British Precast Drainage Association

Publications from the British Precast Drainage Association (BPDA):

BPDA was formed in 2017 from the integration of the Concrete Pipeline Systems Association (CPSA) and the Box Culvert Association (BCA).

Information published by both CPSA and BCA will be rebranded and replaced as BPDA in due course. New material will be branded BPDA.

All CPSA and BCA web traffic will be redirected to the new BPDA web site at www.precastdrainage.co.uk

AN ANSWER IN THE

So you don't want the expense and obloquy of air-conditioning, but you'd rather not risk a naturally ventilated solution? Luckily there's a highly effective third way, which you'll soon be able to inspect at a business park outside Luton. Thomas Lane reports

THE QUAINTLY NAMED BUTTERFIELD BUSINESS VILLAGE LOOKS like just another speculative development on the edge of just another regional town. It consists of the usual two-storey office blocks on the usual winding roads that usually lead nowhere. And just as predictably, the marketing literature plays on its "parkland setting", just outside Luton. Cue pictures of green fields delicately stitched with buttercups.

Less predictably, and further back in the brochure, we discover that this business and technology park has a unique environmental selling point. It is the UK's first commercial scheme to include an earth duct ventilation system, which means the usual air-conditioning system can be ditched. Earth ducts work by drawing air into the building through long subterranean pipes that cool the air as it passes through. According to its promoters, this method is more effective than conventional natural ventilation, which has recently come in for some stick for not performing as well as predicted. Its use on a seemingly anonymous office development shows that sustainable building design is suddenly becoming more, well, usual.

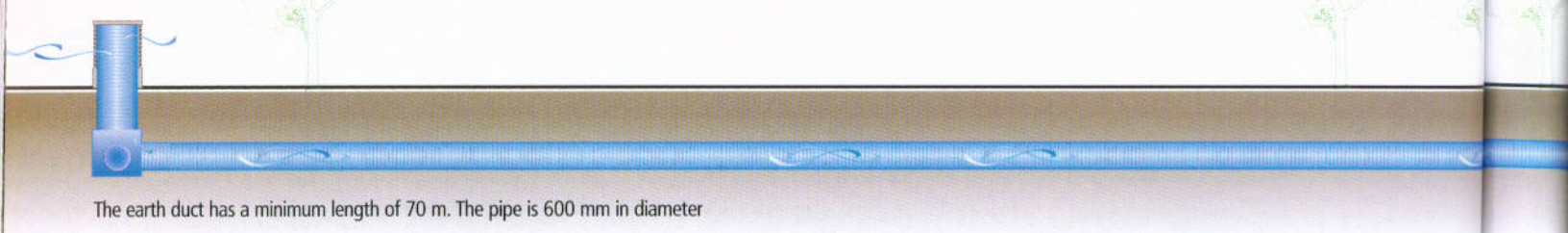
Mike Forster, the development director of Easter Group, the client for the scheme, says there is now a clear business case for sustainable developments of this type. "Building occupiers are much more happy to sit down and talk about this now, whereas three years ago they just wanted air-conditioned office buildings," says Forster. "More and more companies are concerned about sustainability because of corporate social responsibility reports. This helps address those issues and gives them better green credentials."

Another factor influencing the business case is the European Energy Performance of Buildings directive, which came into force in January and rates buildings, in the words of Forster, "like fridges". "We think these buildings will have the equivalent of an A rating," he says. "People won't want a C or a D. They will want an A."

Once the business case for an A rating is established, attention inevitably turns to the means of winning it. With conventional natural ventilation, exposed concrete surfaces in the building are used as heat sinks. The windows are opened at night to allow cool air into the building, which reduces the temperature of the concrete and makes the building more comfortable in the daytime.

But according to Patrick Bellew, director of engineer Atelier Ten, natural ventilation doesn't live up to its promise. "Natural ventilation gives you lots of problems," he says. "People find there isn't enough exposed surface area in the room to cool it, so it tends to overheat on hot days. After a couple of years people start fitting air-conditioning systems, which is the worst thing you can do." He adds that natural ventilation relies on expensive automatic actuators and control systems to open the windows at night. Open windows can also let in insects and, potentially, intruders.

The solution to these problems is to build the heat sink remotely,



The earth duct has a minimum length of 70 m. The pipe is 600 mm in diameter

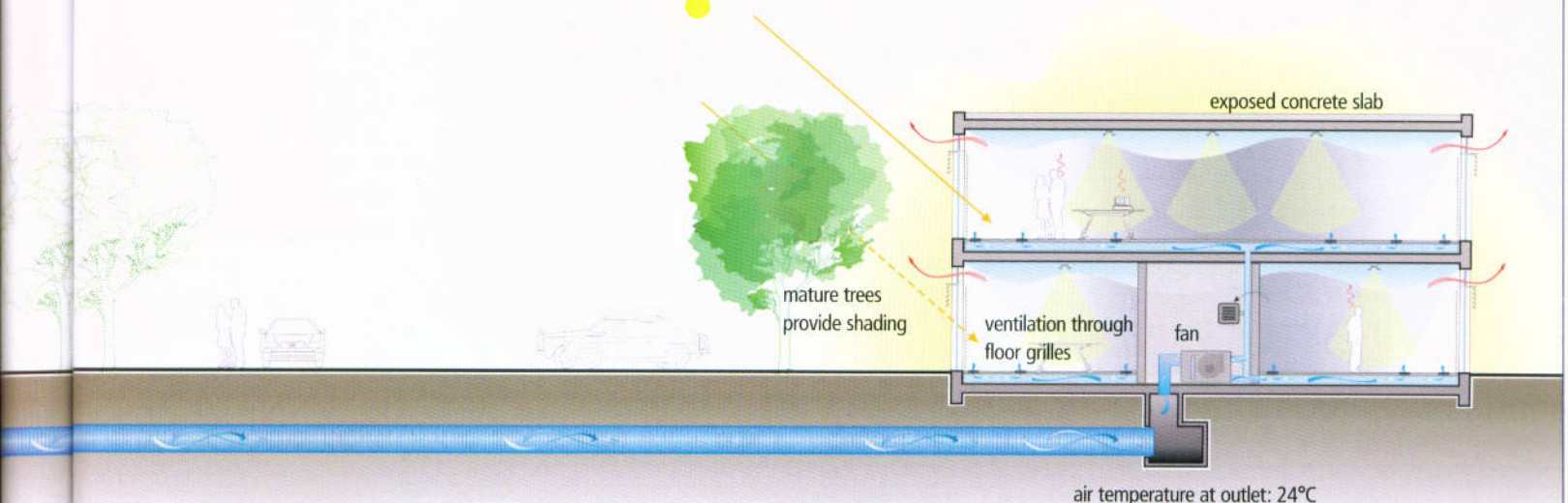
From a distance, the business village looks like any other collection of parkland offices up and down the country

thereby effectively increasing the area of the building. Atelier Ten has taken this approach on projects ranging from the Earth Centre in Doncaster, the Alpine House at London's Kew Gardens and a large commercial development in Melbourne, Australia. These all incorporated subterranean labyrinths full of rippled concrete walls through which cool air circulated.

Butterfield has now developed the system further. "We said, why not use earth rather than concrete as our heat store?" says Bellew. After all, earth is cheaper and more environment-friendly. The beauty of the system is its simplicity. Concrete sewer pipes are used to line long underground ducts. These are 900 mm in diameter and are buried 1.2 m below the surface using conventional construction techniques. At Butterfield, these are 80 m long with one end terminating well away from the building, the other terminating in the building. Air is pulled through the pipes and into the building using a conventional air-handling unit. If the outside air temperature is 28°C the earth duct can cool this to a much more comfortable 22°C. This cool air is circulated around the building on hot days through a conventional displacement ventilation system. The system can also be left on at night to cool down exposed concrete ceilings.

The system has several other advantages over conventional natural ventilation. It does away with window actuators, which reduces complexity and increases security, and the air is filtered. ▶

COLD, COLD EARTH

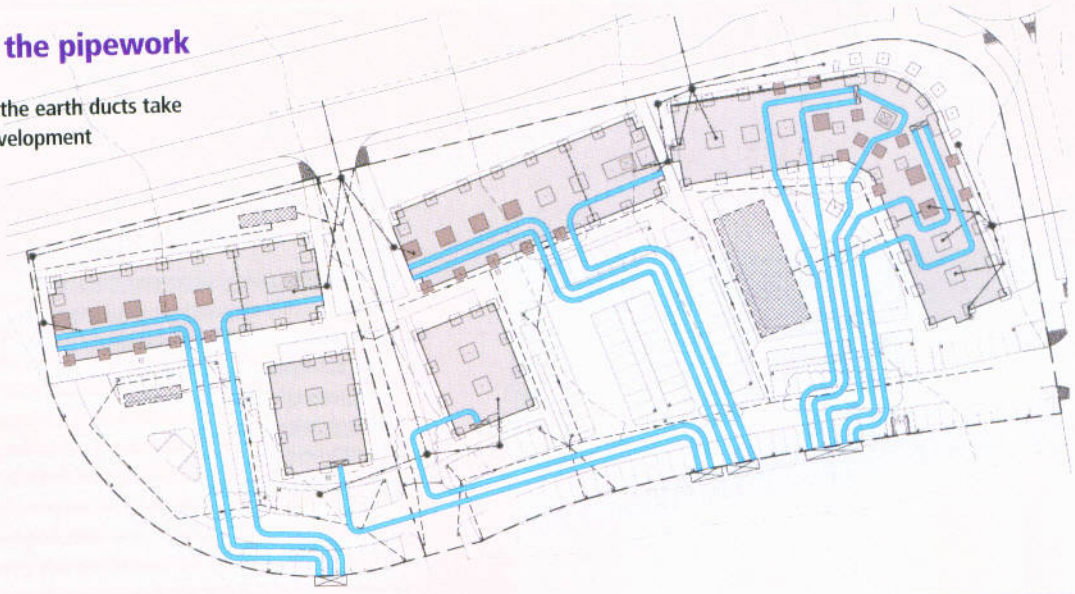


Butterfield Business Village key points

- Occupiers are demanding more energy-efficient buildings to improve their corporate image
- This demand is now filtering down to speculative, regional edge-of-town business parks
- Developer Easter Group has met this demand by pioneering the UK's first commercial application of an earth duct ventilation system to cool a development near Luton

A closer look at the pipework

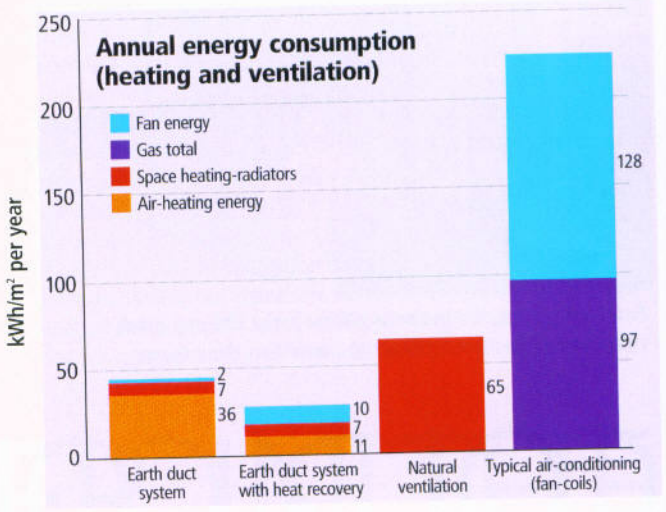
Plan view showing how the earth ducts take air around the whole development



▶ But the system's trump card is that, as the earth is warmer than the air in winter, the system can be used to preheat incoming air during colder months. According to Bellew, if the outside air temperature is –5°C, the air comes into the building at 2°C, thereby reducing the heating load. This works out that the earth duct system uses just half the energy of a conventionally naturally ventilated building (see bar chart, right).

It's also reasonably cheap. Bellew says this system is probably more expensive than conventional naturally ventilated buildings but cheaper than air-conditioning and is ideal for this type of application. "I think it's ideal for edge-of-town commercial and industrial buildings where you have lower densities but still reasonably stringent demands from the occupiers for cooling and comfort," he says.

If Bellew is right, this could become just another everyday feature on just another edge-of-regional-town development. And that's not a bad thing.



It's not just business parks that are going green

Business parks are not the only prosaic building type to go green. Sustainable construction has hit the big shed sector, too. Logistics property developer Gazeley is making its huge warehouses more environment-friendly with a policy it calls EcoTemplate. The idea is to progressively improve the environmental performance of its buildings with the ultimate objective of developing a carbon-neutral shed, or even one that generates power.

As with Butterfield, this thinking is based on a sound business case. "The benefits are that it helps with planning permission, it helps meet the corporate social responsibility agenda of the occupiers, it creates a better working environment as there is more natural light in the building, and on top of that it reduces energy bills," says Patrice Clement of renewable energy consultant Solar Century. "These features are installed without any extra cost to the customer."

EcoTemplate consists of 11 key measures to reduce carbon emissions, reduce water consumption and improve biodiversity. The features include wind, solar or geothermal energy, rainwater harvesting and roof lighting.

It is being used on a £27m, 22,000 m² warehouse called Voltaic at Dagenham Dock in Essex. Gazeley says it collects 400,000 litres of water a year, and its photovoltaic and solar thermal panels and ground source heat pump can generate enough energy to power the equivalent of 68 homes a year.

Gazeley's warehouse developments abroad are even greener, thanks to more generous grants in countries such as Germany, Italy and Spain. One development in Germany has a green roof and some of the developments have cut carbon emissions by 20%.