

Building Low Maintenance Ultra low energy Passivhaus and other! homes.

- **Derek McIlreavy**
- **Business Development Manager.**

We have arrived!!







“A modest masterpiece” is
how the RIBA Stirling prize
judges described the project

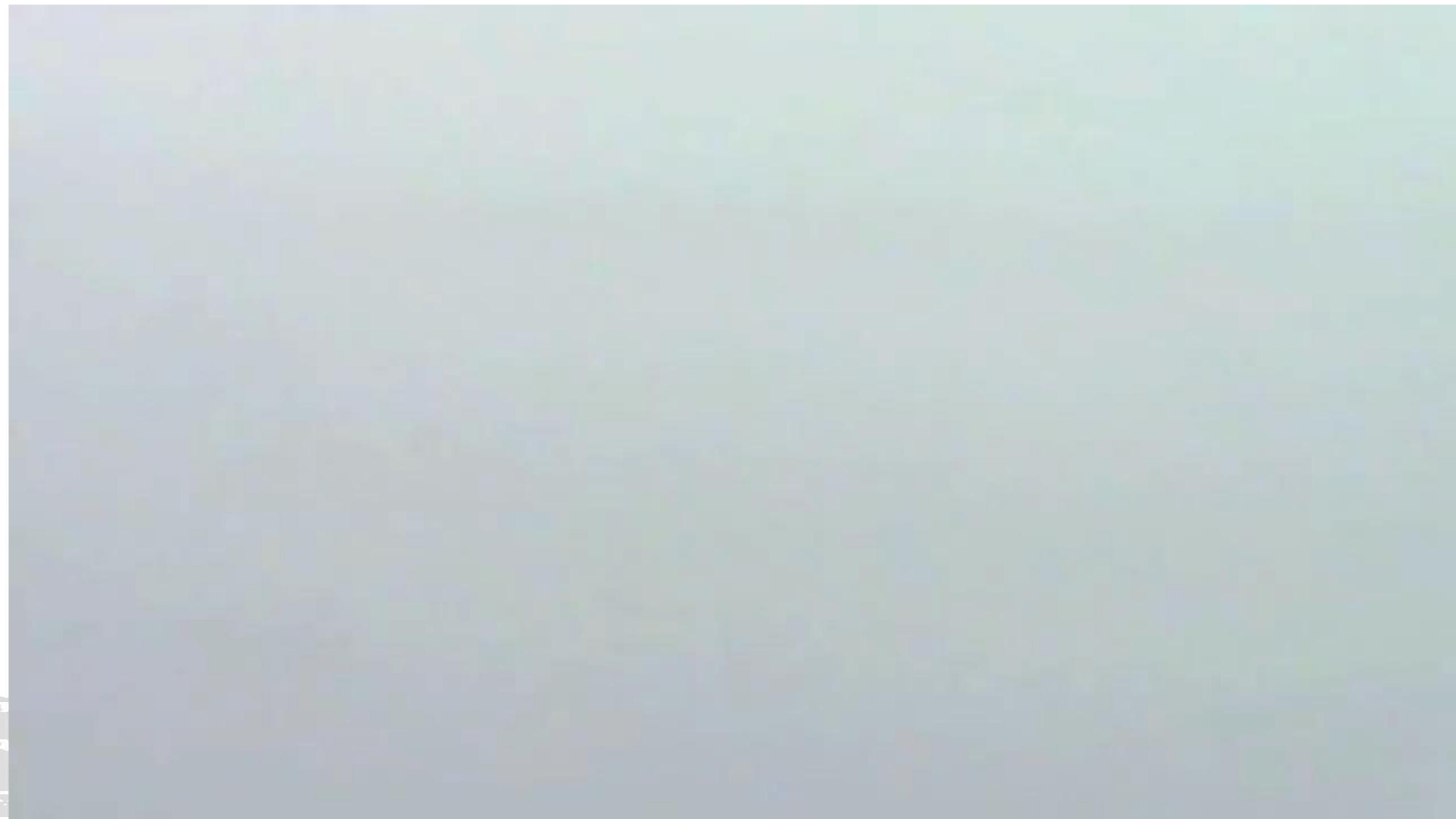
Passivhaus in Glasgow

- **Councillor Susan Aitken, leader of Glasgow City Council**, said:
“Cunningham House is, without doubt, a landmark in how we build homes in Glasgow. These are the first properties in the city to use the Passivhaus design— a pioneering standard of house building used in parts of Europe and North America which require very little energy for heating and cooling.
- “The extremely high construction standards will bring a host of benefits to residents, including lower fuel bills, improved air quality, a more comfortable living environment and reduced CO2 emissions. I have always said that climate and social justice should go hand in hand and by tackling climate change and fuel poverty Passivhaus does just that.
- “I’m delighted this Shettleston Housing Association development could be supported through our Affordable Housing Supply Programme and we will see many more housing developments in Glasgow using Passivhaus in the years ahead.”



So, what “is” Passivhaus?

- “Passivhaus buildings provide a high level of occupant comfort while using very little energy for heating and cooling. They are built with meticulous attention to detail and rigorous design and construction according to principles developed by the Passivhaus Institute in Germany, and is certified through an exacting quality assurance process.”
- Wolfgang Fiest



The five Principles of Passivhaus

Insulation expertly used and fitted to create high thermally efficient walls roofs and floors

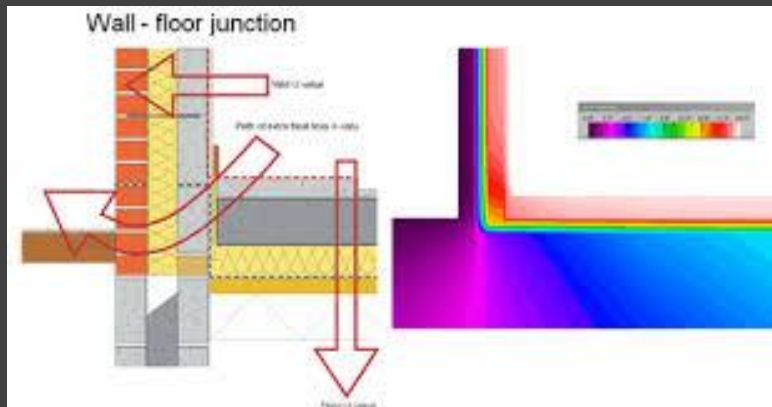
Removal of Thermal Highways during the design process

Triple glazed high efficiency glazing units, Solar gain/ Solar shading.

Very strictly controlled Air tightness

MVHR – Mechanical Ventilation Heat Recovery

Thermal Bridges & Highways



Using the PHPP planning system all thermal bridges are designed out as they will effectively suck heat out of the building creating cold spots.

Very careful thought given to the choice of construction materials and the manner they are used ensures that as homes are built the components are fitted as designed to ensure that no direct thermal transfer paths exist between indoors and the environment outside.

PHPP planning package ensures that we know where any such risk spots will be before we commence any construction

All materials and finishes are selected based on their ability to meet the very strict performance criteria demanded for Passivhaus

Windows doors and Glazing units

Very careful design and selection of the windows and doors takes place to ensure that by having the correct orientation to the sun we take advantage of Solar gain during colder months however shading is adopted to seek to minimise overheating during the warm months by paying attention to the sunlight angles

Selecting very low maintenance window options such as Aluclad we fit a window system that offers all of the advantages but returns low maintenance costs.

Very special attention is paid to the doors used with double and triple seal door systems that offer very long life cycles with little to no maintenance schedules but comply with thermal needs and security in use.

Air Tightness

One of the more crucial design aspects getting rid of draughts!

ATT is done from almost “built shell stages”

Repeated as the build continues to ensure compliance

Logged and data used as part of certification process as a critical aspect.

Trained staff control the build stage to ensure all staff on site follow strict guidelines in the build process to reach very low levels of air transfer both under vacuum and under pressure

Insulation.



Selected for environmental low carbon manufacture as well as super high efficacy



Installed by trained and educated build teams to ensure no gaps voids and open spaces



Durable and sustainable supply chain options

MVHR Mechanical Ventilation Heat Recovery



Very simple in concept – Do you use the heater in your car?



Very few moving parts super reliable in operation

Service items are 2 x replacement air filter elements annually



Exceeding 94% heat recovery levels providing filtered pre-warmed air, in place of internally stale higher CO level environments



Near silent in operation when installed correctly



Very user friendly with no need for user adjustments in normal operation

How does any of this relate to your new homes?

A building standard that is truly energy efficient, comfortable, affordable and ecological at the same time.

Passivhaus is not a brand name, but a construction system, that can be applied by anyone, and has stood the test of time over 27+ years.

Up to 90% energy saving compared with typical existing housing Carbon footprint reduced 35>40%

60-75% energy saving over current “design” new build housing

MVHR Fresh air ventilation system to provide a healthy indoor environment

Life-time costs are dramatically reduced, allowing fuel poverty to be eliminated, and rent arrears reduced

Eildon



Stewart & Shields
SITE SAFETY
CHILDREN MUST NOT PLAY ON THIS SITE
High visibility jackets must be worn
Safety barriers must be used
No unauthorized access
Keep out

Danger
No unauthorized access
Keep out

Stewart & Shields
SITE SAFETY
CHILDREN MUST NOT PLAY ON THIS SITE
High visibility jackets must be worn
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Keep out

Stewart & Shields
Building Contractors


www.gandjgroundworks.co.uk

ACHA



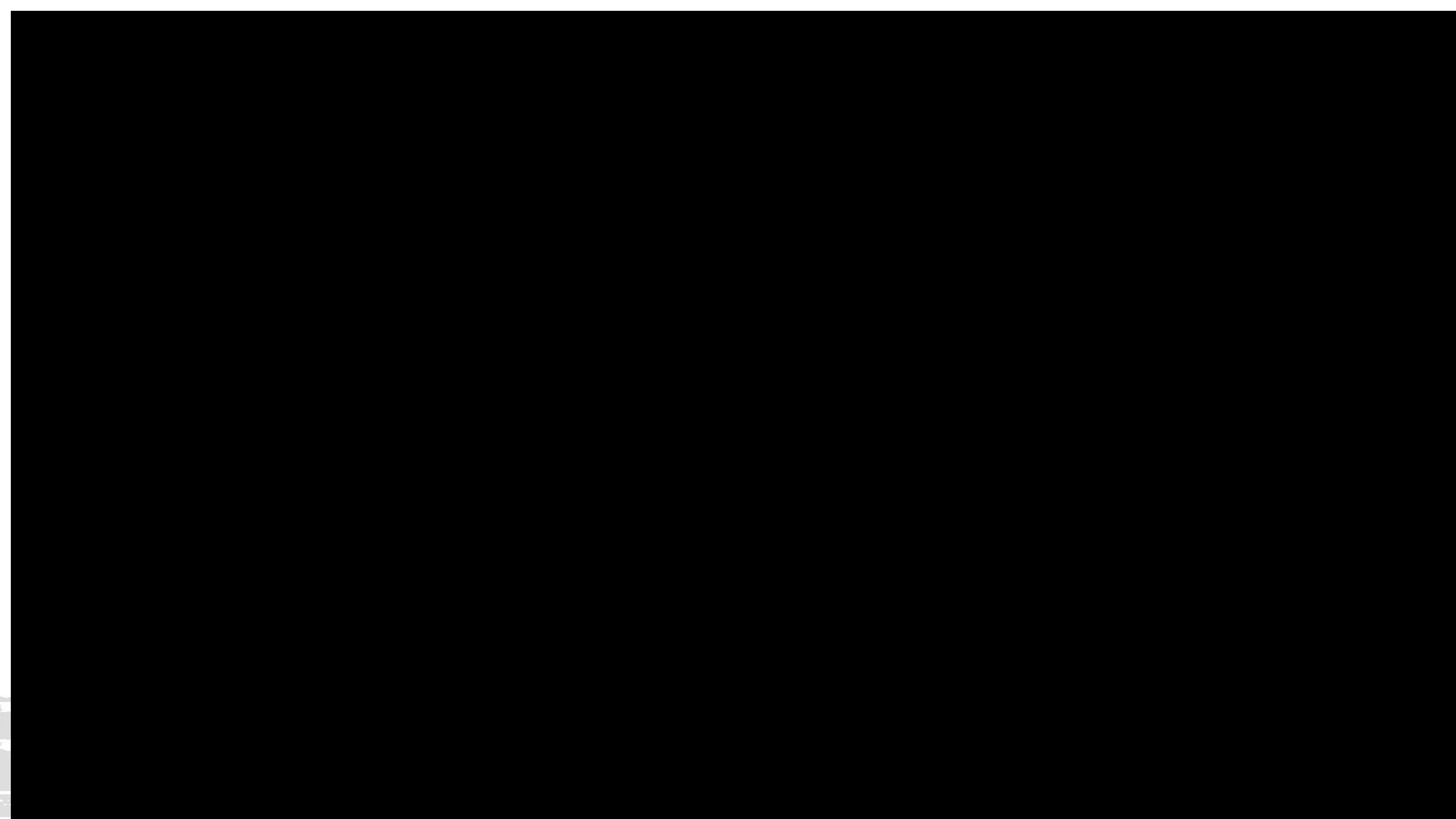


Loreburn



Nith
Valley
Leaf Trust

Stewart
& Shields
Building Contractors
SITE SAFETY
ALL VISITORS AND OPERATORS MUST WEAR A HARD HAT
CHILDREN MUST NOT BE ON SITE AT ANY TIME





Passivhaus – Or????

- Certified Passivhaus is not the only method to create low energy homes
- Energiesprong in trial with Eildon
- Near Zero energy buildings
- Glasgow Gold standard
- Modular Construction



Energiesprong



Build Strategy without any barriers to achievement



Clear heat energy usage agreed on the house



Contractor warranty to ensure homes can perform



Uses additional technology

Air Source / GSHP
Solar Heat / power
MVHR
Battery Storage



Offer a retrofit simple solution for existing stock

Glasgow Gold Standard

- Designed to reduce carbon 20%
- No design criteria
- No external certification or verification
- Reliance on technology
- Does not adopt fabric first
- Will still require upgrading to future standards

terrain from google maps

thermal envelope

easy change of orientation

shading elements

windows from database

designPH interface

designPH main

designPH 2.7.0 beta

The 'Re-initialise model' button reloads all the library files and updates the option lists in all window components. This process is quite slow. This should only be required if something has become corrupt or you have added a user-defined frame or glazing type.

Update window options | Redraw windows

Übersicht | Neigung | Flächen | U-Werte | U-Werte | angucken | Komponenten | Einheiten | Klima

Jahresheizwärmebedarf

▼ Jahresheizwärmebedarf

Gesamte Wärmeverluste (kWh/a)	Summe persön. Gewinne (kWh/a)	Nutzungsgrad	Energiebezugsfläche (m²)	Heiz
6290.13	5743.46	0.94	111.34	

▼ Transmissions-Verluste

Summe thermische Hülle (m²)	Gewichteter U-Wert nach Fläche (1/(m²K))	Mit Temp. Faktor	Heizgradlage pro Jahr (h/24)	Transmissions-Verluste (kWh/a)	Heiz
403.38	0.19	0.81	81.00	6775.18	

▼ Lüftungsverluste

Energiebezugsfläche Lüftung (m²)	Effektiver Lüftungsstrom (m³/h)	Effektiver Lüftungsstrom (m³/h)	Wärmekapazität der Luft
111.34	403.38	0.14	0.33

▼ Solare Gewinne

Gruppen Nr.	Flächengruppe	Fensterfläche (m²)	Verglasungsfläche (m²)	Wert

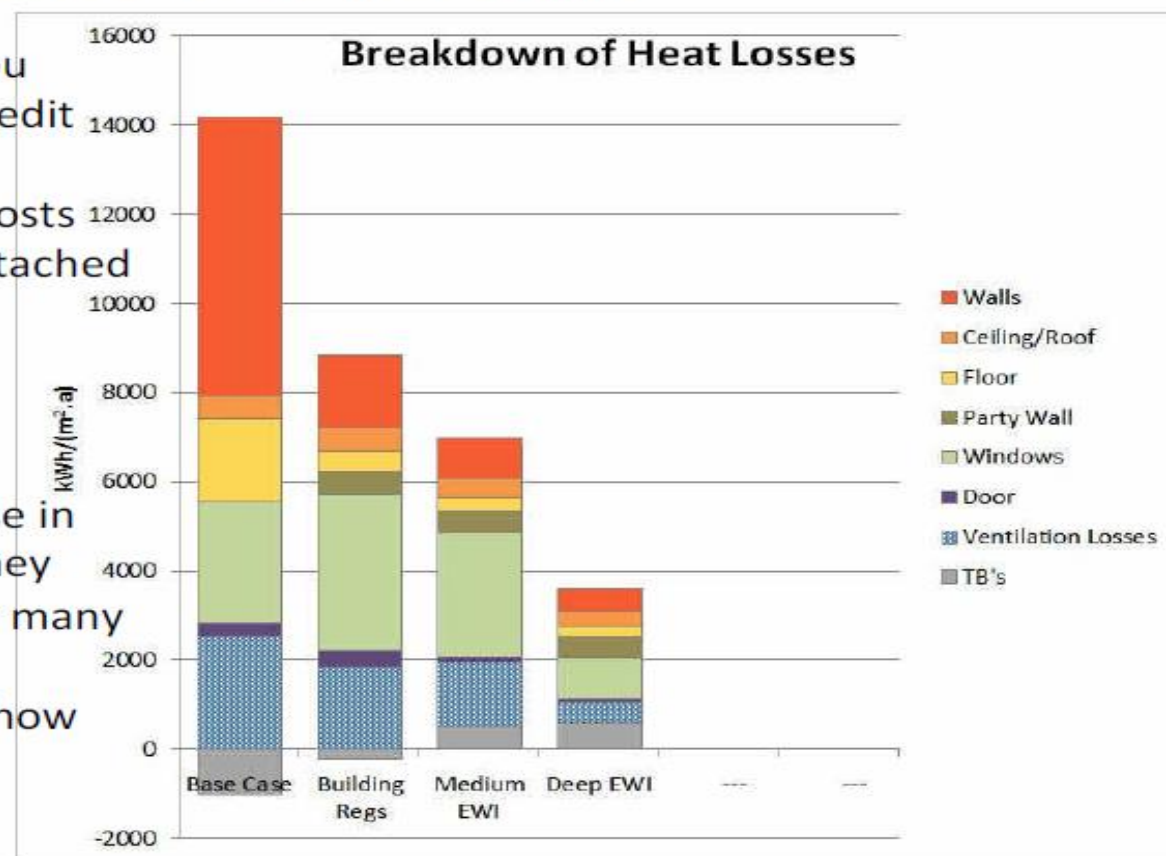
Passive House Institute

Dr. Harald Konrad Metzger

Wählen Sie Objekte aus. Drücken Sie die Umschalttaste, um die Auswahl zu erweitern. Ziehen Sie mit der Maus, um mehrere Objekte

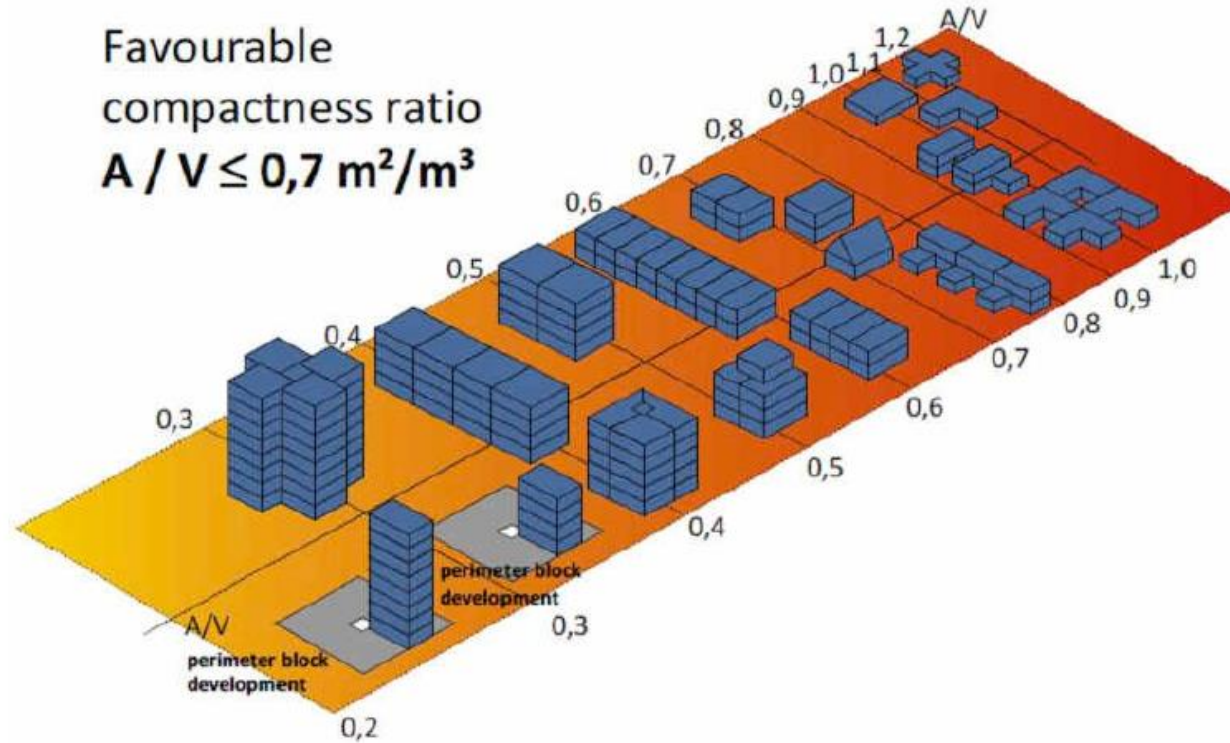
REALcost Passivhaus Retrofit Economics Analysis and Lifetime Costing

- quick and simple to use, writes PHPPs for you
- 11 standard construction build-ups you can edit
- Thermal Bridge Library, we also calculate variations includes build and maintenance costs
- includes fully working example of a semi-detached house
- includes running cost of MVHR or MEV
- choice of fuel type with energy price rises
- optional VAT
- optional co-benefits for comfort and increase in house price, with guidelines of how much they would be optional step-by-step retrofit over many years
- energy results are presented with costs to show how economic each option is (NPV)



THE METHOD: Compaction Ratio

Favourable compactness ratio
 $A / V \leq 0,7 \text{ m}^2/\text{m}^3$



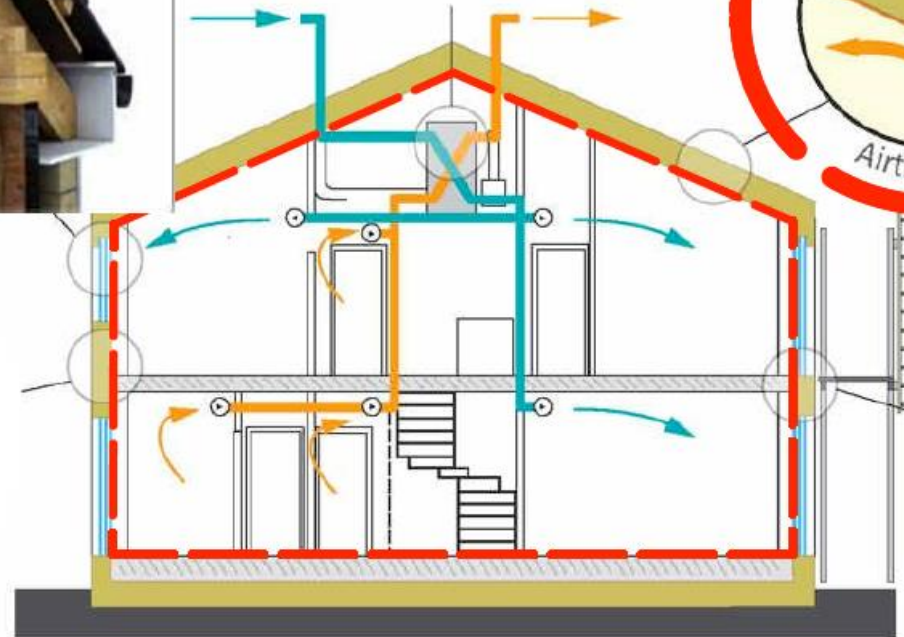
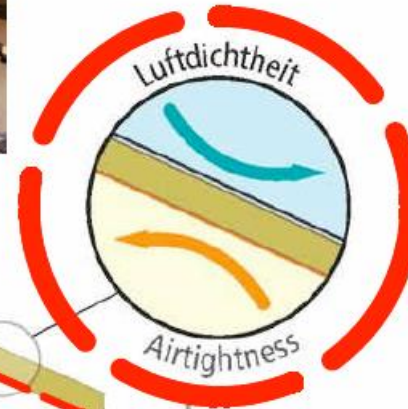
AIRTIGHTNESS
0.6 AIR CHANGES / HOUR



AIR TIGHTNESS TEST



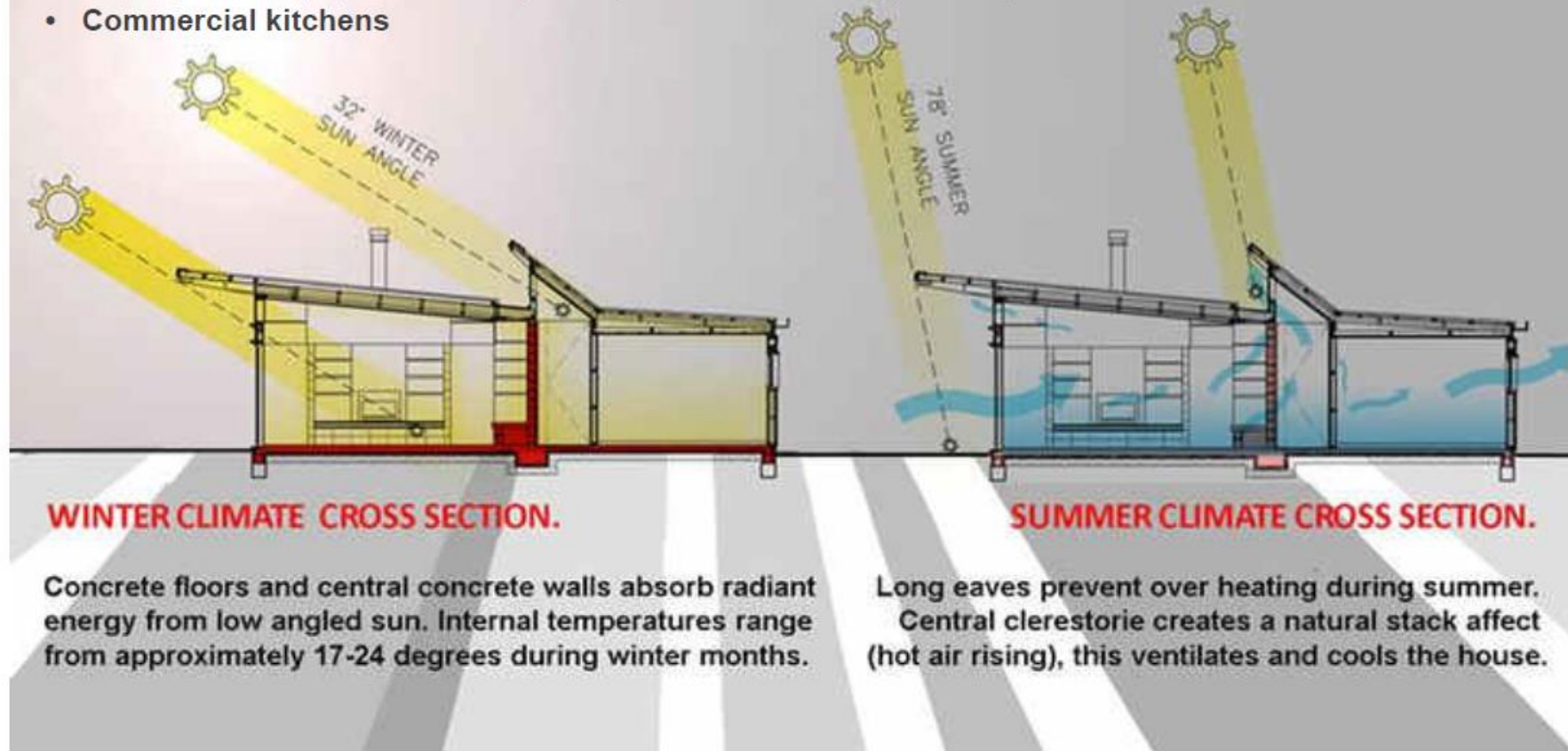
DOOR BLOWER TEST



Winter Useful Heat Gains & Summer Cooling Requirements

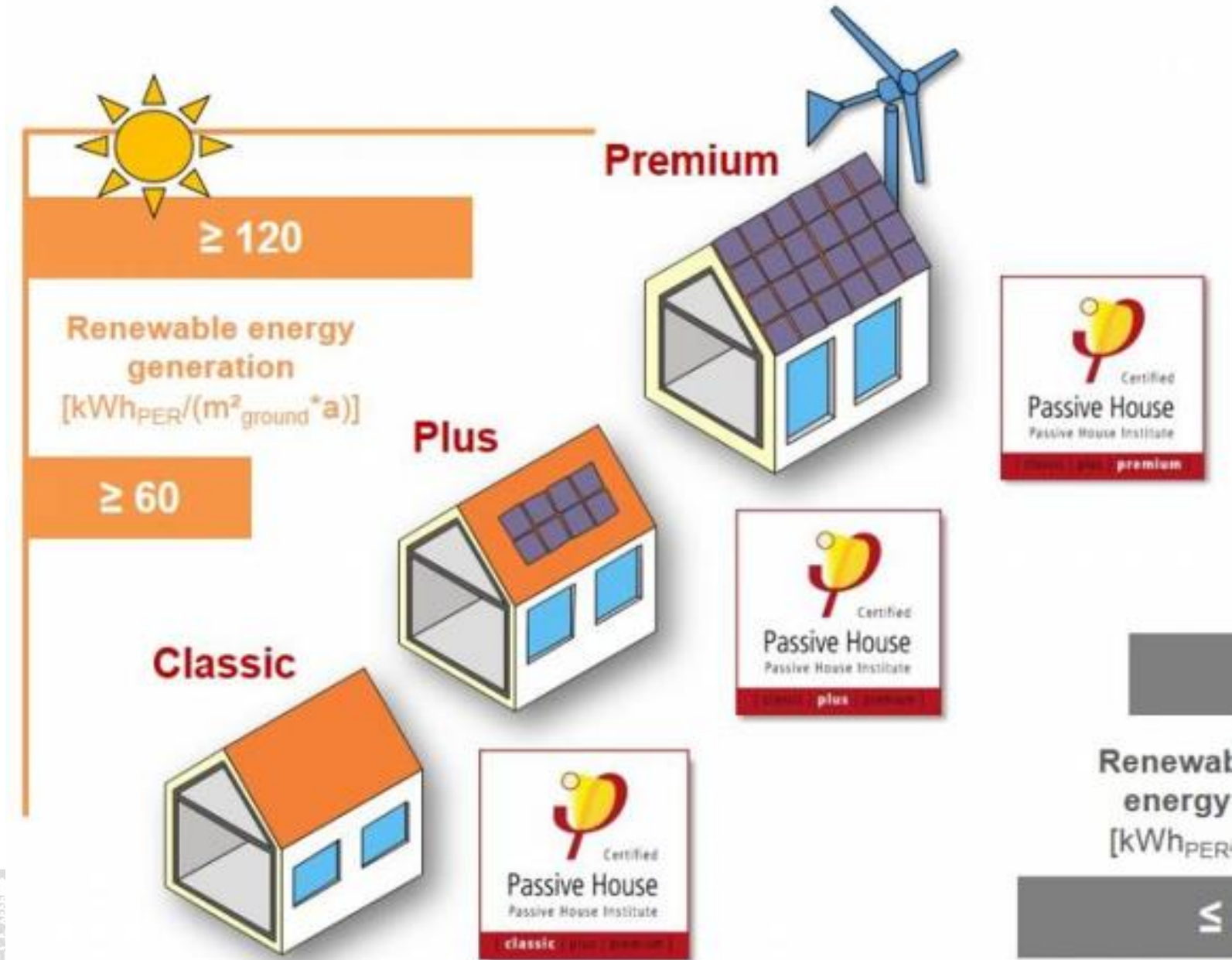
Passivehaus allows a limit of 10% of the year over 25°C

- Solar gains via glazing
- Building users
- Building functions – factory – lecture halls etc
- Small power equipment – computers, coffee machines, printers, IT network
- Commercial kitchens



Passivhaus Classic, Plus & Premium

- **Classic**
 - Where our current demand lies
- **Plus**
 - Very straightforward to reach especially off-grid
- **Premium**
 - Developing Battery technology and renewables make this possible



Unique Certificate No: 10425939R

Building and Test Details

Building or Plot No: Flat 15 - Pre - Test

Tested Building Address: Wellshot Road, Shettleston, Glasgow, G32 7XJ

Footprint (GFA, m²): 76.6

Surface Area (m²): 244.7

Volume (m³): 177.0

Date of Test: 09 July 2018

Temporary sealing (Positive): None.

Temporary sealing (Negative): None.

Deviations (positive): None.

Deviations (Negative): None.

Simplified Test Data and Result

This is to certify that the above named dwelling building has been tested for air permeability by a registered provider in accordance with ATTMA [EN 13829:2001], subject to the above statements regarding temporary sealing and test deviations.

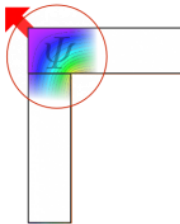
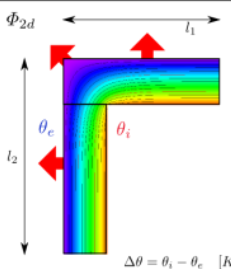
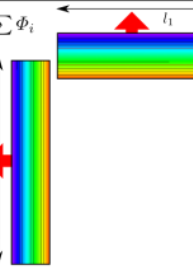
This certificate is a short form report. If a full compliant report is required, please contact the testing company. Enquiries about this certificate should be made to: Scheme Manager, ATTMA, First Floor, Flint House, Flint Barn Court, Church Street, Amersham, Buckinghamshire, HP7 0DE or visit www.attma.org.

The key Leakage characteristics of the building are:

	Result (AP ₅₀)	Result (ACH ₅₀)	Target (ACH ₅₀)
Positive:	0.27 m ³ h ⁻¹ m ⁻² @50Pa	0.38 m ³ h ⁻¹ m ⁻² @50Pa	

Pre Certification Testing Methods

- Analysis of Materials
- Air tightness testing
- Cross reference of environmental aspects
- Solar gain seasonal variations
- Materials specification vs achieved
 - Analysis of “in-Build” results via the certifiers.
 - All carried out on-going as we build.

Differenz / Störung Difference / disturbance	Wärmestrom Simulation (2d) Heat flow simulation (2d)	U-Wert Berechnung (1d) U-value calculation (1d)
		
$\Delta\Phi$ $\Delta\Phi = \Phi_{2d} - \sum \Phi_i$ [W/m]	Φ_{2d} $L_{2d} = \frac{\Phi_{2d}}{\Delta\theta}$	$\sum \Phi_i$ $L_0 = \sum (U_i \cdot l_i)$
$\Psi = L_{2d} - L_0 = \frac{\Delta\Phi_{2d}}{\Delta\theta}$ [W/(mK)]		
$\Psi = \underbrace{L_{2d}}_{\text{2d-Simulation}} - \underbrace{\sum (U_i \cdot l_i)}_{L_0 \text{ aus U-Werte}} \quad [W/(mK)]$		

Passivhaus Institute, unless it has this Official certification, it ISN'T a Passivhaus home!

Passivhaus homes
MUST comply
with independent
testing and
Institute
certification.



Would you MOT
your own car, or
write your own
prescriptions?





How can we ensure a longer lasting benefit?

- Is it enough to create homes?
- What if we want more?
- How can we deliver something to keep the wealth created in construction within the area
- How can we ensure the skills needed to create homes can be sourced locally?

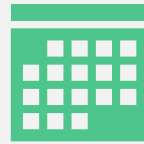
Loreburn Housing Association - Test case

- As an incoming firm we do not want to :-
 - arrive,
 - Take the money
 - Run

Develop a long term strategy



Build a trusted relationship



Devise a long term plan and workstream



Plan out key milestones

Investment objectives

Training objectives



Moving in!

- Working with Loreburn HA.
 - Stewart & Shields are seeking office / storage premises
 - Recruiting in the local area for Apprentices and mature apprentices
 - Networking local colleges and Universities for formal training schemes
 - Working with schools to garner interest in the next generation
 - Networking with the local Chamber of commerce
 - Actively seeking sub-contractors locally and training them in our specialism of building Passivhaus



Putting down Roots

- Build in the local area
- Train in the local area
- Stay in the local area
- Seek future opportunities in that same local area
- Build a relationship and reputation in the new area with trust and support that we won't be going away, and seek to become a feature of the local community

The Best Benefit of all

The best result is by locating in the areas we build we keep the money in the area as well.

We still have to compete and secure business but as local contractors we are geared up to provide a local service.

This is not anything new in this thinking but in our application and apprenticeship scheme we would repeat this model in many areas were the interest proven.

The HAG

Is the current “HAG” used in the most effective manner?

Do we propose that the amount is varied depending on “green homes credentials”

- £36,500 on building regs projects
- £73,000 for Gold Standard projects
- £100,000 for Ultra low energy, environmental, fuel poverty addressing build strategies

What do you think?

Thank you for listening

Any Questions?