EnerPHit Retrofit Plan

Target standard: EnerPHit (Energiebedarfsverfahren) Classic

Building:	**Ash Springer & Kati Rediger's residence**			
	276 Wapello Street			
	CA91001	Altadena		
	California		US-United States of America	
	1-Freestanding single family house			
Climate data set:	US0121a-Burbank			
Climate zone:	5: Warm	Altitude of location:	1548,55643	

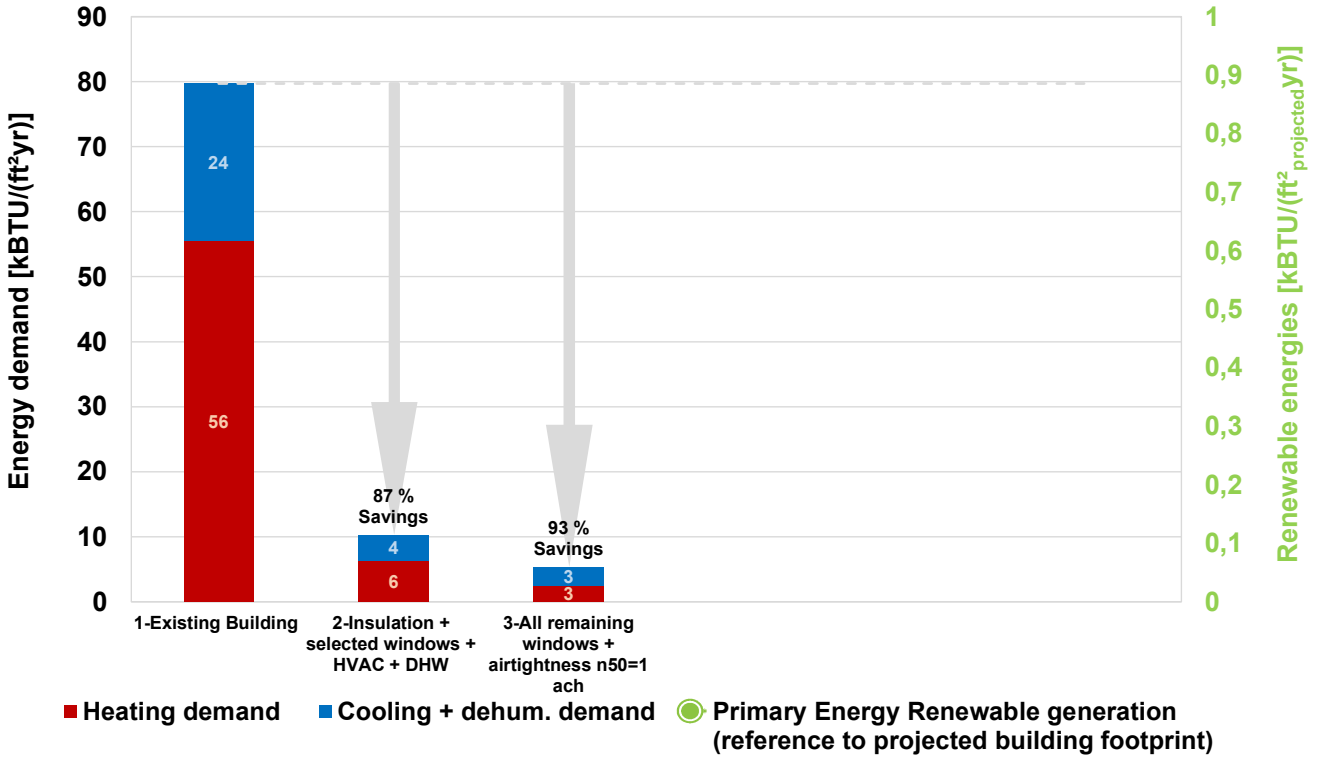
Owner:	**Ash Springer & Kati Rediger**			
	276 Wapello Street			
	CA91001	Altadena		
	California		US-United States of America	

Energy consulting:	**Vincent Marçais, CPHD**			
	5111 S Sherbourne Dr			
	90056	Los Angeles		
	California		USA	

Pre-Certification:	**Oliver Style - Praxis Resilient Buildings**			
	Carrer Torres i Amat 21, 4			
	08001	Barcelona		
	Barcelona		ES-Spain	

Year of construction:	1925	Interior temp. winter [°F]:	68,0
No. of dwelling units:	1	Treated floor area [ft²]:	1597,8
Interior temp. summer [°F]:	77,0		
No. of occupants:	2,9		

Retrofit steps: energy demand and generation



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.

First name	Last name	Signature
Oliver	Style	

Company	Issued (date)	City
Praxis Resilient Buildings	27/11/2024	Barcelona

Barcelona, 27.11.2024

Dear building owner,

in the next years you intend to modernise your building and to improve staged its level of thermal protection. This "EnerPHit Retrofit Plan" will help you to make the right decisions at each step.

EnerPHit Standard
In the case of retrofits of existing buildings, it is not always possible to fully achieve the Passive House Standard with reasonable effort. The reasons for this lie e.g. in the unavoidable thermal bridges due to existing basement walls. For such buildings, the Passive House Institute has developed the EnerPHit Standard. With the use of Passive House components, EnerPHit retrofitted buildings offer almost all the advantages of a Passive House building with optimum cost-effectiveness at the same time:
• Comfortable living with uniformly warm walls, floors and windows
• Draughts, condensation and mould growth are no longer a problem
• Permanent supply of fresh air with a pleasant temperature
• Independence from energy price fluctuations
• Financial profits from the very first year on due to up to 90 % reduced heating costs
• Climate protection due to decreased CO2 emissions of the same scale

EnerPHit Retrofit Plan
Most buildings are modernised in a staged way when the respective building component needs to be renewed. Advantage can be taken of such opportunities to carry out future-oriented improvements to the thermal protection of the building. For example, if the façade already needs to be renewed anyway, the extra effort for thermal protection of the exterior wall to the Passive House quality at the same time will be manageable. Nevertheless, many interdependencies exist between individual energy efficiency measures, so that a good standard of thermal protection can only be achieved cost-effectively if an overall concept is prepared for the entire building prior to the first modernisation step. With the EnerPHit Retrofit plan, such an overall concept will be worked out for you by your Passive House Designer or energy consultant. This offers you the following advantages:
• Preparing for future steps already with today's measures will save costs on the whole and will ensure an optimal final outcome.
• An excellent final outcome can only be achieved if each individual step is implemented with the appropriate quality (EnerPHit-Standard).
• Once the overall concept has been prepared, it is available for every further step and thus facilitates the planning process (you don't have to start from the beginning every time).
• The energy demand is stated for each step.
• The approximate points in time for upcoming retrofit measures are stated in the general plan. This serves as a valuable aid for personal finance planning.

Pre-certification
The EnerPHit Retrofit Plan as well as other relevant documents can be checked by a PHI accredited certifier for additional quality assurance. If the examination shows that the EnerPHit Standard will be achieved with the implementation of all planned measures, then the first step can be carried out. After this, a preliminary EnerPHit certificate can then be issued for the building. If quality assurance is continued accordingly for each step, then the full EnerPHit certificate will be issued for the building upon completion of the last step. Pre-certification increases the value of your building because its potential is clearly demonstrated. It also increases the credibility of the retrofit concept in the context of talks with the bank e.g. because the achievable cost saving is available with a reliable calculation. Apart from that, you can demonstrate to the outside world that you are committed to climate protection.

I wish you every success with your retrofit project!

Vincent Marçais, Certified Passive House Designer

Scheduler

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

Retrofit steps:		1															2			3					
Assemblies	**Last renewal**	1982	1986	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2035	2040	2060	2070	2080	2090	2095
Façade render	1986																								
Gas boiler	2011																								
Anlin windows	2018																								
Façade render	2024																X								
Insulation suspended floor	2024																X								
Insulation external walls	2024																X								
Insulation roof	2024																X								
Pella windows	2024																								
Pella front door	2024																								
Heating & cooling heat pump	2024																								
DHW heat pump	2024																								
HRV	2024																								
Replace Anlin windows	2040																								
Airtightn. test: X, Leakage search: (X)																	(X)	(X)		X					

Initial condition

Main-tenance

Extensive repairs

X Retrofit dates

Smaller repairs

Immediate replacement

Summary of the measures

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

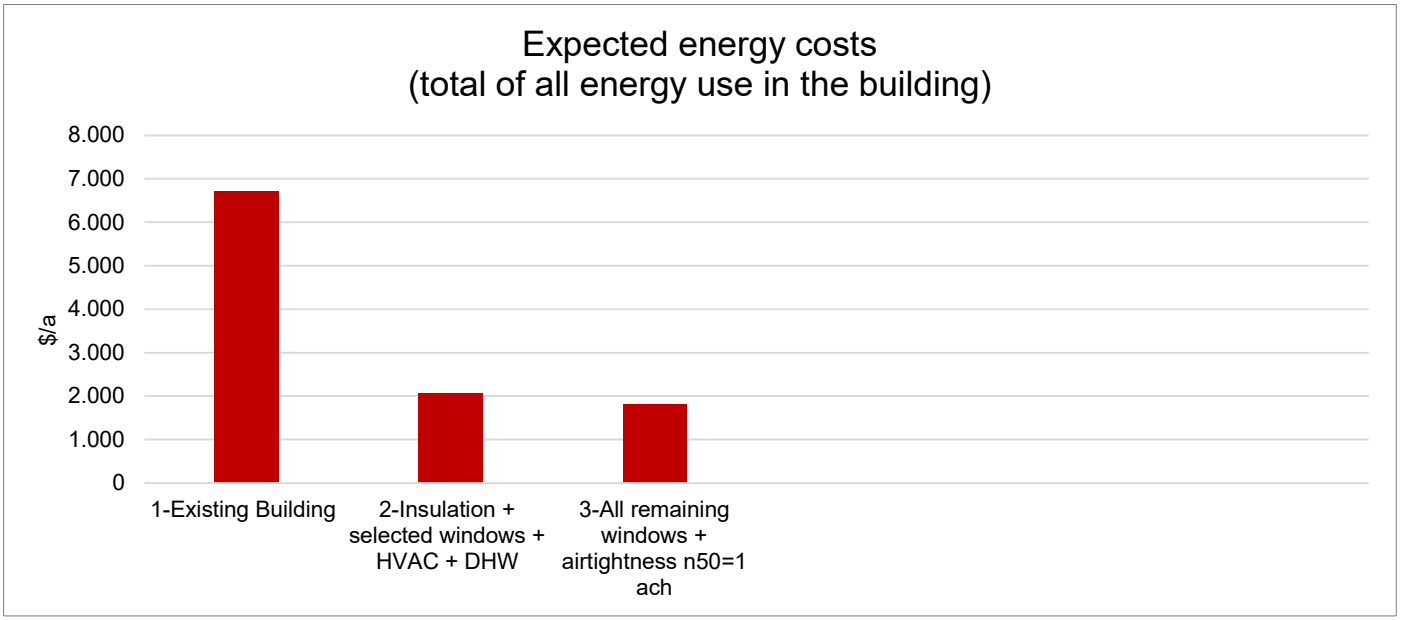
EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

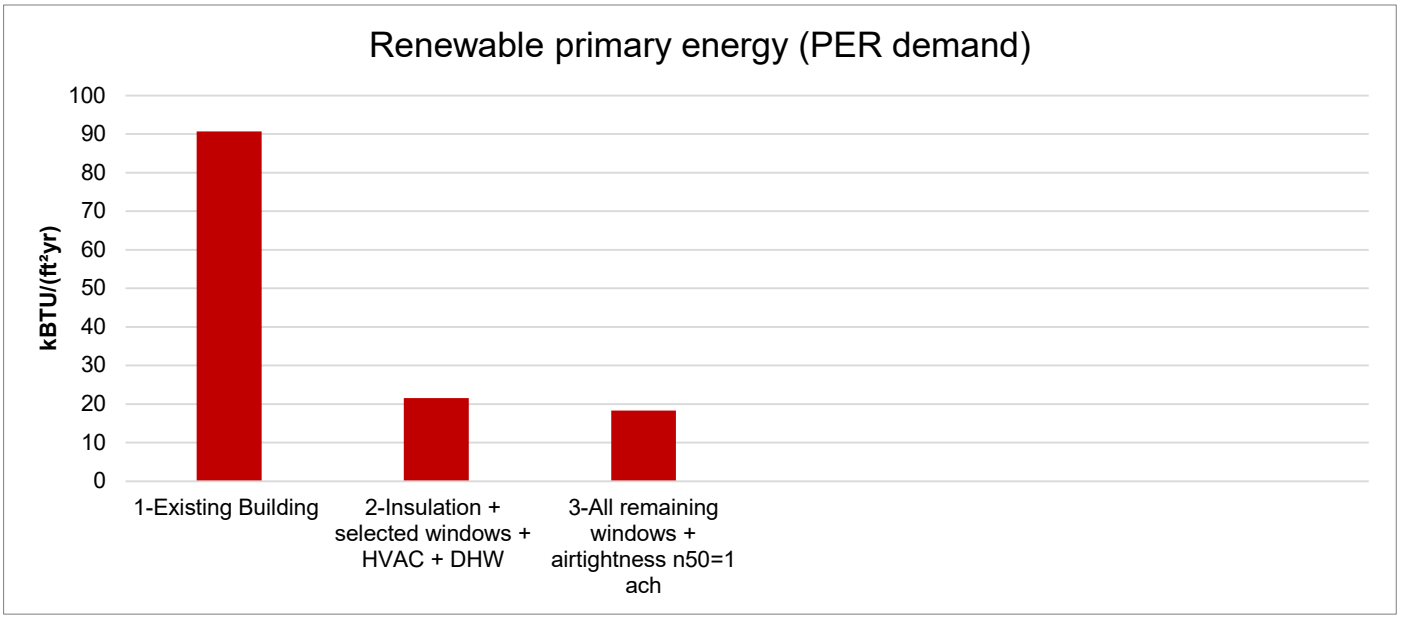
Retrofit step No.		1-Existing Building	2-Insulation + selected windows + HVAC + DHW	3-All remaining windows + airtightness n50=1 ach				Criteria	Alternative criteria
Year		1925	2024	2040					
Measures									
Occasion ("anyway measure")	a		Window replacement	Window replacement					
Energy-saving measure			57% Passivhaus windows	100% Passivhaus windows					
Occasion ("anyway measure")	b		Floor, walls, roof						
Energy-saving measure			Thermal insulation						
Occasion ("anyway measure")	c		Heating & cooling system						
Energy-saving measure			Air-to-air heat pump						
Occasion ("anyway measure")	d		DHW system						
Energy-saving measure			Air-to-water heat pump						
Occasion ("anyway measure")	e		Ventilation						
Energy-saving measure			100% ventilation + heat						
Occasion ("anyway measure")	f								
Energy-saving measure									
Occasion ("anyway measure")	g								
Energy-saving measure									
Occasion ("anyway measure")	h								
Energy-saving measure									
Component characteristics									
Wall to ambient air, ext. insulation (R-value)	[hr.ft².°F/BTU]	3,43	20,57	20,57				-	-
Roof (R-value)	[hr.ft².°F/BTU]	2,86	37,86	37,86				-	-
Building envelope to ambient (R- value)	[hr.ft².°F/BTU]	3,15	25,34	25,34				-	-
Wall to ground with exterior insulation (R-value)	[hr.ft².°F/BTU]							-	-
Basement ceiling / floor slab (R-value)	[hr.ft².°F/BTU]	5,83	26,60	26,60				-	-
Building envelope to ground (heat loss/load)	[kBTU/(ft²yr)]	-1,30	-0,33	-0,33				-	-
Wall with interior insulation to ambient air (R-value)	[hr.ft².°F/BTU]	-	-	-				-	-
Wall with interior insulation to ground (R-value)	[hr.ft².°F/BTU]							-	-
Building envelope to temp. zone X (R-value)	[hr.ft².°F/BTU]	-	-	-				-	-
Building envelope to temp. zone Y (R-value)	[hr.ft².°F/BTU]	-	-	-				-	-
Building envelope to temp. zone Z (R-value)	[hr.ft².°F/BTU]	-	-	-				-	-
Wall with int. insulation to temp. zone X (R-value)	[hr.ft².°F/BTU]	-	-	-				-	-
Wall with int. insulation to temp. zone Y (R-value)		-	-	-				-	-
Wall with int. insulation to temp. zone Z (R-value)	[hr.ft².°F/BTU]	-	-	-				-	-
Flat roof (solar reflectance index, SRI)	-	-	-	-				-	-
Inclined and vertical outer surface (SRI)	-	51	22	22				-	-
Windows / doors ($U_{installed}$)	[BTU/hr.ft².°F]	0,32	0,27	0,22				-	-
Windows ($U_{W,installed}$)	[BTU/hr.ft².°F]	-	-	-				-	-
Windows ($U_{W,installed}$)	[BTU/hr.ft².°F]	-	-	-				-	-
Glazing (g-value)	-	0,30	0,34	0,36				-	-
Glazing/sun protection (max. solar load)	[kBTU/(ft²yr)]	84	89	39				-	-
Ventilation (effective heat recovery efficiency)	[%]	0	83	83				-	-
Ventilation (humidity recovery efficiency)	[%]		0	0				-	-
Air change at press. test n_{50}	[1/h]	15,0	6,2	1,0				1,0	-
Building characteristics									
Heating demand	[kBTU/(ft²yr)]	56	6	3				4,75	-
Heating load	[BTU/(hr.ft²)]	30	7	3				-	-
Cooling + dehum. demand	[kBTU/(ft²yr)]	24	4	3				4,75	-
Cooling load	[BTU/(hr.ft²)]	21	6	4				-	-
Frequency of overheating (> 25 °C)	[%]	-	-	-				-	-
Frequency of excessively high humidity (> 12 g/kg)	[%]	0	0	0				10	-
Non-renewable primary energy (PE demand)	[kBTU/(ft²yr)]	85	46	40				-	-
Renewable primary energy (PER demand)	[kBTU/(ft²yr)]	91	22	18				19	19
Primary Energy Renewable generation (reference to projected building footprint)	[kBTU/(ft²yr)]	0	0	0				-	-
Criteria fulfilled for EnerPHit (Energiebedarfsverfahr		No	No	Yes					
Annual energy-related extra costs (Annuities)									
Energy-related invest. (interest+repayment)	[$/a]	0	328	606					
Expected energy costs (total of all energy use in the build	[$/a]	6700	2070	1810					
Total costs	**[$/a]**	**6700**	**2398**	**2416**					

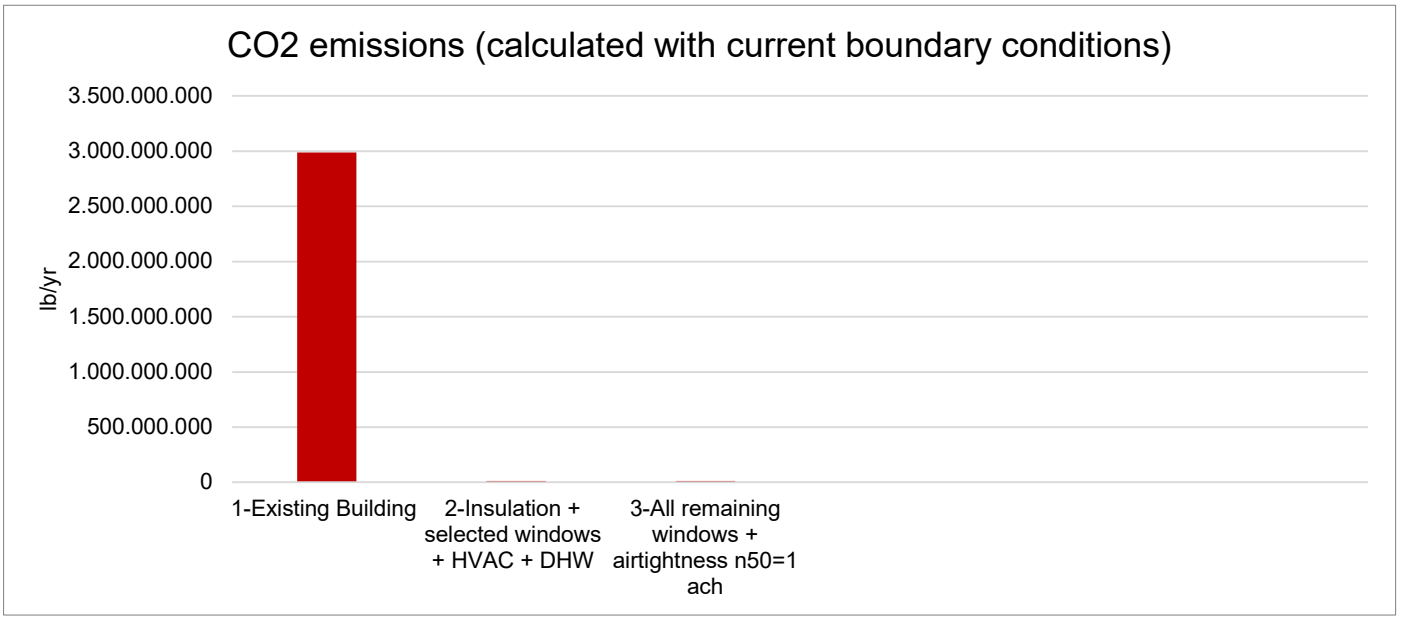
Diagrams

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America







Investment and maintenance costs

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

	Retrofit step No.	1-Existing Building	2-Insulation + selected windows + HVAC + DHW	3-All remaining windows + airtightness n50=1 ach				
	Year	1925	2024	2040				
a	**Occasion ("anyway measure")**		Window replacement	Window replacement				
	Investment costs		11.180	0	6.440	12.000		$
	Maintenance costs (annual)		0	0	0	320		$/a
	Energy-saving measure		57% Passivhaus windows	100% Passivhaus windows				
	Investment costs		16.770	2.160	23.920	16.000		$
	Financial support (present value)		1.677	216	2.392	1.600		$
	Maintenance costs (annual)		0	0	0	100		$/a
	Service life [years]		40	50	50	20		a
	Annuity (energy related only)	**0**	**143**	**62**	**478**	**-74**	**0**	$/a
b	**Occasion ("anyway measure")**		Floor, walls, roof					
	Investment costs		4.680	5.810	1.000	1.000		$
	Maintenance costs (annual)		50	0	0	0		$/a
	Energy-saving measure		Thermal insulation					
	Investment costs		8.580	11.620	1.600	7.500		$
	Financial support (present value)		858	1.162	160	750		$
	Maintenance costs (annual)		100	0	0	70		$/a
	Service life [years]		30	50	40	20		a
	Annuity (energy related only)	**0**	**185**	**147**	**16**	**421**	**0**	$/a
c	**Occasion ("anyway measure")**		Heating & cooling system					
	Investment costs			0				$
	Maintenance costs (annual)			1.500				$/a
	Energy-saving measure		Air-to-air heat pump					
	Investment costs			28.200				$
	Financial support (present value)			2.820				$
	Maintenance costs (annual)			20				$/a
	Service life [years]			20				a
	Annuity (energy related only)	**0**	**0**	**69**	**0**	**0**	**0**	$/a
Total investment costs (annual interest+repayment) [$/a]								
Total (incl. previous steps)		**0**	**994**	**2.956**	**3.691**	**5.152**	**5.152**	$/a
Energy related (incl. previous steps)		**0**	**328**	**606**	**1.100**	**1.448**	**1.448**	$/a

Boundary conditions: Interest rate and inflation: Nominal interest rate 3,0% Inflation 1,0% Real interest rate 2,0% %

Average energy price (during service life): Electricity 0,07 Natural gas / Oil 0,09 Wood 0,07 $

Building assemblies (U-values)

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

Assembly: 01ud-External wall — Area: 0,0 ft²

Areas with this assembly: **Wall_003_N, Wall_004_N, Wall_005_W, Wall_006_S, Wall_007_S**

Retrofit step: 1-Existing Building — 1925

Subarea 1	R per inch	Subarea 2 (optional)	R per inch	Subarea 3 (optional)	R per inch		Thickness [in]
Stucco	0,144						1,00
Blown in Cellulose at 3.5 pcf	0,244	Wood Studs 2x4 (16 OC)	1,109				4,33
Airtightness - Intello Plus							
Service cavity (insulation)	0,416	Battens 2x3 (16 OC)	1,109				2,00
Drywall	0,577						0,50

Area section 1	Area section 2	Area section 3	Total	
92%	8%	0%	**7,8**	in

U-value supplement: 0 BTU/hr.ft².°F — **R-value: 3,434** hr.ft2.°F/BTU

Retrofit step: 2-Insulation + selected windows + HVAC + DHW — 2024

Subarea 1	R per inch	Subarea 2 (optional)	R per inch	Subarea 3 (optional)	R per inch		Thickness [in]
Stucco	0,144						1,00
Blown in Cellulose at 3.5 pcf	3,368	Wood Studs 2x4 (16 OC)	1,109				4,33
Airtightness - Intello Plus							
Service cavity (insulation)	4,000	Battens 2x3 (16 OC)	1,109				2,00
Drywall	0,577						0,50

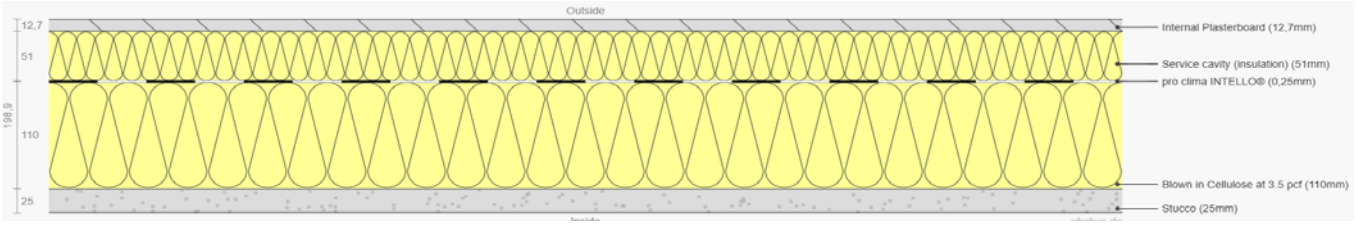
Area section 1	Area section 2	Area section 3	Total	
92%	8%	0%	**7,8**	in

U-value supplement: 0 BTU/hr.ft².°F — **R-value: 20,566** hr.ft2.°F/BTU

Assembly: 01ud-External wall

Notes for implementation

Plan / sketch / image



As part of the 1st retrofit step, external walls have been insulated with 4,3" blown-in cellulose insulation between the timber structure, together with 2" of thermal insulation in the inner service cavity

Building assemblies (U-values)

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

Assembly: 02ud-Roof Area: 0,0 ft²

Areas with this assembly: **Roof_013_W, Roof_014_E, Roof_015_N, Roof_016_H, Roof_017_**

Retrofit step: 1-Existing Building 1925

Subarea 1	R per inch	Subarea 2 (optional)	R per inch	Subarea 3 (optional)	R per inch		Thickness [in]
Gutex Multitherm	0,000						0,00
Existing Roof Deck	1,109						0,39
Airtightness - Solitex Mento 1000 air barrier							
Blown in cellulose at 3.5 pcf	0,155	Rafters 2x6 (24 OC)	1,109				6,00
Airtightness - Intello Plus airtight membrane & smart vapor retarder							
Drywall	0,577						0,50

Area section 1	Area section 2	Area section 3	Total	
95%	5%	0%	**6,9**	in

U-value supplement: 0 BTU/hr.ft².°F **R-value:** **2,859** hr.ft2.°F/BTU

Retrofit step: 2-Insulation + selected windows + HVAC + DHW 2024

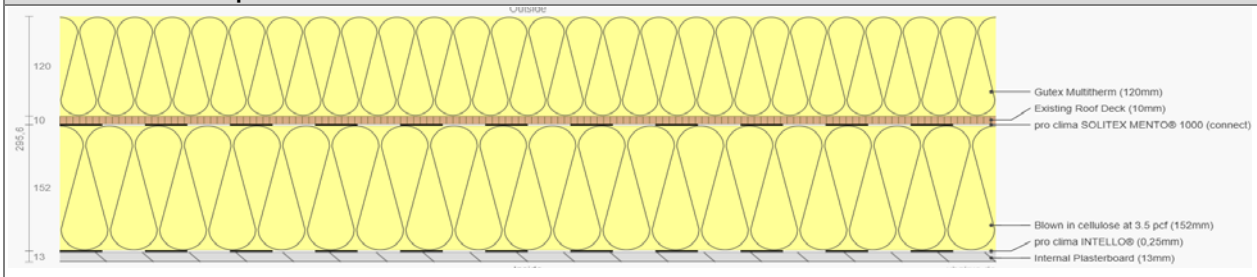
Subarea 1	R per inch	Subarea 2 (optional)	R per inch	Subarea 3 (optional)	R per inch		Thickness [in]
Gutex Multitherm	3,606						4,72
Existing Roof Deck	1,109						0,39
Airtightness - Solitex Mento 1000 air barrier							
Blown in cellulose at 3.5 pcf	3,411	Rafters 2x6 (24 OC)	1,109				6,00
Airtightness - Intello Plus airtight membrane & smart vapor retarder							
Drywall	0,577						0,50

Area section 1	Area section 2	Area section 3	Total	
95%	5%	0%	**11,6**	in

U-value supplement: 0 BTU/hr.ft².°F **R-value:** **37,9** hr.ft2.°F/BTU

Assembly: 02ud-Roof

Notes for implementation



As part of the 1st retrofit step, the roof has been insulated with 4,7" wood fibre insulation on top of the timber structure, together with 6" of blown-in cellulose insulation between the timber structure

Building assemblies (U-values)

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

Assembly: 03ud-Basement ceiling Area: 0,0 ft²

Areas with this assembly: **Floor_001_D**

Retrofit step: 1-Existing Building 1925

Subarea 1	R per inch	Subarea 2 (optional)	R per inch	Subarea 3 (optional)	R per inch		Thickness [in]
White oak floor	1,109						0,50
Blown-in cellulose at 3.5 pcf	0,161	Joists 2x8 (16 OC)	1,109				8,00
Airtightness - Solitex Mento Plus							
Air cavity	0,784	Battens 2x2 (16OC)	1,109				1,50
Plywood board	1,109						0,50

Area section 1	Area section 2	Area section 3	Total	
87%	13%	0%	**10,5**	in

U-value supplement: 0 BTU/hr.ft².°F **U-value: 5,830** hr.ft2.°F/BTU

Retrofit step: 2-Insulation + selected windows + HVAC + DHW 2024

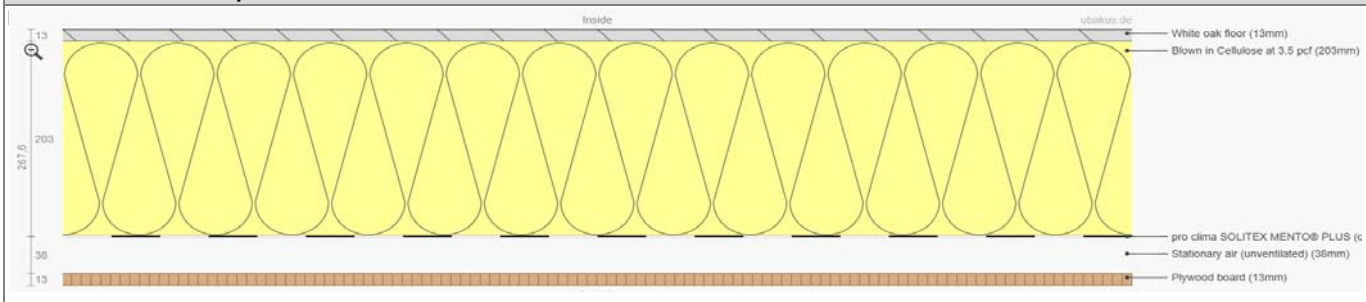
Subarea 1	R per inch	Subarea 2 (optional)	R per inch	Subarea 3 (optional)	R per inch		Thickness [in]
White oak floor	1,109						0,50
Blown-in cellulose at 3.5 pcf	3,448	Joists 2x8 (16 OC)	1,109				8,00
Airtightness - Solitex Mento Plus							
Air cavity	0,784	Battens 2x2 (16OC)	1,109				1,50
Plywood board	1,109						0,50

Area section 1	Area section 2	Area section 3	Total	
87%	13%	0%	**10,5**	in

U-value supplement: 0 BTU/hr.ft².°F **U-value: 26,597** hr.ft2.°F/BTU

Assembly: 03ud-Basement ceiling

Notes for implementation



As part of the 1st retrofit step, the ground floor over a ventilated crawl space has been insulated with 8" blown-in cellulose insulation between the timber structure

Windows (glazing and frames)

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

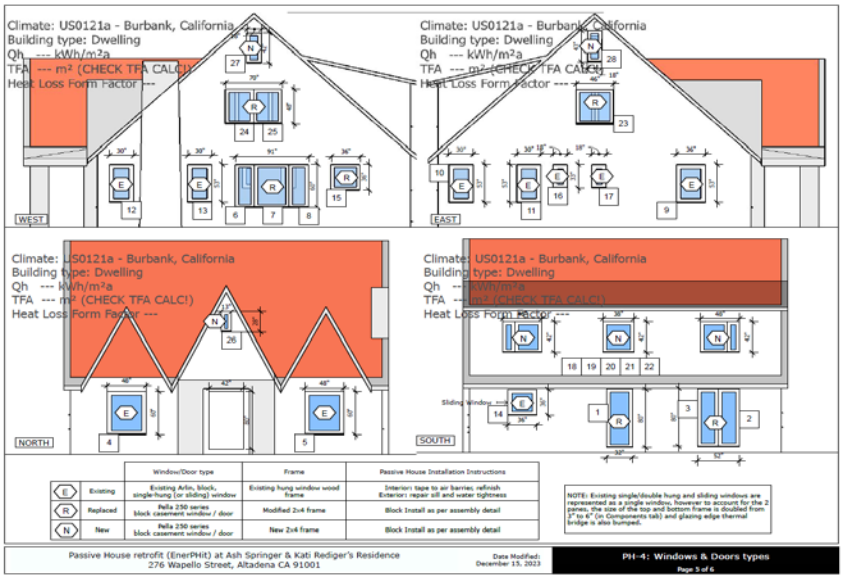
Window type:	**b-Windows B (New)**	Areas: 170,33 ft²

Retrofit step	Year	Glazing	U_g	Frame	U_f
1-Existing building	1925	02ud-Existing - Anlin existing Double (argon)	0,22	06ud-Anlin existing single/double hung	0,39

Retrofit step	Year	Glazing	U_g	Frame	U_f
2-Insulation + selected windows + HVAC + DHW	2024	01ud-New - Pella 250 Triple (advanced lowE, Argon)	0,17	03ud-Pella 250 Casement	0,23

Notes for implementation

Plan / sketch / image



As part of the 1st retrofit step, 57% of the windows were replaced with efficient Passivhaus windows.

Ventilation units

Source file: '20241127 CALIFORNIA-PHPP_V10.6_IP_Variants.xlsm'(PHPP10.6 IP)

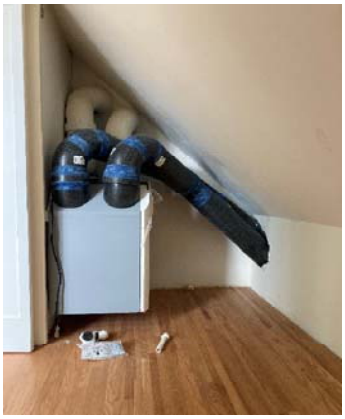
EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

Retrofit step	Year	Ventilation type	Ventilation unit	Heat recovery efficiency	Humidity recovery efficiency	Electric efficiency
1-Existing	1925	3-Only window ventilation	-	-	-	-

Retrofit step	Year	Ventilation type	Ventilation unit	Heat recovery efficiency	Humidity recovery efficiency	Electric efficiency
2-Insulation + selected windows + HVAC + DHW	2024	1-Balanced PH ventilation with HR	0956vs03-Zehnder Group Nederland B.V. - ComfoAir Q350 HRV, Comfort Vent Q350 HRV	#N/D	#N/D	#N/D

Notes for implementation

Plan / sketch / image



A whole house ducted mechanical ventilation system with heat recovery was installed as part of the 1st retrofit step

Heating & cooling

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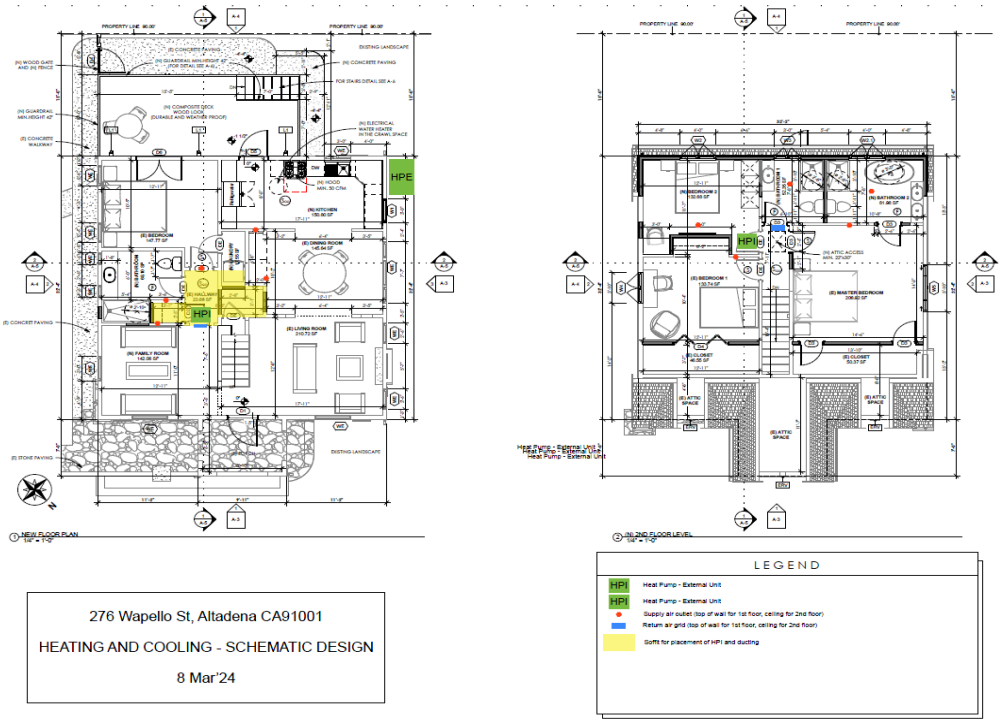
EnerPHit Retrofit Plan: Ash Springer & Kati Rediger's residence, Altadena, US-United States of America

	Retrofit step:	1-Existing Building		1925	
Heating		**Heat generation system**	**Type**	**Heating fraction**	**DHW fraction**
		6-Other	Heating by forced air	100%	
		4-Heating boiler	10-Improved condensing gas boiler		100%
		-	-		
		-	-		
Cooling		**Type**	**Unit**	**Seasonal performance factor**	
	Supply air cooling	-	-		
	Recirculation cooling	2-HP, e.g. according to EN 14825	99ud-Standard air-to-air heat pump	10,7	
	Add. dehumidification	-	-		
	Panel cooling	-	-		

	Retrofit step:	3-All remaining windows + airtightness n50=1 ach		2040	
Heating		**Heat generation system**	**Type**	**Heating fraction**	**DHW fraction**
		2-Heat pump(s)	0	100%	100%
		-	-		
		-	-		
		-	-		
Cooling		**Type**	**Unit**	**Seasonal performance factor**	
	Supply air cooling	-	-		
	Recirculation cooling	2-HP, e.g. according to EN 14825	01ud-Cooling - CH-36MES-230VO (Ducted)	8,2	
	Add. dehumidification	-	-		
	Panel cooling	-	-		

Notes for implementation Heating & cooling

Plan / sketch / image



As part of the 1st retrofit step, the existing heating and cooling system was replaced with an efficient air-air heat pump, with two ducted indoor split units, 1 on the ground floor and 1 on the first floor