

CHOOSING APPROPRIATE APPROACHES TO PASSIVHAUS RETROFIT

Sarah Lewis









CONTEXT

INTRODUCTION TO EnerPHit

ONE HIT PROJECTS

STEP-BY-STEP

LEARN MORE





CONTEXT

UKpassivhaus conference 2020

There are around 27.1 million dwellings in the UK, 80% of which will still exist in 2050*

We built just over 170,000 new homes last year** the highest in 11 years - THAT'S ONLY JUST OVER 0.5% OF OUR CURRENT STOCK

Even if every new home was built to the Passivhaus Standard this would not meet our climate obligations

We have no choice but to RETROFIT our existing stock to meet the targets set by the CLIMATE CHANGE ACT 2008 and the 2016 Paris Agreement

* B. Boardman, 40% House, Environmental Change Institute, 2005
** Ministry of Housing, Communities and Local Government, published figures October 2019





CONTEXT



35 seconds to complete each retrofit*

> * And this is only the residential buildings! (9.461e+8/27,100,000) ** Based on 4 people working for 6 months per project





2,000,000

People needed in

retrofit the industry

(currently 135,000)







"I want you to panic"

Greta Thunberg*

* Greta Thunberg (2019) 'No One Is too Small To Make A Difference', Penguin Random House Group.



EnerPHit

Launched in 2010 as the Passivhaus target standard for deep energy refurbishment of buildings

Uses the same five principles to ensure optimised building performance:

- Continuous thermal envelope
- Solar Gain in winter, solar control in summer
- Thermal Bridging-free
- Draught free (airtight)
- Ventilation through fresh filtered air with heat recovery

Importantly it requires whole building modelling through PHPP











EnerPHit

Heat Demand Method

	Heating	Cooling Max. cooling + dehumidification demand					
Climate zone according to PHPP	Max. heating demand						
	[kWh/(m²a)]	[kWh/(m²a)]					
Arctic	35						
Cold	30						
Cool- temperate	25	equal to Passive					
Warm- temperate	20	House requirement					
Warm	15						
Hot	- 14 I.						
Very hot	-						

Component Method

	Opa	aque envelo	ope ¹ agains	t	1	Windo	Ventilation						
	ground		ambient air		0	veral	l ⁴	Glazing ⁵	Solar load ⁶	ventilation			
Climate	Insu- lation	Exterior insulation	Interior in- sulation ²	Exterior paint ³	M	ax. he	at	Solar beat gain	Max. specific	Min. beat	Min. hu- midity re covery rate ⁸		
zone according to PHPP	Max. he	at transfer c (U-value)	oefficient	Cool colours	tı co (U _C	efficie	er ent _{lled})	coefficient (g-value)	solar load during cooling period	reco- very rate ⁷			
		[W/(m ² K)]))	[V	V/(m²l	()]	1	[kWh/m ² a]		%		
					C								
Arctic		0.09	0.25		0.45	0.50	0.60	$U_{g} - g^{*}0.7 \le 0$		80%			
Cold	Deter-	0.12	0.30		0.65	0.70	0.80	U _g - g*1.0 ≤ 0		80%	93 9 2		
Cool- temperate	mined in PHPP	0.15	0.35	ī	0.85	1.00	1.10	U _g - g*1.6 ≤ 0		75%			
Warm- temperate	from project	0.30	0.50		1.05	1.10	1.20	U _g - g*2.8 ≤ -1		75%	-		
Warm	heating	0.50	0.75		1.25	1.30	1.40	-	100		(2)		
Hot	and cooling degree days	0.50	0.75	Yes	1.25	1.30	1.40	-			60 % (humid climate)		
Very hot	against ground.	0.25	0.45	Yes	1.05	1.10	1.20				60 % (humid climate)		







Retrofit for the Future 2011 bere:architects





HBS

hamsonbarronsmith.com



Passfield Drive - Southern Housing Project Value: c £90,000 Completed: 2011 Project carried out with residents in situ

"As soon as the windows were installed, we felt the difference"

Retrofit for the Future 2011 bere:architects





HBS

hamsonbarronsmith.com



Grove Road - Hounslow Homes Project Value: c £100,000 Completed: 2011 Project carried out with residents in situ

The retrofit of their home towards the Passive House standard immediately resulted in reports from the occupants of significant health improvements.

Retrofit for the Future 2011 bere:architects







Kingspi



UKs first non-domestic Passivhaus Retrofit 2010/11 bere:architects Mayville Community Centre- London Project Value: c £1,700/sqm Completed: 2011

Analysis of the final costs showed that the renovation cost 7% more than if the improvements had achieved only the basic requirements for building regulation compliance

85% average total energy consumption reduction after retrofit





Ernerley Close

Cedar Court

Wilmcote House



Manchester

Glasgow

Portsmouth

2E Architects











HBS.

hamsonbarronsmith.com



Brodie Avenue - East Lothian Project Value: c £60,000 (for energy improvement works) Due to Complete: Dec 2020









singsn



























building

store

Kingspan





Kingspan.

ONE HIT PROJECT APPROACH





















green

store

building

Kingspan.























hamsonbarronsmith.com

HBS.



Kingspan

ONE HIT PROJECT APPROACH

























HBS

hamsonbarronsmith.com



St Sophia's, Galston Due to be one of the UK's first EnerPHit Schools

(RIBA Stage 2)

UKPassivhaus conference 2020





Suitability Assessment - Overall Rating Matrix

This sheet is intended to allow authorities to look at the significance of factors across the whole school, and therefore to make troubleshooting more straightforward.

School: St. Sophia's Primary School

Weighting Score out of 20	50% 12	15% 11	15% 12	10% 11	10% 6	11.2	
	General Learning & Teaching	Internal Social Areas	Internal Facilities	External Social Areas	External Facilities	Total:	
Functionality	В	С	В	с	D	В	
Accessibility	Ð	Ð	Ð	с	D	D	
Environmental Conditions	В	В	В	В	D	В	
Safety & Security	В	В	В	С	С	В	
Fixed Furniture & Fittings	с	С	С	С	Ð	с	
Total:	С	С	с	с	D	с	

Overall Suitability Rating =

С









St Sophia's Existing Energy Split kWh

St Sophia's Space Heat Demand









May

Jun

Jul

Aud

Sep

Oct.

Nov

Elec

Sum spec. gams solar + internal

UKpassivhaus conference 2020

Gains

500

450

400

350

Heat flows [k/\hh/(m²a)] 005 007 007

150

100

50

0

80.6

6.6

151.2

27.7

61.9

122.6

Losses



Ventilation

□ solar heat gains

internal heat gains

heating demand



-Sum spec. losses



kingspan

Existing School Building = 3.76



UKpassivhaus conference 2020



Option 1 = 3.31 a reduction of 12%

Option 2 = 3.19 a reduction of 15%







HBS

hamsonbarronsmith.com









Kingspa















HBS.

hamsonbarronsmith.com

Industry figures



One off projects: optimistically £45-55k per unit (when applied at scale)



Blocks of tenements: £37k per unit (when applied to a whole block)



Multi storey flats: £20k per unit or £290/m² (energy improvement works)





hamsonbarronsmith.con









green

store

building

Kingspan

STEP-BY-STEP EnerPHit

The Step-by-Step accreditation process was launched in 2016, it offers a long term route to certification over multiple phases

Buildings are already upgraded in a step-by-step manner over time, across all sectors local authorities have capital expenditure programmes carrying out modernisation works continuously, as do private individuals and housing associations

How can this be capitalise on this to prevent locking in poor performance?





STEP-BY-STEP EnerPHit







Kingspa

from year

Immediate replacement 2031

> 2036 2037 2021

STEP-BY-STEP

Scheduler for Retrofits (EnerPHit Retrofit Plan ERP)

	Retrofit										2	3		4 5			up to x	up to x	up to x	from x	until ve	ar	until vear	until vear
Assemblies	Last renewal	1950 1955	1960	1970	1975	1980 1985	1990 1996	2000	2005 2010	2015	2017	2020	2030	2035	2045 2045 2050	2055	Main- tenance	Smaller	Extensive	Immediate replacemen t	Main-ten	ance	Smaller repairs	Extensive
Render facade	1976													X			20	35	55	55	1996	3	2011	2031
Facade decoration																	20	40	60	60				
Balconies/Loggias	1976													X			20	40	60	60	1996	6	2016	2036
Exterior door	1987													X			15	35	50	50	2002	2	2022	2037
Pitched roof covering	1956																40	55	65	65	1996	6	2011	2021
Flat roof																	20	30	-	30				
Roof weatherings	1987											X					15	45	-	45	2002	2	2032	
Window	1976										Х						15	30	50	50	1991	1	2006	2026
Blinds / sun screens	1976										X						15	30	40	40	1991	1	2006	2016
Basement ceiling	2025											X					20	30	50	50	2045	5	2055	2075
Boiler	2015																10	15	20	20	2025	5	2030	2035
Ventilation	2017										Х						10	15	20	20	2027	7	2032	2037
Solar thermal system	2040								ĺ					X	C		10	15	30	30	2050)	2055	2070
Airtightn. test: X, Leakage se	earch: (X)										(X)	(X	5	x										
		Init X Re	ial co trofit	ondit	ion		M te Si	lain- mance malle	e r			E: re In re	xtens pairs nmed place	ive liate eme	nt									





STEP-BY-STEP



No regrets!

SHALLOW RETROFITS DEEP RETROFITS







Kingspan

STEP-BY-STEP EnerPHit



building fabric. Monitoring & surveys may be invaluable.

that sets out ALL feasible upgrade measures in an order that does not prohibit further improvements.

approach that spreads both costs & potential disruption. Sequencing is key!

EnerPHit - modelling the building to help set & assess targets for your upgrade is useful

adopt the recommended component values (or better.)



UKpassivhaus conference 2020







Want to Learn More...

https://passivhaustrust.org.uk/competitions_ and_campaigns/passivhaus-retrofit/

Ernerley Close

Woodside Multi-storey Zetland Road



Bowman's Lea

Refurbishment of 2 blocks of flats for Tower block refurb & community One Manchester HA

A pair of Victorian semi-detached regeneration for Queens Cross HA. houses certified to EnerPHit Plus

The Barrel Store

Wilmcote House



Step by-step refurb of a council tower block with residents insitu. Part of the EuroPHit project.

Hiley Road

Historic Colswold stone building

converted into a Yourth Hostel.

Passmore Street

Step-by-step retrofit of a 1970's

3-storey mid-terrace.

Cre8 Barn





Standard.

Victorian mid-terrace to Passivhaus Ugrade of privately rented historic grade II listed terrace in London.

Derelict cow byre transformed into an all-purpose educational centre.







HBS

Want to Learn More...

The Trust is currently involved in the following retrofit projects:

The **Demonstration of Energy Efficiency Potential (DEEP) retrofit** study in conjunction with Leeds Beckett University (2020-21). BEIS-sponsored research.

A <u>Whole House Retrofit</u> project in conjunction with Renfrewshire Council (2020-21). BEIS-sponsored research

<u>Retrofit Workstream</u> in partnership with LETI, RIBA and the AECB. Examining retrofit aims and how that could scale across the UK in terms of overall energy savings.



UKPassivhaus conference 2020

A HEALTHY & GREEN FUTURE

THANK YOU







LEAD SPONSORS