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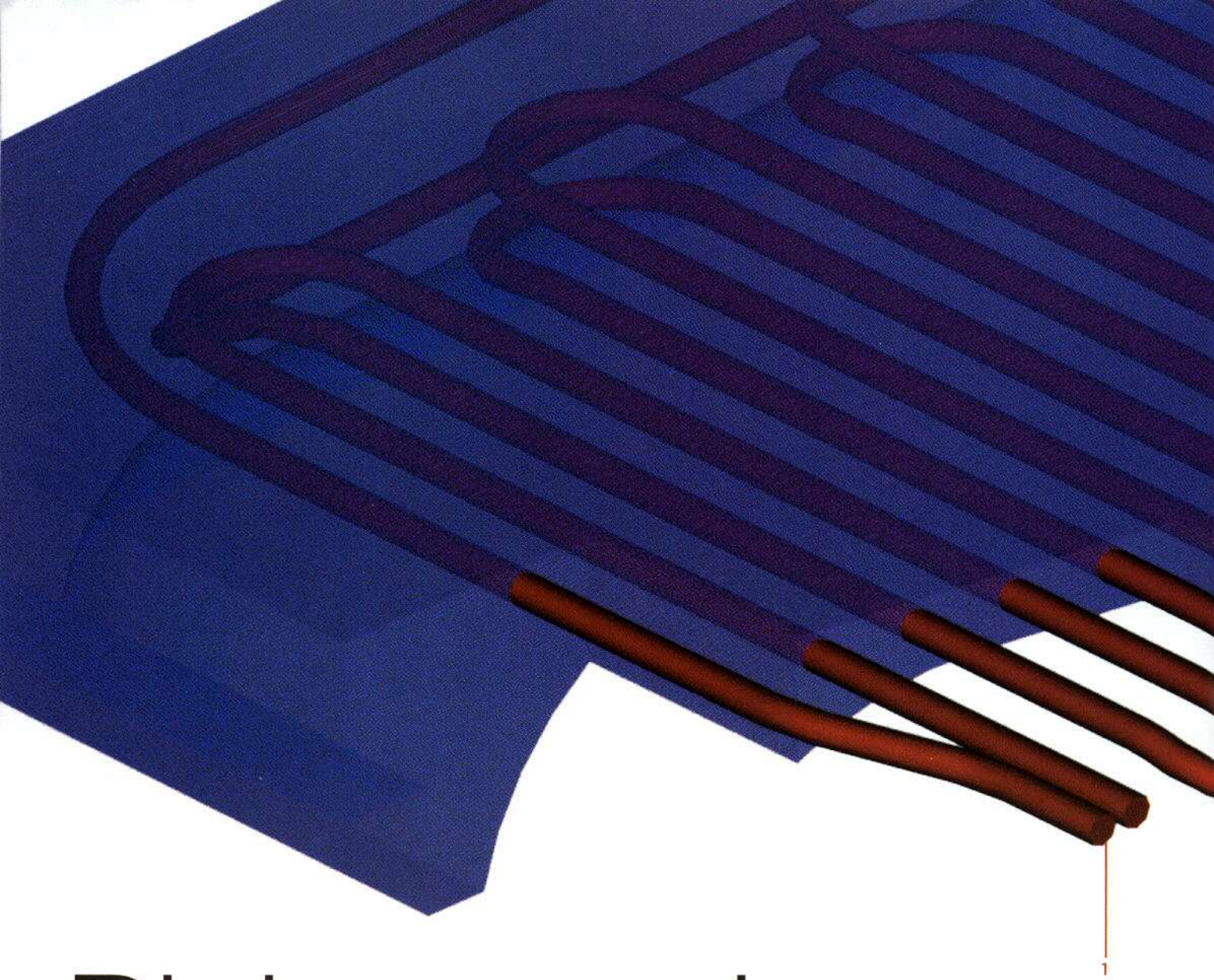


Piping cool

Fitzroy Robinson is using a pioneering technique that takes the lessons learned from passive ventilation a step further. The result is an energy-efficient solution to keep temperatures comfortable at an office building in Basildon.

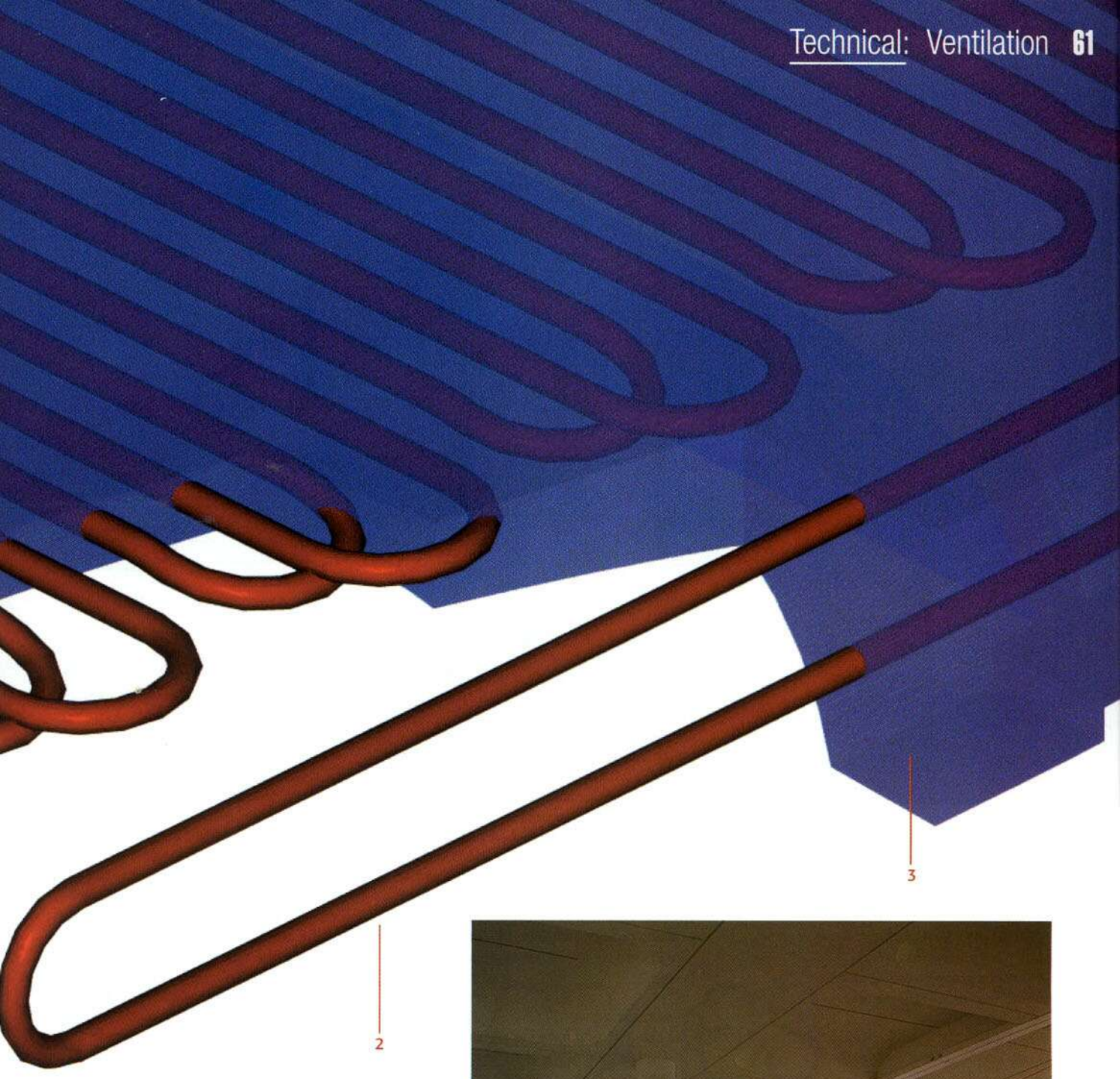
by Miriam Cadji

KEEPING A LARGE COMMERCIAL building cool without relying on hungry air conditioning takes ingenuity. At Barclays Bank's new Essex headquarters, Fitzroy Robinson has installed the first ever chilled precast concrete ceiling system, suspending water from the lake outside above the unsuspecting occupants' heads.

The decision to do away with suspended ceilings and expose a moulded concrete soffit may appear to be aesthetic, but the 380 barrel-vaulted coffers in fact play a vital role in the environmental strategy. Embedded in each coffer is a looping network of pipes that circulates chilled lake water to keep the temperature of the slab even and low.

Each unit begins as a steel skeleton frame, on to which the polybutylene piping is woven. This is then placed in a mould and filled with concrete, left to cure and craned into position. Each 3×7.5m coffer weighs around 11 tonnes. Its shape was designed with more than contemporary good looks in mind: the barrel vault increases surface area for greater cooling capacity, with the concave shape also reducing the weight; and careful calculations on lifting loads dictated the form, with curved corners allowing each coffer to be easily manoeuvred.

Invisible and noiseless, the system uses



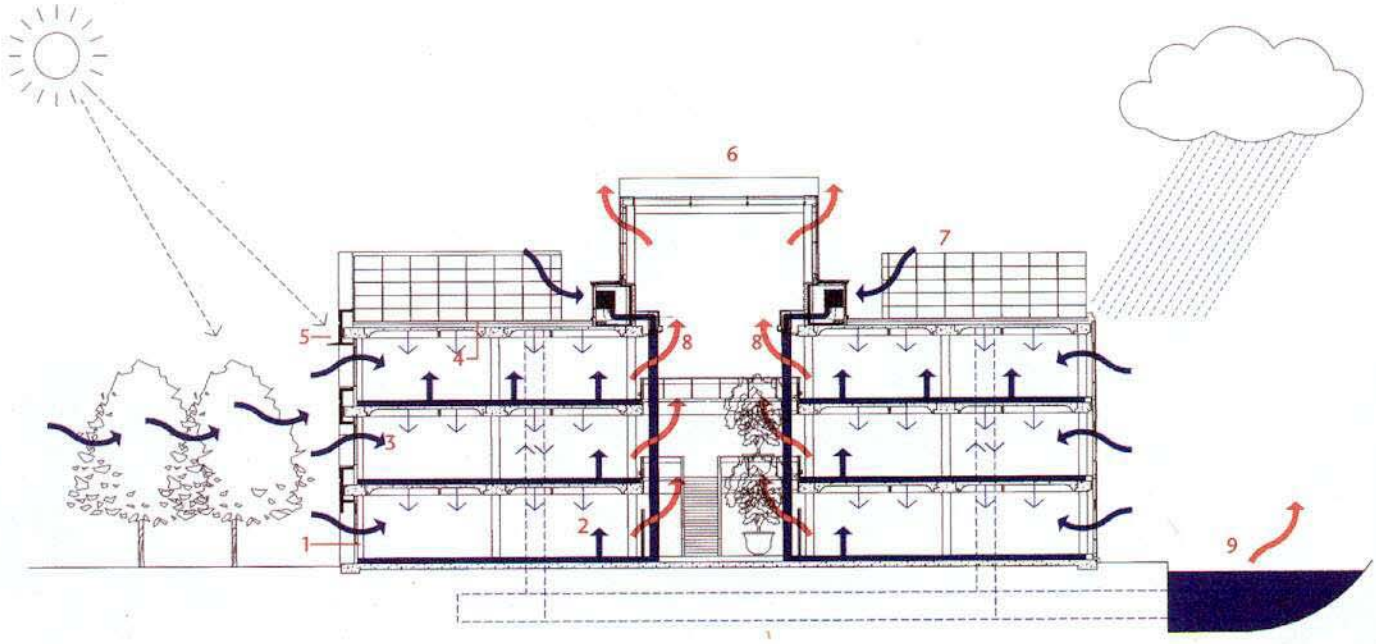
Drawing

View of the underside of concrete coffer (above).

Key

1 Connections to water pipes in floor void above
2 Polybutylene piping cast into the unit
3 Pre-cast concrete unit

The pipework and coffers are already in place, waiting for the rest of the fit-out.



Site plan

Section through the building showing the mixed mode ventilation.

Key

1 Openable windows
2 Displacement ventilation
3 Natural ventilation
4 Chilled concrete coffers
5 Deep reveals and brises soleil provide shading to south elevation
6 Glazed roof allows air to be heated to promote stack effect
7 Roof mounted air handling units provide mechanical displacement ventilation
8 Air tubes
9 Lake supplies chilled water to the concrete coffers inside

the same principle as chilled beams, but because concrete acts as a heat sink it is a more efficient at chilling – while steel beams give out instantaneous cooling, chilled concrete gives out stored cooling. The temperature of the piped water can therefore be relatively high for the system to provide a still comfortable environment, and there is no fear of condensation above 13 deg C.

Although the coffers rely on a mechanical refrigeration system, they can run on 'free' cooling from the lake when conditions are appropriate – the overnight cooling of the lake is used the next day in the concrete coffers. 'The idea is that it radiates "coolth",' explains project architect, Michael Winter. 'Fingers crossed – it's never been done before.'

New technique

The concept originated in France in the 1980s, but trial projects using chilled slabs at floor level failed, perhaps because the heat flow was in the wrong direction. Chilled concrete has since been successfully installed in Switzerland (at Dow Chemical's European headquarters in Zurich by Robert Meierhans) where it was discovered by David Arnold, partner at services engineers Troup, Bywaters and Anders. Arnold suggested the technique to Fitzroy Robinson, and it has been adapted for the first time in a precast form.

Precast slabs have many advantages over those poured in situ, the method previously used to create the coffers. As well as being faster to install and more readily controllable, precast units are less restrictive: unlike insitu systems which are limited to reinforced concrete frames, precast chilled concrete can be installed on steel-framed buildings. Precast elements have to be installed early on in construction, but because the coffers face down, the risk of damage during construction is reduced.

Roderic Bunn, editor of *Building Services Journal*, the magazine of the Chartered Institution of Building Services Engineers (CIBSE) voices concerns. 'It's an elegant way of enhancing the cooling capacity of a heavyweight structure, but there are potential "revenge effects",' he says. 'Passive technology always has a management requirement – this is not a "fit and forget" solution.'

No system is fail-proof, but the engineer is confident that allowances have been made for potential problems: each coffer can be isolated in the event of a leaks, and a sealing additive can be added to the source, like in underfloor heating systems. Water is piped into the building and connected to the buried pipework in the floor void, so if something goes seriously wrong, the surface of the coffer can be chipped away to excavate the pipework, 45mm down. The process is described by Arnold as 'a bit like changing a bike inner-tube tyre'. The coffer then made good and skimmed over – a delicate process, since the concrete plays a structural part in the building.

Fitzroy Robinson challenges the idea that green buildings are impractical and expensive. In fact, this office, due to be completed in September, is ahead of schedule and running under budget.

If the future of building services lies in mixed-mode ventilation techniques, it is precisely new passive methods such as this that will benefit from the revised edition of 'Design Guide A'. Launched by the CIBSE in September, it has been expanded to include up-to-date information on the effects of global climate change, equipping engineers and architects to design buildings that will be both comfortable and energy-efficient well into the future.

■ **CIBSE, tel 0181 675 5211.**

■ **The CIBSE is publishing a guide 'Explaining Building Services to Architects'. It will be available from September, priced £30. We have three FREE copies to give away – fax your details, quoting 'Free guide/RIBAJ' to CIBSE on 0181 675 5449 by 30 September for your chance to win.**