The Performance of the Low Energy Victorian House

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learning and action to cut carbon

LENGARD

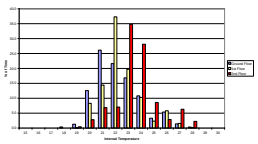
LANDERS
AND ASSOCIATES

Kingspan

LONDON GREEN HOMES
LEADING TO A GREEN LONDON

Heat Loss
Co Heating Test

Summer Over heating



Winter Temperature

How does the LEVH really perform?

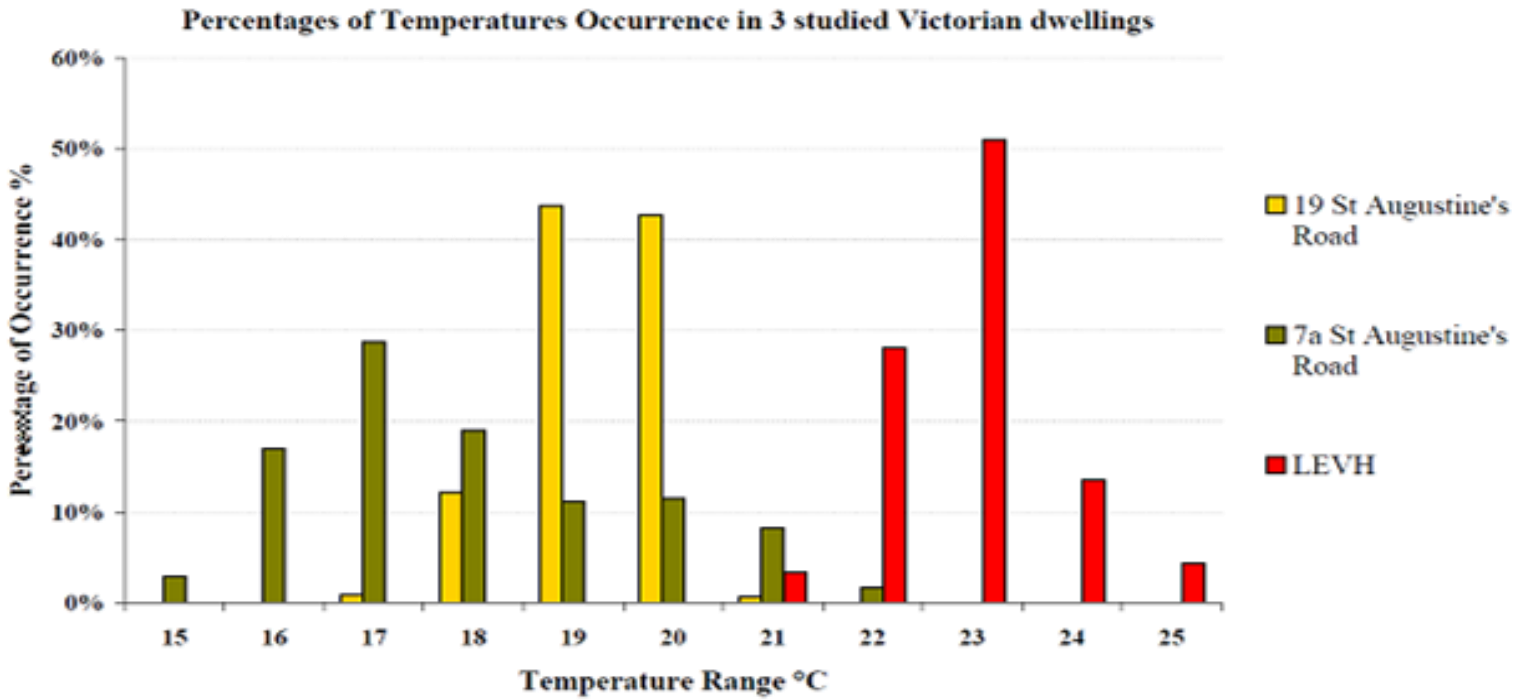
Air permeability :
Fan Pressurisation Test

Gas and Electricity consumption

PV : Electricity Production

Does the internal insulation work?

Temperatures of Neighbouring houses



Co Heating Test

Figure 2.1: Thermostatically controlled Fan heater used in Co-heating test

Figure 2.2: Pyranometers and data logger being installed for Co-heating test

LEVH Heat Loss

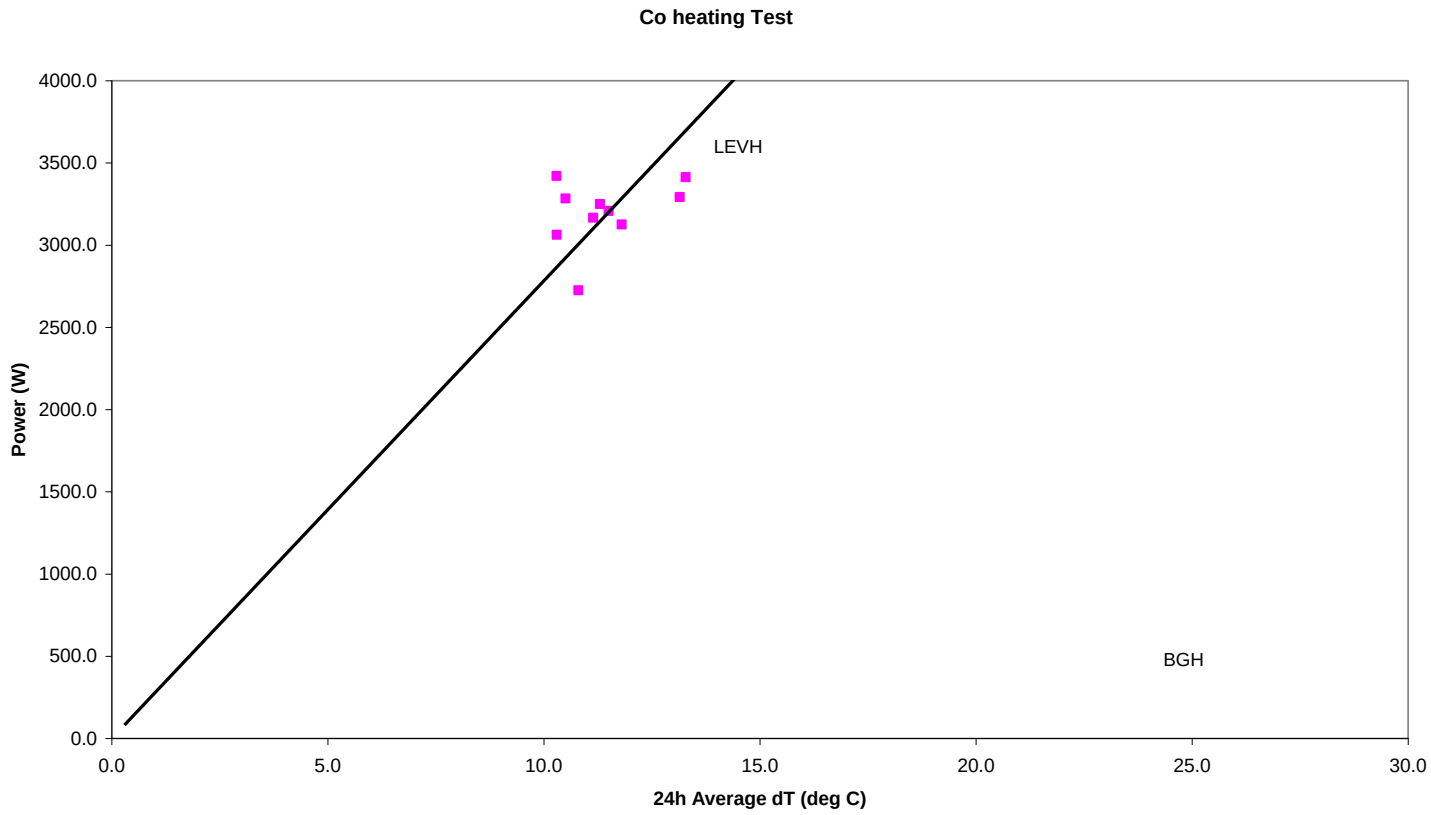
Design Heat Loss

The design values of the Heat loss co efficient and heat loss parameter for the LEVH, are shown in Table 1.1. These values are taken from a SAP calculation performed by Kingspan insulation

Element	Area (m^2)	U-value (W/m^2K)	A × U (W/K)
Windows	23.81	(1.42) 1.5	33.69
Door1	4.11	2	8.22
Door2	6.06	1.5	9.09
Roof1	67.35	0.15	10.1
Roof2	9.7	0.16	1.55
Walls1	61.24	0.3	18.37
Walls2	169.69	0.19	32.25
Walls3	8.37	0.43	3.6
Floor	78.01	0.23	17.94
Total area of elements	428.34		
Fabric heat loss			135
Effect of thermal bridges			34
Total fabric heat loss,			170
Ventilation heat loss,			135
Heat loss coefficient,			**304**
Heat loss parameter (HLP)		**1.23**	

Table 1.1. The design values of the Heat loss co efficient and heat loss parameter for the LEVH

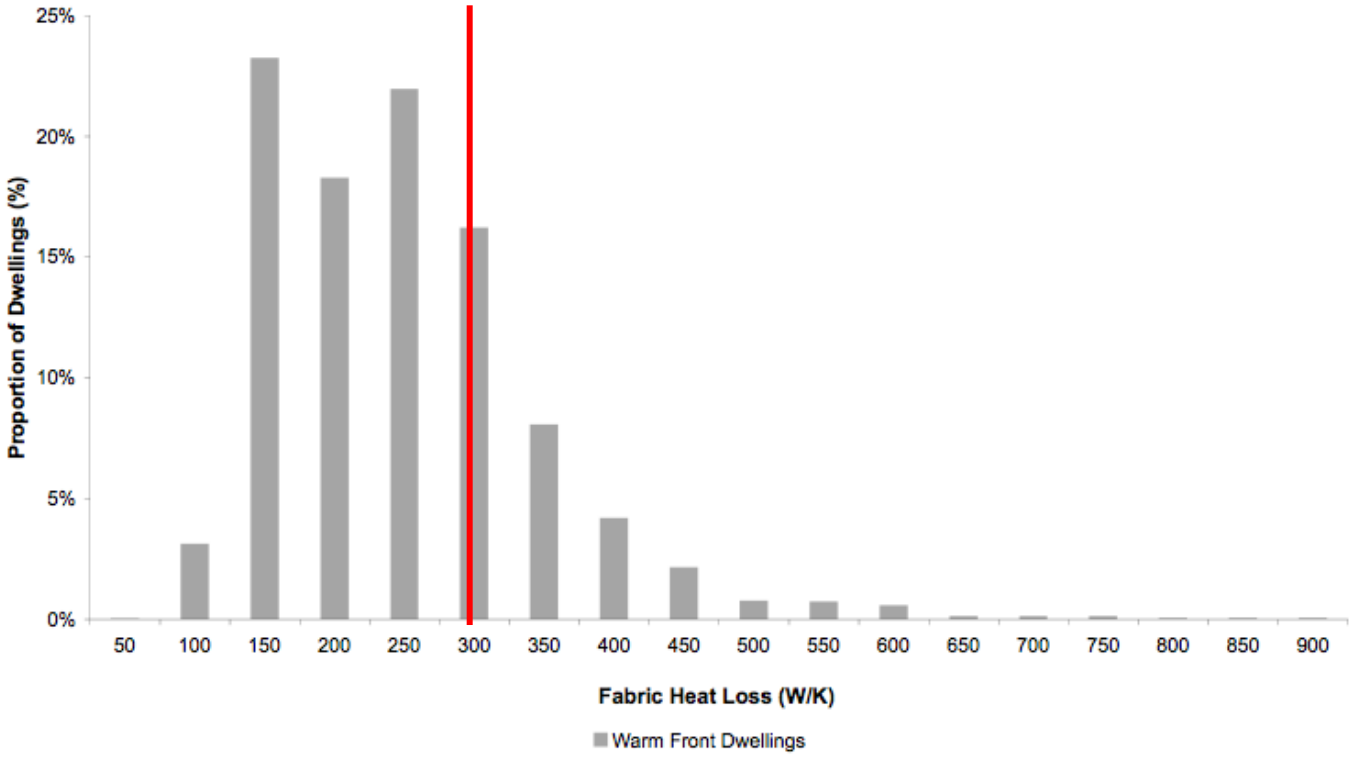
Results of Co heating test



Design Targets met

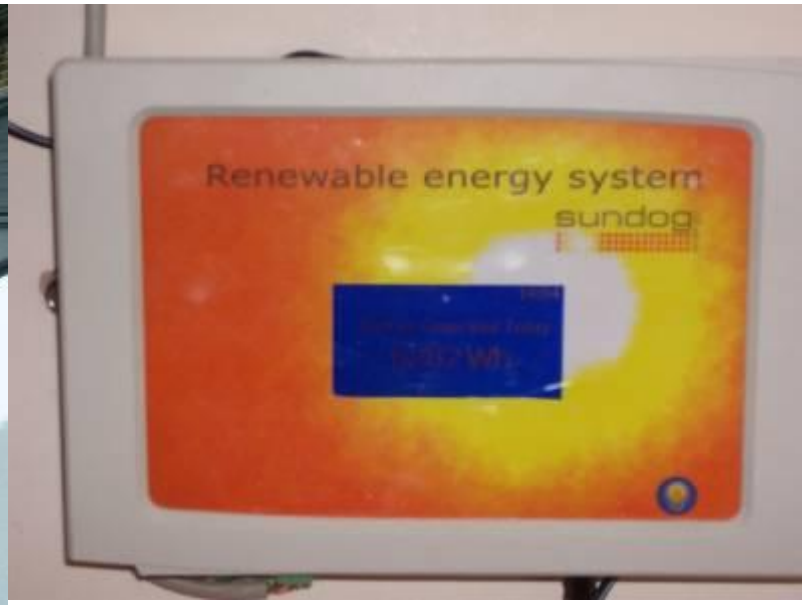
Refurbishment: LEVH	Measured	Design
Heat Loss Coefficient	280 W/K	300 W/K
Heat Loss Parameter	1.12 W/m^2K	1.23 W/m^2K
Air Permeability	6.5 $m^3/hr/m^2$	7 $m^3/hr/m^2$

Distribution of UK Fabric Heat Loss



Hamilton,I.G., Davies,M., Ridley,I., Oreszczyn,T., Hong,S., Barratt,M., Lowe,R. (Forthcoming). The impact of the 'take back' effect in UK domestic stock modeling: health impacts and CO2 emissions. *Building Service Engineering Research and Technology* . ISSN: 0143-6244

Performance of PV system



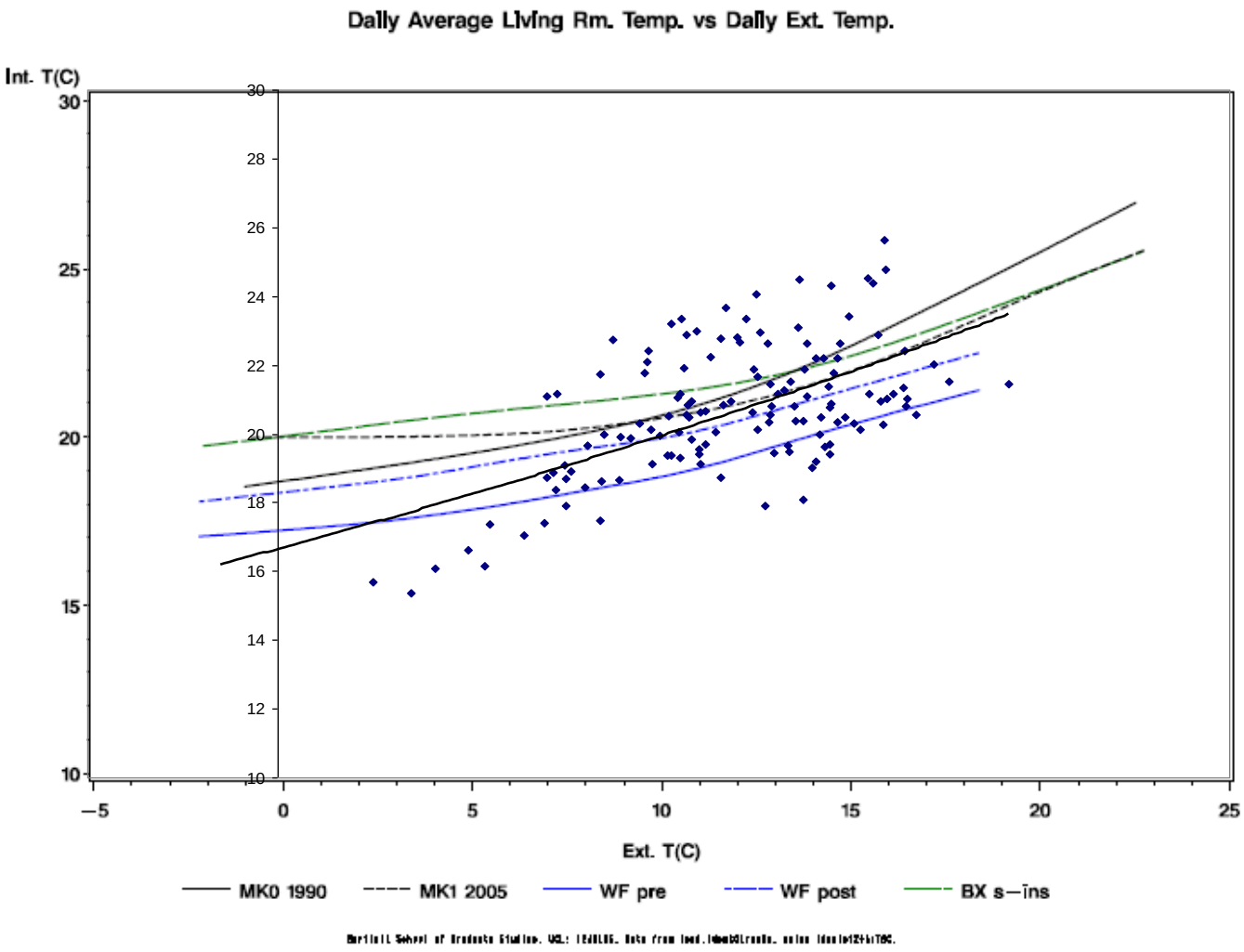
PV Produced 10/12/08 to 18/12/09 = 2850 KWh

Annual Predicted PV Production 2711 KWh

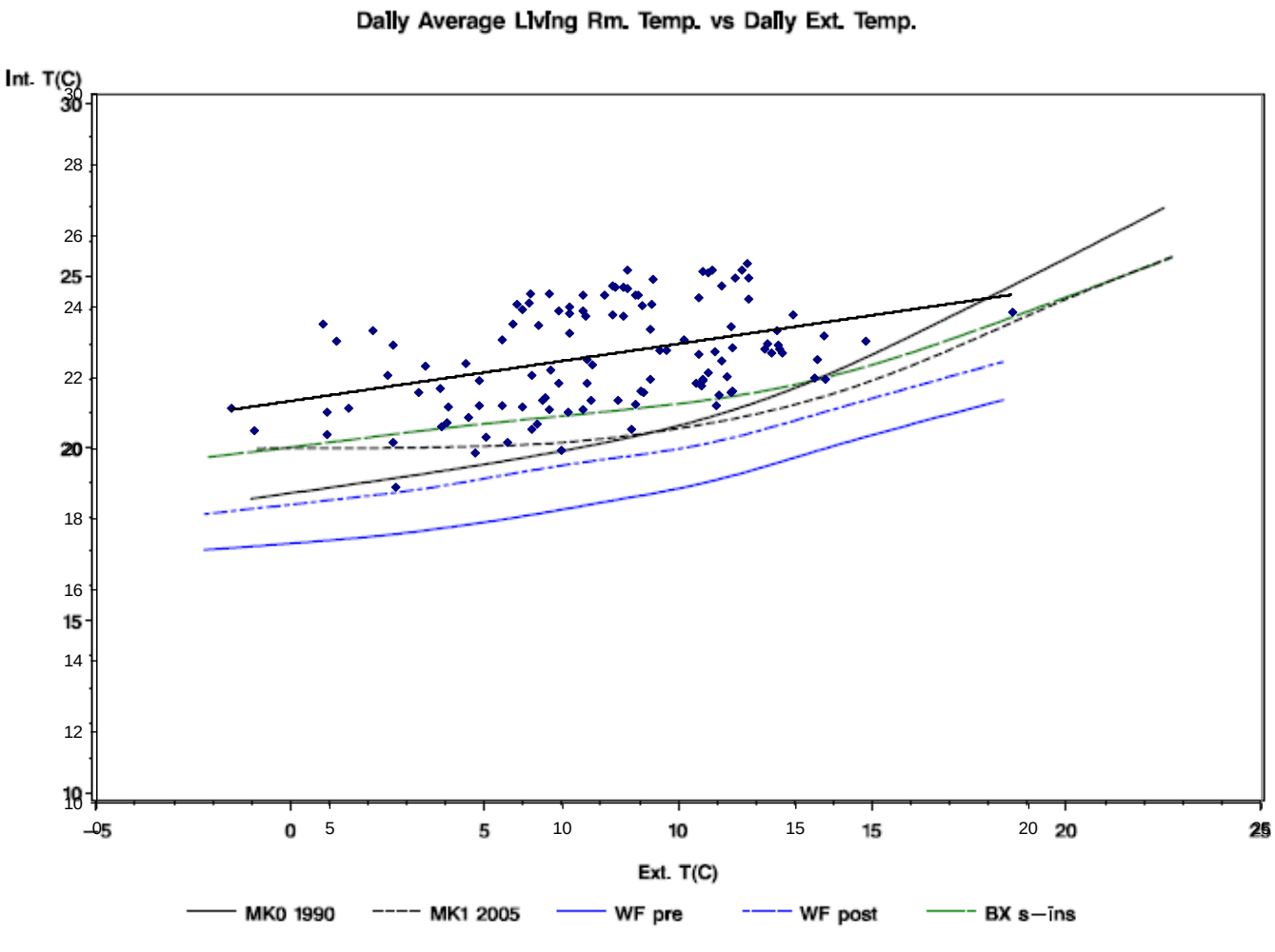
(June, July, August measured Global solar radiation
-5% less than CIBSE TRY)

Solar radiation data Chris Leung,

Internal Temperature



Internal Temperature



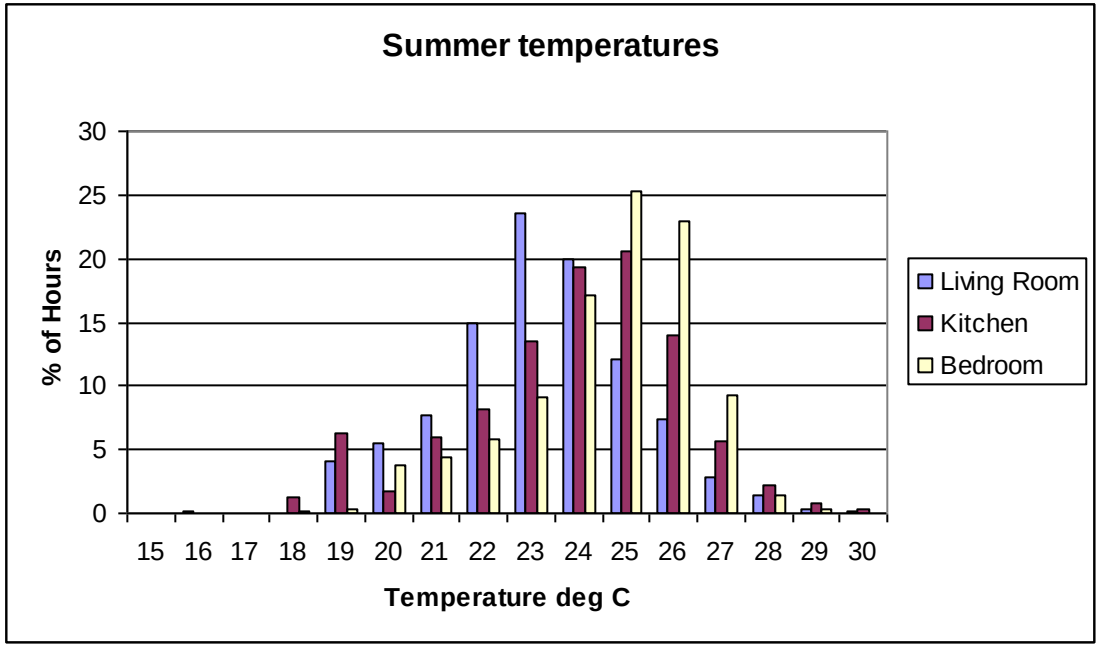
Winter Internal Temperature

Average Winter Bedroom Temperature 22 ^{o}C

Average Winter Living Room Temperature 20.9 ^{o}C

The tenants are taking 1-2 ^{o}C of “comfort” take back

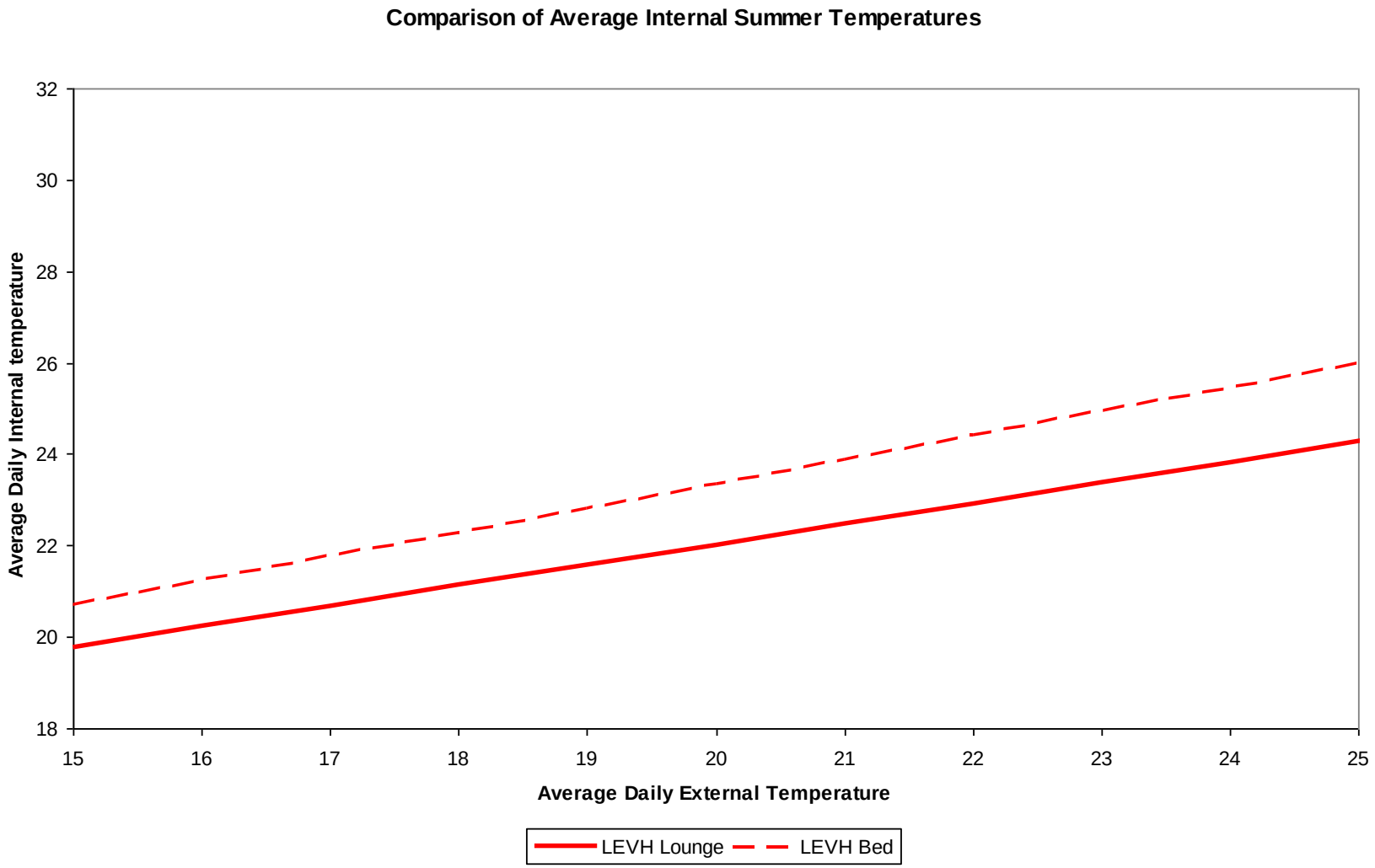
Summer time Overheating?



		CIBSE TRY	2009
	Max	26	23
May	Avg	14	13
	Min	5	6
	Max	32	30
June	Avg	16	16
	Min	6	6
	Max	29	30
July	Avg	16	17
	Min	11	11
	Max	31	26
Aug	Avg	18	17
	Min	9	10

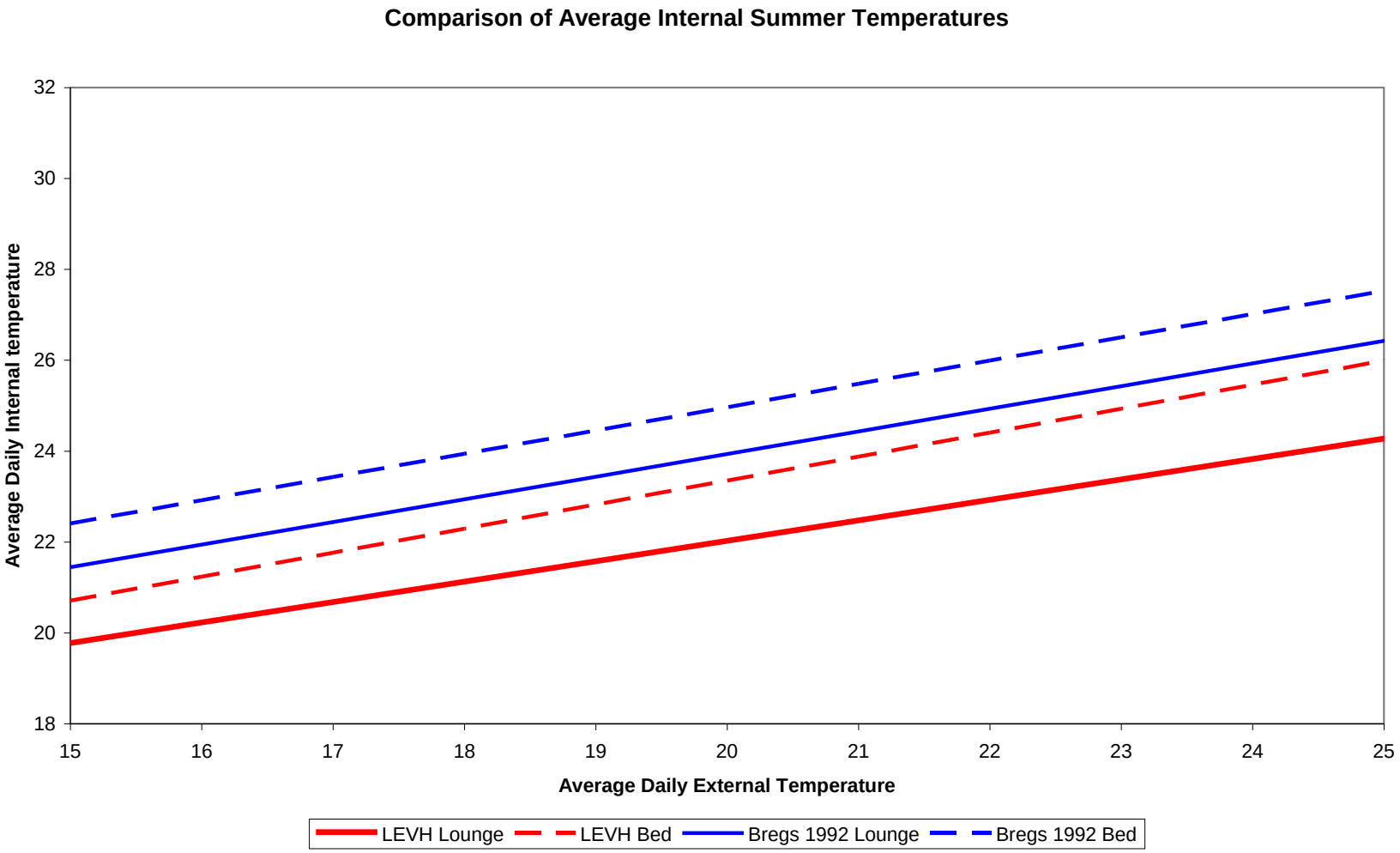
Internal Insulation: Reduce Thermal Mass – Increase summertime overheating?

Summer time Overheating?



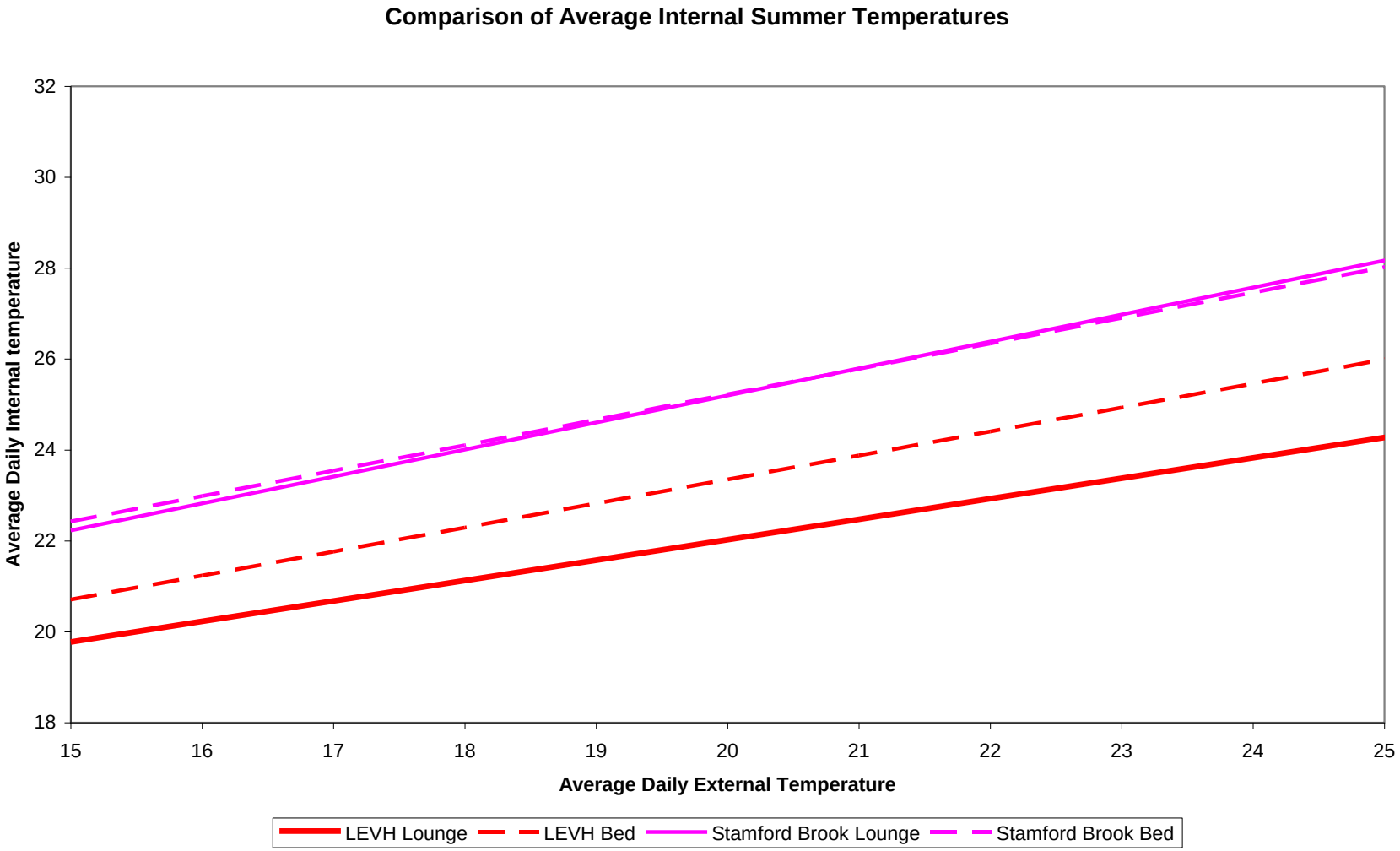
LEVH 1 house (July and August 2008) Ridley, Nikolaidou

Summer time Overheating?



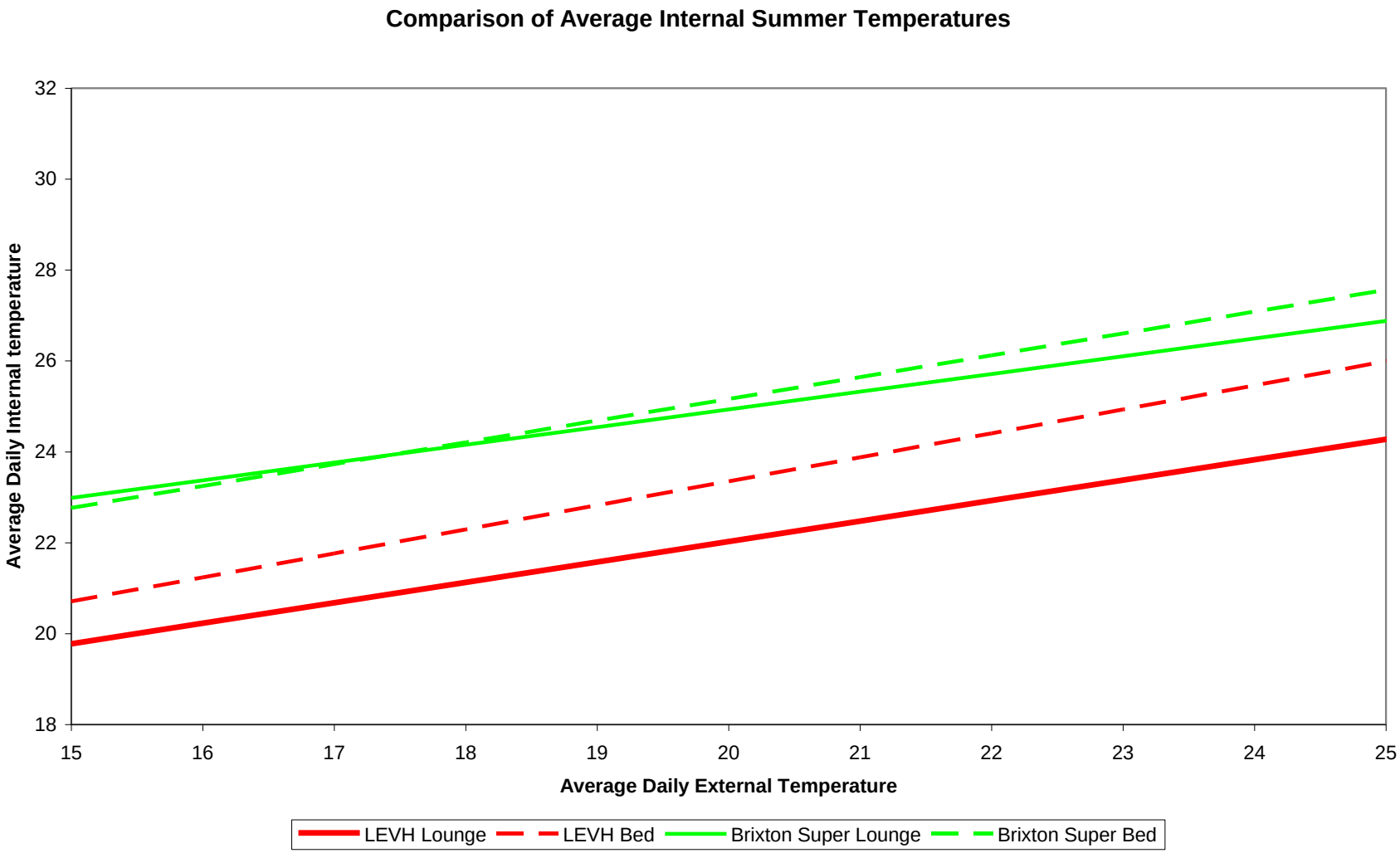
Brixton 5 house (July and Aug 1994) Ridley

Summer time Overheating?



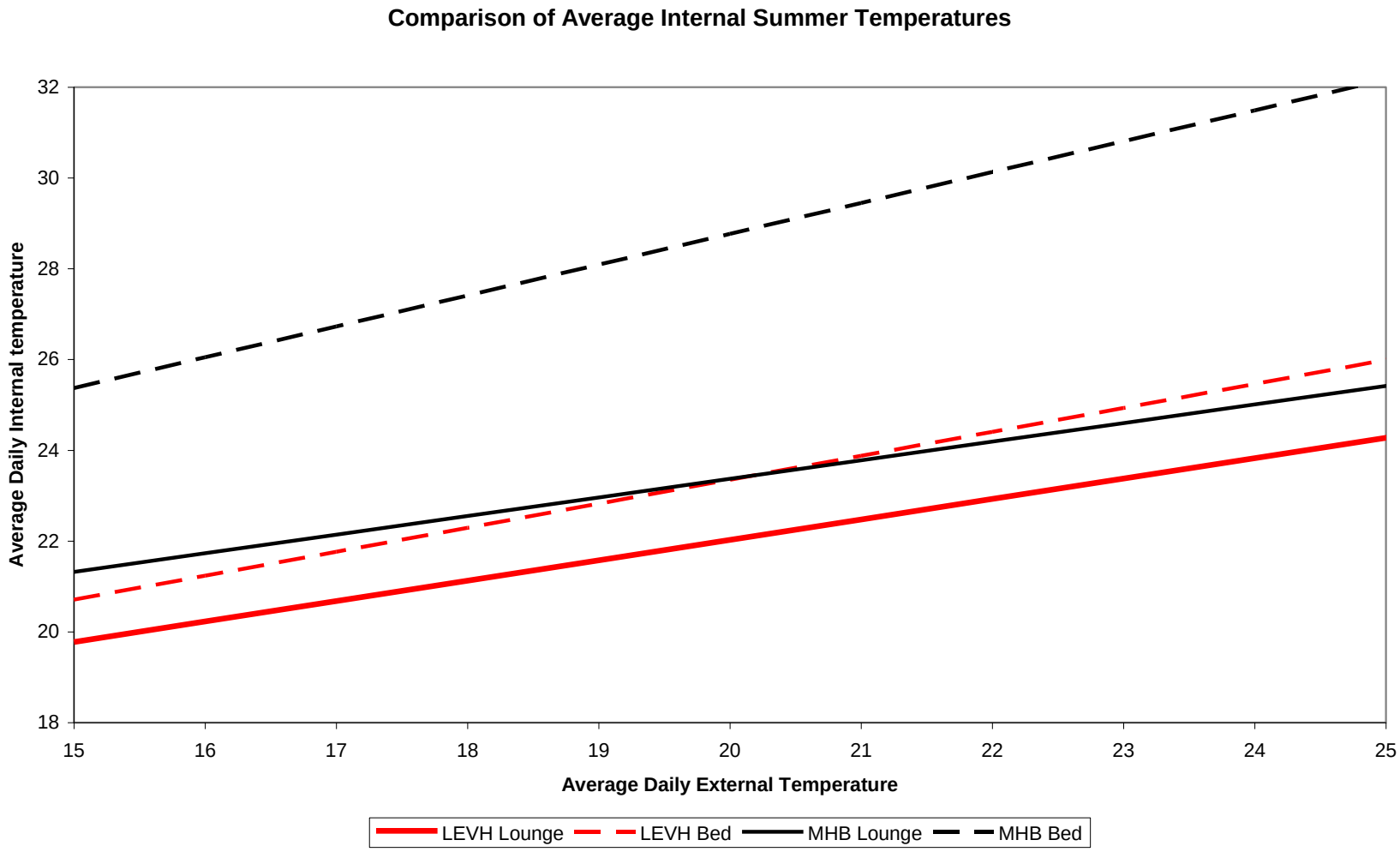
Stamford Brook 3 house (July and Aug 2006) Wingfield, Lowe, Bell

Summer time Overheating?



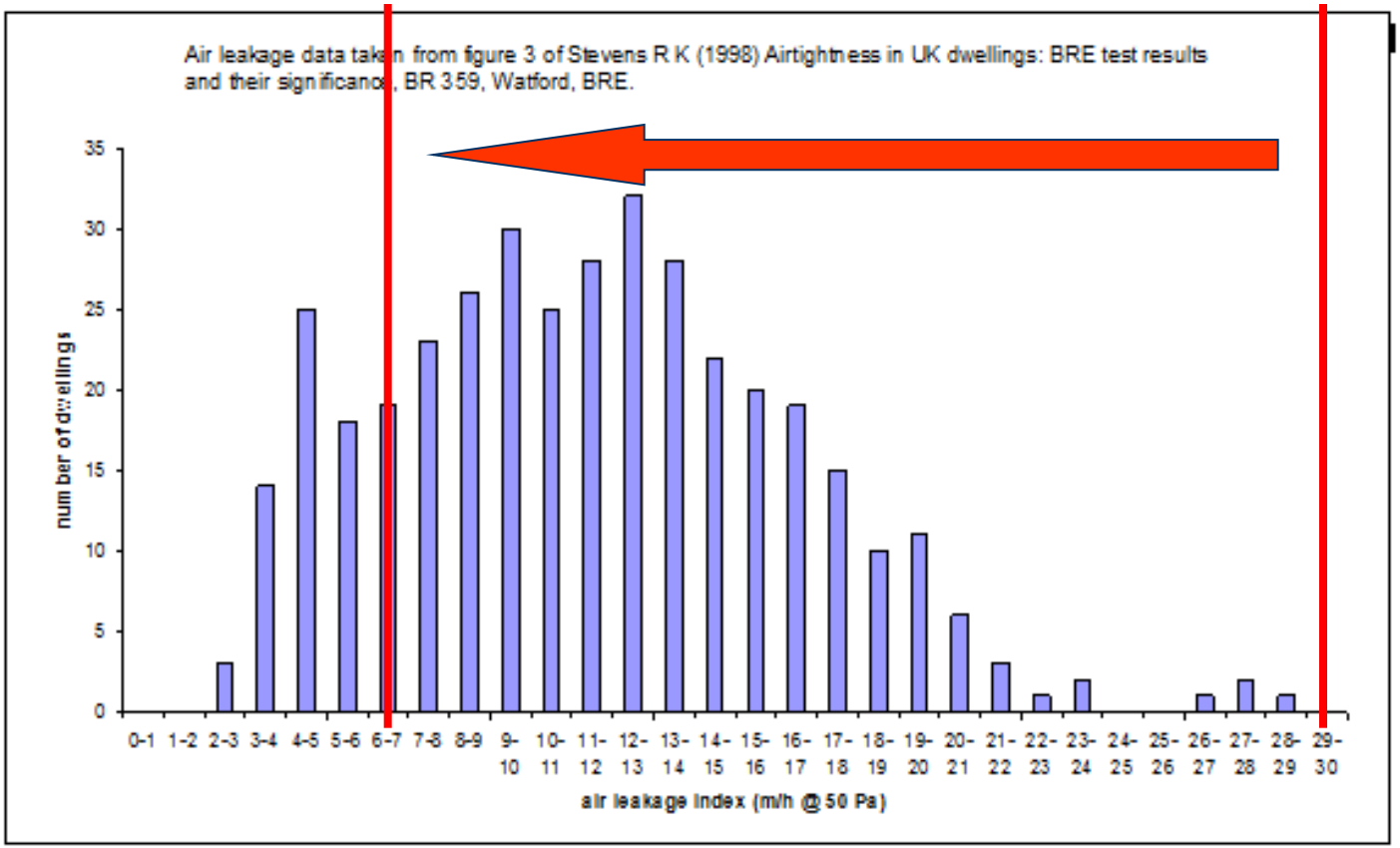
Brixton Super 9 house (July and Aug 1994) Ridley

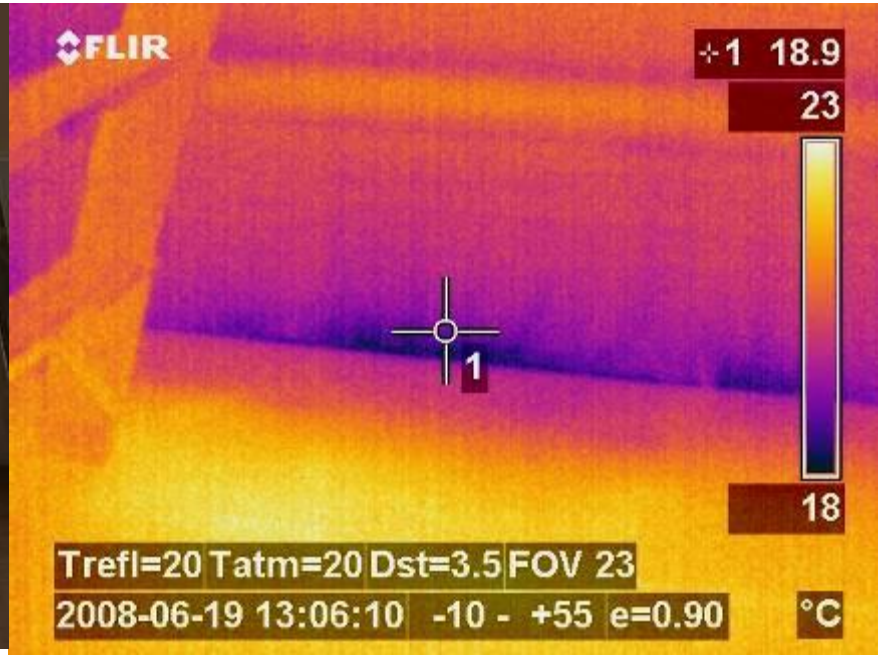
Summer time Overheating?



Air Permeability measurement

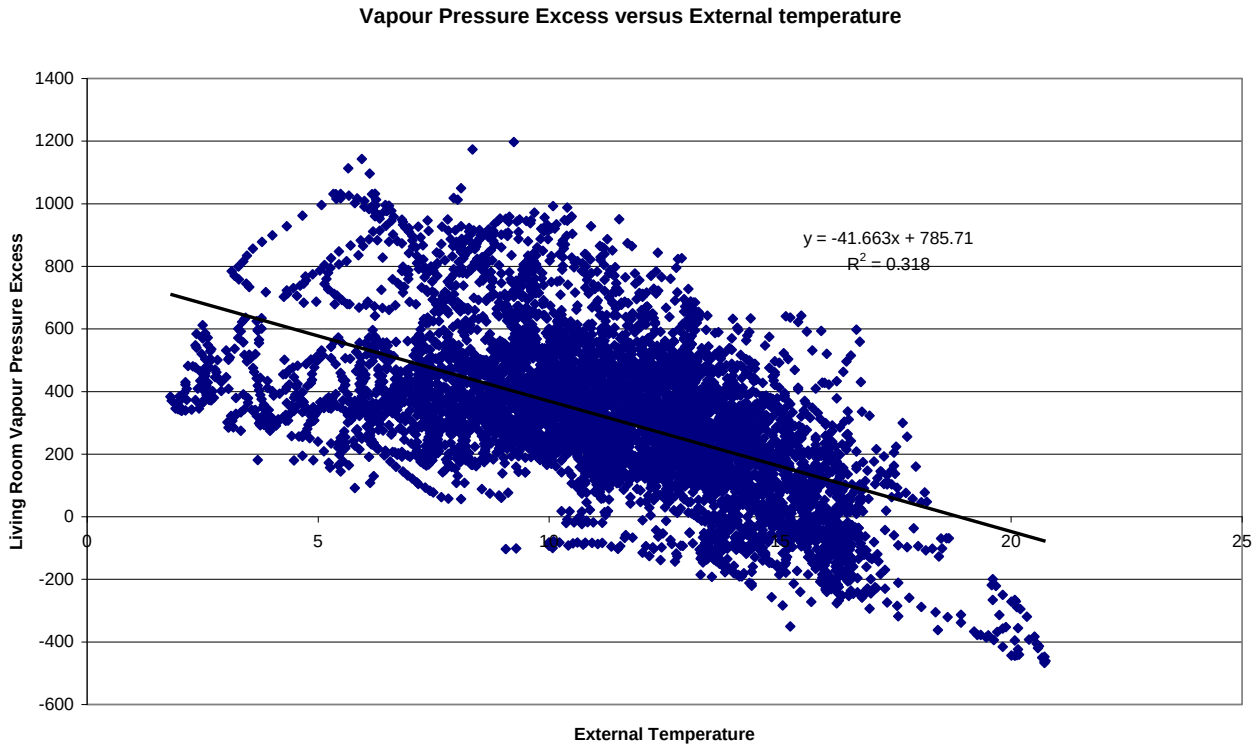
Air Permeability

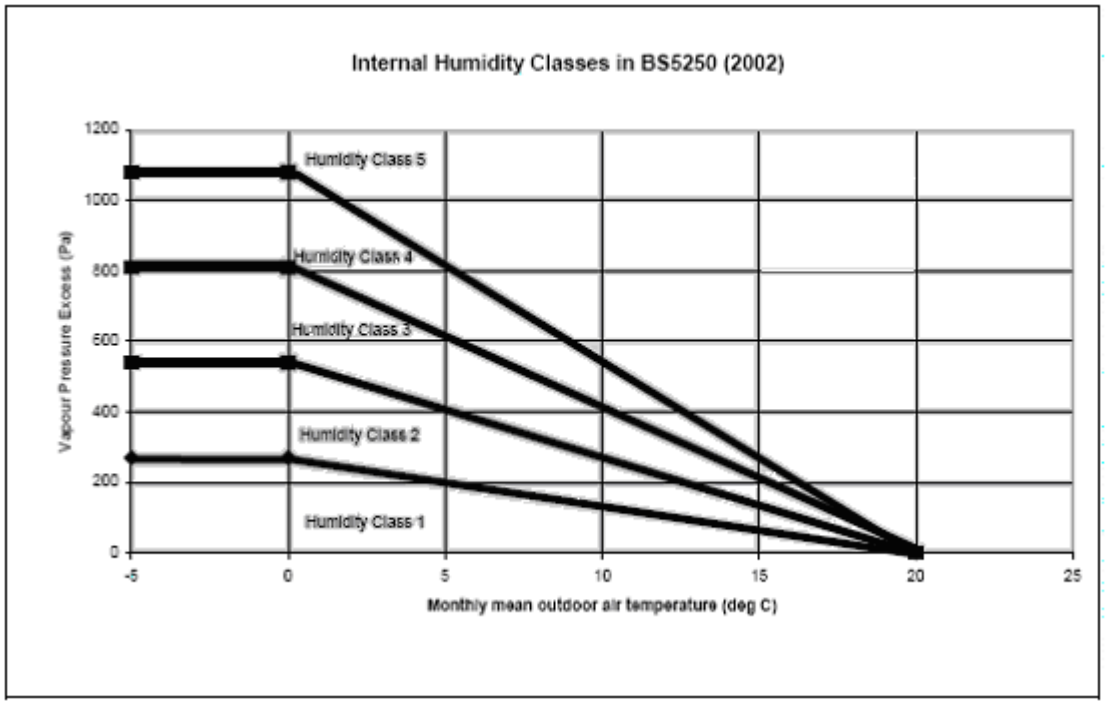



FLIR
1 18.9
23
18
1
Trefl=20 Tatm=20 Dst=3.5 FOV 23
2008-06-19 13:06:10 -10 - +55 e=0.90
°C

Winter Internal RH

Average Winter Bedroom RH 58%
Average Winter Living Room RH 56%

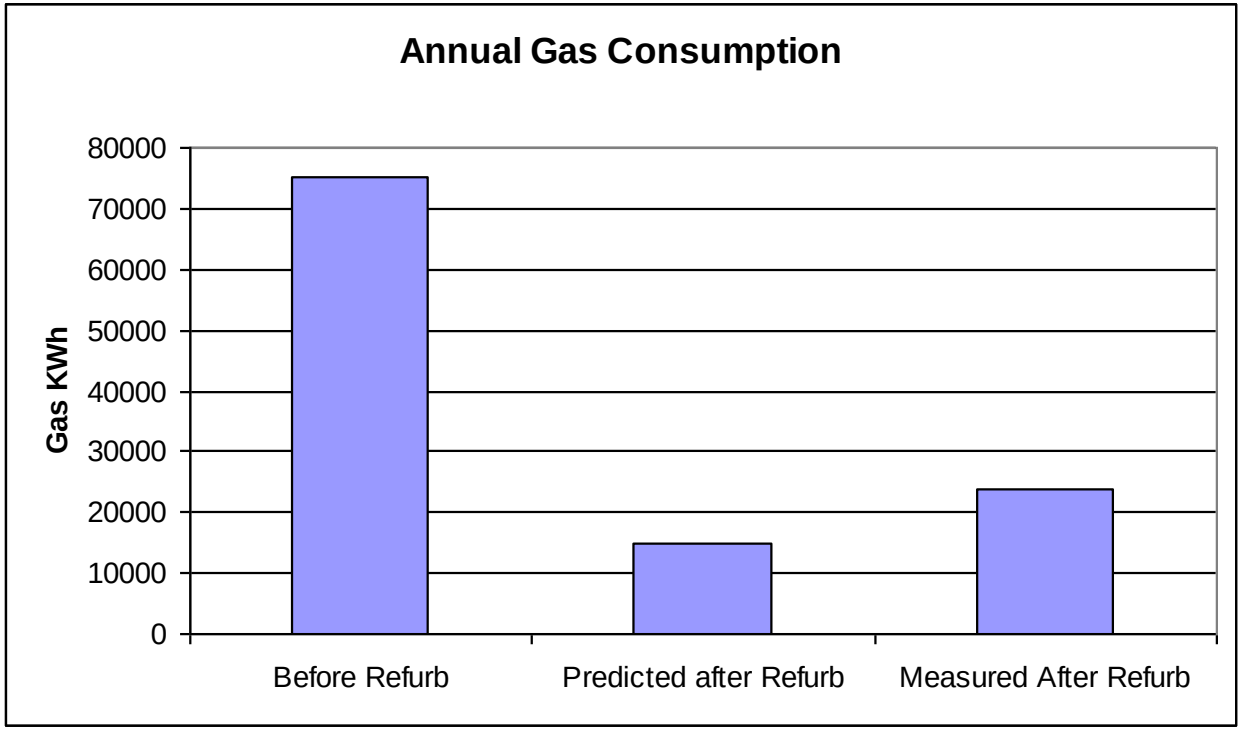




Humidity Class	Building Type	Relative humidity at internal temperature of 20 °C
1	Storage Area	<35%
2	Office Shops	35-50%
3	Dwellings with low occupancy	50-60%
4	Dwellings with high occupancy, sports halls, kitchens, canteens; buildings heated with unflued gas heaters	60-70%
5	Laundry, brewery, swimming pool	>70

Solar Hot Water Production

Annual Gas Consumption



Normalise for Occupation hours

- The house in occupied 24 hrs
- Heat loss of house 300W/K
- Heating house 6 hours less per day would save approx 3000kWh of gas consumption annually

Estimated reduction in CO_2

- Considering the reduction in total Gas consumption (compared to SAP for un refurbished)

- PV electricity production

65%

Annual energy consumption/m^2

- Current performance is **120 kWh/m^2/a**
- Realistic potential performance of **110 kWh/m^2/a**

Annual CO_2 emission per year

- Current performance is **28 kg/m²/a**
- Realistic potential performance of **26 kg/m²/a**

LEVH Performance ?

Air Permeability

Fabric Heat Loss

Summer Overheating

PV Electricity Production

Annual Gas Consumption ? ?

Solar Hot Water

High Vapour Pressure Excess

Future work

- Identify if high domestic hot water consumption is the cause of higher than expected gas consumption
- Interstitial Condensation
- Heat meter on Space heating circuit