

Going underground: Interseasonal Heat Transfer at Howe Dell School

The first use of a new sustainable technology makes Capita's Hertfordshire primary school an important exemplar project, say David Kirkland and Kenneth Fraser. Photos: Peter Durant.

The new Howe Dell primary school in Hatfield, designed by a team from Capita Architecture's London office, will accommodate around 450 children. The building has an efficient rectangular plan form and simple, uncluttered penetrations. It has a welcoming and optimistic feel which is carried through to a central circulation corridor cleverly daylighted on both floors through a series of interlinked lightwells.

From the outset the school was planned as a beacon project for Hertfordshire County Council. Living up to such status can be a trap, as scarce funds are steered into building elements that contribute more to the message than to long-term performance. Efforts to make an eco-building look highly efficient often means that 'eco-bling' is proposed at the expense of other less glamorous, but more effective solutions.

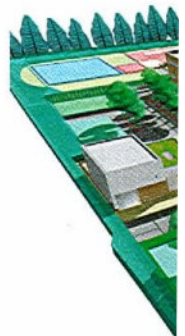
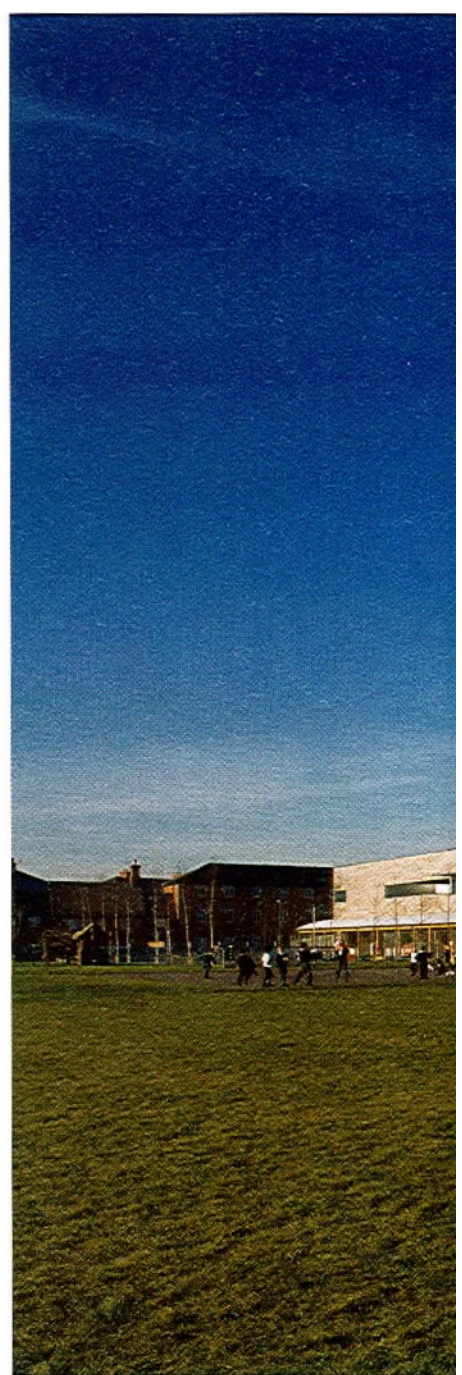
Howe Dell has its fair share of glamorous technologies. A 20kw turbine and 3.5kw PV array go some way to cover power demand while solar thermal panels pre-heat water for use in the school kitchens and washing facilities. This is a big investment, and one wonders whether it could be justified on financial grounds

alone. But sustainable development is not just about energy conservation; decisions must be calculated against the less clear-cut triple-bottom line of social, economic and ecological balance. A school in the heart of a community provides an excellent medium to bring eco-awareness to children, parents and teachers in the hope that they too will adjust the way they live and work now and in the future. Indeed, Howe Dell is designed to support the government's Eco-Schools initiative, in which learning about sustainability and the environment is incorporated into everyday school life. Like the great cathedrals of the past the whole building speaks and teaches in a language that is not bound by words. 'Our curriculum has sustainable education principles at its core and we've already had a lot of positive feedback from Ofsted,' says headteacher Debra Massey, 'Our Eco Squad of pupils helps to promote ideas of sustainability and learning about the environment across the school, enabling us to engage pupils of all ages with the school's ethos.'

To that end an easily accessible, school-wide software interface has been developed that allows pupils to monitor the various environmental systems and help them to understand how energy has been generated by the different technologies, how it is being stored, and how much has been exported to the National Grid. Visitors to the school can even see real-time energy data displayed on a screen within the main school entrance.

The commitment to sustainability is pretty consistent: sedum green roof areas help to manage water run-off, insulate the building and promote biodiversity; high-performance windows reduce heat loss and help control solar gain; sustainably

Howe Dell School relocated to a new building on a former airfield after its existing site was declared unsuitable by Ofsted. The arrangement of classrooms along the southern edge of the building allows easy access to external teaching spaces.



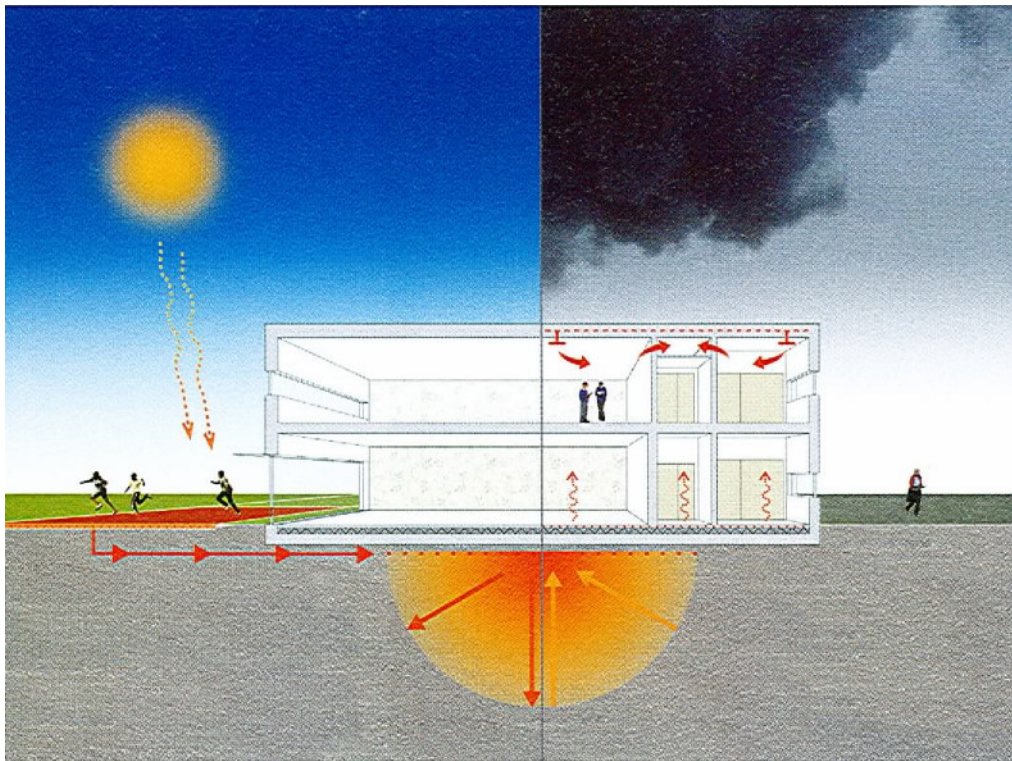




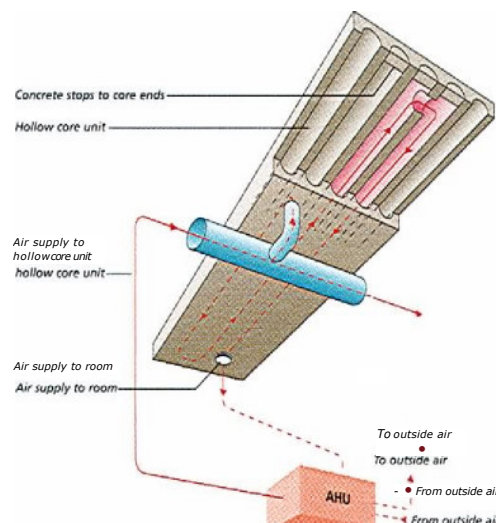
sourced timber and classroom sink tops and splash hacks are made from recycled yogurt pots. Rainwater from the main school roof is used for toilet flushing with any surplus being used by the irrigation system or to top up for the wetland biodiversity area within the school grounds.

So far, so conventional. But Howe Dell has lying beneath it a hidden gem, one that makes this project a true pioneer and an important exemplar of the successful integration of green strategies into building form. A revolutionary heating system — Interseasonal Heat Transfer (IHT) — has been installed to provide heating and cooling throughout the school year. It works by capturing free heat energy from the summer sun and storing it within underground Thermal Banks to be released in winter through a series of heat exchangers linked to the building's underfloor heating and ventilation system.

ICAX, the inventor and developer of the pioneering IHT system with a contribution of £244,000 of grant funding by the Carbon Trust, worked in collaboration with environmental engineer



Interseasonal Heat Transfer works by capturing heat energy from the sun via a collection pipe network just beneath the surface of the school playground. It stores the energy in computer-controlled Thermal Banks in the ground under the school building and releases it to provide underfloor heating in winter via TermoDeck, a heating, cooling and ventilation system (right) that uses the structure of the building to stabilize the internal environment. Fulcrum Consulting, which designed the m&e and renewable energy installations observes of the school: 'We feel that it is important to avoid pushing forward technologies before they have been properly appraised on performance or cost per unit of carbon reduction. Our company ethos is that the message for designing sustainability should be to avoid complexity and overlapping innovations, which this project goes against, but for good reason: it is a demonstration.'



Fulcrum Consulting to integrate the IHT with a TermoDeck fan-assisted heating, cooling and ventilation system, which uses the thermal mass of the structure to stabilize the temperature in the building. The system is also able to work in reverse, capturing the frost of cold winter nights and using it for summer cooling.

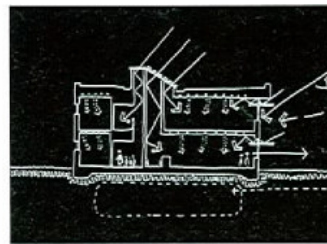
Energy use aside, it is encouraging to see that the project team has successfully achieved many of the goals for sustainable development. Low-VOC materials, locally sourced and recycled building products and excellent day lighting strategies all work together to create teaching and

social spaces that are healthy for both occupants, local ecologies and the global climate. A simple rectangular shape enables the teaching areas — which are all south facing — to have dedicated external classrooms, allowing pupils direct access to the extensive and bio-diverse grounds.

From an aesthetic perspective perhaps the least successful aspect of the project is the timber facade. The need to signify a 'green' building seems to require that the wrapping be visually 'natural' and low processed. Timber cladding in this instance is a good choice but for a building form of this type its treatment and detailing seems to fall down. The timber has weathered to a good colour but has begun to warp and cup. On more rustic arcadian forms this may be entirely appropriate but set against the strong lines and crisp detailing employed here, it signals decay. This is a minor point however, and given the perseverance and commitment of the project team to designing a school that hits so many targets it would be good to allow this minor issue to pass gracefully out of thought. This unique project is a resource for the whole community,' says Keith Emsall, executive member for education at Hertfordshire County Council. I believe that if our children can be enthused about the importance of caring for their environment from a very young age, they will carry that message with them throughout their lives.' The close collaboration between the client, the contractor, Capita Architecture, Fulcrum and ICAX working to prove and successfully apply these emerging technologies has given us a pioneering project which will go a long way to gain acceptance for greater innovation in public buildings.



Right/above
Strategically placed rooflights allow daylight to flood into the centre of the building, minimizing the need for artificial lighting of deep-plan spaces.



Project team

Architect: Capita Architecture
m&e engineer: Fulcrum Consulting
Interseasonal Heat Transfer designer: ICAX structural engineer: Adams Kira Taylor
landscape architect: Watkins Dully
acoustic consultant: Cole Jarman Associates
client: Hertfordshire County Council

Selected suppliers and subcontractors

Metal roofing: SpeedDeck; masonry paint: Keirn Mineral Paints; joinery paint: Aura Natural Paints; rainscreen insulation: Kingspan; carpet tiles: Interface; linoleum: Forbo; fitted furniture: Grossbrooks; precast planks (TermoDeck): Acheson & Glover; structural steel: Britland; sprinklers: Armstrong Priestley; cubicles: Decry; windows: Velfac; acoustic plasterboard ceilings: British Gypsum; low-flush wet: Green Building Store; wind turbine: Gazelle Wind Turbines; green roof system: Radmat; pv panels: Sony; lift: Kone; green roof: Letchworth Roofing Company; exterior lighting: Woodhouse.

David Kirkland and Kenneth Fraser are principals of Kirkland Fraser Moor. Kirkland was previously a project leader at Grimshaw, where he was responsible for the Eden Project, and is an editorial board member for Renzo Piano Workshop's Rome Auditorium. He is an advisor to the Department of the Environment's construction research and innovation strategy panel.