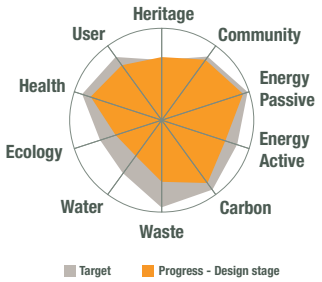


Surpassed PassivHaus standards

PV earned £60,000 in the first year

24% below our construction CO_2 target.

CASE STUDY: MONTGOMERY SCHOOL

Montgomery School is the first PassivHaus certified primary school in the UK. It is also the first school with a target to be zero carbon in use, and demonstrates BAM's ability to deliver sustainable buildings.

SUSTAINABLE DESIGN

The PassivHaus standard (first developed in Germany) requires ultra-low energy consumption and high thermal performance, delivering an efficient and comfortable space for occupants. To achieve this we had to create a building with super insulation, eliminate thermal bridging and reduce air leakage.

Not only did we meet the PassivHaus standard but we also surpassed many of the requirements:

- Annual space heating only requires 12 kWh/m^2 instead of the standard 15 kWh/m_2
- The heating load is 9 W/m^2 instead of the standard 10 W/m^2
- Air tightness achieve 0.68 m^3/hr/m^2 instead of the already tough 1.2 m^3/hr/m^2
- Total primary energy demand for a year is 112 kWh/m^2 instead of 120 kWh/m^2 targeted

TACKLING CLIMATE CHANGE

Our zero carbon approach aimed to minimize energy demand as far as possible, and to provide the small amount of power required from on-site renewable energy.

By meeting the PassivHaus standard, we could ensure that the building had minimal heating demand, and used only a mechanical heat recovery system to provide thermal comfort. High performance insulation in the walls as part of a precast concrete sandwich panel ensures that minimal heat is lost from the building and the heavy weight precast concrete construction allows the daily temperature fluctuations to be smoothed out.

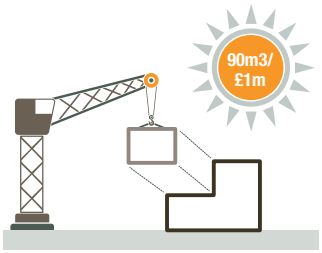
The building is fitted with energy efficient lighting and specialised lighting controls to minimise energy use during occupancy. Laptop charging points are timed and metering is used to monitor energy use. Solar photovoltaics then provide all the power needed (over the course of a year) to run systems.

Throughout the project we worked with the school and Devon County Council to feedback learning. A series of case studies and briefing documents were produced on the buildings key features and easy to use guidance documents help users make best use of the building (eg. for heating, lighting and ventilation).

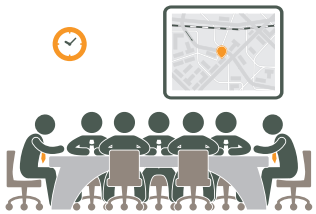
'THIS WAS A TRULY CHALLENGING PROJECT WHICH REQUIRED CLOSE COLLABORATION AND ATTENTION TO DETAIL. THE END RESULT, A ZERO CARBON IN USE SCHOOL WHICH DELIVERS A FIRST CLASS LEARNING ENVIRONMENT, IS SOMETHING WE'RE VERY PROUD OF'.

James Turner, Project Manager, BAM Construction

Completed: **March 2012**
Customer: **Devon County Council**
Architects: **NPS South West**
Mechanical & Electrical consultants: **John Packer Associates**
Structural Engineer: **Robson Liddle**
Project Manager: **Hills**
Quantity Surveyor: **NPS South West**
Services Engineer: **John Packer Associates**



Prefabrication reduced waste on site



Hosted local residents meetings

We also ran energy workshops with the school to engage both pupils and staff. We are now working with the school and council offering five years of support to help monitor and maintain performance (through post occupancy evaluation) and ensure the building and its systems are used as efficiently as possible.

To reduce carbon through construction, we used efficient temporary accommodation, featuring extra insulation, double glazing, AMR meters, efficient lighting and an air source heat pump system. Using prefabricated elements also reduced CO_2 emissions during construction.

WASTE MANAGEMENT

Simple measures were used on the site to reduce waste going to landfill including a cut and fill of excavation soil. However the key to achieving the low waste production figure of less than 90 m^3/£1m was the extensive prefabrication. The sandwich panel frame, floors, roof, primary rafts and acoustic rafts were all prefabricated, which reduced erection time on site, and helped the team meet the tight programme requirements.

COMMUNITY ENGAGEMENT

We interacted with the school throughout the project by organising visits by Considerate Constructor's Ivor Goodsite, interview mornings to help pupils complete 'A Day in the Life of a Builder' essays, energy workshops and parent's evenings to present project issues. We kept the wider community up to date by dropping leaflets and attending local residents meetings.

The energy workshops conducted in the school were of vital importance, as the users of the building needed to be aware of how to manage the new school. The hands-on workshops were integrated into the summer curriculum, and promoted sustainability awareness to the students. Now the key stage 2 students are able to teach the younger students and will deliver similar activities.