# Passivhaus 101
# Treated Floor Area

Mark Stephens CPHD RIBA MRIAI

# The basics

1. The **Space Heating Energy Demand** (ie The amount of active heating input required to heat a building usually expressed in kWh/m2/yr.) is not to exceed 15 kWh per square meter of net living space (treated floor area) per year or 10 W per square meter peak demand.

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*Passivhaus* buildings are planned, optimised and verified with the Passive House Planning Package (PHPP).

# The Principles

1. **The Building Envelope**

A Passivhas has high levels of insulation with u-values (calculated previously) around:

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**4. Controlling Solar Gain!**

You also require thermal comfort & not be TOO HOT!

# The Principles

**5. Thermal Bridge Free Detailing**

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**6. A Passivhaus has fresh air with heat recovery**

In order to provide consistent, vlean fresh air – MHVR is utilised

# Optimising your design

## 1. Orientate

**The ideal orientation is east-west  and maximising the south façade**

**Within 30 degrees of south will also maximise the solar gains**

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## 2. Area & Form

**We will be looking next at the Treated Floor Area**

**And the Form Factor**

# Treated Floor Area (TFA)

All Heat losses and gains in a Passivhaus refer back to a key area of the building called the:

Treated Floor Area (TFA)

This basically is the livable or useful space. You could think of it as the area that is carpeted or tiled.

This is probably the most important figure in all of Passivhaus.

# Treated Floor Area (TFA)

The Rules:

| Include at 100% (if within thermal envelope and ≥2m high) | Include at 50% or 60% only | Not included |
|---|---|---|
| Living and circulation space | Areas between 1m and 2m high can be counted at 50% (if usable) | Areas < 1m high (for example under staircases) |
| Window reveals which are floor to ceiling and ≥130mm deep | If habitable rooms occupy <50% of a floor, i.e. basement, then all adjoining rooms and circulation can only be included at 60% (the habitable room may be included at 100%) | Doorways |
| Stair landings and heads | | Window reveals that are not floor to ceiling or window reveals which are floor to ceiling but not ≥130mm deep |
| Built-in baths, storage, plinths, skirting boards | | Stairs or steps with more than 3 rises |
| Basements if they have habitable rooms occupying >50% of the total basement | | Areas outside the thermal envelope |
| Walls/elements <1500m high | | Walls/elements >1500mm high |

Image from PHPP Illustrated : Sarah Lewis

# Treated Floor Area (TFA)

The Rules:

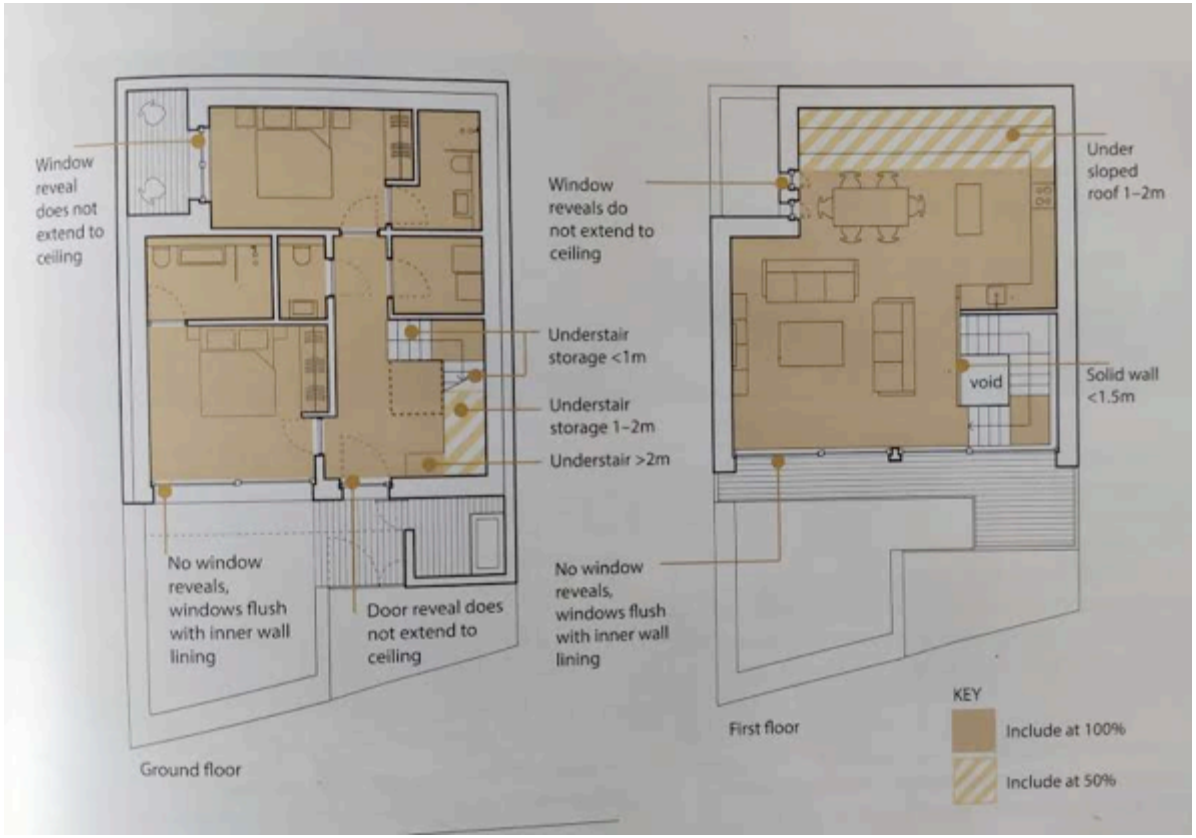



Image from PHPP Illustrated : Sarah Lewis

# Heat Loss Form Factor

The more compact a building is, the easier it is to be energy efficient.

**The Heat Loss Form Factor is a measure of compactness and an indication of how much insulation will be required to achieve the Passivhaus Standard.**

# Heat Loss Form Factor

Passivhaus Basics

**Heat**
**Escape**
**Lessening**
**Position**

elrondburrell.com/blog/passivhaus-heatloss-formfactor

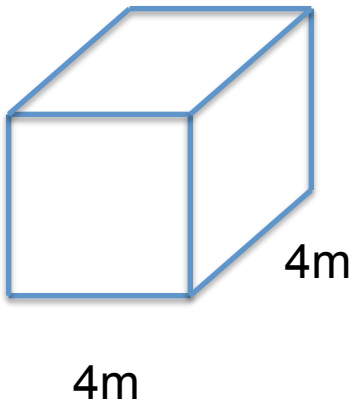
Image via http://www.maritimenz.govt.nz/

# Heat Loss Form Factor

## Calculation:

Heat Loss Form Factor = Heat Loss Area / Treated Floor Area

## Example:




Wall thickness of 0.5m

Therefore Treated Floor Area =
3m x 3m = 9m2

https://elrondburrell.com/blog/passivhaus-heatloss-formfactor/

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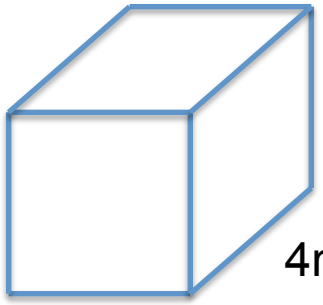


External surface area = 4 x 4 (16) x 6 (faces)
= 96m2

TFA = 9m2

Heat Loss Form Factor = 96m2/ 9m2
= 10.66

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# Heat Loss Form Factor

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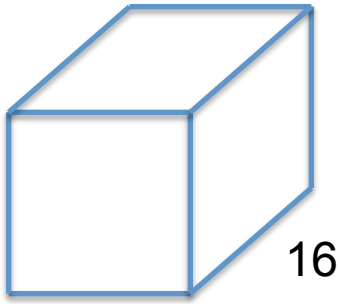
## Example 2:



16m

16m

External surface area =_____

TFA = _____

Heat Loss Form Factor = _____m2/ _____m2

=

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# Heat Loss Form Factor

Result:

The Heat Loss Form Factor is a number generally between 0.5 and 5, with a lower number indicating a more compact building. Passivhaus buildings aim to achieve 3 or less. Once the Form Factor is over 3, achieving the Passivhaus Standard efficiently becomes noticeably more challenging.

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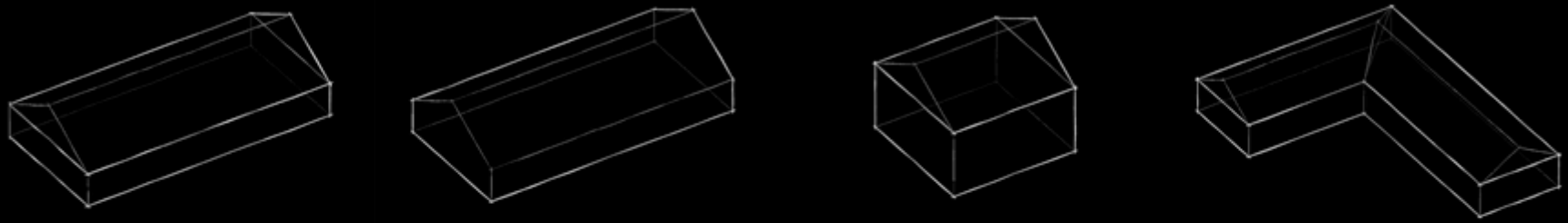
# Heat Loss Form Factor

TFA = 200m²



| Single storey Insulated ceiling | Single storey Insulated roof | Two Storey Insulated ceiling | Single storey L Insulated ceiling |
|---|---|---|---|
| 3.7 | 4.1 | 2.9 | 3.9 |

elrondburrell.com/blog/passivhaus-heatloss-formfactor

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# Heat Loss Form Factor

Passivhaus Basics

## Required U-value
## vs
## Heat Loss Form Factor

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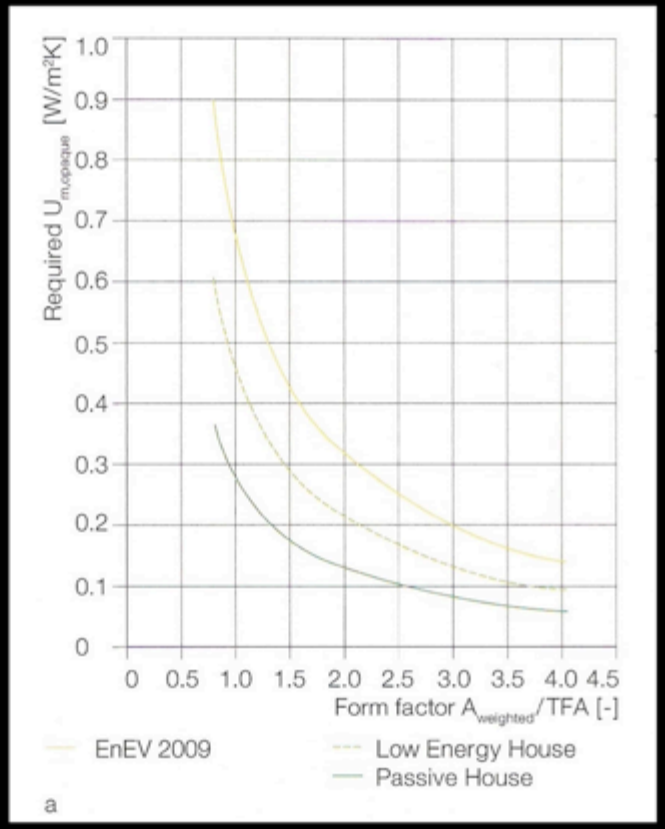


Graph: Gonzalo & Vallentin, Passive House Design

i.e halve the heat loss area and you can halve the required u-value (linear relationship)

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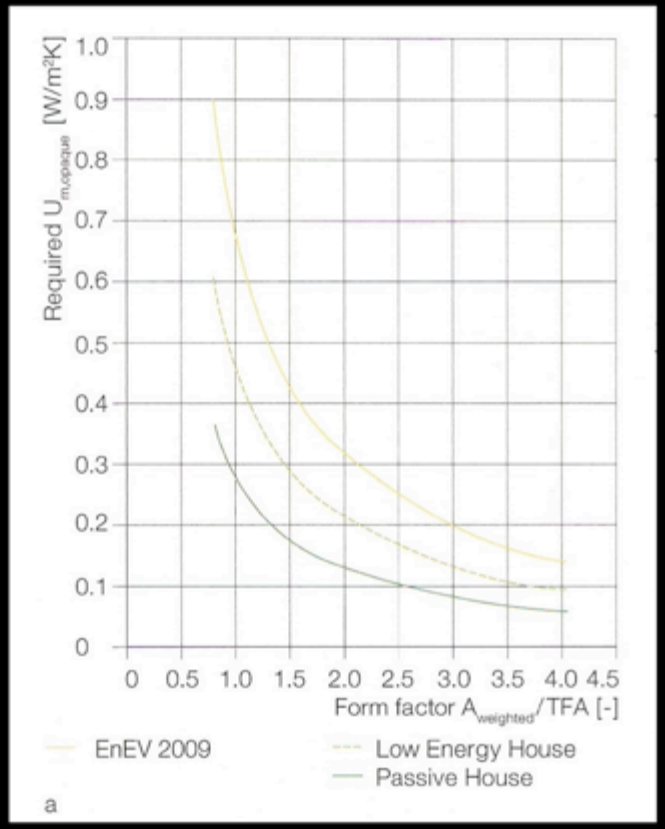


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i.e Passivhaus buildings do not necessarily require thick levels of insulation if designed well

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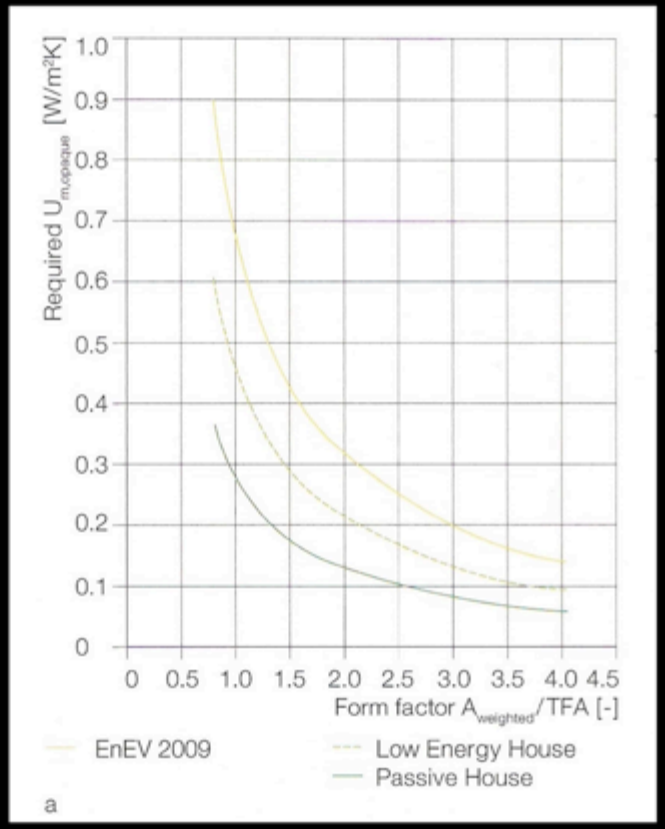


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In simple terms, if the Heat Loss Area of one option is twice that of another option, the insulation will need to be twice as thick!

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