# PassivHaus: Building it right.

We can all agree that it's been difficult not to fall victim to the news fatigue in recent months. While there is a lot we cannot control, as architects and designers, we can help you create a home that can significantly benefit you and even counteract the strain on our environment. How? By designing and building to Passivhaus Standard. Together with **QODA Consulting**, we've outlined what the Standard entails and the benefits of adopting it.

## What is Passivhaus?

As you embark on your home building project, you want the home you build to last. The Passivhaus Standard ensures a long building life by focusing on the internal temperatures of the house. Unlike typical homes with drafts and temperature fluctuations throughout the house, a Passivhaus is built to have a constant comfortable temperature all year around in every room. This approach ensures that you're warm and comfortable in the winter, and cool in the summer, with a supply of fresh, filtered air throughout the year, compensating for poor external air quality[2,3].

*The Passivhaus Standard ensures a long building life by focusing on the internal temperatures of the house.*

The constant temperature, or 'thermal comfort', is achieved through high-quality construction of the building fabric (windows, walls, roof, floor) and careful management of moisture in the home. When we eliminate the temperature fluctuations throughout the year, you won't be resorting to constantly putting the heating on and off. Homes, that by design, maintain this continuity are proven to be highly efficient with significantly lower utility bills. A welcome feature with the increasing energy prices[4]! As a result, CO2 emissions of the house are dramatically lower too[5] – again these can be zero, or even negative, meaning that the house actually benefits the environment and makes you a profit[6].

A recent academic study suggested 80% savings in space heating energy even when retrofitting to Passivhaus, and overall reductions of 50-70% in energy consumption when comparing a new-build conventional house with a new Passivhaus[7], all while offering considerably higher and more comfortable winter air temperatures and better air quality. No other building standard consistently ensures these tangible, measured outcomes.

## How do we build it right?

In a word: quality. The Passivhaus Standard is focused primarily on the building envelope (windows, walls, roof, floor) and architecture, rather than adding expensive and complex systems to the house. We design and build the envelope to the highest standards of quality and efficiency to meet the Standard. To carefully monitor the high standard of the design and build, we use u-values, which measure how much heat passes through the building's structure. The lower the u-value the better the quality and less heat passes from the outside to the inside and vice versa. The u-values of a Passivhaus house typically around half that of a regulations-compliant house, while airtightness is sometimes as much as ten times better. With so little air escaping that it is barely detected by the air permeability measuring tools[8].

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[1] http://www.passivhaustrust.org.uk/what_is_passivhaus.php

[2] https://www.bbc.co.uk/news/health-43964341

[3] https://www.theguardian.com/environment/2018/may/24/air-pollution-worse-inside-london-classrooms-than-outside-study-finds

[4] https://www.gov.uk/government/statistical-data-sets/monthly-domestic-energy-price-stastics

[5] https://passipedia.org/operation/operation_and_experience/measurement_results/energy_use_measurement_results

[6] https://passivehouseplus.ie/magazine/new-build/all-bales-no-bills

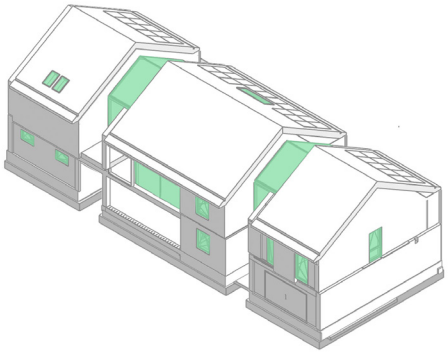
[7] http://eprint.ncl.ac.uk/fulltext.aspx?url=242819%2F41427D4B-47FA-42CF-B321-689F482A1481.pdf&pub_id=242819&ts=636516782130580331

[8] https://www.sciencedirect.com/science/article/pii/S0378778817322612

# Designing it right

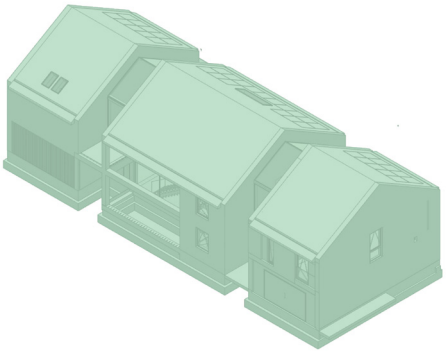
With our goal of maintaining comfortable temperature all year around, we carefully consider every aspect of design and how it will affect our target. We will explore various options and constantly circle back to the goal and how the changes have impacted it. Having such a specific target encourages problem-solving and creativity, as we will never compromise your needs to reach it and instead will explore a variety of solutions until you are happy with the design of your home.

Some of the specific aspects of the architectural design we will address with care are:



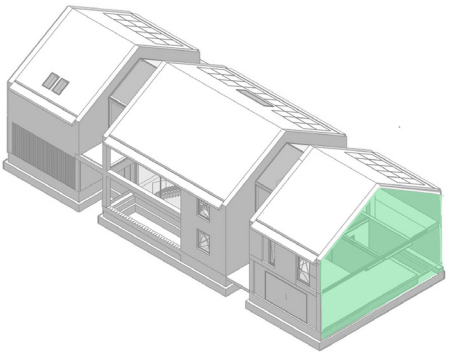
## WINDOWS

These must be triple glazed to ensure winter comfort for you, and to minimise energy consumption. They also must be carefully sized to make the best use of warmth from the sun in winter and to help avoid overheating in summer.



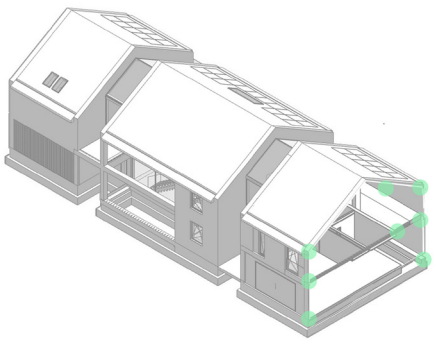
## U-VALUES

By consistently lowering the u-values, or the heat lost through the building's structure we make sure less heating is required and consequently less heating costs!



## AIRTIGHTNESS

Avoiding unwanted winter air leakage is essential for durability, comfort and energy consumption. This leakage is all but eliminated through careful design and construction of a Passivhaus.



## THERMAL BRIDGING

Different elements of a house will conduct heat at different rates, for example steel beams can act as a bridge and transfer heat from the outside in and vice versa. This aspect of building design is unfortunately often overlooked and is frequently the culprit for buildings using more energy than expected to. We can limit and even eliminate this transfer of heat by carefully designing the junctions of such elements and properly insulating them. The result is low energy consumption, higher comfort, and no opportunity for mould or damp.

# Construction essentials.

### BUILDING SERVICES

These systems include heat-recovery ventilation systems and high-efficiency hot water systems, among others. These add to the architectural features to complete the low-energy, high-comfort picture.

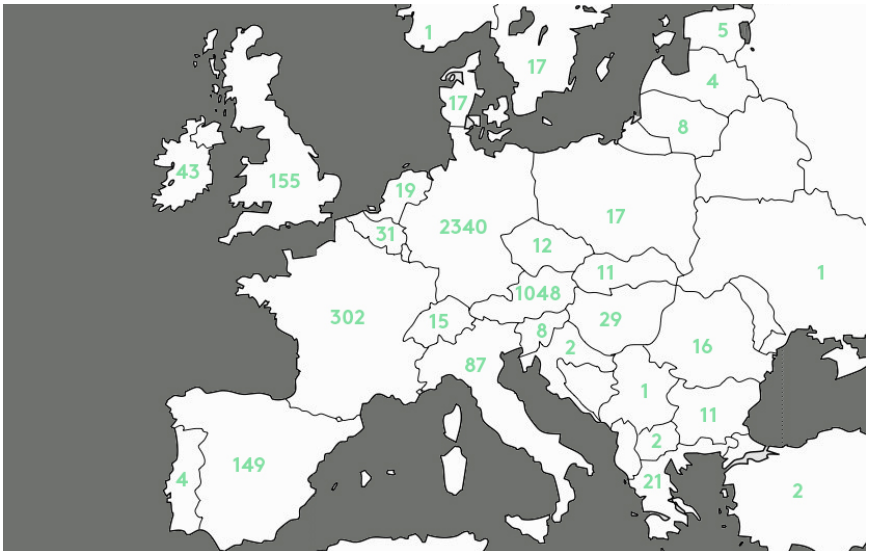
### CONSTRUCTION

Once the house has been carefully designed to the Passivhaus Standard, it must then be built with care and attention to detail, to ensure that the intended design is delivered in practice. An example of this is that most Passivhaus homes have at least two air pressure tests to validate their construction quality, whereas conventional homes have a single test at the end, which often confirms their lack of quality, but too late! A Passivhaus quality champion is usually appointed within the contractor team, to ensure all aspects are delivered as designed.

# Build it right – why not?

In previous years, there have been wild headlines associated with the apparently higher costs of the Passivhaus Standard when compared with a typical UK home – citing for example 15-25% higher capital costs. Thankfully those headlines have been largely debunked, and the UK construction industry has made significant progress. Recent homebuilding projects where architecture is optimised to the Passivhaus Standard have reported moderate or no uplift in capital cost. Specialist publications like Passivhaus Plus magazine (**www.passivehouseplus.ie**) regularly publish full costings of their example projects to demonstrate this. Added to this, occupants of Passivhaus homes almost universally agree that their home was excellent value, and they would never build or live in a conventional house again.

As a result, the construction of Passivhaus homes is accelerating rapidly in the UK, as we begin to catch up with Europe in developing high quality, high comfort, energy-efficient buildings.



Number of PassivHaus homes by country. (Source: https://passivehouse-database.org)

The final piece of the jigsaw is the bigger picture: in a time of unprecedented challenge to the way we live and our impact on our environment, building a Passivhaus is the only sure-fire way of leaving a legacy of low, zero or below-zero environmental impact.

**HollandGreen Architecture, Interiors & Landscapes** together with **QODA Consulting** can help you design and build your home to the PassivHaus standard.

Get in touch to learn more about the services we provide and how we can help you.

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