

# CAN PASSIVHAUS BE AFFORDABLE, AND WILL IT BE THE FUTURE FOR BRITAIN?

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## INTRODUCTION

According to The Department of Business (2020), the residential sector emitted 67.7 MtCO<sub>2</sub>, equating to 20.8% of the UK's territorial carbon emissions. These figures are in relation to heating homes, and cooking; they do not comprise of emissions linked to electricity use. The document also discloses that since 1990, the emissions produced by the residential sector have decreased by 13.5%. So, what are the Government plans to reduce this to net-zero by 2050?

The research formulated from this paper will contribute to the design of a multigenerational building that incorporates residential apartments, a care home, a primary school, a nursery, and a café. The findings of this paper relating to high thermal performing materials and their economic viability will be used to insulate the residential properties on site.

Passivhaus is renowned for being a tough certification to achieve, performance-wise and financially. This can often be a reason why this standard is overlooked but social Passivhaus developments have been engineered through innovative and collaborative design. Thus, this paper aims to investigate why Passivhaus is not more widely used in the UK.

## OBJECTIVES

- No.1** To compare the Passivhaus standard and the Approved document Part L.
- No.2** To research and identify the most economically viable materials and methods of achieving good thermal performance.
- No.3** To gain an understanding of the public's knowledge and perception of sustainable housing.

## WHAT IS PASSIVHAUS?

Emma Walshaw (2020, p.5) describes Passivhaus as "a low energy design standard, that achieves exceptionally comfortable buildings with minimal carbon emissions". For a building to be classed as a 'Passivhaus', it must first be certified by the Passivhaus Institute or a specialist third party (Olivia, 2021).

## FUTURE HOMES STANDARD

In 2019 the Ministry of Housing, Communities & Local Government released a document called the 'Future Homes Standards' (FHS) that disclosed proposals for changes to Part L and Part F of the building regulations to increase the energy efficiency of new builds. These proposed changes mainly impacted a new dwelling's thermal performance and airtightness. In January 2021, the Government responded with amendments to the Approved documents inline with the requirements set out in the FHS.

## PASSIVHAUS VS PART L: U-VALUES

ELEMENT	PART L (W/m <sup>2</sup> K)	PASSIVHAUS (W/m <sup>2</sup> K)
ROOF	0.16	0.15
WALL	0.26	0.10-0.15
FLOOR	0.18	0.10-0.15
PARTY WALLS	0.20	0.6
WINDOW	1.6	<0.8
DOOR	1.6	0.56

## GOLDSMITH STREET

Goldsmith Street is a solar gain driven, social housing development situated in Norwich, comprising of 93 Passivhaus certified homes. The development was completed in 2019 and in the same year, it was the winner of the Stirling Prize (Passivhaus Trust, n.d). The characteristics of the site allowed Mikhail Riches to solve a fluid, south-facing design to effectively utilise solar gains to the most potential

## AGAR GROVE PHASE 1A

This development in North London won at the UK Passivhaus Awards 2021 in the large projects category. This project was designed for Camden Council and aims to tackle fuel poverty on the existing estate and create a good sense of wellbeing (Passivhaus awards, 2021).

## METHODOLOGY

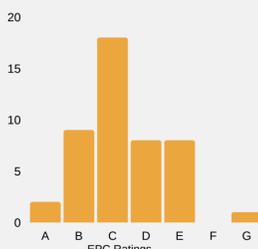
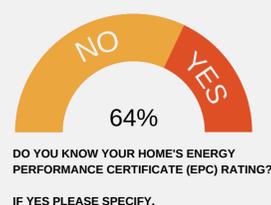
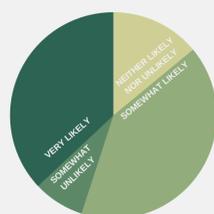
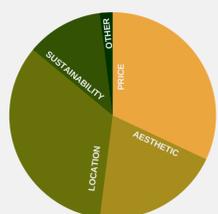
Creswell and Creswell's Research design outlines four philosophical worldviews. Two of the worldviews are seen to be present within and align with the objectives of this research paper such as constructivism and pragmatism.

This paper has followed the theme of constructivism as this theory relates to the third objective. As part of this research, gaining an understanding of how the public perceives and values their home's thermal performance was key to formulating a theory.

When collating and analysing the data received from members of the construction industry regarding the most sustainable methods of insulating a home, the pragmatic view may suggest that the most highly performing materials may not be the most effective approach when compared with their economic viability.

To formulate a better understanding and respond to the objectives of this paper, a questionnaire was circulated. Social media played a huge role while distributing the survey. Platforms such as LinkedIn, Instagram, and Facebook were used to promote and invite people to respond to the survey. Using multiple platforms meant the survey could gather information from different people in different roles as the survey aimed to gather conceptions from outside the built environment. This resulted in a medium sample size of 108 participants which included people from a range of different backgrounds and construction industry professionals. The questionnaire included open and closed-ended questions.

## RESULTS



## WHAT IS THE MOST SUSTAINABLE WAY OF INSULATING A PROPERTY?

One with high performance credentials and that is sourced locally and can be reused or repurposed and does not spoil any materials it touches

SIP panels. Pre-fabricated insulated timber wall panels.

From a material perspective - natural insulation like sheep's wool, hempcrete, mineral wool, cellulose etc.

Making the property airtight to prevent air leakage, using a fabric first approach with high levels of insulation that exceed building regulations

## DISCUSSION

### Comparing Approved Document Part L and Passivhaus

It is evident the most recent Approved Document: Part L (2021) is substantially more efficient than previous years and from reading the Future Homes Standards consultation and the response there is some effort being done to reduce the residential sector CO<sub>2</sub> emissions. It was also clear that the FHS proposed similar principles to Passivhaus but unfortunately were not given the green light.

The government opting for option 2 of the FHS, does cause some concern for the future regarding increased building costs which will inevitably cause property prices to soar. Will there be legislation brought out to tackle this? It comes with no surprise that it's only councils that seem to be progressing Passivhaus developments, why? Housing developments are too profit-driven

### Identifying the most economically viable materials and methods of achieving good thermal performance

The survey allowed to gather information and the opinion of people who work within the built environment. With the help of the feedback and relevant case studies, a middle ground of achieving high thermal performance and cost was able to be established for the multigenerational project. Many participants suggested methods that would not affect the construction cost, such as good detailing, designing out thermal bridges etc.

Also, Emma Walshaw's 'understanding Passivhaus'(2020), someone suggested using non-flammable rigid insulation, which Walshaw details that using rigid insulation in conjunction with high levels of wall insulation, creates a great airtight barrier and achieves a high thermal performance.

MATERIAL	AVERAGE COST	PROS	CONS
Sheep's Wool	EEEE	Eco Friendly, Absorbs moisture, non-flammable, long lasting	Lower thermal efficiency, requires treatment, expensive, specialist installation.
SIPs	EEEEE	Energy efficient, airtight, structural integrity, minimal waste, fast	Prone to damp, expensive, ventilation issues
Cellulose	E	Eco friendly, high thermal performance, fire resistant	Short supply, specialist installation, moisture issues
Hemp Insulation	EEE	Renewable material, pesticide is rare	Contains toxins, thermal conductivity can increase over time
Wood Fibre	EEE	Breathable, recyclable, retain original size, good level of insulating	Costly, not as common
PIR	EE	highly insulating, can be water resistant	Gaps between boards, precision needed when installing

### Gaining an understanding of the public's knowledge and perception of sustainable Housing.

From the survey results, the public does have a good general understanding of what a 'sustainable home' means. However, it was evident that most of the participants did not think of 'sustainability' as being one of their priorities while looking to purchase a home. Contrary to this when asked if they would go beyond their property budget if it meant they would save on bills, the majority chose either somewhat likely (41%) or very likely (37%). Does this mean people would only opt for a more sustainable option if it meant it would benefit them more so than the environment?

The survey also brought to light that over half (64%) of the participants did not know their home's energy performance certificate. From researching further on how and when EPCs are obtained, the Gov website (n.d) states that they are only needed when a property is built, sold, or rented which in some cases could be over a decade before a new one is carried out. However, this information is readily available online, but the survey results could back that this may not be a known resource.



## CONCLUSION

It is not ultimately clear why Passivhaus is not more widely used in the UK, but what this research has proved is that it is on the rise. However, it is clear that the standard is mainly used by councils. Passivhaus is a great way of providing affordable living for residents and maybe councils will start setting the trend amongst property developers.

The FHS had similar principles to Passivhaus but wasn't quite met with enthusiasm in parliament and many proposals were turned down. The government should be pushed to persuade more developers to produce more energy efficient homes without the eye watering prices.