CIBSE JOURNAL

CIBSE

The official magazine of the Chartered Institution of Building Services Engineers

August 2015

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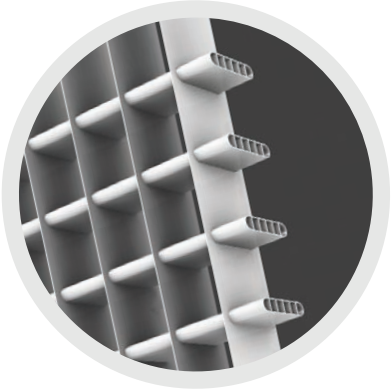

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Amber warning

The news that the government is postponing the 2016 Zero Carbon Standard and scrapping Allowable Solutions was greeted with dismay last month – not least by those companies that have spent large chunks of R&D budgets developing low energy designs to help builders meet the laudable targets.

The announcement came as a shock, but we shouldn't have been too surprised. Conservatives in the coalition government hinted that UK zero carbon targets went well beyond what is required by the EU, which calls for nearly zero buildings to be built from 2020 – four years after the UK target. Alleged gold-plating of EU requirements has been a recurring theme for George Osborne's speech writers (page 7).

With the Lib Dems no longer at the tiller on environmental matters, there is now little to stop the Tories sweeping away green policies it perceives as barriers to business and development – and as we went to press, energy secretary Amber Rudd also announced the government was taking an axe to the Green Deal.

For those involved in delivering low energy buildings, the policy inconsistency is frustrating and will no doubt put a brake on sustainable development. There may be some crumbs of comfort. The UK is still committed to the nearly zero carbon 2020 target and, last month, Rudd told MPs that she would back policies on energy efficiency. She said it was the most effective way of reducing carbon and fuel bills. She promised new announcements in the autumn, after a policy review.

> Alleged gold-plating of EU requirements has been a recurring theme for Osborne's speech writers

It is fortunate that the business benefits of delivering energy efficient and low carbon buildings is well proven. Property owners, for one, understand they will attract higher calibre tenants if they can promise lower energy bills and sustainable and healthy working environments. There are examples, from all over the sector, of firms working on new designs and processes to cut energy, and mandatory ESOS audits – explaining how companies can reduce bills – are in full swing ahead of December's deadline.

Portakabin understands the value of getting to grips with energy use. It is building a mission control for Prince William's new employer, the East Anglian Air Ambulance, and wants to understand the likely energy use at its Cambridge HQ. The firm is using CIBSE's forecasting tool TM54 to predict likely bands of performance (page 20), and could potentially use the tool on all its buildings. This is the sort of common-sense energy policy that cuts across the political divide.

Alex Smith, editor
asmith@cibsejournal.com

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NEWS

All the latest news from around the building industry

MADE IN CHELSEA

Consultant Hurley Palmer Flatt has completed the upgrade of a 1,200m² Grade II-listed building in the Cheyne conservation area of Chelsea.

The project, for Martin's Properties, includes ground-floor and basement retail units with a large garden, and six luxury, one-bedroom apartments, situated on the King's Road, which was once used as a private access route for Charles II.

Originally licensed in 1810 to the Six Bells public house, the basement and ground-floor retail spaces are now home to The Ivy Chelsea Garden restaurant.

The apartments have been retrofitted with high-efficiency heating and cooling from air source heat pumps; mechanical ventilation units with heat recovery systems; and metered cold-water supplies via a boosted cold-water tank and pump in the basement.

Hot-water supplies are provided by unvented electric storage cylinders.

Government scraps zero carbon targets

Osborne cancels policy and loosens planning laws

The Chancellor, George Osborne, has cancelled the UK's zero carbon buildings policy and loosened the planning laws in a bid to speed up housebuilding.

In a green policy shake up, the government also announced that there will be no further funding to the Green Deal Finance Company.

Energy and Climate Change Secretary Amber Rudd announced the axing of the Green Deal in a 'move to protect taxpayers'. She said the government will work with the building industry and consumer groups on a new value-for-money approach.

In his *Fixing the Foundations: Creating a more prosperous nation* report – which is intended to tackle the UK's 'long-term productivity slump' – Osborne (pictured) said the government 'did not intend to proceed with the zero carbon Allowable Solutions carbon offsetting scheme, or the proposed 2016 increase in on-site energy efficiency standards'.

The report added that energy efficiency standards would remain 'under review', recognising that 'existing measures to increase energy efficiency of new buildings should be allowed time to become established'. However, the main planks of a policy first set out in 2007 have been abolished, including: the 2016 zero carbon target for new homes; the 2019 target for non-domestic buildings; and next year's revisions of Part L of the Building Regulations.

Rudd told the Energy and Climate Change Committee that the decision had been to postpone zero carbon policy rather than abandon it. She said: 'Although we are not having new zero carbon homes for now, we are working together [with the Department for Communities and Local Government] on seeing what we can do for existing housing stock.'

CIBSE technical director, Hywel Davies, said the zero carbon and Green Deal announcements were 'not a huge surprise', adding that

LANDMARKMEDIA / SHUTTERSTOCK

'getting the changes to Part L that zero carbon needed was already looking challenging'.

He added that it had been 'clear for some time that the offsetting elements of the Allowable Solutions scheme did not fulfil the requirements of the EU Energy Performance of Buildings Directive, under which the UK has to deliver nearly zero energy buildings from 2021 [2019 in the public sector].'

Davies welcomed the fact that the industry now had 'clarity', and said the next challenge was to deliver 'nearly zero energy buildings' for the public sector by 1 January 2019. 'All that the government has to do now is work out how,' he said.

However, the UK Green Building Council denounced the changes as the 'death knell' for zero carbon homes, with chief executive, Julie Hirigoyen, describing the Chancellor's strategy as 'short-sighted, unnecessary, retrograde and damaging to the industry'. She acknowledged the need to build more homes, but said they should not be saddled with a 'legacy of high energy bills'.

Business leaders hit back over policy U-turn

A total of 246 senior business figures have put their names to a letter urging the Chancellor to reverse his decision to drop zero carbon building targets.

Directors of energy and property organisations – including E.ON, Whitbread, Saint-Gobain and the British Property Federation – said George Osborne's U-turn on carbon policy has 'undermined industry confidence' and could damage investment in technological innovation.

'The weakening of standards will mean our future homes, offices, schools and factories will be more costly to run, locking future residents and building users into higher energy bills,' the letter read.

'It also runs counter to advice from the Committee on Climate Change, impeding our ability to meet our statutory carbon targets cost-effectively, at a time when we should be showing international leadership on this issue.'

Green groups savage Osborne over levy

The Chancellor George Osborne has come under fire for his decision to make renewable energy subject to the Climate Change Levy (CCL).

His removal of the CCL exemption for renewables and scrapping of subsidies for onshore wind production were condemned as examples of 'this government's unfair, illogical and obsessive attacks on renewables', by Gordon Edge, director of policy at RenewableUK.

He accused the government of 'moving the goalposts (and) pushing some marginal projects from profit into loss'.

Osborne countered that the CCL exemption had meant overseas electricity generation had been benefiting from UK taxpayer subsidies, but he was labelled 'a man out of step with the times' by Greenpeace policy director Doug Parr.

Osborne is now 'taxing clean power as if it were a fossil fuel', which will make it 'more expensive for businesses to buy electricity from renewable power', he said.

Lords question planning chiefs

The House of Lords Committee on the Built Environment held some of the country's leading built environment officials to account over failures to hit housebuilding targets and the impact of reforms to planning laws.

Steve Quartermain, chief planner at the Department for Communities and Local Government (DCLG), Gill Graham, head of heritage at the Department for Culture Media and Sport (DCMS) and Ruth Stanier, director of planning at DCLG, faced the committee.

They answered questions on: government proposals for prioritising the development of brownfield land; plans for additional floors to be added to buildings in London without planning; and why responsibility for architecture and design was moved to DCLG from DCMS.

The Lords asked if the officials believed new developments were sufficiently sustainable, resilient and long-lasting.

Government scraps leadership council and chief adviser

● New 'business-focused' group to replace CLC

The government has scrapped the 30-strong Construction Leadership Council (CLC) and replaced it with a slimmed-down panel of 12 individuals. It will also abolish the post of chief construction adviser (CCA) in November when the incumbent, Peter Hansford, steps down.

The council was created in 2013 to work between industry and government 'to identify and deliver actions to improve efficiency, skills and growth in UK construction', but skills minister Nick Boles – who co-chairs the council – said the move was in response to calls from the sector to make it more 'effective and business-focused'.

The new members have been drawn from large construction firms, such as Laing O'Rourke, Bouygues UK, Skanska and includes Crossrail boss Andrew Wolstenholme. They will be joined by a major house builder.


Peter Hansford

'The UK's construction sector is growing and leading the way in many fields, but productivity and skills are big issues we need to address and I look forward to working with my colleagues on the council to achieve this,' said Bouygues UK chairman Madani Sow.

But SMEs will be nervous about the changes, according to the Building and Engineering Services Association (B&ES).

'It would be rash to leave everything to market forces – there has to be close liaison between industry and the government to ensure the supply chain functions well and quality standards are enforced,' said Rob Driscoll, the association's head of commercial and legal affairs.

CIC chief executive Graham Watts said he could not see 'any circumstances that have changed to negate the need for the role [of a CCA]'.

Tech Symposium calls for papers

A call for papers, posters and case studies to be showcased at CIBSE's sixth Technical Symposium, has been issued by chair Tim Dwyer.

Dwyer said he was 'overwhelmed with the enthusiasm shown both by delegates and speakers at this year's event' and was excited that the theme for 2016 was integration.

'It is the holistic approach to building design and operation that delivers real benefits to building developers, users, operators and, importantly, the environment,' said Dwyer.

For more information about the 2016 event, which is due to take place in Edinburgh, visit **www.cibse.org/symposium**

Rolton Group turnover up by 13%

Engineering consultancy Rolton Group has reported a 20% rise in staff numbers and a turnover increase of 13% year on year.

The Northamptonshire-based firm is on track to achieve a further 13% growth in turnover in 2015.

Rolton Group is supporting a £30m, 77,000ft^2 extension of Peterborough's Queensgate Shopping Centre (pictured). It will carry out civil and structural feasibility work and give advice on planning and mechanical and electrical feasibility.

Other major new projects include the Bacton residential development in Camden, where Rolton is providing energy and mechanical and electrical services, including district heating and hot water for the 290 new homes, using waste heat from the Royal Free Hospital's gas turbine.

Among its high-profile clients are: Jaguar Land Rover, EC Harris, BMW, Ikea, Taylor Wimpey, Ford, Asda and Persimmon Homes.

The firm has 10 CIBSE-certified consultants, and is recruiting for a further eight positions.

● We are carrying out a survey of firms with 10 or more CIBSE members. Download the survey at **www.cibsejournal.com** and complete by 31 August to feature in the *Journal* results article.

DECC welcomes heat networks code

● **CIBSE code already used in tenders and by local authorities to benchmark projects**

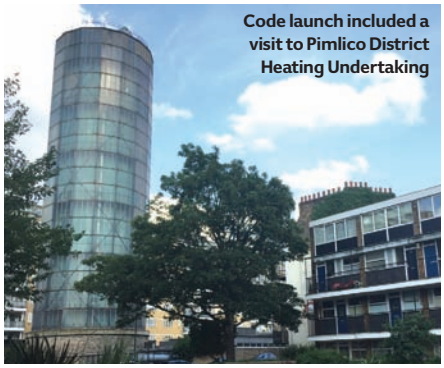
CIBSE has responded to the increased activity in the heat network market by producing its first UK Code of Practice (CoP).

The Heat Networks: Code of Practice (CP1), produced in partnership with the Association for Decentralised Energy (ADE), introduces urgently needed minimum standards for the district heating sector, welcomed by the Department for Energy and Climate Change (DECC).

'Heat networks are going to be a substantial part of the effort to decarbonise UK heating,' said David Wagstaff, head of the DECC's heat infrastructure team. 'However, quality must improve. We have to get this right or we will undermine the whole market. Government tends to listen to consumers and, if they are not happy, then we will not realise the full potential of this approach.'

Phil Jones, chair of the publication steering committee, stressed that a CoP differs from technical guidance in that it discourages users from 'cherry-picking the bits they like' and requires them to follow a complete process to achieve the desired result. He said that the heat network market was booming in the UK, but that 'we still have a lot of catching up to do' with other parts of the world'.

The CIBSE CoP is already being used in tenders and by several local authorities to benchmark proposed projects.



Code launch included a visit to Pimlico District Heating Undertaking

'This shows just how much it is needed and we believe it will take the sector to the next level,' said Jones. He emphasised that there were many good district heating schemes operating in the UK, but that quality problems were often the result of a failure to carry out adequate feasibility studies.

The CoP's author, Paul Woods, said correct sizing of the plant and network were also vital, but that many people had been relying on inaccurate data. 'The basic rule is that you need a maximum of 5kW per dwelling – if you are much over that, then you have probably done something wrong,' he said.

ADE director Tim Rotheray said the CoP would play a big part in tackling 'hugely wasteful' power generation. 'We waste enough energy to heat every home in the UK,' he said.

The Heat Networks: Code of Practice is free for CIBSE members via the Knowledge Portal.

● For more on the Code, see Heat Works, in October 2014 *CIBSE Journal*.

WSP PARSONS BRINCKERHOFF TAKES STARRING ROLE IN STUDIO REMAKE

WSP Parsons Brinckerhoff has been appointed as building services engineer on the highrise towers replacing the Manchester TV studios where *Coronation Street* was filmed for more than 50 years.

The consultant is working with architect Child Graddon Lewis on a planning application being submitted this month by developer Allied London.

The proposed first phase includes interconnecting towers of 35 and 50 storeys.

It will eventually feature six towers across two sites, incorporating 1,200 homes, retail units, restaurants, education facilities and office space.

The global engineer is currently providing services at 22 Bishopsgate as reported in July's *Journal*.

Rating scheme 'threat' to efficiency

The new European Energy Labelling regulation, which came into force in July, could inadvertently reduce the uptake of energy efficient appliances, according to a number of manufacturers' trade bodies.

They fear certain heating and lighting products, despite being highly energy efficient, will be downgraded from 'A' to 'E' on the new labels, so putting off potential buyers.

In a joint statement, the organisations said the reclassification of some products, coupled with the complexity of the revision process, would create confusion and 'make Europe waste precious time in its quest to reduce energy consumption by 2030'.

They say changes, resulting from a review of the Energy Labelling Directive, were intended to solve a problem that exists only for some product categories, such as washing machines or refrigerators, where the top-rating classes had become 'saturated' due to technological development and innovation.

'However, a problem for one or two products should not prevent a well-designed system from unleashing its potential for energy efficiency. Current framework legislation already offers a solution for that: changing the product specific regulations,' a statement said.

Andrea Voigt, director general of the European Partnership for Energy and the Environment, said the review could be 'counter-productive', confusing consumers and creating more red tape.

NEW STANDARDS SET FOR RHI

New regulations for the domestic and non-domestic Renewable Heat Incentive (RHI) schemes are now in place and include bringing the incentive schemes in line with the Microgeneration Certification Scheme (MCS).

The new regulations introduce updated installer standards for heat pumps, solid biomass and solar thermal aimed at achieving consistency of language across all MCS standards.

The heat pump installer standard has also been updated to bring MCS regulations in line with the European Energy-related Products (ErP) Directive.

CBI fears government's plan for apprenticeships is flawed

- **Employers concerned about school-leavers' literacy and communication skills**

As many as 73% of contractors say they are struggling to find the higher-skilled staff they need to keep up with the growing demand for quality buildings.

A survey by the Confederation of British Industry (CBI) and education publisher Pearson also cast doubt on the government's plan to boost apprenticeships, which it said 'will not deliver the high-quality, business-relevant training needed'.

Katja Hall, CBI deputy director-general, said: 'The government has set out its stall to create a high-skilled economy, but firms are facing a skills emergency now, threatening to starve economic growth. Worryingly, it's the high-growth, high-value sectors with the most potential [that are] under most pressure. That includes construction.'

The research appeared just as the government announced plans for a levy on major employers to pay for more apprenticeships. Construction already has its own training levy system, managed by the Construction Industry Training Board (CITB).

The survey also highlighted continuing fears among employers about the standard of teaching in schools. More than a third of firms reported concerns over school-leavers' literacy and basic numeracy, while 49% were unhappy with the quality of their communication skills.


NG Bailey's class of 2014: government plans to increase apprenticeships

The CITB's director of policy, Steve Radley, said: 'Levies alone won't deliver quality apprenticeships – it is also critical to have proper forecasting of skills demand and better engagement with training providers to meet employer needs.'

Continual criticism masking our successes, say industry presidents

There is too much negativity about the industry's performance, according to the presidents of CIBSE, RIBA and B&ES.

Continual criticism about failing buildings and the lack of a collaborative culture mask considerable achievements, they told a presidential Question Time, organised by the CIBSE Patrons, at RIBA headquarters in London. This followed an earlier presidential debate in June, at Westminster Central Hall. See the July *Journal* for more.

CIBSE's Nick Mead said the industry should celebrate 'our successes and our heroes', and publicise the 'fantastic projects' identified in CIBSE's Building Performance Awards that provide evidence of 'improving long-term performance'.

But he said there was a problem with the quality of specification writing, which was creating confusion and leaving contractors unsure about which stage of the design they were tendering for. 'There is far too much irrelevant information passed down the line,' he added. 'People need to stop hiding behind reams of paperwork and get clarity into the process.'


Nick Mead

B&ES president Andy Sneyd, who finished his term in office soon after the event, said the industry was collaborating pretty well. He added that 'nobody deliberately sets out to do a bad job and the industry has a good record of delivering to the specifications we are given'.

'We should get a lot more credit for the fact that we still construct some great buildings, despite the generally poor standard of instructions we receive.'

RIBA president, Stephen Hodder MBE, said there was still a 'silo culture, where everyone just concentrates on their own part of a project'. He called for a radical overhaul of the education system to make it more suitable for modern industry and to instil a 'collaborative culture' in young architects and engineers.

He added that the lack of post occupancy evaluations is still a problem that makes it difficult for industry to learn from its mistakes.

The Question Time event video is available at **bit.ly/1LzY5tZ**

Marner issues skills warning

Skills shortages are threatening the ability of firms to take advantage of the economic recovery, the new president of the Building & Engineering Services Association (B&ES) has warned.

Jim Marner said a 'fairer and more equitable payment culture' was essential to allow businesses to operate profitably and 'to invest in skills, resources and technology'.

Speaking at the association's annual general meeting, at which he was elected, he also called for a more 'accessible and transparent pre-qualification regime', and for contractors to embrace the 'digital revolution'.

'We must lobby for smarter procurement, preferred supply chain status and open-book, two-stage tendering – whereby firms can establish their competence, capability and financial stability before investing significantly in the production of detailed designs for a job they may very well fail to secure,' added Marner.

Smart-code consultation

The Department of Energy and Climate Change has launched a consultation on new Smart Energy Code content and related licence amendments. The consultation is on proposed legal drafting for the code, as well as gas and electricity supply licences, to support smart metering. It can be viewed at **http://bit.ly/1TO5Pf1** and the closing date for responses is 1 September 2015.

IoT competition

British cities and businesses are being encouraged to apply for a £10m fund by entering a competition aimed at showing how the Internet of Things (IoT) can deliver environmental improvements, economic opportunities, and more efficient and effective delivery of transport, healthcare and energy.

The Department for Culture, Media and Sport and Innovate UK are offering the funding for a project showing the capability of IoT in a city region. Details can be found at **bit.ly/1RvWt9V**

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In brief

PERFORMANCE MATTERS

CIBSE has been celebrating building performance at its annual awards for 10 years now.

The two categories for the Consultancy of the Year accolade are a big part of that. If you can demonstrate how you meet client expectations of performance, including occupant satisfaction, comfort and energy, now is the time to enter. Visit **www.cibse.org/bpa**

CHALLENGE ENTRIES CLOSING SOON

Entries for the Society of Public Health Engineers' Young Engineers Awards 2015 close on 4 September. This year, teams of up to three people, aged 18-35, must come up with an affordable solution for promoting the moringa plant and the cactus for household water treatment and safe storage in deprived communities. Alternatively, they can develop a mobile biosand filter for river/hand-dug well-water filtration. For details and to enter, visit **www.cibse.org/sophe**

AGM CORRECTION

The AGM minutes printed in the July edition of *CIBSE Journal* wrongly stated that George Adams is the immediate past president. This should have read Peter Kinsella. We apologise for any upset this may have caused.

Papers, posters or case studies sought for 2016 Symposium

- **Committee looking for 250-word submissions**

CIBSE Technical Symposium 2016 will be held at Heriot Watt University, in Edinburgh, from 14-16 April.

The committee is keen to attract submissions – by 14 September – from across the industry, academia and research centres. Suggested areas for submissions include:

- Integrating leading-edge products and systems into building environmental engineering
- Closing the design and operation loop
- Fusing passive and active building systems
- Performance of integrated building solutions
- Benchmarks, regulations and standards for building performance
- Whole-life costing and environmental assessment
- Interdisciplinary working – barriers and opportunities
- Fusing passive and active building systems
- Professional collaboration – lessons for the future
- Education and skills for collaborative design and operation
- BIM for integrated design, construction, commissioning, operation and maintenance
- Labelling and certification for procurement and operations.

The list is not exhaustive and submissions on other relevant areas are welcome. For more information, visit **www.cibse.org/symposium**

CIBSE conference and exhibition 2015 programme announced

The programme for this year's CIBSE Building Performance Conference and Exhibition has now been finalised.

It is available at **www.cibse.org/conference** and includes sessions titled: Security in building systems and networks; Lighting, wellbeing and comfort; BIM in building operations; and Adapting buildings to a changing climate. The programme will also look at real post occupancy case studies.

The overarching focus of the event will be on building performance, highlighting the importance of energy efficiency and low carbon.

The conference and exhibition will be held at the QEII centre, Westminster, on 3 and 4 November. Book now for early bird rates.

Young engineers kick off summer tour at WWF centre

- **Group listens to full story of the Living Planet Centre**


The WWF Living Planet Centre, Woking

The CIBSE Young Energy Performance Group (YEPG) has taken its summer series on tour, organising site visits and talks across London and the surrounding area.

The group's first visit, in June, was to the WWF Living Planet Centre, in Woking, for a tour of the BREEAM 'Outstanding' building. Saadia Ansari, YEPG steering committee member, reported on the visit:

The group heard an honest account of both the positive and negative aspects of the building, from the success of using 200 hot desks for 300 employees, to the noisy wind cowls and the difficulty in managing temperature on the upper floor.

The WWF's aim was to create space where nature and people could thrive. The work that went into trying to achieve this was exceptional, including playing bird song to reduce occupants' stress levels, providing space for outside working, and planting trees in the central atrium of the building.

The Living Planet Centre also used a number of innovative and renewable technologies, such as wind cowls to aid natural ventilation. Additionally, materials for the building were sourced locally to reduce its carbon footprint, and all the wood – including the furniture – is FSC-certified.

The most striking thing about the project was the influence that positive relationships between all parties – from the design team and architects to the contractors and sub-contractors – had on the way the building is used.

This holistic approach has produced a building with a very strong focus on the end users and there is continuing effort to improve certain aspects of the construction.

Keep an eye on the CIBSE YEPG LinkedIn page for information on future tours, or you can follow them on Twitter, **@CIBSEyepg**

New website finds jobseekers and recruiters a perfect match

CIBSE Journal Jobs, the official careers site for the Chartered Institution of Building Services Engineers (CIBSE), is now even better.

The website has been relaunched on a new and improved platform, giving employers more ways to reach their perfect candidate, and offering jobseekers better search facilities, careers advice and functionality.

The new responsive design is optimised for use on mobiles and tablets, so you can look for jobs on the move, and employers can benefit from improved reporting on campaigns.

As a jobseeker, you can:

- Upload your CV to be found by the best employers
- Register to receive the latest jobs straight to your inbox
- Manage your search for the perfect job by saving your profile and jobs
- Find your perfect role on the move with mobile and tablet optimised site.

As an employer or recruiter, you can:

- Upload and post jobs through our new self-service site
- Increase your brand profile to ensure your jobs are the first to be seen
- Send targeted emails to thousands of registered candidates who match your recruiting criteria
- Include video in your campaign
- Receive carefully matched candidates for your roles using our social media resourcing tool.

Visit the *CIBSE Journal* Jobs website at **jobs.cibsejournal.com**

CIBSE celebrates 15,000 followers

If you are not already following us on Twitter, you can find us here, **@CIBSE**, to be kept up to date with CIBSE and industry-wide news.

CIBSE also has a very active LinkedIn Group, with around 20,000 members. To join the CIBSE Group, simply search for CIBSE once you have logged into LinkedIn.

Resilient cities group blog

The CIBSE Resilient Cities special interest group has launched a new blog.

Every month, the group will publish insight from people within the industry on the adaptability, sustainability and resilience of cities.

It will gather and disseminate the latest knowledge and practice in this area, looking at the role of building services in a wider context.

Visit **www.cibse.org/networks/groups/resilient-cities** to read the first entry, from vice-chair, Susie Diamond.

In-house training opportunities

CIBSE CPD training offers a wide variety of one- to three-day building services courses, ranging from introductory to more advanced levels. Our trainers are experts in their fields and ensure courses are continually updated to benefit professionals and organisations.

All the courses can be delivered at your workplace – at discounted rates – for a minimum of six members of staff.

Topics include: Building Regulations; electrical services; energy efficiency; facilities management; fire safety; lighting; mechanical services; project management; and water services and public health.

For more information, email Melissa on **mfileppi@cibse.org** with the name of the course, the number of staff you wish to sign up for it and your address, or call 020 8772 3640. A full list of training courses is available at **www.cibse.org/training**

HOW DATA COULD EASE COMPLIANCE CONCERNS

The European Commission has warned the UK that it may not be complying with legislation concerning display energy certificates. **Hywel Davies** considers the implications

Each month, the European Commission (EC) publishes a list of infraction cases where it considers that member states are not correctly implementing EU legislation. In June, the UK's arrangements for the display of energy certificates featured on this list.[1] The Commission reported that it had 'received a complaint regarding a potential lack of compliance by the UK for the issuing and display of Energy Performance Certificates [EPCs] in public buildings'.

Under the Energy Performance of Buildings Directive (EPBD), member states must ensure that certificates are issued and displayed for certain categories of buildings. Announcing the infraction proceedings, the Commission stated that 'the system of penalties and controls for the display of the Energy Performance Certificates introduced by the United Kingdom... appears insufficient to ensure compliance with the obligations of the Directive. Therefore... the Commission sent a reasoned opinion[2] to the United Kingdom asking to fully ensure that... certificates are displayed in accordance with the Buildings Directive.'

The UK now has two months to notify the Commission of measures taken to remedy the situation, or the Commission may refer the case to the EU Court of Justice.

A 'reasoned opinion' is a legally privileged document, and CIBSE did not make the complaint, so we do not know the details, but there is concern that the system of display energy certificates (DECs) based on metered energy-consumption data is at risk.

Analysis by CIBSE and others indicates that the current system of metered DECs is robust. The justification for this bears setting out in detail to reassure all involved with DECs that these concerns appear to be unfounded.

The original Directive defined an 'energy certificate' as a certificate recognised by a member state that indicates the energy performance of a building or building unit. The UK chose to implement this using EPCs for calculation of energy ratings for construction, sale or rent, and DECs for assessing public buildings based on actual annual energy consumption.

Buildings more than 250m² and occupied by a public authority and frequently visited by the public – such as St Thomas' Hospital, London – must have a DEC

PISAPHOTOGRAPHY / SHUTTERSTOCK

> There is no connection between registering a sale or rental transaction with the Land Registry, and lodging an EPC for the building

This was done to avoid the significant costs of producing EPCs for large hospital and university sites. DECs provide energy managers on these sites with annual updates on performance to incentivise and inform better energy usage, to reduce spending of taxpayers money on energy bills, and to free up that money for front-line service delivery. A detailed regulatory impact assessment showed significant cost benefit from the DEC approach for the public sector in 2007[3].

Energy certificates in the Directive

The recast Directive, Article 2(12,), renames the energy certificate as an energy performance certificate, or one recognised by a member state indicating energy performance as calculated using a methodology in accordance with Article 3.

Article 3 requires the methodology to be in accordance with Annex 1, which says that 'the energy performance of a building shall be determined on the basis of the calculated or actual energy that is consumed'. This removes any basis for questioning the validity of the DECs based on annual energy consumption data.

Article 12 requires certificates to be issued when a building (or building unit) is constructed, sold or rented to a new tenant, and for buildings where a total useful floor area of more than 250m² is occupied by a public authority and frequently visited by the public. (The 250m² limit came into effect on 9 July 2015). The requirement for a certificate on rental only applies for a new tenant, and not for a lease renewal, according to Article 12 (1) (a).

Finally, Article 13, display of certificates, requires that any certificate for a public building issued under Article 12 (1) must be displayed 'in a prominent place clearly visible to the public'. It also requires this for any building – public or private – which has a certificate issued under Article 12 (1) and is frequently visited by the public.

In England, Wales and Northern Ireland, this means DECs must be prominently and publicly displayed; EPCs for buildings frequently visited by the public – including shops, leisure centres and public buildings recently constructed, sold or rented to the government for the first time – should also all be on public display.

The logic for separate EPCs and DECs, based on calculation and annual consumption respectively, seems to be fully in line with the Directive, and the cost benefits of DECs – assuming compliance and action to implement the cost-effective measures identified in the DEC Advisory Report – were clearly articulated in 2007. So it seems unlikely, after all this time, that the Commission is challenging this approach.

Compliance

Article 27 requires member states 'to lay down the rules on penalties applicable to infringements of the national provisions adopted pursuant to this Directive and shall take all measures necessary to ensure that they are implemented. The penalties... must be effective, proportionate and dissuasive.'

Given the Commission's announcement that 'the system of penalties and controls... introduced by the UK... appears insufficient to ensure compliance', it would appear that compliance is the concern.

Replacing annual DECs with one-off EPCs for public buildings will not address this concern, and would undermine the UK government's claims to be managing energy use in the public estate wisely. What is more likely is that the government will need to look again at enforcement arrangements – but there is scope for a quick and innovative win here.

At present, each local authority has responsibility for enforcement in its patch, through trading standards officers (TSOs), with only the Landmark register of lodged energy certificates to support them. The new business secretary has committed to extending the Primary Authority scheme, which allows businesses to form a partnership with a single local authority, which then provides advice to other councils when dealing with issues such as non-compliance. It should quickly establish a Primary Authority for those organisations that need publicly to display an EPC in a building.

The government has asset registers of its estate, so knows which buildings are more than 250m². It also has the Landmark database, so could very simply identify which buildings need – and have – a DEC. It could do this in the two months that the Commission has given it to respond to the reasoned opinion. This would deliver better compliance, give the public sector better energy-management information and resolve the Commission's concerns.

There is another big data opportunity. At present, there is no connection between registering a sale or rental transaction and lodging an EPC for the building. If an entry on the Land Registry required a valid EPC (or confirmation of exemption), it would remove the need for TSOs to enforce EPCs. Using existing data in this way would deliver better regulation, reduce enforcement costs, and provide an effective and proportionate means of ensuring the issue of certificates. **CJ**

References:

1 EC June infringement package: key decisions **bit.ly/1CUvPBj**

2 Infringement notice 20144002, by reasoned opinion issued on 18/06/2015 to the UK, for the implementation of the Energy Performance of Buildings Directive, relating to the issue and display of EPCs in public buildings.

3 See the Explanatory Memorandum issued with SI 991/2007, in particular Annex C on DECs.

● **HYWEL DAVIES** is technical director at CIBSE **www.cibse.org**

WHAT DO WE MEAN BY 'CARBON'?

Designing and building sustainably can be a challenge when faced with so many definitions of the term 'carbon'. **Blaise Kelly**, from the Austrian Institute of Technology, questions what we actually mean by it

'Carbon' – and how we can reduce it – was mentioned in nearly every presentation at the recent CIBSE Technical Symposium. But what do we mean when we talk about 'carbon', and is it stopping us from adequately addressing the challenge of sustainable construction?

During the recent UK General Election campaign, climate change and the environment were hardly mentioned. One of the reasons for this is, undoubtedly, the lack of public interest. Since the financial crisis, more pressing issues – such as money and jobs – have put reducing one's carbon footprint way down the agenda. Could 'carbon' be part of this problem?

In many cases, 'carbon' is used simply as shorthand for carbon dioxide (CO_2). The Department for Business, Innovation & Skills' *Low carbon Construction* guide[1] refers to 'carbon and other greenhouse gases'. The TM56[2] defines it as CO_2 equivalents (CO_2e), based on the Inventory of Carbon &Energy (ICE)[3]. However, the standards on which TM56 is based – all developed under CEN/TC 350, Sustainability of Construction works[4] – do not use the term 'carbon', and neither does the Intergovernmental Panel on Climate Change (IPCC).

The drivers of climate change are measured by the IPCC[5] in terms of radiative forcing (RF, see Table 1), the biggest culprit being well mixed greenhouse gases (WMGHGs). Break down the RF of the main emitted compounds, and CO_2 from the burning of fossil fuels is estimated to be only 33% of the total problem.[6]

Other WMGHGs, such as methane, nitrous oxide, halocarbons and fluorinated gases (F-Gases), are important, as are short-lived gases (SLG) – such as non-methane volatile organic compounds (NMVOCs) – and aerosols and precursors (A&P), such as black carbon (BC) and aircraft contrails.

> Since the financial crisis, more pressing issues have put reducing one's carbon footprint way down the agenda

Globally, in 2010, buildings accounted for 33% of BC and F-Gas emissions, 32% of total energy use and 19% of WMGHG emissions.[8]

We can measure the energy used to manufacture materials and to construct a building, and the amount consumed by a building during its operation. We cannot measure CO_2 or any other emissions, but we can convert this measured energy data based on experiments – which were mainly carried out by the US Environmental Protection Agency in 1998. To give results/expectations of projects in terms of CO_2e and/or 'carbon' implies a level of accuracy that does not exist, misses off the raw data (energy) and can be incredibly confusing.

The estimation of embodied energy, itself a non-trivial task, is described in TM56. This is made more complex by referring to it as 'embodied carbon'.

	Emitted compound	Best estimate % +RF effect
WMGHG	CO_2	41.9
	CH_4	24.2
A&P	BC	16.0
SLG	CO	5.7
WMGHG	Halocarbons	4.5
	N_20	4.2
SLG	NMVOC	2.5
WMGHG	HFCs PFCs SF_6	0.7
A&P	Aircraft Contrails	0.2

Table 1 - Radiative forcing (RF) effect of the main anthropogenic drivers of climate change[7]

Describing building materials using embodied carbon also risks confusion with 'sequestered carbon', which is the process of storing CO_2 taken out of the atmosphere by crops – such as straw, wood, hemp and cork – and using it in construction. Indeed, every construction material contains carbon.

If we are measuring building performance in terms of energy, why convert it? If we do convert it to emissions estimates, the outputs can be used to express benefits of projects that are relevant to real life and to the public, and not simply rounded down to CO_2e or 'carbon'.

Is 'carbon' only climate change?

A recent World Health Organization report estimated that, every year, air pollution is responsible for the premature deaths of approximately 600,000 people and costs the EU £1.1tn. Of this, around £60bn is footed by the UK taxpayer – 4% of GDP.[9]

In terms of the effects of air pollution on human health, particulate matter (PM) is the biggest culprit. Recent studies have shown that the effects of $PM_{2.5}$ have been significantly underestimated and – aside from the obvious lung impacts – are linked to a host of neurodevelopment and cognitive-function problems, particularly in children, as well as other chronic diseases, such as diabetes.[10]

BC is the strongest radiative absorbing component of PM. It is the third-biggest contributor to climate change (see Table 1) and – with a lifespan of only days in the atmosphere – curtailing its production will reap an almost instant negative RF effect.

Using freely available data from the European Environment Agency, it is possible to estimate emissions from nearly all common combustion sources. So, for the UK, you can break down the external cost estimates associated with each pollutant generated from the 2010 UK electricity mix, expressing the adverse

impacts on human health and the environment as a monetary value.[11] This is summed up and converted as a cost per kWh. (The list of 28 pollutants and their estimated costs is available online.) It is calculated that every kWh of electricity consumed has a €0.03 additional 'external' cost, which we pay for, primarily, through our taxes and loss of quality of life.

A recent European Commission report blames the misconceived rush to biomass for use in household fuel combustion as a significant contribution to air pollution[12]. Growing the wrong crops, creating monocultures and sourcing from distant, delicate ecosystems can have a negative effect on RF through methane (CH_4) and nitrous oxide (N_2O) emissions. These must be considered in detail when attempting to include them as 'carbon savings' in 'sustainable' projects. **CJ**

- All references are available online at **www.cibsejournal.com**

BLAISE KELLY is a junior engineer at the Austrian Institute of Technology

Radiative forcing – what makes up climate change?

Carbon dioxide (CO_2) is the dominant greenhouse gas responsible for 42% of total RF on the best-estimate scale. Of this, around 20% (8.6% of total) is not from fossil fuels, but from the burning of – and loss of – forest for sourcing of building materials and the creation of agricultural land, in some cases to grow biofuels.

Anthropogenic sources of **methane** (CH_4) account for around 65% of the global emissions since 2000. This includes rice paddies, agriculture, ruminant animals, sewage and waste, landfills and fossil-fuel extraction.

Three main anthropogenic sources of **nitrous oxide** (N_2O) are the Haber-Bosch process (the industrial procedure for producing ammonia), the cultivation of legumes and crops increasing biological nitrogen fixation (BNF), and the combustion of fossil fuels, which converts atmospheric N2 into NO_x and is redeposited on the earth.

Halogenated species can be powerful greenhouse gases; those containing chlorine and bromine also deplete the stratospheric ozone and have been sharply reduced thanks to the Montreal Protocol and its amendments. However, the consumption and emission of hydrofluorocarbons (HFCs) is expected to increase substantially over the next few decades because of demand for air conditioning units and insulated foam products, mainly in developing countries (Velders *et al*, 2009).

Tropospheric ozone (O_3) is a short-lived trace gas with an average lifespan of a few weeks (23 days). It is produced by precursor gases such as CO, NMVOC and NO_x. NMVOC are emitted from industry, paint application, road transport, dry cleaning and other solvent uses. Benzene and 1,3-butadiene are directly hazardous to human health. Ozone is powerful and aggressive, reducing plants' ability to photosynthesise and reproduce, and it stunts growth. In humans, it causes inflammation in the lungs and bronchia (EEA, 2013b).

Aerosols (and cloud effects) consist of black carbon (BC), organic carbon and dust. BC gives a positive RF effect through its absorption of heat in the atmosphere and the dulling of white surfaces, such as the ice caps and glaciers.

IN IT FOR THE HONEY

Urban beekeeping has the potential to revive ailing bee populations and provide city dwellers with a welcome taste of the wild. Cundall invited 30,000 honeybees onto the terrace of its London office, and controlled hive temperature and humidity to ensure a bumper harvest for its staff. **Harry Barnes** and **Kavita Kumari** report

Cundall's own-label honey is harvested in August

Bees may appear to be ubiquitous in our gardens and hedgerows at this time of year, but the high level of activity is deceptive. Their numbers are on the decline and, according to research by the International Union for Conservation of Nature, around 10% of European wild-bee species are in danger of extinction.

There are nearly 2,000 species of bee, but the most important to humans is the honey bee because it is responsible for 80% of the world's pollination.

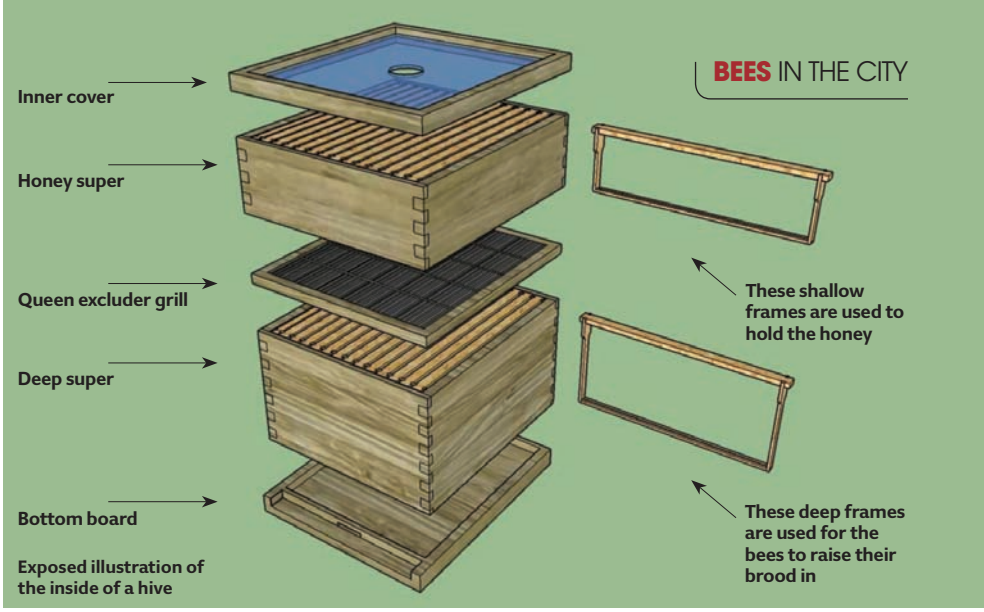
Their numbers are falling in the UK – over the winter of 2014/15, there was a 14.5% loss of bees, according to the British Beekeepers Association, which is in excess of what is considered normal losses of 5-10%.

In the US, beekeepers reported a 42% decline in colonies in one year, prompting President Obama to set up a Pollinator Health Task Force aimed at improving the health of the bee population. Environmentalists say the particularly bleak picture in America is because of the country's continued use of neonicotinoid pesticides. Their use was suspended in the EU in 2013, although Defra last month permitted their limited use in response to a request from the National Farmers Union. Other causes are said to be the parasite varroa mite, global warming[1] and a decline in the number of bee-friendly plants.

In 2012, the London mayor, Boris Johnson, said that large, urban centres had become havens for bee populations, providing a milder climate and a wider range of food sources than the countryside. 'London has a key part to play in the future survival of Britain's bee populations and, with more Londoners choosing to grow their own food, bees are more important than ever,' he said.

Cundall currently has two colonies of around 30,000 bees, in two hives on the terrace of its London office. While we enjoy hosting the bees, we are very aware of our responsibility for their welfare.

We employ a professional beekeeper –



Exposed illustration of the inside of a hive

Luke Dixon, from Urban Beekeeping – who visits once a week to monitor the hives and make sure they are healthy. One key check is to make sure the queen bee has produced multiple eggs and larvae, but there are many other factors that come into play. For the young to develop, the interior of the hive is kept at a constant 36°C. In the winter, when the colony is quiet and no eggs are being laid, the bees still maintain a temperature of 20°C.

The beekeeper puts in sugar for the bees to eat in the winter months, when they can't feed from flowers. In the summer, he takes measures to prevent the bees from swarming and to ensure honey is being produced. A good way to check that the bees are producing honey is by monitoring the temperature and humidity inside the hive.

Swarming happens when the queen leaves the hive and about 60% of the worker bees go with her. We do our best to avoid swarming by watching out for the production of new queens within the hive and then splitting the colony in two to create an artificial swarm.

Last year, a swarm of about half the bees regrouped on the roof of the next door building. We had to collect them and move them to a separate hive for two weeks, until their swarming drive had been extinguished and we could recombine the hives.

Bees feed on nectar for their primary energy source, and pollen for protein and other nutrients. To help our bees thrive, we planted many of their favourite flowers – lemon balm, honeysuckle, heather, wild bergamot, bluebells, mint and a variety of French and English lavenders – near to the hives, each of which needs as much as 30kg of pollen and 118kg of nectar to sustain itself.

Nectar is about 80% water and honey about 18% water. In transforming one to the other, bees evaporate away the excess water. They keep the hive ventilated to ensure that, despite all the moisture, it remains dry. We do our bit to help the bees by adjusting the floor and front openings to help airflow.

Bees plan their comb building by forming catenary chains, which hang down in loops. As the space is filled with hexagonal wax cells, more bees join the chain and the comb grows. The technique is the same as the catenaries used in bridge building.

We harvest honey in the last week of August and put it into jars with Cundall labels. The plants that the bees feed on affect the flavour of the honey, which is how our honey gets its distinctive taste. From the feedback we received about our first batch of honey, there were noticeable hints of heather and lavender.

Bees have been well received in London and, despite initial fears that they could pose a risk to staff and our neighbours, nobody has been stung. We are now looking to keep bees in our other offices as well. **CJ**

Further reading

70 Million Years of Building Thermal Envelope Experience: Building Science Lessons from the Honey Bee, R. Christopher Mathis MASHRAE, David R. Tarpy, 2008 **bit.ly/1DBlt3W**

References:

1 'Climate change impacts on bumblebees converge across continents', *Science*, 10 July 2015, Vol 349 no 6244, pp 177-180

● **KAVITA KUMARI** MCIBSE is a senior engineer and **HARRY BARNES** a trainee engineer, both at Cundall

Buildings for bees

As with any 'bioclimatic design', compromises are often required to provide the best year-round conditions to reduce excessive heating or cooling loads for the occupants of the hive. To ensure that bees have the best opportunity to maintain their comfort, I ensure that the hive is protected from the prevailing wind and, ideally, that there is some shade on sunnier days, when outdoor temperatures are high - deciduous flora can provide some seasonal shade. I prefer to use the 'WBC' hive – a double-walled hive with external housing that splays out towards the bottom of each frame . Not only does it look more aesthetically pleasing, but its cavity-walled construction provides additional insulation and, in summer, acts as a self-controlling, naturally ventilated façade, regulating the impact of incident solar radiation.

● By Tim Dwyer, technical editor and part-time beekeeper

The East Anglian Air Ambulance has flown 16,000 missions since its inception in 2000

CREDIT / EAAA

Portakabin is using CIBSE's TM54 tool to help predict energy use at a new Cambridge base for the East Anglian Air Ambulance. **Peter Rankin** explains why the modular builder is taking an 'honest approach' to energy efficiency

ON A MISSION

Forecast building energy performance is important for any project, but particularly so for the East Anglian Air Ambulance (EAAA), because every pound spent on energy means less money available to keep its helicopters in the air.

The annual cost of running the vital service – which relies on charitable donations – is approximately £8.6m. Higher-than-predicted energy costs would mean channelling funding away from the operation of the air ambulance.

EAAA is currently building a new two-storey operations base for mission control and air ambulance crew at Cambridge International Airport. It is using CIBSE's forecasting tool, TM54 *Evaluating Operational Energy Performance of Buildings at the Design Stage*, to give a reliable and verifiable forecast of in-use energy, and to demonstrate the energy efficiency of the construction method (see panel, 'TM54 v EPC').

The new building will come under particular scrutiny because EAAA's newest pilot just happens to be second in line to the British throne. Prince William started flying one of the volunteer organisation's two helicopters last month, after training for the role earlier in the year.

Prince William works as a pilot for the EAAA, based in Cambridge

WPA POOL / GETTY IMAGES

Building brief

EAAA's brief for its new building included an office, mission control, mess and sleeping accommodation. The operations base was needed quickly and there was a desire to minimise disruption on the air ambulance's airport site, so the client opted for off-site construction.

Walls, roofs and floors were assembled in a factory, which meant the superstructure could be fabricated and constructed at the same time as the groundworks. Yorkon's off-site solution uses prefabricated modules, which are then assembled on site to create the completed building.

The first stage of energy modelling is to establish occupancy patterns. The National Calculation Methodology (NCM) profiles used for Part L and EPCs were not too far off what is expected for the building; this is unusual, because the NCM tends to underestimate 'out of hours' use.[1]

U-values of the building system are slightly better than the Part L notional building. One common problem with U-value calculations is the use of linear heat-loss calculations, which can be unrealistically optimistic, as they do not take account of repeat or intermediate thermal bridging.

CREDIT / PORTAKABIN

A simulation of the EAAA's new Cambridge base, which is due to be completed this autumn

Fabric modelling for the project takes full account of thermal bridging, using 3D heat-flow modelling (see Figure 1). These calculations are also backed by third-party verification to the relevant British Standards.

In temperature-critical areas of the building, reversible DX heat pumps are used. In other areas an air-to-LTHW heat pump system is specified; this also delivers hot water for showers and washbasins.

Using the right efficiency figures in the model for heating and cooling systems is important. The availability of seasonal coefficient of performance (COP) figures has, in theory, been a great step in narrowing the gap between design and performance. No longer can designers optimise their equipment for a single test condition. However, we must still treat seasonal COPs and energy efficiency ratios with caution, because the demand profile used for seasonal calculations will probably not match the reality, and may not take the defrost cycle into account.

Another area in which we need to be careful about how we use manufacturers' data is ventilation, which is delivered by decentralised heat-recovery air handling units. The manufacturer claims a 70% heat-recovery efficiency for the plate heat exchangers. Heat exchanger efficiencies are determined using set conditions[2] for temperature, humidity, and airflow, all of which will vary in reality. At this stage, a more conservative 55% figure[3] has been used in the energy model.

Lighting is LED throughout, with absence control to occupied areas, and presence control elsewhere. Daylight in the building is limited because glazing areas are designed to reduce noise nuisance from the airport outside. Nevertheless, modelling showed daylight to be beneficial in certain areas.

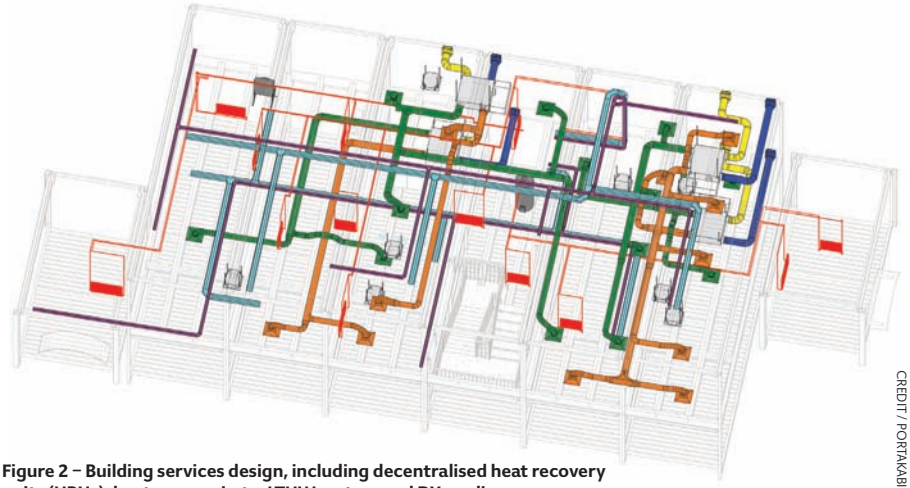
Controls are often cited as a key reason for buildings not performing as designed.[4] The studied building has a very simple system, with a central controller for the LTHW heating system, and local controls for direct expansion (DX) systems. Cooling systems are to be coupled with ventilation to make the best use of free cooling, and systems are specified so that simultaneous heating and cooling of the same space cannot occur. (See Figure 2, building services design).

CHOPPER FACTS

The EAAA is a charitable organisation covering Bedfordshire, Cambridgeshire, Norfolk and Suffolk. It employs critical-care paramedics, doctors, and support staff to work alongside helicopter pilots. Maintaining air ambulance operations for 365 days a year involves a number of costs, including aircraft maintenance, staff, accommodation, medical equipment and fuel.

From 2013/14, the EAAA attended 1,730 missions – an average of 4.7 per day – 244 of which were night missions. Since its inception in 2000, the air ambulance has flown more than 16,000 missions.

If you would like to find out more about the work of the East Anglian Air Ambulance, or wish to make a donation, visit **www.eaaa.org.uk** or call 08450 669 999.



CREDIT / PORTAKABIN

Figure 2 – Building services design, including decentralised heat recovery units (HRUs), heat-pump air-to-LTHW system and DX cooling

Energy model comparison (KWh/annum)

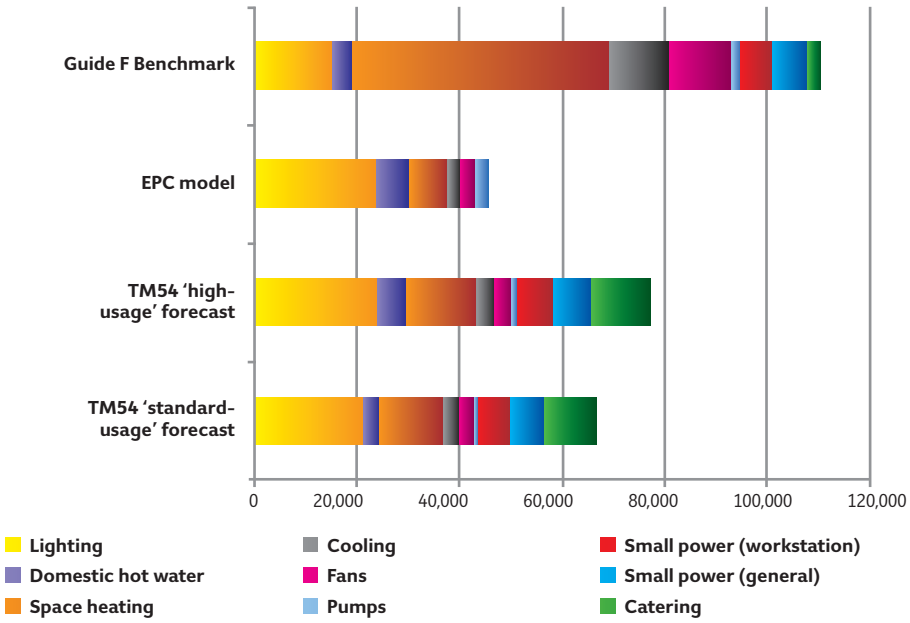


Figure 3 – showing the TM54 forecasts against the EPC modelling results and the CIBSE Guide F benchmarks

The EAAA modules have been constructed off site like this building

CREDIT / PORTAKABIN

TM54 v EPCs

CIBSE's TM54: *Evaluating Operational Energy Performance of Buildings at Design Stage* sets out a framework in which to build models to forecast in-use energy. In most cases, this will involve modification of the Part L/EPC model using the same dynamic simulation software.

The energy 'performance gap' – the difference between as-designed and as-built energy use – is a hot topic among building professionals. Data from CarbonBuzz suggest that a typical office building will consume 59% more energy than its design target.[5] The Green Construction Board suggests the performance gap could be closer to 200%.[6]

Much of the discussion has focused on commissioning, build quality and the influence of the end user. These are crucial to energy performance in operation, but one factor that is often misunderstood is energy modelling.

Energy Performance Certificates (EPCs) are not designed to predict in-use energy performance. EPC and Part L modelling is designed, instead, to assess the theoretical energy and CO_2 efficiency of a building in a method common to all buildings of its type.

To make different buildings comparable, the EPC method must ignore actual operational profiles and variables such as small-power loads. Some fixed building services – such as lifts, escalators, security systems, and emergency lighting – are also ignored. This rigidity means assessors cannot use their judgement to make realistic and conservative adjustments to standard inputs, or to allow for how occupants will use the building.

A lack of reliable energy data at design stage not only means disappointment at the as-built stage, but also hampers our ability to make well-informed design decisions. Percentage CO_2 savings targets from renewables are a good example of where as-measured results may be well below design targets.

Despite the best intentions of design, we must still account for the possibility that controls may not be used optimally. Giving building users control over heating and cooling systems can have its benefits, but can also increase energy consumption as users wrestle with controls – for example, setting cooling to 16°C on the misapprehension that this will cool the room more quickly.

Small-power and catering energy use were taken from estimates of equipment power draw and its use. The TM54 document offers useful guidance and examples for how to estimate small power. Small power use in the building includes computers, server, and on-board specialist medical equipment, which the flight crew will recharge in the building.

TM54 encourages the use of scenarios to present a range of forecast outcomes. At this early project stage, a 'standard practice' forecast was created alongside a high-usage forecast. The scenarios assume that occupancy patterns are as expected, all equipment is well commissioned, maintained effectively and used appropriately, and that energy is monitored and targeted by building management. These scenarios are then given an uncertainty range to account for building management factors.

More scenarios may be added at a later date – for instance, if we find that crews are carrying out more night missions than anticipated, or that crews are using the residential facilities more than expected.

TM54 forecast

Figure 3 shows the TM54 forecasts for the EAAA building against the EPC modelling results and the CIBSE Guide F benchmarks.

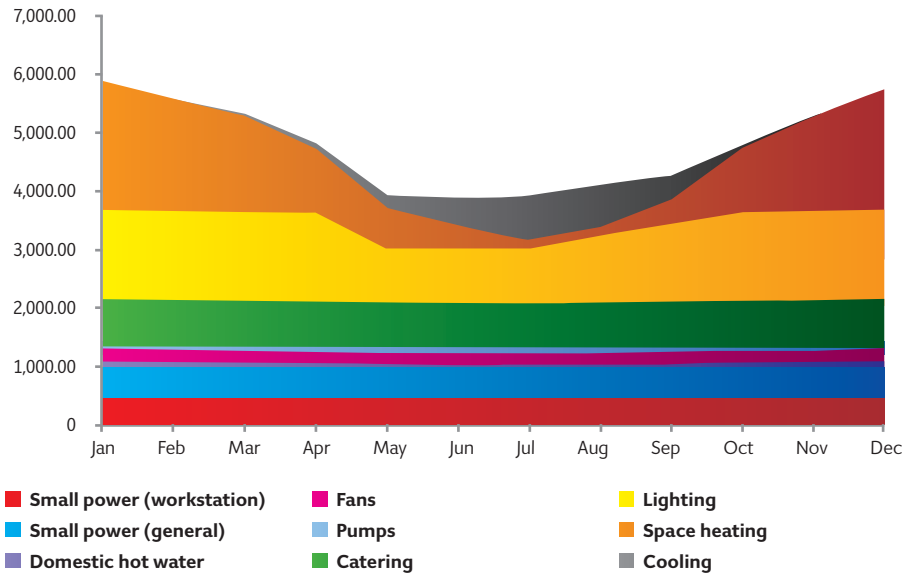
The forecast energy use is between 77.1MWh and 66.7MWh per year for the high- and standard-usage scenarios respectively, which suggests the EPC has underestimated by 46-69%. This underestimate is largely from the unregulated loads of small power and catering.

The model forecast that lighting would be the highest single source of energy use because of the building's long occupancy hours, particularly at night.

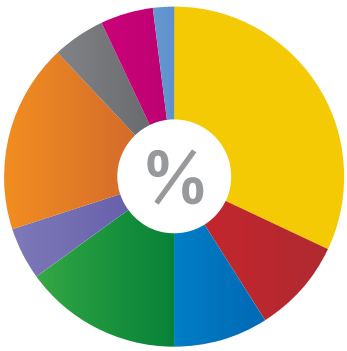
The EPC model assumes lighting is on for 24 hours a day; this is similar to the profiles assumed for the TM54 forecast, but these may be revised for later scenarios. Choosing LEDs for efficiency and longevity has been validated by these results. This is one area in which different occupancy scenarios will have a big effect.

Results suggest that the EPC model

Annual energy forecast (kWh/month)



Annual energy breakdown (kWh/month)



Small power (workstation)	6,285
Small power (general)	6,573
Domestic hot water	3,072
Fans	2,803
Pumps	973
Catering	10,223
Lighting	21,183
Space heating	12,511
Cooling	3,089

Figure 4 – Annual and monthly 'standard usage' energy forecast for the building.

underestimated energy use for heating and cooling, because of restrictions in the EPC process when accounting for control inefficiencies, defrost cycles and in-use efficiency. Energy used for domestic hot water appears to have been overestimated in the EPC because of demand profiles assuming a far greater use of changing and shower facilities than predicted.

There was some difficulty in finding appropriate benchmarks in CIBSE Guide F; the closest approximations for each energy use were mostly office buildings. It is nevertheless interesting that cooling and ventilation energy use are so much higher than the modelled results.

Heating and DHW energy benchmarks should be taken with the knowledge that the Guide F standards are for fossil-fuel systems rather than heat pumps.

The advantages of TM54

It is natural for design teams to be optimistic about energy efficiency, but – when it comes to energy forecasting – we must replace this with an honest approach that recognises uncertainty in data and accounts for the influence of the end user.

Ultimately, operational energy use is the figure that matters to building users. Good energy modelling allows us to make effective design decisions, and enables occupants to benchmark their energy use.

For the air ambulance project, going through the TM54 framework gives added confidence in design-energy modelling, and will allow the client to make informed decisions as the design progresses.

The real test for the Cambridge operations base will be how the energy forecasts compare to the measured consumption.

The building is due for completion in late autumn 2015. **CJ**

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1 Technology Strategy Board – *The performance gap in non-domestic buildings* (2013).

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3 ECA Energy Technology Criteria List 2013 – Air to Air Energy Recovery.

4 Innovate UK – *Building Performance Evaluation Programme Early Findings from Non-Domestic Projects* (2014).

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PETER RANKIN ACIBSE is energy and sustainability engineer at Portakabin Group

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This month: Natural ventilation at a Durham PCC, designing for cancer care, and monitoring heat pump performance

CHP has an important role to play in improving the efficiency of buildings, particularly those with high and continuous heating loads, such as healthcare buildings. This is because CHP operates most efficiently during long running hours. Less stopping and starting means less wear on the engine, reducing maintenance costs and downtime and making the system more efficient overall.

Furthermore, with electricity from the grid both subject to transmission losses and costing three or four times more than that produced on-site, CHP can potentially be approximately 30% more efficient than traditional heating plant electricity (See panel, 'The economics of CHP'). The 30% efficiency is based on savings made from electricity being produced by CHP using natural gas, rather than purchasing electricity from the grid, plus the generation of heat. For example, 15kW of heat and 5.5kW of electricity from the grid would cost an average of £1.37 (based on 14p per kWh for electricity and 4p per kWh for gas[1]), but only an average of 81p if generated via a Dachs 5.5 CHP unit, which requires 20.3kW of gas to produce the same amount of heat and power.

This has been recognised in *NHS and Sustainability* – a report to the House of Commons environmental audit committee by the National Audit Office (NAO) – which said that CHP should be extended across healthcare facilities in a bid to cut costs by £180m a year.[2] However, for CHP's potential to be realised, systems need to be correctly designed, commissioned – and monitored.

When assessing a site to see how feasible it is for CHP, we look at the base load for electricity and heat. For example, the heat produced on a mini-CHP unit is typically between 12.5kW and 15.5kW – depending on the return temperature to the unit – and the electrical output is 5.5kW. If the base heating load is above these figures, the CHP will run continuously, and the heat and electricity will be used in the building – which is the ideal.

There is no minimal operational period per year that has to be met, but it is important to note that – if a unit is not running – it is not contributing towards payback. As there is no Feed-in Tariff available for electricity generated by gas CHP units above 2kW, the system should be specifically designed to ensure that all the electricity generated is used in the building.

As a CHP unit supplements existing boilers ›

CHP is ideal for healthcare centres but only if systems are designed and commissioned properly. SenerTec's **Gary Stoddart** looks at lessons learned in Cumbria

CARE PACKAGE

THE ECONOMICS OF CHP

CHP uses natural gas to generate electricity (with the combustion exhaust gases being disposed of in the same manner as with a boiler) to replace electricity drawn from the grid. With an energy cost ratio of around 3.5/1 (electricity 15p per kWh and gas 4p per kWh), the savings are calculated using the cost of energy input to the CHP unit (natural gas) and the value of the heat output (thermal) and the electricity produced.

As an example, a mini-CHP unit operating 24 hours a day could save more than £10,000 a year and approximately 60 tonnes of CO_2, but this depends on many factors, including energy costs and the efficiency of the existing heating system.

CHP unit at Cockermouth Community Hospital and Health Centre

> We estimate that there are a large number of CHP units installed across the country that are not running as intended

and/or water heaters, the system needs to be designed and sized to ensure that the CHP is used first, and that the boilers and water heaters are used during peak periods.

If a site has peak demands for hot water, storage is the best solution to keep the CHP unit running. Heat produced by the CHP over a period of 10 hours or more is stored in a preheat cylinder, and this hot water can be used during the peak period (for example, 6.30am to 9am). The cylinder will then be heated by the CHP during the day, ready for the evening peak (say, 4.30pm to 7pm). If the heat cannot be used, the site will either have to dissipate (waste) it or shut down the CHP.

We estimate that there are a large number of CHP units installed across the country that are not running as intended – but this situation could easily be avoided through early discussions about system design, CHP sizing and effective monitoring.

The integration of a mini-CHP at Cockermouth Community Hospital and Health Centre in Cumbria illustrates what can happen if the technology is not optimised. The BMS controls were not set correctly, which meant the boilers took lead heat generation for the system, which resulted in the CHP unit remaining in a standby position (see panel, 'Cockermouth: the importance of check-ups'). Adjustments were made to the BMS system, reducing the system flow temperatures and allowing the CHP unit to take lead heat generation. The site is now recording significantly higher CHP running hours and benefiting from the resulting heat and electrical contribution to the building.

This illustrates the need to be mindful of the building dynamics and of how the end user intends to use heat and power. CIBSE's AM12 urges designers to seek the advice of CHP suppliers 'at an early stage of the design'. A timely conversation with the controls engineer is also crucial to ensure the BMS is set up with the CHP properly integrated.

Putting an effective monitoring system in place can help you keep track of how CHP is performing. A modem, connected to a landline or mobile network, can transmit data between the site and the CHP unit's monitoring centre. The manufacturer should have the resource and expertise to analyse data in real time, and provide guidance on how to solve any issues or alter the system to maximise performance.

Consideration should be given to availability of a long-term maintenance contract. CHP engines are maintained on a 'running hours' basis; the maintenance period for the CHP at Cockermouth is 3,500 operating hours. If the mini-CHP unit is being remotely monitored through a modem, it will inform the end user and – in this case SenerTec – when a service is due. The firm is set to offer remote monitoring with every Dachs Mini-CHP unit.

If CHP is to be more widely deployed across the healthcare sector, the importance of correct design, commissioning, monitoring and maintenance must be fully understood. **CJ**

Cockermouth: the importance of check-ups

Cockermouth Community Hospital and Health Centre in Cumbria was rebuilt in 2013, with the aim of accommodating the town's primary healthcare services under one roof.

CHP was specified as part of an energy and carbon saving strategy to meet long-term environmental and BREEAM targets. A 5.5kW Dachs Mini-CHP unit was installed to provide both hot water for general medical needs and electricity to supplement main grid supply.

Initially, when integrated with the BMS, the CHP unit did not run as expected. The system operating temperatures for the heating system and the heating water flow rates were both set significantly higher than required. This resulted in system return temperatures in excess of 73°C. As a result, the CHP would only run for a matter of minutes first thing in the morning and then stand idle for the rest of the day.

When our business development manager Mark Gibbons visited the hospital, he quickly realised that the CHP unit had been running for only a fraction of the time possible.

By reducing the boiler temperatures down by 1 or 2°C we were able to operate the CHP as intended. The hospital's maintenance engineer reset the system pumps so that the velocity in the system dropped, increasing the flow and return delta T and reducing the return temperatures to the central plant room.

The mini-CHP unit is now running almost continuously, meaning the hospital is benefiting from the carbon and energy savings the system was originally specified to deliver.

References:

1 Energy Saving Trust: Calculations **bit.ly/1RQxQ87**

2 NHS and Sustainability, NAO, March 2015 **http://bit.ly/1RQyGBO**

● **GARY STODDART** is general manager at SenerTec

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Houghton-le-Spring Primary Care Centre in Durham

THE NATURAL SOLUTION

Understanding airflow is key when considering natural ventilation. Breathing Buildings' **Shaun Fitzgerald** explains how flow patterns were optimised at a Durham Primary Care Centre to provide more passive cooling

The Houghton-le-Spring Primary Care Centre (PCC) in Durham, completed in 2011, was the first large healthcare facility in the UK to be rated BREEAM Outstanding, heralding a new dawn for low-energy building design.

It was one of the case studies discussed by the CIBSE Natural Ventilation Group, which hosted a session on 'the natural solution' during the two-day CIBSE Symposium, at University College London, in April.

The project was led by Stephen Naylor, of Sunderland NHS Trust, whose vision for a naturally ventilated building meant the scheme stayed true to its course during the design and building periods.

Naylor had visited the Breathing Space building in Rotherham – designed by Rotherham Metropolitan Borough Council and Breathing Buildings – and was convinced by its internal environment, created using thermal mass and natural ventilation. He approached Breathing Buildings, to assist in the creation of Houghton-le-Spring PCC. Designers here helped to design a thermally massive plenum – similar to the one in Breathing Space – for the new healthcare building, and incorporated a thermal wall into the design. This resulted in an innovation credit being granted as part of the BREEAM assessment, and in the building receiving the 2012 Ecobuild Healthcare Building of the Year award.

At the CIBSE Symposium, I spoke about the actual performance of the building, and how our understanding of natural ventilation has been enhanced by it.

Ventilation strategies

In winter, the Houghton-le-Spring PCC uses a mixing ventilation strategy: internal heat gains are used to mitigate cold draughts by ensuring that the incoming cold, fresh air is mixed with warm, interior air before it reaches the occupants. This strategy is now widely accepted as the lowest energy

> In summer, a different ventilation strategy is used; during the day, hot air descends... yes, it descends. This is because it is cooled by the night-cooled thermal wall

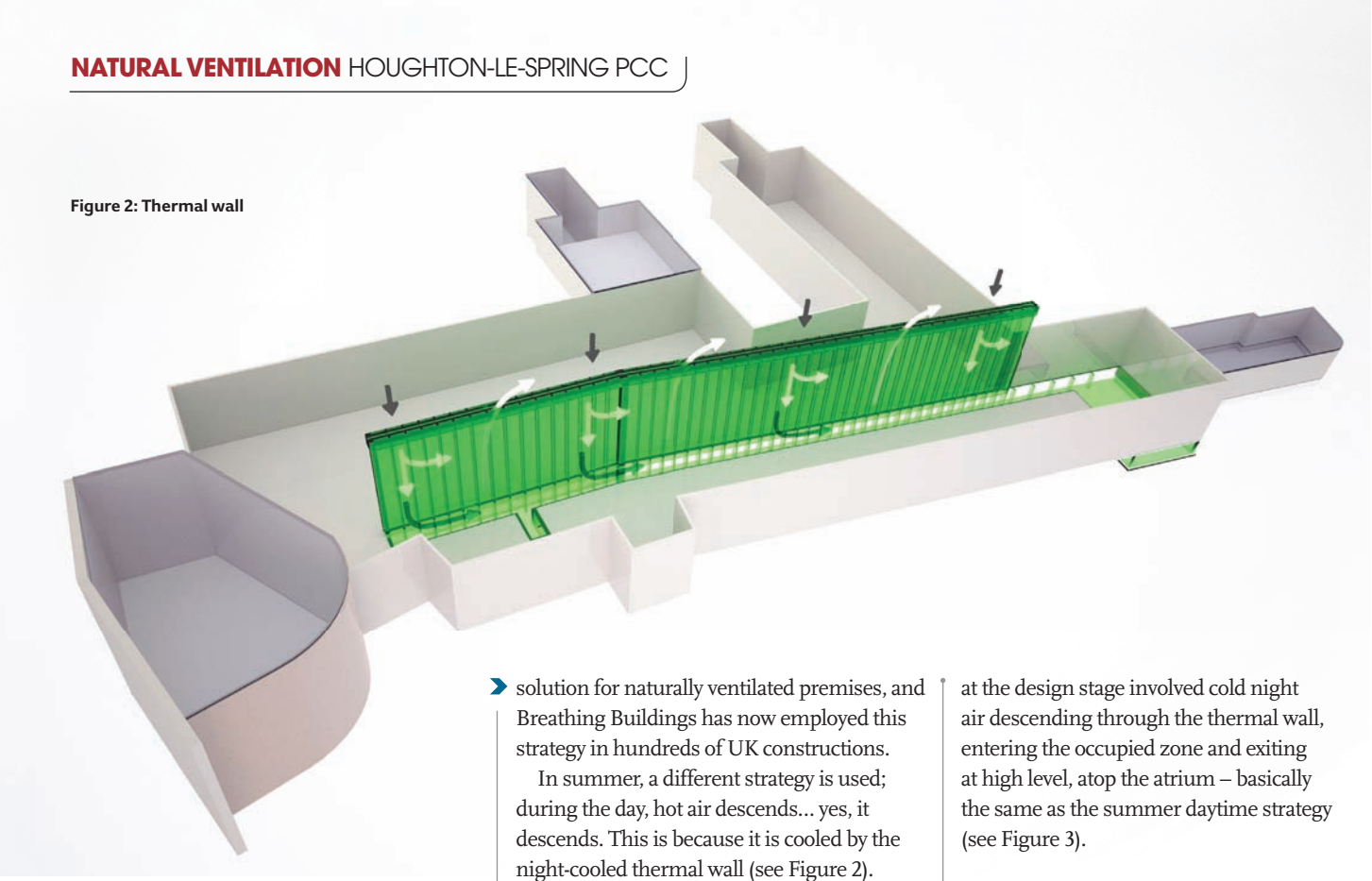

Figure 2: Thermal wall

solution for naturally ventilated premises, and Breathing Buildings has now employed this strategy in hundreds of UK constructions.

In summer, a different strategy is used; during the day, hot air descends... yes, it descends. This is because it is cooled by the night-cooled thermal wall (see Figure 2).

The cooling effect of the thermal wall chills the hot air, which becomes denser than the outside air. This results in the air falling and being exposed to more night-cooled thermal mass, thus cooling further. The descending cold air drags the fresh hot air down to replace it, hence the apparent effect of hot air descending – although it is the falling dense cold air that drives this.

The extent of the cooling in the thermal wall and plenum is such that the air entering the occupied zone can be kept at 19°C. Once this air is exposed to the heat gains within the building, it warms to 21-22°C. This is a perfect temperature for the interior of the building on a hot summer's day. When the outside temperature is greater than 21-22°C, the optimum flow rate to use in the building is that which is needed to maintain CO_2 in the occupied zone at the maximum level – 1,000ppm daily average in an office.

Finally, the summertime strategy relies critically on adequate night cooling of the thermal wall. The flow pattern envisaged at the design stage involved cold night air descending through the thermal wall, entering the occupied zone and exiting at high level, atop the atrium – basically the same as the summer daytime strategy (see Figure 3).

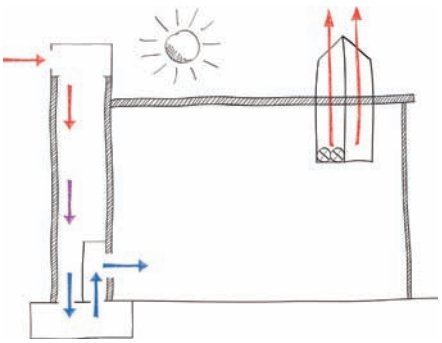

Figure 3: Intended summer daytime strategy

Controlling flow patterns

Unsurprisingly, data showed that flow patterns exhibited during the winter operation were as per the design. The building doesn't actually use the thermal wall for the main occupied zone in winter and there are many examples of Breathing Buildings' mixing ventilation strategy.

However, it was found that the flow patterns in summer can be different from those envisaged at the design stage. The main difference was at night. Rather than cold night air descending into the thermal wall, it was observed that another stable flow regime can be established, whereby the flow is the reverse of the summer daytime operation; cold air has a tendency to come in through the high-level vents atop the atrium space, enter the thermal wall at low level, and rise up through the thermal wall. The reason for this stable flow regime is that the thermal wall is warm compared to the night air, and is a source of buoyancy. Air within the thermal wall is heated and, therefore, will rise.

The main challenge with this night-cooling flow is that there is a limit to how low the atrium temperature can be allowed to fall, especially if it is occupied at night. This, in turn, can limit the extent to which the thermal wall can be cooled.

In the case of Houghton-le-Spring PCC, Breathing Buildings had included ceiling fans within the thermal wall to control the flow direction, if this was deemed necessary. As a result of the 2012 observations, with the building operating in a purely passive mode, Breathing Buildings undertook an

> The main challenge with the night-cooling flow is that there is a limit to how low the atrium temperature can be allowed to fall

Figure 4a: sensor locations at Houghton-le-Spring

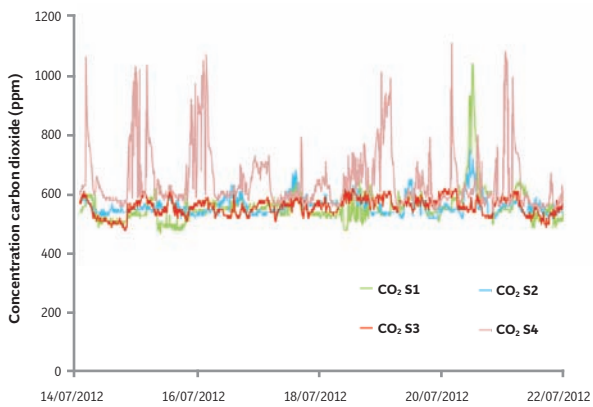

Figure 4b: CO_2 levels from sensors

experiment in which the building had fan-assisted night cooling for three hours each night, and the fans directed the inflowing cold night air downwards through the thermal wall. The data showed that – by using a fan-assisted, night-time cooling strategy – the thermal mass of the wall could be exposed directly to more cold night air, thus providing more cooling the following day, with a reduction in interior temperatures of 1-2°C.

While this reduction may seem small, these margins matter – the building was designed so interior temperatures would not exceed 25°C for more than 100 hours a year.

The final piece of the jigsaw related to CO_2 levels (see Figure 4a and 4b). We showed that CO_2 levels were kept very low in the summer – generally around 600ppm.

However, one area of the building was kept at 1,000ppm, which is the target daily maximum average recommended for offices. This area was the zone closest to the main entrance and it is perhaps a surprising find because areas in the vicinity of opening doors are normally exposed to more fresh air.

The exact reasons for the slightly elevated CO_2 levels near the door are unknown, because the pattern of occupancy and dwell time within the different parts of the waiting area were not monitored. However, it is possible that if the building has an open door, is cooler inside than outside, and air is supplied at the centre, then fresher conditions would be expected near the thermal wall, and higher CO_2 levels near the point of exit. Also an open door would be an exit for the stale air if it is cooler than outside (see Figure 5).

Lessons learned

The study showed that the building performs extremely well and that the passive cooling, resulting from the thermal mass, provides a significant and beneficial thermal buffer in summer. However, the actual operation of the building led to differences in flow patterns from those envisaged at the design stage, although – with the appropriate location of sensors and control strategy – it was shown that the systems can still work extremely well. **CJ**

● **SHAUN FITZGERALD** FCIBSE is chief executive of Breathing Buildings

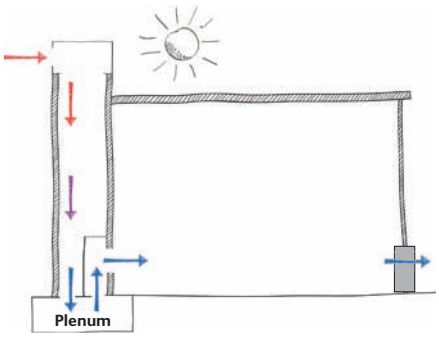

Figure 5: Actual daytime strategy with an open front entrance

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LIGHT AT THE END OF THE TUNNEL

Endless corridors, dingy waiting rooms and basement treatment rooms will be a thing of the past at Guy's new Cancer Centre when it opens in 2016. **Liza Young** finds out how innovative service design has helped to create a blueprint for modern cancer care buildings

An artist's impression of one of the naturally ventilated and light-filled atria

WATCH NOW
Watch the 3D video of the cancer centre at **www.cibsejournal.com**

PROJECT TEAM

- **Client:** Guy's and St Thomas' NHS Foundation Trust
- **Build project manager:** Essentia
- **Main contractor:** Laing O'Rourke
- **Architects:** Rogers Stirk Harbour + Partners and Stantec
- **Structural and building services engineers:** Arup
- **Academic partner:** King's College London

Long hospital corridors: disorientating, oppressive, intimidating. It is a journey that cancer patients are familiar with – traipsing along endless passageways between consultants' rooms, chemotherapy wards and radiotherapy departments. The latter are particularly depressing, involving descents into remote basements illuminated by harsh artificial light.

The days of navigating endless corridors will be a thing of the past at the new £160m Cancer Centre at Guy's and St Thomas' Hospital, which opens in autumn 2016.

Lead architect Rogers Stirk Harbour + Partners has reduced the distances between departments on the 200,000ft^2 site by grouping the functions of the building into manageable, multi-storey sections – termed 'villages' by the hospital. This means consulting rooms and treatment departments are close together.

The radiotherapy 'bunkers' – typically found at basement level – have been moved to the second floor, where patients can benefit from daylight while they await their treatment.

The heavy radiation shielding on these rooms has required a massive reorganisation of the services and clever structural design, including ducting on the outside of the building to maximise internal space.

Designing at a human scale

The radiotherapy department is vertically stacked over three levels, each of which corresponds to a particular stage of a patient's treatment. The radiotherapy machines – known as linear accelerators (Linac) – and reception are on the second floor, the staff areas on the third, and treatment-planning and imaging equipment (CT and MRI scanners) on the fourth.

The floors are organised into high-technology – or 'science of treatment' – zones towards the rear of the building, and low-technology, or 'art of care', zones towards the front of the cancer centre.

A range of services that are currently delivered separately will be brought together in the chemotherapy unit, which means different patient groups and treatment sessions can be run concurrently. The unit also includes a research floor for King's College London university, potentially giving more patients the opportunity to take part in clinical trials.

The outpatients department encompasses elements that outpatients are most likely to use – such as imaging and minor procedures facilities – thus allowing them to remain in one place during their visit.

In all, the hospital's new cancer centre will include six radiotherapy bunkers, a 44-chair chemotherapy day unit, 22 consulting rooms, and support services. A whole floor has also been set aside for research facilities and laboratories.

Rooms with a view

The cancer centre will be the first such development in the UK – and one of the first in Europe – to site radiotherapy treatment facilities above ground level. Linac machines are typically housed in basements because the ground can be used as part of the radiation shielding for the department.

CREDIT FOR TOP 3 PICS: ROGERS STIRK HARBOUR + PARTNERS

The 12-storey plant tower juts out from the northern façade where external ducts are also visible

Malcolm Turpin, associate director at structural and building services engineers Arup, says: 'We wanted to avoid patients having to go to the basement for treatment, and maximise daylighting, while controlling heat gains with a well-shaded façade.'

In order to locate the Linacs in the smallest possible footprint, the depth of the new radiotherapy department's walls was reduced from the traditional 3m-thick concrete structures to half the thickness, using high-density concrete with 819mm lead blocks for shielding. These blocks can be dismantled, so the area could be redesigned in the future if less-invasive cancer treatment became available and Linac procedures were no longer required. Patients will enter the bunkers directly, through heavily lead-shielded doors, rather than via a long concrete maze.

To accommodate all the equipment and shielding, the radiotherapy level needed to be at least 6m high. This meant inserting plant zones with reduced ceiling heights immediately below and above the Linac floor.

Turpin says: 'This was a groundbreaking design that took a lot of integrated engineering work, and which is an exciting development for the future delivery of cancer treatment.'

Ventilation strategy

The ventilation requirements of the building vary according to the use of the space, says Turpin. Some spaces require high air change rates and filtration to ensure clean air, while others have lower demand.

Typically, rooms will be mechanically ventilated, except for the consulting and exam rooms, which are on the perimeter of the floorplate and are naturally ventilated through an opening panel in the façade.

The ventilation strategy needed to deliver occupant comfort and infection control, while remaining low energy and flexible for the future, adds Turpin.

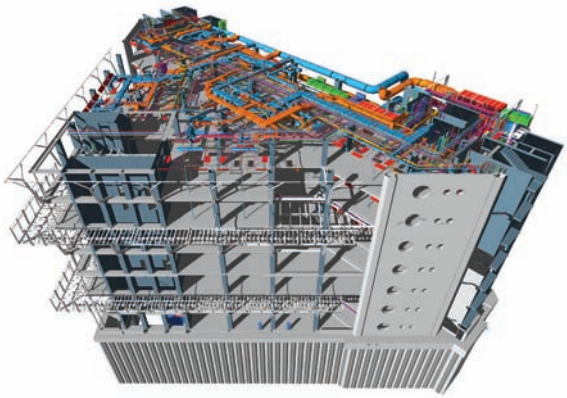
Floor-by-floor ventilation distribution with air handling units (AHUs) – located in a plant tower to the north of the building – are central to overcoming the design challenges presented by the building's height and the diversity of room types.

This keeps the ventilation on each level separate and adaptable for future needs, while adjacent floors remain fully functional. It also helps to minimise the number of services risers, freeing up space in the building, and reducing the length of ductwork runs – which, in turn, helps to minimise system pressure drops and, therefore, energy consumption.

To avoid large horizontal ductwork runs inside the building – which are often associated with floor-by-floor ventilation strategies – the primary ventilation distribution is outside the building. This complements Rogers Stirk Harbour + Partners' architectural vision of expressing the high-tech 'science of treatment', says Turpin.

The most highly ventilated clinical spaces are to the north of the building, as part of the 'science of treatment' zone. This is close to the external ductwork, which helps to minimise large duct runs deep into the building, easing congestion and boosting ceiling height by 2ft.

The ventilation systems in the 'art of care' zone, to the south of the building, were kept to a minimum, says Turpin, with natural



CREDIT: ARUP

BIM image of a portion of the services overlaid with the building structure

ventilation used wherever possible, particularly in perimeter consult/exam spaces and the atria. This helped to minimise energy consumption and maximise the amount of natural daylight entering the building.

Ventilation systems for specialist treatment have to meet air change and filtration rates to maintain the required degree of cleanliness. The ventilation system for the Linac bunkers is a variable air volume (VAV) system with local temperature control to each bunker.

The VAV system allows the air volume for each bunker to be altered from the bunker control rooms and set back when unused. The air volume required depends on the treatment cycle, and a boost function can be used in one bunker at a time to purge contaminated air generated during the most intensive treatment cycles.

Heating and cooling

The cancer centre has an array of room types, ranging from specialist imaging rooms – requiring accurate temperature control – and equipment and server rooms with high heat-load densities, to three-storey atria and consultation/exam rooms.

Turpin says the heating and cooling terminal units are selected to suit the different requirements of these spaces, and include duct-mounted heating coils, radiant panels, underfloor heating, fan coil units and chilled beams.

'The aspiration with all these solutions was to minimise energy and provide appropriate levels of comfort,' says Turpin.

Chilled water for HVAC systems is generated from highly efficient and responsive Turbocor chillers, and the Linac cooling is provided by free-cooling chillers, which have a consistent year-round cooling load.

Heating is provided from a site-wide heating network, which includes a combined heat and power system.

The space heating and cooling water systems are shared between floors, and can be isolated floor by floor as necessary, Turpin adds.

The offsite solution

Located in busy London Bridge, the cancer centre's footprint reaches to the edges of its triangular site. As a result, layout and storage space were at a premium, making construction a logistical challenge.

To overcome this, main contractor Laing O'Rourke used its design for manufacture and assembly (DfMA) processes to make parts in a factory for on-site assembly, thereby reducing in-situ building work (see article on **www.cibsejournal.com** for more on modular design).

The Guy's and St Thomas' Hospital's new cancer centre is targeted to achieve the BREEAM Healthcare Excellence rating, and aims to accommodate 700 outpatients at peak times.

People were at the heart of the design, and patient feedback inspired the project team to come up with a novel solution that brought the radiotherapy units into the light and out of the basement – which was also restricted because of a Roman boat buried 4m below the site! **CJ**

AFTERCARE SERVICE

As industry debates the level of involvement required from manufacturers to raise efficiencies, Remeha Commercial's **Mike Hefford** provides an insight into a two-year project where the firm was responsible for the design, installation and monitoring of heat pumps in a hybrid heating and hot water system for a care home near Banbury

Renewable technology is increasingly specified as the prime source of energy for heating and water provision on both new-build and refurbishment projects. Yet recent projects have highlighted the frequent failure of these sophisticated solutions to deliver the predicted energy and carbon savings, because of renewable equipment either underperforming or failing to operate at all.

When the high efficiency figure quoted by manufacturers on their product is not achieved, the cause usually stems from a failure to adhere to good system design and control, rather than from a problem with the product. This can be a cause of great frustration for manufacturers, who effectively relinquish control over a heating product as soon as it is released, despite being responsible for it while it remains under warranty.

So what if manufacturers were more involved in system design? Would their knowledge of the products' installation and operation lead to a more efficient system?

Taking care

The refurbishment of Lake House care home, in Banbury, provided Remeha Commercial with the perfect opportunity to analyse the impact of greater manufacturer involvement on achieving the anticipated efficiencies from a heating system.

Lake House is one of 70 care homes run by the not-for-profit provider The Orders of St John Care Trust (OSJCT), and offers private rooms for 43 residents, plus communal facilities. When the existing boilers began to fail, the OSJCT was interested in upgrading the heating system with renewable energy equipment, as the Trust was looking to reduce its carbon footprint and utility bills.

There were two main considerations when recommending a new system. The first was reliability, because of the vulnerability of many of the residents, and the second was the

The system's 1,000-litre, twin-coil buffer vessel

> As soon as a heating product is released, the manufacturer effectively relinquishes control over it, despite being responsible for it while it remains under warranty

high demand for heating and hot water. To meet these requirements, Remeha proposed installing a hybrid heating and hot water system that combines gas absorption heat pumps (GAHPs) and condensing boilers, with a BMS control.

GAHPs are gaining increasing support as an adaptable renewable solution to heating. They offer enhanced environmental and financial benefits for building operators because of their use of gas – rather than electricity – to drive the heat pump, and of an ammonia/water working fluid – rather than HCFCs – as the refrigerant.

Furthermore, Lake House was particularly suited to GAHPs because of the low hot-water temperatures that are mandatory in care homes. The existing heating system was designed for a maximum flow temperature of 42°C to ensure the low surface temperature for radiators and pipework required in a care home.

The project would enable us to gain a thorough understanding of the capability of the system through hands-on experience, and give us the knowledge of how to achieve the highest efficiencies from the heat pumps. The OSJCT would also benefit because the arrangement would ensure optimum operation of the new heating and hot water system and, consequently, maximum energy and carbon savings.

Remeha proposed installing Fusion Hybrid at Lake House as a turnkey project. We would be responsible for the specifying, installation and commissioning of the project, but a two-year monitoring period was also included in the agreement, after which time Remeha would train staff at the OSJCT to operate and manage the system. For data purposes, we installed pulsed heat and gas meters to provide information on the efficiencies achieved in real life.

The problems that arise with renewable equipment – particularly sophisticated hybrid systems that combine renewable and traditional heating – are generally caused by a lack of in-depth knowledge and understanding of this technology within the industry. In essence, there are five key steps to follow when working with renewable technology: size right; design right; install right; control right; and commission right.

Care-home package

The care home was previously heated by three condensing boilers with a total output of 180kW. To meet the required heating and hot-water demand, three 35kW GAHPs were installed on a plinth in a yard outside the boiler house, as the primary source of heat generation. The GAHPs directly heat water within a 1,000-litre, twin-coil buffer vessel to 50°C and preheat the cold water feed. Heat is transferred to the heating system by a coil in the cylinder and blended with the return water to reach the required flow temperature. This is controlled according to heat load and can be as low as 30°C. The lead heat pump is rotated every 200 hours to ensure good operation.

The system also includes two 45kW gas condensing boilers, installed in cascade to provide support when required – although, to date, the need for them has been minimal because of the output of the GAHPs. In addition, the GAHPs are used to preheat incoming mains water before it is reheated by direct-fired water heaters with an output of 48kW.

Remeha Fusion 35kW GAHPs are the primary source of heat generation at Lake House care home

A seven-inch touchscreen panel was designed to ensure easy operation of the system (see panel, 'In control').

The transition to the new system was carried out in just half a day, with the two condensing boilers installed first, in order to maintain heating and hot water throughout the care home.

GAHP maintenance needs are similar to those of condensing boilers. The gas generator is serviced in the same way, and – unless there's a failure – no scheduled maintenance is needed on the refrigeration circuit over its life. The toothed belt for the internal pump has to be replaced every three to four years.

Lessons learned

The project has demonstrated the enormous energy-saving potential of gas absorption heat pumps. Before the Lake House experience, we had anticipated achieving efficiencies of between 120% and 130%; this proved to be a conservative estimate because data from the pulsed gas and heat meters indicates that the GAHPs are delivering a seasonal efficiency of 140% net (126% gross).

The heat pumps are also providing around 90-95% of the heating for the care home. In terms of savings, a comparison of energy use from December 2013 and December 2014 reveals a 27% reduction in gas consumption after the installation of the system. We would expect the heat pump to last between 15 and 18 years, and with the heat pump running around 40% more efficiently, the financial payback for the OSJCT is four to five years – or sooner still when gas-driven heat pumps become eligible for Renewable Heat Initiative (RHI) funding.

Ideally, there would have been an allocation in the budget to upgrade the water heaters. Zoned control was also not an option. That said, the occupancy at Lake House stays fairly stable because it is a care home, and the extra valves and pumps that zoned control requires would have brought higher capital and running costs for the nursing facility.

We carried out careful commissioning, because this step is crucial to achieving maximum performance, and yet is often the part that is skimped on when projects run over budget. The hydraulic commissioning confirmed that everything was working well, with just a few minor tweaks required to the controls for the gas absorption heat pumps.

This project has confirmed to us the value of consulting manufacturers on hybrid and renewable technology to achieve maximum thermal efficiencies. The detailed product information that manufacturers hold – from how it works to how best to size it, combine it with other equipment and integrate it into an existing system – can be critical in avoiding an energy performance gap from heating.

While the monitoring process at Lake House might not be commonplace, more manufacturers are offering turnkey biomass projects and assuming more responsibility in the sizing, design and installation of CHP.

Manufacturers can support the project team by providing realistic efficiencies on their product, rather than headline efficiencies achieved in laboratory conditions.

The data from this project, for example, has contributed to the accurate performance table we can provide to assist consultants in calculating the outputs and efficiencies of this hybrid system to suit their own projects.

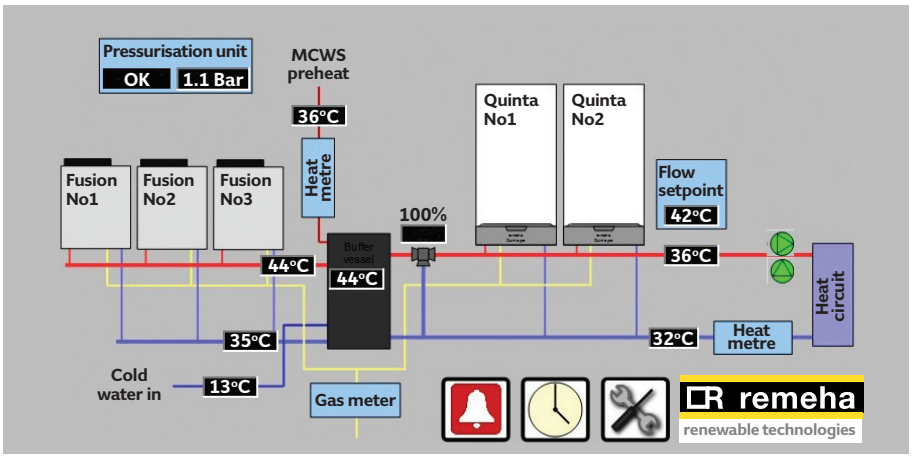
This greater involvement and sharing of knowledge is at the heart of what will become our industry's new way of working. Ultimately, it is the greater collaboration among our fellow professionals – supported by initiatives such as BIM – that will enable us to achieve potential savings from renewable technologies. **CJ**

> Manufacturers can support the project team by providing realistic efficiencies on their product, rather than headline ones achieved in a laboratory

MIKE HEFFORD is head of renewable technology at Remeha Commercial

In control

Good control is critical to the effective operation of hybrid systems, enabling individual components and the overall system to achieve their maximum potential. Our system uses a specially configured, scalable BMS to integrate the two high-efficiency technologies, and more accurately to match the heating and hot-water requirements of the building. It is important that controls are straightforward and easy to use. With our system, a seven-inch touch-screen panel displays the performance data of all the components, with clear options for adjustments to ensure optimum operational efficiencies. It can also be monitored and controlled remotely.



The Remeha Touch BMS displays the performance data of all the components of the system

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GUIDE A

CIBSE's essential guide to environmental design explained, Part two

Thermal properties, plant sizing and natural ventilation are among the key areas covered in the latest edition of the environmental design guide. **Tim Dwyer** highlights the most notable changes in CIBSE's indispensible guide

MARKUS PFAFF / SHUTTERSTOCK

The CIBSE guide to *Environmental design* has had a major upgrade for the first time in nine years, and large parts of the edition have been revised. This is the second of three articles that aim to provide an overview of the new Guide A. As with all key CIBSE publications, this Guide can be downloaded free of charge by CIBSE members from the CIBSE Knowledge Portal **www.cibse.org/knowledge**

Chapter 3 Thermal properties of building structures

This chapter has one of the lightest touches of the 2015 Guide A revision. Updates and corrections include the redefinition of the equation for radiative heat transfer when considering an air cavity thermal resistance, and a clarification of the

thermal-bridging impact of metal wall ties that pass across an insulated cavity.

A small amendment to the wording of the explanation that 'U values apply between the internal and external environments' helps to ease the uncertainty about which temperatures to use for those who are inexperienced at determining heat flow through structures such as ground floors.

The chapter has been brought closer to current building techniques, with the introduction of multi-layer foil insulation and reorganised tables of glazing U values. These now include data for triple-glazed windows, as well as listing an extended set of additional thermal resistances, such as blinds, curtains and secondary glazing.

Since the 2006 Guide, the effect of thermal bridging has become increasingly significant as standards require more rigorous – and realistic – measures of thermal performance. This is reflected by the inclusion of a new section on thermal bypass and a rewrite of the coverage of linear thermal transmittance. The tables of 'typical' building constructions maintain their historical interest, but with very few of the external structures having a place in modern buildings.

About the author

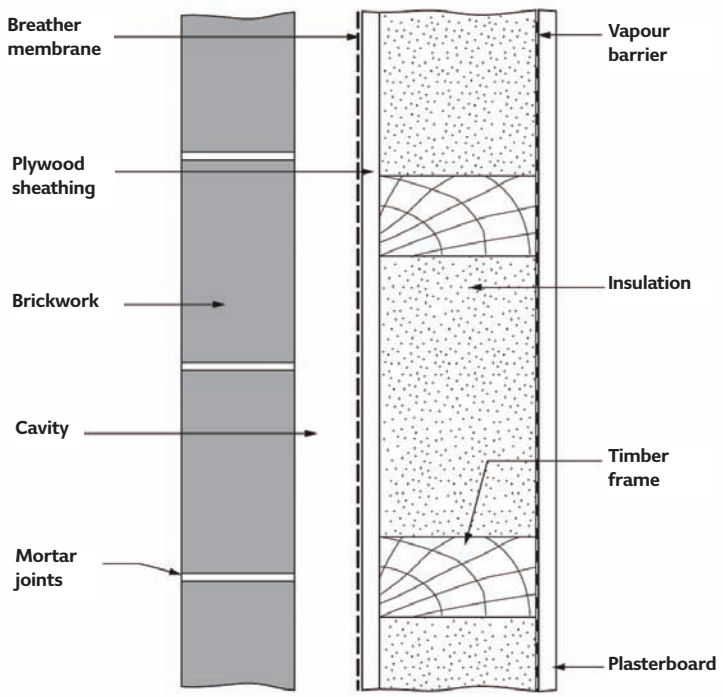
Lead author Brian Anderson has extensive experience in the assessment of thermal transmittance for real building elements, having managed and delivered key, UK government guides on the evaluation and application of U values.

Chapter 4 – Ventilation and air infiltration

This chapter has been extensively rewritten and reordered. The reorganised introduction explains that, while building ventilation and air exchange provide fresh air and dilute pollutants, they can account for half of a building's primary energy use.

The information, data and equations have been developed and reorganised to give a core understanding, with the expectation that the simple tools could, for example, be set up using a spreadsheet model.

The scope has a subtle change, noting that the assessment of ventilation is not only useful in terms of passive cooling, but also in the general maintenance of thermal comfort. A useful addition is the explanation of the two 'units' of ventilation – airflow rate and airchange rate. The former is a volumetric flow rate, such as litres per second, while airchange rate is typically expressed in air changes per hour.



(Not to scale)

Figure 1: Data, calculations and examples of Chapter 3 – such as for the timber-frame wall construction shown – have few changes compared with the 2006 edition [Source: CIBSE Guide A 2015 Fig 3.6]

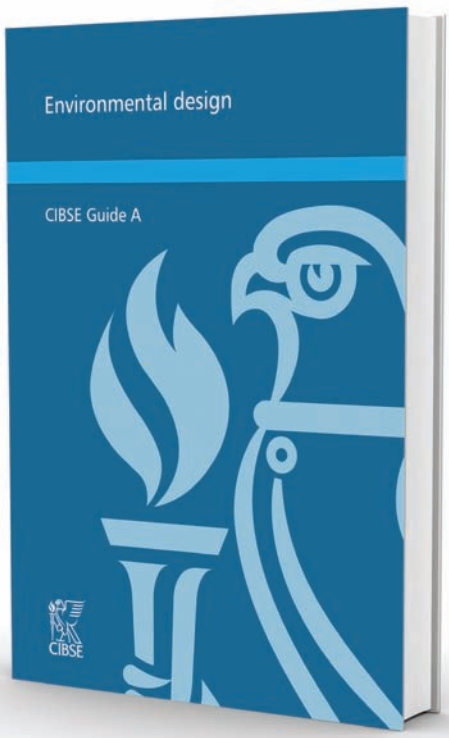
There is general confusion in the industry – including in written standards and academia – about the denotation of 'air infiltration' and 'ventilation'. This is an area in which the author has extensive experience, so it is no surprise that this is clarified early on.

The concept of airtightness has been brought forward from the latter stages of the previous document, and the section has been rewritten. It has more extensive descriptions of relevant terminology such as 'air leakage index' and 'air permeability', plus typical values that will be used to determine appropriate air tightness in buildings.

There is a stronger emphasis on the role of ventilation to secure optimum air quality for occupant health and comfort, with new tables covering minimum ventilation rates for dwellings, offices and other buildings – most of which have been acquired from various UK regulatory documents.

The expanded explanation of indoor pollutants includes the classic concentration decay equation, which allows analysis of the dilution effect of outdoor air on contaminants in a room. By applying this equation, the chapter explains how an understanding of dilution ventilation may be used to establish the air quality in a space, as well as the effect of incoming contaminants in the outdoor air.

Before the chapter goes on to consider the effect of ventilation on heat loss, there is a very brief discussion of filtration that refers the reader to more appropriate sources.



Having defined the basic heat loss (or cooling) equation for ventilation, a new concept is introduced. This accounts for the limits in heat transfer between the ventilation air and internal fabric of the building, which can be used, for example, when evaluating cooling from outdoor ventilation. In future additions – or online supporting notes – this may benefit from a little more explanation and an illustration of the consequence of the moderated ventilation affect. This section closes with an example of how the 'reservoir' of the bulk of the air in the building may maintain reasonable air quality, even at low rates of ventilation.

There follows a section that provides expanded coverage of mechanical systems. After a brief rationale for the use of mechanical ventilation, there is a set of sketches (Figure 2) of generic mechanical systems, and a discussion of the pressures that drive airflow through buildings and their ventilation systems.

The two main room air-supply systems are noted together, with a few lines of description followed by brief notes on distribution techniques. This provides a preamble to a new discussion on environmental design for energy-efficient mechanical ventilation, which considers fan power and methods of control, as well as air-to-air heat recovery and commissioning and maintenance.

The next section covers the fundamentals of natural and mixed-mode ventilation, with a much stronger emphasis on the application of natural ventilation as a cost-effective solution. The principles have, of course, not changed since the 2006 edition – stack and wind-driven ventilation; however there is a new commentary, which includes reference to more recent research.

'Methods for estimating their infiltration and natural ventilation' has not changed significantly, but has been restructured and updated. The brief section on airtightness testing in the 2006 edition has been partly rewritten, with the notable increase in the upper limit of building pressure differential from 50 Pa to 100 Pa.

The appendices contain updated pressure coefficient data, as well as more extensive air-leakage characteristics for building elements. The final pages provide the 'retro' BASIC code listing for Martin Liddament's AIDA air-infiltration calculator, which can be morphed into modern programming environments.

About the author

Martin Liddament FCIBSE is chair of the CIBSE Natural Ventilation Group.

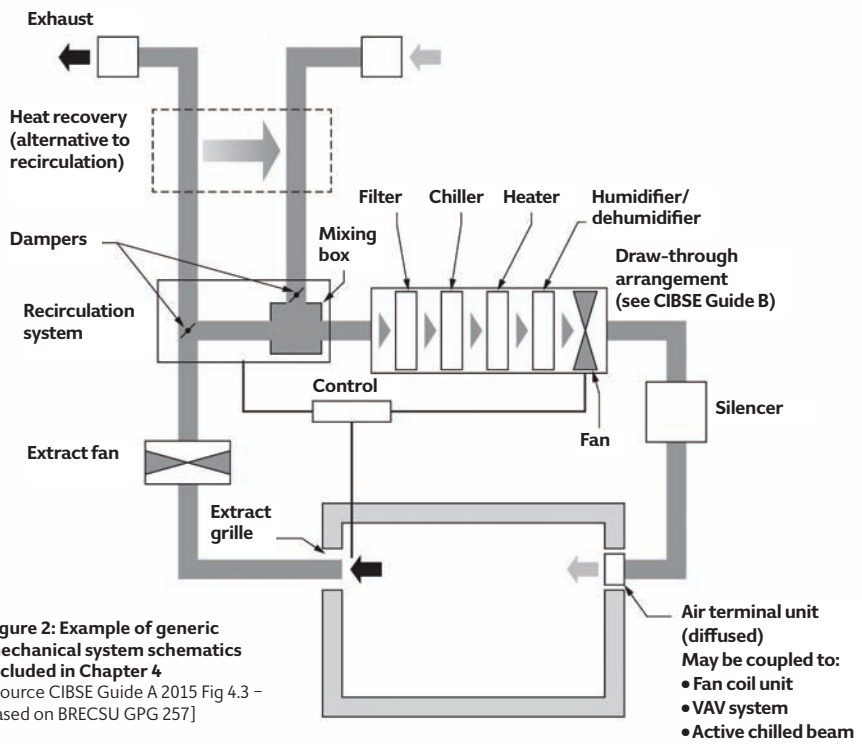


Figure 2: Example of generic mechanical system schematics included in Chapter 4
[Source CIBSE Guide A 2015 Fig 4.3 – based on BRECSU GPG 257]

Guide A can be downloaded free of charge by CIBSE members from the Knowledge Portal at **www.cibse.org/knowledge**

Chapter 5 – Thermal response, plant sizing and energy conservation

This chapter has been written to satisfy the need for establishing loads in buildings and evaluating baseline performance for regulatory purposes, and to help designers meet more exacting standards than those required by the UK's national calculation methodology (NCM).

ASHRAE Standard 90.1 is cited as one of those standards where the emphasis is on detailed modelling of the HVAC systems, as opposed to the NCM, which is designed for compliance checks.

Engineers have frequently raised concerns about using 'black box' software when they have little knowledge of the calculation method and no way of verifying the implementation of the underlying theory.

As with the previous edition, this chapter recommends the use of CIBSE TM33 *Tests for software accreditation and verification* for that validation process, but emphasises the limitations of those tests. The need for integrated quality management is stressed and there are minimum requirements for the technical content of software tools, and a suggested method for using these tools.

The challenge of assessing overheating is discussed, and reference is made to more extensive coverage in CIBSE TM52 *The limits of thermal comfort: avoiding overheating in European buildings*; however, the largest proportion of this chapter is still on the analysis and evaluation (and mitigation) of summertime temperatures in buildings.

The CIBSE Admittance Method is applied within this section, with a commentary that provides a much clearer understanding of the concepts and application.

Boundaries between 'building' and 'system' become fuzzier as more sophisticated modelling and simulation tools enable integrated design, so there is now a section on HVAC system and thermal storage modelling.

A new section, 'Calculation methods for thermal design', introduces freshly composed sections, covering: 'Heating plant sizing', 'Cooling plant sizing', 'Summer temperatures in buildings' and 'Building energy demand'. Although they include much material from previous editions, these areas have been completely rewritten to provide clearer and more joined-up explanations of these interdependent computations.

The CIBSE Admittance method has been retained, but it is noted that it is there for it's 'educational value', and is suitable only for conventional building air conditioning loads

Design question

	Risk of overheating	Size of openings for natural ventilation	Local plant sizing	Central plant sizing	Energy demand	Renewables	Part L compliance
Concept	Dynamic thermal modelling CIBSE steady and admittance methods BRE environmental design manual	Rules of thumb CIBSE AM10 Computational fluid dynamics	CIBSE steady and admittance methods Dynamic thermal modelling	Rules of thumb Dynamic thermal modelling	Benchmarks Dynamic thermal modelling	Rules of thumb London renewables toolkit Dynamic thermal modelling	SBEM Dynamic thermal modelling
Scheme	CIBSE steady and admittance methods Dynamic thermal modelling	CIBSE AM10 Computational fluid dynamics	CIBSE steady and admittance methods Dynamic thermal modelling	CIBSE steady and admittance methods Dynamic thermal modelling	Dynamic thermal modelling	Dynamic thermal modelling	SBEM Dynamic thermal modelling
Detail	Dynamic thermal modelling	CIBSE AM10 Computational fluid dynamics	CIBSE steady and admittance methods Dynamic thermal modelling	CIBSE steady and admittance methods Dynamic thermal modelling	Dynamic thermal modelling	Dynamic thermal modelling	SBEM Dynamic thermal modelling

Figure 3: An example of possible routes from design query to detail investigation [Source: CIBSE Guide A 2015 Fig 5.2]

and early-stage overheating risk assessment. This perhaps recognises that modelling tools are overtaking the practical application of this simple method (no matter how much it is enjoyed by academics). However, the explanations – and the sometimes difficult-to-comprehend concepts that underpin this cyclic calculation method – have been rewritten to provide a more considered description of how to understand and implement it. It is applied extensively in the latter sections of the chapter.

Chapter 5 emphasises the need for an holistic approach when undertaking building thermal analysis – and particularly when examining overheating. It highlights the need for dialogue with the client to include lighting and indoor air quality (and implicitly noise), as well as the thermal analysis and predicted operative temperatures.

Such an analysis – particularly in buildings that are seen as being passively environmentally controlled – is likely to require an understanding of the effects of airflow throughout the spaces. This edition includes a far more extensive section on airflow modelling, which considers different techniques and applications, and replaces the few paragraphs contained in the 2006 version.

To illustrate that 'the calculations to be carried out at each design stage depend on the design question being answered', there is a new table (Figure 1); this provides an example hierarchy of methods and tools to navigate a route between specific design queries and detailed resolution. This is a welcome addition to guide the designer towards establishing their own path through the plethora of tools and methods outlined in this chapter.

The six appendices to Chapter 5 included in the print edition – in addition to the six that are available online – are a treasure trove of information. They include some of the key worked examples that were previously in the main chapter, as well as additional supporting descriptions, derivations and calculations.

New areas include banded weather data and bin-method application; an extensive discussion on glass and glazing; and the algorithm that drives the excellent (free) passive design assessment (PDA) tool, used to make speedy early assessments of building thermal performance.

There is a fresh clarity in these appendices and, along with the rest of the chapter, they deserve the attention of many in the industry who consider that they 'model' buildings.

About the author

Michael Holmes' MCIBSE work has been used extensively in CIBSE publications to model buildings in order to establish design loads and building performance. **CJ**

● Next month: Tim Dwyer completes this series by highlighting the significant changes in the chapters considering internal heat gains, moisture transfer and condensation, and health issues.

MARKUS PRAFF / SHUTTERSTOCK

Professional development

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You can also complete the questionnaire online, and receive your results by return email.

Solar thermal heating for commercial potable hot water

This CPD module considers appropriate sizing and stagnation mitigation for solar thermal systems used to supply heat for domestic (potable) hot water in commercial premises

There can be strong financial and environmental reasons to consider the application of solar thermal hot water heating in commercial applications. In the UK, the commercial Renewable Heat Incentive (RHI) payments provide around 10p per kWh of useful solar thermal heat generated to heat domestic hot water (DHW), in addition to the benefit of the 'no-cost' hot water itself.

The RHI is designed to provide a return on investment (ROI), so that properly applied technology is economically viable. It is particularly beneficial in applications where solar thermal is displacing oil or electric heating, and can give very attractive payback periods. Environmental assessment methods (such as BREEAM and LEED) recognise the contribution of applying renewable technologies either directly or by considering the low emission levels from the building heating systems. To ensure year round supply, solar thermal systems may be designed to work alongside – and in conjunction with – the majority of traditional hot water heating systems.

Solar irradiance will vary throughout a day (and, of course, across the seasons) and depend on the weather – it may range from tens of watts per square metre up to several hundred watts in the middle of a summer day, depending on the cloud cover. But even in northern European locations, there is sufficient solar energy to provide useful hot water – typically meeting 30 to 40% of annual requirements in a commercial building application.

To determine the most appropriate size of solar thermal system requires knowledge of the daily hot water consumption. Typically, this will relate to the type of installation, and can be evaluated using actual historic hot water usage data or tabulated data such as that shown in Table 1. However, some caution should be used with such generalised data, as it may be misleading – for example, a (limited) study[1] in the US showed that in two monitored hotels, there was no relationship between the number of guests and hot water consumption.

Colleges and schools	
- boarding	115
- day	15
Factories	15
Hospitals	
– general	136
– infectious	225
Hotels	
– five-star rating	136
– two-star rating	114
Offices	14

Table 1: Indicative hot water use per person per day (litres) (Source: CIBSE Guide G)

Since the timing of hot water load is unlikely to match the availability of the solar resource, a storage (buffer) tank is used to store the heat for subsequent use by the DHW system. In northern Europe, the principal systems used to collect and store the heat either employ a sealed system (as shown in Figure 1) or, alternatively, when using flat-plate collectors, a 'drain-back' atmospheric pressure system (Figure 2).

The two main commercial methods of capturing the solar energy – flat-plate collectors (Figure 3) and evacuated tubes (Figure 4) have been described in a previous CPD article – see **www.cibsejournal.com/cpd**/2009-02/. *(For an interesting real-time comparison of an example domestic installation of the two solar collector types, see* ***http://bit.ly/comparecollectors****).*

The performance of the collectors will be determined by their type and position. Both the orientation and the tilt of the receiving panel will impact the availability of solar radiation. The optimum is related to the site latitude – in the UK this means that simple flat-plate collectors should be south facing, with an angle of inclination of between 30° to 45°.

Both closed and open (atmospheric) systems employ a pump and controllers to optimise the amount of useful collected solar energy. Once

the heat has been captured, it is commonly used as part of a combined solar store and DHW store (as in Figure 3) or – increasingly commonly – to preheat the water supply for a separate dedicated DHW storage tank or continuous-flow (gas-fired) hot water system.

Although the drain-back system – which allows water to drain from the solar collectors when there is no demand for the heat or there is a risk of freezing – is simpler in concept, and requires fewer components, it is the closed system that is more often used, as it is more forgiving of variances in installation and more responsive to changes in demand. Drain-back systems would normally use water as the heat transfer fluid, whereas sealed systems use a glycol mixture, since the fluid will be subject to sub-zero temperatures in the collectors and pipework. The use of a glycol solution is a compromise, as it is acidic and has a lower heat transfer coefficient (by about 15%) compared with water, and is subject to significant degradation as temperatures rise towards those that can occur at times of 'stagnation'.

Stagnation

Where there is no flow through the collectors – typically, when there is no DHW demand or there has been a component failure – and the sun is shining, the collectors will rise in temperature; this is known as 'stagnation' (see the box 'The five phases of stagnation'). The manufacturer's quoted 'stagnation temperature' for a particular collector is the temperature reached when, under stagnation conditions, the heat losses from the collector are equal to the heat gains. This will depend on climate, as well as the thermal characteristics of the collector. There are standardised conditions for 'stagnation temperature' defined by EN ISO 9806 *Solar energy – Solar thermal collectors – Test methods* to enable comparison and

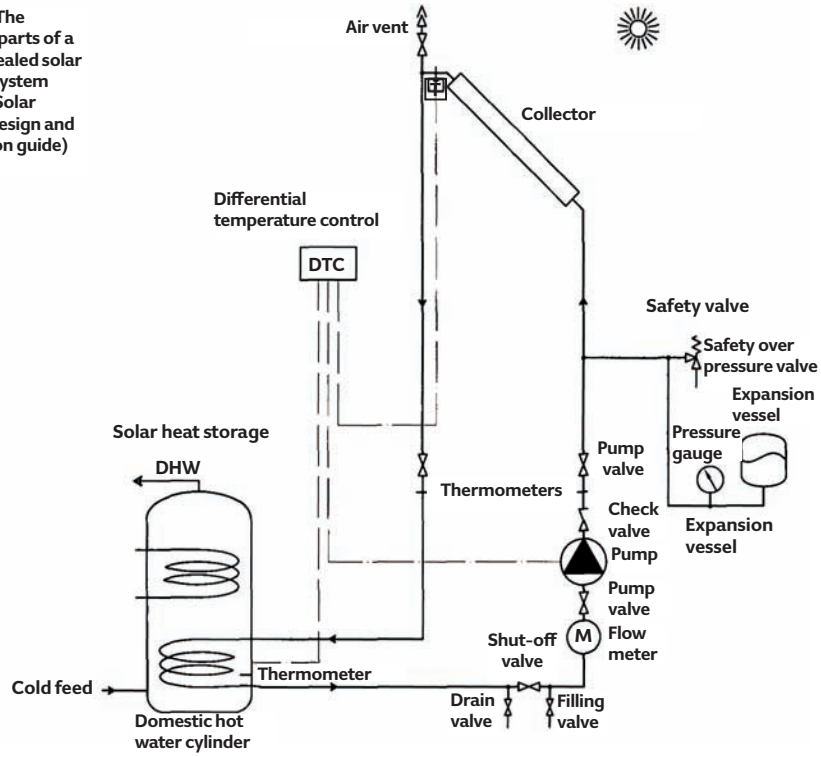

Figure 1: The principal parts of a generic sealed solar thermal system (Source: Solar heating design and installation guide)

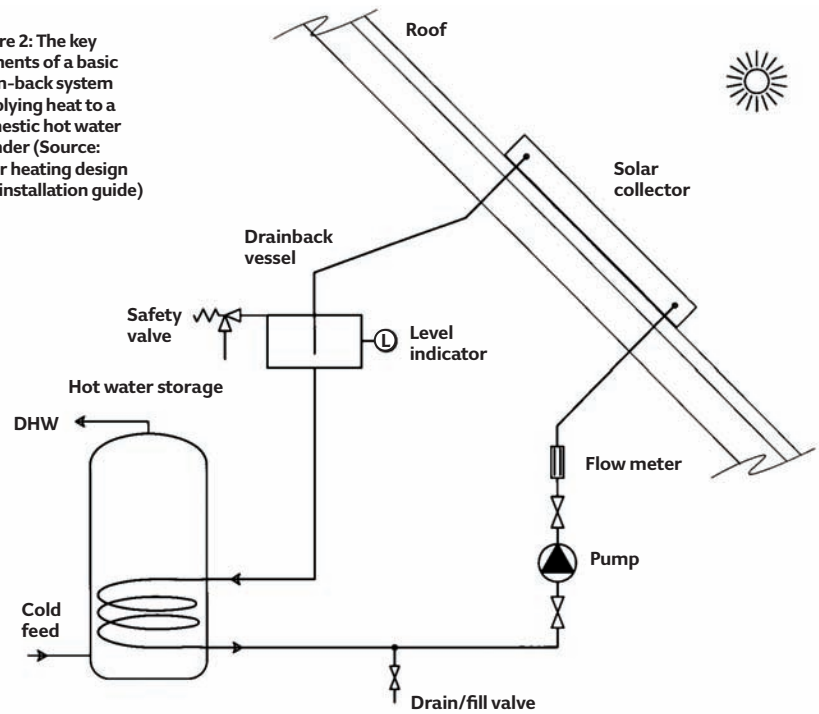

Figure 2: The key elements of a basic drain-back system supplying heat to a domestic hot water cylinder (Source: Solar heating design and installation guide)

The five phases of stagnation

This is based on the informative IEA publication *Stagnation behaviour of solar thermal systems*[2] that provides the following simplified stagnation phases:

1 – Collector temperatures rise until evaporation process begins somewhere in the upper part of the collector array. Increase in system pressure is small.

2 – Liquid is pushed into expansion vessel by steam from collector. System pressure rises rapidly, as does the boiling point in the pipe sections filled with saturated steam. Liquid almost at boiling temperature puts a high temperature stress on system components. This phase lasts for only a few minutes and ends when there is a continuous path for steam from the collector inlet to the outlet. Residual liquid remains in the collector.

3 – Liquid left in collector evaporates passing energy to other system components by condensing steam at the local boiling temperature. With system pressures of around 1.5 to 3.5 bar, boiling temperatures are circa 130°C to 155°C. Energy transported out of the collector is released to components (and the environment) from condensing steam. At the end of phase three, the steam volume and the system pressure reach maximum values.

4 – Superheated steam in collector decreases the effectiveness of heat transfer so steam volume reduces, drawing liquid back until the lower connection of the collector, even though solar irradiation continues. This cycle ends when solar energy reduces. On collectors with the top fill connections, slow saw-tooth-like pressure fluctuations can occur.

5 – Collector refills when collector temperature falls below the boiling temperature and condensation begins when solar irradiation reduces.

performance modeling of different collectors.

To avoid pressure damage in a closed circuit, an expansion vessel is used to accommodate the expanding liquid (as well as the displacement caused by boiling liquid). Since this is a sealed system, a pressure relief device is also included – this will reject valuable system fluid to drain away, and should only be for emergency use.

Pipework, components (including the expansion vessel) and connections rising to the collectors (the 'solar loop') must be installed with methods that can withstand the stagnation temperature.

There are systems – particularly those employing evacuated tube collectors – that prevent heat flowing into the solar loop when it is at risk of stagnation conditions. Alternatively, loops using convection heat exchangers may be used to reject the heat to the outside air at times of low DHW load. These systems can respond quickly to changing demands without evacuating the collectors, as well as limiting the risk of excessive temperatures that will otherwise reduce the life of system components.

Properly designed and maintained, drain-back systems can also avoid the persistent high temperatures of stagnation conditions.

Balancing the system components

Whichever type of system is used, there is a balance required between the daily hot water demand, the area of the solar collectors (the 'absorber' area) and the solar store (and its associated heat transfer coil). The term 'solar fraction' (SF) is used to describe the proportion of hot water that can usefully be produced by the solar thermal system. Typically, this will be quoted as an annual figure and installations will vary from approximately 30% (in colder climes) to 60% (in southern Europe).

To evaluate an appropriate balance of component size, the collector performance coefficients that account for the gains and losses from collectors, as defined by EN ISO 9806 (or its predecessor EN12975-2 *Thermal Solar Systems and Components*), are used with a dynamic thermal model or an application of software, such as the free RETScreen[3], the more basic Tecsol[4], or commercial packages such as TSol.[5]

For example, consider a small two-star hotel application in Stornoway (latitude 58°) with a year round occupancy of 40 guests. Modelled using a tool such as Tecsol, this allows a swift sensitivity analysis on the effect of altering the number of collectors and the size of the solar store. This example will use 2.37m² flat-plate collectors (such as Baxi Sol 250 of Figure 3) facing due south with an inclination of 35°. The data produced from this simple exercise (shown in Figure 5) appears to support the 'rule of thumb' that 50 litres of thermal store per metre

Figure 3: Flat-plate solar panels being installed on the roof of a London hotel (Source: Andrews Water Heaters)

Figure 4: Evacuated tube collectors on Bristol educational building (Source: Andrews Water Heaters)

squared of flat-plate absorber appears to be a reasonable maximum size. (Where the solar store is combined with the DHW store, this volume may well be larger.) It also indicates that there is clearly a diminishing benefit as more collectors are added. Also, as the number of collectors increase, there is a greater opportunity for stagnation in the summer months.

The contribution to the heating of the DHW (the solar fraction (SF)) will vary throughout the year, as shown in Figure 6. Although there may appear to be an opportunity to increase the winter SF by adding more collectors, this will likely lead to stagnation in summer and, of course, increase the time to deliver financial and environmental payback.

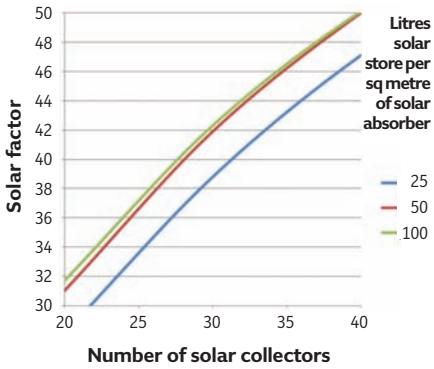

Figure 5: Illustration of the impact of the number of collectors and the volume of solar storage on the solar factor for the example hotel in Stornoway (based on simple analysis using Tecsol)

The total annual contribution to the DHW heating in this example was determined as being approximately 1 MWh per collector; the same installation in Plymouth (50°N) would produce approximately 1.25 MWh per collector per annum, and in Greece (38°N) 1.4 MWh.

Further reading:

CIBSE KS15 – *Capturing Solar Energy* provides a great overview of this topic.

The jointly published *Solar heating design and installation guide* by CIBSE et al has a comprehensive coverage, including several example calculations.

For a fundamental understanding of the thermal performance and application of solar systems, see the seminal book by Duffie and Beckman, *Solar Engineering of Thermal Processes*.

References:

1 Urban, E., *Monitoring And Modeling Hot Water Consumption In Hotels For Solar Thermal Water Heating System Optimization*, MSc Thesis, Appalachian State University, 2011.

2 *Stagnation behaviour of solar thermal systems – A report of IEA SHC – Task 26 Solar Combisystems*, November 2002.

3 www.retscreen.net

4 www.tecsol.fr/st_uk/default-uk.htm

5 www.solardesign.co.uk/tsol.php

Turn over page to complete module

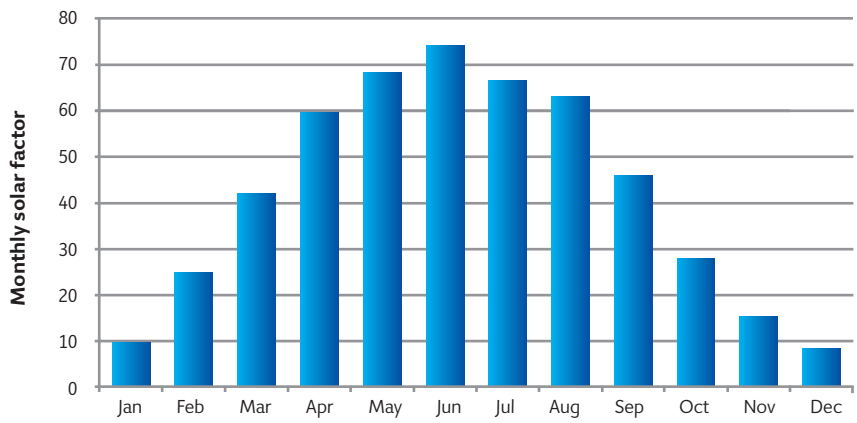

Figure 6: Monthly solar fraction for Stornoway hotel example, using 30 collectors and a solar store of 50 litres per square metre of absorber (based on simple analysis using Tecsol)

Module 80

August 2015

ANDREWS WATER HEATERS

1. What is the proportion of annual hot-water heating that could typically be expected from solar thermal systems in northern European applications?

- ☐ A 10-20%
- ☐ B 20-30%
- ☐ C 30-40%
- ☐ D 40-50%
- ☐ E 50-60%

2. According to the CIBSE Guide, what is the difference in the 'per person' hot water consumption in a five-star hotel compared to a two-star hotel?

- ☐ A They are the same
- ☐ B Approximately +5% per day in the five-star hotel
- ☐ C Approximately +10% per day in the five-star hotel
- ☐ D Approximately +15% per day in the five-star hotel
- ☐ E Approximately +20% per day in the five-star hotel

3. Which is the most recent international standard defining collector performance coefficients that account for thermal gains and losses?

- ☐ A KS15
- ☐ B EN ISO 9806
- ☐ C EN12975-2
- ☐ D IEA Task 26 Report
- ☐ E ISO 9001

4. During which of the 'five phases of stagnation' does the production of superheated steam reduce the heat transfer in the solar collector?

- ☐ A Stage 1
- ☐ B Stage 2
- ☐ C Stage 3
- ☐ D Stage 4
- ☐ E Stage 5

5. In the (simple) example, how much more annual contribution could theoretically be expected from a solar collector in Greece than one in Stornoway?

- ☐ A 10%
- ☐ B 20%
- ☐ C 30%
- ☐ D 40%
- ☐ E 50%

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Great service at Wimbledon

With 41 courts to keep irrigated, ground staff have their work cut out to maintain the world-famous Wimbledon grass courts. Water plays a significant role – but it's not a case of simply keeping the courts well hydrated; to achieve the perfect playing surface, each court has to be watered to its own precise needs.

To help them achieve this, the ground staff have an arsenal of Grundfos pumps, all living their quiet existence at the grounds, far from the eyes of the spectators and tennis stars. This secluded life belies the importance of the pumps and systems, however, as all the equipment must work flawlessly.

The Grundfos impact at the Wimbledon Championships does not end with the irrigation systems; the company has also supplied all the pumps and related solutions to the All England Club, where they help get the job done without creating a fuss.

● **Call 01525 850 000, email grundfosuk@grundfos.com or visit www.grundfos.co.uk**

Sustainable flexible cooling for MAF Properties' headquarters in Dubai

The headquarters of one of the leading companies in the Middle East and North Africa region, Majid Al Futtaim (MAF) Properties, is the first building in the UAE to achieve the LEED EBOM Gold rating. The AET flexible space, underfloor air conditioning system helps to achieve occupant comfort. Conditioned air is introduced into the space via floor-recessed fan-terminal units – or fantiles – which feature integrated controllers.

● **Call 01342 310 400, email lucy@flexiblespace.com or visit www.flexiblespace.com**

Elco boilers installed at National Graphene Institute

Three highly efficient, R600 gas-fired, floor-standing boilers – from Elco UK – have been installed at the new National Graphene Institute at the University of Manchester.

The £61m, 7,825m² building opened in March, and houses state-of-the-art facilities for research into graphene, the world's thinnest material.

The tight footprint of the building was a determining factor in the decision by project engineers at Balfour Beatty to specify the R600 boilers from Elco UK.

● **Visit www.elco.co.uk**

Aquatech booster sets prevent stagnant water issues

All the new Aquatech Pressmain Aquamatic AMV cold-water pressure booster sets include a flow-through vessel – an important step in preventing stagnant-water issues, which can occur when the units are not regularly or professionally maintained. The booster sets are programmed to run in staged-cascade operation – as the flow demand increases or decreases – making them energy efficient, and reducing running time and maintenance costs.

● **Call 01206 215121, email sales@aquatechpressmain.co.uk or visit www.aquatechpressmain.co.uk**

New airflow CPDs bring clarity to ventilation legislation

Airflow Developments has created two new CPDs, bringing together all the relevant legislation for those designing and specifying compliant ventilation in residential and non-residential buildings.

The *UK Building Regulations relating to ventilation and heat recovery* CPD provides quality information in relation to residential buildings. It covers approved documents (Part F and Part L1 and L2) and their compliance guides.

● **Visit www.airflow.com/trainingandcpdservices**

Andrews expands sales team

Four new area sales managers have been appointed by Andrews Water Heaters. Ricky Lewis joins from Remeha Commercial to cover the Home Counties; Neville Radford takes on the midlands, having previously worked for Hamworthy Heating; Dean Thornton will deal with the southern counties, after experience in the residential sector; and Peter Winfield, formerly of EOGB Burners, will cover the South East. The appointments signal the start of a programme of investment into the brand.

● **Visit www.andrewswaterheaters.co.uk**

Atlantic provides perfect climate for Waltham puppies

Atlantic Boilers has supplied a new electric boiler system for precise control of heating in a new puppy birthing zone at the Waltham Centre for Pet Nutrition. The Leicestershire-based centre conducts scientific research into pet care, nutrition and behaviour.

Its new boiler system uses reverse heat pump air conditioning, supported by two Atlantic multi-elec standard 120kW electric boilers. These are silent, efficient and require minimum maintenance.

● **Call 0161 621 5960, email nabeela@atlanticboilers.com or visit www.atlanticboilers.com**

Danfoss's new heat exchangers lead the way with HVAC efficiency

Danfoss is driving innovation in HVAC performance with a range of plate heat exchangers that deliver efficiency and flexibility in a compact design.

The new range features a unique dimple pattern design for improved flow of fluid across the micro plates and utilisation of the surface area.

The new micro plate heat exchangers offer up to 10% enhanced heat transfer and up to 35% lower pressure loss.

● **Call 0845 121 7400 or visit www.heating.danfoss.co.uk**

EcoMESH adiabatic air inlet cooling

The EcoMESH concept is based on intermittently spraying water onto a mesh placed in front of the heat-reduction surface.

This method reduces power consumption by as much as 30-40% and improves the performance of air cooled chillers, dry coolers and condensers and refrigeration plants.

EcoMESH is a unique mesh and water spray system that improves performance, reduces energy consumption, eliminates high ambient problems, is virtually maintenance free and can pay back in one cooling season.

● **Call 01733 244 224 or visit www.ecomesh.eu**

New air handling unit optimises energy efficiency

Daikin has launched a new 'plug and play' air handling unit – the D-AHU Modular – which keeps down costs by improving efficiency through heat recovery and reduced ecological impact. The highly efficient, quiet and intelligently controlled air handling is a perfect climate-control solution for offices, schools and colleges, hotels and leisure centres.

The D-AHU Modular is able to salvage precious energy from the exhaust air stream and reuse it to heat intake air – improving energy efficiency.

● **Call 01322 424 950, email info@daikinapplied.uk or visit www.daikinapplied.uk**

Elco UK's floor-standing boilers guaranteed for 10 years

Elco UK has extended the guarantees on its powerful range of floor-standing, gas-fired condensing boilers to 10 years. All boilers in the R600, R3400, R3600 and TRIGON L ranges now boast this comprehensive warranty, in addition to impressive outputs of up to 1.9MW, low water content for optimum efficiencies and stainless steel heat exchangers, which provide lifetime reliability. These boilers have set benchmarks for high output combined with low weight, compact dimensions and low emissions.

● **Call 01268 546 721 or visit www.elco.co.uk**

Goosehill Hall chooses Jaga in key restoration

Goosehill Hall is a prominent Grade II-listed building in Derbyshire's Hope Valley. A recent major refurbishment of the property was an opportunity to install an efficient and effective heating system.

Jaga's Strada DBE heat-pump-compatible radiators were used in various bedrooms, bathrooms and living spaces – each specified in different sizes as per the building's requirements. Additionally, Jaga's mini freestanding DBE radiators were chosen to fit into pre-existing alcoves in the ground-floor dining room.

● **Call 01531 631 533, email jaga@jaga.co.uk or visit www.jaga.co.uk**

Excool wins at the Eco Internet Awards 2015

Congratulations to Excool for winning at the Eco Internet Awards 2015, held in Cologne, Germany, on 25 June.

The accolade was presented to the company for Excool Space – under the datacentre/hosting/housing category – and is a clear indication of how far the firm has come in such a short time.

Excool Space is the only pre-built, modular, datacentre system designed to provide the highest efficiency, plus cost-effective scaleability for reconfiguring or relocating.

● **Call 01527 492750 or visit www.excool.com and www.excoolspace.com**

New home for Kamstrup UK

Kamstrup is synonymous with high-accuracy energy metering and remote-reading solutions. With an exciting range of RHI-compliant heat and energy meters conforming to MID EN1434, Kamstrup also offers a range of meter-reading solutions, from simple to fully automated installations.

The UK team has just moved to a modern, open-plan office at Unit 2B, Stour Valley Business Centre, Brundon Lane, Sudbury, Suffolk, CO10 7GB.

● **Call 01787 319081, email info@kamstrup.co.uk or visit www.kamstrup.com**

Admiral flies the flag with Kingspan industrial insulation

The new Cardiff HQ of Admiral insurance has achieved a BREEAM 'Excellent' rating, thanks – in part – to Kooltherm FM pipe insulation, from Kingspan Industrial Insulation. To meet the 'Excellent' standard, more than 15,000m of Kingspan's Kooltherm FM pipe insulation was specified. It is suitable for pipework and equipment operating in temperatures ranging between -50°C and +110°C, and offers industry-leading performance, with thermal conductivities as low as 0.025 W/m·K.

● **Call 01544 388 601, email info@kingspaninsulation.co.uk or visit www.kingspaninsulation.co.uk**

New home for Marflow Hydronics

Marflow Hydronics has moved to a bigger office and factory space as a result of its recent significant growth.

The company has had double-digit growth for the past three years and extended its team greatly, so needed to find somewhere to house everyone and everything.

The premises have allowed the firm to build new facilities, offering better training and demonstration opportunities, and an improved production area.

● **Visit www.marflowhydronics.co.uk**

Mikrofill supplies Solihull School

Solihull School (below) is a co-educational, independent school in the centre of Solihull, in the West Midlands.

As part of the school's continual improvement programme, a refurbishment of the sports hall was carried out. Mikrofill supplied an Ethos 50kW condensing boiler, pressurisation package and an Extreme 300l HWS loading cylinder c/w unvented kit.

The equipment provides heating to a VT circuit within the sports hall and more than 1,100l/hr of HWS to the shower block.

● **Call 03452 60 60 20 or visit www.mikrofill.com**

Klima-Therm to distribute Gree's pioneering photovoltaic-powered VRF and split air conditioning

Klima-Therm has been appointed as a distributor for Gree's pioneering photovoltaic-powered VRF air conditioning and split systems. The announcement follows the firm's recent distribution agreement with Gree for centrifugal chillers, and means Klima-Therm is the only UK supplier of the Chinese manufacturer's full air conditioning range.

Klima-Therm will stock all popular models of Gree VRF and split air conditioning, plus spares.

● **Call 020 8971 4195 or email info@klima-therm.co.uk**

Remeha Commercial appoints new business development manager

UK heating manufacturer Remeha Commercial has appointed Paul Hawkins as its national business development manager.

In this key role, Hawkins is tasked with developing and managing strategic business relationships with existing and new customers across the UK. He is also the Remeha area sales manager for the North East region.

With nearly 30 years' experience in the commercial heating industry, Hawkins (right) brings a wealth of technical knowledge and sales expertise to the position.

● **Call 0118 978 3434, email boilers@remeha.co.uk or visit www.remeha.co.uk**

Pegler Yorkshire launches range of CPD modules

Plumbing and heating manufacturer Pegler Yorkshire has launched a portfolio of continuous personal development (CPD) modules, which are suitable for industry professionals across a variety of sectors.

The online training modules – which can be accessed via 'My PY' on the company's new website – cover general topics, including central heating, taps and mixers, metal push-fit, and commissioning. More modules will be uploaded to the website throughout the year.

Additionally, Pegler Yorkshire is continuing to develop a portfolio of CPD site seminars.

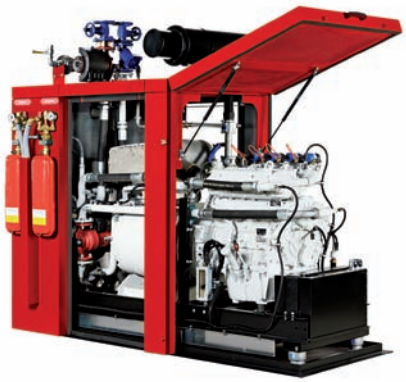
● **Call 0844 243 4400 or visit www.pegleryorkshire.co.uk**

Remeha Commercial launches new natural gas CHP range

Remeha Commercial has introduced a new range of combined heat and power (CHP) systems to its low-carbon commercial heating range.

The Remeha R-Gen Natural Gas CHP includes 26 models with outputs from 20kWe up to 2,000kWe. With total efficiency levels of between 85-90%, the Remeha R-Gen NG CHP range offers a potential saving in primary energy of around 30%, and a reduction in GHG emissions of around 20%.

● **Call 0118 978 3434, email chp@remeha.co.uk or visit www.remeha.co.uk**



RDM launches new control system front end with 10.1-inch touch screen

To optimise the user experience and make it even easier to monitor and control sites, the front end of the dmTouch resource data management's advanced control system now comes with a 10.1in multi-touch screen.

The dmTouch gathers high volumes of complex data from multiple sites in real time, and processes it into easily interpreted insights, accessible remotely on a PC or mobile device.

● **Call 0141 810 2828, email sales@resourcedm.com or visit www.resourcedm.com/dmTouch**

The perfect plan

The Plan Compact, from Purmo, is a panel radiator with a difference. Its sleek and stylish appearance is characterised by its smooth front panel and laminated finish. It comes with a top grille and side panels for a look that blends effortlessly into the background.

The Plan Compact combines these good looks with leading performance, and comes in a large range of types and sizes available from stock, and in special colours on request.

● **Call 0845 070 1090, email uk@purmo.co.uk or visit www.purmo.com/en**

iVECTOR is Myson's quietest fan convector yet

Traditional fan convectors have a reputation for being noisy, but Myson decided to break the mould and make sound levels a key consideration during the development of the iVECTOR.

The result is that Myson has delivered its quietest fan convector yet, without compromising on performance. The stylish-looking iVECTOR operates silently at normal speeds while maintaining high heat outputs.

● **Call 0845 402 3434, email sales@myson.co.uk or visit www.myson.co.uk**

Spirotech makes lasting impression on Wolverhampton homes

Spirotech has been working closely with housing management organisation Wolverhampton Homes to help protect and maintain the energy efficiency of its gas domestic heating systems in approximately 19,300 properties across the city.

Wolverhampton Homes switched to Spirotech and the SpiroTrap MB3 magnetic dirt separator 18 months ago.

The SpiroTrap MB3 features a detachable, external magnet that contains unique field-booster technology. This helps to separate and quickly remove even the smallest dirt particles – both magnetic and non-magnetic – from a heating system.

● **Visit www.spirotech.com**

Ideal Commercial boilers make the grade at the University of London

Ideal Commercial has supplied eight floor-standing condensing boilers to the University of London as part of an environmental initiative to reduce carbon emissions and minimise running costs during ongoing refurbishment projects.

The Evomod and Imax Xtra floor-standing boilers have been installed in three student accommodation buildings and are now delivering reliable, high-efficiency heating.

In addition to providing warmth to the students' rooms, the heating system in each hall also serves a bar, kitchen, dining room, laundry room and games room.

● **Call 01482 492 251, email commercial@idealboilers.com or visit www.idealcommercialboilers.com**

John Cleveland College gets fired up over wood chips

A college in Leicestershire has saved £30,000 in just four months, thanks to a new woodchip boiler supplied and installed by Rural Energy.

The 800kW Herz BioFire boiler – for which Rural Energy is the sole mainland UK distributor – is expected to save John Cleveland College up to £45,000 a year in fuel and maintenance.

In addition, the new biomass heating system is expected to reduce the college's carbon emissions by around 250 tonnes per year.

● **Visit www.ruralenergy.co.uk**

Poor ventilation linked to cardiovascular disease

Ventilation specialist Vent-Axia has welcomed new research on the dangers of poor indoor air quality. A pan-European study by the National Institute for Health and Welfare has highlighted the impact of indoor allergens on disease and life expectancy, revealing links between indoor exposure to pollutants and cardiovascular disease. It claims indoor air pollution is potentially responsible for the annual loss of more than 200,000 healthy life years in the UK.

● **Call 0844 856 0590 or visit www.vent-axia.com**

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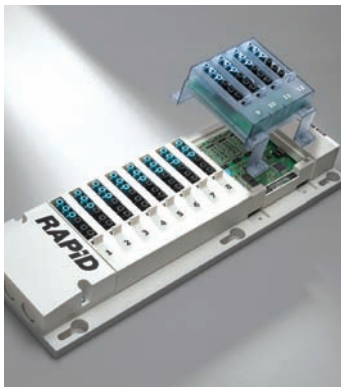

CP Electronics' sophisticated RAPID lighting control system just got slicker

The flagship RAPID, fully addressable lighting-control system, from CP Electronics, has long been applying intelligent control and energy efficiency in thousands of buildings. This year, the next generation of RAPID will be launched – providing a smarter, evolved and cutting-edge solution.

This advanced system combines state-of-the-art technology and modular mechanics with an easy-to-use front end PC software and graphical interface. Key highlights of the system include an expandable lighting-control module and new energy-measurement technology.

● **Call 0333 9000 671, email enquiry@cpelectronics.co.uk or visit www.cpelectronics.co.uk**

Lift-off for Toshiba's new digital inverter air conditioning units

The first UK installation of Toshiba's new high-efficiency Digital Inverter 4 range of air conditioning units has been carried out by Metainy Air Conditioning.

The new heat pump-based system was installed at Metainy's headquarters, at Woodlands Business Park, Maidenhead, as part of an upgrade of the existing system serving the project design and administration offices. The installation supplies cooled and heated air through the ceiling void to outlet grilles above the main working area.

● **Visit www.toshiba-aircon.co.uk**

JS air curtains are blooming at garden centre

JS Air Curtains proved to be the ideal choice to protect customers from chilly drafts at Cannon Hall Garden Centre, in the village of Cawthorne, South Yorkshire.

Seeking a retrofit solution to the problem of drafts, the centre's owner, Deborah Robinson, approached a number of companies, but eventually plumped for the cost-effective and attractive Mini Optima.

Offered in several lengths, the Mini Optima air curtain is available as a single- or three-phase unit, making installation simple.

● **Call 01903 858 656 or email sales@jsaircurtains.com**

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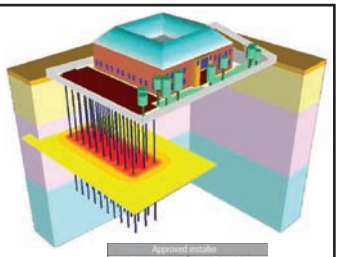

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Senior Mechanical Engineer

London/Surrey, £40k - £46k + benefits

The consultancy we are working with on this appointment are involved in a range of projects across the globe in residential, aviation, mixed use, leisure and commercial sectors. Responsibilities will include completing tender packages, preparation of budget cost reports, initial and detailed design of mechanical building services, and client liaison. BAR2727/JA

Senior Mechanical Design Engineer

London, £40 - £42p/h

Excellent opportunity for a long term contract with a leading building services consultancy working on major projects in the UK from the healthcare, laboratories, data centre, and mission critical sectors. Successful candidates should be capable of working under their own initiative, delivering to agreed timescales and possess specific project experience from within one of these sectors. BAR2666/KB

Principal Electrical Engineer

Central London, £75k – £100k + benefits

Our client is an International consultancy working on large multi-story buildings and commercial projects in the Middle East. This is an opportunity for a career driven engineer to make their mark by leading major projects and working directly with clients. You will lead a team, developing new and existing business relationships and accept responsibility for the successful delivery of key projects. This presents an opportunity in the future for equity stake/share ownership. BAR2583/MO

Lead Thermal Modeller

London, £35k - £50k + benefits

A unique opportunity for a senior thermal modeller to grow and manage a team at one of the UK's leading design consultancies. As a specialist with IES you will be the main point of call for modelling and energy reports. This is a rare role for you to educate engineers in best practice modelling on high profile projects and have a structured career path into senior management. BAR2817/CB

BIM Coordinator

London, £38p/h

An established M&E consultancy working with a high-profile educational institution requires a Revit Coordinator for at least 9 months to liaise with the MEP teams to develop a working BIM model on a 14 storey mixed use new-build project. This project consists of education, retail, and accommodation. You must have at least 2 years relevant experience to be considered for this role. BAR2815/MA

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Principal Mechanical & Energy Engineer

Ref: PSS-06741

Focused on best practice and value for money, you will design, implement and maintain effective policies and procedures for reactive and planned maintenance, as well as energy management. You will lead a team of mechanical and energy engineers and other technical staff. Professional Chartered Membership of CIBSE is essential, along with an established track-record in Mechanical and Energy engineering management across a wide portfolio of building types.

Mechanical Engineer – Compliance & Energy

Ref: PSS-06555

Expect to be involved in delivering long-term maintenance and capital projects, developing outline design briefs for commissions and ensuring we maintain high standards and low-energy design parameters. You'll have a track-record in construction, engineering and facilities management, and will hold or be working towards membership of CIBSE and the Engineering Council.

For further information and to apply please visit www.manchester.ac.uk/jobs

Closing date: Midnight, Monday 31 August 2015.

As an equal opportunities employer, we make all appointments on merit. However, we would particularly welcome applications from black and minority ethnic or female candidates as they are currently under-represented at this level in this area.

www.manchester.ac.uk/jobs

POSITIVE ABOUT DISABLED PEOPLE

LIGHTING THE WAY

With almost 3,000 members, the Society of Light and Lighting has grown rapidly over the past few years. The society's new president, **Liz Peck**, explains her journey into the industry and her aims for the year

Having come to office during the Unesco International Year of Light, Liz Peck – the Society of Light and Lighting (SLL) president – believes there is a real opportunity to get the society's message to a wider audience. The theme of her presidential address, given on 26 May, was collaboration and sharing expertise with other light-minded organisations. She emphasised that her aim was not only encouraging people and organisations to join the 'lighting family', but also to share their enthusiasm.

How did you start your career in lighting?

Like most people – by accident. I needed a job and a friend advised me to ring Concord Lighting, in Newhaven, which was often on the lookout for people in customer service. As part of a team, I took over the technical helpline and the obstinate side of my personality came to the fore, dealing with contractors who didn't want help from a woman. One day, I was talking to a lighting designer – asking how to read a cone diagram – and his job sounded quite cool. At my next appraisal, I asked if I could be a lighting designer. At the time of the Concord/Marlin merger, Mike Simpson invited me to an interview and I got the job. I did my Lighting Industry Federation courses and then went to the Bartlett, moving to Philips in the middle of my MSc. I never planned for a career in lighting – I don't even have a physics GCSE; but having fallen into and in love with lighting, I'd never change now.

What do you want to achieve in your year as SLL president?

I'm very fortunate to have come to office during the Unesco International Year of Light, so there's a real opportunity to get our message across to a much wider public. If the outcome of everything we do this year is inspiring a 10-year-old to get into lighting, that would be fantastic.

> I want to be appointed on a project because I'm good at what I do, not because of my gender

The theme of my presidential address was collaboration. We have so many synergies with other light-minded organisations, it seems a shame that we don't share our expertise. We're already working with the Royal Institute of British Architects (RIBA) on the forthcoming Masterclass series and the Royal Photographic Society on our Night of Heritage Light, in October, when we are lighting Unesco World Heritage Sites across the UK and Ireland for one night. We're breaking down the perceived barriers of who is – or isn't – welcome to join. Ultimately, if you're interested in lighting, you're in.

Why is lighting so closely linked to health?

The discovery of a non-visual ganglion cell in the eye at the turn of the century has been a bit of a game-changer. It's role is to regulate our 24-hour body clock, which is a light-dark cycle, and this made everyone realise that light – and dark – are fundamental to our physical and mental wellbeing. More research is being done; the SLL has commissioned Public Health England to conduct research into the effects of LEDs on humans because there's much speculation about possible side effects from blue light.

What is the most inspiring lighting installation?

Ready Steady Light, a competition that SLL runs every year, is what I find most inspiring. Around 15 teams arrive at Rose Bruford College, where they have three hours to create an installation. Sometimes, it's the first time a competitor has had their hands on lighting equipment – because so much is done on computers now – and the last hour, when darkness falls, is always entertaining because designs are fully realised and changed. It never fails to bring some ingenious and innovative schemes, and when you see people playing with light, that's inspiring.

How can lighters be more involved in project design?

All too often, lighting is seen as the last commodity, despite it probably being the most important. When you consider how good or bad lighting can affect the mood, morale and performance of children in schools and people at work, and the overall appearance of the built environment, I find it astonishing that projects focus so little on their lighting. Put us higher up the food chain and we'll show the value of good lighting.

Are women underrepresented in the lighting sector?

I don't think so. I was recently talking to one of the leading lighting design practitioners, who said they have more women than men in their design teams. I think it's the blend of art and science that appeals to women and, as an industry, we're very inclusive. There's a decent representation of women on the SLL committees and it's only ever a case of bringing in the right people, not filling quotas. That's really important to me; I want to be appointed on a project because I'm good at what I do, not because of my gender.

● **LIZ PECK** runs LPA Lighting, and is president of the SLL

Events & training

NATIONAL EVENTS AND CONFERENCES

CIBSE Building Performance Conference and Exhibition
3-4 November, London
CIBSE's annual event returns for the second year to the Queen Elizabeth II Centre, Westminster. The conference programme is now available at www.cibse.org/conference

CPD TRAINING

For more information, visit **www.cibse.org/mcc** or call **020 8772 3640**

Building services explained for FMs
8-10 September, Manchester

Mechanical (HVAC) services explained
22-24 September, London

Electrical services explained
27-29 October, London

Building services explained for FMs
27-29 October, London

ENERGY ASSESSOR TRAINING

For more information visit **www.cibse.org/events** or call **020 8772 3616**

ESOS training
8 September, London

ESOS training
17 September, Manchester

EPC training
21-22 September, London

DEC training
28-30 September, Manchester

EPC training
28 September, London

CIBSE GROUPS, REGIONS AND SOCIETIES

For more information, visit **www.cibse.org/events**

ANZ Region & AIRAH: Building tuning
5 August, Perth
10 September, Melbourne
A well-tuned car performs and saves money, so does a well-tuned building. Reduce operating and maintenance costs. OK, but you have no budget. Building tuning can get you there. But how and where do you look to 'tune' a building; what can you make more efficient; how much efficiency can you gain; and what are the real benefits for the owner? Presented by Dr Paul Bannister.

ANZ Region & AMCA: BIM-MEP Construction Innovation 2015 Forum
6-7 August, Melbourne
Hosted by the Air Conditioning and Mechanical Contractors' Association (AMCA), the 2015 forum will be held on 6-7 August at the Melbourne Convention and Exhibition Centre. This year's forum brings together thought leaders and practitioners from across the world to provide insight into how leading firms are using technological advancements to deliver innovative best practice solutions in the building and construction industry. The 2015 forum promises to be an exciting and enjoyable event that offers not only an insight into BIM development and practices, but also networking and professional development opportunities.

HCNW Region: Colourdome in London – The HCNW lighting paper
13 August, London
An introductory talk about colour, repeating HCNW's successful event in High Wycombe last year. Monocrom will demonstrate the profound psychological impact of colour using a brief experience in Monocrom's colour dome – a planetarium-like shroud for relaxation, which generates a sense of floating in infinite space filled with brilliant colour projections.

ANZ Region – NSW Chapter: Case studies 2
1 September, Sydney
An evening seminar organised by the NSW Chapter of the ANZ Region. Three projects will be presented in various stages of design, construction and operation phases, with the intent to revisit these as they progress through the project lifecycle.

West Midlands Region: ECO design regulations of the EU
9 September, Birmingham
This evening seminar examines the transformer evolution and design, and answers questions raised by EU eco regulations. It addresses the eco issues affecting the whole supply chain, from manufacturer to end user.

SoPHE: Water leak detection systems
8 September, London
A Society of Public Health Engineers event, sponsored by Aquilar.
http://www.cibse.org/training-events/september-2015/sophe-water-leak-detection-systems

SoPHE: Catalytic chlorine dioxide and engineering services
16 September, Manchester
A free Society of Public Health Engineers event, with a talk by Peter Tyson, Ian Wedd and Tim Gaston, from Clearwater Technology.

HCNE Region: Biomass as a heat source for businesses and housing
22 September, Essex
This technical presentation by Innasol, with speaker Simon Butcher, training manager at Innosal, relates to the use of biomass as a heat sourse for businesses and housing. It will look at the main driving forces behind biomass within the building services industry.

HCNW Region: Building Regulations – a practical guide to the changes
23 September, Milton Keynes
An evening seminar.

Lifts Group: Symposium on Lift and Escalator Technologies 2015
23 and 24 September, Northampton
This annual symposium brings together experts from the field of vertical transportation, offering an opportunity for speakers to present peer-reviewed papers on the subject of their research. Speakers include industry experts, academics and post-graduate students.

SLL & HCNW Region: The HCNW lighting paper at GX: LG7 – office lighting
30 September, Chalfont St Peter
Simon Robinson, of WSP, provides an introductory review to include room design information for primary office spaces, secondary office spaces, circulation areas and back-of-house, and lighting for planting, especially in atria.

YEN SW: Speed networking in the built environment
1 October, Bristol
Timed rounds will put your networking skills to the test and provide a great venue for meeting other young professionals in the built environment. This collaboration of key built environment organisations: YEN, FFT, G4C, IStructE and WiP, brings you the ultimate networking event.

Night of heritage light
1 October, venues nationwide
The Society of Light and Llighting will have a day of celebrations for the International Year of Light 2015, by illuminating several UNESCO World Heritage Sites in the UK and Ireland.
www.nohl-sll.org/read-me-encore

Lifts Group: CIBSE Guide D 2015 seminar and launch

22 September, Northampton

CIBSE *Guide D Transportation systems in buildings* is an internationally-recognised and respected reference on vertical transportation. The Guide is an invaluable source of information for those involved in the design, installation, commissioning, operation and maintenance of transportation systems in buildings.

There will be presentations from the authors, who will provide an overview of each chapter, in particular highlighting new material. The seminar registration fee of £140 (ex VAT) includes both lunch and dinner. All delegates will receive a free copy of the new Guide.

For more information and to book your place visit **www.cibse.org/events**

CIBSE BUILDING PERFORMANCE CONFERENCE AND EXHIBITION

3-4 November 2015
QEII Centre
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Working together for resilient, efficient & healthy buildings

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ONE DAY

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Full rate	£275 + VAT per person
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Exhibition & CPD Presentations	Free *

* Exhibition and CPD presentations are free to attend but registration is required. Conditions apply.

Tuesday 3 November 2015	Wednesday 4 November 2015
Security of Building Systems & Networks	Adapting the UK Building Stock to a Changing Climate
Using BIM in Building Operations	Legislation and Building Performance
Lighting, Wellbeing & Comfort in Buildings	Building Performance Evaluation – Learning from the Innovate UK Programme
Reliability Centred Maintenance	Innovation & Collaboration in Building Performance
Drinks Reception – Building Performance Awards 2016 Shortlist Announced	Conference Summary and Networking

For more information and to register please visit: www.cibse.org/conference

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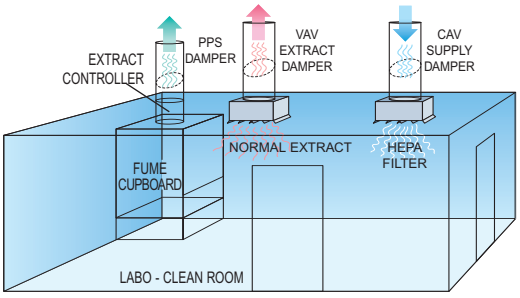

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