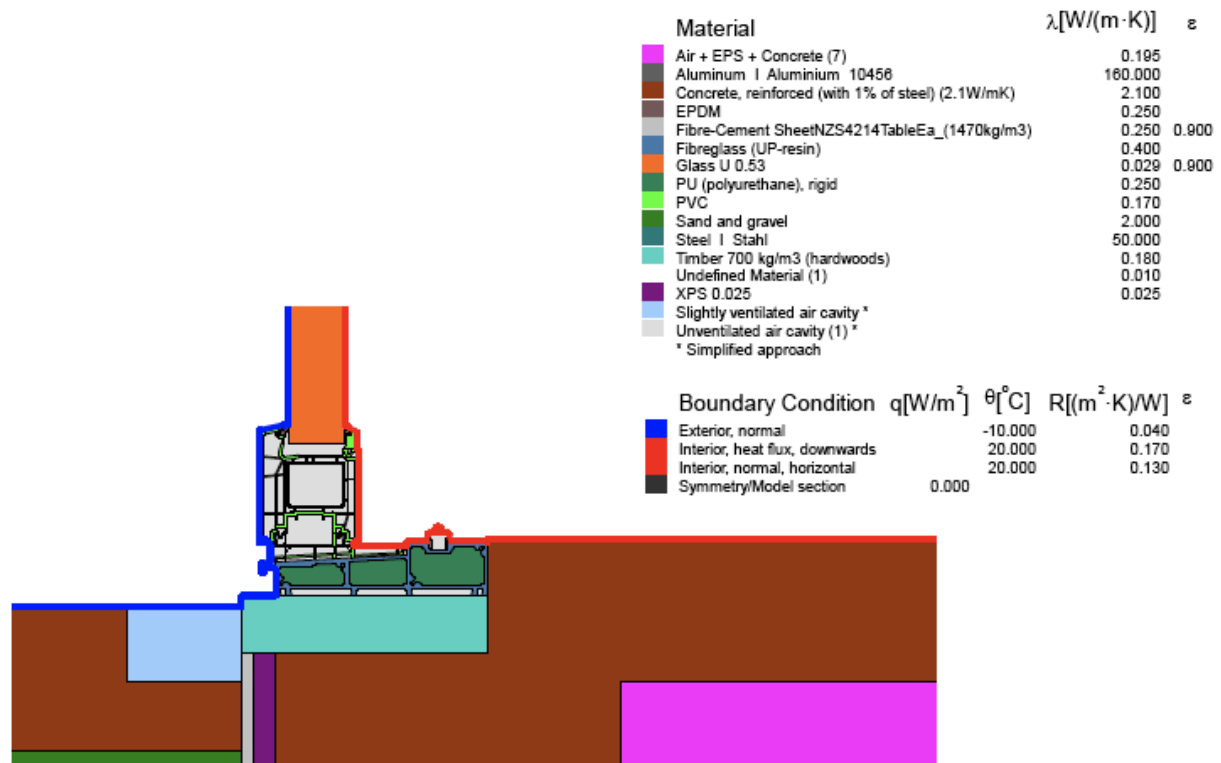
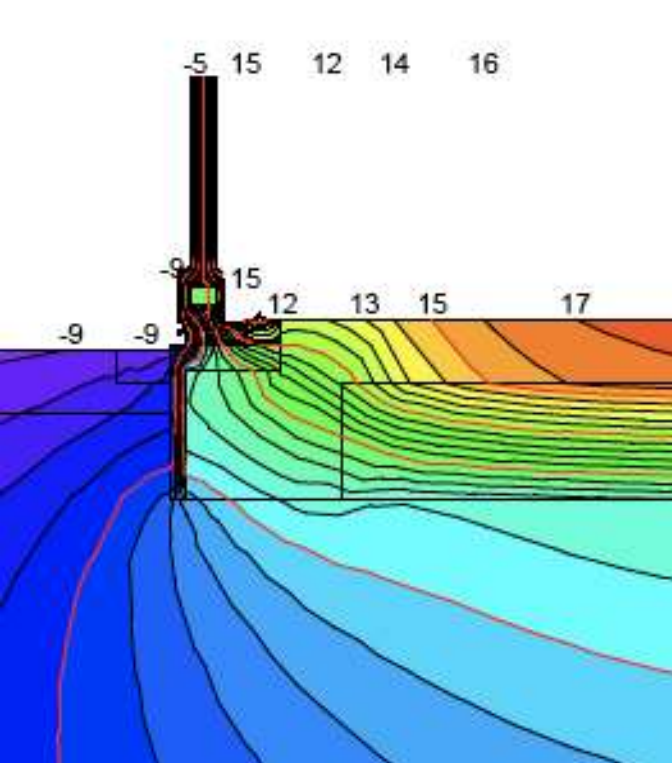




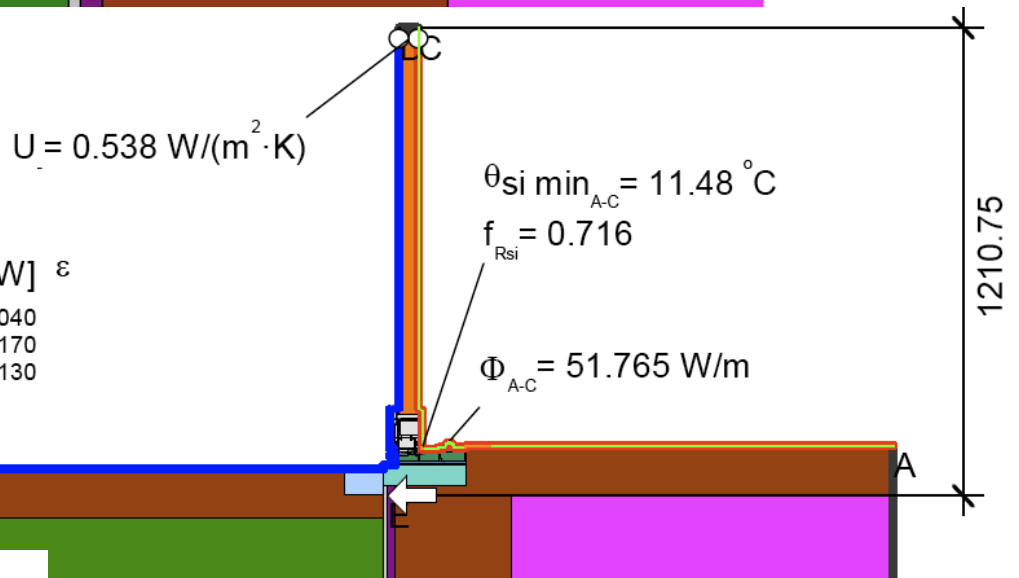


$$U_{tA,B} = \frac{\Phi}{\Delta T} - \frac{U_p \cdot b_p}{b_t} = \frac{11.918}{30.000} - \frac{0.648 \cdot 0.221}{0.149} = 1.706 \text{ W/(m}^2 \cdot \text{K)}$$

$$\psi_s = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_j \cdot b_j = \frac{11.7}{30} - 0.500 \cdot 0.221 - 1.706 \cdot 0.149 = 0.0253 \text{ W/mK}$$



Health Heat flow



Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Exterior, normal		-10.000	0.040	
Interior, heat flux, downwards		20.000	0.170	
Interior, normal, horizontal		20.000	0.130	
Symmetry/Model section	0.000			

$$\Psi_{A-E-C,*} = \frac{51.765}{30.000} - \frac{18.660}{30.000} - 0.538 \cdot 1.211 = 0.452 \text{ W/(m·K)}$$

Complexity to simplicity



PHI Component database



Component Database

Opaque building envelope

- Wall and construction systems
- Façade anchors
- Floor slabs
- ICF for roof parapets
- Flue systems
- Balcony connections
- Attic staircases
- Airtightness systems

Building services

- Compact heat pump units
- Ventilation systems
(capacity < 600 m³/h)
- Decentralised ventilation system
(single room only / with second
room connection)
- Decentralised ventilation system
(school room)
- Ventilation systems
(capacity > 600 m³/h)
- Drain water heat recovery

Explore the house and find the links or

let the hotspots show up



Transparent building envelope

- Windows
- Roof windows
- Skylights
- Curtain wall systems
- Glass roofs
- Openable elements in glass roof
- Shutters
- Entry doors
- Sliding doors
- Glazing
- Glazing edge bonds

Components Map



https://database.passivehouse.com/en/components/details/construction_system/carbonlite-designbuild-panellite-1020cs04

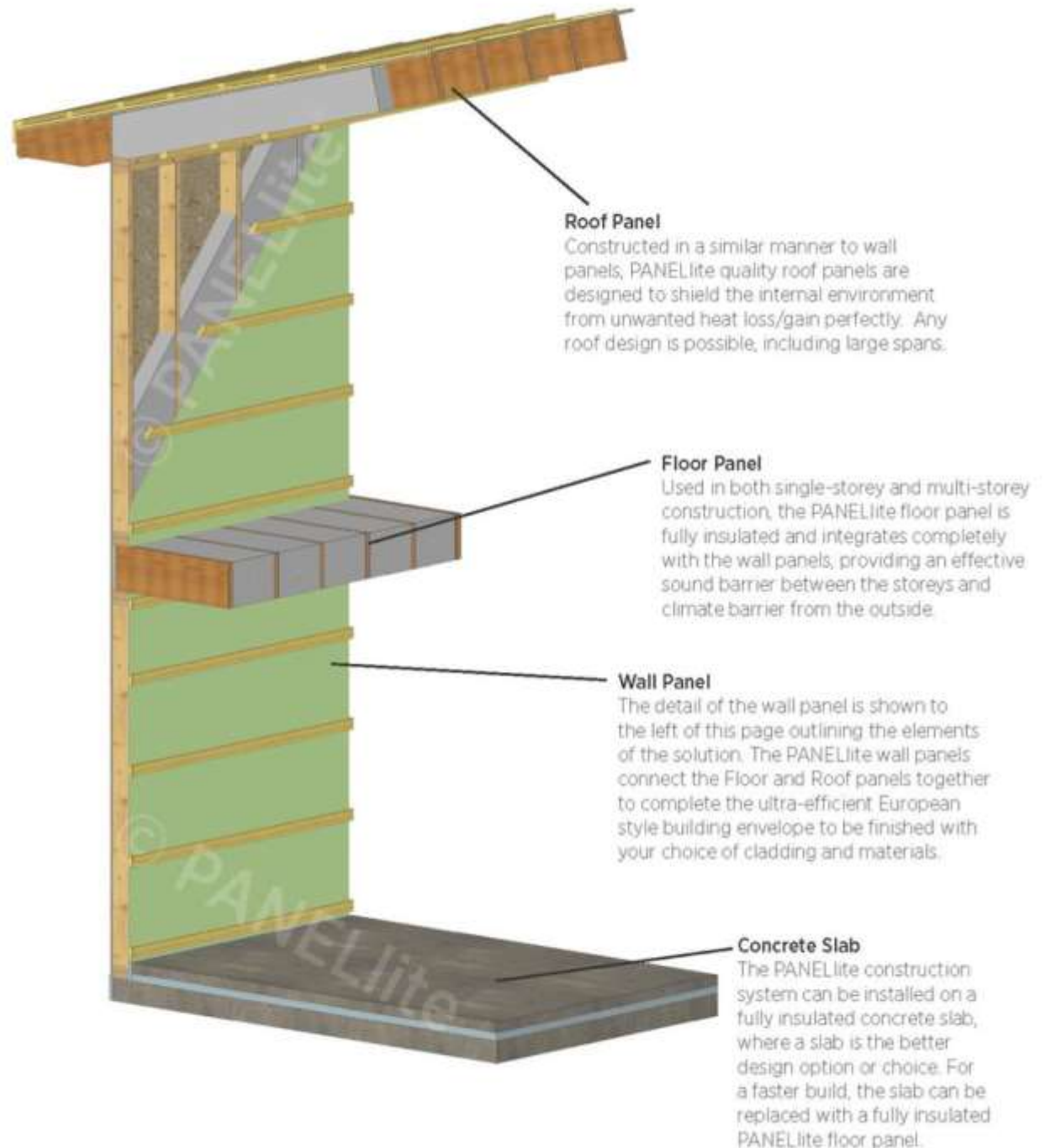
Certified construction system

Panelised system

Deemed thermal bridge free

Flexible

Quick on site



Ventilation

Penalised for not using
Certified product due to
different testing regimes



Certification

Quality assurance



Certificate

Χερφέδ Πασσιβέ Ηουσε Πλυσ



Αυτογραφέδι
βιμ



49 The Esplanade, Thornleigh, Australia



Χλέντ	Ματθίω Κοσνίκ & Κατμερινε Ωύσον 49 Τηε Εσπλίανωδε 2120 Τηορνλέιη, Αυστράλι
Αρχιτέχτ	Ενπαρωεχτιρε 48 Κάλανγ Ροαδ 2101 Ελίνορα Ηεγιητε, Αυστράλι
Βυδώνγ Σεραχεσ	
Ενεργη Χονσούαντ	Ενπαρωεχτιρε 48 Κάλανγ Ροαδ 2101 Ελίνορα Ηεγιητε, Αυστράλι

Πασσιβέ Ηουσε βυδώνγ σ όφφρεξέλεντ τηε μίλιον φικανδ πέριγσοδ αρθωαίτηαίλιε αρρουνδ. Λυε το τηε ρηηη η ενεργησέφχε νημ ενεργησέσασ ωε λασ γρε ενηουσε γασ εμ ισσιονσ αρε εξέφμ ελίλωε.

The design of the above-mentioned building meets the criteria defined by the Passive House Institute for the 'Passive House Plus' standard:

Building quality	This building	Criteria	Alternative criteria
Heating	Ηεσπνγ δεμ ανδ [κΩ η/(μ²α)]	4	15
	Ηεσπνγ λωαδ [Ω/μ²]	8	10
Cooling	Χοολνγ + δεηομ ώφχεσπον δεμ ανδ [κΩ η/(μ²α)]	13	17
	Χοολνγ λωαδ [Ω/μ²]	15	10
Airtightness	Πρεσσυρζαπιον πεστρεσυλε (ν ₅₀) [1/η]	0.4	0.6
Renewable primary energy (PER)	ΠΕΡ-δεμ ανδ [κΩ η/(μ²α)]	31	45
	Γενερεπιον (ρεφερενχε το γρουνδ αρεα) [κΩ η/(μ²α)]	52	60

Τηε ασσοχιεσδ χερφέφχαπιον βουκλετ χονπινσ μ ορε χηαριχερεσπαχ παλσεσ φορτησ βυδώνγ.

Beechworth, 28th August 2019
Χερφέδ Πασσιβέ Ηουσε Πλυσ



Certified

Passivhaus

Passivhaus Institut

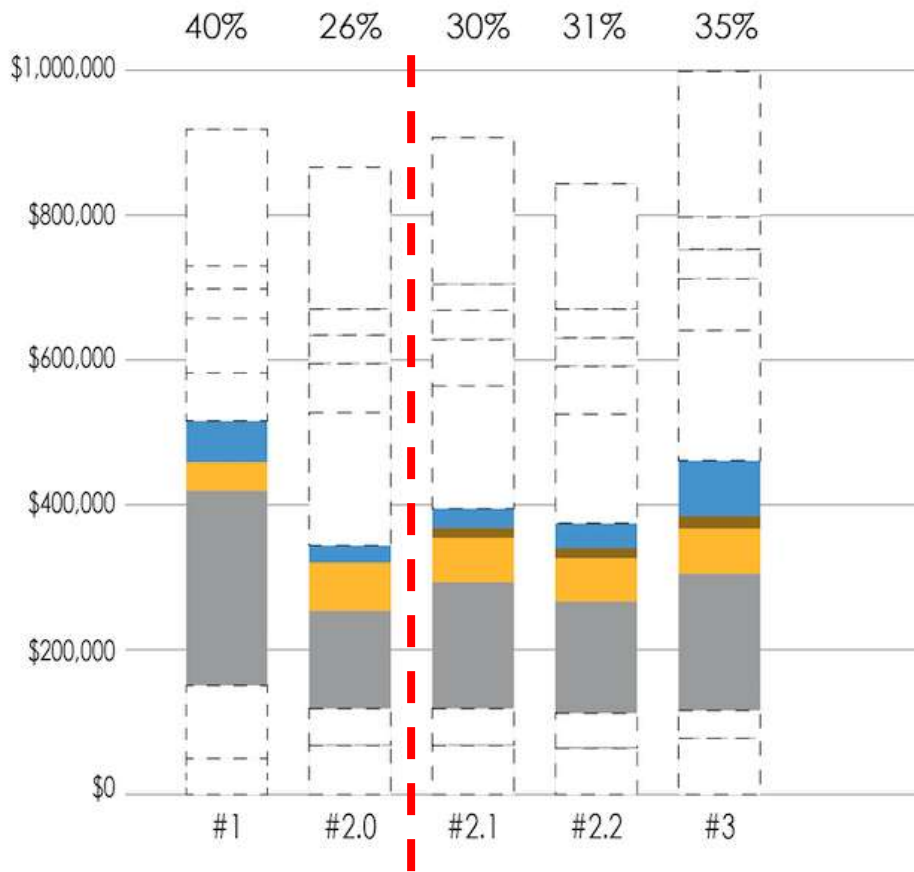
Quality Control

- Get what you paid for (happy)
- Risk management for builders (happy)
- Higher levels of documentation equals faster builds with less headaches (easier & happy)



- Compete on quality

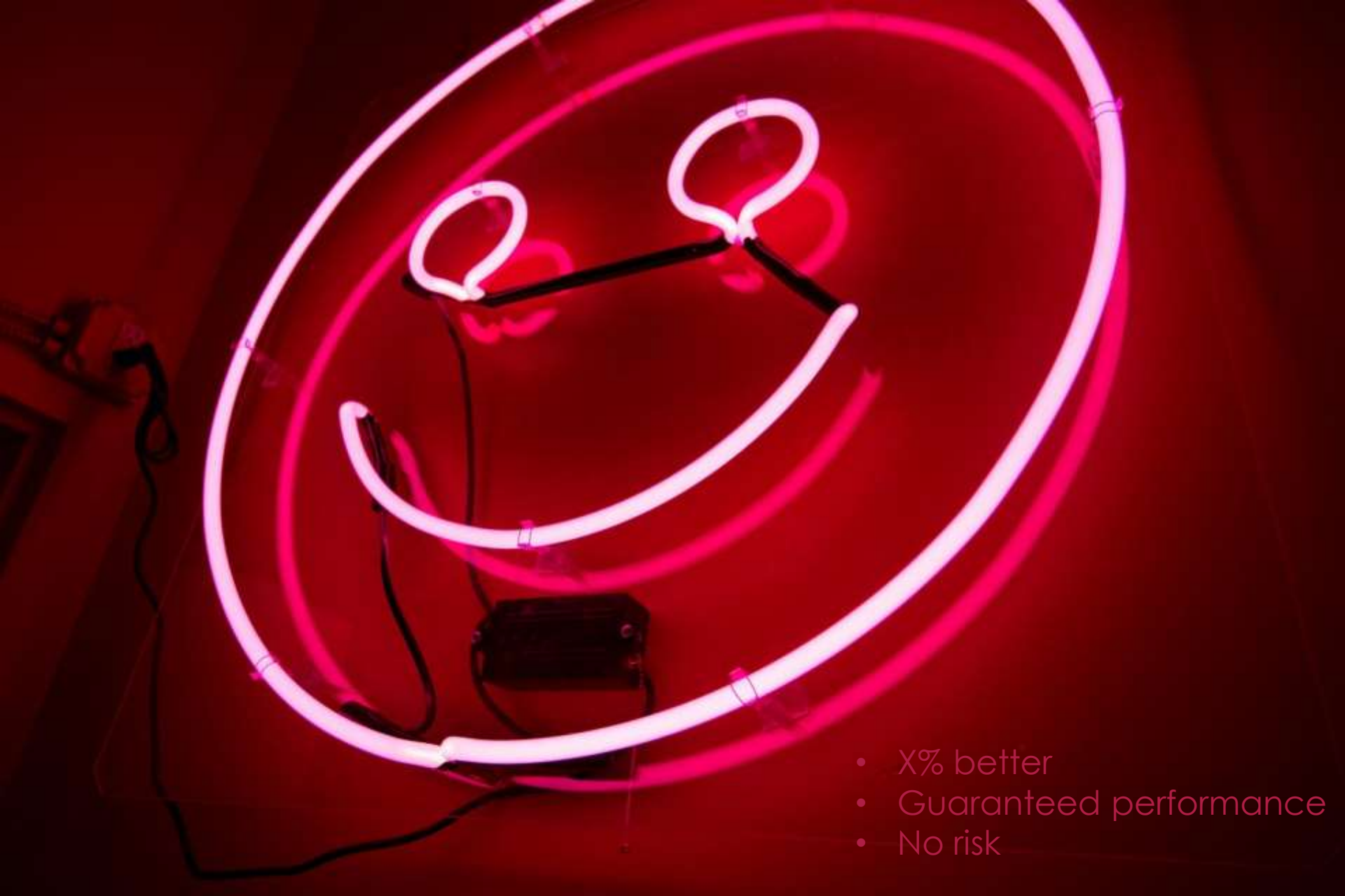




envelope costs
(standard)

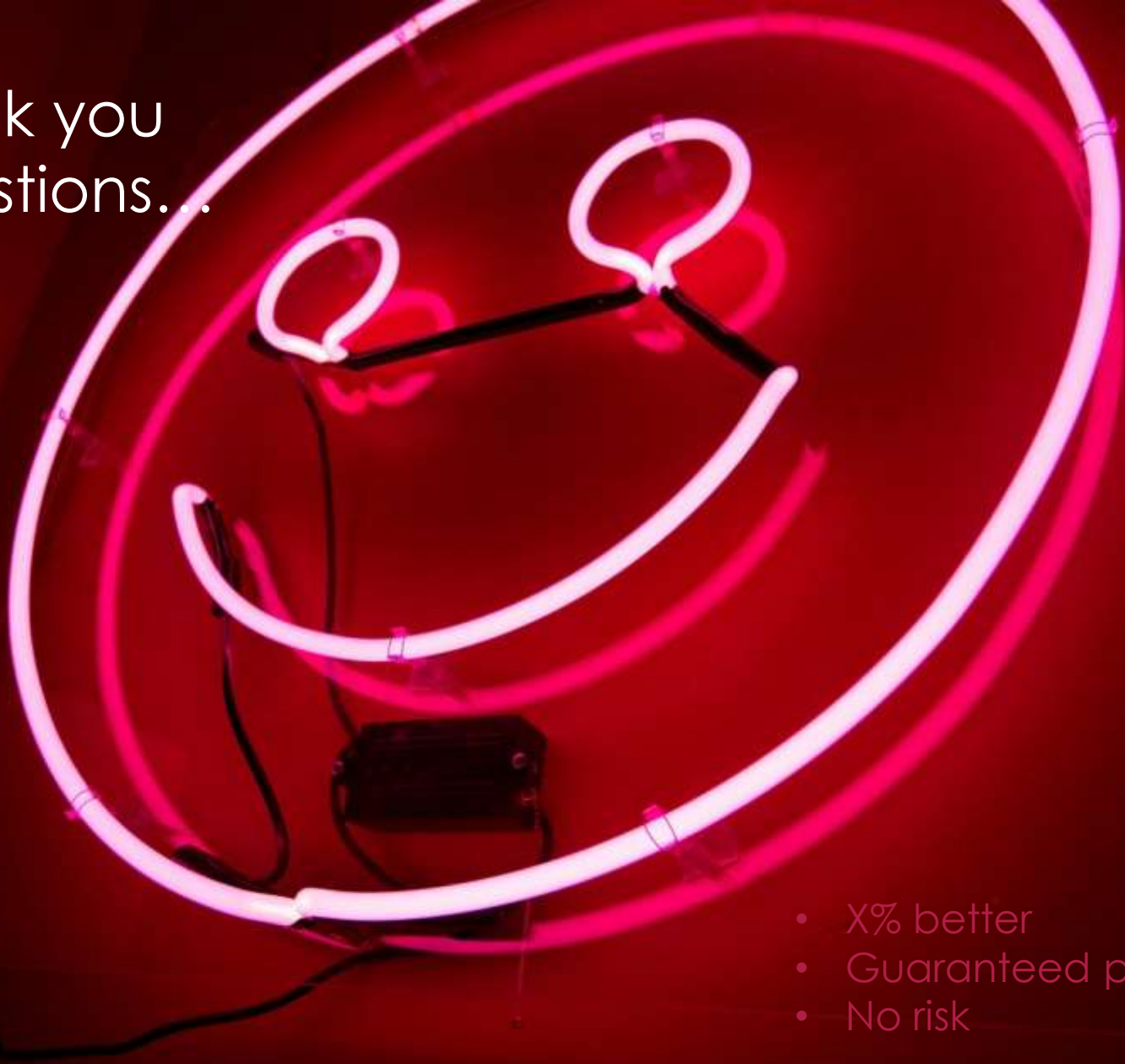


PH premium
(envelope)



- X% better
- Guaranteed performance
- No risk

Thank you
Questions...



- X% better
- Guaranteed performance
- No risk

Passive Solar vs Passive House