





Aims of Presentation

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- First Generation Passivhaus Schools
- Second Generation Passivhaus School
- Lessons Learnt Passivhaus
- Monitoring Passivhaus
- Passivhaus User Guides
- Third Generation Passivhaus School
- Fourth Generation Passivhaus Schools
- Summary









First Generation Passivhaus Schools Bushbury Hill Primary School: Wolverhampton: 2011

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Oak Meadow Primary School: Wolverhampton: 2011







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Wilkinson Primary School: Wolverhampton: 2013



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Wilkinson Primary School: Wolverhampton: 2013





























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Construction Approach

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Lessons Learnt Passivhaus





Timber Frame Improvements

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Window Improvements

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M&E and BMS Improvements





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Monitoring Passivhaus





Monitoring method & studied parameters

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Non-Passivhaus schools

1 Much Birch 1970 2 St Luke's 2009 3 Willows 2010

Passivhaus schools

4 Oak Meadow 2011 5 Bushbury Hill 2011 6 Wilkinson 2013







Non-Passivhaus schools

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Non-Passivhaus schools

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Non-Passivhaus schools

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Non-Passivhaus schools

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Passivhaus schools

4 Oak Meadow 2011 5 Bushbury Hill 2011 6 **Wilkinson 2013**







Monitoring Energy Use / Heating & hot water











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Indoor Environment / Indoor Air Quality / Winter



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Indoor Environment / Indoor Air Quality / Winter



VKUHITAH

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Indoor Environment / Indoor Air Quality / Summer



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Indoor Environment / Indoor Air Quality / Summer





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Indoor Environment / Indoor Air Quality / Summer



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Passivhaus User Guides





Why do we need the user guide

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Structure & content of the user guide & building manual

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Image Source: The documents' hierarchy pyramid is adapted from BSRIA BG 26 Building Manuals and Building User Guides, 2011





Classroom Guide

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Classroom guide



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In Summer ...





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Explaining BMS override controls for windows

Which switch? Where?



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High-level windows & roof-lights override switch

Users can take over control of these high-level openings, using override switches, located conveniently in the building and clearly labelled (Figure X.Y).

Any action using override switches lasts for 2 hours. These are called override switches because they allow the user to override the BMS settings.

In the hub-space, different high-level windows, respond to different override switches, as the hub-space is notionally divided in east and west zones.







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Explaining BMS controls for high-level windows in Wilkinson

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The high-level windows in the hub-space open to prevent overheating of the hub-space but also to help cool down the rest of the building (see schematic cross-section).

Warmer air escapes through the open high level windows. This movement draws inside cooler outdoor air.



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High-level windows and roof-lights in the building are automatically operated. These open and close with the use of actuators which are controlled by the BMS, based on Temperature readings in the relevant zone.,



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Windows close automatically if heavy rain is detected in the direction of the window, or if it is too windy.

The BMS settings for the daytime operation of high-level windows and roof-lights are the same for both winter and summer mode.

'When school is NOT occupied.'

High-level windows remain closed outside the school occupancy hours and outside overnight cooling hours.



'When school is OCCUPIED.'

If the highest temperature in any of the classrooms of the 'Natural ventilation zone' (Tzmax),goes over the Natural Ventilation Setpoint which is 24 °C, then windows will start opening.

The windows will be fully open at 26 °C.



'Overnight cooling with Natural Ventilation'

Can be activated by the FM (see 'How to activate overnight cooling' section) once made available by the BMS.

Overnight cooling is available:

- Between 9pm and 6 am
- If BMS is on sumer mode.

- Outdoor Air Temperature (OAT) is lower than the Highest space temperature of the zone (Tzmax).

- Tzmax was above the Night-time free cooling Temperature; 25 °C, at any point during the previous day's occupancy.

- Tzmax is above 16 °C.

Natural Ventilation Zones

The Natural Ventilation Zones (NVZ) are notional zones in the building. Temperature readings in each zone affect the control of the high-level windows in that zone. Zones 1 & 2 include a part of the Hub and adjacent rooms.





Third Generation Passivhaus School





Third Generation Passivhaus School Burry Port: Carmarthenshire: 2015

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Third Generation Passivhaus School













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Trimsaren: Carmarthenshire: Coming Soon!



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Summary




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- use PHPP as a design tool from day one
- work with Passivhaus skilled experts
- collaborative team work at every stage
- constant focus on simplicity of design and detailing
- relentless focus on value engineering to achieve cost
- focussed workshops with all key sub-contractors
- rigorous and frequent site inspection
- continuous building monitoring and rigorous analysis of data
- work with and help end user understand their new environment
- learn lessons from monitored data and end user feedback and include within next project





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19th Century

simple energy consuming uncomfortable



20th Century

complex energy offsetting unsustainable 21st Century

simple energy saving comfortable



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Thank you for listening

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