

Zero carbon refurbishment in an East England school

WESTBOROUGH PRIMARY SCHOOL, ENGLAND

Procurement objectives

Commissioned by the Southend-on-Sea Borough Council and the Governors of Westborough Primary School, Westborough Primary School embarked on a project to reduce the school's carbon footprint and become the country's first zero carbon school. Since its opening in 1915, Westborough Primary School has undergone a variety of adaptations and additions. The need for repair and refurbishment of the school provided an opportunity to build a more sustainable school. To reach this goal, the school, with the help of an architectural design firm, focused on reducing energy demand, addressing inefficiencies, and selecting low carbon energy supplies.

Phase 1 of this two-phase project covered the refurbishing of the oldest school buildings and represented around a third of the school area. A 90% CO₂ emissions reduction target was set for Phase 1, representing a reduction of approximately 30% across the whole school.

Criteria used

The project involved a two-phase tender that would allow for construction to begin on the site before the design of the building was fully complete. The carbon reduction concept of the project was based on three key principles:

- Increasing energy efficiency
- Increasing the use of renewable energy sources
- Performance monitoring

Subject matter of the contract:

Refurbishment of a low-energy and low-carbon school building

Technical specifications:

Improvements to energy efficiency:

- Installation of thermal insulation in existing walls, Low Temperature Hot Water (LTHW) pipe systems and roof constructions
- Construction of thermal buffer zones
- Replacement of fluorescent lights with efficient T5 lamps
- Installation of daylight sensors to control classroom lighting
- Recommissioning of existing boiler controllers
- Installation of hot water spray taps

Installation of renewable energy sources:

- Installation of a solar Photovoltaic Array
- Installation of a wind turbine
- Installation of a biomass boiler

Performance monitoring:

- Installation of new metering and sub-metering systems

Background

In 2007, the Department for Children, Schools and Families' (DCSF) "Children's Plan", set out the ambitious aim for all new school buildings in England to produce zero carbon emissions by 2016. To help reach this goal, the DCSF set up a Zero Carbon Task Force, through which Westborough Primary School was able to secure partial funding for a refurbishment project that would improve the school's sustainability.



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Results

Refurbishment works began on the site by mid-2009 and were completed by September 2010. By November 2011, the biomass boiler system delivered 65% of the overall heating for the refurbished area. The total annual photovoltaic generation represented around 33% of the electricity delivered to this area. This contributed to a 65.8 % reduction in gas consumption and a 65.6 % reduction in electricity consumption.

Westborough Primary School was named a winner at the 2011 Retrofit Awards in the Public Sector-Education category. The reward is given to projects that have demonstrated design and engineering excellence, that also prolong the life of buildings and helps lower energy consumption and CO2 emissions.

Environmental impacts

UK schools generate approximately 15% of the UK public sector's CO2 emissions. Retrofitting existing school buildings will greatly contribute to the reduction of CO2 emissions originating from the public sector. A performance review of Westborough School following the refurbishment showed a total savings of 66% of CO2, in line with earlier projections. Westborough School provides a good example of how retrofitting existing structures can contribute to significant reductions in energy consumption, and consequently, CO2 emissions.

Lessons learned

One factor that greatly contributed to the project's success was the close collaboration between the school and the architects, Cottrell and Vermulen. The well-established relationship between these two groups allowed a clear understanding of the school's expectations and an efficient delivery of the proposed design.

It was acknowledged that performance monitoring systems should be considered an essential feature that should be included in the design phase of refurbishment projects of this nature. The inclusion of such systems provides a good understanding of how carbon reduction methods are performing, and allows for clear reporting of results.

Although most of the design plans were delivered smoothly, the school was ultimately denied planning permission for the installation of a wind turbine, due mainly to the objection of the local community. Seeking active input from the local community through extensive consultation may have avoided the refusal.