

Larger homes with smaller footprints

Increasingly, we want homes that are larger but with a smaller carbon footprint. Concrete offers the sustainable solution – more space with less CO₂ emissions – argues Guy Thompson, head of architecture and housing at The Concrete Centre



With 90% of a home's carbon emissions being attributable to the energy used to heat, cool and light it, increasing a home's energy efficiency is paramount if we are to reduce its impact on the environment. Here, the value of concrete's inherent thermal mass is being recognised and harnessed via a number of prototype homes that promise to set the agenda for future domestic construction.

Barratt's prototype house at the BRE Innovation Park in

Watford is the first concrete constructed home built by a major house-builder to achieve Level 6 of the Code for Sustainable Homes. Designed by Gaunt Francis Architects, the Barratt Green House proved to be the winner with the public vote in the British Homes Awards' Home for the Future competition in 2007.

The house aims to realise the potential of concrete thermal mass to reduce heating and cooling energy consumption over the lifetime of the home. It features a 350mm in-situ concrete

"THE PRINCIPAL DESIGN FEATURE IS A VENTILATING ROOF LANTERN THAT FACILITATES NATURAL AIR CURRENTS VIA A STACK EFFECT"

ground floor slab, 150mm precast concrete plant upper floors and a precast aerated concrete wall panel system. These panels are 200mm thick, 600mm wide and a full storey in height. The joint area is minimised and, to limit the potential for air leakage still further, a 4mm coat of polymer plaster was spray applied internally as a back-up seal. Hot water for space heating and domestic use comes from a solar roof panel on the roof and an air-source heat pump. The house will be tested over the next two years to ascertain its success at keeping the internal ambient temperature cool in the summer and warm in the winter with significantly reduced energy consumption.

The Barratt Green House sits alongside another concrete house built by Hanson, which also exploits the thermal mass of heavyweight concrete and masonry construction and the use of natural ventilation to mitigate the impact of predicted hotter summers due to climate change. The principal design feature is a ventilating roof lantern that facilitates natural air currents via a stack effect. To take full advantage of this, the bedrooms are located on the cooler ground floor and the living areas are located on the upper floor. As with Hanson's first house at BRE built two years earlier, the main structure is built using masonry panels precast concrete floors manufactured off-site. Whilst the thermal sink and natural ventilation will help to cool the building during the summer, the building will remain warmer for longer in winter because it is highly insulated thereby



The Concrete Centre



reducing heating CO₂ emissions and bills.

Concrete construction can also help to reduce the immediate impact of housing on the environment by providing more house for less land. This can be achieved by building basements which can provide 50% more living space for a two-storey house and up to 100% for a bungalow without increasing the amount of land used or the height of the home. This means more living space for a smaller foot print.

In addition, basements can also reduce the energy consumption of houses. Heat losses through basements, floors and walls are less than those at ground and upper floor levels. Research carried out by the BRE found that given two houses of the same floor area and construction, the one with a basement was 10% more energy efficient. Basement living space also offers better sound insulation which makes the lower ground floor an ideal location for a study, play or work room.

Some forward-thinking house builders are beginning to explore the potential of building basements. David Wilson Homes, now part of

Barratt Homes, included a basement in its Project:LIFE. This involved building a detached four-bedroomed home that included features such as the provision of wireless technology throughout the home, an energy efficient heat-exchanger and a basement that contained a den and laundry room. The home was 'test driven' by a family for six months. The basement proved to be extremely popular with the family. As a result the housebuilder is now considering incorporating basements into some of its new house designs. Martin Grant Homes has built a notable development in Cambridge that includes basements, and various other housebuilders are now beginning to incorporate basements in their new developments.

Via basements, concrete construction can provide larger, more flexible homes that have even more floor space but with a smaller carbon footprint due to the high thermal mass of concrete thereby meeting homeowners' wishes for more living space and reduced energy consumption.

