Dormont Park Passivhaus Development

For the technically minded:

The houses are designed and constructed to the German Passivhaus standard, an advanced low-energy design standard that is increasingly seen as the backbone for delivering zero carbon buildings.

The Passivhaus Planning Package (PHPP) is the energy modelling tool used to determine whether a building can achieve the required standards. PHPP is also used as an interactive design tool to refine the project design and construction detailing. Any variation in specification of materials, services systems design and layout must be tested to check the energy standards are met, including any changes that occur on site.

Final Certification can only be achieved if every part of the constructed building complies with the input PHPP details. This provides for a very positive and interactive relationship between the whole design and construction team.

There are 5 key design steps for a Passivhaus design:

1. Optimising the building shape and orientation to reduce heat loss and maximise solar gain
2. Super insulating the building fabric
3. Reducing ventilation heat loss with an air tight fabric
4. Providing continuous fresh air with mechanical ventilation and heat recovery
5. Reducing primary energy demand to less than 120kWh/m²/year and applying renewable energy systems when appropriate

For a building to be certified to the Passivhaus standard it must meet the following criteria:-

Space heating demand no more than 15kWh/m²/annum
Building heating load 10W/m²
Useful cooling demand 15kWh/m²/annum
Primary energy demand 120kWh/m²/annum
Building air tightness 0.6ac/h@50pa

Overheating frequency 10%

The low energy demand is produced by following the 5 key design criteria.

1. Optimising the building shape and orientation to reduce heat loss and maximise solar gain

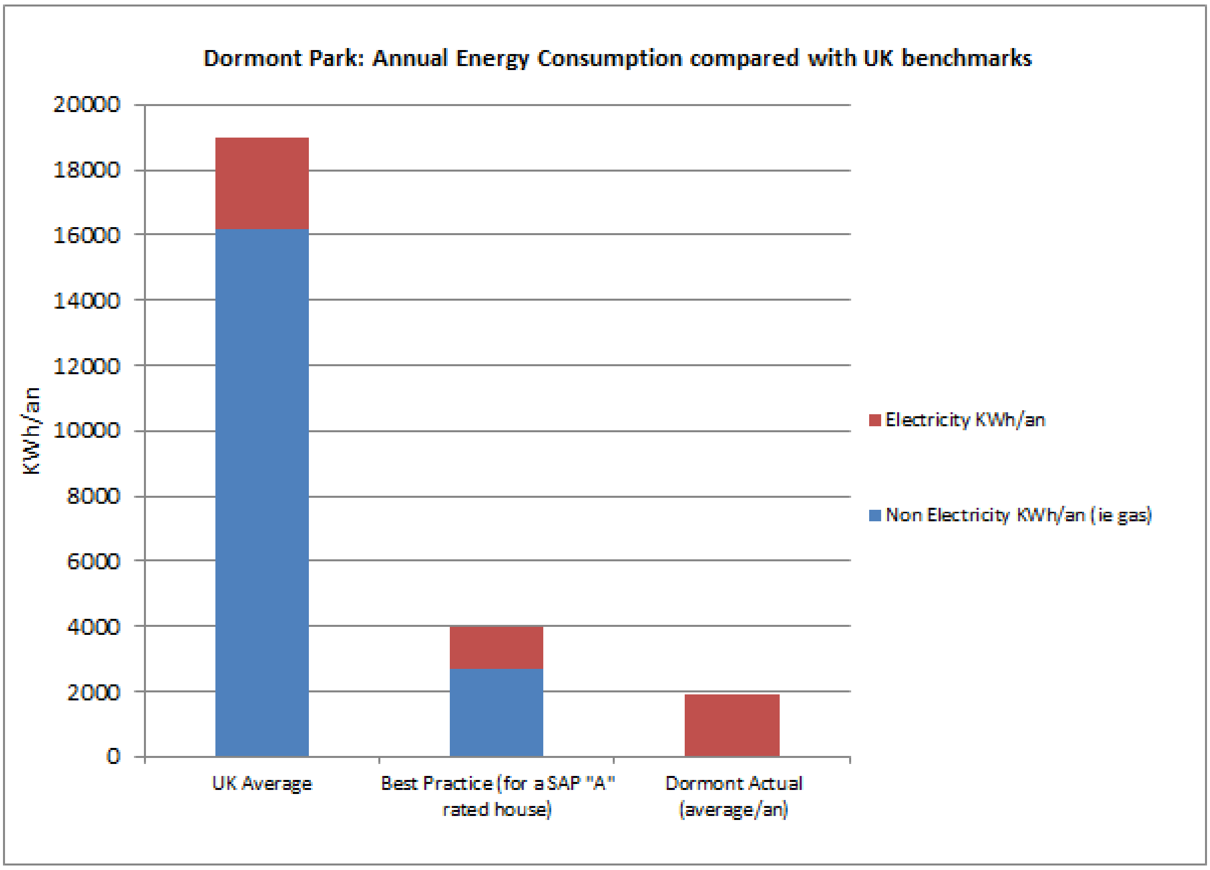
The houses are all designed on an east-west axis to maximise solar gain from the south facing elevations and the semi-detached design also reduces heat loss through the party wall.

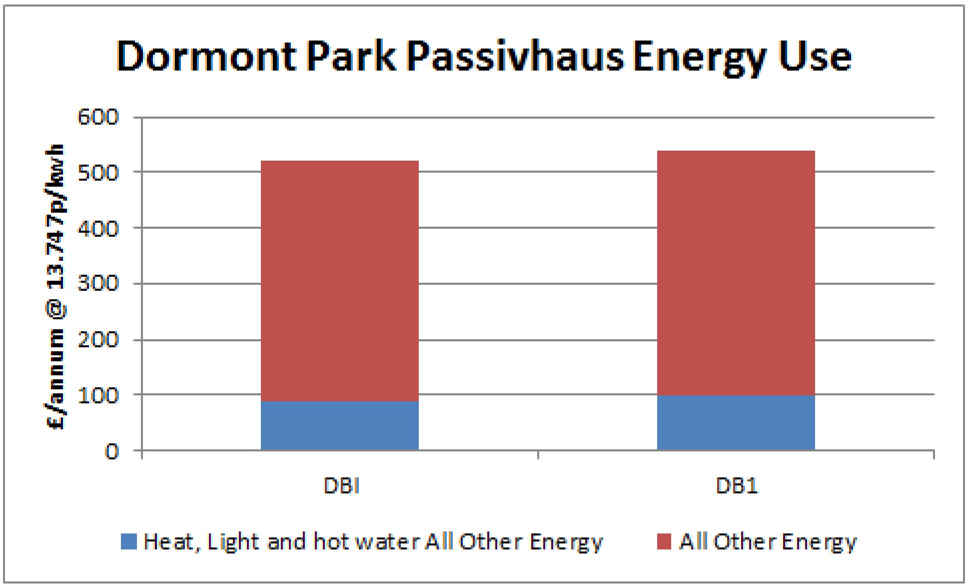
Careful consideration was given to the external design due to the rural location and the desire to blend well with the existing traditional cottages. The inclusion of dormers and external porches is designed to cater for the additional insulation requirements to avoid thermal bridging.

2. Super insulating the building fabric

Although the Passivhaus standards set minimum U-values to be achieved, the actual U-values of a certified Passivhaus can be much lower to achieve the overall energy demand. The U-values of the constructed building fabric are:

External wall U-value is 0.095W/m²K
Roof U-value is 0.118W/m²K
Ground floor U-value is 0.111W/m²K
Windows have a U-value of 0.74W/m²K





3. Reducing ventilation heat loss with an air tight fabric

An essential requirement of Passivhaus Certification is a successful air tightness test for every property to achieve 0.6ac/h@50pa. This demanding standard required careful design before fabrication of the timber kit and very high standards of build quality on site. All houses achieved the required standard of air tightness.

4. Providing continuous fresh air with mechanical ventilation and heat recovery

The chosen Mechanical Ventilation with Heat Recovery units installed in the houses provide a heat recovery rate of 90%. The system is ducted throughout the houses, extracting from kitchens and wet areas and supplying to all habitable rooms. The systems are exceptionally quiet in operation and ensure a very healthy and comfortable internal environment. The units are fitted with a post heater fed from the hot water tank to allow a heat boost if required and the PHPP also confirmed that overheating is within the defined standards.

5. Reducing primary energy demand to less than 120kWh/m²/year and applying renewable energy systems when appropriate

The PHPP was used to refine the design and test the anticipated impact and performance of energy systems within the houses. The domestic hot water for the houses is provided by solar thermal panels feeding a storage tank and supplemented by a log burning stove with back boiler. A suitable wood burner had to be specified which provided minimal heat to the room and also did not draw any air through the unit. The selected unit takes 90% of heat to the hot water tank and has a direct combustion air feed from outside. CO_2 emissions from this unit are 4g/kWh in comparison with 304 g/kWh for heating oil.