AECB Standard

New build – why do it?

Alan Budden

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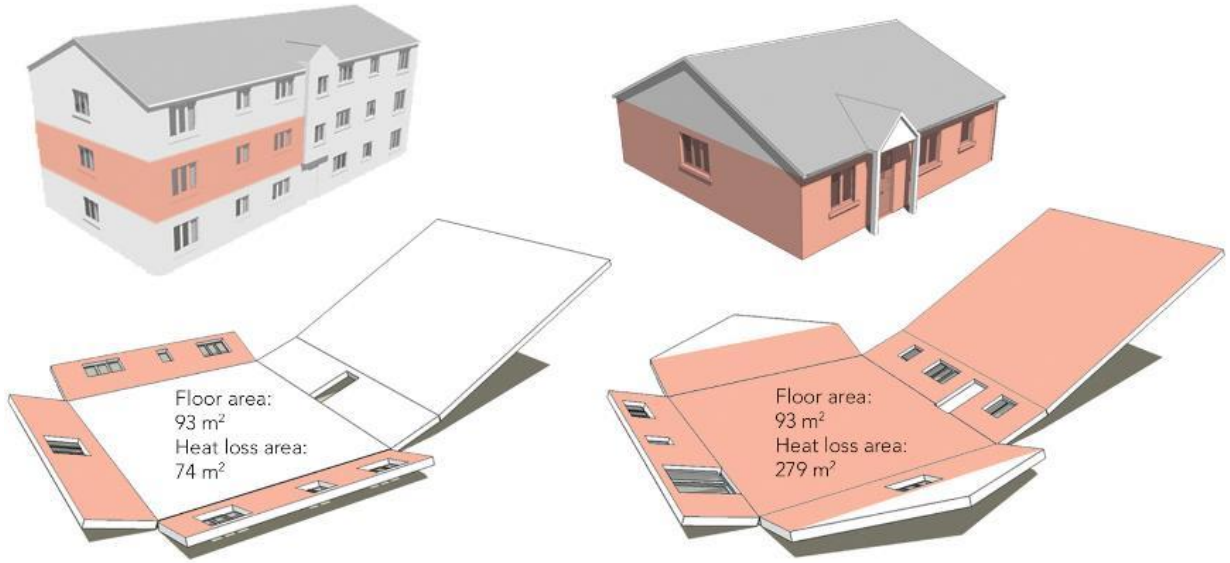
AECB Standard

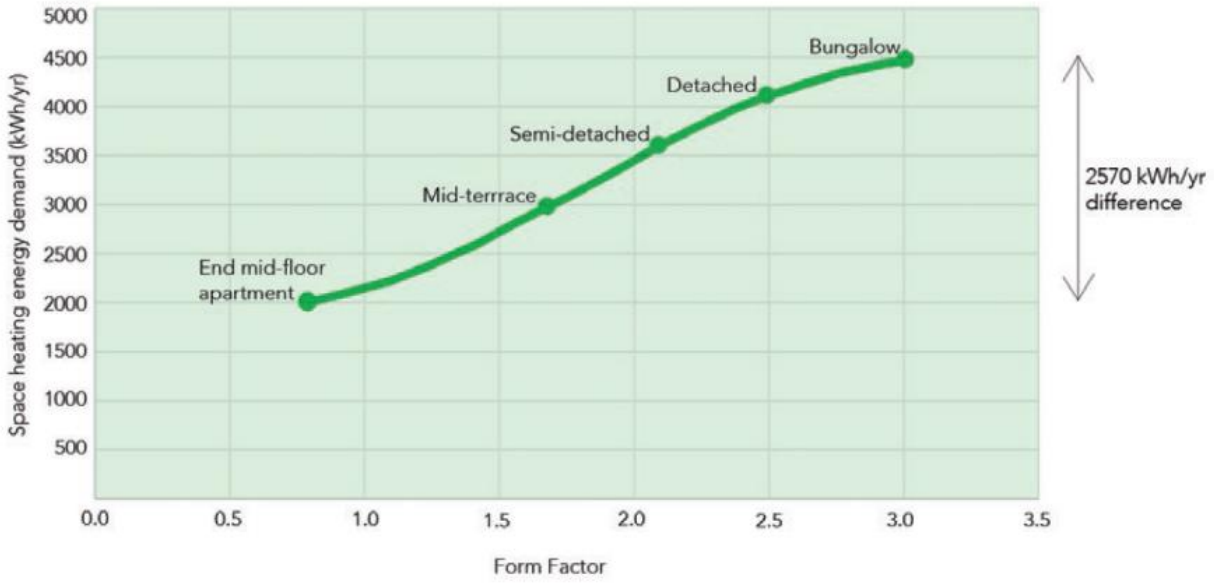
• Delivered Heat and cooling	≤ **40**kWh/(m²a) using PHPP and Passivhaus methodology
• Primary Energy demand	Varies by country, PHPP 9.6 UK PE is **135** kWh/(m²a)
• Air tightness (n50)	≤ **1.5** h-1 With MVHR *or* ≤ 3 h-1 with MEV
• Thermal Bridges	Psi external <0.01 W/m *or* calculated if > 0.01 W
• Summer overheating	<10% but <5% recommended
• Self certification	

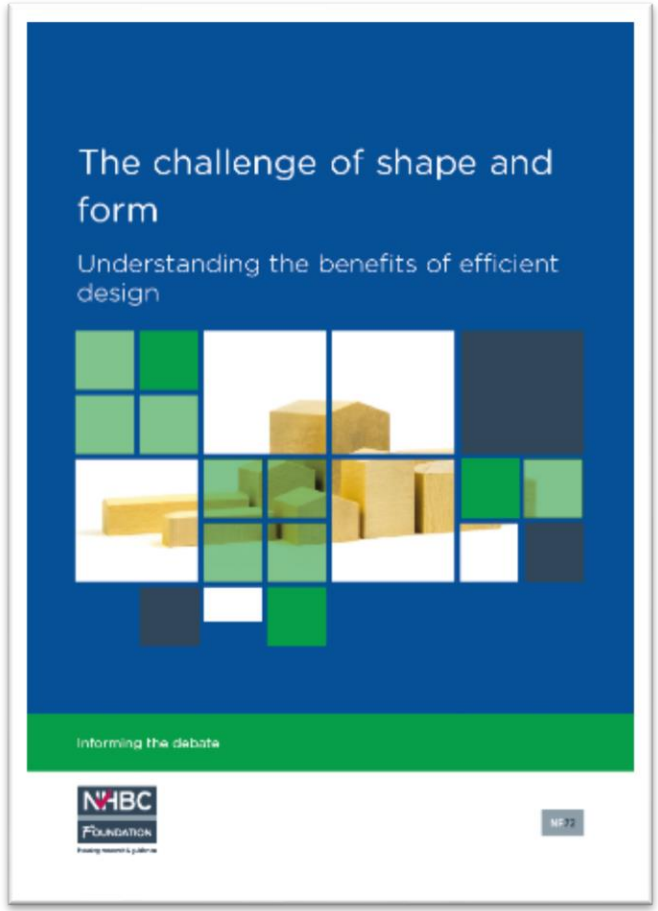
Comparable Standards

Building Regulations	AECB Silver Standard	PHI Low Energy Building Standard	Passivhaus
Specific Heating Demand			
57-96 kWh/m²/year	40 kWh/m²/year	30 kWh/m²/year	15 kWh/m²/year
Primary Energy Demand			
-	Varies according to country UK 135kWh/m²/year, which includes heating, DHW, cooling, auxiliary and electricity consumption (120 if old PHPP)		
Airtightness			
≤10 m3/m2 5 m3/m2 Nominal	≤1.5 ach/h MVHR ≤3 ach/h with MEV	≤1.0 ach/h MVHR	≤0.6 ach/h MVHR
Thermal Bridges			
-	$Psi_{external}$ <0.01 W/m		
Summer Overheating			
-	<10%, <5% recommended		

Efficient Shape

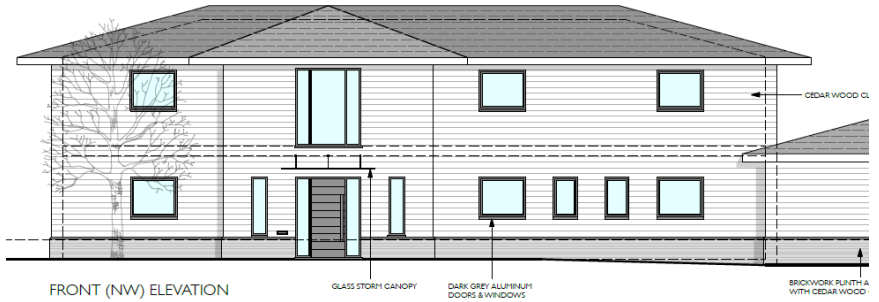


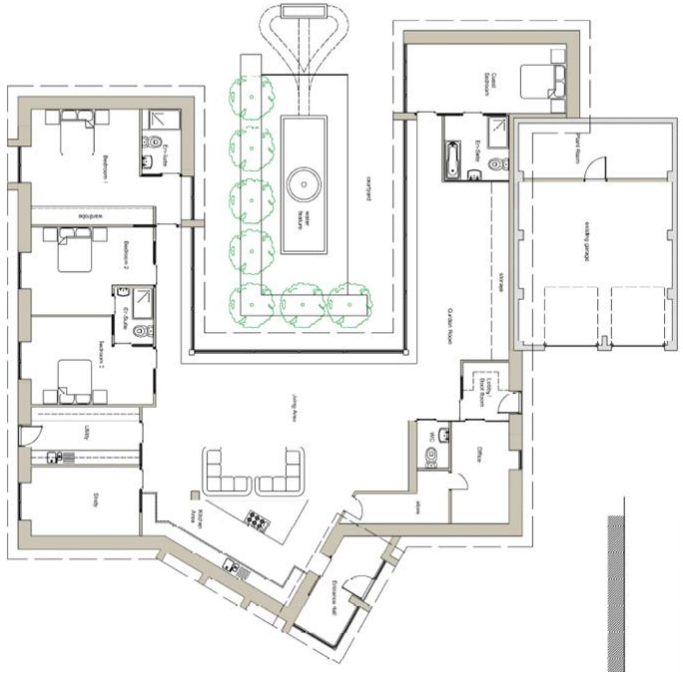


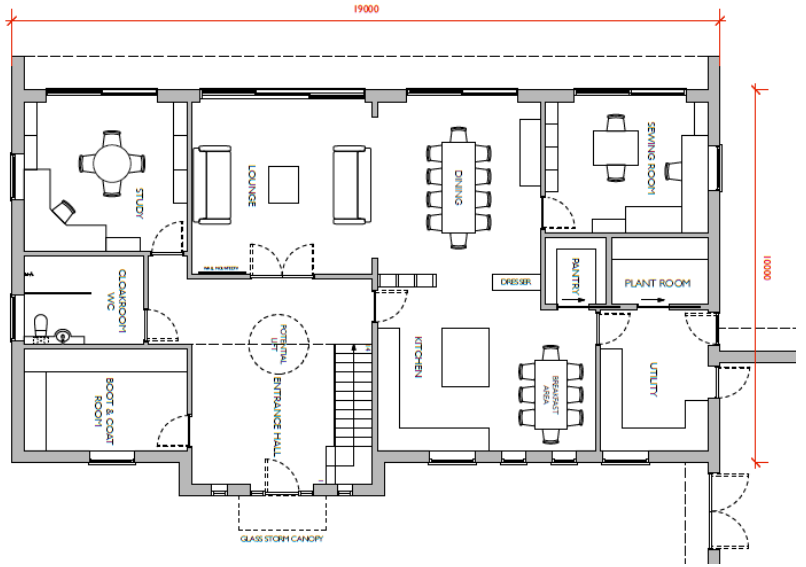


Efficient Shape

FRONT (NORTH) ELEVATION TO MAIN APPROACH







90 kWh/m²/year

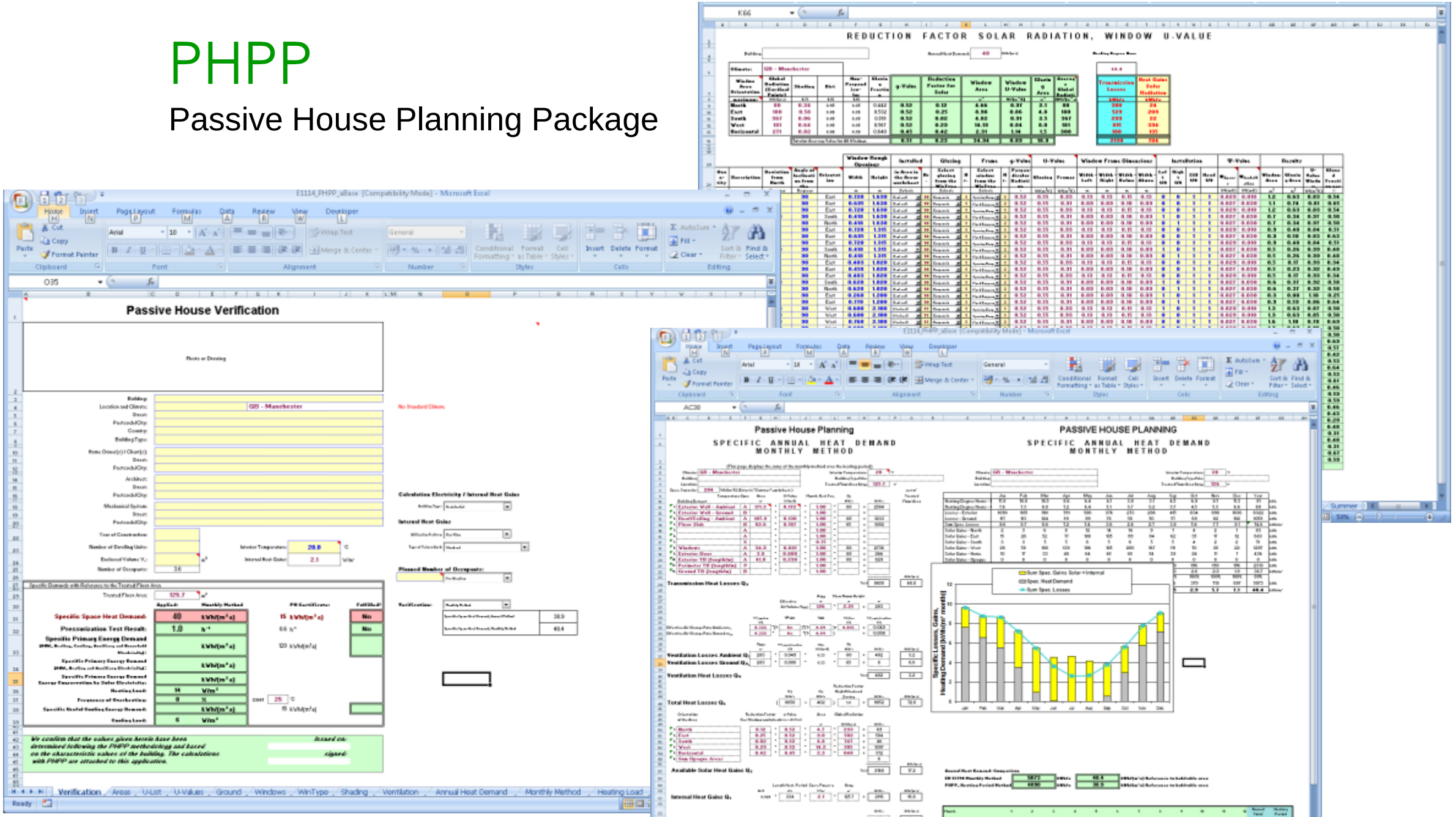
57 kWh/m²/year

Why chose the AECB Standard for a new build?

- Higher standard than Building Regulations
- A target is better than no target
- Approximately 50% low fuel bills
- Cheaper than Passivhaus
- More robust calculations
- Lower performance gap
- Possible with standard timber frame

PHPP

Passive House Planning Package

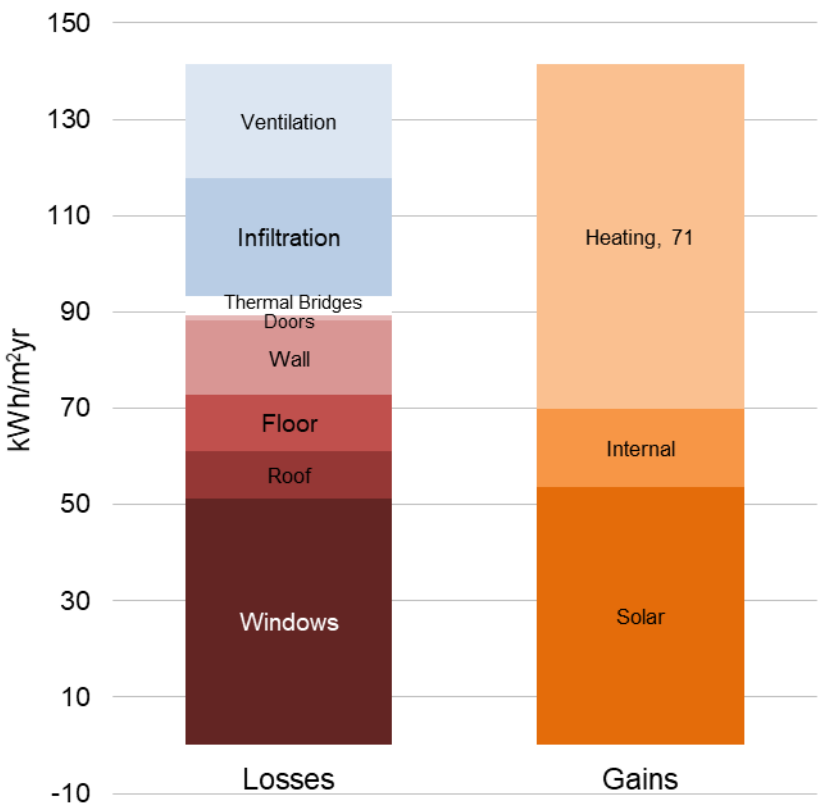


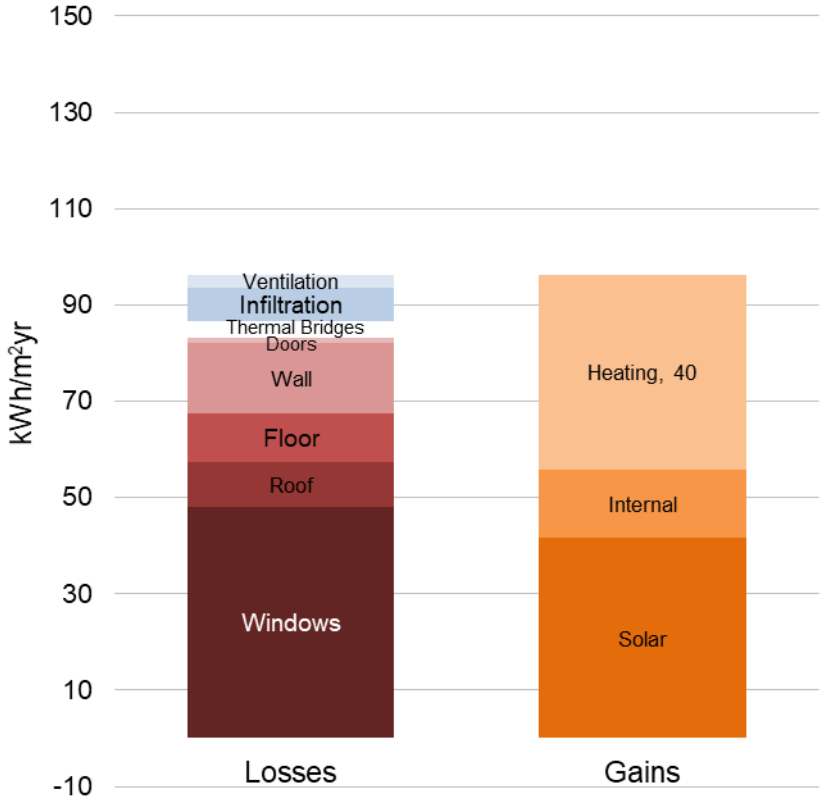
Advantages of PHPP

- SAP does not take shape of building into account.
  upto +45 kWh/m^{2}a
- Windows often not entered fully into SAP, frame factor
  +5 kWh/m2a for 25% wider frame components
- MVHR exhaust and intake duct losses not considered.
  +5 kWh/m2a for 2 x 5m uninsulated ducts
- Air pressure test average of positive & negative test not just which ever is better, and every property.
  +2 kWh/m2a for increase of 0.5 ach/h
- Shading and Orientation more accurate
- Over heating risk more accurate

The Island, AECB

The Island, AECB





Building Regs

5 ach/hr

Trickle vents

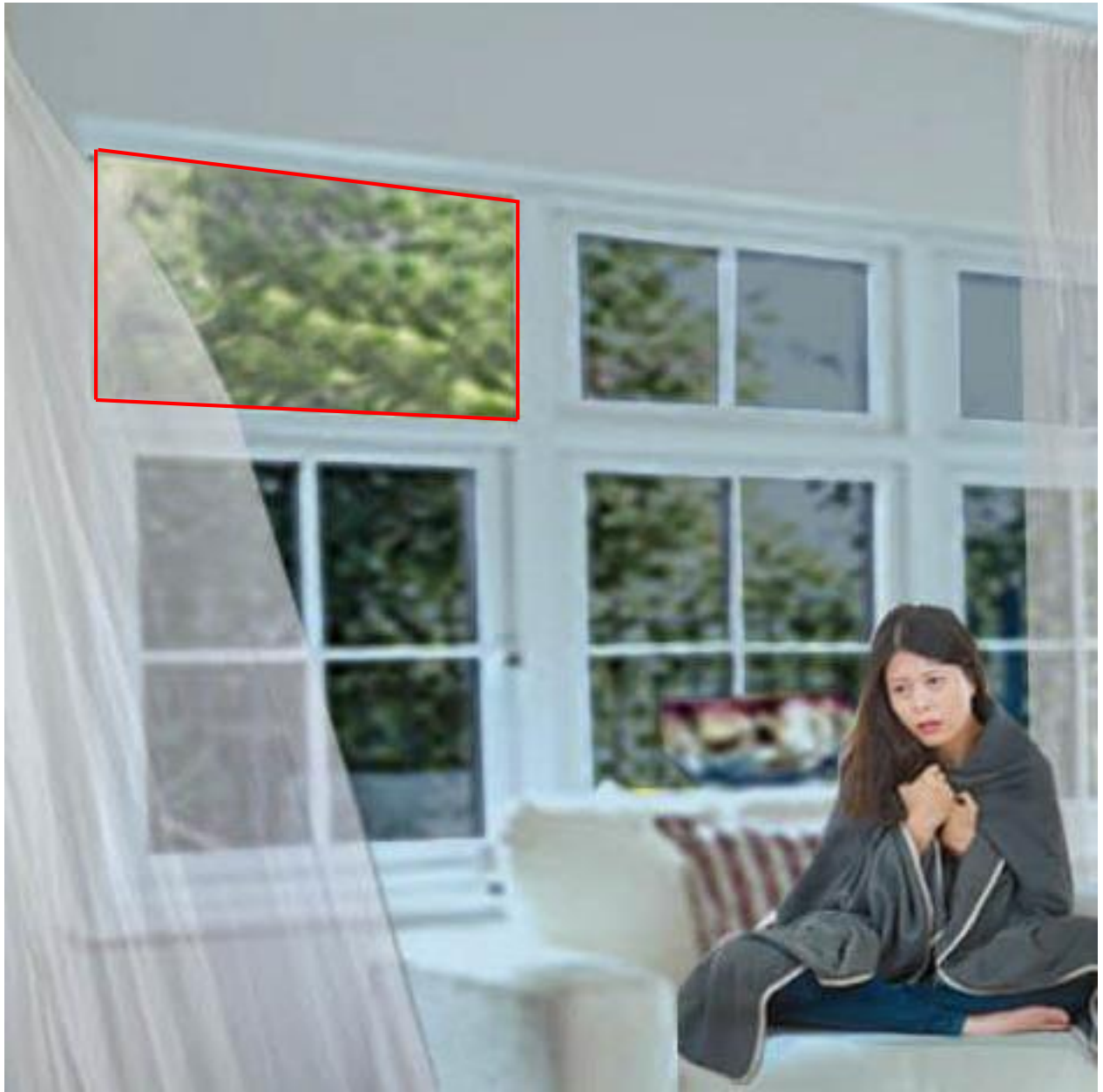
→

AECB

1.5 ach/hr

MVHR

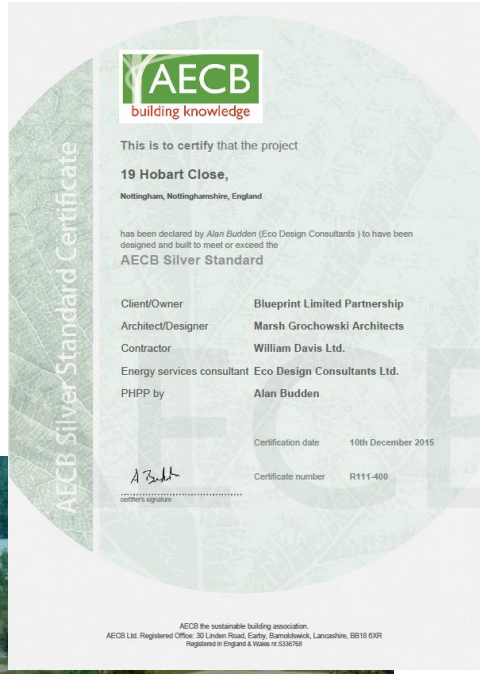
Draughts



Would you leave a hole like this open in your house in winter?

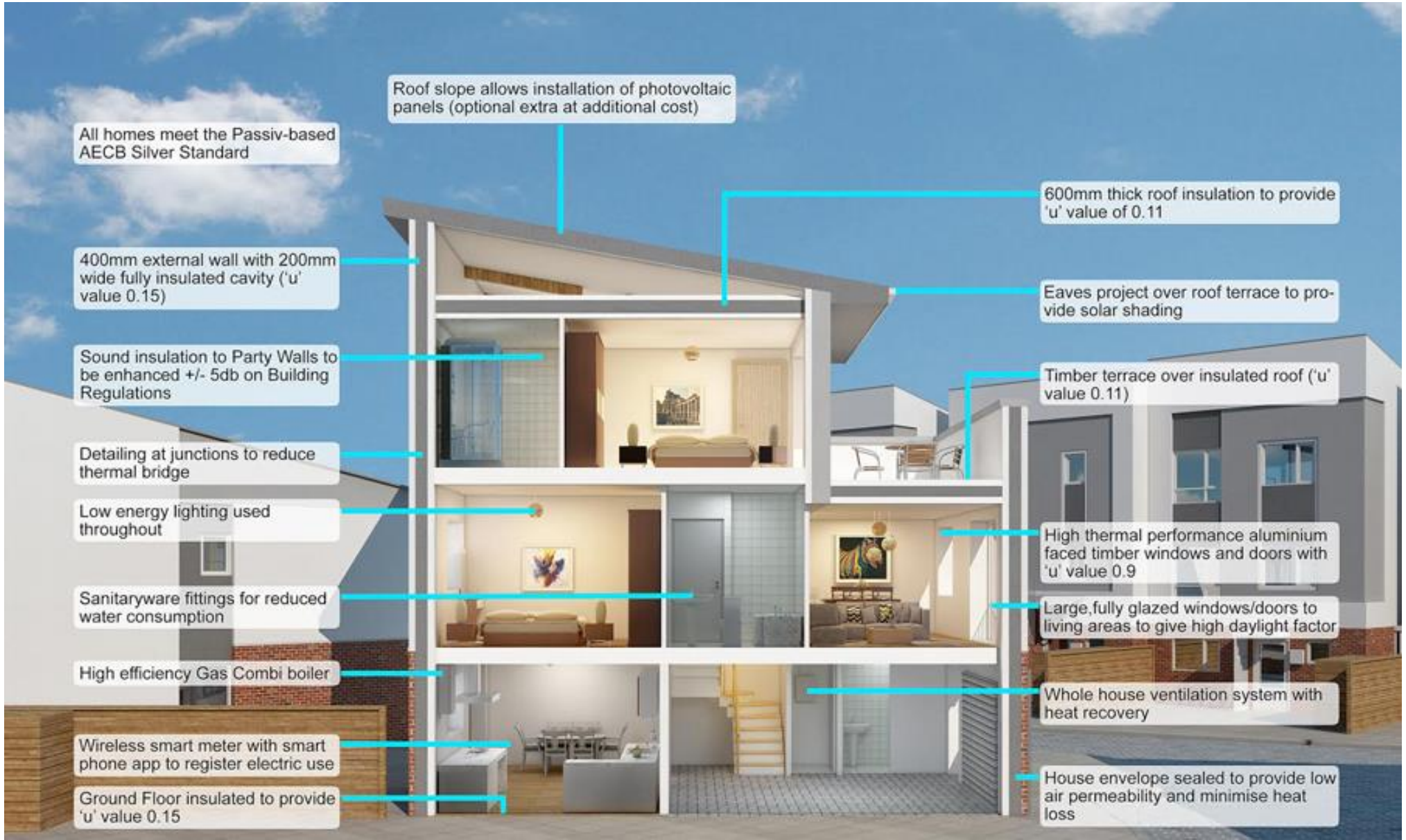
Case Study

- 63 Units to AECB Silver in Nottingham



blueprint asra HOUSING GROUP WILLIAM DAVIS igloo marsh:grochowski architects PULSE ASSOCIATES eco design consultants Architects & Environmental Consultants

Case Study


Roof slope allows installation of photovoltaic panels (optional extra at additional cost)
All homes meet the Passiv-based AECB Silver Standard
600mm thick roof insulation to provide 'u' value of 0.11
400mm external wall with 200mm wide fully insulated cavity ('u' value 0.15)
Eaves project over roof terrace to provide solar shading
Sound insulation to Party Walls to be enhanced +/- 5db on Building Regulations
Timber terrace over insulated roof ('u' value 0.11)
Detailing at junctions to reduce thermal bridge
Low energy lighting used throughout
High thermal performance aluminium faced timber windows and doors with 'u' value 0.9
Sanitaryware fittings for reduced water consumption
Large,fully glazed windows/doors to living areas to give high daylight factor
High efficiency Gas Combi boiler
Whole house ventilation system with heat recovery
Wireless smart meter with smart phone app to register electric use
House envelope sealed to provide low air permeability and minimise heat loss
Ground Floor insulated to provide 'u' value 0.15

Case Study

PHPP Modelling and analysis

eco Design Consultants
Architects & Environmental Consultants

Kings School Meadows, Nottingham
AECB Silver Options report using PassivHaus Planning Package (PHPP) Calculations

For Blueprint 27th June 2013 Version 01

Type A3_Plot 7 - *Detached*
Type S2_Plot 17 - *Mid Terrace*

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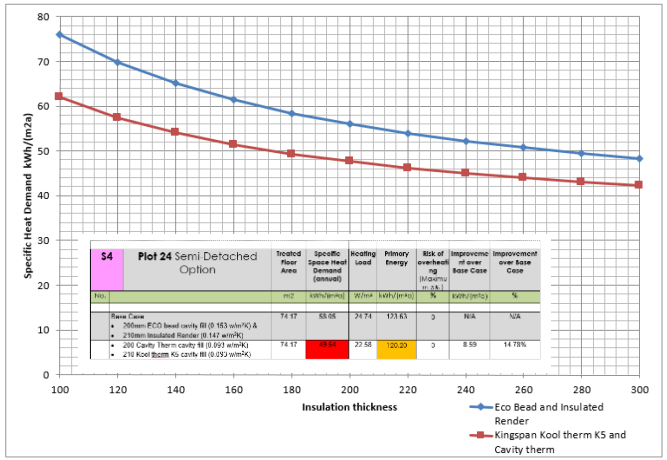
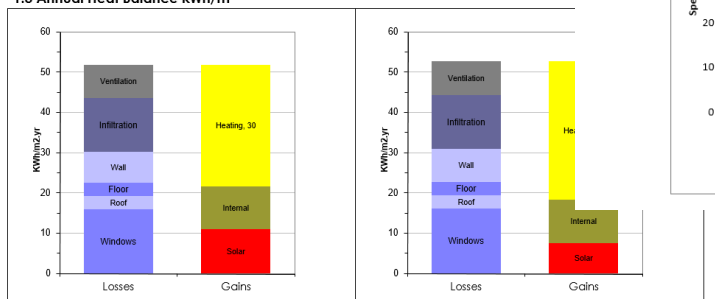
Type R5: Improving External Wall Insulation Graph



1.3 Annual Heat Balance kWh/m²



S4	**Plot 24** Semi-Detached Option	Treated Floor Area	Specific Space Heat Demand (annual)	Heating Load	Primary Energy			
No.		m2	kWh/(m²a)	W/m²	kWh/(m²			
	Base Case	74.17	58.05	24.74	123.63			
	Option 01 • 200mm Cavity Therm cavity fill (0.093 w/m²K) • 210mm Kool therm K5 cavity fill (0.093 w/m²K) • 250mm Celotex 4000 Ground floor insulation • Airtightness of 2	74.17	44.19	19.15	114.03			
	This option indicates an improvement over Base case by 23%, Option 01 improves the insulation lambda values and increases the floor insulation thickness by 50mm. The airtightness has changed from 3 to 2/hr, which has made a significant impact							
	Option 02 • 200mm Cavity Therm cavity fill (0.093 w/m²K) • 210mm Kool therm K5 cavity fill (0.093 w/m²K) • 150mm Celotex 4000 Ground floor insulation • Airtightness of 1	74.17	38.99	15.78	108.03	0	19.13	32.91%
	This option indicates an improvement over Base case by 32.34%, Option 02 improves the insulation lambda values and improved the airtightness from 3 to 2/hr. This has made a significant impact and allowed the this type to pass.							
	Option 03 • 200mm Cavity Therm cavity fill (0.093 w/m²K) • 210mm Kool therm K5 cavity fill (0.093 w/m²K) • 200mm Celotex 4000 Ground floor insulation Airtightness of 2 Insulating inside of lower window panels	74.17	39.14	17.97	102.84	0	18.91	32.57%
	This option indicates an improvement over Base case by 34.91%, Option 03 is similar to option 2 but has and air tightness of 2 and adds insulation to the inside of the lower window panels.							

Type A2 Plot 05 – *End Terrace*

- Type A2 Plot 5 – End Terrace is achieving the AECB silver certification.
- The tall tree line to the south reduces the amount of direct sun, minimising passive solar heat gains.
- Is achieving the specific space heating of less than 40 kWh/m²yr
- Primary energy consumption is below 120 kWh/m²yr
- Is achieving less than 22kWh(m²a)

Type A2 Plot 05 – *Mid Terrace Option*

- Type A2 Plot 5 – Mid Terrace Option would achieve the AECB silver certification.
- The tall tree line to the south reduces the amount of direct sun, minimising passive solar heat gains.
- Is achieving the specific space heating of less than 40 kWh/m²yr
- Primary energy consumption is below 120 kWh/m²yr
- Is achieving less than 22kWh(m²a)

ations

alculation and result formulated ons without improvements. The ing the current proposed house Grochowski Architects and the late the SAP Calculations by

tion:

Heat Loss Areas	U-Value W/m²K
External Wall	0.15
Roof	0.09
Exposed Floor	0.15
Door	0.7
Window	0.7
Party Wall	0.15
Air Permeability	3.0 m³/m²

Windows

	Glass g Transmission	Glass U_g W/(m²K)	Frame W/(m²K)	ψ_{spacer} W/(mK)
Nordan Ntech Villa	0.37	0.53	1.11	0.038
Nordan N-Tech 0.7	0.50	0.58	0.86	0.038

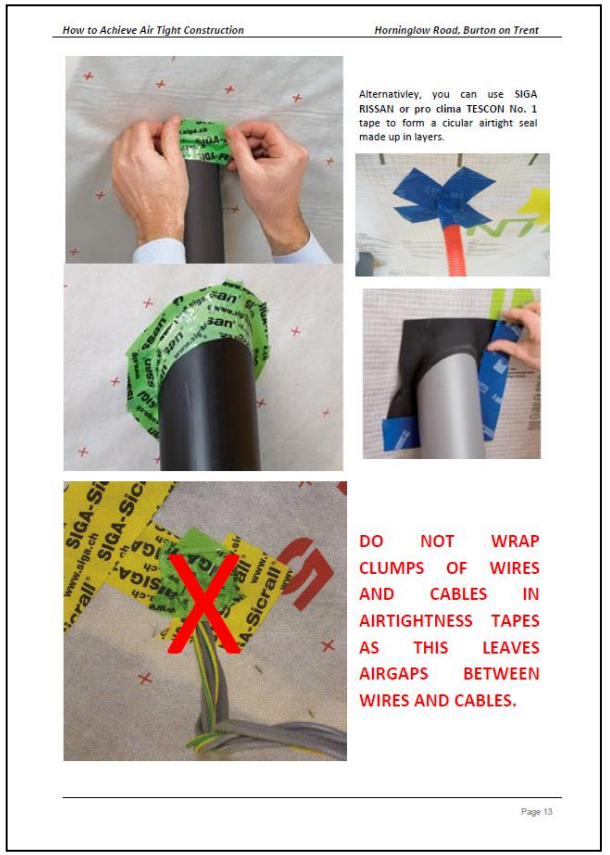
- **Thermal bridges**
  Thermal bridges (Ψ) are a linear heat coefficient, and a correction factor between U values. Passivhaus requires external Ψ ≥ 0.01 W/mK. Currently these have not been considered and an assumption of meeting this requirement has been used.
- **Air Permeability**
  50 pascals

Services specification

- **Ventilation:**
  MVHR system
- **Space Heating**
  Fuel:
  - Boiler System with radiators or under floor.
  - Mains Gas
  - Improved Gas Condensing Boiler
- **Domestic Hot Water**
  No Cylinder
- **Lights and appliances : Electric Efficiency**
  Low Energy fixed lights
- **Mechanical Ventilation**
  Continues supply and extract system.

Case Study

Airtightness Strategy & Workshop



How to Achieve Air Tight Construction — Horninglow Road, Burton on Trent

Alternativley, you can use SIGA RISSAN or pro clima TESCON No. 1 tape to form a cicular airtight seal made up in layers.

DO NOT WRAP CLUMPS OF WIRES AND CABLES IN AIRTIGHTNESS TAPES AS THIS LEAVES AIRGAPS BETWEEN WIRES AND CABLES.

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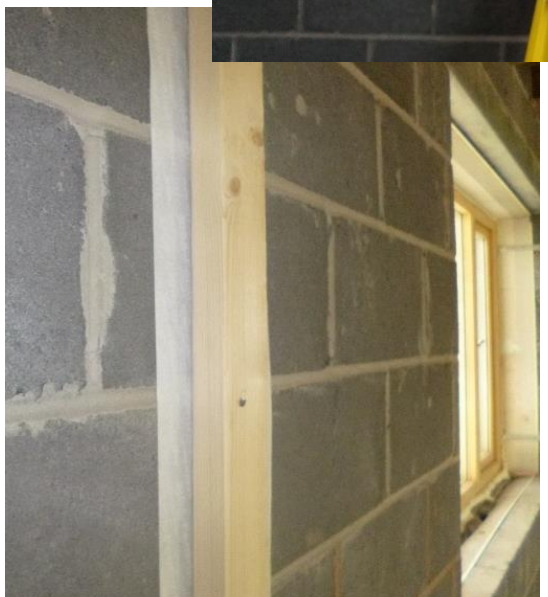
Case Study

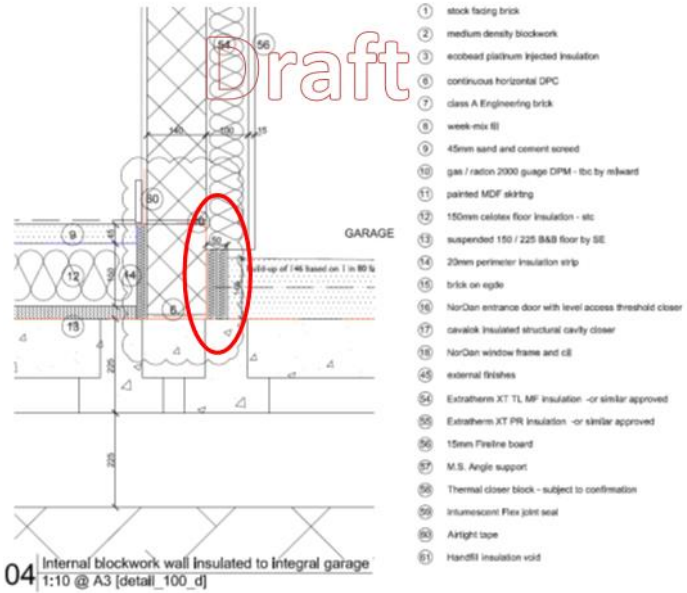
Development of check sheets & on site support



AECB Silver check sheet

King school Meadows

Perimeter insulation to garage



04 Internal blockwork wall insulated to integral garage
1:10 @ A3 [detail_100_d]

Perimeter insulation to all walls adjoining house in garage?		Plot Number	
		Date	
Insulation thickness (mm)		Name of inspector	
Insulation type		position	
Photo name		Signature	


Flame
WPA GS C16
DRY GRADED


ATLAS STREET


TREET
KT59 XOA


NOTTINGHAM
CITY
COUNCIL

Case Study

Lessons learnt:

- Achieving an airtightness of 1.5 is difficult
- Houses with simpler shape were easier to achieve standard.
- Wet plaster is better than parge coat with dot & dab.
- Ensure membrane is added behind stairs as it goes in.
- Integral garages and terraces were difficult.
- Avoid blockwork internal walls where possible.
- Train an airtightness champion.
- Keeping details simple is always good.

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Thank you
for listening

any questions?

Alan Budden

- PassivHaus Consultation & Design
- Energy Strategies
- Renewable Energy Feasibility Studies
- Sustainability Statements
- Thermal Bridging Analysis & Calculations (psi value)
- Airtightness Detailing
- Architectural Design & Working Drawings

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