BUILDING THE FUTURE

Home gave three leading eco-architects different budgets and one brief: to create a sustainable urban family dwelling. Jill Macnair is impressed by the results

So, you want a stylish green home, but think it will cost the earth? Think again. Home asked three leading exponents of sustainable design to come up with the ultimate green new-build house to suit three very different budgets — and the results were spectacular.

All had the same brief: to design a home for a young part-time teacher and her husband, an IT specialist. The imaginary couple have two children, aged nine and seven, and own an end-of-terrace plot on a tree-lined street of Victorian houses. The house can't be taller than neighbouring three-storey homes, and must be as green as possible.

Dan Burr, 40, an associate partner at Sheppard Robson, which has offices in London and Manchester, has come up with a three-bedroom, 1,500 sq ft home costing £250,000 (plus land costs). Burr was the design director on Britain's first zero-carbon house, the Lighthouse, built in Watford last year. The building meets level 6 of the Code for Sustainable Homes, with which all new homes in Britain will have to comply by 2016.

Justin Bere, 48, principal of the north London-based firm Bere Architects, designed a four-bedroom, 1,800 sq ft home costing £400,000 (plus land costs). His residential projects include Focus House, built in 2006 in Finsbury Park, north London, which won the Riba London Region Award 2007, among other prizes. His practice is a devotee of PassivHaus, an established German style of energy-efficient construction.

The third property is a five-bedroom, 2,500 sq ft home costing £600,000, designed by the husband-and-wife team Catherine Burd and Buddy Haward, both 41. Based in northwest London, they devised the low-energy Brooke Coombes House, in Ealing, west London, which in 2002 won the Riba Manser Medal, and are designing 600 sustainable homes in the Rochester Riverside scheme at Thames Gateway.

Their EZ House has three key principles: its construction must incorporate local materials from sustainable sources and low-energy build methods; it must consume little or no energy, so conserve or generate it on site; and the flexible design must have non-load-bearing internal walls, so that it can be adapted to the changing needs of the occupants.

"The most important aspect of ensuring any low-energy home works properly is educating the user," says Haward. "There have been many cases of low-energy public buildings developing problems because people didn't know how to use the technology."

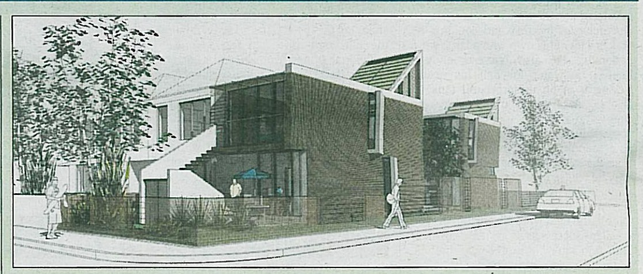
The sectional house **£250,000**

The open-plan layout of the Sheppard Robson three-bedroom, £250,000 house, designed by Dan Burr, surrounds an open courtyard that effectively splits the building into two zones and introduces light and ventilation. A smaller street-facing block has a guest flat or home office on the ground floor, with the master bedroom suite above it.

This wing is connected to the main section by a hall and stairs — or "service spine" — running front to back. This has storage, a utility room for drying clothes (rather than a mechanical dryer), a biomass boiler for top-up space heating and hot water in winter, a grey-water recycling tank and a mechanical ventilation heat-recovery system.

The prefabricated structure is made of Sips panels, designed a bit like a choc-ice: thick plywood sides sandwich a rigid 1ft core of polystyrene insulation. It is clad in sweet chestnut from local coppiced woods. Only 18% of the building is glazed — 10% less than a conventional home — but what windows there are triple-glazed and gas-filled, with external shutters.

"One of the starting premises of the design is to manage the daylight coming in," Burr says. "When you have a superinsulated box and it heats up, it's difficult to lose that heat again."



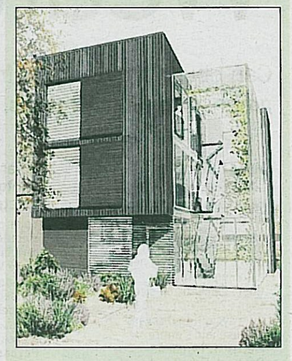
Two wedge-shaped, monopitch roofs bring in "north light" — daylight, not direct sunlight. The inverted plan, with family living space on the top floor and the children's bedrooms below — benefits from this. Photovoltaic panels power lights and triple-A-rated appliances; solar panels provide hot water. All are angled 40 degrees south for best performance.

A computer in the kitchen monitors energy use; adjustments can be made as it fluctuates. Rooftop wind-catchers have vents on four sides to let heat out and fresh air in. There is a subterranean rainwater recycling tank, and a sedum green roof encourages biodiversity and controls rainwater run-off in wet weather.

Charlotte Wood/Arcblue

The award-winning Brooke Coombes House, in Ealing, west London, designed by Burd Haward

The EZ House **£600,000**



One of the key elements of Burd Haward's five-bedroom, £600,000 EZ House is its large, south-facing glazed courtyard, which most rooms overlook. Externally, it is double-glazed; internally, full-height, triple-glazed sliding doors lead onto it from each floor. "So, in effect, the whole building, from inside to out, is five times glazed," Haward says. The courtyard makes the greatest use of energy from the sun in winter and cuts heat loss from windows. Climbing plants on the walls and roof ("seasonal shading") limit solar gain in summer and utilise it in winter. The sliding doors can be opened to let air circulate — vents open and close at the top, allowing hot air out — and little artificial lighting is needed; any used is low-energy.

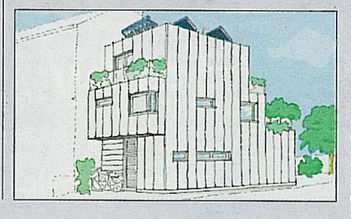
The frame is made of laminated timber beams and columns; external walls are made of timber studs and cladding, superinsulated with recycled newspaper to create an airtight envelope. Other windows are triple-glazed and gas-filled, with thermal shutters that control energy gain from the sun during the day and reduce heat loss at night. A ventilation heat-recovery system recycles up to 70% of energy that would otherwise be lost, and a wood-pellet boiler provides top-up underfloor space heating and hot water. The house has low-energy appliances, space for bicycle storage, recycling and composting, and, in the garage, a charging point for an electric car. Rain and grey water are harvested and stored separately underground, saving 60% of average water consumption.

The PassivHaus **£400,000**

Justin Bere's four-bedroom, £400,000 PassivHaus doesn't need a boiler, radiator, underfloor heating or air conditioning. Instead, it stays warm in winter and cool in summer by limiting its energy consumption. The basic structure is made of laminated wood panels from sustainably managed forests. The wood has absorbed CO_2 — up to 35 tons — that would otherwise pollute the atmosphere.

The home has a skin of oriented strand-board panels — like chipboard, but less chemically based — making it 14 times more airtight than required by British building regulations. Zinc cladding creates a durable, waterproof finish — and looks stylish.

The heavy insulation also exceeds building regulations. All windows are triple glazed, and the south-facing facade has large glass sections that let in daylight and keep the need for artificial light to a minimum. They are also carefully planned to provide cross-ventilation in summer, when opened.



Smaller windows on the north side minimise heat loss, and external timber louvres reduce overheating. By opening and shutting them, you can control the amount of light — and heat — entering the house.

If the building is airtight, how does the air inside stay fresh, in winter in particular? Thanks to a whole-house ventilation unit with heat recovery. This transfers heat from the stale air leaving the building to the fresh air coming in. "When a building is airtight, it's essential to incorporate a system for bringing ample fresh air into the house, to make sure it's healthy," Bere says.

A small ground-source heat pump boosts the temperature if necessary (such as when the house is left unoccupied during holidays: some of the heat the house uses is provided by the body heat of the occupants).

Domestic appliances are all A-rated, lights are low voltage and energy efficient, and a 3,000-litre rainwater-harvesting tank beneath the garden provides water for the sprinkler system (which meets fire regulations), the six-litre dual-flush lavatories, the washing machine and an external tap for the garden. The tank reduces pressure on the public sewer during periods of high rainfall, playing its own small part in reducing the risk of flooding.

Glass-tube solar panelling fitted to the roof provides at least 65% of the home's hot-water requirements, and the heat pump can boost domestic hot water if necessary.

Finally, roof gardens help to moderate the microclimate and encourage biodiversity.

TRIPLE WHAMMY
For a picture gallery of our green architectural plans, go to timesonline.co.uk/property