



Health & well-being: more than building performance

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31st January 2018

CUNDALL

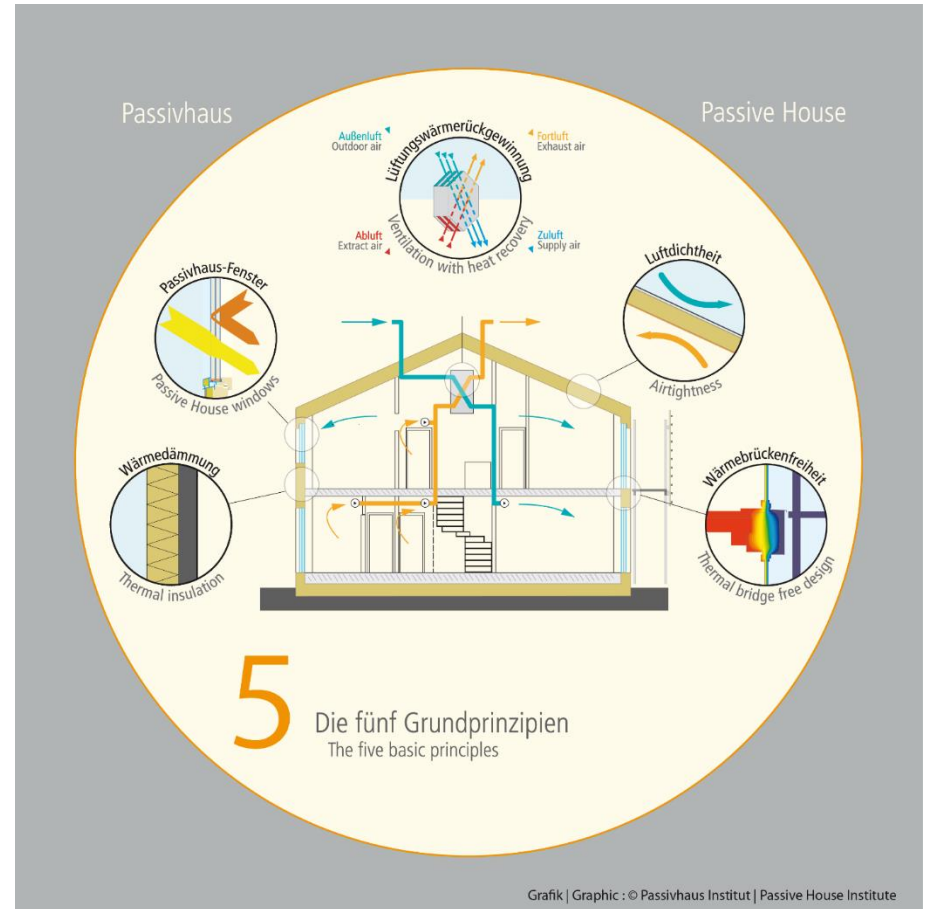
Does Passivhaus lead to healthy buildings?

The stoic northern European

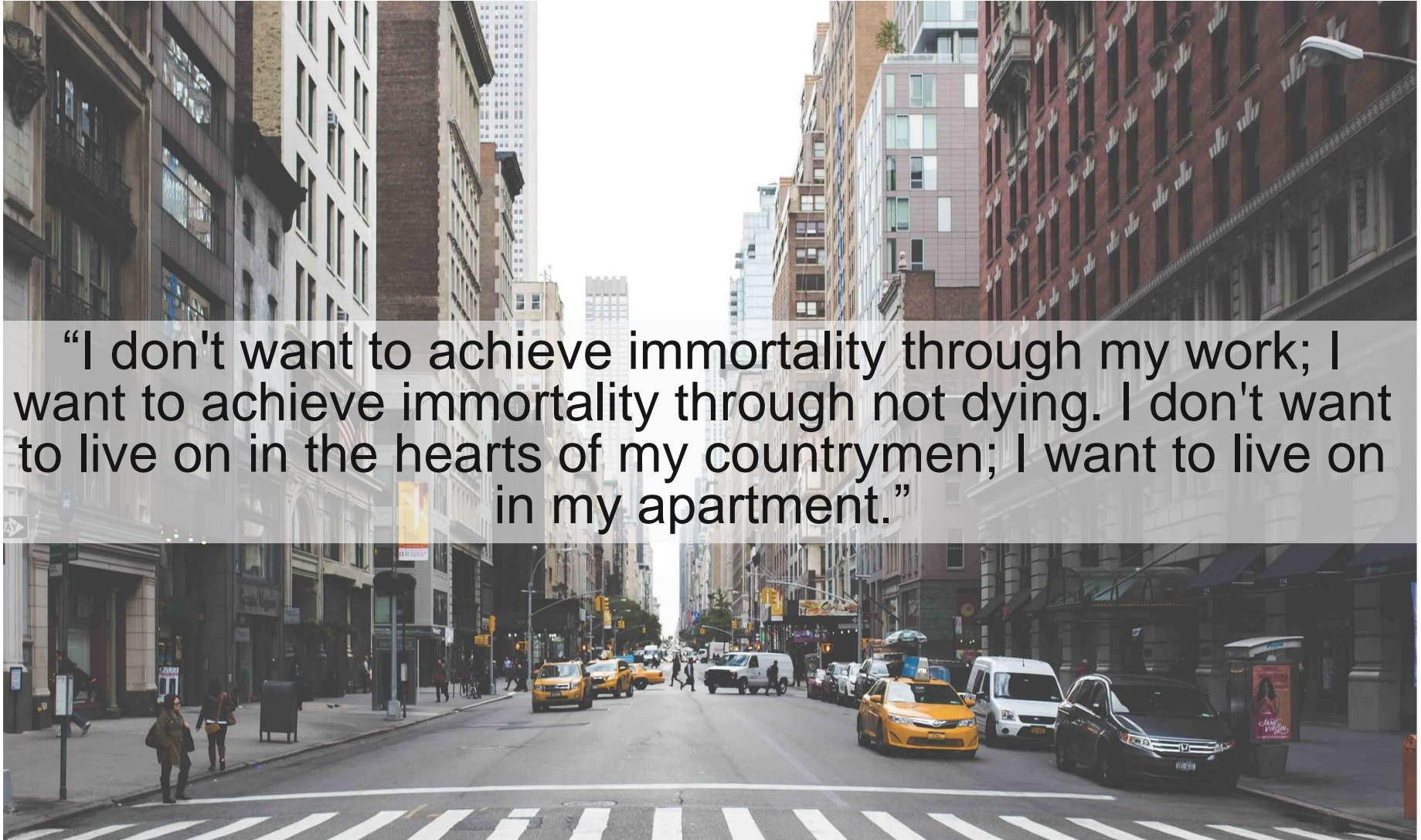


Passivhaus performance

- Air-tightness
- Quality windows
- Insulation
- Eliminate thermal bridging
- MVHR



The New York hypochondriac`



“I don't want to achieve immortality through my work; I want to achieve immortality through not dying. I don't want to live on in the hearts of my countrymen; I want to live on in my apartment.”

WELL Building Standard



Air



Water



Nourishment



Light



Fitness



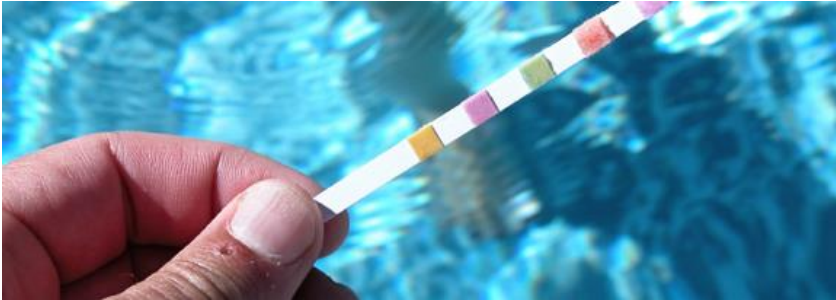
Comfort



Mind

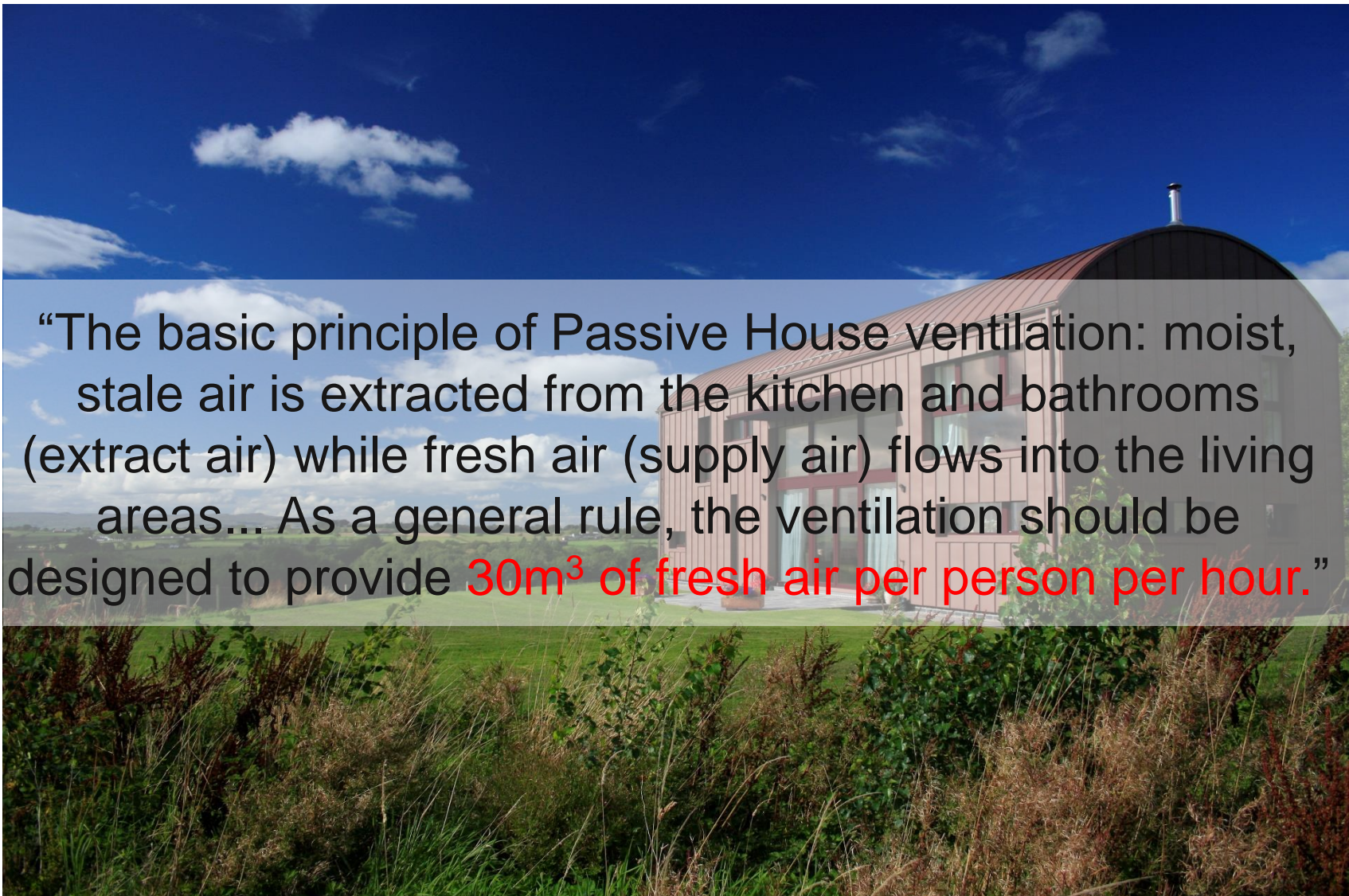


Design vs. Performance



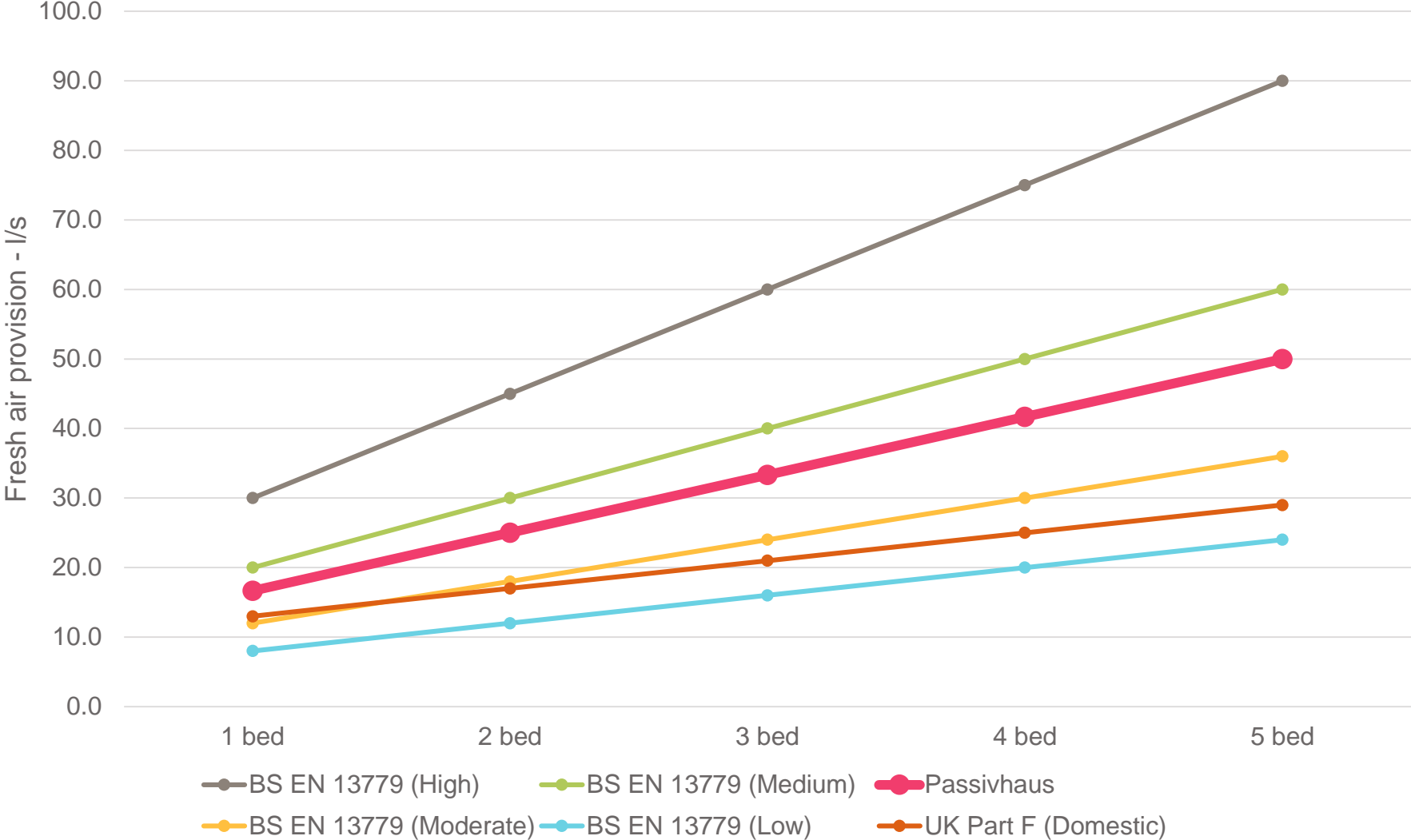
Air

Air - Passivhaus approach to ventilation



“The basic principle of Passive House ventilation: moist, stale air is extracted from the kitchen and bathrooms (extract air) while fresh air (supply air) flows into the living areas... As a general rule, the ventilation should be designed to provide **30m³ of fresh air per person per hour.**”

Air – How much is enough?



Air – Materials and VOCs



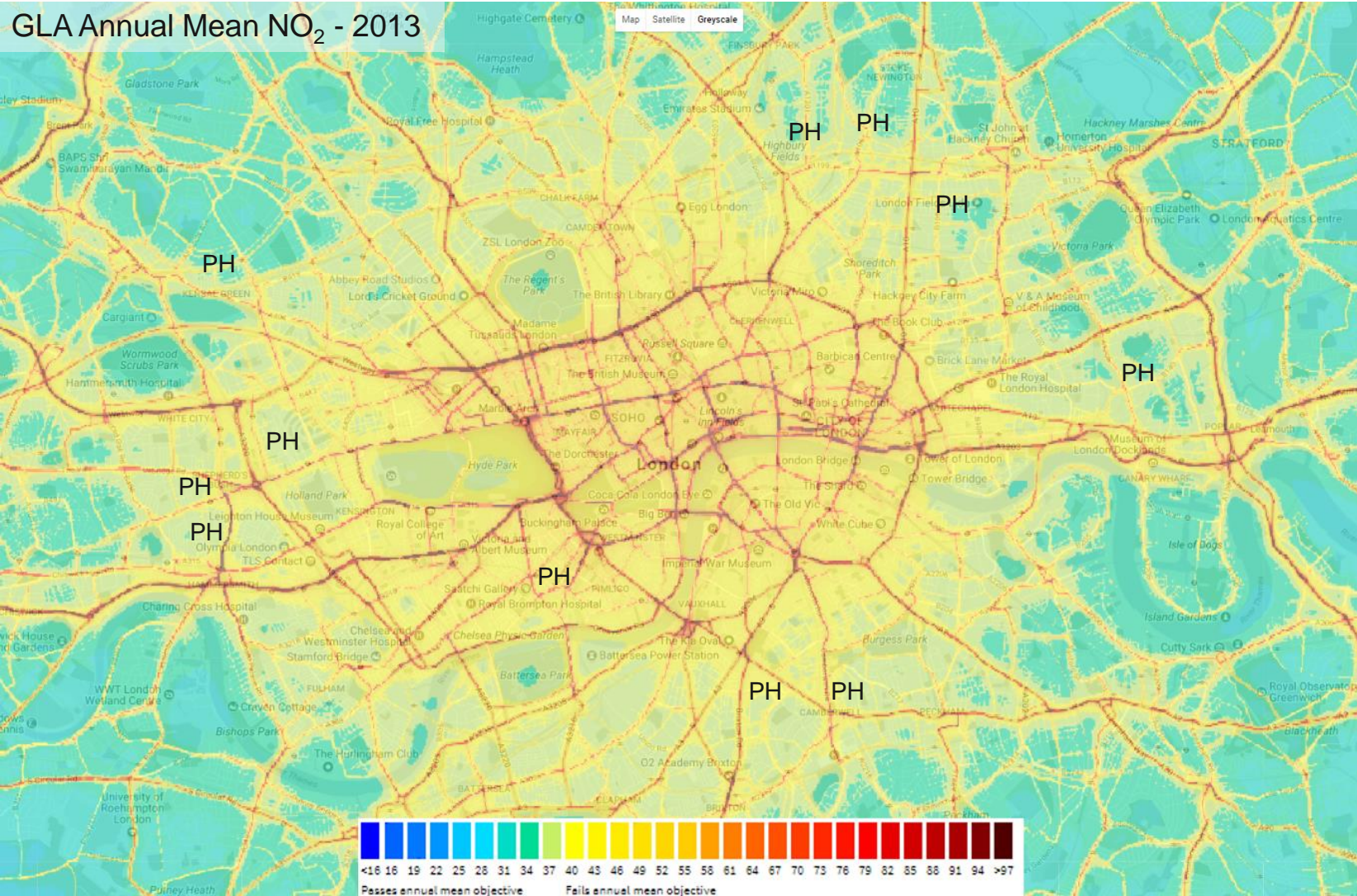
BOLON



“...I understand it now, if I can eat it, I can install it...”

Air – Fresh air!

GLA Annual Mean NO₂ - 2013



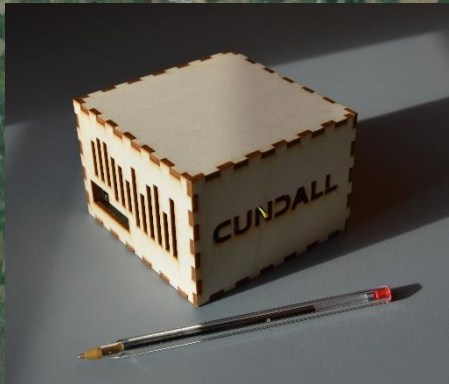
Air – Filtration will protect you

ASHRAE Standard 52.2-1999				ASHRAE 52.1		EN	EN779:2012			EN 1822
Minimum Eff Reporting Value	Composite Average Particle Size Efficiency % in Size Range, μm			Average Arrestance	Average Dust Spot Efficiency	Filter Class	Av. Arrestance of Syn. Dust	Average Eff at 0.4 μm	Min. Eff at 0.4 μm	Average Eff at MPPS
	Range 1	Range 2	Range 3	<i>NB. This standard is obsolete and here for reference only. Performances are not equivalent to ASHREA 52:2 or EN779.</i>			Test Final DP 250Pa	Test Final DP 450Pa		
(MERV)	0.30 - 1.0	1.0 - 3.0	3.0 - 10.0	%	%		%	%	%	%
1	n/a	n/a	E3<20	Aavg<65	<20	G1	50≤Am≤65			
2	n/a	n/a	E3<20	Aavg<65	<20	G2	65≤Am≤80			
3	n/a	n/a	E3<20	Aavg<70	<20					
4	n/a	n/a	E3<20	Aavg<75	<20					
5	n/a	n/a	E3≥20	80	20	G3	80≤Am≤90			
6	n/a	n/a	E3≥35	85	20-25					
7	n/a	n/a	E3≥50	90	25-30	G4	90Am≤			
8	n/a	n/a	E3≥70	92	30-35					
9	n/a	n/a	E3≥85	95	40-45	M5		40≤Em≤60		
10	n/a	E2≥50	E3≥85	96	50-55					
11	n/a	E2≥65	E3≥85	97	60-65	M6		60≤Em≤80		
12	n/a	E2≥80	E3≥90	98	70-75					
13	n/a	E2≥90	E3≥90	98	80-85	F7		80≤Em≤90	35	
14	E1≥75	E2≥90	E3≥90	99	90-95	F8		90≤Em≤95	55	
15	E1≥85	E2≥90	E3≥90	99	95	F9		95≤Em	70	
16	E1≥95	E2≥95	E3≥95	100	99	E10				<85

Hampshire Passivhaus – Ruth Butler Architects

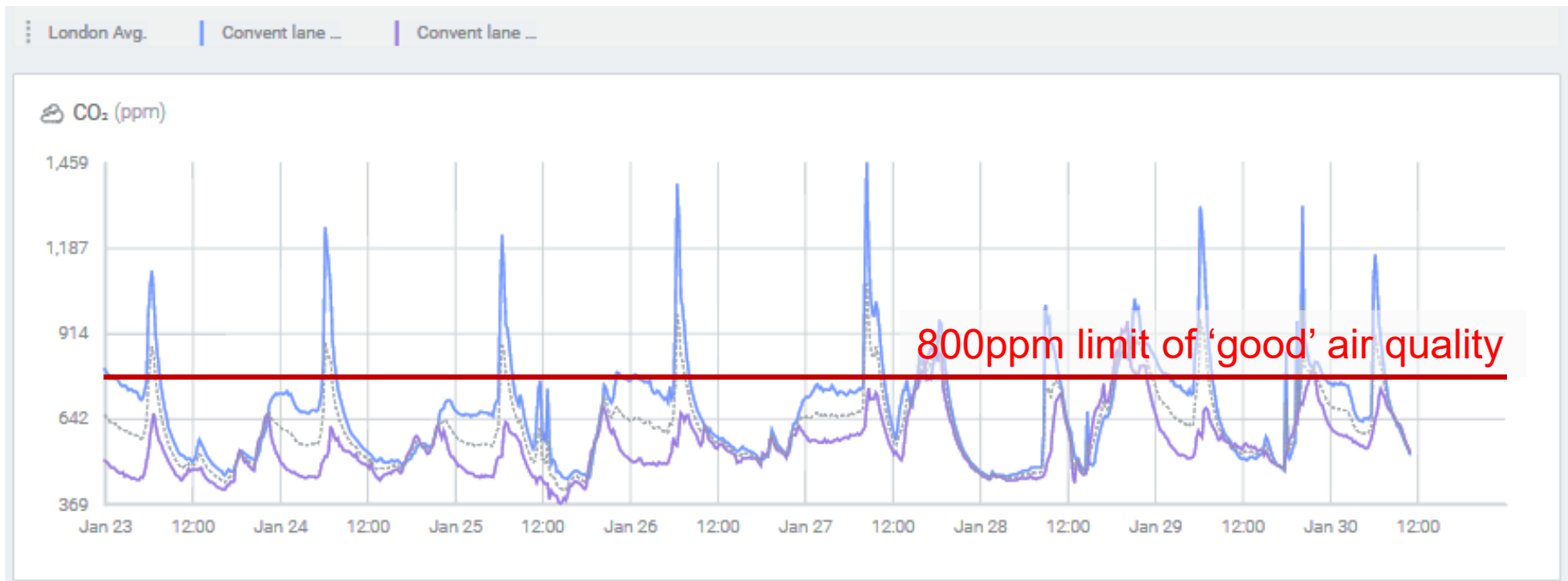


Air – Monitoring a Passivhaus

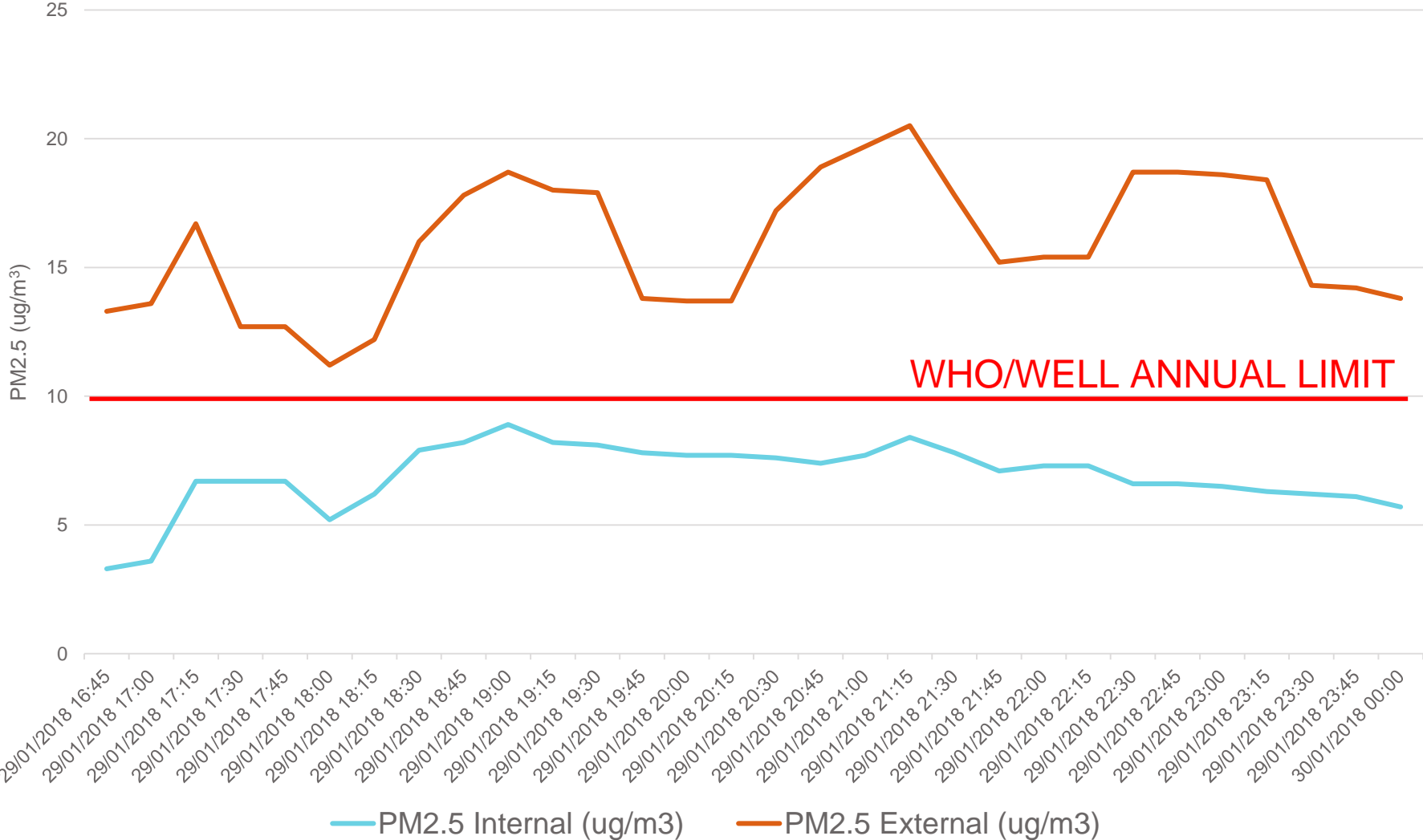


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Air – Is MVHR any good?

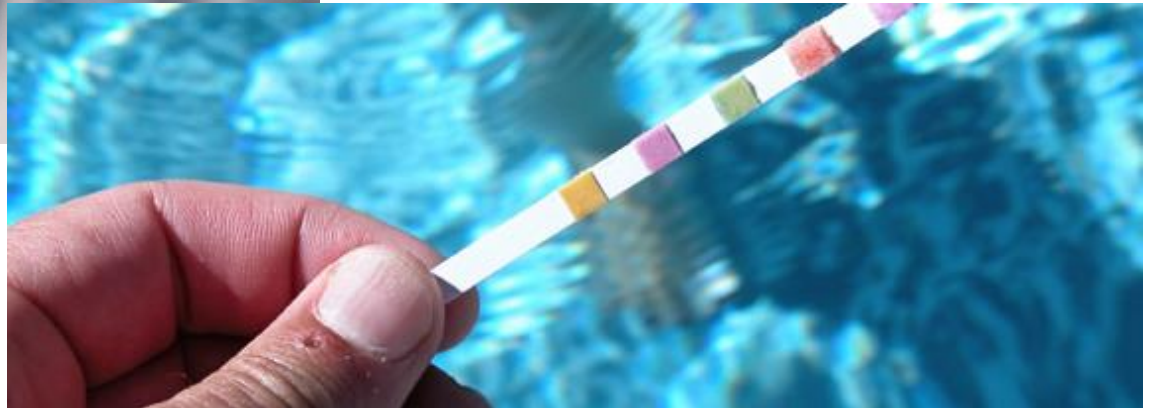
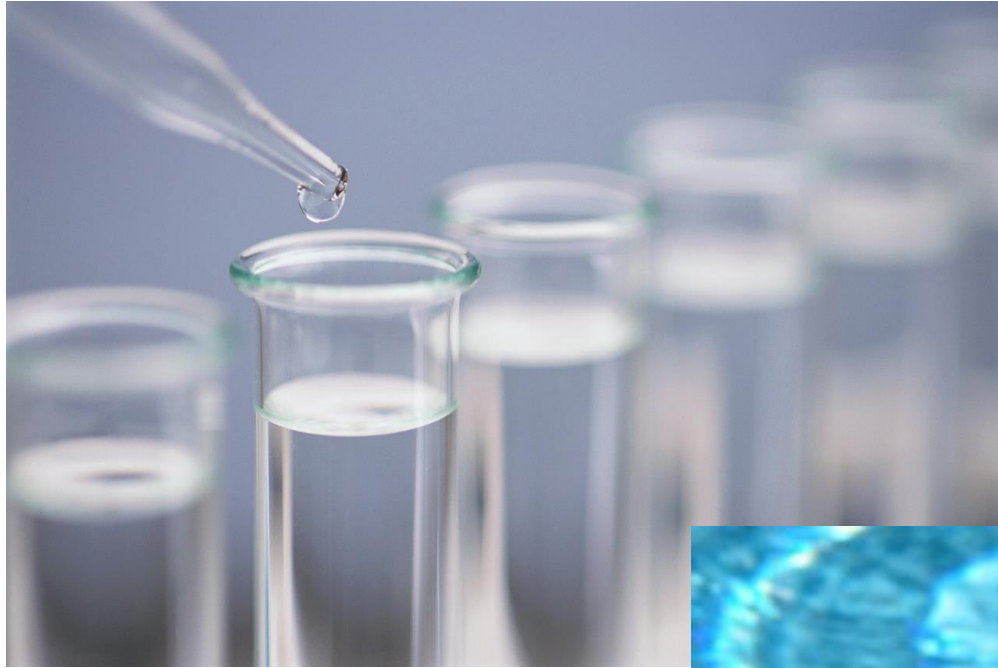


Air – What about PM2.5



Water

Water - Testing



Light

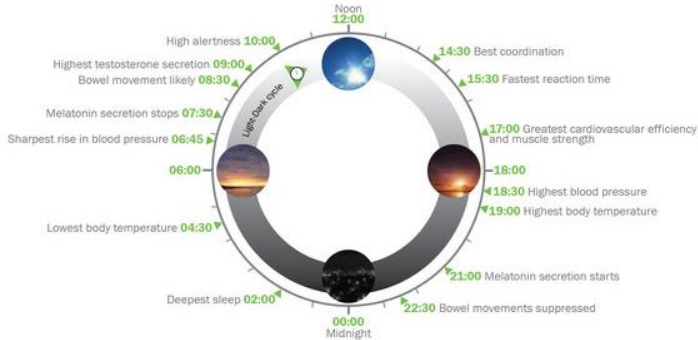
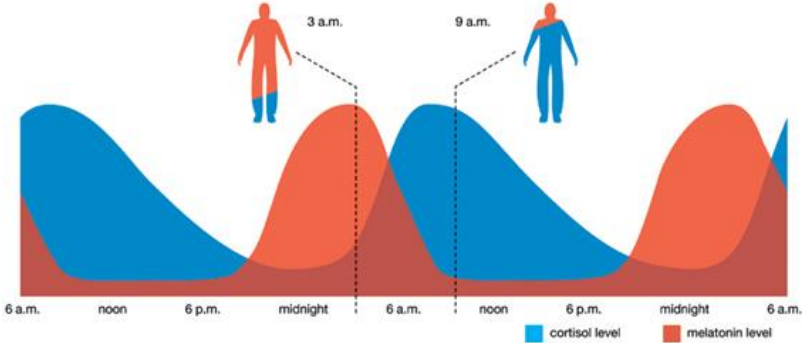
Light - Energy über alles



Light – Electric light & Circadian stimulus



Influence of daylight on the human body



Comfort

Comfort - Thermal comfort?

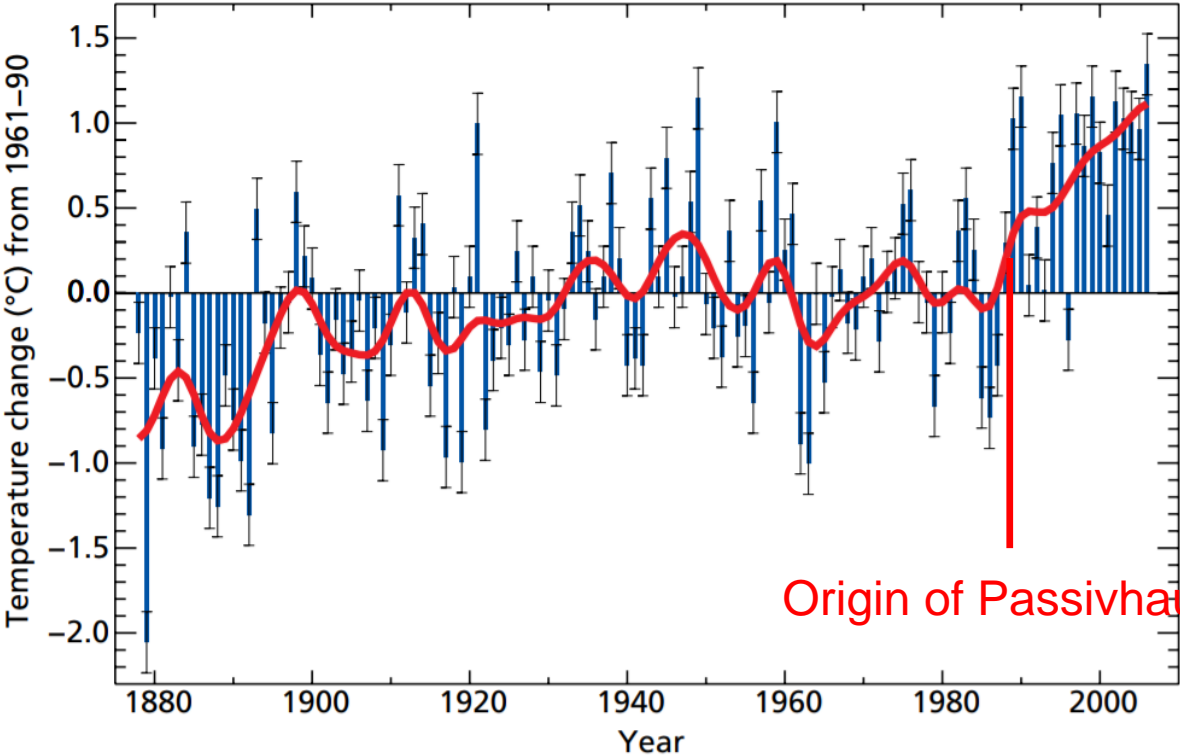
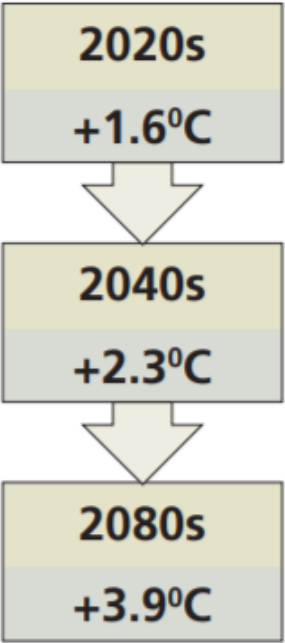


Figure 1.4: Changes in CET annual values (blue bars) from 1877 to 2006 relative to the average over the 1961-90 baseline period (about 9.5 °C). Error bars enclose the 95% confidence range. The red line emphasises decadal variations. (Source: MOHC)

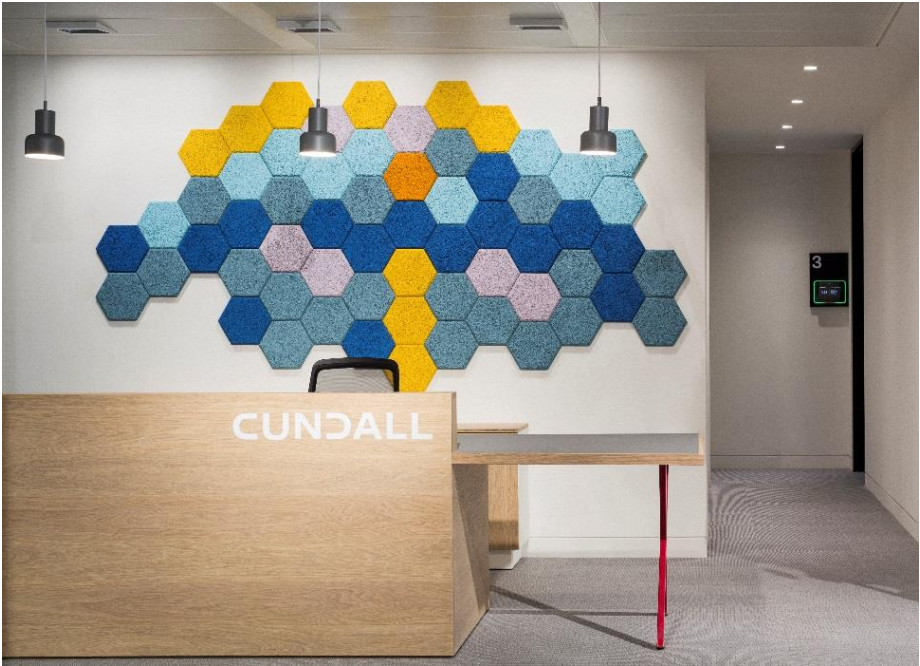


Comfort – Visual and Acoustic

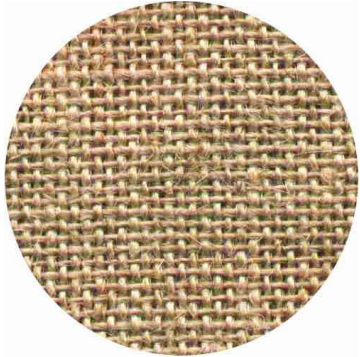


Mind

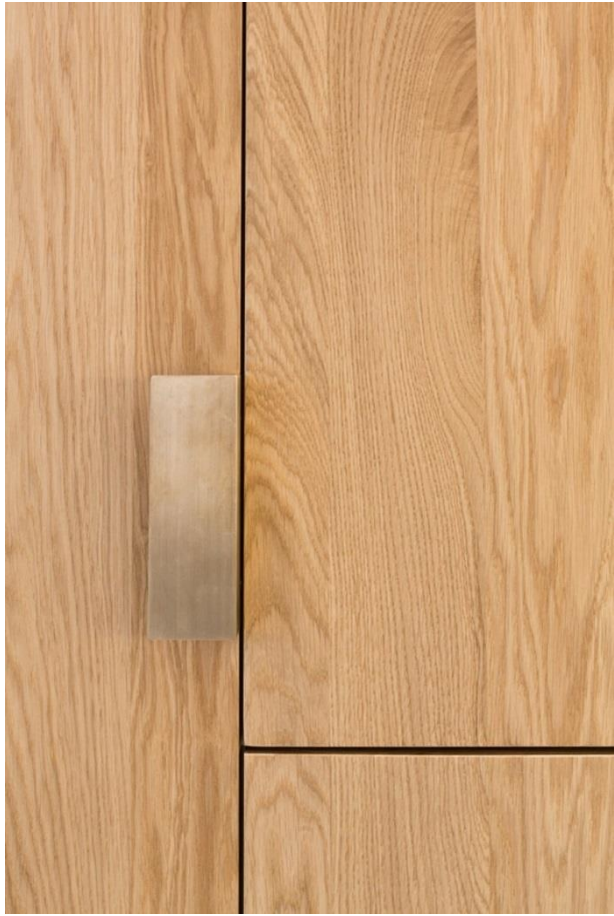
Mind - Beauty + Design



Mind – Biophilic Design



Mind – Biophilic Design



Conclusions

Is there much more to healthy buildings that simply focusing on Indoor Air Quality, and thermal comfort?

- Obviously YES
- Passivhaus is a comfort based energy efficiency standard
- Does Passivhaus do Air Quality and Thermal Comfort right?
- Everything else?