

SCHOOLS

**AN EXTRACT FROM
MACE'S SCHOOLS
BROCHURE**

The story of Howe Dell School



TOP OF ITS CLASS

Hertfordshire County Council asked for the first fully sustainable school. What it got was a virtual educational laboratory packed with the latest green technologies.







Visitors to Howe Dell primary in Hatfield could be forgiven for assuming the school's playground isn't one of the most interesting things about it. Their eyes are much more likely to be drawn to its wind turbine, the solar panels on its roof, the wildlife garden or a modern design where every classroom leads on to an outdoor space. But it is what's under the tarmac and grass of the playing area and the car park that really sets the school apart – a groundbreaking system that enables it to use free natural energy to heat and cool the school all year round. Indeed, the best clue to Howe Dell's secret is the school's gas bills – they are very, very low.

In 2002, Hertfordshire County Council asked Mace to deliver the first fully sustainable school, a pioneer that would underline its commitment to sustainability and provide a test-bed for the newest technologies, as well as an inspiring example to its pupils. Mace's multi-disciplinary design team provided project management, construction management and design consultancy, working with Capita Architecture, and eventually took over the contracting as well when the original firm went bust. The result is Howe Dell, which opened in September 2007, and an adjoining children's centre. The local authority's hopes were fulfilled: the school has been awarded an ECO Green Flag, the highest rating available under the UK's eco-schools programme. It was also used as a pilot for the BREEAM for Schools eco-assessment, under which it would receive the highest "excellent" rating.

Howe Dell school is the first building in the UK to incorporate interseasonal heat transfer, for which it received an innovation



grant of £264,000 from the Carbon Trust. As the black tarmac of the playground absorbs the heat of the summer sun, it warms the water in coiled pipes located underneath the ground. The water is then pumped into a reservoir 33m below the school, where it is so well insulated, it remains at that temperature until the winter months, when the school can draw on it to heat the building. In the winter, the pipes capture the frost on the ground and store it in a separate thermal tank to cool the building when the weather is warmer.

"It's basically like a fridge working in reverse," explains Danny Pollock, engineering manager at Mace. "Most buildings have car parks or playing fields, so this is doing something sustainable with them, actually using the energy they collect rather than wasting it." The water from underneath Howe Dell's playground is already around 25°C before it even reaches the boilers.

The solar panels on the roof of the school have also contributed to dramatic savings on Howe Dell's gas bills. During the summer, they can heat the water for the school kitchens and wash basins to up to 95°C. Of course, during the warmest months of July and August, everyone's on holiday. But the energy still isn't wasted – the Howe Dell children's centre closes for only two weeks of the year, and in the summer the school's clever building management system directs all the hot water to the centre. At the sunniest times, it has a completely free supply.

Minimising demand

The design team also explored ways of constructing the school so that its heating and cooling requirements are as low as they can be to start with. Underfloor heating means that water only needs to be heated to 55°, compared with 70-80°C to feed a radiator system. The concrete structure of the building

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itself is a key part of the TermoDeck natural ventilation system – fans push the air around the hollow spaces in the floors and ceilings to stabilise the temperature across the school so it is constant and never too hot or too cold.


The building has 100mm of rockwool insulation, double the standard when it was built, but now the norm. Rockwool was chosen because it’s a natural, sustainable material, made without releasing any CFCs into the atmosphere. All materials and finishes were sustainably sourced and chosen to meet the highest environmental standards, and recycled products have been used around the school – there are tyres in the floors and benches, and classroom sinks and splashbacks made of old yoghurt cartons. Roof lights allow natural daylight to flood the centre of the building.

Wind energy

Pollock admits that the really challenging part for engineers is renewable electricity. Howe Dell has a natural advantage – there’s plenty of wind. “It used to be an old airfield, and now they’ve built houses there, which has turned where the school is into a nice wind tunnel,” he explains. “We were originally going to install a really big 250kW turbine but it was turned down by planning. Instead, there’s a 75kW one, which is medium-scale, and you quite often see it really whirring around. That provides around 10% of the school’s electricity.” Howe Dell also has photovoltaic panels on the roof which use the sun’s energy to produce a small amount of electricity.

And the roof has a third use – a sedum roof provides insulation and collects rainwater, which is recycled to flush toilets and irrigate the wildlife garden, where the children can learn about biodiversity. ►



A young boy in a school uniform is looking thoughtfully to the side. The background is blurred, showing other people in a classroom or school setting.

“It’s not going to be the adults who reduce their energy use, it’ll be the school kids – and they’ll educate their parents.”

► It’s partly down to the many roles that the council entrusted to Mace that it was able to make such a difference. The multi-disciplinary team of design consultants, engineers and school and sustainability experts were able to work together to ensure the challenges of the pioneering project were met, without compromising the council’s ambitions. “All of the team understood the need for a plant room in a particular place, or to orientate the school building in a particular way, and the need for a certain type of roof for the photovoltaic cells and rainwater harvesting. Because we were one team, we could work together to achieve that.”

Eco-curriculum

But it wasn’t only the Mace design team that decided how the school would look and function – the project has been at the centre of the school’s “eco-curriculum”. “One of the key benefits we look at on any education project is how to use it as an educational tool,” says Pollock. “We meter everything so that the kids can see what happens when they don’t switch the lights off, how much energy is coming from the photovoltaics and the wind turbine. That’s the key thing about children – they will educate their parents to switch things off at home. It’s not going to be the adults who reduce their energy use, it’ll be the school kids.”

The children at Howe Dell were involved at every stage of the design of their new school. They met with the consultants, explored the sustainability and recyclability of different materials and learned about ways of producing renewable energy. They also had lessons overlooking the building site in

a specially installed classroom. “When the school opened in September 2007, it was the children who took the visitors round and explained all the features of their new building. They were only nine or ten years old and they’d been involved in the project for a few years. The children were really fantastic, they had so much enthusiasm.” The only disappointment was for the older ones who weren’t returning that term: “I gather from the headteacher that they were most annoyed that they couldn’t start in the new school!”

More than two years on, Mace has a wealth of data about the building and all its renewable technologies to inform future education projects. And Howe Dell school continues to enjoy both the financial and education benefits of a truly exemplary building. ■



“The technology is there now.”



**Q&A with
Danny Pollock,
engineering manager**

Why is sustainability so important in the education sector?

The future generation are the people who are going to have to live with sustainability, and if you catch children at an early enough stage, they will educate the parents. You can't get a 60, 50 or even a 40 year old to change their way of living without that message from young people. We are already seeing really strong examples of that, where children are going home and saying, "Why have you switched that light on?" or "Why have you filled the kettle right up?"

What regulations or targets do education projects have to meet?

There's Part L of the Building Regulations to do with energy management, which is being updated every three years. By 2016, all new education buildings must be zero carbon. That's a difficult thing to define, and the definition is changing all the time. There are also various building bulletins from the Department for Children, Schools and Families that education buildings have to meet, that define things like the size of classrooms and levels of ventilation. Every project that is funded by central government also has to achieve a BREEAM energy assessment rating of "very good" too.

How can Mace help them do that?

Mace would get involved in the design at the earliest possible stage, explain the guidance and legislation that the building needs to meet and how schools can do that. We try to explain what actually saves you money over the life of the project, rather than just through construction and design. That's very important – much more money is spent on maintenance and running a building than designing and constructing it by a ratio of about 0.1 to 1 to 5 (design: construction:running costs). If you have 30 kids in a classroom using a laptop, for example, that uses a lot more power, and generates a lot more heat, than 30 kids using pens and paper. We can also offer

ongoing consultancy, and we work with Mace Macro our facilities management team. We've been advising Hertfordshire County Council on meeting their carbon reduction commitments too, so they can show they're reducing energy use by 10% year-on-year across their portfolio.

What technologies or products will be most important on education projects?

To reduce the energy of buildings, we need to be lean, mean and green. Lean means designing a building so it doesn't need to use energy in the first place – improving the insulation and glazing, and orienting it so that it doesn't heat up. Mean is controlling the energy you're using, and installing lighting, heating and ventilation controls so that you're only using energy when you're occupying the building. Green means using renewable energy, which is good for generating heat but much more difficult for electricity. But if you've already reduced the energy you need, it's easier to meet those targets.

What will the sustainable school of the future look like?

Renewable energy won't bring anything unusual or new, it will be just more effective and efficient. We will see buildings that are very well insulated, and oriented to minimise heat build-up. Glazing will let in as much light as possible, right to the back of the classroom, but there will be shading to minimise glare. On the roof, there might be a green roof to help insulate the building and harvest rainwater, and photovoltaic cells, wind turbines or solar panels to generate electricity and heat. There might be a nature garden and a pond at the back of the school that can be used to purify water from the toilets so it processes as much on-site as possible. The technology is pretty much out there now, but the school of the future is about pupils and teachers knowing how to manage their building, with plasma screens and meters to show how much energy they're using so energy consumption is an educational tool.

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