

Will these retrofit technologies catch on?

PRP Architects has completed a retrofit of a post-second world war mid-terrace house in Dartford as part of the the **Technology Strategy Board's** Retrofit for the Future competition. Their measures have boosted the Energy Performance Rating to an 'A', as **Ella Taylor** discovers.

Before the retrofit of 98 Willow Road, Dartford, the two bedroom house would have typically emitted around 80kg CO₂/m²/yr and had a primary energy demand of around 490kWh/m²/yr. The retrofit, completed this month, is being used as a pilot project to test various technologies before they are rolled out on a larger scale.

One such technology is a hybrid solar 'PV-T' panel which combines photovoltaic and thermal systems. The array of these panels is cooled by water, with waste heat added back in to the solar thermal circuit.

As well as the hybrid solar panels, a 150mm insulated external foam render, internal insulation, triple glazed windows and doors with thermal breaks and insulation built into the frames and high efficiency internal insulation between the rafters and on the ceiling increase the building's energy efficiency. Mineral wool loft insulation, Nanogel insulation on the floors and Polybeads to back-fill the chimney flue all insulate and help to boost air tightness.

6.7w LED light bulbs – developed for social housing and designed to last for over 30 years – combined with a lighting control system should further help to reduce electricity demand.

Steve Sheldon, head of low carbon technologies at **Connaught Partnerships**, which helped carry out the retrofit with PRP and **Dartford Borough Council**, said the company sees the project as “a fundamental step in testing new methods and innovative products that will make a difference to our clients. Making homes energy efficient is only part of the solution if we are to significantly reduce our carbon emissions.”

But, he added: “We believe that one of the greatest challenges lies in changing people's behaviour. With this in mind we have developed a resident's handbook, which clearly illustrates how people can reduce carbon emissions and save money by making changes to their everyday lifestyles.”

Waste heat is captured and utilised through different methods: a **Zenex** Gas Saver captures waste heat which would usually be lost from a boiler's flue, using this to heat water before it enters the hot water cylinder, meaning that less energy is



needed to produce hot water. This is used in combination with the solar thermal heating panels on the roof. Waste water heat is also recovered and reused, via a device like a narrow hot water cylinder which transfers warmth from waste hot water over to fresh cold water. There are no moving parts in the device and so it should be maintenance-free and relatively reliable.

PRP's environmental director explained: “PRP's aim was to develop an energy reduction solution which was innovative yet replicable, as well as being economically viable. The design proposals had to be simple to construct, operate and maintain and we believe the final product achieves these aspirations.”

“Retrofit cannot be ignored in the UK as it may be that all UK homes will need to be near zero carbon by 2050, in order to meet the Government's targets. We need to work together to trial innovative solutions, such as those used in Willow Road, to substantially reduce our carbon emissions and change the way we live.”

Other sustainable additions to the home include a low energy ventilation system, a real-time energy monitoring system, AA++ kitchen appliances and solar light pipes to harness natural lighting. The

solar light pipes bring natural daylight into rooms – during daylight hours – by a small transparent dome on the roof of the building. Light passes through this dome into a reflective pipe, which feeds light into a diffuser in the ceiling, which then bounces the light into every corner, negating the need for artificial light during the day.

Underfloor heating was also installed in the Willow Road house, requiring a lower pipe temperature and therefore using less energy to heat rooms. It is compatible with heat pumps, which could be added in the future, when the existing boiler nears the end of its useful life. Thermostats which accommodate varying needs for different areas in the home and for different days also help to save energy, while a 'weather compensator' will lower or lessen boiler flow temperature depending on the weather.

All the works combined to achieve a significant reduction in carbon dioxide emissions (below 17kg/m²/yr) and primary energy consumption (115kWh/m²/yr).

Council head of housing **Paul Dosad** said it strongly supports the TSB Retrofit for the Future competition, which gave an average of £142,000 to 87 pilot projects across the UK to be developed to demonstrate innovative energy efficiency measures (*SB*, March 2010). Each of the demonstrator houses, including Willow Road, will be evaluated by the **Energy Saving Trust** for at least two years and assessed for their potential for lower cost implementation across further UK social housing.

Mr Dosad said: “We are looking forward to moving our new tenant into the property in order that we can assess the benefits of the technologies installed.”

“Longer term Dartford Borough Council would like to replicate elements of this initiative and install them into its other properties and offer it to the private sector. However, this can only be done once the new and innovative technologies involved in this project are tested in a domestic environment to see what effect it has on the lives of the families living with them on a daily basis, over a long time frame, and this is why the TSB pilot is vital in terms of informing our future planning and investment decisions.”