BIM 4 Passivhaus

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Overview

Introductions What is BIM? (Revisit!) What is Passivhaus? Why Focus on Energy Performance? BIM + PH The Seduction of BIM PHPP = BIM?BIM 4 PH **Visual Interrogation** Accurate Live Numerical Data Achieving a Radical Reduction in Energy in use Conclusion





Introductions

Elrond Burrell

- Kiwi
- UK Qualified Architect
- Associate based in Hereford
- Used Autodesk Revit since v6 / 2003
- Introduced & led the implementation of BIM in Architype

Twitter: @ElrondBurrell

ARCHITYPE

- Formed 27+ years ago in Sth London
- 40 people in 2 offices London & Hereford
- Came out of Social Housing & Self-build movement
- Design led with Social & Environmental concerns at the heart
- Client engagement & Collaboration central to our work
- First BREEAM excellent Primary School in England
- Completed 3 of the first 4 Certified Passivhaus schools in the UK
- Exploring & Implementing BIM since 2007

Twitter: @ArchitypeUK



What is **BIM**?

"Building Information Modeling (BIM) is the process of generating and managing information about a built asset over its whole life."

- Cabinet Office 2012





What is **BIM**?

A quality assurance delivery strategy & process

» The right Information at the right point in the process





What is Passivhaus?

"... the world's leading standard in energy efficient design."

A Passivhaus building is one "for which thermal comfort (ISO 7730) can be achieved solely by post-heating or post-cooling of the fresh air mass, which is required to achieve sufficient indoor air quality conditions – without the need for additional recirculation of air."

- http://passipedia.passiv.de

Achieved through

- Orientation
- High Level of Insulation
- High performance windows
- Airtight construction
- Eliminating thermal bridges
- MVHR





What is Passivhaus?

A quality assurance standard for energy performance & comfort

- » The right Information in the energy model (PHPP) as an integral part of the design process
- » The building must be built accurately to the design to be certified







Why focus on Energy Performance?

The difference between Energy and broader "Sustainability" is that without energy efficiency there is no sustainability!

That is, we can live without chilled water (BREEAM HW24), for example, but not without energy.

Energy performance is at the root of sustainability.





BIM + PH

Design & process central » Not a tick-box exercise or a piece of software

The "I" is central » Sexy 3d images & thermal graphics aren't enough

Rigorous model analysis and testing central » Build it virtually first, then build it right on site once



The Seduction of BIM



- Just because the software can, it doesn't mean we should
- Just because it looks good, doesn't mean the information is actually useful

Elephant from: http://therevitcomplex.blogspot.com/



The Seduction of BIM

STORE STOR

"Essentially, all models are wrong, but some are useful."

- George E.P. Box





PHPP = BIM?

Passive House Planning Package

"A pragmatic solution: simplified models, precise data"

- Conservative (accurate!) energy assumptions
- Open
- Parametric
- Instant



- das Planungstool für Passivhäuser

Anforderungen an qualitätsgeprüfte Passivhäuser



BIM 4 PH

Simple + Useful + Productive

- Visual interrogation
- Accurate Live Numerical Data





Visual Interrogation of the model(s)

- Thermal Continuity
- Heat Loss Envelope
- Inter-disciplinary coordination / integration



Thermal & Airtight Fabric Continuity

- Structure
- Insulation
- Cladding
- Check & identify issues





Thermal Bridges

- Identify in Building Model
- Re-model in appropriate software to calculate







Heat Loss Area





Inter-disciplinary Coordination / Integration





Accurate Live Numerical Data

- Treated Floor Area (TFA)
- Ventilation Volumes
- Actual Room / Building Volumes
- Heat Loss Areas
- Window / Door Opening Areas

Treated Floor Area + Volumes

		s)		PHILU ROOM SCh	eaule	·····		
		Name	Department	Area (sqm)	Volume (m3)	PHPP		
Level	Number					TFA Category	TFA Area (m2)	Vent Volume (m3
Ground Floor								
Ground Floor	1	Entrance	Management	15	41.30	Primary Space	15	36.6
Ground Floor	2	Repro	Management	15	43.26	Primary Space	15	37.8
Ground Floor	3	Sick	Management	5	11.85	Primary Space	5	11.3
Ground Floor	4	Snr Management	Management	11	28.20	Primary Space	11	27.0
Ground Floor	5	Head	Management	14	37,49	Primary Space	14	35.9
Ground Floor	6	General Office	Management	24	62.59	Primary Space	24	59.2
Ground Floor	7	Visitor WC	Sanitary	3	8.34	Primary Space	3	8.6
Ground Floor	8	Office Store	Management	2	5.28	Primary Space	2	38
Ground Floor	9	Visitor WC	Sanitary	3	11.99	Primary Space	3	8.6
Ground Floor	10	Interview Room	Management	8	18.34	Primary Space	8	19.1
Ground Floor		Nursery Utility	Storage Rold-Play	Void-over Acc./Station			7 Interactive 26 m ²	
	1.54				10.00	n Alliary opaco		
Ground Floor	72	KS1 Store	Storage	5	18.26	Primary Space	6	14.8
Ground Floor	73	Interactive Library	Learning Resources	104	512.30 65.03	Primary Space	202	100.0 65.1
Ground Floor	74	Food/Food Bay	Learning Resources	46	120.95	Primary Space	46	116.0
Ground Floor	75	Hub Space	Hub Space	18	44.10	Primary Space	18	45.3
Ground Floor	76	Performance	Learning Resources	26	92.19	Primary Space	26	64.0
Ground Floor	132	Pump House		20	49.35	(none)		
Ground Floor	133	Water storage		46	112.47	(none)		
Ground Floor	134	Mini Bus Garage		52	126.13	(none)		



Room Volumes





Heat Loss Areas



Mark	Count	Area
Heatloss	Ground Floor	
C GE 01		196 01 m ²
C-GF-01	1	56 77 m ²
C-GF-02	1	11.20 m ²
C-GF-03	1	1 20 m ²
C-GF-04	1	265.27 m ²
Heat Loss -	Roof	200.27 11
C-R-01	1	165 69 m ²
C-R-02	1	92 35 m ²
C-R-03	1	1 86 m ²
01100	3	259 90 m ²
Heat Loss -	Roof Soffit	200.00 11
C-RS-01	1	68.54 m²
C-RS-02	1	5.11 m²
C-RS-03	1	4.15 m ²
C-RS-04	1	1.86 m ²
C-RS-05	1	1.83 m²
C-RS-06	1	0.66 m²
C-RS-07	1	0.27 m²
	7	82.43 m ²
Heat Loss -	Roof Terrace	
C-RT-01	1	82.20 m²
C-RT-02	1	31.78 m²
	2	113.99 m²
Heat Loss -	Rooflight roof	s
C-RL-01	1	3.58 m²
C-RL-02	1	3.58 m²
C-RL-03	1	2.59 m²
C-RL-04	1	3.89 m²
C-RL-05	1	3.89 m²
C-RL-06	1	3.78 m²
C-RL-07	1	3.77 m²
	7	25.09 m²
Heat Loss -	Soffit to Denti	st or Retail
C-RSR-01	1	51.05 m²
	1	51.05 m²
Grand total	24	797.73 m ²

Roof / Floor Heatloss Area Schedule

Count	Area				
Heat Loss - Above Ground					
84	1175.16 m²				
84	1175.16 m²				
Heat Loss - Below Ground					
4	22.25 m²				
4	22.25 m²				
Heat Loss - Rooflights					
24	10.70 m²				
24	10.70 m²				
Heat Loss - To Dentist or Retail					
4	32.15 m²				
4	32.15 m²				
116	1240.26 m²				

Wall Heatloss Area Schedule







Achieving a Radical Reduction in Energy in use



Oakmeadow Primary School (2,200m²)

2 x 65kW boilers installed

25kW peak heat demand = 5x oversized!

First full year of occupation: Gas bills <u>90% less</u> than old building





Conclusion

Overview of BIM & Passivhaus

How we use BIM for Passivhaus Design

- Visual Interrogation of the Model
- Accurate Live Numerical Data

Use BIM to support the PH design process

People design sustainable buildings not software!





