



**Towards Zero Carbon:
A Short Introduction to Passivhaus at Tye Green**
Paul Smyth, Passivhaus Certifier & Tye Green Consultant

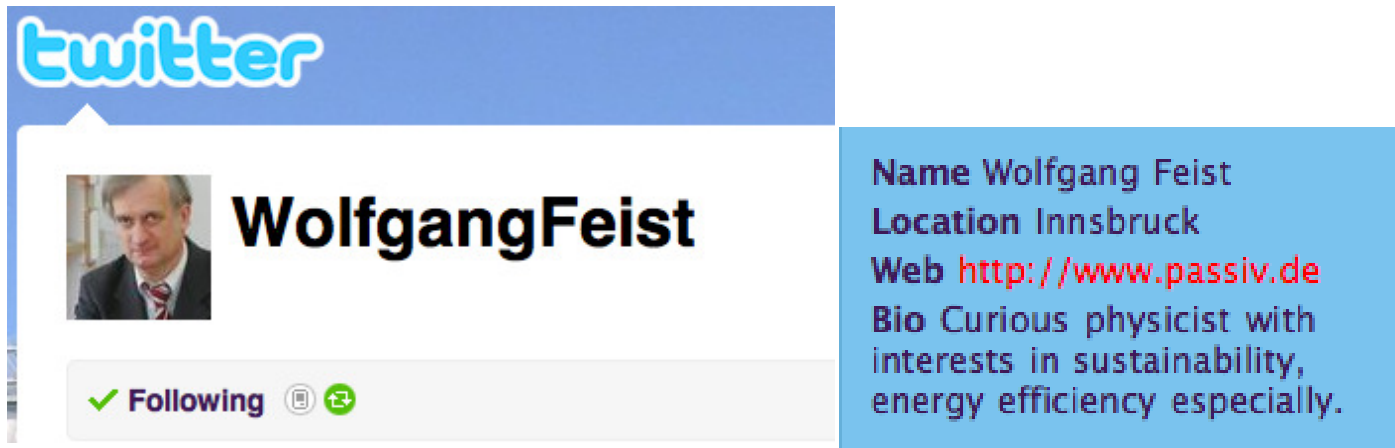


What is Passivhaus?

An energy and comfort standard for buildings

Developed in Germany in the 1980's.

Proven in over 7000 buildings worldwide



The image shows a Twitter profile for Wolfgang Feist. The profile picture is a man in a suit. The name is "WolfgangFeist". The bio is "Curious physicist with interests in sustainability, energy efficiency especially." The location is "Innsbruck". The website is "http://www.passiv.de". The status is "Following".

twitter

 **WolfgangFeist**

✓ **Following**  

Name Wolfgang Feist
Location Innsbruck
Web <http://www.passiv.de>
Bio Curious physicist with interests in sustainability, energy efficiency especially.

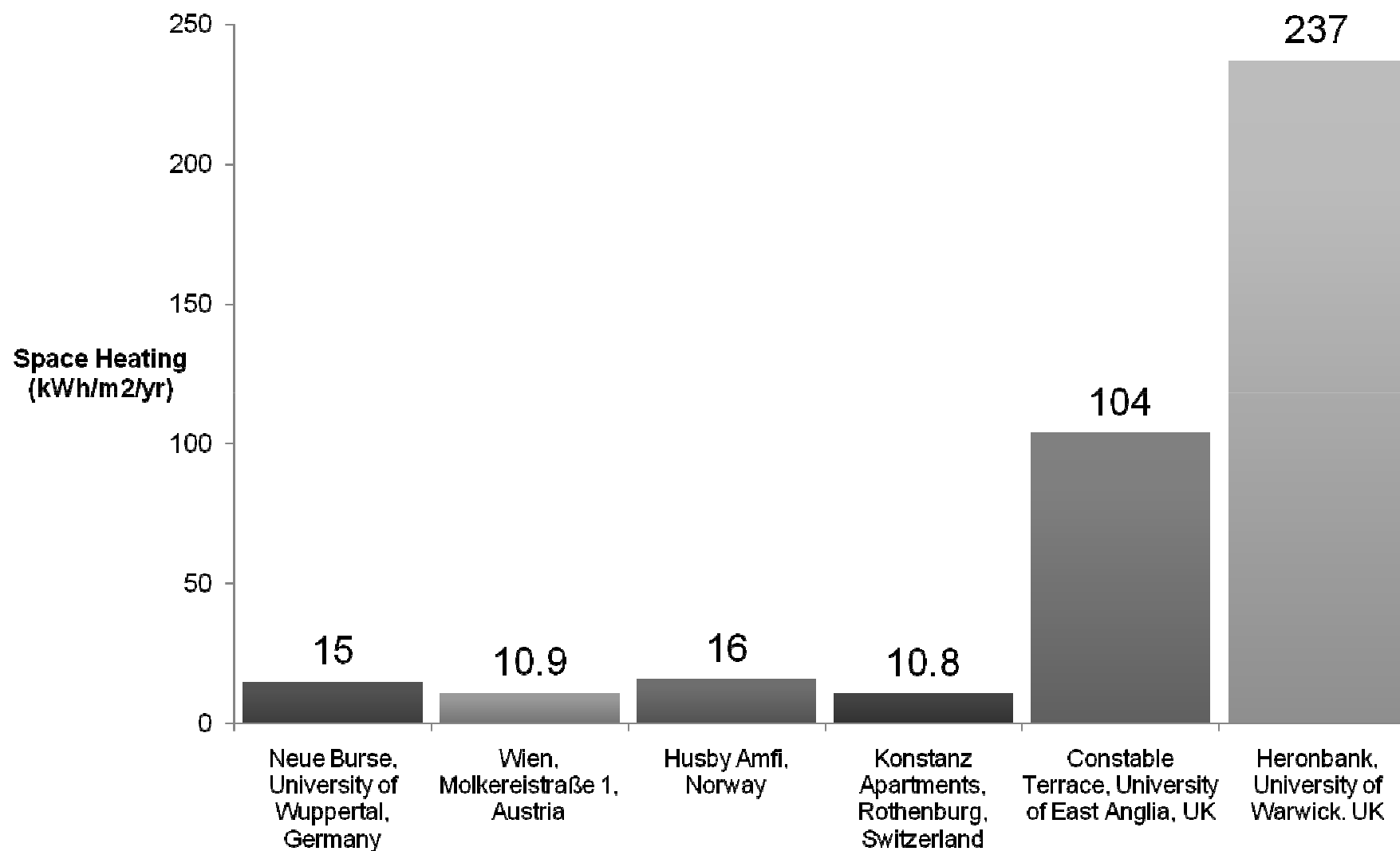


Huge reductions in energy use for heating



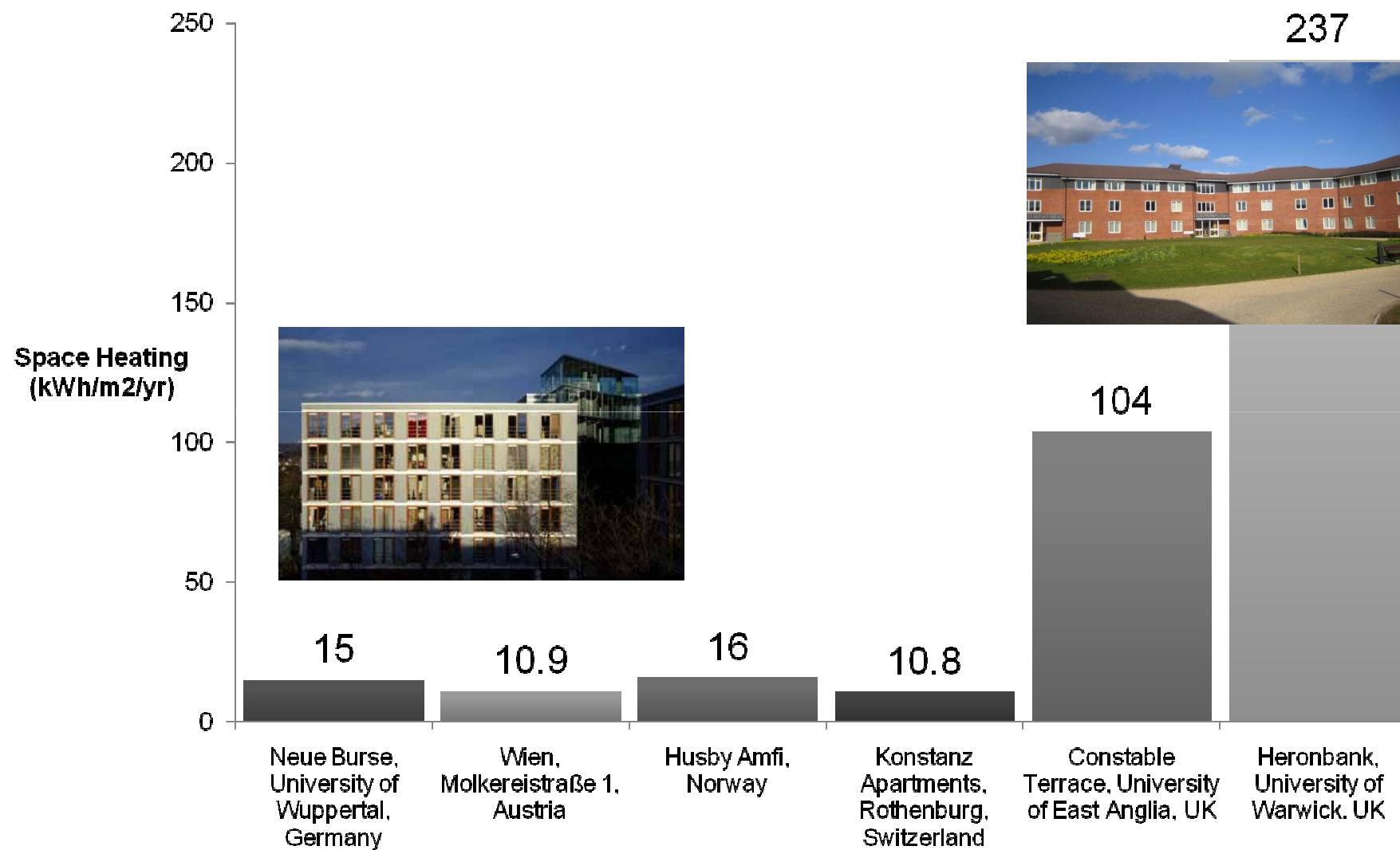


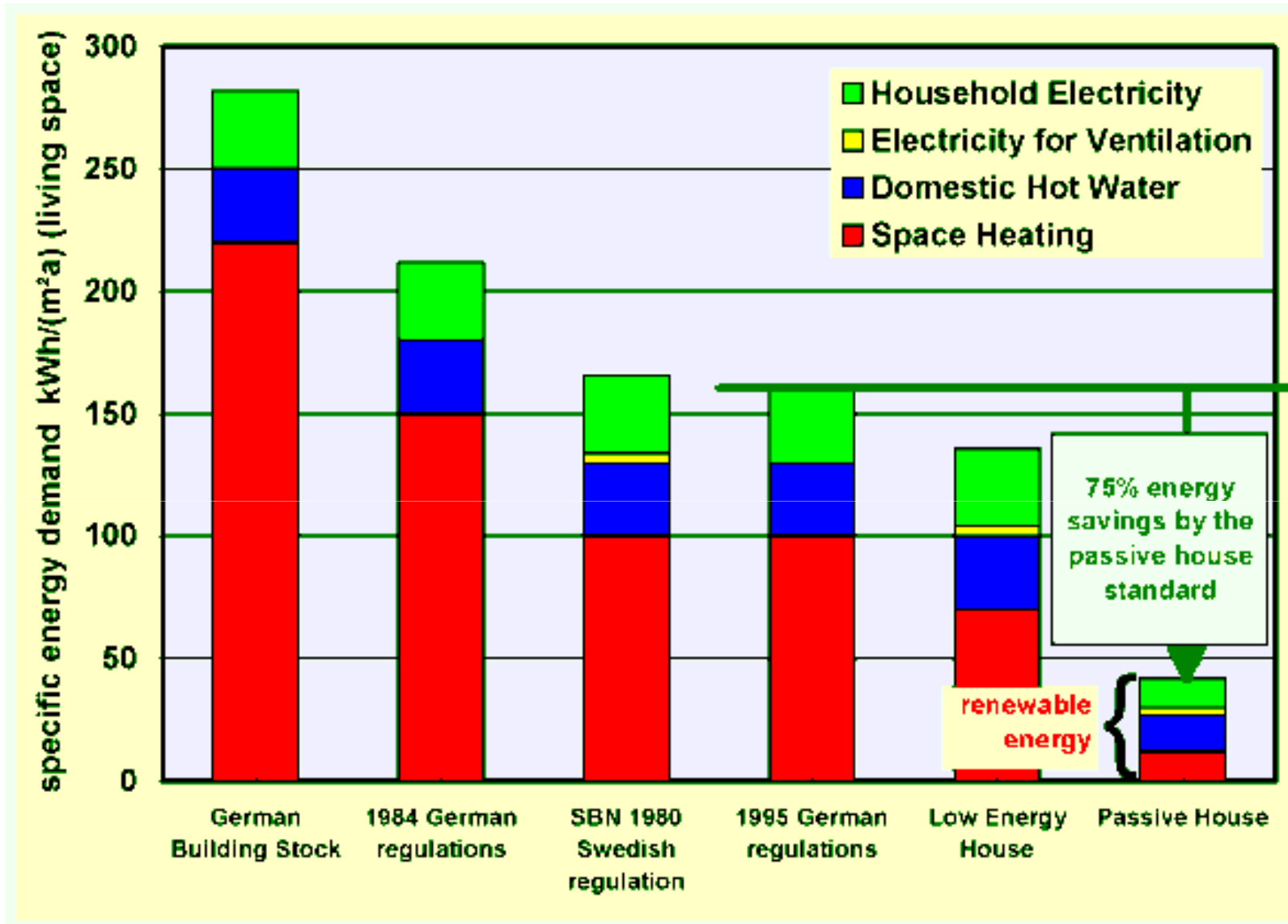
Comparison of UK and European Best Practice





Comparison of UK and European Best Practice





Source: Passivhaus Institut, Darmstadt



How do we do it?



Passive House Verification



Building: **End-of-Terrace Passive House Kranichstein**
Location and Climate: **Darmstadt Kranichstein** **Standard Germany**
Street:
Parcel/City: **D-64289 Darmstadt**
Country: **Germany/Hesse**
Building Type: **Terraced House/Dwelling**
Home Owner(s) / Client(s): **Bauherrengemeinschaft Passivhaus**
Street:
Parcel/City: **D-64289 Darmstadt**
Architect: **Prof. Bott/Ridder/Westermeyer**
Street: **Jahnstr. 8**
Parcel/City: **D-64289 Darmstadt**
Mechanical System: **Geb. Dipl.-Ing. Norbert Storz**
Street: **Bahnhofstr. 49**
Parcel/City: **D-64319 Pfungstadt**
Year of Construction: **1991**
Number of Dwelling Units: **1**
Enclosed Volume $V_{e,i}$: **665.0** m³
Number of Occupants: **4.5**
Interior Temperature: **20.0** °C
Internal Heat Gain: **2.1** W/m²

Specific Demands with Reference to the Treated Floor Area

Treated Floor Area:	156.0	m ²	Applied:	Heating Method	PH Certificate:	Fulfilled:
Specific Space Heat Demand:	14	kWh/(m ² a)	15	kWh/(m ² a)	Yes	
Proportionation Test Result:	0.2	k ⁻¹	0.6	k ⁻¹	Yes	
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):	65	kWh/(m ² a)	120	kWh/(m ² a)	Yes	
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):	37	kWh/(m ² a)				
Specific Primary Energy Demand (Energy Consumption by Solar Electricity):		kWh/(m ² a)				
Heating Load:	10	W/m ²				
Frequency of Overheating:	3	%	over 25	°C		
Specific Useful Cooling Energy Demand:		kWh/(m ² a)	15	kWh/(m ² a)		
Cooling Load:	9	W/m ²				

We confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The calculations with PHPP are attached to this application.

Issued on:

signed:

Calculate energy using the Passive House Planning Package (PHPP).





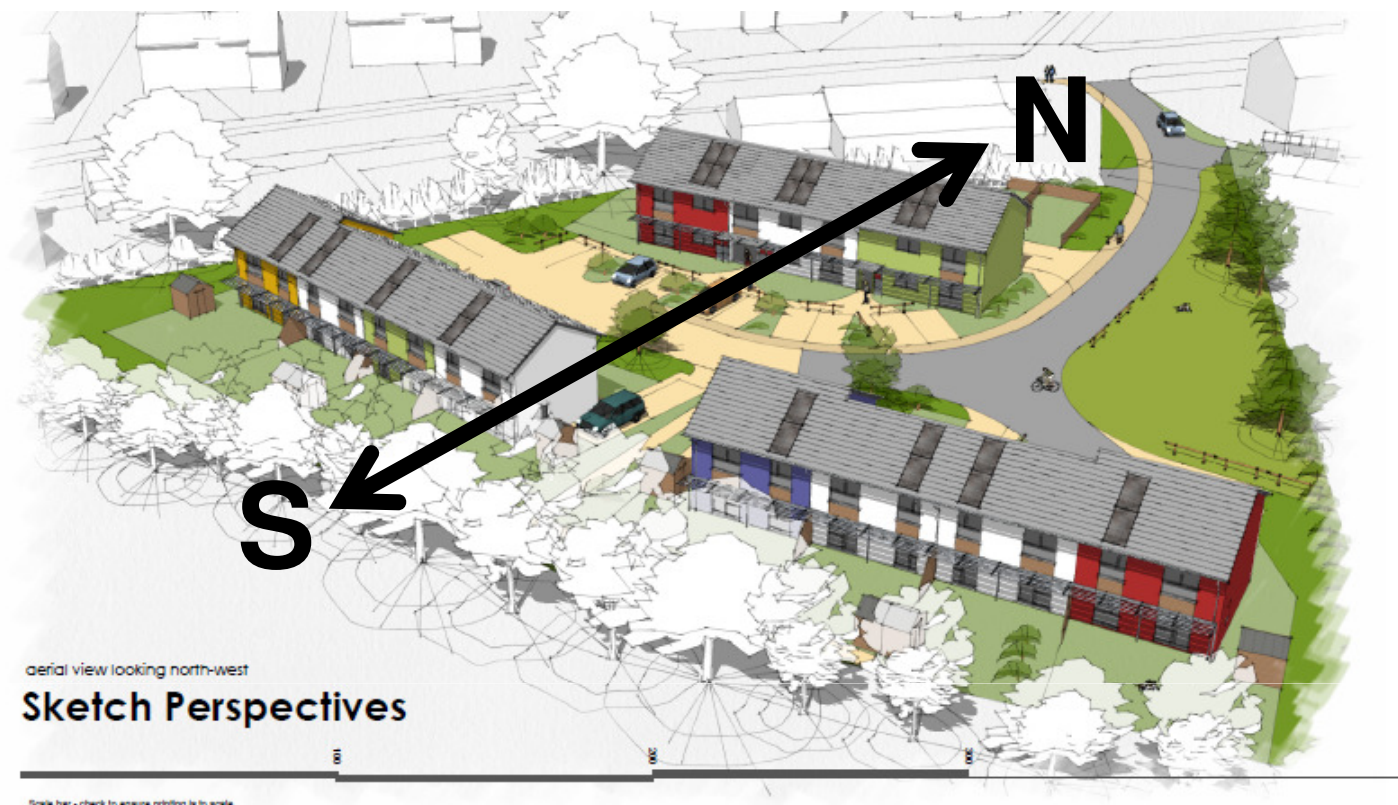
Maximise 'free' heat savings

Huddle buildings together
into terraces or flats

Increase windows on the
South to capture the sun's
heat.

Keep the building simple.

Balconies or radiator fins?



airial view looking north-west

Sketch Perspectives

Scale bar - check to ensure printing is to scale

South facing

12.0

kWh/m²/ yr

Specific Space Heat Demand:

12 kWh/(m²a)

Pressurization Test Result:

0.6 h⁻¹

Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):

100 kWh/(m²a)

Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):

56 kWh/(m²a)

Specific Primary Energy Demand Energy Conservation by Solar Electricity:

kWh/(m²a)

Heating Load:

9 W/m²

Frequency of Overheating:

1 %

Specific Useful Cooling Energy Demand:

kWh/(m²a)

Cooling Load:

7 W/m²

North facing

19.3

kWh/m²/ yr

19 kWh/(m²a)

0.6 h⁻¹

103 kWh/(m²a)

60 kWh/(m²a)

kWh/(m²a)

9 W/m²

0 %

kWh/(m²a)

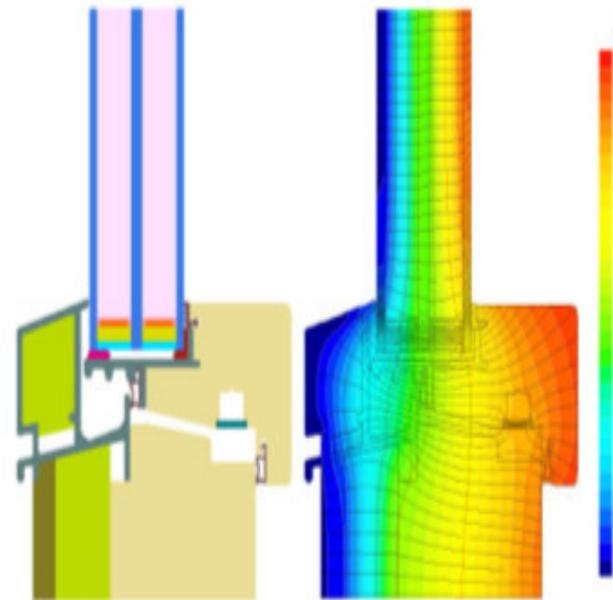
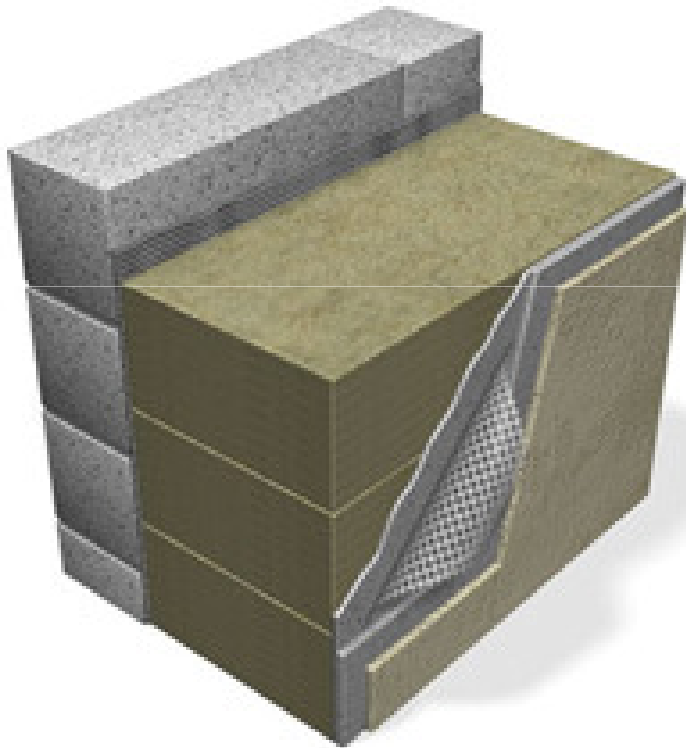
5 W/m²



Tea cosy of insulation

>30cm thick, no gaps (e.g thermal bridge free)

Triple glazed windows, insulated doors

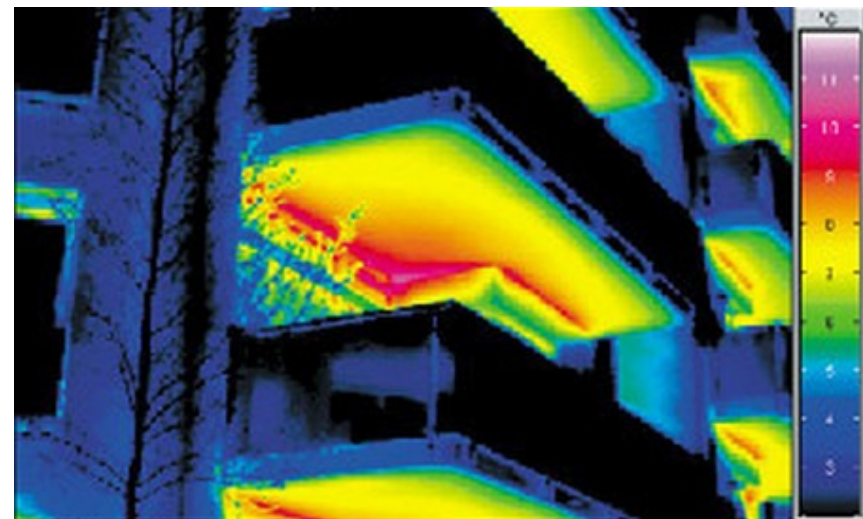
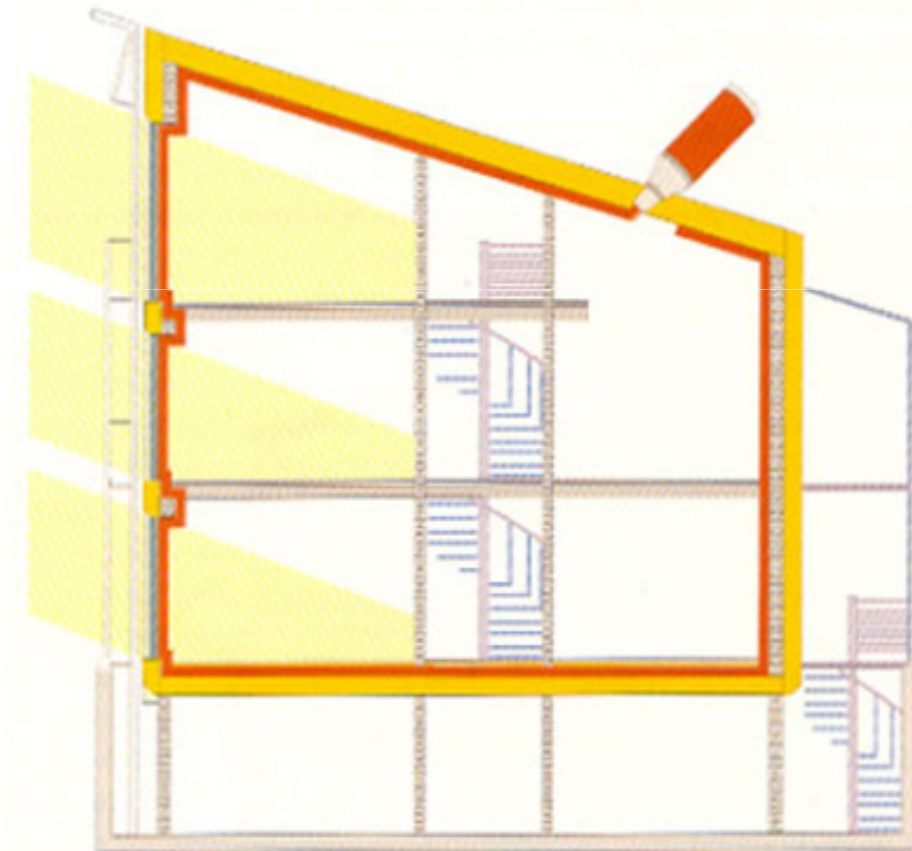




Tea cosy of insulation

>30cm thick, no gaps (e.g thermal bridge free)

Triple glazed windows, insulated doors





Eliminate air leakage

10X better than building regulations

Building Type	Air Permeability (m ³ /hr/m ² at 50 Pa)	
	Good practice	Best practice
Dwellings	10.0	5.0
Dwellings (with balanced mech. vent.)	5.0	3.0
Offices (naturally ventilated)	7.0	3.5
Offices (with balanced mech. Vent.)	3.5	2.0
Superstores	3.0	1.5
Offices (low energy)	3.5	2.0
Industrial	10.0	2.0
Museums and Archives	1.7	1.25
Cold Storage	0.8	0.4
Air Leakage Standards, based on CIBSE TM23 2000 (upper five), BSRIA Specification 10/98 and BRE BR448, 2002 (lower four).		

Build quality must be game changing



Ventilation

Continuous flow of fresh, filtered air into the home.

Heat is recovered from extract air.

Passivhaus is mixed mode so windows can be opened!



MVHR filter after 6 months in Central London
Image from bere:architects.co.uk





10X smaller heating system
needed to stay warm

Building stays warm “passively” from
solar gain, appliances and people!

You could heat the house with a hair
dryer!

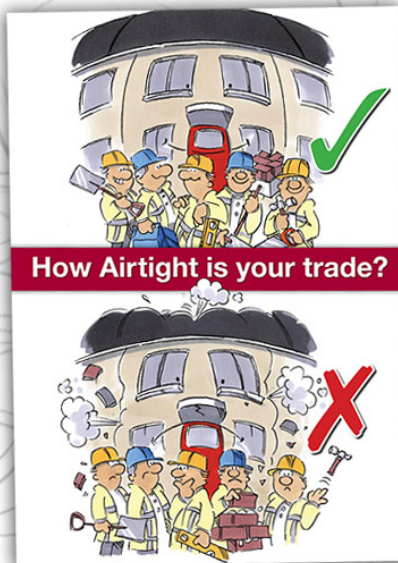


Mercedes Benz quality

Comfort is reliant on good workmanship

Opportunity to improve low carbon skills

New homes 'Airtightness' poster campaign





Passivhaus V Code for Sustainable Homes

Passivhaus only deals with energy. Code addresses water, materials, biodiversity etc.

Focus on fabric and energy rather than renewables and carbon. You need both for a zero carbon home.

Passivhaus = Code Level 3 or 4.

Passivhaus principles will be standard practice within 10 years





Homes not houses

“I want to reduce my carbon emissions”

“We need a warm house as my husband has Raynauds syndrome”

“We want to save on fuel bills, they’re only going to go up”

“Filtering the air will help with my hayfever”



Huge reductions in
energy costs

€39 bill for 8 months
of heating!

Auftraggeber
ABG Frankfurt Holding
Whg.-Bau u.Bet.-Ges.mBH
Elbestr. 48
D-60329 Frankfurt

techem

**Heiz-, Warm- und Kaltwasser-
kostenabrechnung 2007**

Erstellt am
12.09.2008

Ihre Nutzer-Nr.
00010.0204.0.0350.02

Techem Nutzer-Nr.
0011/07820 0003/0-15 Lage
1G

Abrechnungseinheit
Tevesstr. 48-54
Wg 204
D-60326 Frankfurt

Techem Energy Services GmbH - Hauptstraße 89 - 65760 Eschborn

Ihr Nutzungszeitraum
01.04.2007 - 31.12.2007

Abrechnungszeitraum
01.01.2007 - 31.12.2007

Ihre Heiz- und Warmwasserkosten	390,28 EUR
Ihre Kaltwasserkosten	276,68 EUR
Ihr Anteil an den Gesamtkosten	666,96 EUR
Ihre Vorauszahlung Heizung/ Warmwasser	-414,00 EUR
Ihre Vorauszahlung Kaltwasserkosten	-414,00 EUR
Ihr Guthaben	161,04 EUR

Ihr Anteil an den Gesamtkosten (1)

	Gesamtkosten : in EUR	Gesamteinheiten (2)	= Preis je Einheit x Ihre Einheiten x Zeitfaktor (3) =	Ihre Kosten in EUR
Heizkosten	1.729,77			
30% Grundkosten	518,93 :	1.310,021 m² Nutzfläche	= 0,396123 x 85,980x	18,73
70% Heizungskosten	1.210,84 :	14.647,100 Kilowatt-Stunden	= 0,082668 x 477,300	39,46
Warmwasserkosten	7.372,41			
30% Grundkosten	2.211,72 :	1.381,309 m² Nutzfläche	= 1,601177 x 89,280x	107,71
70% Warmwasserkosten	5.160,69 :	406,860 Kubikmeter	= 12,684191 x 17,690	224,38
Ihre Gesamtkosten Heizung/Warmwasser				390,28
Kaltwasserkosten	4.967,49			
Frischwasser Kalt	2.053,78 :	944,200 Kubikmeter	= 2,175154 x 54,600	118,76
Abwasser Kalt	1.799,42 :	944,200 Kubikmeter	= 1,905761 x 54,600	104,06
Abwasser aus Warmwasser	736,74 :	406,860 Kubikmeter	= 1,810795 x 17,690	32,03
Eichung / Zählertausch	266,56 :	944,200 Kubikmeter	= 0,282313 x 54,600	15,41
Verbrauchserfassung	110,99 :	944,200 Kubikmeter	= 0,117549 x 54,600	6,42
Ihre Kaltwasserkosten				276,68
Ihr Anteil an den Gesamtkosten				666,96

Ihre Ablesewerte

Gerätenummer/ Skala	Raum (3)	Zeitfaktor (3)	Datum	Ablesewert alt	Ablesewert neu	Verbrauch
Wärmezähler						
57	Z	550/560,97		1.390,000 ✓	1.867,300	477,300
Verbrauch (Kilowatt-Stunden)						477,300
Warmwasserzähler						
60753608	B		31.12.2007	0,010 ✓	17,700	17,690
Verbrauch (Kubikmeter)						17,690
Kaltwasserzähler						
61355272	B		31.12.2007	0,200 ✓	54,800	54,600
Verbrauch (Kubikmeter)						54,600

(1) Die Gesamtkosten können Sie der nachfolgenden Kostenaufstellung des gesamten Objektes entnehmen
(2) Gesamteinheiten des Objektes
(3) Siehe Erläuterungen

EINZELABRECHNUNG

Seite 1/3

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