



SETTING STANDARDS IN  
SUSTAINABLE LOW ENERGY BUILDING

  
**CYGNUM**<sup>®</sup>  
PASSIVE

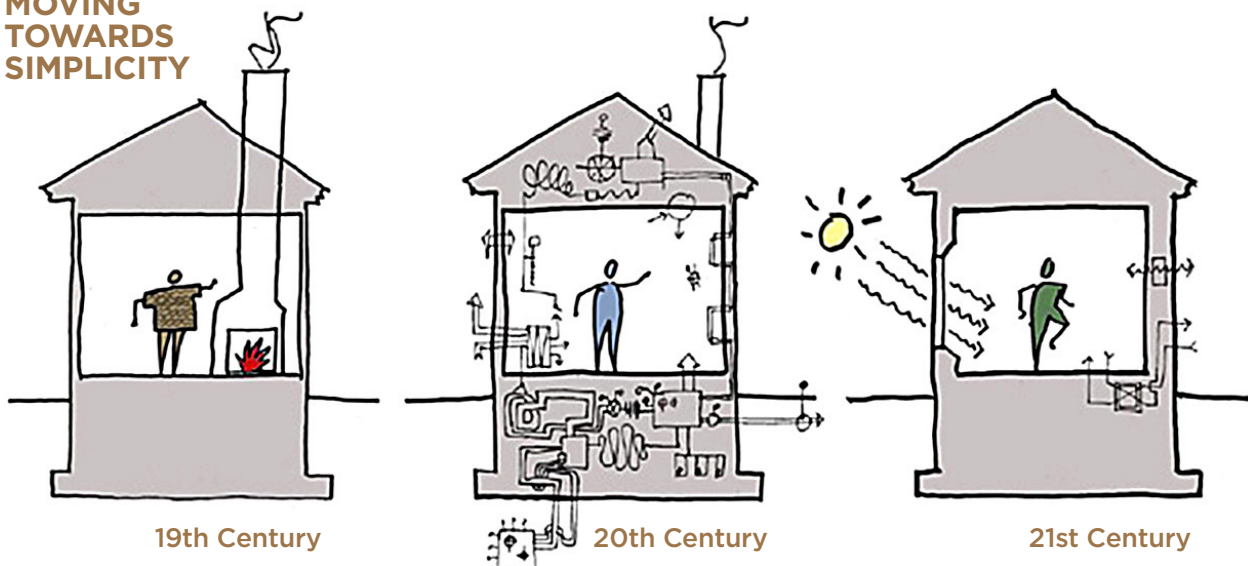


# INTRODUCTION TO PASSIVE HOUSE



Passive House is a rigorous energy efficiency standard. It applies to ultra-low energy buildings that require minimum energy for space heating or cooling. Achieving Passive House requires expertise and consideration from the initial design of a building to on-site completion. The standard is driven by air quality and comfort. It has become the fastest growing building energy performance standard in the world.

## MOVING TOWARDS SIMPLICITY



## KEY CONSIDERATIONS WHEN BUILDING TO THE PASSIVE HOUSE STANDARD

### DESIGN

- Efficient form
- Orientation and window shape to optimise sunlight and shading

### BUILDING FABRIC

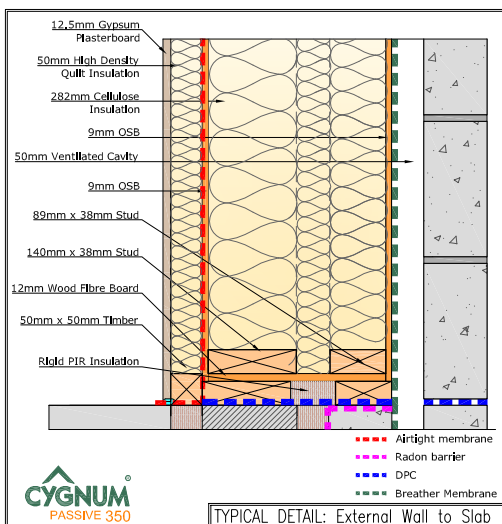
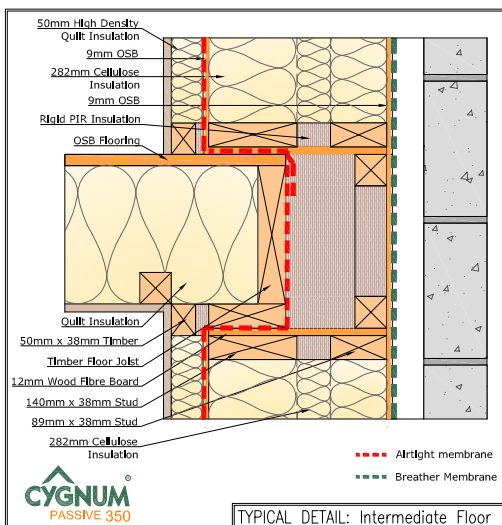
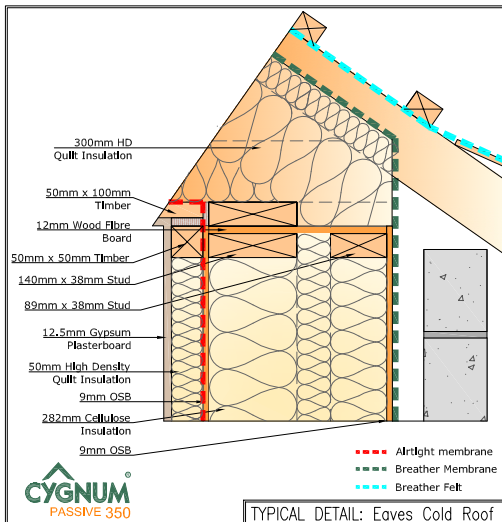
- Very high levels of insulation
- Draught free
- Minimum thermal bridging

### EFFICIENT SERVICES

- Mechanical ventilation with heat recovery
- Efficient water heating, lighting and appliances

### PASSIVE HOUSE CRITERIA

Space Heating:	$\leq 15\text{kWh/m}^2/\text{year}$
or	
Space Heating Load:	$\leq 10\text{W/m}^2$
Primary Energy Demand:	$\leq 120\text{kWh/m}^2/\text{year}$
Airtightness n50:	$\leq 0.6$ air changes per hour



## OUR CERTIFIED PASSIVE SYSTEM

**CYGNUM**<sup>®</sup>  
PASSIVE 350

Cygnum was one of the first companies in both the UK and Ireland to develop a building system certified by the Passivhaus Institute in Germany.

Our in-house design team have designed a flexible cost-effective external wall system which surpasses all the rigorous Passive House tests.

To reach Passivhaus certification there were 3 key challenges:

**Airtightness:** Minimise air leakage from building.

**Thermal bridging:** Minimise cold bridges formed by structure in the insulation zone.

**U-value:** Reduce the wall U-value to 0.13 W/m<sup>2</sup>K.

Passive 350 features a 282mm twin wall system with a membrane on the inside forming the airtight layer.

Passive 350 achieves a U-value of 0.13 W/m<sup>2</sup>K, but this can be increased or reduced by altering the width of the wall.



## TAILORED SOLUTIONS

Cygnum are in a unique position to offer clients passive wall solutions tailored to suit their needs. Tell us what your target U-value is, your preference on green technologies and airtight solutions and we will offer a solution to suit.



# OUR EXPERIENCE

Cygnum has successfully designed and installed many award winning Passive House buildings. In 2011, Cygnum built one of the UK's first Passive House registered schools at Oak Meadow in Wolverhampton. The success of Oak Meadow and quality of delivery has led to many further large scale Passive House projects. Client satisfaction has always been very positive. This is borne out by a comment from a very pleased Head Teacher at Oak Meadow:

***The children are more alert in the afternoon and are more attentive because the air is so fresh and comfortable. It has raised our spirits, the children and teachers love our Passive House school.***

Sara Morris, Head Teacher, Oak Meadow Primary School

From in-house design, to production and installation, Cygnum has developed and retained an exceptional level of Passive House expertise. The company is now recognised as the leading supplier of timber frame to the Passive House sector in the UK and Ireland.



## ASSOCIATED PROJECT AWARDS INCLUDE:

**Quality Approved Passivhaus – WARM** Oak Meadow Primary School, Wolverhampton

**UK Passivhaus Awards Winner** – Oak Meadow Primary School

**RSAW Welsh Architecture Awards Shortlisted** – Cwm Ifor Primary School

**Green Apple Award Environmental Best Practice** – Wilkinson Primary School

**Passivhaus Trust Awards – Large Projects** Wilkinson Primary School

**Constructing Excellence West Midlands – Best Value Project** Herefordshire Archive and Records Centre

**Constructing Excellence West Midlands – Best Sustainable Project** Herefordshire Archive and Records Centre

**Building & Energy Efficiency Awards – Non Domestic New Build** Wilkinson Primary School

**Education Estates Awards – Project of the Year** UEA Enterprise Centre (Highly Commended)

**Education Estates Awards – Sustainable Project** UEA Enterprise Centre





## OUR CARBON FOOTPRINT

Our primary raw material is timber, which is widely recognised as having the lowest CO<sup>2</sup> cost of any commercially available building material. We are FSC and PEFC compliant ensuring that our timber is sourced only from responsibly managed sources.

We use recycled newspaper and wood fibre board as our main sources of insulation and oriented strand board as our sheeting material.

By choosing Cygnum Timber Frame for your Passive House project not alone are you reducing environmental impact by minimising running cost, you are also choosing a building with ultra-low embodied energy.





## OAK MEADOW PRIMARY SCHOOL

Oak Meadow Primary School was one of the first primary schools in the UK to receive Passivhaus certification, granted in February 2012. This was our first large passive project and Cygnum must thank Architype, the project architects, for their assistance in guiding us through the passive learning curve.

<b>SIZE</b>	2,300 sqm
<b>DESIGN FEATURES</b>	<ul style="list-style-type: none"> <li>Oak Meadow Primary School has an innovative design with corridors eliminated and combined with specialist spaces to form two activity 'hubs', around which the classrooms are arranged. The core design philosophy was to design an uplifting and enriching building, with radically reduced energy consumption and environmental impact, at an affordable cost.</li> </ul>
<b>TIMBER FRAME FEATURES</b>	<ul style="list-style-type: none"> <li>Glulam frames to carry the floors and roof were located inside the external walls to avoid unnecessary structure in the thermal envelope.</li> <li>Roof comprises of closed panels with 400mm deep 'I' beams filled with 'upcycled' cellulose insulation, U-value 0.12W/m<sup>2</sup>K.</li> <li>The 340mm timber frame walls were sheathed on the outside with Hunton Bitroc board, 18mm OSB3 forms the airtight layer internally. The wall is filled with 'upcycled' cellulose insulation, U-value 0.12W/m<sup>2</sup>k.</li> <li>Airtightness achieved (at 50 Pascals): 0.48 air changes per hour.</li> </ul>





## HEREFORD ARCHIVE AND RECORD CENTRE

UK's first archival storage building to be built to the rigorous Passivhaus standard as well the first archival facility in the UK to be constructed to the new PD5454:2012 standard; Guidance on the storage and exhibition of archival materials.

<b>SIZE</b>	3,350 sqm
<b>DESIGN FEATURES</b>	<ul style="list-style-type: none"> <li>• The building takes the form of two simple and distinct masses separated by a 'buffer zone' which is articulated into an entrance foyer, reception, information and display area, overlooked by bridges and a tunnel at higher levels connecting the two spaces.</li> <li>• Clear and simple form and layout that creates a variety of stimulating internal spaces.</li> <li>• Special attention has been paid to creating a design that is welcoming to both regular and drop-in visitors.</li> </ul>
<b>TIMBER FRAME FEATURES</b>	<ul style="list-style-type: none"> <li>• The construction of the timber frame half of the building is primarily post and beam.</li> <li>• The 340mm timber frame walls were sheathed on the outside with Hunton Bitroc board and filled with 'upcycled' cellulose insulation, U-value 0.12W/m<sup>2</sup>k.</li> <li>• The key challenge on this project was linking the timber frame half of the building to the masonry half of the building whilst maintaining the air tight layer integrity.</li> <li>• Airtightness achieved (at 50 Pascals): 0.36 air changes per hour.</li> </ul>





## THE ENTERPRISE CENTRE AT THE UNIVERSITY OF EAST ANGLIA

The Enterprise Centre, dubbed by the press as the UK's greenest building, has been designed and delivered to achieve the Passivhaus standard and a BREEAM outstanding rating. The new university building aims to encourage new sustainable businesses from graduates who emerge from its academic research programme and those involved in activities within the wider Norwich Research Park.

<b>SIZE</b>	3,400 sqm
<b>DESIGN FEATURES</b>	<ul style="list-style-type: none"> <li>• To achieve the requirements of the brief, the building was designed to meet a 100 year design life.</li> <li>• Passivhaus certification and BREEAM outstanding.</li> <li>• The design is well above Best Practice, with embodied carbon (including sequestration) between 1/5 and 1/4 of many new university buildings.</li> </ul>
<b>TIMBER FRAME FEATURES</b>	<ul style="list-style-type: none"> <li>• The timber frame structure was manufactured using Corsican pine timber sourced locally from Thetford Forest.</li> <li>• The construction of the building is partly beam and post with timber frame racking walls.</li> <li>• The 340mm thick walls of the frame and 400mm deep roof were filled with Warmcell insulation.</li> <li>• Lift shafts are designed and manufactured in cross laminated timber.</li> <li>• Airtightness achieved (at 50 Pascals): 0.21 air changes per hour.</li> </ul>







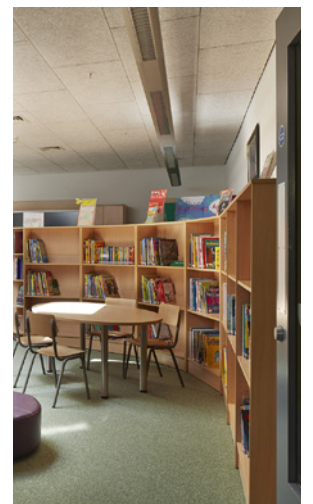


## STEBON PRIMARY SCHOOL, LONDON

London's first certified Passivhaus School. This is an exciting expansion of an inner London primary school from a two to three form entry. The project reinforces the school's role as the heart of its community with extended family provision, a free broadband service and a multi-use games area (MUGA) that is open out-of-hours.

<b>SIZE</b>	1,295 sqm
<b>DESIGN FEATURES</b>	<ul style="list-style-type: none"> <li>• A new, two storey classroom block attaches to the existing school by way of a glazed link, increasing the number of pupils and improving the overall layout and operation of the school.</li> <li>• Constructed to strict Passivhaus environmental standards, the new classroom block also takes advantage of passive solar gain and should yield energy savings of up to 80% compared to standard construction.</li> </ul>
<b>TIMBER FRAME FEATURES</b>	<ul style="list-style-type: none"> <li>• The timber frame was platform construction with classroom and corridor walls providing the main racking resistance.</li> <li>• The 340mm thick walls of the frame and 400mm deep roof were filled with Warmcell insulation.</li> <li>• Airtightness achieved (at 50 Pascals): 0.52 air changes per hour.</li> </ul>





## WILKINSON PRIMARY SCHOOL, WOLVERHAMPTON

The staff and pupils had input into the innovative and imaginative design of their new school which features classrooms and group rooms clustered around shared, central activity hubs.

<b>SIZE</b>	2,500 sqm
<b>DESIGN FEATURES</b>	<ul style="list-style-type: none"> <li>The ground floor classrooms enjoy direct access to the outdoor areas, while large windows throughout the building provide bright, well-lit spaces.</li> <li>The school building utilises high levels of natural light and excellent ventilation to create a healthy and positive atmosphere that helps motivate the pupils and aid concentration.</li> </ul>
<b>TIMBER FRAME FEATURES</b>	<ul style="list-style-type: none"> <li>Balloon construction to avoid the need to sit the floor joists on to the external wall thus into the thermal envelope.</li> <li>Roof comprises of closed panels with 400mm deep 'I' beams filled with 'upcycled' cellulose insulation, U-value 0.12W/m<sup>2</sup>K.</li> <li>The 340mm timber frame walls were sheathed on the outside with Hunton Bitroc board, 18mm OSB3 forms the airtight layer internally. The wall is filled with 'upcycled' cellulose insulation, U-value 0.12W/m<sup>2</sup>k.</li> <li>Airtightness achieved (at 50 Pascals): 0.48 air changes per hour.</li> </ul>





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