

Costs

- everyone says Passivhaus - “costs 5 – 10% more?”
- but how much does construction REALLY cost?
- the “Jono” rule of cost estimating.....
 - “if you think it costs more, it will”
 - “price is a matter of priority”

Costs

- extra costs through: more insulation, higher performance windows and doors, achieving better airtightness, and installing MVHR
- reduced costs through: smaller heating system, eliminating underfloor heating, simpler controls, and reduced requirement for renewables
- nil costs through: construction of good design, thermal bridging, simple construction etc



Architype's Passivhaus schools

- Passivhaus was achieved within the standard schools budget available to the project



UK's first Passivhaus archive and records centre

- Passivhaus came in 5% cheaper than conventional construction with a standard services solution

Costs

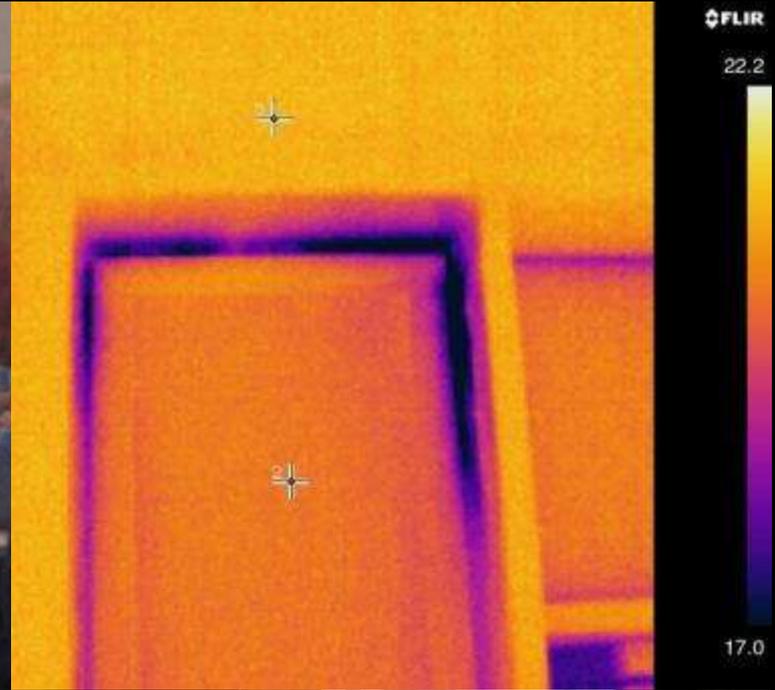
- think....price is a matter of priority

.....and employ the right expertise

Procurement & construction

- conventional tendering
- contractor led design and build from outset
- client led design, then contractor design and build
- partnered contract, of various sorts

Collaboration across the entire team



Design team, client, contractor, and supply chain

Collaboration at every level

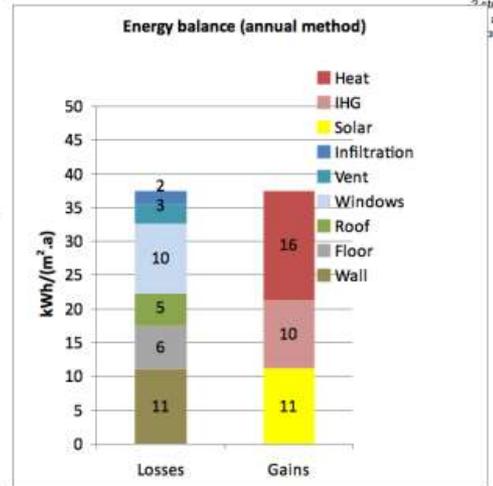
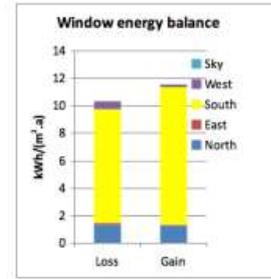
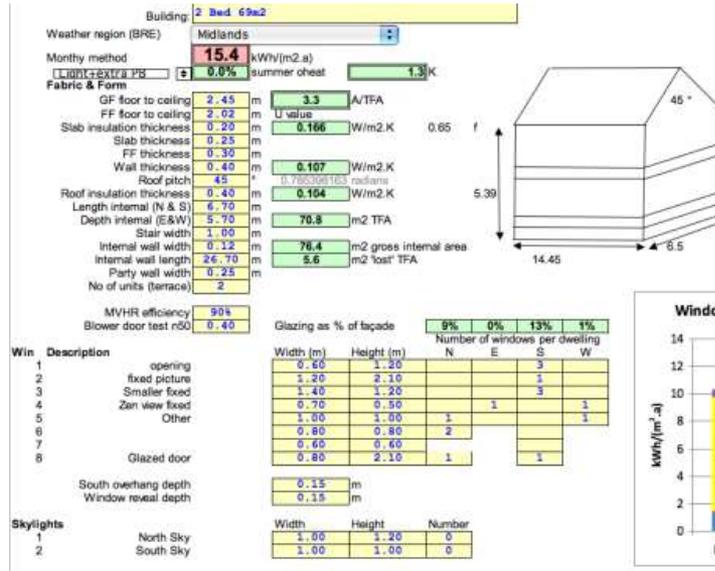
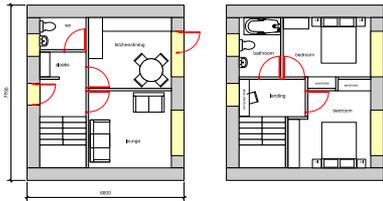


Rethink design from first principles

ArchiHaus House Types - Early Stage PHPP Analysis

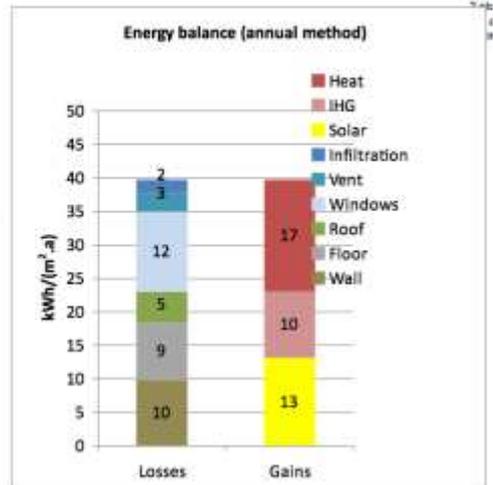
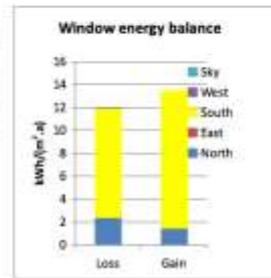
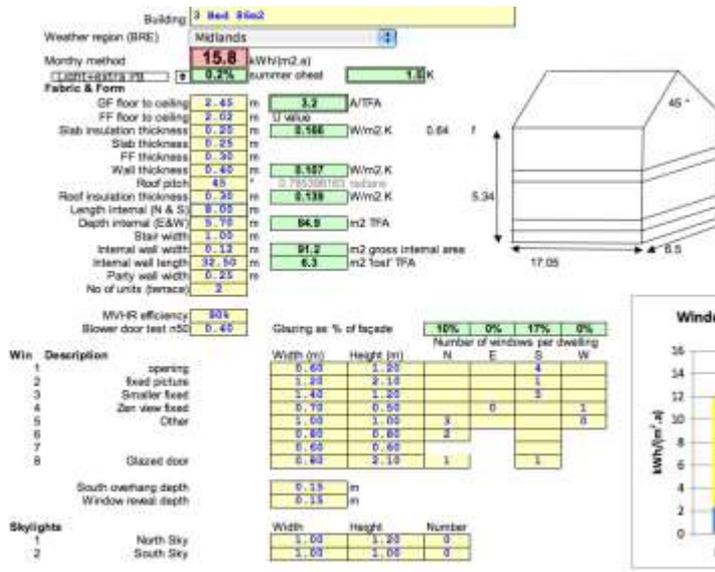
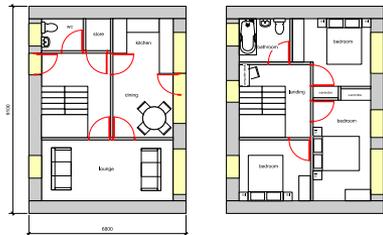
2 bed house type - 69m²

- smallest 2 bed house type chosen as it will be the hardest to meet PassivHaus standards.
- house type must be used at least as a semi-detached house but would be much better as a terraced option



3 bed house type - 86m²

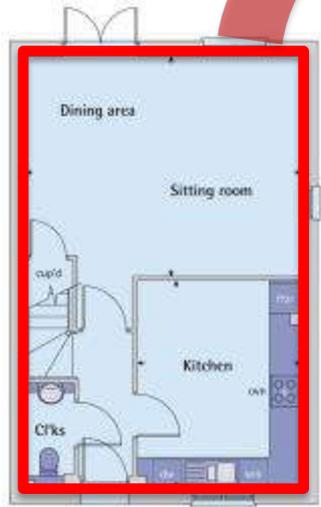
- smallest 3 bed house type chosen as it will be the hardest to meet PassivHaus standards.
- house type must be used at least as a semi-detached house.



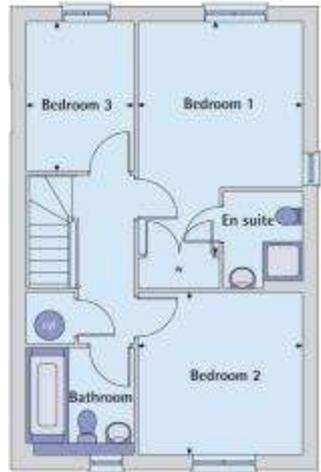
Rethink design from first principles



typical developer 3 bed house type

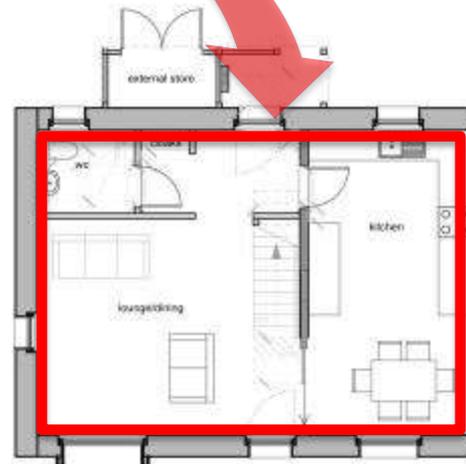


ground floor plan



first floor plan

Archihaus 3 bed house type

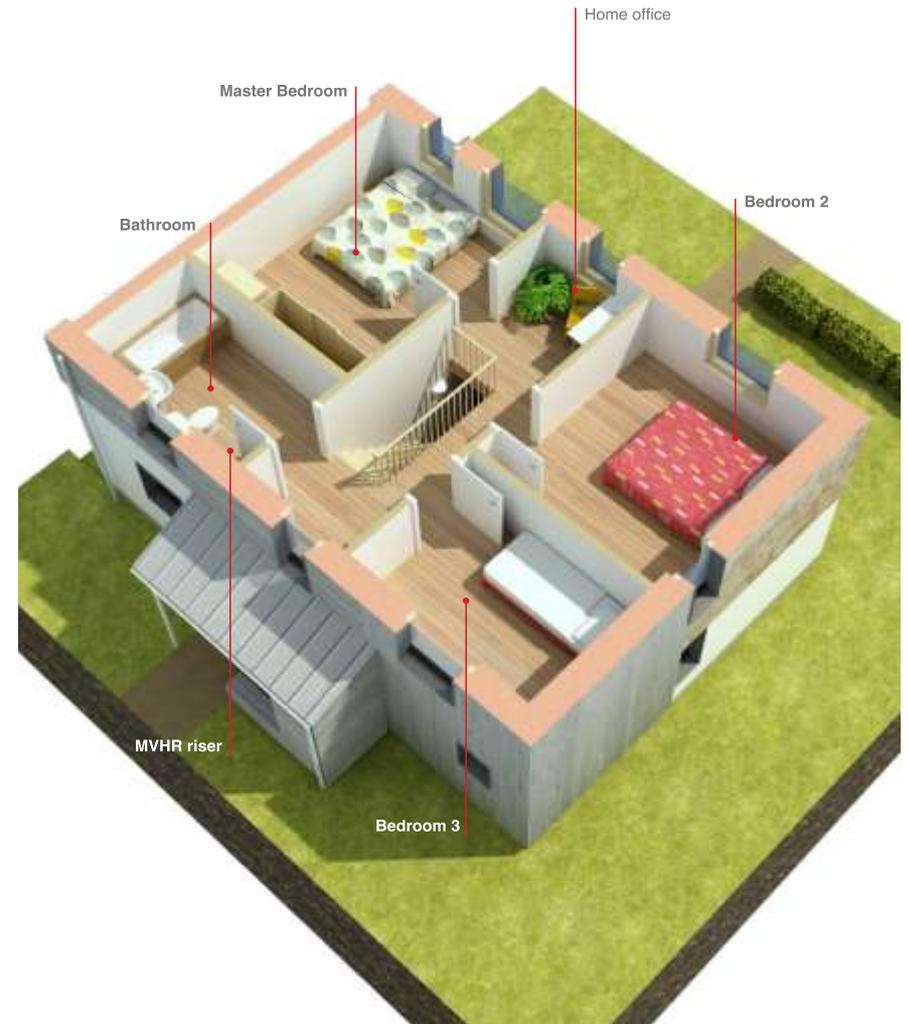


ground floor plan

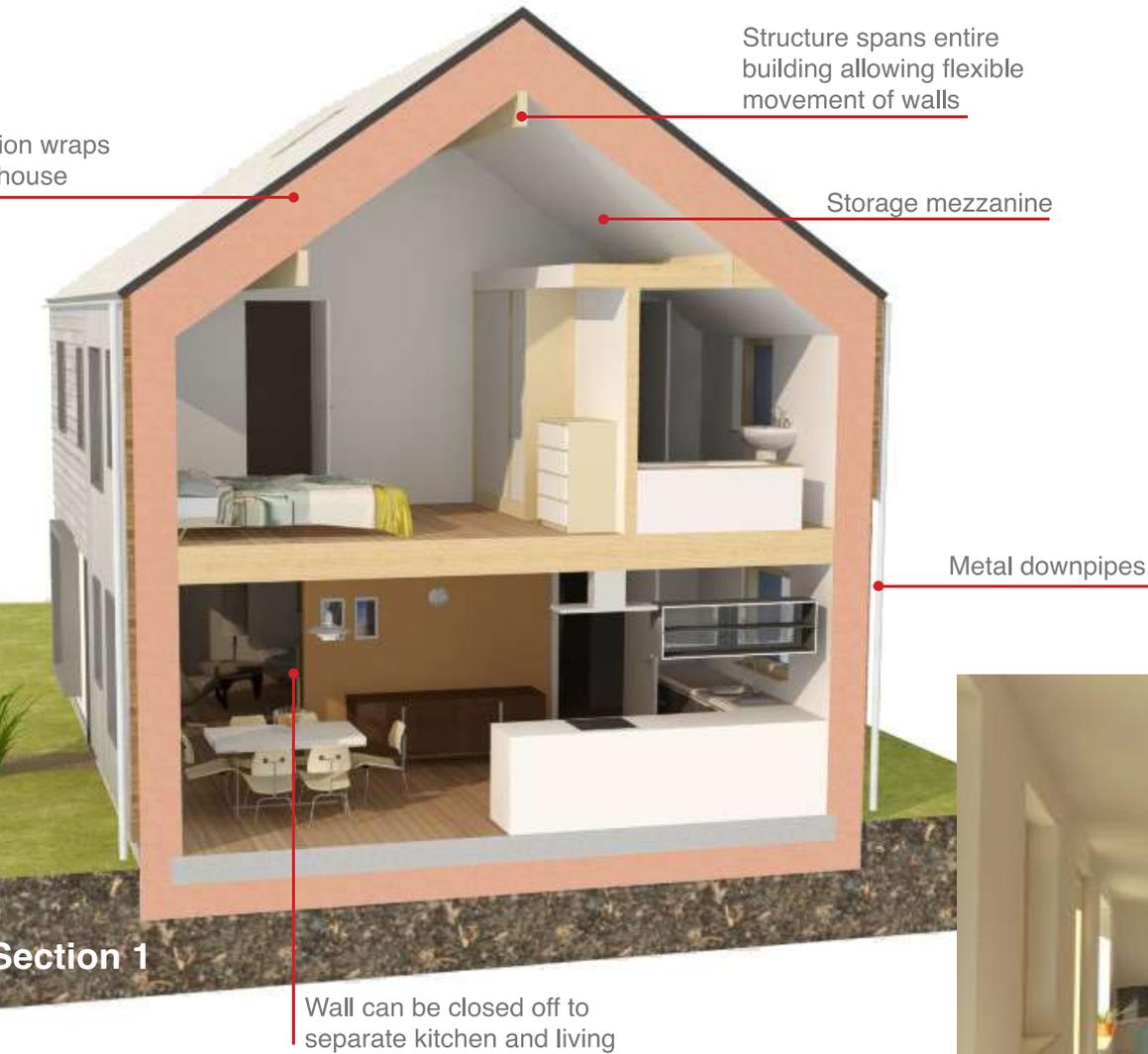


first floor plan

Rethink design from first principles



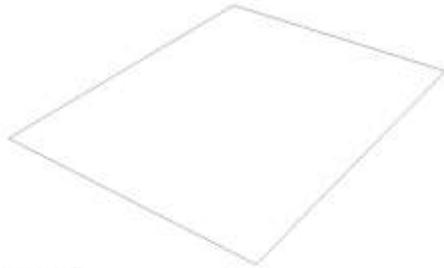
Rethin design from first principles



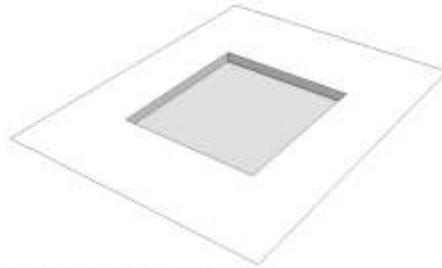
Rethink design from first principles



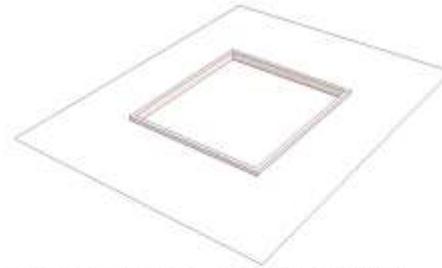
Rethink construction from first principles



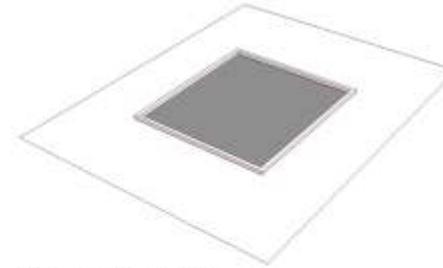
01 site



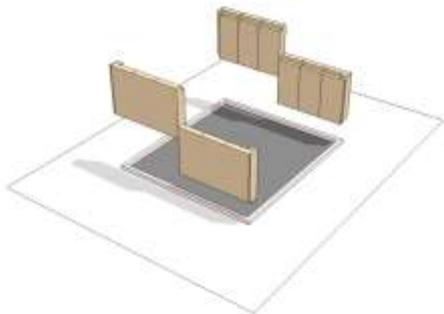
02 site excavation



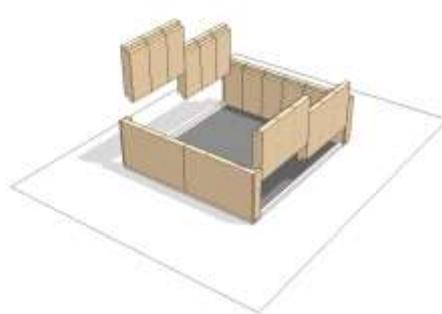
03 below slab insulation formwork



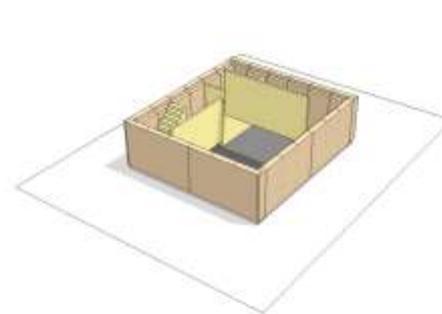
04 raft foundation



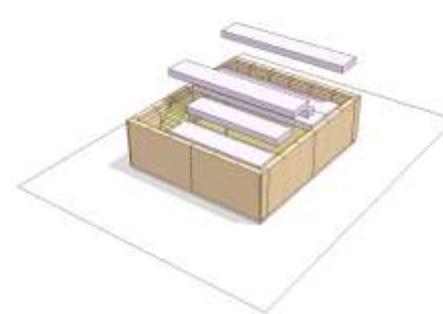
05 ground floor gable walls



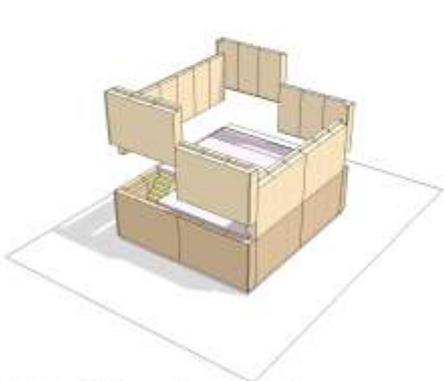
06 ground floor external walls



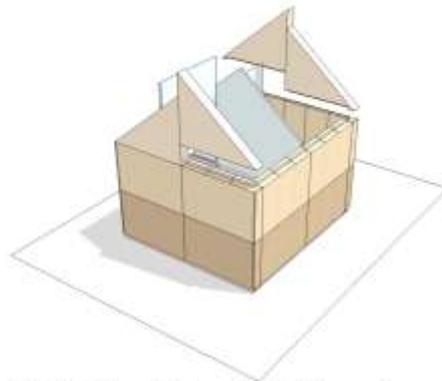
07 ground floor internal elements



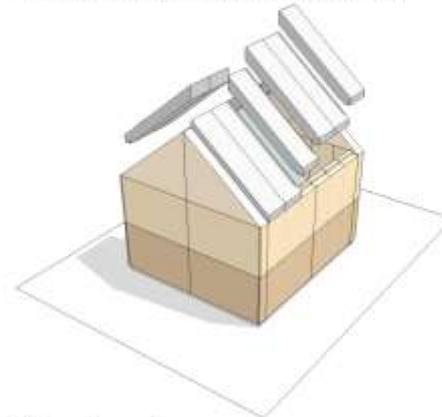
08 first floor construction



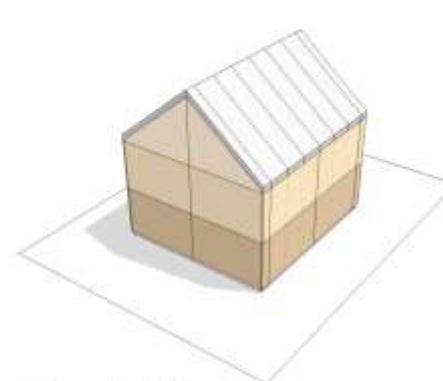
09 first floor external walls



10 first floor internal & gable walls



11 roof panels



12 completed house

Procurement & construction

- think....any procurement *can* work

.....but ensure collaboration across the team

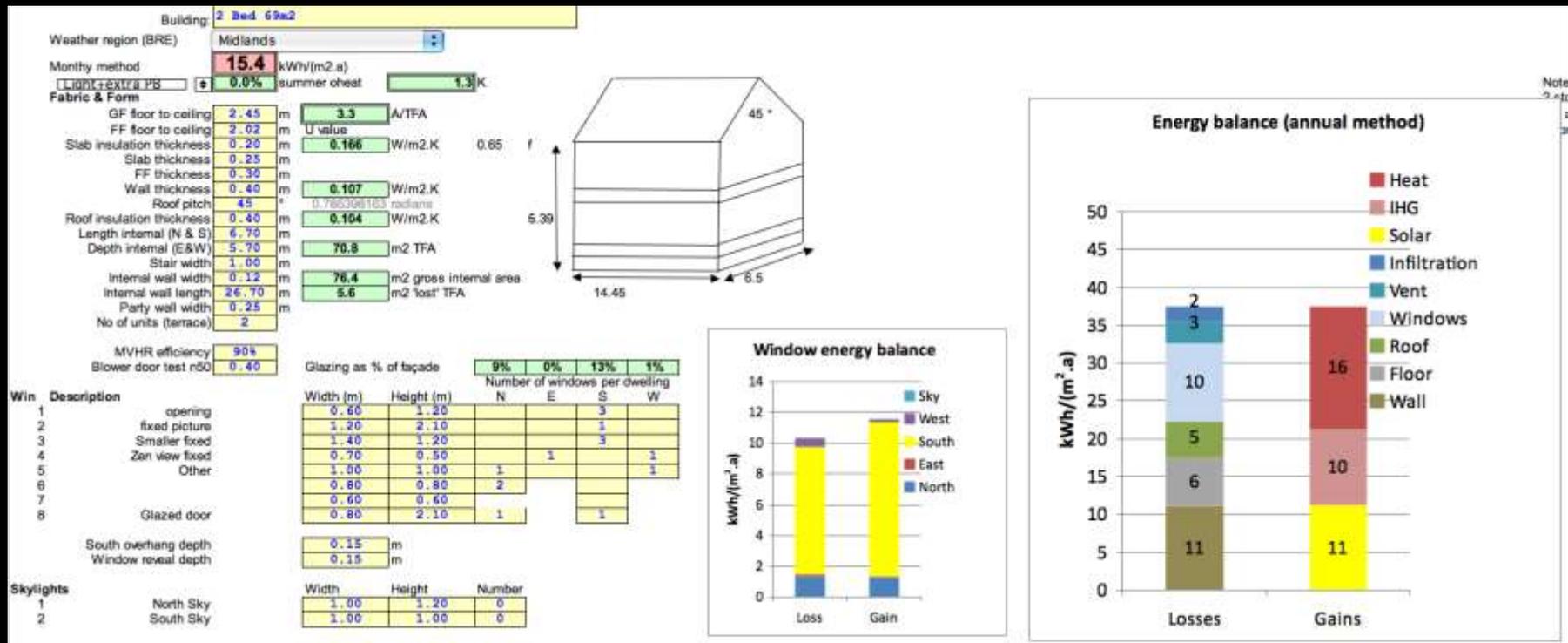
.....and employ the right expertise

Certification

- designing to Passivhaus “principles”
- it either ***IS*** or it ***ISN'T*** Passivhaus!

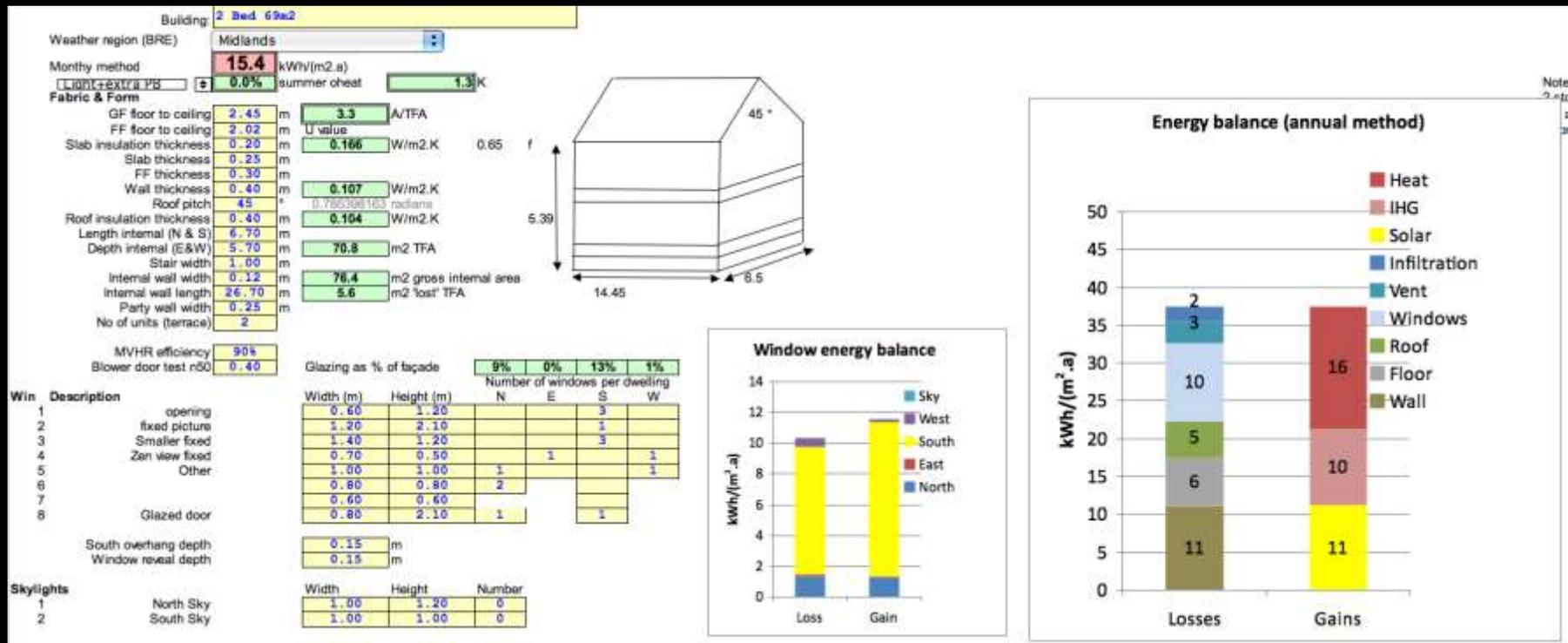
Certification

- Use PHPP as a design tool



Certification

- involve the certifier EARLY on !



Certification

- think....quality assurance of PHPP and certification

.....engage the certifier early

.....and employ the right expertise

Occupation

- fundamental fault with the UK building industry



Soft Landings

ARCHITYPE		THOMAS VALE				
RESPONSES TO FEEDBACK						
Client:	Wolverhampton City Council	Job no: 8320	Date: 26.11.11			
Project:	Oak Meadow Primary School	Sheet: SLD030	By: LF			
Rev:						
Dear Staff and teachers						
Below are the issues we have been made aware of as for being out of fit during our visit in September, and the steps we have taken to remedy them. If you have any additional comments please see us at the next proposed inspection, or contact your head teacher.						
Item	Reported by	Location	Comment	Resolution	Date reported	Date Resolved
06	Head teacher	Class 6 (110)	Several parents not wearing safety.	Sub-contractor returning to site 26.11.11. Head teacher advised that sub-contractor returned to site on 26.11.11. Sub-contractor advised that safety is now in place.	25.11.11	26.11.11
07	Head teacher	Green class (108)	Stairs slip - Chair position. Reception Classroom stairs (11.11.11)	Sub-contractor aware. On 26.11.11. Sub-contractor advised that safety is now in place.	25.11.11	
08	Head teacher	Reception	Art board partially missing.	Sub-contractor returning to site 26.11.11	25.11.11	26.11.11
09	Head teacher	Green class (108)	Stair blocked access.	Sub-contractor aware. On 26.11.11. Sub-contractor advised that safety is now in place.	25.11.11	
10	Head teacher	General Issue	Fire doors not closing properly (checked access)	Completed	25.11.11	26.11.11
11	Head teacher	Reception Terrace	Site fencing blocking under site	Sub-contractor aware. On 26.11.11. Sub-contractor advised that safety is now in place.	25.11.11	
12	Head teacher	RE	Light in class room cannot not in class - can this be relocated	Contractor to return and head teacher to return to school on 26.11.11	25.11.11	
13	Head teacher	Site 8 (110) (101)	Down of gutter missing	Contractor to return. On 26.11.11	25.11.11	
14	Head teacher	Site Office (105)	2 x entrance lockers. Head on lock in site office	Contractor to return. On 26.11.11	25.11.11	
15	Head teacher	General Issue	Site entrance (reception area) - delivery - blocking in cars and small areas.	Contractor to return. On 26.11.11	25.11.11	26.11.11

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Engaging with users and facilities managers on operational issues

Soft Landings

Lighting & Ventilation Control

Light Switches:

- Each classroom has two light switches, one close to the entrance of the room, and the other nearer the whiteboard.
- The lights closest to the whiteboard can be controlled independently from the other lights. To dim the lights, press the switch until the desired level is reached.
- To switch the lights on (or dim the switch down and) the lighting reaches the required level, then release. Repeat to increase the lighting level.
- On leaving the room switch off the lights. If they are left on for 8 minutes with no movement in the room an absence detector will switch the lights automatically. If the daylight inside the classroom is of a sufficient level a sensor will automatically dim or switch the lights off.
- The blinds over external windows/doors can also be used to control the lighting levels within the classrooms.

Example: Lights close to whiteboard. Main room lights.

Oak Meadow Primary School

Ventilation:

- Ventilation panels/doors are controlled manually by turning the handle and opening to the desired position. Ventilation panels can be left open at night.
- Windows are electronically opened and closed using the switches located close to the classroom door.
- The switches for the windows are designed for single click pushes and must not be held continuously.
 - One push to the top part of the switch, window opens to 1/3 position.
 - Two pushes, to 2/3 position.
 - Three pushes, to fully open position.
 - To close repeat as above, but pushing the bottom part of the switch.
- Remember windows and ventilation panels can be opened at any time during the school day, only some can remain open during the night.
- The windows will automatically close after 60 minutes at the end of the day.
- If it is very cold outside, the opening of the high level ventilation panels will reduce automatically.

Window open / close switch

Temperature sensor connected to the Building Management System

Summer

The building is naturally cooled and therefore supplied by fresh air from outside, however if you are:

Feeling too cold:

Close windows (external panel) or ventilation panels.

Feeling too hot:

Open windows (external) and/or ventilation panels. The building needs to cool down at night therefore the window ventilation panels should be left open at night, allowing the room night air to reduce the internal building temperature in preparation for the following next day.

All occupants using the building will have different perceptions of temperatures but if everybody is feeling too hot or too cold then please contact your caretaker who will be able to organise manual adjustments to the building services.

Classroom Strategy

Day: Fresh air supply from windows, hot air will cool as in.

Night: Ventilation panels opened at any time, opened automatically at night.

Night 2: Fresh air supply from door, exhaust air from door.

Passivhaus Strategy

Heating: The highly insulated building fabric keeps the building warmer during the summer. Solar heat gain is controlled by the blinds used.

Ventilation: Summer cross ventilation is controlled by opening windows and ventilation panels. An heat exchanger filters the classroom and passes through them into the hall space. It allows the building through high level vents in the hall doors.

Heat exchanger
 Whiteboard panel
 Locally controlled radiator
 Exhaust air
 Cooling at floor

Winter

The classrooms are supplied with a constant flow of pre-warmed fresh air, which will help keep the building at a fairly constant temperature, however if you are:

Feeling too cold:

Turn the radiator valve (adjacent to radiator) to a higher figure.

Feeling too hot:

Turn the radiator valve (adjacent to the radiator) to a lower figure. **High heating fan on:** Windows (external) or ventilation panels can be opened (could be closed at end of day) remember healthy energy will be lost.

All occupants using the building will have different perceptions of temperatures but if everybody is feeling too hot or too cold then please contact your caretaker who will be able to organise manual adjustments to the building services.

Classroom Strategy

Day: Fresh air supply from door, exhaust air from door.

Night: Windows can be opened (when open heat will be lost).

Passivhaus Strategy

Heating: Heat is contained within the building by the highly insulated air tight walls, and double glazed windows. The building is heated by solar gains and radiators that can be individually controlled.

Ventilation: A central heat recovery system supplies fresh air to classrooms via meshy grilles, air is then extracted through grilles from classrooms to hall spaces. Windows and ventilation panels can be opened to supply air direct from outside. However heat will be lost.

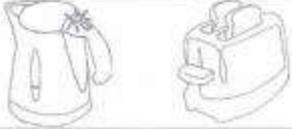
Heating at floor
 Solar gains window
 Radiator solar gains
 Fan grille

Explaining how to operate a Passivhaus classroom using presentations and user guides

Soft Landings

Energy Scavenger Hunt!

Let's try and find everything in the school that uses energy!

	How many COMPUTERS and LAPTOPS can you find? How many were switched on?
	How many PROJECTORS and WHITEBOARDS can you find? How many were switched on?
	How many KETTLES and TOASTERS can you find?
	How many LIGHTS and LAMPS can you find? (HINT: Look outside too!) How many were switched on?
	How many HOT WATER TAPS can you find?

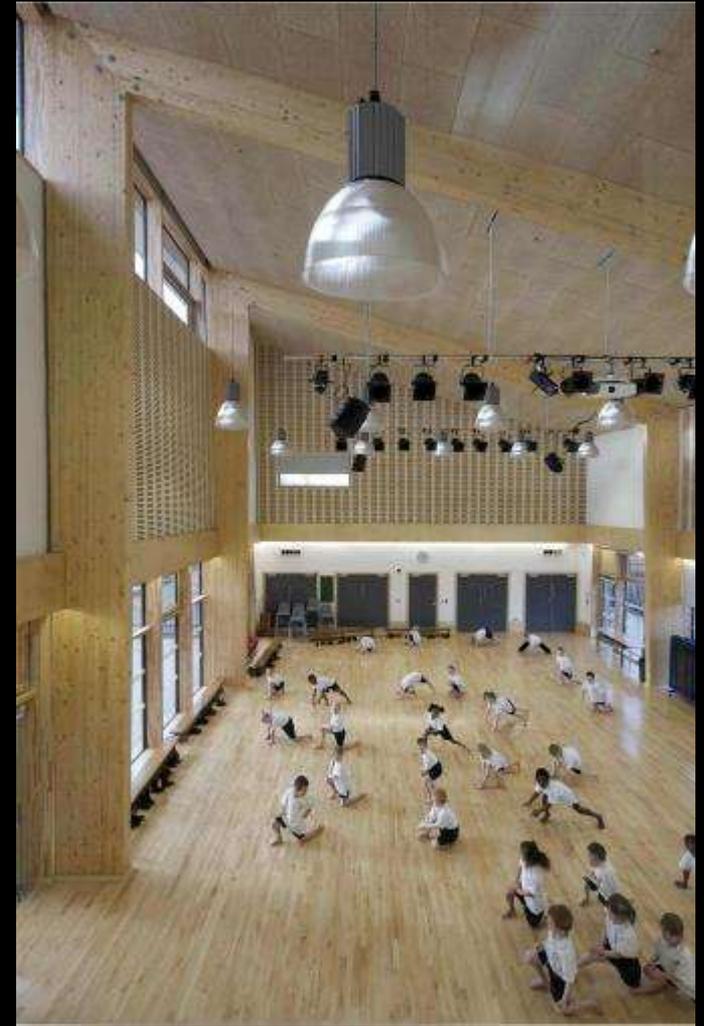
BONUS: What did you find that uses energy that **IS NOT** on the list?

© Lisa Ann Pascoe



Engaging the pupil council in energy issues

Lessons learnt: lighting



Both schools deliver great day lighting, however with over complicated controls and user intervention this benefit has been compromised

Lessons learnt: ventilation & controls



“We feel that our children are more alert and attentive in lessons due to the amount of daylight in classrooms and the constant fresh air”



Sara Morris, Head teacher
Oak Meadow School

Good quality MVHR units provide excellent air quality, however filters need to be changed or their operation is compromised

Lessons learnt: operation & maintenance



Supporting users and maintenance teams is vital

Lessons learnt: heating



2 x 65kW
boilers 25kW
peak heat
demand 5x
oversized!



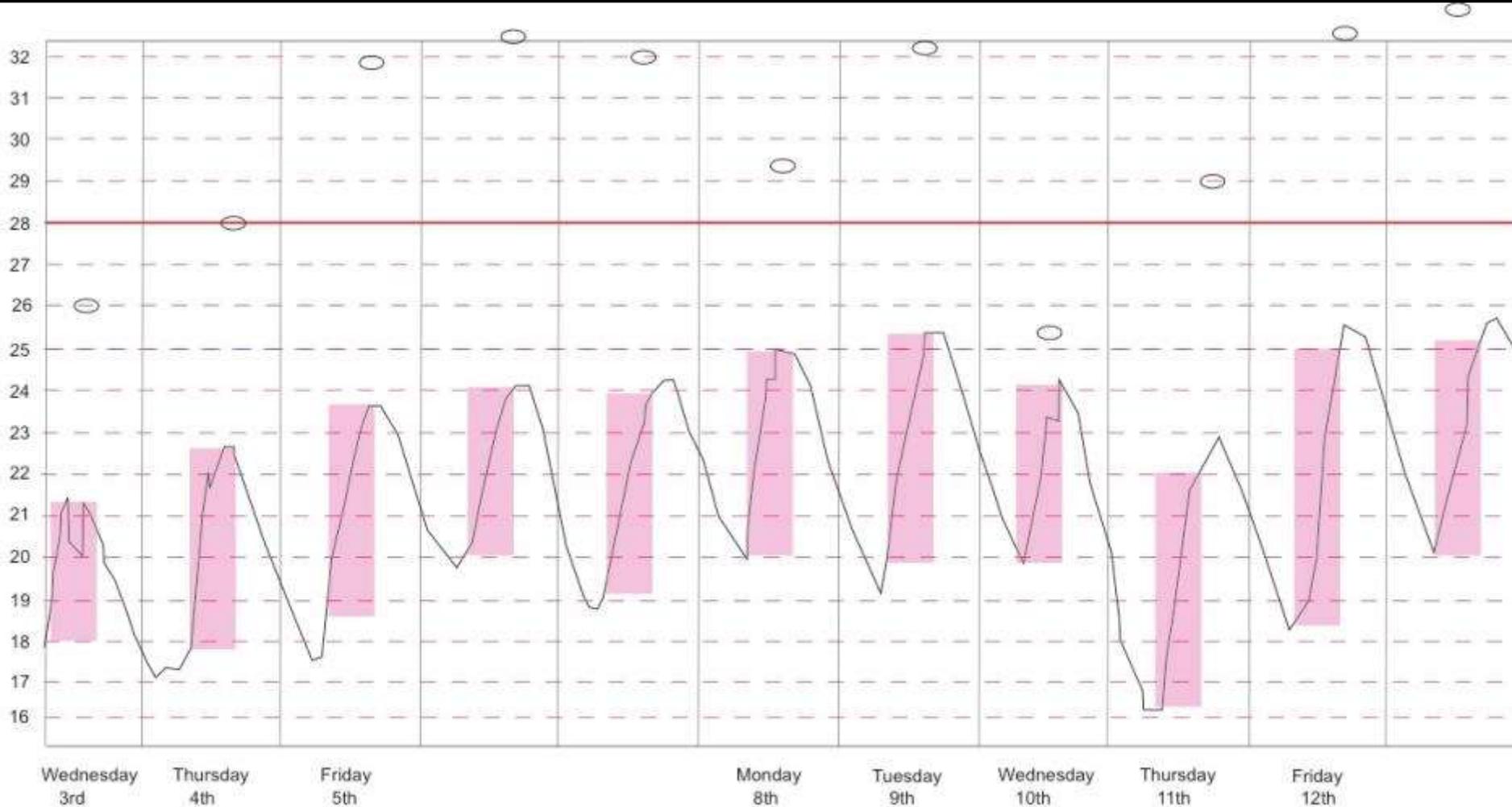
One gas
boiler is
more than
enough

Lessons learnt: school kitchens



Use of induction hobs and low energy appliances to reduce surplus heat and primary energy

Lessons learnt: monitoring



Monitoring is essential to know how things are working – or not!

Lessons learnt: monitoring

Bushbury Primary School

Figures are based first year readings.

Gas(x 1.1 for PE):

Space heating*:

14kWh/(m².a)

Hot water*:

7kWh/(m².a)

Electric (x 2.7 for PE):

Lighting:

12kWh/(m².a)

Power & plant:

22kWh/(m².a)

Kitchen:

7kWh/(m².a)

Sprinklers:

14kWh/(m².a)

Comment:

Primary energy is higher than the target 120 kWh/(m².a)

Sprinklers = 38kWh/(m².a) PE

Main success:

Kitchen energy & comfort

Main lessons:

Issues with automatic lighting controls and sprinkler systems.

Occupation

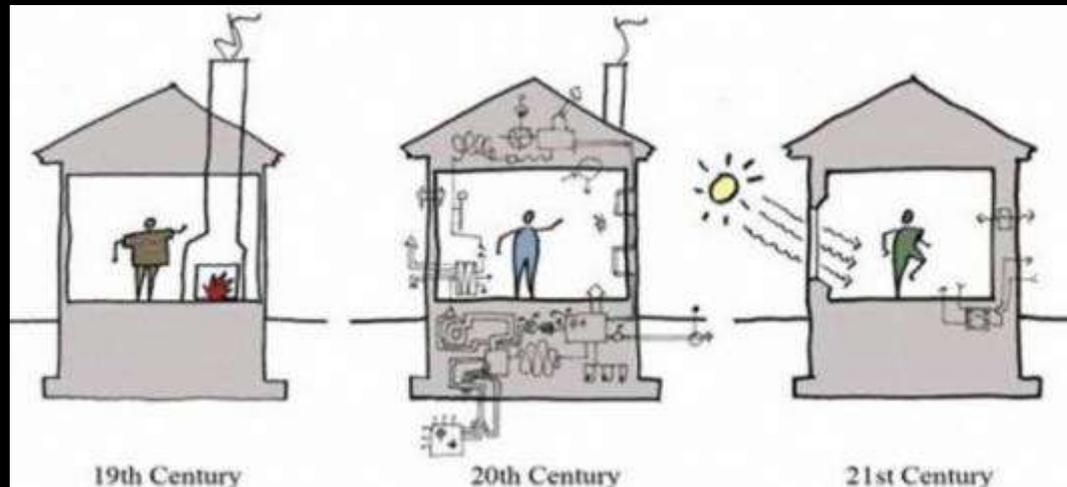
- think....provide full Soft Landings support

.....monitor and work with the users

.....and employ the right expertise

Successful delivery of Passivhaus

- strive for simplicity of design – more for less
- base design on the evidence of what actually works
- engage with, and support the users, in occupation





“Making the simple complicated is commonplace,
making the complicated simple – that’s
creativity” Charlie Mingus

...employ the right expertise