

CIBSE

JOURNAL



The official magazine of the Chartered Institution of Building Services Engineers

September 2015

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Local thatch helps Norwich Enterprise Centre embody Passivhaus principles

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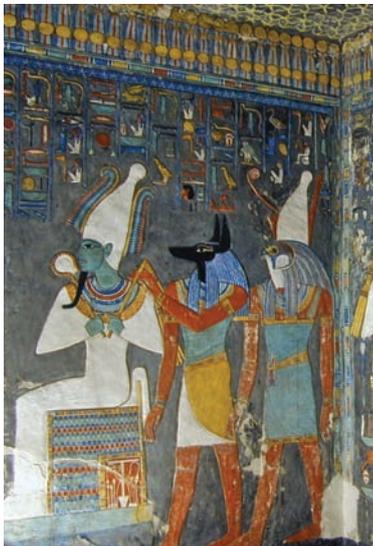
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Saving grace

The Energy Savings Opportunity Scheme (ESOS) has dominated headlines in the construction press since coming into force earlier this year. Worryingly, its message doesn't seem to have reached the industries it is targeting. The Environmental Agency has revealed that only 120 companies have logged themselves as ESOS compliant. It is a huge shortfall when you consider that, under ESOS, around 10,000 organisations are required to carry out energy audits (page 9). With the deadline due in December, there will be a last-minute Christmas rush for those organisations that have left it late.

Recent government rollback of green policies such as zero carbon homes is likely to be contributing to the low uptake – firms won't make energy efficiency a priority if sustainability is low on the political agenda. We should not abandon all hope, however. The government has announced that respected BRE chief executive Peter Bonfield is to undertake an independent review of energy efficiency provision. His report will point the way for a replacement for the Green Deal, which the government also scotched after the election (page 17).

Meanwhile enlightened businesses, and those with a long-term interest in low carbon buildings, continue to invest in energy efficient

stock, among them operators in the nascent build-to-rent market. The private sector's answer to council homes are being designed as low-maintenance, low carbon apartment schemes. Essential Living is a leading player – responsible for a Dubai-esque pair of connected towers in Canary Wharf – and its operations director Ian Merrick explains how the firm will ensure performance targets are

met for the financial benefit of both investors and tenants (page 73).

We have yet to hear of plans for Passivhaus build-to-rent apartments but, judging by the rising popularity of the German building standard, it won't be long. Commercial Passivhaus projects are rare in the UK, so the development of the Enterprise Centre in Norwich has been followed with close interest. We take a look at the building on page 24, and report on how the passive design and extensive insulation has kept building services lean.

The designer Architype won a Building Performance Award in 2013 with another Passivhaus project – Bushbury Hill Primary School. Entries for the 2016 awards are closing this month. If you have not entered visit www.cibse.org/awards and be sure to submit your project before the 10 September deadline.



Alex Smith, editor
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There will be a last-minute Christmas rush for those organisations that have left ESOS late

“We can't afford to take risks when we appoint outside contractors”

Robert Marsh

Robert Marsh, Director (Electrical),
Johnathan Hart Associates

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LJJ DESIGNING M&E FOR DESIGN MUSEUM

Building services specialist LJJ has been appointed by Willmott Dixon Interiors to deliver mechanical and electrical design and installation for the new £80m Design Museum in Kensington.

The project, designed by John Pawson Architects, will see the museum move from its current premises near Tower Bridge to the Grade II* listed former Commonwealth Institute, a 1960s building originally designed by Robert Matthew Johnson Marshall Architects, and featuring a copper-clad hyperbolic paraboloid roof.



ALEX MORRIS VISUALISATION

M&E market value increased by 7% to £16bn last year

● Increase driven by legislation and long-term cost savings

The market for mechanical and electrical (M&E) contracting was valued at close to £16bn in 2014, up by 7% on the previous 12 months, according to AMA Research. However, it added that the market was still 13% below its 2008 peak.

Installations aimed at improving energy efficiency and reducing carbon emissions enjoyed a healthy year, driven by increasingly stringent legislation and regulations, but also 'given impetus by the long-term cost savings that can be made by installing such systems', researchers said.

The forecasters said the market would continue to grow over the next four years, although at a more modest rate of around 3-4%, thanks to opportunities in areas like university expenditure, student accommodation, free and academy schools 'where private funding is being channelled into public sector projects'.

'Non-domestic construction output is set to increase during 2015 and remain positive through to 2019, although the



JOSEPH S.L. TAN/MATT / SHUTTERSTOCK

government's efforts to reduce public sector spending are ongoing, and may lead to reduced opportunities within the public sector for M&E contractors in the next few years,' the report said.

The market slowed in 2012 but growth picked up again in 2013, driven by improvements in office and leisure sectors in particular. The report added that this trend continued throughout 2014 and 2015.

However, M&E contractors face growing competition and 'are expected to diversify into wider service areas in order to build revenues; for example, offering design and build capabilities or expanding to total management of

hard FM projects,' AMA added.

Improved market conditions are feeding through into better profit margins, so firms are starting to experience 'the benefits of restructuring and streamlining exercises', but the research also pointed out that 'consolidation activity among suppliers continues to be high... and this has led to a number of major players increasing in size'. This is partly in response to demand for more integrated services 'with contractors widening the range of services they offer'.

'The fact that businesses within both the public and private sectors urgently need to find cost savings has led to demand for more energy-efficient heating, lighting and ventilation systems, both the simple extract types and the mechanical extract and heat recovery types,' said Keith Taylor, director of AMA Research.

'This type of work will also be stimulated by legislation and guidelines around carbon reduction and renewable energy sources and, as a result, energy management will become an even more important area of focus for M&E contractors.'

Imtech to get new owners

Imtech UK is to have new owners following the placing of its Dutch holding company Royal Imtech NV in bankruptcy.

Trustees have been appointed in Holland and the company's two main operating divisions have been sold, securing the employment of 7,300 staff.

'Trustees are currently in discussions with potential buyers for Imtech UK/Ireland,' a statement said.

A spokesperson for the large contractor added: 'We can reiterate that Imtech UK and Ireland continues to trade and is not subject to this administration or bankruptcy procedure. Discussions with a number of interested parties about long-term options for the business in the UK and Ireland are also very active.'

'Imtech UK and Ireland continues to trade independently, with our management team remaining in control of the business, actively managing available resources to best advantage,' they added.

In brief

CARILLION SET TO BOOST ITS APPRENTICE NUMBERS

Carillion Construction says it is on track to create 5,000 apprenticeships over the next five years, thanks to the £7m it has received from the Skills Funding Agency.

Its King's Cross training centre currently supports 96 apprentices and the company said this would increase during the September intake. The centre offers training, apprenticeships, employment advice and job opportunities to local people looking to work in construction.

RESTRICTIONS LIFTED ON INVOICE FINANCE

Businesses will be freed from 'restrictive clauses in contracts' that prevent them from gaining invoice finance when new measures come into force early next year, according to the Department for Business Innovation and Skills (BIS).

Invoice finance allows businesses to apply for credit using invoices for money owed to them as security. This means they can get money faster than if they waited for their customers to pay them.

RUSKIN GIVES ITS BACKING TO THE SEA EAGLES

Ruskin Air Management is sponsoring Tonga in this year's Rugby World Cup, which takes place in England and Wales during September and October.

The *Ikale Tahi* (Sea Eagles) achieved their greatest win to date in the competition in New Zealand, four years ago, when they beat France 19-14, but – after losing to New Zealand and Canada – they failed to make it to the quarter-finals.

Tonga is in another tough group this time, with the mighty All Blacks of New Zealand again, as well as Argentina, Georgia and Namibia. The Sea Eagles will face the All Blacks at Newcastle United's St James' Park stadium on 9 October.



New York outbreak leads to adoption of legionella standard

● Cooling-tower owners required to create plan for equipment maintenance

An outbreak of Legionnaires' disease in July, which led to 12 deaths and more than 120 cases of infection, has prompted New York City Council to draw up legislation requiring cooling-tower owners to comply with part of ASHRAE's newly published legionella standard.

Owners will have to create and file a plan to maintain equipment to comply with Section 7.2 of

ANSI/ASHRAE Standard 188-2015, Legionellosis: Risk Management for Building Water Systems.

The standard provides minimum legionellosis risk-management requirements for the design, construction, commissioning, operation, maintenance, repair, replacement and expansion of new and existing buildings, and their associated water systems and components.

'Standard 188 was published just two months ago,' said ASHRAE President, David Underwood. 'Although the

circumstances surrounding its use are tragic, ASHRAE is grateful that the standard is available to set requirements to manage risk of this bacteria. We are hopeful that other governments will follow the lead of the New York City Council to help safeguard public health.'

Michael Patton, a member of the ASHRAE committee that wrote Standard 188, addressed members of the New York City Council, and pointed out that the standard lists common tasks and steps for such things as new-system start-up and seasonal shutdowns, general system maintenance, water treatment, and disinfection plans.

'Section 7 is very good by itself, but it doesn't really address the whole idea of informing building owners and managers about how to put into place a plan for a whole building, and what it should contain,' said Patton, urging adoption of the complete standard.

Underwood said ASHRAE would continue to push for the full standard to be adopted in New York City and across the US.



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BIM 2050 group rises to challenge of greater industry collaboration

The young engineers of the BIM2050 group say they are already addressing many of the challenges set by the *Collaboration for Change* report produced by The Edge as part of its remit to promote interdisciplinary working across construction.

The group said the report was 'a direct challenge to cross-institutional groups... to embrace our cross-disciplinary nature, join forces and lead from the front'. Its members were addressing the report's accusation that the industry was failing to collaborate and was too 'silo' based, it said, by making a commitment to work with each other to share ideas and data.

'We communicate frankly, openly and in an environment of trust. We're resolved to make measurable progress, leading to outcomes with real value and impact, and share the results freely around

our professions, the industry and beyond,' a group statement said.

BIM 2050 has already developed 'simple, practical messages and tools' to move the industry forward in key areas – including education – by promoting built environment careers to schoolchildren; encouraging movement between professions; and establishing a shared vision of 'structural reform' of the industry.

'We are looking at the tools and processes required to support new structures – for example, in training and procurement – and speaking with digital entrepreneurs outside construction, as well as institutional task groups,' the group said.

It is also 'seeking to identify processes where new technology can enable us to improve efficiency, communication, and effect positive change within and without the industry'.

Nine quarters of growth, but building sector is still wary

- Future growth is not assured because of rising labour costs as a result of skills shortages

The construction industry has enjoyed nine consecutive quarters of market growth, with the house-building, office and retail sectors all reporting high levels of activity in the second quarter of 2015, according to the Construction Products Association (CPA).

Its latest trade survey did, however, reveal that skills shortages and rising wages are 'major clouds on the horizon', and that there was a drop in repair and maintenance work as a result of cuts to government energy efficiency schemes.

The National Federation of Builders (NFB) also warned that future growth is far from assured.

Its economics director, Noble Francis, said: 'Firms across the construction supply chain, including building contractors, SMEs, specialist contractors, civil engineers and product manufacturers, all reported rises in output during Q2.'

'Growth in output was led by the



MIKECHOTTO/SHUTTERSTOCK

private housing sector, in which 43% of firms, on balance, reported a rise in output.'

Francis also noted a rise in output in the private commercial sector, where 18% of firms reported improved volumes in office and retail work, while 57% of firms identified rising labour costs as a result of skills shortages.

Suzannah Nichol, Build UK chief executive, said: 'The outlook remains positive, with building contractors enjoying rising output and almost half of specialist contractors looking at expansion in the next quarter. However,

the impact of skills shortages continues to be felt, not least through increased labour costs.'

She believes the industry needs to improve its image to overcome the difficulties in recruiting key trades, and there should be more focus on apprenticeship reform.

NFB chief executive, Richard Beresford, added: 'The severity of the skills shortage is such that the industry will see unsustainable rising labour costs or an increasing inability to deliver work.'

'Industry's efforts to address skills shortages cannot take effect soon enough.'

IS IT A BIRD? IS IT A PLANE? NO, IT'S SPEEDO-MAN

A breathtaking 25m swimming pool suspended between two residential towers has been proposed for a site opposite the new American Embassy in Nine Elms, London.

The 'Sky Pool' is the brainchild of Sean Mulryan, the CEO and chairman of Ballymore, which is developing the 2,000-home Embassy Gardens site in partnership with Eco World. Mulryan says swimming in the transparent pool would be like 'floating through the air in central London'.

Designed by Arup Associates, with input from structural glass specialist Eckerley O'Callaghan and aquarium designer Reynolds, the pool will allow residents to swim between the two buildings. It will be 5m wide and 3m deep, with water to a depth of 1.2m.

After a dip, users can make use of a spa, summer bar and Orangery situated on adjacent roof terraces.



Firms affected by ESOS leaving it late

Only 120 of the estimated 10,000-plus businesses that need to comply with the government's Energy Saving Opportunity Scheme (ESOS) have completed the mandatory energy audit.

Under the scheme – a product of the European Union's Energy Efficiency Directive – all UK businesses with more than 250 employees, £40m in annual turnover or a balance sheet of more than £34m are obliged to complete an energy efficiency audit every four years.

Only 120 businesses have notified the Environment Agency (EA) that they are compliant.

Any such business that has not completed its first audit by 5 December risks a fine of up to £50,000.

The EA says a last-minute rush may put significant pressure on energy consultancies as demand for approved energy auditors soars.

CIBSE Certification has an ESOS Lead Assessors register that passed the 100 mark on 13 January. To find a CIBSE assessor, or to become one, visit www.cibseenergycentre.co.uk/esos

\$1bn of energy storage ordered

The founder of energy storage provider Tesla claims his company has taken 100,000 orders for its battery products, worth an estimated \$1bn.

Elon Musk said this will kick-start a revolution in the storage of renewable energy and power station demand management, and added that Tesla would sell \$50m of storage in the fourth quarter of 2015, and up to \$500m in both 2016 and 2017.

The company's chief technology officer, Jeffrey Straubel, said around 70% of the orders were for the 1MW Powerpack system, designed for commercial users and large-scale energy generators.

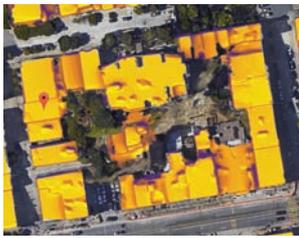
The Australian Renewable Energy Agency (ARENA) has also released a report predicting an international 'megashift' towards energy storage within the next 10 years as the cost of batteries falls by up to 60%.

Google goes solar

Google has launched a sunlight database that tells users how much solar energy hits their building, and the savings they might make by installing PVs.

Project Sunroof, currently available in the US cities of Boston, San Francisco and Fresno, estimates whether your roof receives enough light to justify solar panels.

Google Maps has satellite, navigation and sunlight data for every property in the world, so can be used to inform users about potential energy cost savings and payback. If the pilot is successful, the service will be rolled out across North America and, potentially, the world.



Graduates aim for Orlando

● Young engineers to battle it out for coveted accolade

The 2015 Young Engineers Awards shortlist has been unveiled, with 10 graduates and six employers in the running for top honours.

With a trip to the ASHRAE Winter Conference, in Orlando, Florida, at stake for the winner of the Graduate of the Year Award, the competition has attracted a record number of entries in its 20th year.

Cash bursaries from the Rumford Club are also on offer for two runners-up.

The finalists are: **Demetrios Constantinou**, Foster and Partners/National Technical University of Athens; **Ruth Howlett**, AECOM /University of Nottingham; **Andrew James**, Buro Happold/ California State University; **Peng Jiang**, Skelly & Couch/University College London; **Alexandra Lindesay Bethune**, Arup/



2014 winner Emilia Targońska

Edinburgh University; **Jorge Abarca Montero**, Cundall/Sheffield Hallam University; **Abdul Wahab Malik**, Meinhardt Pakistan/NED University, Karachi; **Charity Nicholls**, Atkins/ Heriot Watt University; **Ryan Rodrigues**, HurleyPalmerFlatt/ London South Bank University; and **William Webb**, Buro Happold/ University of the West of England.

Each finalist will give a short presentation to the judging panel at the Institution of Mechanical Engineers (IMechE) headquarters,

in London, on Thursday 8 October.

Also facing tough competition are the firms up for the Employer of the Year Award.

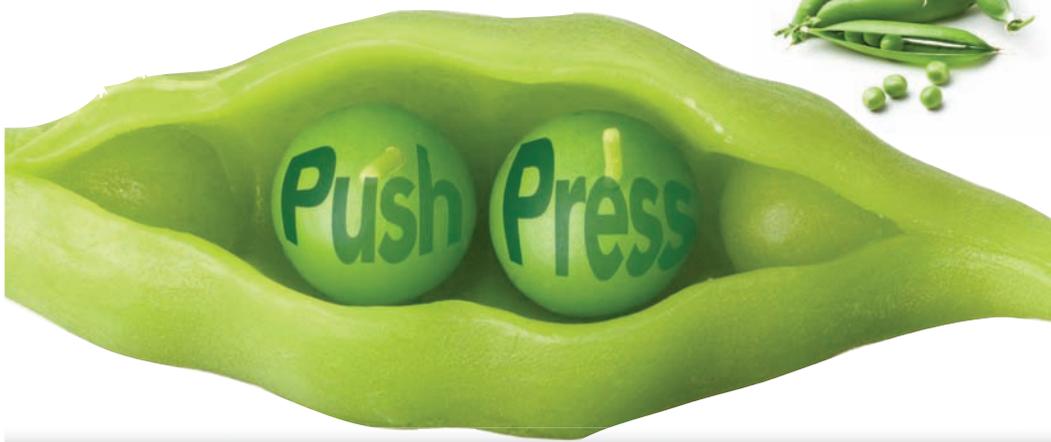
The finalists for this award are: Large employers – **Hoare Lea, AECOM**; Medium employers – **Ethos Engineering, Troupe Bywaters + Anders**; Small employers – **Service Design Solutions, JDP**.

Tim Dwyer, chair of the CIBSE ASHRAE Group and the Graduate Award judging panel, said: 'The quality and volume of entries never ceases to amaze, and was particularly high in this landmark year. The calibre of graduates competing for this high-profile accolade gives us all great hope for the future.'

CIBSE, ASHRAE, the IMechE and CIBSE Patrons support the awards, sponsored by Andrews Water Heaters, Ruskin Air Management and Schneider Electric.

To book a place to the free event, visit www.cibse.org/yea

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AC settings too low and 'sexist' for modern mixed-gender workplaces

● Experts believe we're only cooling for male population

Commercial offices are running their air conditioning at temperatures that are too low because settings are based on outdated and even 'sexist' calculations, according to research by Maastricht University.

The study revealed that temperatures in UK buildings tend to suit men and not women, and still adhere to guidance produced by ASHRAE in the 1960s.

Guide temperatures are based on the resting metabolic rate of a 40-year-old man, which is around 30% faster than a woman's. So while men might feel perfectly comfortable in cool office conditions, more women complain about being cold during summer.

Dr Boris Kingma, who led the study by the university's medical centre, in Holland, said they were not recommending a specific range of room temperatures, but simply wanted metabolic rate to be taken into account when defining indoor climate standards.

He said the equations used to calculate humidity, air temperature, airflow, radiant temperature and the metabolism of people likely

to be in a building were outdated – particularly as women now account for at least half of the workforce in modern offices.

The Maastricht team calculated that women, who tend to be smaller than men and have more body fat, had an average resting metabolic rate of 48 watts per square metre, significantly lower than the average used to calculate heating and cooling needs in buildings, as the typical 40-year-old man would have a rate of 58 watts.

'Many men think that women are just nagging, but it is a genuine physiology issue,' said Joost van Hoof, a building physicist at Fontys University of Applied Sciences, in the Netherlands. 'Also, if women have lower need for cooling it means you can save energy, because, right now, we're only cooling for the male population.'



DEAN DROBOT / SHUTTERSTOCK

Late-paying local authorities named and shamed

More local authorities have admitted to holding 10% payment retentions against work carried out by building services firms, after enquiries by the Specialist Engineering Contractors' (SEC) Group.

Among those that admitted holding back payments were Basildon, Central Bedfordshire, Elmbridge, Hastings, Kent, Northamptonshire, Police Service NI and Kent Police. The survey also revealed that 6% of public bodies held onto retention cash for up to two years, but that 21% charged no retention.

The SEC Group threatened to report the authorities to the government's Mystery Shopper Scheme for investigation.

The Electrical Contractors' Association added: 'We urge the government to stop this practice, which is stifling innovation and investment in the contracting supply chain.'

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Clark launches starter-home fund

Communities Secretary Greg Clark has launched a £26m fund to support the government's Starter Homes initiative, so house builders can improve the range of properties for first-time buyers.

The fund will be used to buy brownfield sites to provide land for starter homes. Money from the sale of these sites will go back to the government.

Up to £10m has also been made available by government for local authorities to prepare more brownfield land for the development of starter homes. It has pledged to build 200,000 starter homes by 2020.

Power to the people

A four-bed North Yorkshire house that can power itself and two neighbouring properties has been unveiled.

Known as Furrows, it has a unique renewable energy system, allowing it to generate more than 13,000kWh of electricity and heat a year. Around 5,000kWh will be used by the homeowners, with the rest exported to the grid – enough to run another two houses.

Furrows will feature 64 solar PV and solar thermal panels, and spare energy will be diverted to an on-site storage system for use outside sunlight hours. Excess thermal energy will heat domestic hot water, while the storage system means the house will be off-grid 85% of the time.

Have your say on minimum wage

The government is making major changes to UK wages and is seeking evidence to inform the Low Pay Commission's (LPC's) report on national minimum wage rates.

The LPC wants employers' and workers' views on existing rates, and evidence of the potential impact of the national living wage, introduced in April 2016.

The consultation runs until 25 September. Complete an online questionnaire at <http://bit.ly/1M0Oheh> or respond via email to lpc@lowpay.gov.uk

F-Gas records on half of sites inconsistent or non-existent



● Lack of information risks legal action for end users

F-Gas-compliance standards on many commercial refrigeration and air conditioning sites are falling short of mandatory requirements, exposing end users to the risk of legal action.

Air conditioning and refrigeration firm Cool-Therm claims that, in 50% of the sites it visited, the detailed records required to meet regulatory requirements are either absent or incomplete. It is calling for an industry-wide review to ensure F-Gas requirements are fully met, and clients are better informed about their responsibilities.

The requirement for detailed site records applies to all systems containing more than five tonnes of CO₂-equivalent F-Gas, and includes the common refrigerants R134a, R410A, R407C and R404A. Hermetically sealed equipment containing up to 10 tonnes CO₂-equivalent is exempt, and there is a grace period for units containing less than 3kg of any F-Gas until the end of 2016.

New mandatory obligations came into force in April last year, with the introduction of updated European legislation.

'The F-Gas Regulation lays down strict requirements for record keeping, designed to ensure a log is available on site

for all operations affecting F-Gas plant,' said Cool-Therm technical director, Alex Strong.

'This has to include a log sheet for every applicable F-Gas asset, and to record all mandatory leak tests carried out, whether any leaks are identified, and if any remedial work is required, with a record of all refrigerant moved in/out of the plant.

'Importantly, there is a requirement to log all top-ups of F-Gas refrigerant made to equipment. Full records should be kept for at least five years.'

Strong said that, in reality, records are 'at best inconsistent or poorly presented, with no annual summary or management review; and at worst non-existent, providing no documentary evidence of F-Gas work' – meaning owners are breaking the law.

The problem is 'particularly acute' on sites attended by different contractors over a period of time. For example, a facilities management provider or contractor responsible for a site may be replaced, perhaps several times over several years, and data lost or subsequently recorded in a different format or place, Cool-Therm explained.

OLIVIER LE QUENEC/SHUTTERSTOCK

Paternosters get stay of execution

German labour minister Andrea Nahles has backed down on plans to ban paternoster lifts under strict new workplace safety regulations.

Under the new rules, only people 'trained in paternoster riding' would have been allowed to use the perpetual-motion appliances. An outcry across the country, however – particularly among civil servants – forced a rethink about the role of a device that was invented in the UK in 1860.

Only a handful are still in use here, but they remain popular in Germany, with more than 250 still believed to be in regular service.



Nahles has agreed to amend the legislation stating: 'The paternoster is the VW Beetle among lifts. Not many people ride them any more, but many people love them.'

This U-turn was welcomed by Cornelius Mager, of Munich's Paternoster Association, which was set up 20 years' ago to fight off earlier attempts to ban this

type of transportation. He argued that they were not dangerous and said repeated claims that people have died riding paternosters were totally unfounded.

He added that 'crossing the road is probably more dangerous, and taking the stairs can also be a fraught business'.

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New scheme to bring together industry and academics

CIBSE is piloting a matching scheme for academics and commercial companies to identify industry's knowledge requirements. Students can then research these for dissertations and end-of-year projects at postgraduate degree level.

Areas of interest will be promoted on the CIBSE website, through which initial contact can be made. Interaction between parties will be flexible and there is no financial commitment. Final marking of the project will be the responsibility of the academic partner, unless the industrial partner is willing to be involved.

The project output will be shared with the industry partner and CIBSE on completion of the marking exercise. For further information, contact Sara Kassam skassam@cibse.org

Ken Dale Travel Award goes to Julie's Bicycle manager

● Luke Ramsay will research low carbon data centres

Luke Ramsay, environmental sustainability manager at charity Julie's Bicycle, has won the Ken Dale Award 2015.

Ramsay will be visiting America, Canada, Dubai, Singapore and Indonesia to research his project 'Low carbon cooling in data centres: Barriers and Opportunities'. He hopes to visit data centres in each of the countries – as well as some in the UK – to conduct interviews, and begin to understand how they can reduce their carbon footprint. He will also visit academic institutions.

'I'm incredibly excited and honoured to have been awarded the Ken Dale bursary this year,' said Ramsay.

'Data centres are predicted to surpass the aviation sector in terms of carbon emissions in



the near future. This research will expose me to some of the most innovative data centres in the world, which are successfully making huge reductions in their energy consumption.'

The Ken Dale Travel Bursary is an annual prize open to all CIBSE members in the developmental stage of their career.

Shortlisted candidates have to attend an interview at which they outline their travel proposals and

the reasons for them.

The winner is granted up to £4,000 to venture outside their own country for between three and four weeks. The aim is for them to undertake research on an aspect of their field of work, which will benefit CIBSE, their employer, their clients and the profession.

Further information and past winners can be found at www.cibse.org/Building-Services/Awards/Ken-Dale-Travel-Bursary

CIBSE Code of Professional Conduct update

CIBSE's updated Code of Professional Conduct was due to be launched on 1 September, after approval by the Board.

The Code was reviewed by the Professional Practices Committee, made up of CIBSE members, to bring it in line with changes to other policies, and to ensure its continued relevance.

CIBSE expects high standards of its members in all grades, who are required to abide by the code, which was set up to uphold the dignity and reputation of the profession, and to safeguard the public interest in matters relevant to the art, science and practice of building services engineering.

Members of the Institution

reaffirm their commitment to the code each year through renewal of their membership.

Although the code does not stipulate standards relevant to specific nations, members are required to ensure they are familiar with the local codes and requirements for the country in which they are carrying out work.

Responsibility for professional and personal decisions and actions, however, rests with the individual member.

Through the Knowledge Portal, CIBSE provides technical information and guidance to support members when making decisions, and to ensure they act ethically and professionally.

Supplementary guidance notes for revamped professional Code

Guidance on risk

Risk is inherent in the activities undertaken by engineering professionals. Members of the profession therefore have a significant role to play in managing and limiting it. The Engineering Council's guidance on risk describes the role of professional engineers and technicians in dealing with risk, and their responsibilities to society.

Guidance on sustainability

Professionally registered engineers and technicians are required to carry out their

work in a way that contributes to sustainable development, as outlined in the UK Standard for Professional Engineering Competence (UK-Spec).

Statement of ethical principles

Together with the Royal Academy of Engineering, the Engineering Council has produced a statement of ethical principles to guide engineering practice. This statement summarises the fundamental principles and is designed to supplement the codes of conduct published by the

engineering institutions. It draws on discussions with engineers from a range of bodies, as well as philosophers specialising in applied ethics.

If you believe a member's conduct has breached the code, notification should be sent to the CIBSE Professional Practices Committee, who will review it under the Institution's disciplinary procedures.

The Code of Professional Conduct and supplementary guidance can be found on the CIBSE website at www.cibse.org/codeofconduct

Door open for Façades 2015 competition entries

● Society of Façades Engineering launch awards

After the success of the inaugural event in 2013, the Society of Façade Engineering (SFE) has called for entries for FAÇADE2015. The international competition is designed to recognise, promote and reward excellence in this increasingly important element of building design and construction.

There are three awards: Façade of the Year: New Build; Façade of the Year: Refurbishment; and Outstanding Façade Innovation. The winners will be presented with their accolades in December, at the Glass Supper conference and dinner, to be held at the Sky Garden in the City of London.



The 2013 International Award for Façade Engineering Excellence was won by Aedas Architects for the façade engineering work on Al Bahr Towers in Abu Dhabi

Applications from individuals, companies or project teams should demonstrate:

- Excellence in technical

design and/or research that has made a significant contribution to façade engineering

- The development of technologies, product designs, systems or buildings.

Entries can relate to projects that are agreed, under construction or completed.

Competition organiser Graham Hackley said: 'Façades engineering has come of age and there is a wider recognition of the technical engineering and scientific underpinning required to push the industry to new levels of achievement.'

'The Competition seeks to highlight the skills and vision that are creating the best of these projects.'

Entries must be received by 2 November 2015. Visit www.sfecompetition.org

BIM survey launched

The building services sector's ability to engage with BIM will be tested by a major new survey, to be conducted by the Electrical Contractors' Association (ECA), supported by CIBSE and BSRIA.

Over the next six to 12 months, businesses will be able to share data via an online survey, which should reveal how prepared the sector is to adopt BIM Level 2.

The survey will provide much-needed and timely information on how ready building services is for Level 2 BIM as the government's 2016 deadline for its use in their procurement approaches. Hywel Davies, CIBSE technical director, said: 'Getting the right information into the model and then ensuring that it is still accurate on handover to building managers and operators is key to the success of BIM.' The study will run until 15 September, and can be accessed by following the link: www.surveymonkey.com/r/ECA-BIM

Have your say on industry policy

CIBSE encourages all its members to participate in consultations in the building services sector and to contribute to the Institution's responses.

You can view the current ones in the improved News and Policy section of the CIBSE website at www.cibse.org/news-and-policy/consultations/current-consultations

Consultations help make policies and regulations more effective by considering the interests of affected parties, fostering informed debate and exposing the costs and benefits of different regulatory options.

By responding to consultations, you can make an input into the decision-making process. Evidence, research and real-life experiences that you provide will ensure the government is aware of the impact of its policies in your local area.

A consultation currently open for response is: Evaluation of the Energy Performance of Buildings Directive (closing date for contributions to a CIBSE response is 9 October). The aim is to evaluate whether the directive has met its aims. The consultation will also explore the Smart Finance for Smart Buildings initiative.

Night of light

Up to 12 Unesco World Heritage sites across the UK and Ireland will be lit up on 1 October, in celebration of the International Year of Light 2015.

The Society of Light and Lighting is organising the event, and Liz Peck, SLL President, said: 'This is an opportunity to show how lighting transforms our landscapes and brings history to life.' Visit www.nohl-sll.org

New members, fellows and associates

FELLOWS

Lee, Wah Cheong Patrick

Lam Tin, Hong Kong

Pitman, David Martin

Cardiff, UK

Yousuf, Sharif

Leeds, UK

MEMBER

Carter, John Roy

Chelmsford, UK

Cassells, Steven Yeon

Sydney, Australia

Chan, Tak Choi

Hung Hom, Hong Kong

Chan, Kwok Yu Alex

Shatin, Hong Kong

Fanelli, Maurizio Antonello

London, UK

Fok, Ka Ming

Fanling, Hong Kong

Hayde, James

Dublin 2, Republic of Ireland

Ho, Chun To

Yuen Long, Hong Kong

Jambocus, Hishaam

Mahebourg, Mauritius

James, Paul Thomas John

Hengoed, UK

Ko, Kai Yuen

New Territories, Hong Kong

Kosterno, David John

Clermont, United States

Kung, Man Lok

Shatin, Hong Kong

Kwok, Hiu Kwan

Kwun Tong, Hong Kong

LaiMan, Him Paul

Kwai Fong, Hong Kong

Law, On Shing

Kowloon, Hong Kong

Leung, Chun Ho

Chai Wan, Hong Kong

Saffarini, Eyad

Jeddah 21423, Saudi Arabia

Suen, Yat Yeung

Tsuen Wan, Hong Kong

Szeto, Tik Chun

Yuen Long, Hong Kong

Wentz, Timothy

Lincoln, United States

Wong, Kim Hung

NT Hong Kong

Yu, Kin Ching

Tseung Kwan O, Hong Kong

ASSOCIATE

De Souza, Villiers Newman

Auckland, New Zealand

Guest, Tony Roy

Wallington, UK

Pearson, James

Bristol, UK

LICENTIATE

Bradley, James

Surrey, UK

Chapman, Stephen

Sutton, UK

Fitzgerald, James Christopher

Warrington, UK

Mahappu Arachchige Don,

Sumudu Nilanke Marcellinus

Dubai, United Arab Emirates

Mariyanayagam, Noyal Kristen

London, UK

Sanjurjo, David

Enfield, UK

Letters

This month, a reader discusses HVAC during warm-up or cool-down, and technical editor Tim Dwyer responds

Overcoming setbacks

The article 'Oversizing: Escaping the trap' in the July *CIBSE Journal*, omits a very important consideration: warm-up and cool-down. Better thermal quality and today's airtight buildings mean sufficient additional HVAC capacity is required to raise or lower the temperature of buildings after being set back, especially after long weekends or holidays, and in severe weather. Safety factors as a percentage of design load are no longer adequate, because the loads are much lower than before. Too many intermittently

occupied buildings using the methods described by Richard Green are unable to recover temperatures in a reasonable time, so the buildings maintain comfort temperatures for longer or all of the time, thus wasting energy.

There is little support in literature for claims that oversizing HVAC for large commercial buildings wastes energy when properly designed and operated. The ASHRAE Handbook says: 'Engineering judgment must be applied for the particular project. Armstrong *et al*^{1,2} provide a design method to deal with warm-up and cool-down load.'

Engineers have a responsibility to evaluate all heating and cooling loads, and to use their judgment when selecting HVAC sizes

Some computer programs and HVAC equipment manufacturers advocate diversity during operation when sizing equipment to reduce its capacity and first cost. But there is rarely any diversity available when warm-up or cool-down from setback is needed. Another important judgment relates to future loads that may be imposed over the HVAC system's life, such as higher internal heat gains or ventilation.

Engineers have a responsibility to evaluate all heating and cooling loads, and to use their judgment when selecting HVAC sizes.
Larry Spielvogel FCIBSE, ASHRAE past president

Tim Dwyer replies

In most buildings, there will be a need to size the heating/cooling plant – and distribution system – so that they may operate at setback temperatures during unoccupied periods and then be conditioned ready for occupancy. Running continuously at conditions suitable for occupancy is likely to be severely detrimental to the energy use, environmental impact and operating cost. Although this needs to be properly considered and appropriately designed (and controlled), I do not necessarily see it is a deficiency in this article, as it was focusing on controlling oversized VRV systems to operate more effectively during times of normal occupation.

There is a good applied discussion of this in section A5.10.3.3 of Guide A Environmental Design (2015) and in section 3.2 of *CIBSE TM41 Degree days: Theory and application*.

See page 54 for part three of Dwyer's overview of CIBSE Guide A.

References:

- 1 Armstrong, PR, Hancock III, CE, and Seem, JE, 1992a/2b. 'Commercial building temperature recovery – Part I: Design procedure based on a step response model'. *ASHRAE Transactions* 98(1):381-396.
- 2 'Part II: Experiments to verify the step response model'. *ASHRAE Transactions* 98(1):397-410.

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A CHANGING LANDSCAPE

The first 100 days of Conservative government have resulted in numerous policy changes related to energy in the built environment. Hywel Davies takes stock

Reduced support for renewable energy; the end of the Green Deal, zero carbon homes and non-domestic buildings; and the sale of the Green Investment Bank have generated a flurry of policy announcements from the Department of Energy & Climate Change (DECC) and the Treasury.

There has also been tough talk about local authorities determining planning applications for shale-gas extraction within the statutory timescale.

Many have commented on these policy changes, but what do they mean for building services engineers?

The changes to government support for renewable energy supplies include: subsidy cuts for onshore wind and for solar; removal of the exemption from the Climate Change Levy for renewable energy; and postponement of the next Contracts for Difference (CfD) auction.

The government proposes to end financial support for solar and biomass conversion plants and to amend the Feed-in Tariff (FiT) scheme for smaller projects, with consultation on an end to support for solar PV installations of 5MW and less under the Renewables Obligation scheme from April 2016. A similar move last year excluded solar farms of more than 5MW in size – about 25 acres – from the scheme from April this year.

Justifying the changes, Secretary of State for Energy and Climate Change, Amber Rudd, said the measures are intended to deal with a projected over-allocation of renewable energy subsidies through the Levy Control Framework (LCF). ‘My priorities are clear,’ she added; ‘we need to keep bills as low as possible for hardworking families and businesses, while reducing our emissions in the most cost-effective way.’

This line was also used by Lord Bourne, Energy Minister, to explain the decision to terminate funding for the Green Deal Finance Company. He said:



Amber Rudd wants to reduce emissions in most cost-effective way

Those in the sector who committed to the Green Deal may be less enthusiastic to support the new policy, whatever that is

‘I haven’t spoken to a single member of any industrial team that was taken by surprise by our action on the Green Deal – it simply hadn’t been delivering. We’re now discussing what we put in its place. We’re working with industry so that we can get something that is lasting, durable and helps consumers.’

It is hard to argue that the Green Deal worked; in the non-domestic sector there was still no funding available – although there was a process to carry out assessments – while the numbers of domestic schemes was a fraction of original forecasts. We must hope that ‘working with industry’ extends to listening to those who invested a huge amount of time, effort and money into developing business models that would deliver the Green Deal effectively and transform energy inefficient homes, and to learning from their experience.

There is some ground for optimism

here, as DECC and the Department for Communities and Local Government (DCLG) have commissioned Dr Peter Bonfield to undertake an independent review of energy efficiency provision, with a particular emphasis on consumer confidence.

Bonfield is CEO of the BRE, so this review is being undertaken with support from DECC and DCLG, and not through the BRE. It is expected to report by the end of the year, and to identify existing mechanisms to promote and deliver energy efficiency. This is very likely to inform future policy, so will be well worth watching. It also runs in parallel with a Treasury-led review of business energy efficiency schemes, such as the Energy Savings Opportunity Scheme and Carbon Reduction Commitment.

It is unclear how the end of the Green Deal will affect the Minimum Energy Efficiency Standards – the requirement, introduced just before the General Election, for homes and business premises that are rented out to have at least E-rated EPCs. The regulations were based on having the Green Deal available to finance upgrades to deliver the E rating.

Changes to the FiT mean that designers need to be aware that subsidies available for schemes are likely to fall before project completion, and before the final tariff has been determined. This has always been the case, but the rate at which tariffs may fall between design and completion may now be greater.

The demise of zero carbon homes was announced in the government’s productivity plan, ending the policy of Allowable Solutions. Effectively a tax, this was based on the difference between calculated emissions under Building Regulations and the zero carbon level.

While a number have expressed concerns about the significant change

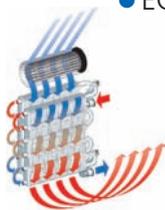


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of approach after eight years of zero carbon policy – albeit with changes along the way – this does now clear the way for the development of energy efficiency in the Building Regulations.

Under the European Energy Performance of Buildings Directive (EPBD), the government will have to undertake a study of whether our 'minimum energy efficiency standards' (Part L in England, Part L in Wales, Section 6 in Scotland and Part F in Northern Ireland) are 'cost optimal', as defined by the European Commission, in 2017. Then, in 2018, those same standards will need to be reviewed and set at the cost-optimal level, and will form the basis for the introduction of 'nearly zero energy' buildings under the EPBD from 1 January 2021.

At this stage, then, we have some clear indications of the way forward. The consumer is at the centre of policy-making; bills are to be kept down and energy efficiency schemes are to be focused on consumer confidence. In the non-domestic sector, there is a drive to rationalise the many energy-related schemes, to reduce burdens on business while maintaining revenues for HM Treasury. Building Regulations in England will proceed at the pace required by the EPBD; the Celtic nations may proceed faster, or further, if they wish.

What the recent announcements may have done to investor confidence remains to be seen – some renewable schemes will doubtless fall by the wayside. Those in the energy-efficiency sector who committed to the Green Deal may be less enthusiastic to support the new policy, whatever that is.

Finally, elements of the Renewable Heat Incentive (RHI) are due to be reviewed before the end of the current funding next March. With a comprehensive spending review and ongoing measures to keep the LCF for renewables subsidies under control, we might anticipate an announcement about the RHI in due course. **CJ**

● For more details on the zero carbon announcement, and the requirements of the EPBD, see blog entry 'A pathway to nearly zero energy' from 24 July 2015 at www.cibseblog.co.uk

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

WHAT'S IMPORTANT TO YOU?

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Is choice important to you?

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If you answered yes to any of those questions then, when selecting a building management system, you really should be talking to Sauter.

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The company released its first BMS back in the early 1970's and today has a full range of products manufactured at its Headquarters facility in Basel, Switzerland.

In the UK there are four operating units making up Sauter Automation Limited: Systems sales, Maintenance & service, Components and the recently launched Technical FM Business Unit.

All current products are open protocol BACnet/IP allowing for a more flexible approach to building management and integration at whatever level you require it. As for choice, Sauter has deliberately developed solutions that can be stand-alone or form part of a complete BMS.

Mark Clinch, UK Deputy Managing Director, explains: "To keep pace with market needs, we developed the

Automated Room Control range which can be installed as a self-contained unit or as part of a wider Sauter BMS. This range gives you full automation of heating, air conditioning, lighting and solar shading. We also recently launched an App for the high end residential market giving the same features. Called RESIDE, it complements the quality and finish expected in these apartments by providing an up to date tool for residents to use with which they will be familiar as it is accessed by tablet or smartphone."

Sauter has also recognised the need for change in its business model and has recently started recruiting systems house partners so product specifiers and contractors have a choice in the marketplace. "This also gives end users choice for any additional works and service options", says Mark.

RESIDE was one of the features of the recently completed Fitzroy Place project where Sauter provided a full BMS for the two new office buildings, apartments, retail units and landlord services and which also utilises another recently launched product, the Sauter Energy Management Solution. Sauter's EMS is

used by the landlord for aM&T and energy management services as well as providing the basis for billing commercial tenants and individual apartments.

Sauter also manufactures components and even these come with energy saving benefits. Mark again: "Our components range is renowned for its quality, pricing and support but what few know is that, for example, our most recent range of actuators uses almost half the wattage of its nearest rival. So, you save money installing them and then save money running them."

"When we install or supply equipment we expect it to last and have customers still running products that we installed back in the 80's. Some of our clients are only now upgrading so they can have more functionality available in later products and which allows for programmes like energy management to be better handled," concludes Mark.



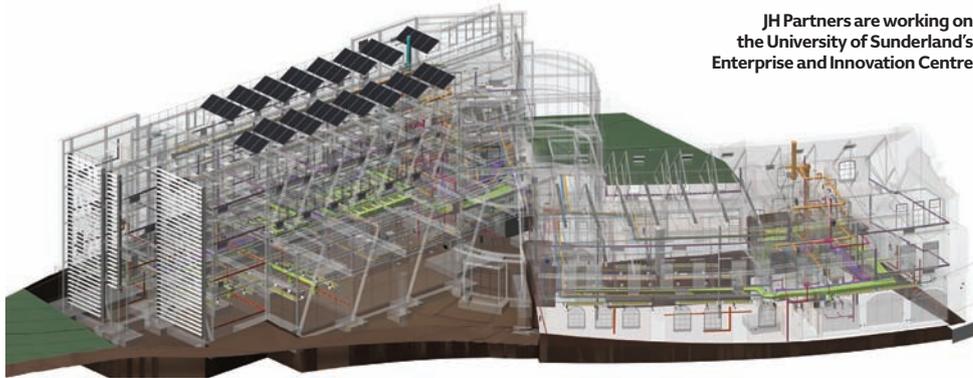
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ARE YOU PLAYING THE BIM GAME, OR RAISING IT?



BIM has the potential to revolutionise the construction sector but, says JH Partners director **Craig Jordan**, M&E designers have to be involved early in the design stage to maximise its impact



JH Partners are working on the University of Sunderland's Enterprise and Innovation Centre

Everywhere you look, companies are crowing about their success in embracing building information modelling (BIM).

While I am a firm believer in the value of improving design and construction methods by creating virtual building prototypes, I don't believe things are going as well as is being suggested. There's no doubt BIM has the potential to revolutionise the industry; currently, however, it's not working for everyone – in particular, mechanical and electrical engineers.

The baseline for BIM is the ability to share modelling data and, despite spending the past five years developing our in-house expertise to the highest levels, we still have compatibility and integration challenges with our other engineering design software. The BIM platforms that our lead designer clients are using do not readily bolt together with our M&E design software. In effect, therefore, we are modelling projects three and four times.

This is a rather fundamental issue, and I don't understand why more building services engineers are not speaking out about it. Only by raising the problems will we find a solution.

We have taken a number of opportunities to highlight our plight, including hosting cross-party meetings with equipment manufacturers,

architects, contractors and clients, attending workshops and entering competitions. It is through the latter that the most progress has been made as team collaborators were able to see our technological frustrations first-hand – they could really feel our pain.

Working together, against the clock, on a 'live' BIM construction project clearly demonstrated the need for open dialogue to bridge the gaps until properly joined-up information systems are available.

Collaboration is, of course, another key facet of BIM and one that we also feel needs further work. The M&E disciplines are, more often than not, invited late to the design party, but – for BIM to be achieved – this has to change. Integration at the outset is something that may have seemed unnecessary and time consuming in the past, but it will reap significant benefits under BIM as projects progress. Agreeing project-delivery methods at the earliest stages ensures a coordinated and consistent approach. We have always pushed for early involvement and are now pushing that bit harder.

Gearing up for this new way of working while keeping a busy engineering consultancy running smoothly requires a considerable leap of faith. Working protocols are being re-evaluated and there is much investment

in time and resources. Additional technology is being integrated, staffing levels have been increased to facilitate the extra work, and personnel are being trained. Many small to medium-size companies in the sector are finding the investment required prohibitive, especially against a backdrop of ever-tighter project budgets.

While I am keen to air the challenges, I think it is important to remember that pursuing BIM isn't just about pain without any gain. M&E companies that embrace BIM will, like us, see significant improvements in the quality of their work, I'm sure. For example, there hasn't been much talk about the higher standards of modelling now being aimed for and achieved. BIM requires greater accuracy and detailing; where, previously, 3D models may have included representational images, now precise, design-rich information is being produced. Being part of this evolution has to be worth striving for.

Greater understanding about the M&E arena is also very welcome. Until these early stages of BIM adoption, there had been little real comprehension about the workings of our sector. For many, it seems confusing and multiskilled, but the benefits of collaboration and detailed visualisations are making what we do much clearer.

Those involved in the initial building design, right through to those who manage and maintain it, will be able to see each individual element of this design correctly modelled in three dimensions, with exact details. Being able to share this level of data simplifies and contextualises our work.

BIM's harnessing of technologies already being used extensively in other industries – such as gaming, film-making and manufacturing – to create models that precisely represent the physical aspects of a building, and the way it's constructed and operates, is bound to throw up difficulties. Game changers always do.

I am all for discussing the topic that is having such a huge impact across the construction sector, but would prefer people to be honest rather than simply pay lip service to it

● **CRAIG JORDAN** is director at JH Partners

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MAKING CONNECTIONS

ASHRAE CEO Jeff Littleton could be forgiven high spirits when addressing members at the Society's summer conference in Atlanta, Georgia. He told delegates that ASHRAE had grown 20% in size over the last year to 54,000 members, and had achieved a near-record net financial surplus.

Littleton said growth mirrored that of the local economy in ASHRAE's home city, where 'Hotlanta's economic growth was parallel to the growth of air conditioning'.

Littleton told delegates that volunteers, staff and consultants had been looking at strategies to increase global activity. He said a key issue was adjusting the \$28m (£18m) ASHRAE society model to meet the needs of professionals in the rest of the world.

The summer meeting is where presidents pass the baton of office, and outgoing president Tom Phoenix reported a swathe of new ASHRAE chapters and sections around the world – including one in the UK.

He updated the audience of several hundred members on the push into the 'developing economies' that started under the presidential initiatives of Tom Watson. There are now five subcommittees actively considering the cold (refrigeration) and food chain; outreach and education; government interaction and resource; construction industry needs;

New ASHRAE president David Underwood underlined the Society's plans to expand overseas in his address at the summer conference in Atlanta. **Tim Dwyer reports**

and transition. These are working with governments, NGOs, and ASHRAE members to develop ASHRAE's presence.

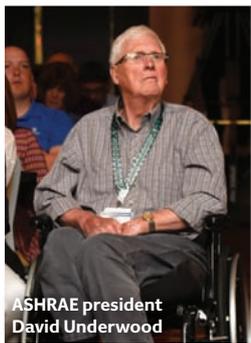
The theme for new president David Underwood is 'making connections'. He said that ASHRAE had to reach out beyond its existing membership to industry, communities, governments and the public.

The Canadian said the days were gone when North America's technical knowledge was thought sufficiently developed for all overseas markets, by applying minor localised 'tweaks'. He cited lessons learned from applying standards in Kuwait. 'They were adopted but the hotter climate, different building materials and construction techniques triggered the need for significant modification'.

He reflected on his younger years where his enthusiastic questioning of a site engineer



Littleton announced that Standard 188 'Legionellosis: Risk Management for Building Water Systems' had been released



ASHRAE president David Underwood

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TOP SPEAKERS REVEALED FOR 2015 CIBSE BUILDING PERFORMANCE CONFERENCE

The first speakers have been announced for the 2015 Building Performance Conference and Exhibition, which returns to the QEII Centre, in London, on 3 and 4 November.

The speakers come from academia and industry, and include two technologists from Innovate UK, who will be discussing ongoing work on the Building Performance Evaluation programme.

Confirmed speakers include:

- Matt Colmer, lead technologist, built environment, Innovate UK
- Michael Dixey, principal consultant, GGR Associates
- David Fisk, past president, CIBSE
- Mark Hawker, senior engineering design manager – property, Sainsbury's
- Rick Holland, lead technologist, built environment, Innovate UK
- Cathy Noakes, professor, Leeds University
- Ashraf Patel, energy and environment manager, Arcus Facilities Management
- Nina Reid, director, responsible property investment, M&G Real Estate
- Mike Simpson, technical and design director UK, Philips Lighting

Speakers will address the impact of legislative change on industry, present research studies to improve building performance, and demonstrate innovative business case studies.

The theme of the conference is working together for resilient, efficient and healthy buildings. It is a chance for key decision makers from the building services and built environment sectors to meet, learn and debate

critical issues facing industry, from building security issues to maintenance and operational performance.

Following on from CIBSE President Nick Mead's call for closer working between the many building services disciplines, this year's conference will centre on the question of how collaboration can more effectively deliver better building performance.

Attendees will be able to meet and network with more than 300 like-minded professionals, clients and suppliers from around the world.

The programme is suitable for anybody working to improve performance from design through to operation. The conference offers extra value for delegates who book early. Register before 7 September 2015 and save up to 20% at www.cibse.org/conference

was rewarded with patient responses. His experience has taught him that 'mentoring is part of the DNA for engineers'. He noted that Rudyard Kipling wrote a poem specifically for Canadian engineers – *The ritual of the calling of an engineer* – that is still recited at graduations across Canada where a ceremonial ring is presented. This reminds long-time engineers of their responsibilities in receiving, welcoming and supporting young engineers.

Strong links with employers are seen as a key means of developing and maintaining a strong membership. He spoke of the ASHRAE Vital programme (Value to industry of technical ASHRAE leadership) engaging with employers by highlighting ASHRAE's value is based on volunteerism and standardising of industry practices. **CJ**



CONFERENCE PROGRAMME

Day 1: November 3

Security of Building systems and networks;
Using BIM in building operations;
Lighting, wellbeing and comfort in buildings;
Reliability centred maintenance

Drinks reception: Building Performance Awards 2016 shortlist announcement

Day 2: November 4

Adapting the UK building stock to a changing climate; Legislation and building performance; Building Performance Evaluation – Learning from the Innovate UK programme; Innovation and collaboration in building performance.

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In aiming for Passivhaus the project team at the Enterprise Centre worked to the tightest of parameters leading to the use of 70% bio-based materials, a super-airtight envelope and minimal plug loads. **Andy Pearson** reports on the challenges involved

NO COMPROMISE

Is this the UK's greenest commercial building? The Enterprise Centre at the University of East Anglia (UEA) in Norwich is targeting BREEAM Outstanding and Passivhaus certification. Designed to last for 100 years, it has been built on a brownfield site using 70% bio-based materials, many of which have been sourced locally. And it exceeds local planning requirements for 10% of the building's energy to be from renewables, with a 480m² roof-mounted photovoltaic array, predicted to generate 44MWh a year.

Consequently, over its lifetime the building's embodied carbon is predicted to be one quarter that of a conventionally constructed building.

This pioneering two-storey 3,400m² building is the new home for the Adapt Low Carbon Group, which was created to commercialise graduate start-up firms that have grown out of UEA's world-class environmental sciences.

Adapt wanted its new facilities to be an exemplar of sustainability. 'There is no point in being a lead institution on climate change if we don't act on our values and build a site that can help mitigate climate change and can cope with its impacts,' says group CEO John French.

The biggest clue to the £11.6m building's climate mitigation aspirations is its cladding – the building is wrapped in thatch. In a dramatic reinterpretation of the use of this traditional Norfolk roofing material, the thatch is formed of 250mm thick layers of straw set in prefabricated, vertically-hung timber cassettes – a world first according to Morgan Sindall's senior site manager Ken Bassett.

The thatch holds the carbon absorbed by plants photosynthesising for 100 years or so. 'We recognised thatch would be a good carbon negative local material,' Bassett explains.

The unique cassette system was developed under a single point delivery contract by Morgan Sindall and project architect Architype. The cassettes were thatched horizontally by local thatchers, who were able to carry out the work safely in barns through the winter when traditionally there is very little work for them. 'Once all the panels were in place, a thatcher came along and dressed the wall with a machine like a large hedge cutter to give the building a haircut,' says Bassett.

The use of cassettes has enabled this traditional material to be installed in much the


PROJECT TEAM

- Client: University of East Anglia
- Developer: Adapt Low Carbon Group
- Contractor: Morgan Sindall
- Architect: Architype
- M&E: BDP
- Lifecycle cost analysis: BSRIA



The amount of carbon embodied in the building's thatch cladding cassettes was calculated by Architype using its newly developed Rapiere software, using information taken from the project BIM model



same way as conventional cladding panels. Significantly, the panels sit outside of the building's airtightness and insulation line and are not part of the structure.

Thatch cladding features on every elevation of this E-shaped building. The building's form was the result of the need to maximise the amount of daylight. The top and bottom elements of the E are formed by the two main wings, one of which is for teaching, and the other for start-ups. The building is orientated such that the wing façades face north and south. A predominantly transparent block links the wings, in its centre, and forming the middle of the E is a 300-seat auditorium.

Achieving CO₂ targets

The amount of carbon embodied in the building's thatch cladding cassettes was calculated by Architype using its newly developed Rapiere software, using information taken from the project BIM model.

The client set the design team a target of 500kg of emitted CO₂ per square metre over the 100-year life of the building. This meant that every material was selected based on an



assessment of embodied carbon and cost.

'Normally I'd look at cost and programme when selecting materials but here it was a complex equation. We had to look holistically to ensure we reached the optimum balance between achieving BREEAM and Passivhaus targets, minimised embodied energy and lifecycle costs while ensuring we met the construction programme,' explains Bassett.

The building's foundations were one area where the team had to work extremely hard to find an appropriate solution. The building is supported on a glulam timber frame.

Originally it was proposed the frame would be supported on small concrete pad foundations and that the building would feature a timber ground floor supported from the glulam columns.

However, Morgan Sindall's geotechnical investigation revealed a site dotted with sinkholes and the remnants of a glacial riverbed. This resulted in the pad proposal being abandoned, along with the timber ground floor, in favour of a 375mm thick concrete raft foundation incorporating three layers of 98% recycled steel reinforcement.



polystyrene insulation, positioned on a sub-base formed from crushed, recycled basement salvaged from the demolition of a nearby hospital. For this project the manufacturer developed special polystyrene kerb units which not only removed the need for shuttering but, equally importantly, enabled the insulating envelope to continue from under the concrete raft to join up with the insulation in the wall minimising heat losses. ‘The solution worked brilliantly,’ says Bassett.

In keeping with the low-carbon philosophy, the raft’s top surface has been ground and polished to save on floor finishes. A carpet had been proposed as a covering for the ground floor; this would have been replaced under UEA’s maintenance strategy every seven years. ‘When we looked at the carbon embedded in using a carpet, it was actually more than was in the raft foundation, so we got rid of the carpet and went for a ground finish,’ says Gareth Selby, an associate at architect Architype.

The building’s glulam structural frame is supported by the raft. It was sourced from abroad because there are no commercial-scale glulam makers in the UK. The project does, however, make use of Corsican Pine – sourced from Thetford Forest some 30 miles away – in the construction of internal studwork walls.

Timber is also used for construction of the façade brise soleil. Future climate data was generated for this project by EA’s Climate Team for an 87-year period. Using this information, Architype simulated a range of design scenarios in Passivhaus Planning

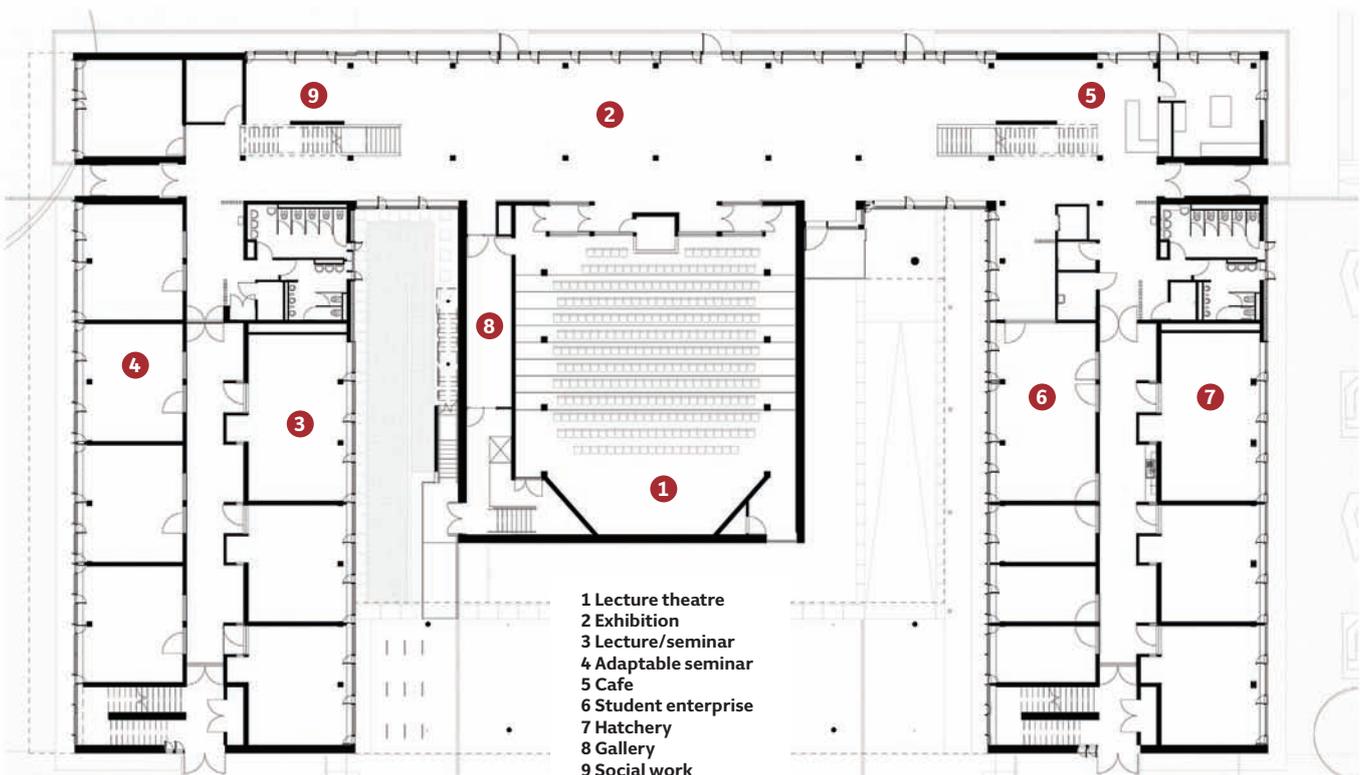
➤ **Not just a cement mix**

Concrete has a high level of embodied carbon as a result of the use of cement produced by heating Portland stone to about 1,400°C. ‘Using 1,000m³ of ordinary concrete for the raft would have knocked the project way off its carbon target,’ Bassett explains. Morgan Sindall worked in partnership with its concrete supplier to produce a mix incorporating ground granulated blast furnace slag, which allowed 70% of the cement to be removed from the mix. In addition, recycled sand and responsibly sourced aggregate were also used. ‘This concrete had 38% embodied carbon when compared to ordinary concrete of a comparable mix,’ proclaims Bassett.

The raft was cast on a base of Isoquick

CIBSE guidance on resource efficiency

The embodied energy strategy was highlighted as a case study in CIBSE TM56 *Resource Efficiency of Building Services: 2014*. Members can download this for free at www.cibse.org.uk/knowledgeportal Cost for non-members is £50.50.



CREDIT @ARCHITYPE

Package (PHPP) to optimise the façade design.

The analysis highlighted the need to rethink slightly the allocation of south-facing windows deemed essential by Passivhaus as a source of passive heating, to help limit internal gains.

‘From the analysis we boosted shading slightly by setting the windows further back into the reveals,’ explains Selby. ‘From a future perspective we developed a timber brise soleil, which can be adapted to allow more louvres to be added in the future.’

Keeping cool

While the building’s lightweight construction has helped save on embodied carbon, there were some concerns that its lack of thermal mass could result in the building overheating, even in the current climate.

These concerns were mitigated, in part, by floor-to-ceiling heights in excess of 3.3m on both floors which helped create sufficient volume to cope with temperature rises and ensure good daylight levels on the floorplates. Aided by LED lighting and an intelligent control system this helped keep lighting loads to a minimum and kept the primary energy demand below 120kWh/m²/y.

The building is exceptionally airtight, even by Passivhaus standards. ‘We achieved an airtightness of 0.21m³/m² at 50Pa, which is three times better than needed for Passivhaus compliance, and about 100 times better than is required under Part L,’ laughs Bassett.

A demand-led ventilation system controlled by occupancy and CO₂ sensors delivers

fresh air to keep occupants comfortable. The building has three ventilation plantrooms: one in each wing and one in the central auditorium. Each plantroom houses a Swegon Gold, Passivhaus certified, air handling unit (AHU) incorporating a thermal wheel.

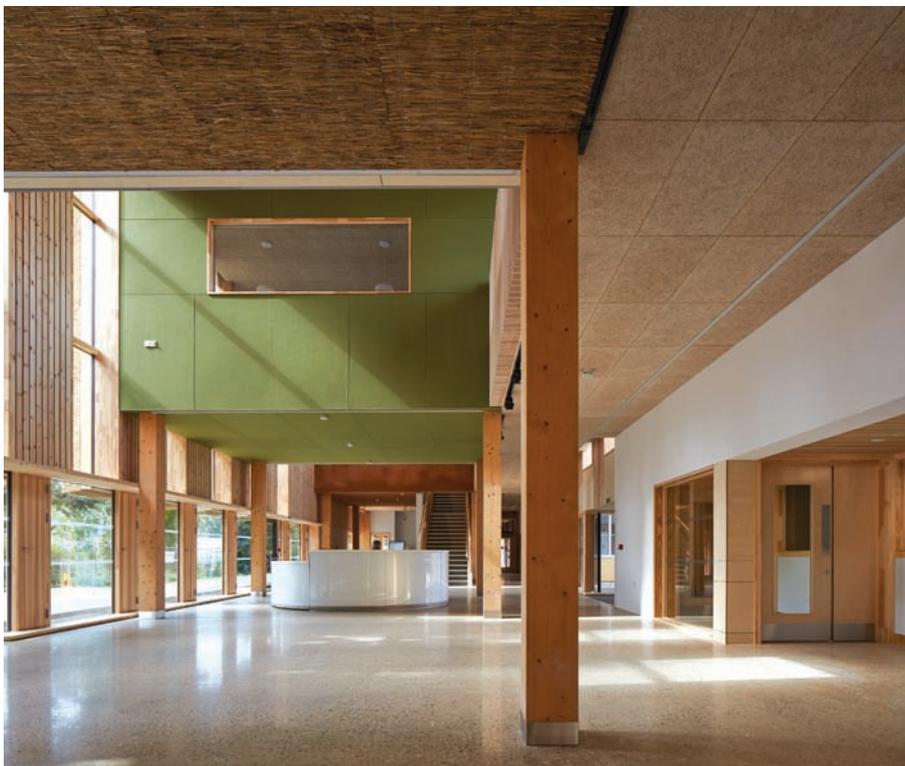
Air from AHUs is ducted to the floors and distributed via Trox VAV units mounted in a services distribution bulkhead that doubles as an attenuated return air plenum. Air is extracted from the wings via the toilet blocks (there are no toilet extract fans); extracted air is then passed through the thermal wheel before being discharged to outside.

Unusually for a Passivhaus project, the Enterprise Centre does include a small amount of cooling in the 300-seat auditorium to ensure it remains comfortable in summer. This is provided by a small direct expansion system with a cooling coil positioned in the supply air stream and a heat rejection unit situated in the exhaust air stream. ‘We’re using cooling just to peak-lop the fresh air supply temperature in summer because the students will be dressed appropriately for the conditions,’ explains James Hepburn, engineer director at BDP, the project’s services engineer.

In the main floor areas there is no cooling. Instead occupants can open the building’s windows to provide ventilation [See panel ‘Window of opportunity’].

The ventilation strategy, and other aspects of the scheme, were agreed with the UEA’s estates team, who were involved with the project under its Soft Landings initiative

6 The building’s glulam structural frame was sourced from abroad because there are no commercial-scale glulam manufacturers in the UK



Window of opportunity

There is no cooling to the main floor areas. However, when conditions allow, the occupants can open the building’s triple-glazed windows to provide ventilation. A display panel in each room contains two LED lamps, which are illuminated when outside air temperatures are suitable to allow windows to be opened. The CO₂ sensors in the room will then detect improved air quality and back off the VAV damper serving that room.

If temperatures are very hot, occupants are encouraged to leave the windows open overnight to allow night ventilation.

In winter heating availability is limited and controlled by the BMS. Heat in occupied rooms is provided by ‘tiny’ radiators, each fitted with a TRV. ‘We didn’t want to run the risk of not having heating in these rooms, because the building does not have automatic windows so there is a chance a window could be left open overnight,’ explains Hepburn.

and led by Stuart Thompson, senior design manager at Morgan Sindall. This is a good thing because estates will probably need to be proactive in managing the operation of this highly value-engineered ventilation solution and innovative building.

Heat for the building comes from the UEA's district heating system. The heating mains ran close to the building, which was fortunate because heat loss from the spur to the building had to be included in the Passivhaus compliance criteria. A heat interface unit incorporating two heat exchangers, one for the heating and one for the hot water – separates the building from the mains.

One of the biggest challenges in achieving Passivhaus compliance was the provision of hot water to toilet blocks. This is because standing heat losses from hot water pipes are factored into the PHPP spreadsheet.

The form of the building with its two wings meant the losses were so high that hot water in the southern wing, the one furthest from the heat interface unit, had to be provided by point-of-use local electric water heaters. Micro-bore pipework, which has lower standing heat losses, feeds the remaining hot water outlets.

As far as minimising embodied carbon goes, Hepburn says: 'We did a fair amount

of research looking at different materials but we were not satisfied with the robustness of alternatives in meeting the building's 100 year life. The best you can do is install less M&E.'

One of the constraints of Passivhaus is becoming apparent now the building is in use. One challenge of gaining certification is that small power loads are included in the Primary Energy Demand maximum. As a result, the design team spent a lot of time selecting the building's AV systems and, to keep small power loads to a minimum, the client was keen not to flood the building with electrical sockets. 'Passivhaus is very challenging because it limits what you can do in terms of computers and catering, which we're finding a little bit constraining,' remarks French.

Bassett, meanwhile, has submitted his last spreadsheets for carbon emissions from deliveries and from the workforce. The sheets include all deliveries to site, including such details as where the vehicle was from, miles driven, type of vehicle, and fuel. 'The threshold was less than 500kg/m² emitted CO₂ over the 100-year life including construction carbon – we think we'll be 10% below that figure,' says Adapt's John French. 'From my perspective we've set a new standard in sustainable architecture and it has not cost the earth'. CJ

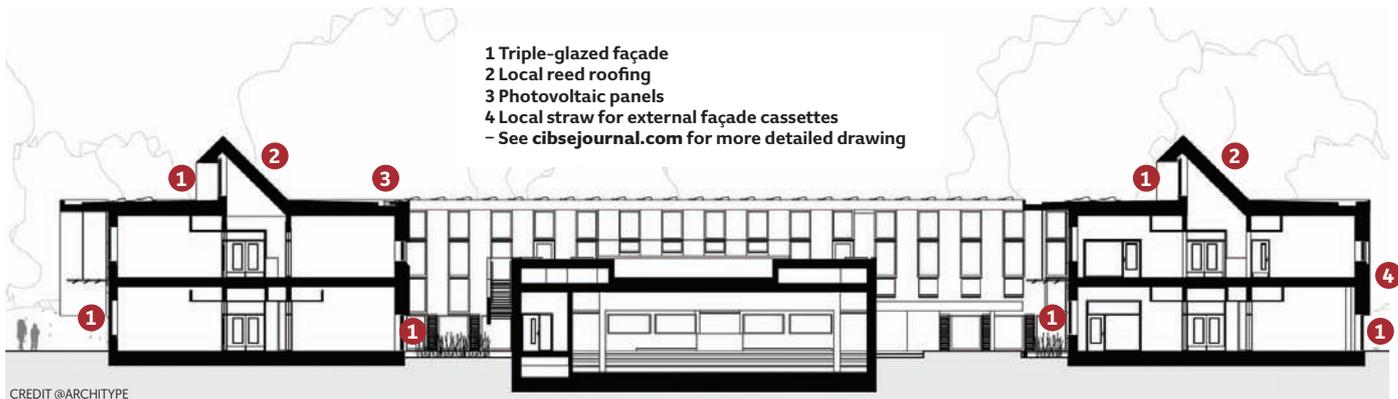


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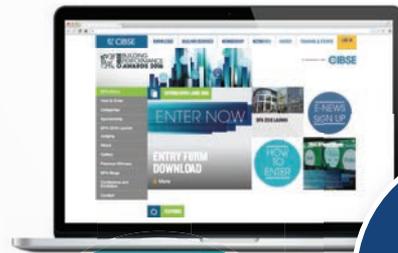
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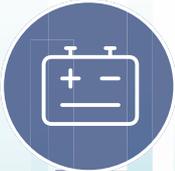
- » Provide evidence of user satisfaction - client and occupier testimonials provide valuable insight
- » Include measured data - demonstrate results against specific objectives. DEC, ESOS, BREAM & LEED reports and certificates will boost your entry
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- » Send supporting photos - photos can bring your entry to life and will be used to promote your entry if shortlisted

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PREPARE FOR LANDING



As the 2016 deadline for using BIM Level 2 on public sector projects looms, **Martin Howe** explains how Shepherd Engineering Services is adapting to BIM by improving supply chain coordination and integrating its software tools

Cost and client demand were identified in the 2015 NBS *National Building Information Modelling (BIM) Report* as the main barriers to uptake of BIM. It could be argued that the two are inextricably linked, given that our clients will not demand BIM until the building industry's supply chain embraces new processes and technology to maximise efficiency – thus reducing cost and increasing profitability and value.

To achieve widescale adoption of BIM in the construction industry – and maximise the 'push' from the government's push-pull BIM strategy – I believe every stakeholder

needs to identify how it will benefit their business. This means using it not because they have to, but because they can ascertain improvements in quality, processes, efficiency and profit through its implementation.

As a national design and build contractor, and manufacturer of building services, our BIM journey was born out of necessity and was very much a natural progression – a case of evolution not revolution.

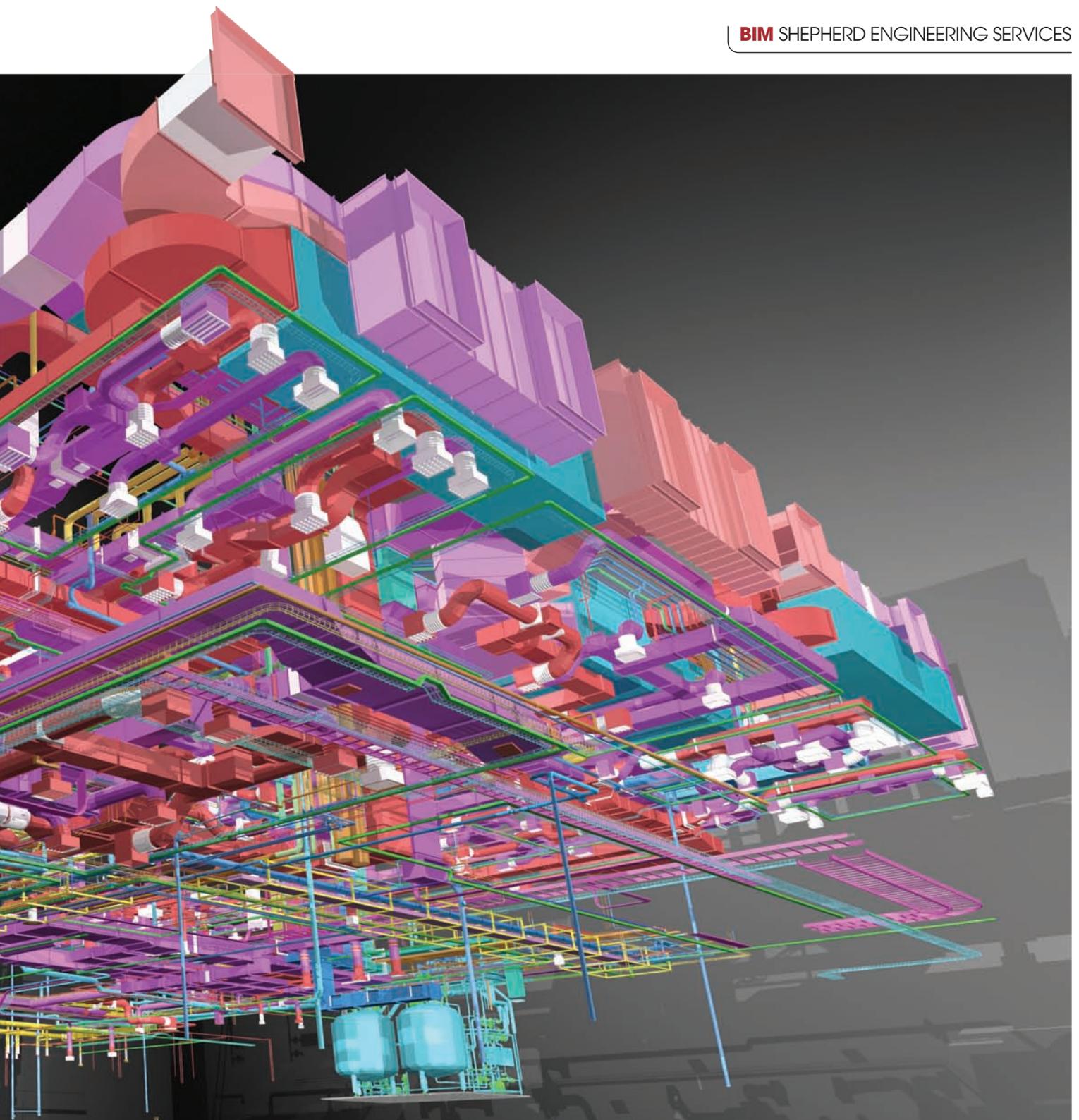
The move from the drawing board to CAD, and from 2D CAD to 3D CAD, had improved our quality and consistency; however, the demands of our manufacturing facility gave rise to a concept that meant we could link the

3D model to our business systems – that is, both data and information. By making this link, we could see the potential to become more efficient by having a single source of information that could be used many times through automated processes.

The technology was complex, but there were many other challenges to overcome on our BIM journey, not least the cultural change required to achieve our objectives.

Making changes

To create true value from BIM, we had to ensure we authored virtual construction models. In the past, we may have worked



to an 80/20 rule, where 80% of issues were resolved during pre-construction and the remaining 20% resolved on site. As we were moving into a manufacturing-led regime, however, our models needed to be as close to 100% accurate as possible. To do this required several changes:

1 The coordination team needed to have a greater understanding of site engineering and build process, as they were now responsible for creating an exact model of the MEP installation, including details such as pipe couplings, adapters and bracketry. This was an extensive learning and development process, which included

product seminars, one-to-one mentoring and practical training. It is also an ongoing challenge as new products emerge and we develop enhanced install methods. It is a challenge worth tackling though – not just for us, but for the industry as a whole. We must start with the end in mind to ensure minimal re-work, double handling and wasted effort when we are creating the BIM or virtual construction model.

2 We had to standardise methods, materials and products – a major step to enable early decision-making and to realise the benefit and efficiencies of using repeatable solutions. Initially, the standardisation

of materials facilitated by the off-site manufacturing process helped to reduce the scope of our task. It allowed us to link components in the 3D model to products in the database through a unique code, to a manageable level – for example 10,000 items rather than 200,000.

3 Our software tools and systems had to be developed and integrated. We were fortunate to have a well-established enterprise resource planning (ERP) system, which provided bespoke solutions for estimating, planning and procurement – and the background to this was a database management system.



BIM images are of the National Biologics Manufacturing Centre in Doncaster, which was completed this year

Now that the BIM process is fully implemented on all of our projects... we save several thousand working hours per year

- We made an early decision to keep the data necessary for business operation separate from the 3D model, because we believed the, best place to collect, store and manage data was in a database and not the model.
 - 4 During the development phase, we refined our best practice using feedback from project teams to provide live data, ensuring processes and procedures met our business needs. Rigorous implementation of these throughout our BIM team ensures accuracy, consistency and efficiency, and that our models are created as a virtual MEP construction project.
 - 5 We have a clear strategy on early decision-making, enabling an optimised delivery programme, enhanced quality and maximum value for Shepherd Engineering Services and our customers.
- Our objectives for the BIM development project were to: produce high-quality installation and manufacturing information;

automate material take-off and labour planning; and have electronic ordering of materials. Each of these has enabled us to realise business efficiencies.

Now that the process is fully implemented on all of our projects, we save between one and three hours per assembly, equating to several thousand working hours per year. This has been measured and quantified to demonstrate return on investment.

Consequently, many of the improvements we made for our manufacturing process have been transferred to the traditional install areas of the project, bringing benefits such as:

- Enhanced interoperability and early collaboration of all project stakeholders
- Incorporation of best-practice engineered solutions before arriving on site
- Maximised opportunities for off-site manufacture, leading to less waste, increased safety and reduction of on-site labour and programme
- Reduced profit leakage by minimising rework and redesign, loss of productivity, late procurement, snagging and defects
- Maximising time on site to manage health and safety, quality, labour, productivity, contractor relationships and soft landings.

To expand our initiative further – and for Shepherd Engineering Services to become a true Level 2 BIM-enabled business – we are now working with our supply chain and our partners across the industry to adopt the fundamental principles of the BIM process.

Whether you are a product supplier, design engineer, specialist subcontractor, installer or FM provider, our challenge is to embrace BIM so we can improve as an industry, and make our businesses fit for purpose in a digital built Britain. **CS**

● **MARTIN HOWE** is national BIM manager at Shepherd Engineering Services

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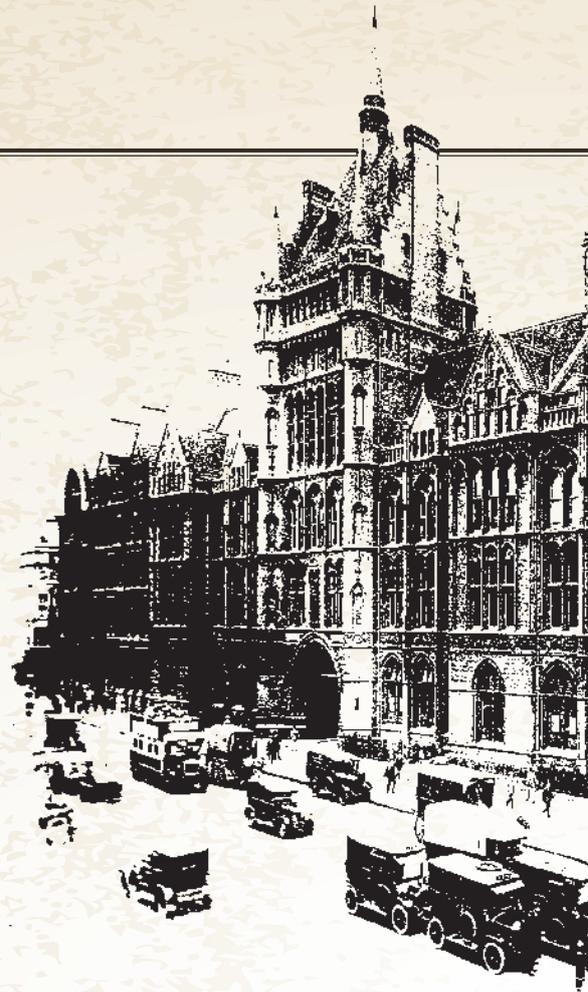
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WHO MOVED IN HIGH CIRCLES



The work of Wilson Weatherley Phipson had gone largely unrecognised until recent research unearthed his extraordinary achievements. Neil Sturrock explains how the Victorian engineer exploited family connections to bring innovative heating and ventilation to some of Britain's grandest buildings

Until recently, few people would have heard of Wilson Weatherley Phipson (1838-1891), but recent research by the CIBSE Heritage Group means his contribution to the development of building services can now be revealed.

Phipson's family connections enabled him to win work on some of the Victorian era's most famous buildings, including the Natural History Museum, the Royal Albert Hall and Gilbert Scott's University of Glasgow. A European education introduced him to pioneers of heating and ventilation, and it was their techniques that he brought back to England at the height of the Victorian building boom.

Building services in the 19th century

The use of steam for heating buildings was first proposed in the middle of the 18th century, by Colonel William Cook. Rapid development in the early 19th century led to it being used for heating factories and mills, and occasionally houses – as at Quarry Bank Mill in Styal, Cheshire.

Hot water had been used for heating greenhouses in the 18th century, but the main

developments in hot-water heating took place in France and were then brought to Britain in 1816 by the Marquis de Chabannes. High-pressure hot-water heating was devised by Angier March Perkins in 1831.

Ventilation had been provided in mines for many years by fans turned by hand or by animal power, and a hand-driven 'ventilating' fan was installed in the House of Commons by John Theophilus Desaguliers in 1735. In the 19th century, however, early attempts at providing 'powered' ventilation in large buildings often relied on fire-assisted stacks, such as in the temporary House of Commons (1836, see 'The pioneer who rid Parliament of hot air', *CIBSE Journal*, January 2015). The General Prison for Scotland in Perth (1840) and Pentonville (1842) also relied on this principle, as did most subsequent prisons.

Steam engines were probably first used to power a building's ventilating fans in London's Reform Club (1841). They required only a fraction of the fuel of a fire-assisted stack, but – if the steam engine failed – there was no backup.

Phipson's birth, in Queen Victoria's coronation year, roughly coincided with the development of 'warming and ventilating' as a major 19th century industry. There was a frenzy of church development in the 50 years

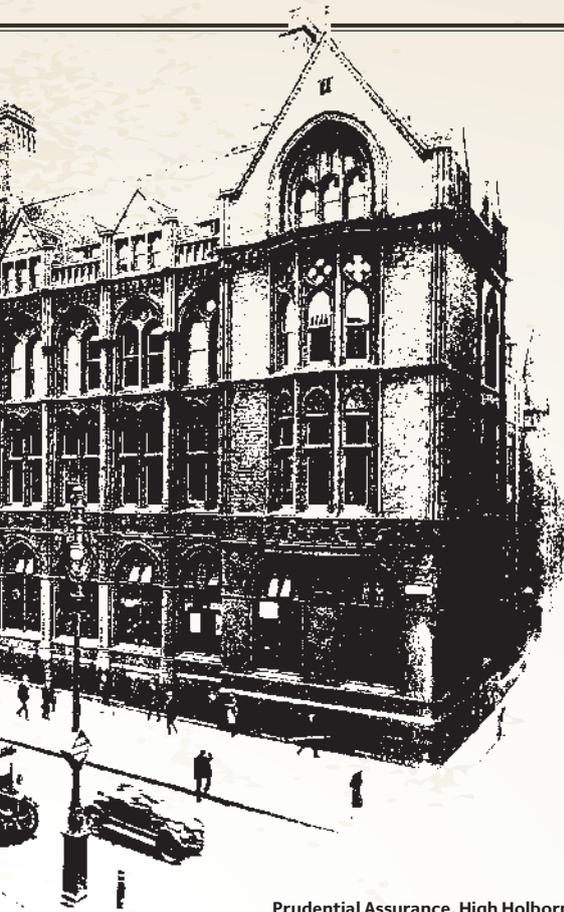
up to around 1870; thousands were built and they all needed heating.

Social reform in the Victorian era also meant hundreds of institutional buildings were erected, including town halls, museums, public baths, schools, hospitals, workhouses, lunatic asylums and prisons. The stately homes of the rich and famous were another major source of business for the industry.

Phipson, the man

Wilson Weatherley Phipson was born, the third son of Samuel Ryland Phipson. As well as two older brothers, Phipson had three younger sisters, although the first of these sisters died in infancy. Samuel's occupation is given on Wilson's marriage certificate as 'Gentleman' and he appears to have occupied a prominent position in society. He was educated at the University of Jena, in Germany, and his home – at Ladywood, near Birmingham – hosted MPs, French ministers of state, writer and philosopher Thomas Carlyle and many other distinguished visitors, such as actor and theatre manager William Charles Macready.

Around 1847, however, Samuel suffered severe financial losses after the collapse of both the North of England Joint Stock Bank and a US bank in which he was a shareholder.



Prudential Assurance, High Holborn

This led to the family moving to Brussels, where living and education were cheaper.

Wilson Phipson's formal education took place in Brussels and Paris, where he was enrolled at the *École Impériale des Ponts et Chaussées* from 1854 to 1856. He then worked for two years in Brussels with Dr Englebert-Theophile Van Hecke, who discovered a new method for heating and ventilating hospitals that had proved economic and efficient.

Phipson helped Van Hecke in Paris – warming and ventilating hospitals at Necker and Beaujon – and accompanied him to Bordeaux and the Netherlands, where similar work was done on government buildings.

By the late 1850s, Phipson was well known among high society in France and Belgium. He was a talented pianist and singer, and became a favourite of Prince George of Prussia, who wanted Phipson to be his secretary and travelling companion. Phipson was not fluent in German, however, and he decided to return to England to try to bring Van Hecke's methods to a new market.

Engineering breakthrough

Phipson was somewhat dismayed by the prejudice and ignorance he had to overcome to try to get Van Hecke's principles adopted in his native country. Controlled ventilation was

“ An indication of the circles Phipson moved in is that Joseph Bazalgette supported his application to be an Associate Member of the Institute of Civil Engineers

in its infancy, and Phipson could not attract any interest in the Van Hecke system. Finally, through the influence of his father, he was able to obtain a contract to warm and ventilate the bank of Baron Rothschild, in St Swithin's Lane, and the Baron's private residence in Piccadilly.

His success attracted the attention of some of the leading architects of the day, and his next project appears to have been The Strand Music Hall. His father's influential circle of friends may have helped further, but very soon Phipson was employed to design systems for the Royal Albert Hall, The Natural History Museum and the rebuilt Alexandra Palace.

Formally, Phipson was a civil engineer and it is an indication of the circles he moved in that – when he applied to be an Associate Member of the Institution, in 1869 – one of his supporters was Joseph Bazalgette, London's principle sewer engineer. His application to be a full Member was supported by William Thompson (Lord Kelvin).

Phipson married Elizabeth Newcombe in 1867 and later – because there were no children from the marriage – he adopted and educated one of his wife's nieces. The 1881 census shows this niece and her younger sister both living with the couple.

Phipson worked with many well-known architects of the Victorian era, including Sir George Gilbert Scott, George Edmund Street, Thomas Verity, Augustus Pugin and, most closely, Alfred Waterhouse. The Royal Albert Hall was not designed by an architect, but by Henry Young Darracott Scott, a Major-General in the Royal Engineers, and Phipson designed the system for this. Unfortunately,



Phipson's combined extract stack and fireplace chimneys at the Liverpool Royal Infirmary

the Heritage Group has not been able to gain access to the venue to view anything that remains of the Phipson system.

No working link has been established between Phipson and the architect Matthew Digby Wyatt – a member of the dynasty of Wyatt architects and sculptors – who may just have been a family friend. He is listed as a witness at Phipson's wedding and that of his older brother, Thomas.

Many of Phipson's best-known projects were carried out on the buildings of Waterhouse; as well as the Natural History Museum, he worked with him on Liverpool Royal Infirmary (see Case study, p28), the University of Liverpool, and the National Liberal Club.

One of the most significant buildings they worked on together, however, was the Prudential Assurance Building in High Holborn, begun in 1878 (pictured). Phipson specified steam-driven dynamos, installed in 1886 by Drake & Gorham, for the electrical services – primarily direct-current lighting – and the exhaust steam from the engines was used for space heating. This was probably the first major application of combined heat and power in the UK, and the system was extended in 1904 to provide electricity for 8,000 lamps.

Phipson also designed a very elaborate system for the University of Glasgow, which will be described in a later article.

Despite the CIBSE Heritage Group's research, no picture of Phipson has come to light. If anyone knows of an image of him, the group would love to hear from you. CJ

CASE STUDY: LIVERPOOL ROYAL INFIRMARY

The present Liverpool Royal Infirmary buildings were designed by Alfred Waterhouse in 1885. Remnants of an earlier infirmary, from 1824, remain on the site, but the shortcomings of this original building had been highlighted by Florence Nightingale during her visit in 1858. It was not until 1882, however, that the hospital trustees finally decided to rebuild according to her guiding principles.

In the May 2015 edition of *CIBSE Journal*, Chris Iddon describes Florence Nightingale's recommendations about the supply of fresh air to hospital wards. 'Pavilion' wards were preferable, she suggested, and these should be no more than about 30 feet wide and about 16 feet high. They should be 'well-ventilated and spacious', with the window space being not less than one third of the total wall.

Waterhouse was not entirely convinced because he was an admirer of the 'circular ward' concept, which purported to provide light and ventilation from all directions, and give extra headroom and floor space.

His design, however, allowed for eight Nightingale 'Pavilion' wards, although he also incorporated two circular ward blocks. All were heated by means of circular radiators, each of which was supplied with fresh air from below, via floor ducts.

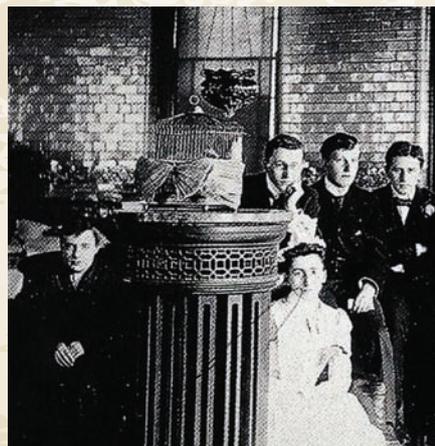
Extraction from all wards was powered by the heat from the fireplace chimneys, the vitiated air from other spaces was gathered at the central extract tower, where a steam coil provided additional buoyancy. Phipson calculated that the wards would enjoy four air-changes per hour.

An additional – and very unusual – feature was the inclusion of a miniature train running in the infirmary's roof space, to deliver food from the kitchen to the ward blocks.

The last patient left

the building in 1978 and it has since been refurbished to provide a primary healthcare facility, among other functions. The University of Liverpool recently converted the original boiler house to use as its energy centre.

For more on the CIBSE Heritage group, visit www.hevac-heritage.org For more information on Wilson Weatherley Phipson, visit <http://bit.ly/iMfv7A5>



Each circular ward was heated by three radiators and three fireplaces

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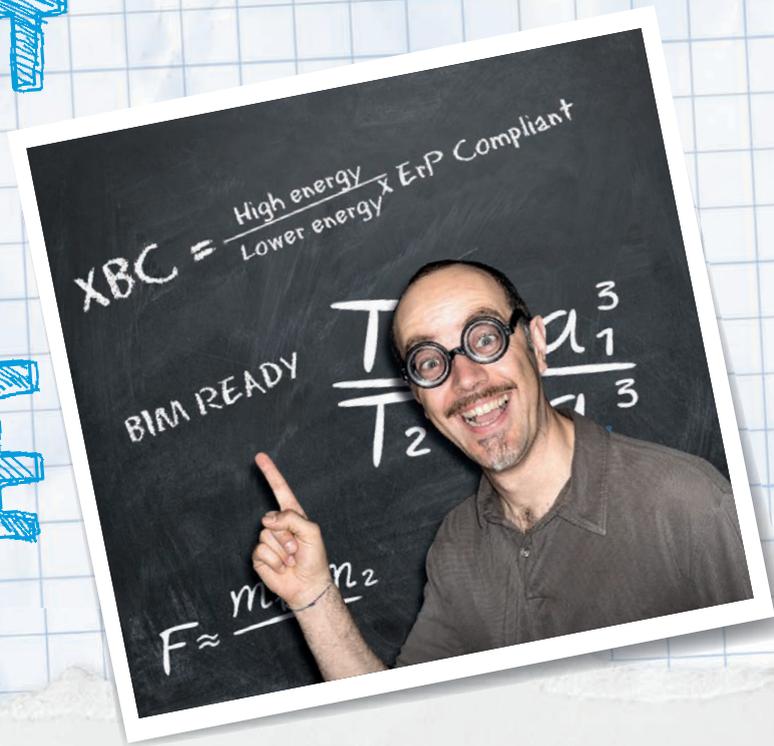
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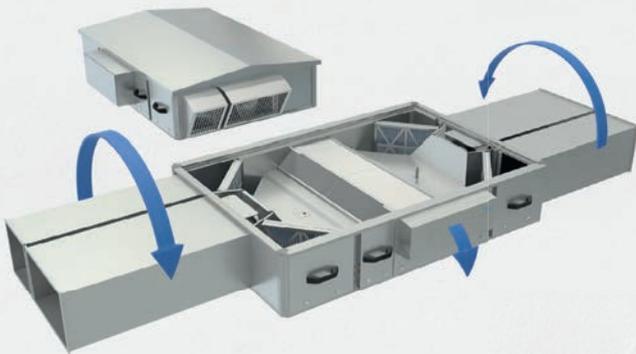
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This month: Heat recovery in commercial buildings, ventilating atria, and conditioning air in an Egyptian tomb

A SENSIBLE APPROACH TO HEAT RECOVERY



Heat-recovery technology has an important role to play in minimising energy use in commercial buildings where natural ventilation is not an option. **Chris Jones**, of Fläkt Woods, considers the practicalities of recovering latent and sensible heat

The commercial sector contributes 38% to the nation's carbon emissions, so has a significant role to play in helping the UK meet its carbon-reduction commitments. Heating and air conditioning, in particular, can account for a considerable amount of an organisation's energy use, so it is essential that the system specified is as efficient as possible.

In the new-build sector, the drive for airtight structures is positive news when it comes to reducing heat loss and improving efficiency. It does mean, however, that unless an effective ventilation system is also implemented, the quantities of fresh, outside air being introduced into the building will be compromised, and the potential for unacceptable levels of humidity will rise.

The NHS recognises that common symptoms of illness can be attributed to poor indoor air quality (IAQ) – 'sick building syndrome' – and it encourages businesses to invest in better ventilation to help reduce these.¹

Specifiers should work closely with their chosen

manufacturer to select a heating and mechanical ventilation solution that includes heat recovery, which is particularly important in buildings where effective natural ventilation is impossible.

Recovering heat

Energy recovery – sometimes referred to as heat recovery – is already a proven solution for commercial premises that don't have effective natural ventilation. It works by extracting moist, stale air from inside the building, and replacing it with fresh outside air. The system uses heat from the outgoing air to warm the incoming air via a heat exchanger in an air handling unit (AHU).

By using components, such as rotary heat exchangers, these systems can achieve high levels of heat recovery for a building ventilation system. However, it is important to understand the types of heat exchangers available and the differences between latent and sensible heat.

Sensible heat is heat that causes a change in temperature of air or another substance; for example, when cool air is heated, its temperature rises as a result of this added heat. The reverse effect, when heat is removed from the air and its temperature falls, is also sensible heat.

Latent heat, however, does not affect the temperature of a substance. For example, water remains at 100°C while boiling, and the heat added to keep the water boiling is latent heat. Heat that causes a change of state, with no change in temperature, is latent heat.

There are two types of rotary heat exchangers, or rotary wheels: non-hygroscopic and hygroscopic. Generally, non-hygroscopic rotors are used for heat recovery during the winter. In temperate climates, such as the UK's, cooling energy recovery during the summer is usually very limited, as a non-hygroscopic rotor transfers only sensible heat.

In terms of heat recovery, if the outdoor air is sufficiently cold and the extract air is warm and



The Recoiler HP (all images) has a reversible heat pump and recovery wheel

► humid, moisture will condense on the extract air side and evaporate on the supply air side. In this way, the rotor will transfer a certain amount of moisture to inside air, ensuring an acceptable level of humidity to meet best practice for indoor air quality.

Without any supply of humidified air to the rooms, the rotor can manage outdoor temperatures as low as -15°C without a frost problem. If outdoor air is very cold, however, frost will form inside the rotor and defrosting will be required.

A hygroscopic rotor can transfer both sensible and latent heat under all conditions. Hygroscopic rotors have a surface coating with a high capacity for absorbing and emitting water molecules.

When the rotor passage is on the side that has the highest vapour pressure, the water molecules will be adsorbed on the surface and later emitted to the air on the dry side.

A hygroscopic rotor can cope with the potential of frost better than a non-hygroscopic one. When normal ventilation is used, the hygroscopic rotor can still operate, even if the outdoor temperature drops to -25°C, without any frosting problem.

Because the hygroscopic rotor transfers moisture, it contributes to a better indoor climate during the winter when the indoor air will typically have a low relative humidity. In the summer, when the outdoor air is warm and humid, the rotor dries it, and contributes drier and cooler air to the indoor climate.

So a hygroscopic rotary wheel can cool and dehumidify the incoming air in summer, while heating and humidifying the incoming air in winter, instead of having to add a steam humidifier, for example, which would need additional plant – to create the steam – increasing energy use.

Increasing the moisture content of the air using an evaporative humidifier would need a constant water supply, while the pressure drop associated with it would increase specific fan power (SFP). A high SFP could lead to non-compliance under Part L, meaning the AHU size would have to be increased.

In the winter months, when the air is cold and dry with little moisture content, the rotary wheel is able to operate to its anticipated high performance, ensuring effective heat recovery while helping to sustain the optimal level of moisture in the air inside the building. This, in turn, lessens the impact that dry air can have on occupants – reducing the potential for breathing difficulties and discomfort.

During the summer, the recovery principles are the same, but with the reverse effect,

decreasing the cooling load required by the overall system and removing humidity from the supply airstream.

This summer operation also has a benefit when sizing cooling coils. If recovering only sensible energy in summer, you would reduce the cooling coil size by approximately 30%. If recovering latent energy too, this can be increased to 60%. This means a smaller cooling coil is needed, resulting in a smaller SFP because the pressure drop across the coil is not as high. The associated chilled water plant can also be reduced, freeing up plant space for other services. Financially, the hygroscopic thermal wheel costs about 10% more than a standard rotary wheel, and has no maintenance or longevity implications.

A combined approach

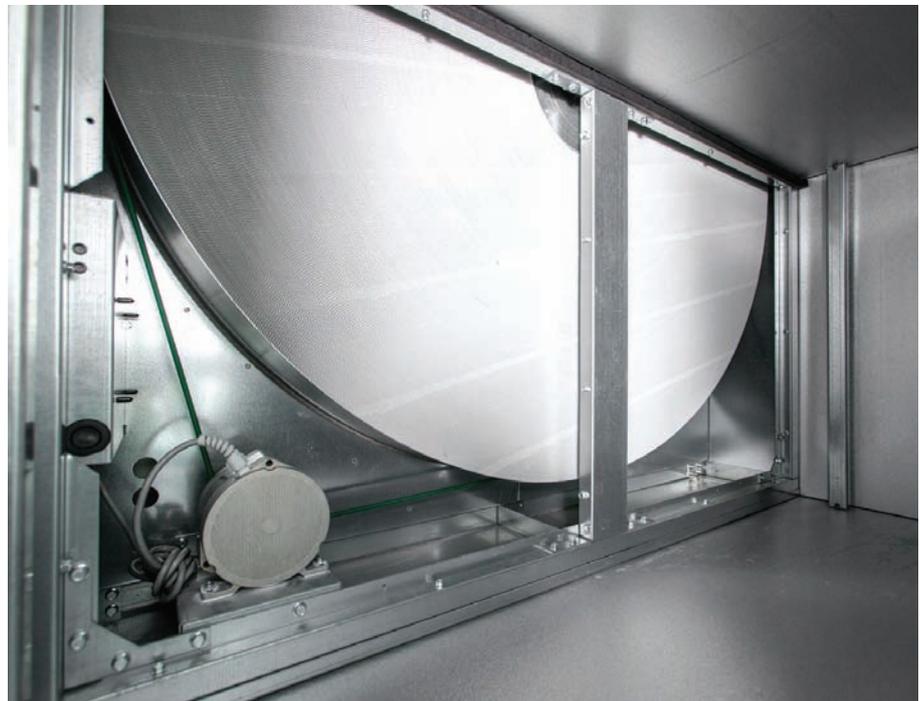
Combined systems that use, for example, a reversible heat pump and an energy recovery wheel in one unit, can deliver reduced operating costs as well as effective ventilation. Manufacturers are continuing to develop hybrid ‘all in one’ solutions designed to meet IAQ demands, while also improving energy efficiency, meeting regulations and cutting life-cycle costs. **CJ**

References:

- 1 NHS Choices website: Sick building syndrome definition <http://bit.ly/1E55RL>
- 2 Research conducted by Populus for Guardian Air Hygiene; www.gwtttd.com

● **CHRIS JONES** is national product sales manager at Fläkt Woods

Hygroscopic rotors have a surface coating with a high capacity for absorbing and emitting water molecules



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AIR TO THE THRONE

Excessive relative humidity is threatening priceless wall paintings in the tombs of Egyptian kings. **Essam E Khalil**, of Cairo University, explains how his research into the ventilation and conditioning system of one such chamber could help preserve them

Every year, the Valley of the Kings attracts hundreds of thousands of tourists to Luxor, all keen to see the final resting places of the Egyptian pharaohs. By far the most famous of these is Tutankhamen but, 14 years before the boy king's burial chamber was discovered, archaeologists uncovered King Horemheb's tomb (KV57), on 25 February 1908.

Horemheb was the last king of Egypt's 18th Dynasty, and was a Great Commander of the army. The decoration in his burial chamber and other parts of his tomb was left in various stages of completion, and so provides scholars with a fascinating glimpse into the processes involved in preparing painted reliefs. It reveals, for example, that wall decorations were created by following a grid system in red ink, over which figures were drawn in black before being carved and painted.

It is also the first burial chamber in the valley to show the ancient Egyptian funerary text, the Book of Gates, while other decorations depict deities and Horemheb with the gods.

Such priceless antiquities, however, are being threatened by excessive relative humidity (RH) in the tomb; this can affect the mechanical and physical properties of the materials used to create the wall paintings, as well as raise the levels of bacteria and fungus inside the chamber.

Currently, whenever condensation forms on the walls, KV57 is closed. As this has happened frequently over the past five years, the tomb has only been opened to the public for around 10% of the time.

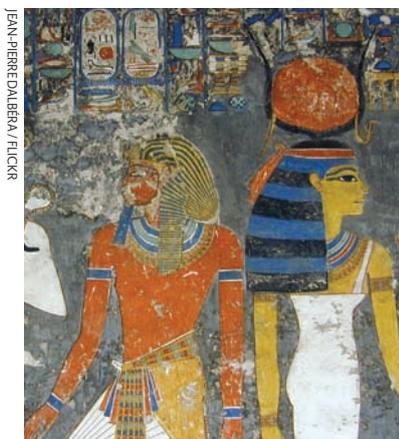
To try to preserve the wall paintings from these harmful factors – as well as improve the comfort of visitors to the tomb – I recently undertook research into the effect of mechanical ventilation systems on airflow patterns, temperature and RH inside KV57, as well as the thermal comfort prediction, using commercial computational fluid dynamics (CFD) package Ansys Fluent 15.

It was found that the optimum air-side system design should allow air to pass through all the enclosure areas before being extracted, with careful selection of near-wall velocities to avoid erosion of the tomb's wall paintings. The number of simultaneous visitors to the tomb should also be restricted to limit the relative humidity inside.

Introduction

The restoration of the Valley of the Kings started in the late 1970s with the Theban Mapping Project³, which fully documented its tombs in contour and engineering form, as built drawings of the various burial chambers.

Horemheb's tomb is located in the west branch of the south-west valley, and its



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TOMB DIMENSIONS

- Maximum height: 5.36m
- Minimum width: 0.66m
- Maximum width: 8.94m
- Total length: 127.88m.
- Floor area: 472.61m²
- Total volume: 1,328.17m³

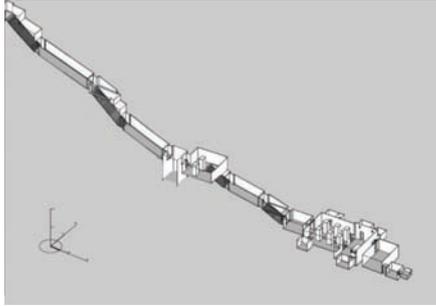


Fig. 1: Tomb of Horemheb configuration schematic geometry.

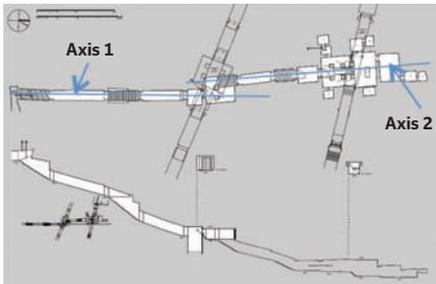
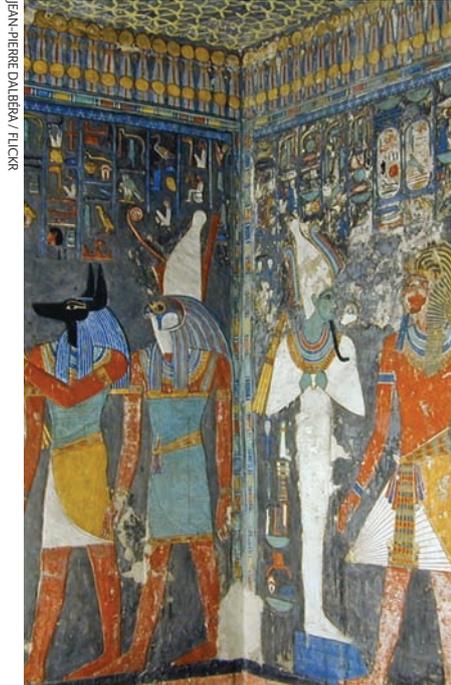


Fig. 2: Tomb schematic geometry



JEAN-PIERRE DALBERA / FLICKR

High humidity can damage the wall paintings

- opening – just above the valley’s ancient floor – is low in the south side of a hill that projects eastward into the central valley from the cliff face where the tomb of Amenhetep II was cut. It is composed of two parallel axes: the first consists of the entrance and a corridor, which leads to a well chamber; there is then a second axis that leads to a six-pillared

burial chamber (see Figures 1 and 2). The tomb is 5.36m at its highest and its width ranges from 0.66m to 8.94m. It is 127.88m long, has a floor area of 472.61m² and a total volume of 1,328.17m³.

My research builds on earlier studies by AbdelAziz¹, Ezz Eldin² and Mohamed³; it was a numerical study carried out to further investigate the air-side design of the tomb’s air ventilation and conditioning system to provide optimum comfort, healthy conditions, and optimal energy use (see panel ‘Numerical investigations’ below). Air-side design types were considered for the tomb passage of KV57, including different visitors in alternative positions to test the design’s ability to provide optimum characteristics.

The air supply and mechanically extracted ducted air play an important role in shaping the main flow pattern. The flexible ducts are above the raised wooden floor, and run less than 0.2 m above the original stone flooring.

Simulation and discussions

To design appropriate ventilation systems, simulation of actual airflow patterns and heat transfer behaviour were carried out. Air outlets were located on the raised floor to keep the archaeological scheme unaltered. The air outlets may be located either near the side walls or at the floor centre, allowing a diversity of air-side system designs. The CFD ➤

Numerical investigations

Governing equations

The governing partial differential equations are typically in the general form, Khalil⁴ and Kameel,⁵ in 3D configurations under steady state conditions as:

$$\frac{\delta}{\delta x} \rho U \Phi + \frac{\delta}{\delta y} \rho V \Phi + \frac{\delta}{\delta z} \rho W \Phi = \frac{\delta}{\delta x} \left(\Gamma_{\Phi, \text{eff}} \frac{\delta \Phi}{\delta x} \right) + \frac{\delta}{\delta y} \left(\Gamma_{\Phi, \text{eff}} \frac{\delta \Phi}{\delta y} \right) + \frac{\delta}{\delta z} \left(\Gamma_{\Phi, \text{eff}} \frac{\delta \Phi}{\delta z} \right) + S_{\Phi}$$

Where:

ρ = Air density, kgm⁻³; S_{Φ} = Source term of Φ ; Φ = Dependent variable; U, V, W = Velocity vectors; $\Gamma_{\Phi, \text{eff}}$ = Effective diffusion coefficient.

The diffusion coefficients and source terms for the differential equations can be found in this reference by Khalil⁶.

Boundary conditions assumption

The following boundary conditions assumptions were made in the investigations:

- (1) The inlet air condition is taken as the average day maximum of 40°C and 30% relative humidity (humidity ratio = 0.0138), representing August conditions, Egyptian code⁷. When air is admitted freely to the tomb, the turbulence intensity was assumed to be 5%, and the length scale assumed to be 1m.
- (2) The air outlets are set as outflow conditions, where the specification of the airflow distribution can differ from one outlet to the other in order to allow more flexibility.
- (3) The walls are deep inside the earth; they are treated as a block kept at constant temperature, which is the wet-bulb temperature or dew-point temperature for outside air condition, representing August conditions. Using the psychrometric chart, one can obtain the outside air wet-bulb temperature of 25°C. The walls were assumed to have zero: mass transfer of species, water vapour, and diffusion flux.
- (4) The visitors’ bodies were treated as a wall

- at a constant temperature (isothermal), where the skin temperature is a function of metabolic rate. Visitors have an assumed metabolic rate of 116 W.m⁻² (2 Met) – equivalent to 32.5°C skin temperature – and the body is assumed to have zero diffusion flux.
- (5) The visitors’ faces were also considered as isothermal walls, kept at the human skin temperature of 32.5°C. The sweat effect in moisture gain to the tomb airflow was taken into account.

Computational results

More than eight million computational cells were used to map the tomb’s total volume at 1,328.17m³; more than 1,500 iterations were necessary to achieve the convergence criteria. The application of CFD simulation in the indoor environment is based on conservation equations of energy, mass and momentum of incompressible air. The turbulence model used in the numerical model is the widely used standard k- ϵ model^{8,9}.



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grid independency check was achieved for a grid size of about eight million nodes. The comparison was made through line plots at a location above the sarcophagus.

The burial zone is of prime importance because visitors group around the sarcophagus. The tomb model design incorporated 52 grilles (1.0 × 0.15m) – taking up to 8% of the tomb area – for mechanical air extraction to limit the air velocity near walls to prevent scouring erosion. Figures 3 and 4 show that a velocity higher than 0.12 m s⁻¹ is only found in the entry of the tomb, after which velocities are low to prevent erosion of the surfaces.

Temperatures decrease from 313K (40°C) to 305K (32°C) inside KV57. Temperature contours are shown in Figure 5. The predicted RH indicated that the max RH at the wall is 70% and that RH varies from 63% to 69% in the burial chamber, as shown in Figure 6 for RH at the mid-plan axis two. The comfort zone is based on predicted mean vote (PMV) values of between -0.5 and +0.5¹¹⁻¹² and the predicted percentage of dissatisfied (PPD) value is 25%.

The different number of occupancies shows that the RH decreases when the number of people inside the tomb goes down; however, this decrease is very small. The max RH decreased from 75% (85 people) to 73% (65 people) and then to 70% (42 people).

The high RH can be attributed to the high moisture content air drawn from outside the tomb for ventilation; this means the RH inside the tomb is highly dependent on the outdoor air conditions, which vary with the time of the year.

The effect of outside air conditions from simulation indicates that RH increases at all times of the year except June, July, August, and September – so opening the tomb only during these months will save it from the excessive relative humidity that causes problems with mould, corrosion, decay and other moisture-related deterioration. Figures 3-4 show RH% predictions for July and November.

Conclusions

The aim of my study was to enhance the understanding of flow regimes, thermal patterns and ventilation-system characteristics in the tomb. It found that RH is not affected greatly by the number of people inside the tomb, but is highly affected by the outdoor air conditions. The maximum RH in June, July, August and September is 75%, while, in other months it is above 75%. It is, therefore, not recommended to open the tomb for visitors at these times.

Air velocity inside the tomb should not exceed 0.12 m s⁻¹ to avoid creating undesired drafts. The velocities near the floor-mounted extracting grilles are expected and accepted to be higher than the limiting value of 0.12 m s⁻¹, while the velocities in the rest of the domain are generally less than 0.12 m s⁻¹, particularly near the walls. Velocities higher than 0.12 m s⁻¹ are only found in the entry of the tomb up until the well chamber, after which the velocity is low to prevent erosion of the paintings. **CJ**

References:

- 1 O Abdel-Aziz, 'Flow regimes, thermal and humidity patterns in ventilated archaeological tombs, kings valley, Luxor', MSc thesis, Cairo University, 2005.
- 2 H Ezz Eldin, 'Thermal comfort prediction and assessment ventilated archaeological tombs, Kings Valley, Luxor', MSc thesis, Cairo University, 2006.
- 3 O Mohamed, 'Flow, thermal patterns and moisture distribution in ventilated archaeological tombs, Kings Valley, Luxor', MSc thesis, Cairo University, 2008
- 4 K Weeks, Theban Mapping project, AUC, Egypt, 1999 bit.ly/1TRqRY4
- 5 E E Khalil, *Air Distributions in Buildings*, CRC Press, Taylor and Francis, November 2013
- 6 R Kameel, E E Khalil, 'Computer-aided design of flow regimes in air-conditioned spaces', in Proc. ESDA2000 ASME 5th Biennial Conference on Engineering Systems Design & Analysis, Montreux, 2000
- 7 Egyptian HVAC code, Ministry of Housing, HBRC, Vol. 1, 2014
- 8 E H Mathews, 'Numerical solutions of fluid problems related to buildings, structures and the environment', *Building and Environment* 24 (1) (1989) 3-110
- 9 B E Launder, D B Spalding, 'The numerical computation of turbulent flows', *Computer Methods in Applied Mechanics and Engineering* 3 (2) (1974) 269-289

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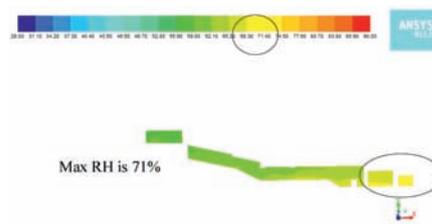


Fig 3 RH contours for July with 85 people inside tomb (outside conditions 41°C DBT, 28% RH)

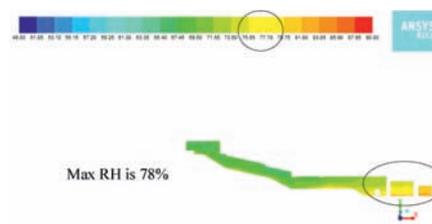


Fig 4 RH contours for November with 85 people inside tomb (outside conditions 30°C DBT, 49% RH)



JEAN-PIERRE DALBERA / FLICKR

The burial zone has unfinished paintings on its walls

The challenge of preserving historic artefacts

By Tim Dwyer

Designers of building environmental control systems are normally focused on occupant comfort, to deliver a healthy and productive environment. In historic buildings, however, it is often the fabric, the surface finishes and the artefacts that command the environmental criteria. The 'thermal mass' of a structure or an artefact – such as a book – can mean that its surface temperature is significantly below the (dry-bulb) temperature of the surrounding air.

This is particularly so when the space is heated swiftly by, for example, crowds of visitors

– who, coincidentally, act as very effective room humidifiers – or by warm and often humid outdoor air. This may mean the relative humidity in the overall space must be controlled at a level not primarily to provide occupant comfort.

In the worst scenario, this will ensure the cooler air next to the surfaces does not approach its dew point – so risking condensation – or, where there are absorbent materials (fabrics and paper), prevent it rising beyond a 'safe' maximum humidity. See CIBSE *Guide to building services for historic buildings*, and CIBSE KS19 Humidification.



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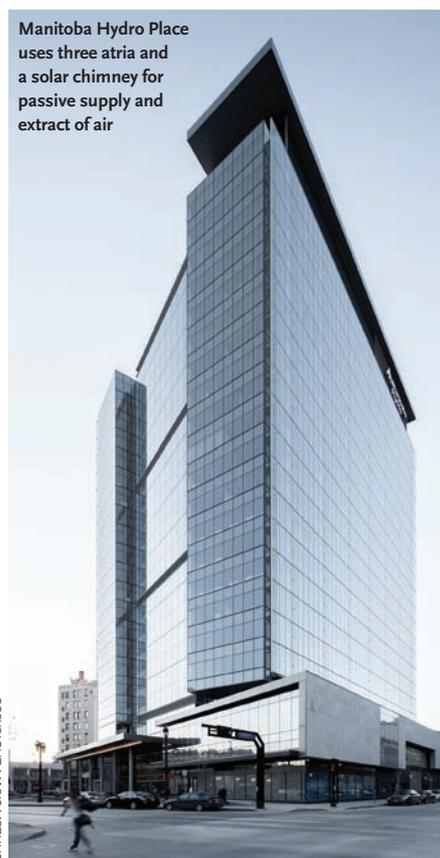
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ROAD TO BASICS

With some way to go before natural ventilation is completely accepted as a viable alternative to mechanical systems, **Andrew Acred** shares a simple model for implementing it effectively in atria buildings



Manitoba Hydro Place uses three atria and a solar chimney for passive supply and extract of air

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Our model does not capture all facets of a building's design. It is a blueprint for an optimised design; a starting point for more detailed modelling using multizone software, CFD and other tools

We are still learning how to design and use natural ventilation. Historically, the need for a supply of fresh air at a comfortable temperature resulted in distinctive and eye-catching architectural elements, designed to harness the freely available forces of wind and thermal buoyancy. A classic example is the windcatcher towers (*badgir*) in Iran.

Today, as we are squeezed for space on the ground and build upwards, more striking building features – such as atria, lightwells and solar chimneys – are finding their way into our architectural lexicon. As we recover from the 'sealed box' designs of the 70s and 80s, we need to learn to use these building elements to deliver a healthy indoor environment, while minimising energy use.

The good and the bad

Tall buildings offer opportunities for harnessing natural ventilation, not just from the wind but also from buoyancy. A tall atrium, linking multiple floors and filled with buoyant air, is a source of driving pressure for ventilation that, tapped into, can supply fresh air to occupants. The taller the atrium – and the greater the temperature difference from the outside (either hotter or cooler) – the greater the potential for natural ventilation.

We still have some way to go, however, before natural ventilation is accepted as a viable alternative to mechanical systems, and we understand how to implement it most effectively, particularly in large buildings.

By their nature, 'free running' ventilation systems cannot deliver the desired internal environment at the push of a button, leading to the perception that natural ventilation systems are unreliable. Even worse, it can lead to air flowing in the wrong direction and an uncomfortable internal environment – particularly on the top storey.

Some examples of problematic flow patterns in a four-storey atrium building are shown in Figure 1. Overheating on the



Ancient windcatcher towers (*badgir*)

top storey – either because of insufficient ventilation or recirculation of stuffy air from lower storeys (a reversed flow) – is common.

Exchange flows – in which simultaneous inflow and outflow occur at a high-level vent – can also reduce net ventilation flow rates, and contravene fire regulations because an inflow occurs at what should be an outlet vent.¹

The need for simplicity

These problems can be avoided – and, indeed, have been avoided in a number of benchmark, naturally ventilated buildings. A notable example is Manitoba Hydro Place, in Winnipeg, Canada, a 22-storey building that uses three atria and a solar chimney for passive supply and extract of air.

Its success lies not only in the building form, but also in the sophisticated BMS



Atria in the Gemini Residence, Copenhagen, waterfront flats

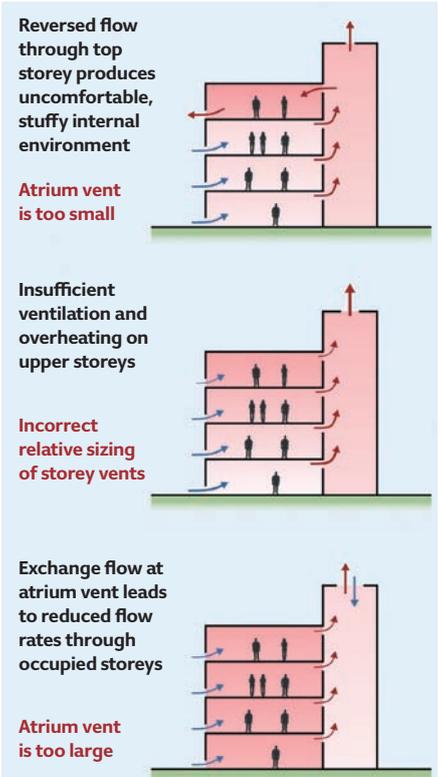


Figure 1: Examples of problematic flow patterns in a four-storey atrium building

design – with more than 25,000 sensors – the commissioning of which would have been impossible without the client’s willingness to engage in a fully integrated design process.²

We would all like clients to aim for outstanding building designs, but what about projects on tighter budgets, or with clients – and tenants – who are less willing to engage with the details of HVAC system design?

The theme of this year’s CIBSE Technical Symposium was ‘Simple buildings, better buildings?’ – a question that was met with a resounding ‘yes’ from participants across the board, from architects to BIM specialists.

The take-home message, from my perspective, was that a simple design allows for better communication between all parties at all stages – from design to construction to commissioning and operation – maximising the chances of a successful outcome.

An intuitive design approach

My work with Professor Gary Hunt, at the University of Cambridge, focuses on developing simple, back-of-the-envelope methods that can be used to provide intuitive guidance to designers and clients.

Our method targets design at the conceptual stage, when the building form is fluid and high-level decisions on architectural elements, such as atria, are being made. We focus on the generic, multi-storey building

form, with an atrium – or solar chimney, or similar ‘vertically spanning’ space – that acts as an exhaust stack.

The basis of our approach is a simple mathematical model that can be used to balance a number of core design parameters, including vent sizes, heat inputs, target air temperatures and building geometry.

There are three notable features of the model. First, we focus only on buoyancy-driven ventilation, designing for the ‘worst-case’ scenario in which wind is not available to assist ventilating flows. Second, all quantities are specified on a per-person basis – including vent sizes and heat gains – allowing for development of a demand-based design.

Finally, we quantify the ventilation performance of the atrium using an ‘atrium enhancement’ metric (see Figure 2) that

compares the theoretical flow rate per person through the top storey with, and without, an atrium. Flows through the top storey are driven by the smallest stack height, making it the ‘worst performing’ storey in terms of ventilation. Aiming for an ‘atrium-enhanced’ flow on the top storey, therefore, ensures that the atrium is beneficial for driving flows through all storeys.

Optimising design: rules of thumb

By running our simple model for a range of building operation scenarios – which can be done rapidly because of the simplicity of the model – we can optimise the building for natural ventilation and determine some rules of thumb for design.

An effective design largely comes down to the correct relative sizing of vents. When the

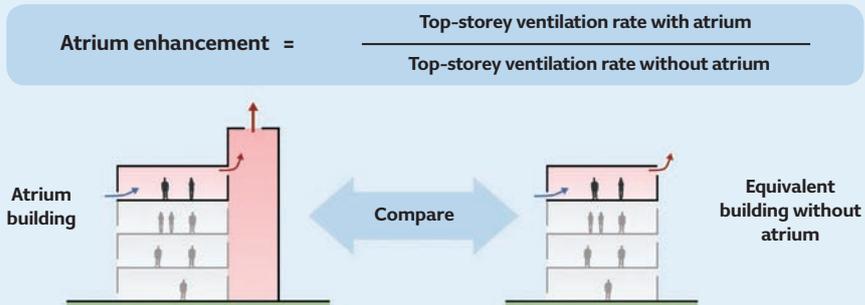


Figure 2: Definition of the atrium enhancement metric

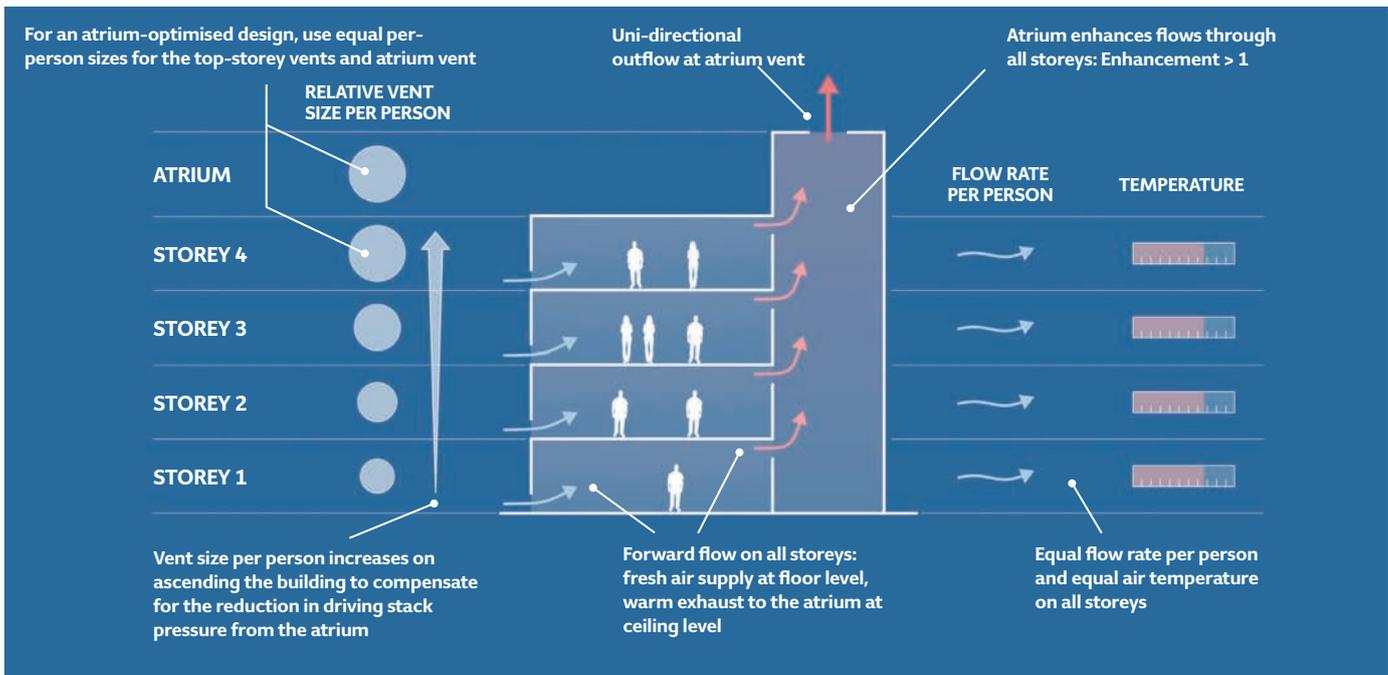


Figure 3: Ideal design 'blueprint' for an atrium building – shown for a four-storey building but, in principle, applicable to any number of storeys

► atrium outlet is too small, compared to the storey vents, reversed flows through the top storey are common.

Conversely, exchange flows at the atrium outlet may occur when the atrium vent is too large, or when flows through the storeys are restricted. Modelling during the design of the Library of Birmingham led to balconies within its central atrium being aligned to allow air to pass unrestricted through the lower parts of the building, thereby avoiding exchange flows at the atrium outlet.³

The optimum design has equal per-person vent sizes at the atrium outlet and in the top storey (see Figure 3), providing our first rule of thumb. This shares control between all vents in the building, ensures a 'forward flow' on all storeys, and minimises the likelihood of air flowing in the wrong direction.

A second rule of thumb is that vent sizes should increase in higher storeys, to compensate for the reduction in driving stack pressure from the atrium, thereby avoiding overheating on the upper storeys.

A final rule of thumb is that the atrium should extend at least one storey height above the top storey to ensure an 'enhanced' flow through all storeys. This may not always be possible, as the height of the atrium may be limited by planning or budgetary constraints. In these cases, it may be beneficial to disconnect the top storey from the atrium and provide its ventilation using a separate system. This strategy has worked at the Lanchester Library at Coventry University,⁴ and is planned for the James Dyson building at the University of Cambridge's engineering department.

Simple models in the design process

Our model does not capture all facets of a building's design, nor does it intend to. It is a blueprint for an optimised design; a starting point for more detailed modelling using multizone software, CFD and other tools.

Our approach is intended to provide simple and intuitive rules of thumb that are accessible to all – from architects and engineers to clients and tenants – and to encourage an inclusive approach to natural ventilation design.

For full details of the design approach, see the CIBSE Symposium conference paper⁵ and related publications by the author.^{1,6} CJ

References:

- 1 A Acred & G R Hunt (2013) 'Multiple flow regimes in stack ventilation of multi-storey atrium buildings'. *International Journal of Ventilation* 12:1, 31-40.
- 2 K Stormont (2014) *Ken Dale Travel Bursary 2014: Natural Ventilation in High Rise and its application to the Middle East*. CIBSE, London.
- 3 G McCutcheon (2011) *Library of Birmingham: Environmental modelling*. Buro Happold, Bath.
- 4 B Krause, M Cook & K J Lomas (2007) 'Environmental performance of a naturally ventilated city centre library'. *Energy and Buildings* 39, 792-801.
- 5 A Acred & G R Hunt (2015) *Optimising a multi-storey atrium building for stack ventilation*. 2015 CIBSE Technical Symposium, London.
- 6 A Acred & G R Hunt (2014) 'Stack ventilation in multi-storey atrium buildings: a dimensionless design approach'. *Building and Environment* 72, 44-52.

● **ANDREW ACRED** is a research associate and Gary Hunt a professor at the University of Cambridge engineering department, in the fluid mechanics group

Our approach is intended to provide simple and intuitive rules of thumb that are accessible to all – from architects and engineers to clients and tenants – and to encourage an inclusive approach to natural ventilation design



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GUIDE A

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

Important updates on internal heat gains, condensation, and indoor air quality are included in the new version of Guide A. **Tim Dwyer** concludes his series on this key document by drawing attention to the most significant changes in these areas

The CIBSE guide to *Environmental design* has had a major upgrade for the first time in nine years. This is the last of three articles that aim to provide an overview of the new Guide A.

Chapter 6: Internal heat gains

Principal author David Arnold starts the chapter with a subtle change to its introductory wording, with the broader term 'mechanical cooling' used in place of 'air conditioning' when referring to the way internal heat gains typically are removed from a space. This is, of course, noted alongside ventilation and 'other means' (presumably referring to passive cooling and natural ventilation), but clearly indicates the increased application of 'comfort cooling' (that is, the control of temperature while not maintaining a specific value of humidity), as opposed to traditional centralised 'full' air conditioning.

Benchmark values for internal heat gains have not altered since the previous edition,



although the accompanying text notes the impact of the transition to LED lights is likely to reduce lighting gain by up to 50%.

The equipment loads cited in that table have not altered in this revision. This could be explained by the development of computers since Guide A 2006. There have been increasing equipment loads in the intervening years – from the application of desktop computers and so on – which, because of improving technology and a reduction in heat emissions, have subsequently fallen back to levels assumed by the 2006 edition.

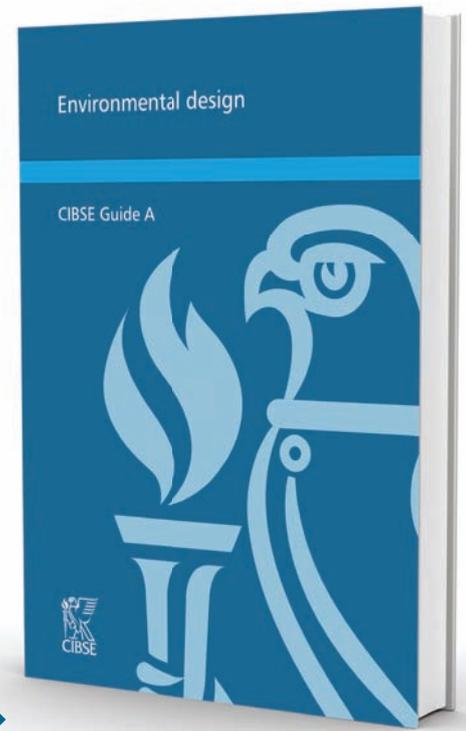
Due to a glitch in the publishing process, the version of Table 6.3 that has been included in the published 2015 Guide A on typical heat emitted by humans is, erroneously, an updated version of the one used in the 2006 edition (as taken from the *ASHRAE Fundamentals Handbook*, 2013). Following (pre-publication) feedback from CIBSE reviewers, it was decided that Table 6.3 should revert to the style and content of that used in the pre-2006 editions of the Guide. The correct version is shown in Figure 1 and this will be incorporated in the updated Guide A 2015 editions. A newly added note to this table indicates the original source of the data is unknown but the figures represent custom and practice and are deemed

suitable for practical use in the UK and other temperate climates.

When considering the gain from lighting, the effect of the optics, casing and mounting of the luminaire – as well as the proportions of the radiant, conductive and convective components – are highlighted as being significant to the space heat gain. Information reporting on the performance of luminaires is presented – as in the example of Figure 2, which indicates the effect of airflow rate on the heat gain through an air-handling luminaire. A subsequent note includes a brief discussion on the effect of airflow on the (radiative/convective) mode of the gain.

The table that previously included lighting energy targets has been removed. This chapter’s rewrite has coincided with the more regular application of LED lighting. There is a short section reflecting this shift in technology, which is likely to have a more significant impact by the time this chapter is next revised.

Updated data – based on research published in 2011 – is given for office equipment such as computers and laser printers; however, it is unlikely that this is wholly representative of current equipment. A brief discussion on office television displays is now included, indicating that – although the Energy Star



A draft of the correct version of Table 6.3 for the 2015 Guide A

Figure 1: Heat emission (W) from adult male body (surface area 2m²) and average heat emission per person for a mix of men, women and children typical of stated application

Activity	Typical application	Occupancy density (m ² /person)	Total, sensible and latent heat emission (W) for stated application and dry-bulb temperature (C) for adult male (and average for mixture of men, women and children)										
			Total	15		20		22		24		26	
				Sensible	Latent								
Seated, inactive	Theatre, cinema matinee	0.75-1.0	115(100)	100(87)	15(13)	90(78)	25(22)	80(70)	35(30)	75(65)	40(35)	65(57)	50(43)
Seated, inactive	Theatre, cinema evening	0.75-1.0	115(105)	100(91)	15(14)	90(82)	25(23)	80(73)	35(32)	75(68)	40(37)	65(59)	50(46)
Seated, light work	Restaurant	1.0-2.0	140(126)	110(99)	30(27)	100(90)	40(36)	90(81)	50(45)	80(72)	60(54)	70(63)	70(63)
Seated, moderate work	Office	14	140(130)	110(102)	30(28)	100(93)	40(37)	90(84)	50(46)	80(74)	60(56)	70(65)	70(65)
Standing, light work walking	Department store	1.7-4.3	160(141)	120(106)	40(35)	110(97)	50(44)	100(88)	60(53)	85(75)	75(66)	75(66)	85(75)
Standing, light work walking	Bank	-	160(142)	120(107)	40(35)	110(98)	50(44)	100(89)	60(53)	85(76)	75(66)	75(66)	85(76)
Light bench work	Factory	-	235(209)	150(133)	85(76)	130(116)	105(93)	115(102)	120(107)	100(89)	135(121)	80(71)	155(138)
Medium bench work	Factory	-	265(249)	160(150)	105(99)	140(132)	125(117)	125(117)	140(132)	105(99)	160(150)	90(85)	175(164)
Heavy work	Factory	-	440(440)	220(220)	220(220)	190(190)	250(250)	165(165)	275(275)	135(135)	305(305)	105(105)	335(335)
Moderate dancing	Dance hall	0.5-1.0	265(249)	160(150)	105(99)	140(132)	125(117)	125(117)	140(132)	105(99)	160(150)	90(85)	175(164)

Notes

- 1 Figures in parenthesis are adjusted heat gains based on normal percentage of men, women and children for the applications listed. This is based on the heat gain for women and children of 85% and 75% respectively of that of an adult male.
- 2 For restaurant serving hot meals add 10 W sensible and 10 W latent for food per individual.

requirements set a maximum power of 108W – heat output from some large flat-panel, plasma TVs has exceeded 500 W.

Commercial cooking appliances have a refreshed set of tables drawn from the *ASHRAE Fundamentals Handbook*, but some may struggle to apply the data if they are unfamiliar with North American terminology and application.

New heat-gain tables have been added to the section on hospital and laboratory equipment. Domestic appliances and equipment are now included with tables of indicative energy consumption, with average power emitted throughout the day – this needs careful application, as the source data is presumably based on some very specific scenarios of frequency and duration of application use.

Chapter 7: Moisture transfer and condensation

In the renewed introduction, principal author Chris Sanders expands on what is likely to exacerbate moisture problems in the fabric of buildings: leakage of warm and humid air; cooling of exposed surfaces through radiation to night skies; and thermal bridging.

The introduction to the basic psychrometric properties needed to evaluate moisture conditions in buildings has been expanded and moved to the beginning of this chapter, along with relevant empirical equations.

A new explanation of the ‘sorption curve’ – the relationship between moisture content in the material and that of its immediate surroundings – is included.

The ‘Mechanisms of moisture movement’ section summarises the drivers of moisture movement through buildings – vapour diffusion, liquid flow and moisture-laden airflow. Then there is new material on surface buffering – the ability of materials to absorb and desorb moisture from their surfaces – and on liquid water movement driven by differences in the internal pressure of a structure caused by capillary forces and the surrounding air pressure.

A new equation is added to determine the amount of water vapour associated with the movement of air through gaps at the junction of construction elements and cracks. The accompanying note, however, makes it clear that, in practice, this is difficult to establish because the airflow rates are typically not known, but this mechanism is very likely to produce substantial moisture transfer.

References have been updated and there are new recommendations for standard building details that reduce the opportunity for thermal bridging and consequent condensation.

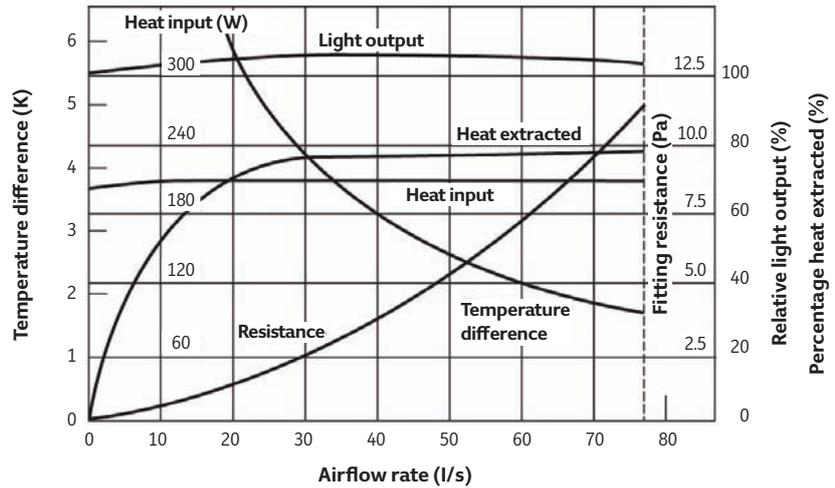


Figure 2: Typical air-handling performance data for a prismatic air-handling lighting fitting - plenum extract type with two 2.4m 85 W lamps in ambient temperature of 21°C¹

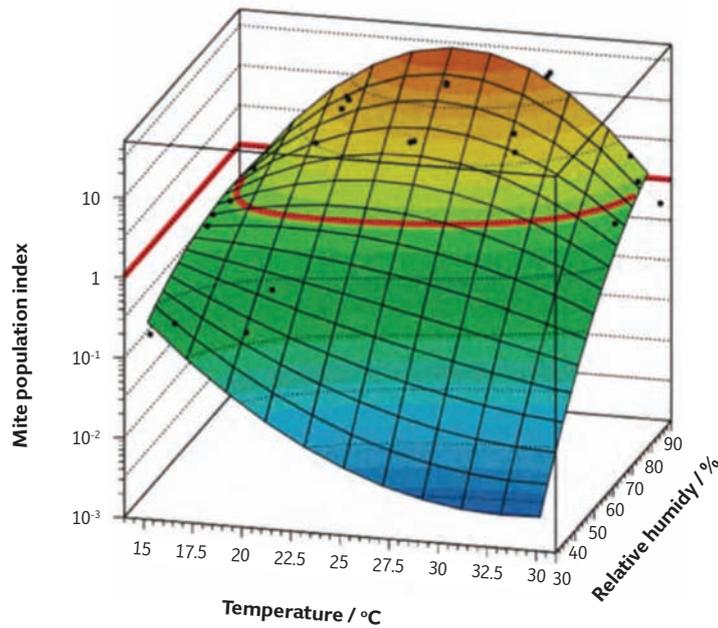


Figure 3 – The mite population index model, for example, 1.1 indicates 10% population growth and 0.9 indicates 10% population decline²

Traditional interstitial condensation calculation – the ‘Glaser diffusion model’ – is explained, and the potential sources of error given a more prominent position. The conclusion is this calculation method is less suitable for building components where there is significant storage of water capable of experiencing large diurnal changes in temperature.

Since the 2006 edition, more complex, software-based models have been introduced following the specification in BS EN ISO 15026. These do hourly calculations that account for the numerous thermal and moisture transport and storage mechanisms. But these models can simulate the moisture transfers associated with ‘leaky’ constructions, such as pitched roof spaces, for which empirical methods are referenced.

The section on inside and outside design conditions has been largely rewritten, with more extensive discussion of climate classes as a method of classifying internal climates for different types of buildings and use, for both the UK and ‘continental’ climates. Greater detail is included to help avoid interstitial condensation, particularly for suspended and ground-bearing floors.

Condensation risk on cold pipes is discussed in this revised chapter. The final sections consider control of surface and interstitial condensation, with a new commentary on determining the appropriate method for assessing risk and developing remedies.

The final paragraph raises a concern arising from the standard calculation methods determining that a vapour barrier should be used on the warm side of an internally

insulated solid masonry wall, as would frequently be used in the refurbishment of traditional buildings. This can cause problems by impeding the mechanisms that allow evaporation of water that has been absorbed at the external face of the wall into the outside air.

Chapter 8: Health issues

Principal author Marialena Nikolopoulou has re-ordered this chapter and practically all sections have been revised to include material supported by recent research on health issues.

More extensive discussions, including new charts examining the risk of ‘burns’, and ‘scalds’, has been moved to a later (new) section on water services. The text on high humidity includes more on reducing house dust mites (HDM) by regulating temperature and humidity. The mite population index model (see Figure 3) provides empirical results for HDM population growth at varying temperature and humidity combinations.

Lower humidities not only deter HDM, but – as a newly introduced comment indicates – indoor air quality (IAQ) is likely to be perceived as being better at lower relative humidities. A key factor for IAQ – the per person fresh air supply rate – includes a variation to previous editions; as well as the UK HSE guidance of $8L \cdot s^{-1}$ being cited – a note has been introduced explicitly saying that ‘CIBSE recommends higher values of $10L \cdot s^{-1}$ for comfort’.

The section on the health effects of common indoor pollutants has been expanded. Microbiological contamination of the ventilation paths is highlighted through examples such as the Sars – severe acute respiratory syndrome – outbreak. The ‘sick building syndrome’ discussion has been extended and, at the end of section ‘Air quality and ventilation’, new paragraphs consider the interaction of environment with productivity.

The section on visual environment has been clarified and extended, with a summary of the ‘four classes’ used to describe the health effects of light: by radiation; through the visual system; through the circadian system; and acting as a purifier. There is a new section on the application of ultra violet germicidal irradiation (UVGI) in building air applications, including safety and maintenance factors.

A section on water quality gives an overview of the health and safety aspects of cold, potable and hot water services, and discussing Legionnaires disease and scalds. The material on static electricity, meanwhile, has been expanded to more fully explain the cause of static problems for building occupants.

The section ‘Noise and vibration’ has been rewritten and now includes a paragraph on the acoustic requirements of health facilities.

Finally, the health impact assessment (HIA) concept is introduced, acknowledging that health and wellbeing are determined by many environmental and socio-economic factors.

About the authors

Tim Dwyer FCIBSE, technical editor at *CIBSE Journal*; Marialena Nikolopoulou, director at CASE Research Centre at the University of Kent; David Arnold FCIBSE, partner at Troup Bywaters & Anders, and visiting professor at London South Bank University; Chris Sanders, director of Research on Indoor Climate and Health at Glasgow Caledonian University. 

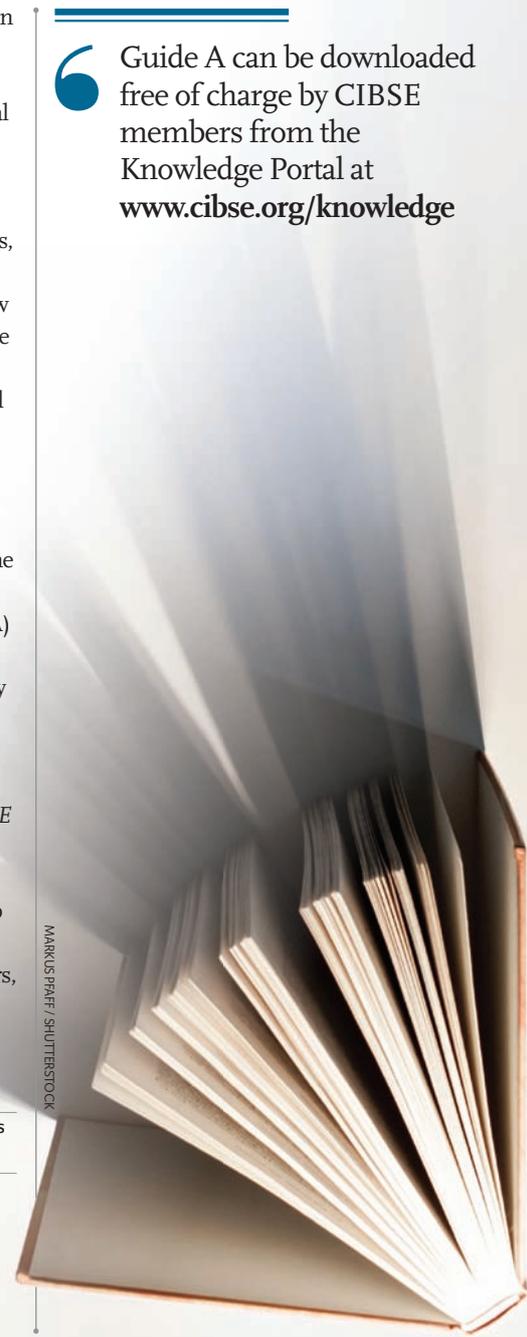
References:

- 1 CIBSE Guide A 2015, Chapter 6, taken from Bedocs and Hewitt, 1970
- 2 CIBSE Guide A 2015, Chapter 8 taken from Crowther et al, *Experimental and Applied Acarology* 39, 2006]

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Implications of enhanced F-gas regulations for air conditioning applications

This module considers the impact of changes in EU regulations aimed at reducing global warming by limiting the use of F-gas refrigerants in air conditioning

Fluorinated gases (F-gases) contributed 2% of total EU-27 'greenhouse gas' (GHG) emissions in 2010¹, and the EU's F-gas regulations are aimed at reducing global warming by limiting their application and consequent emissions. In March 2014, the European Parliament voted to introduce tighter regulations on hydrofluorocarbons (HFCs), to ensure a significant reduction in their use by 2030. This CPD article will consider this in the context of air conditioning applications.

The new regulations² – applied from January 2015 – both repeal and enhance the controls introduced in the 2006 legislation³ on the handling of HFCs, including refrigerants used in air conditioning and refrigeration equipment.

The regulations originated in the drive to reduce emissions of fluorinated greenhouse gases – covered by the Kyoto Protocol – through controlled containment and active prevention. The increase in the application of HFCs had been driven by the replacement of the ozone-depleting refrigerants outlawed by the EU in 1994.⁴ The 2006 EU regulations set out to restrict fluorocarbon use, permitting the continued use of HFCs – such as R410A – under strict controls to prevent environmental damage. Almost all

refrigerants have a global warming potential (GWP), as shown in Table 1.

Hydrochlorofluorocarbons (HCFCs) – such as R22 refrigerant and certain aerosol propellants – have already been banned because of their impact on global warming and ozone depletion. Systems using R22 are still allowed to operate; however, should it be necessary to work on the refrigerant circuit, the refrigerant 'charge' has to be removed from the system and treated as a hazardous waste – so any reduction in charge as a result of leakage or major component change will render them inoperable. Most manufacturers do not recommend the use of 'drop-in'

refrigerant replacements, especially in complex direct expansion (DX) systems such as variable refrigerant volume/flow (VRV/F).

Significant changes to F-gas regulations: Refrigerants with GWP over 2,500

The phase-out of the higher GWP HFCs – such as R404a – mostly affects the commercial refrigeration sector, with deadlines for various market segments staggered over the coming 10 years. There are deadlines affecting portable air conditioning units (2020) and single split air conditioning units with less than 3kg of refrigerant.

Refrigerant	Refrigerant family	GWP
R22	HCFC	1,810
R32	HFC	675
R134a	HFC	1,430
R290 (propane)	HC	3.3
R404a	HFC	3,922
R407c	HFC	1,774
R410a	HFC	2,088
R717 (ammonia)	Inorganic compound	0
R744 (CO ₂)	Inorganic compound	1
R1234ze (E)	HFO	≈1

Table 1: Current data for basic refrigerant GWP

➤ **Refrigerants with GWP below 2,500**

The lower GWP HFCs – such as R32, R134a, R407c and R410a – are to be phased down over a 15-year period, so that by 2030 their use will be 21% of the level in 2015 (based on CO₂ tonnes equivalent), as illustrated in Figure 2.

The phase-down will be controlled in part by annual quotas for producers and importers of HFCs, from 2015 onwards. Manufacturers and importers of equipment containing HFCs will, from 2017 onwards, need to provide documentary proof that the HFCs in their equipment is ‘covered’ by the quota.

This part of the regulation deals with new refrigerants being supplied to recharge operational systems and new pre-charged equipment from 2017. Should a system charge be recovered and cleaned, or recycled, it will fall under a different section of the new regulation that will allow its reuse, and its use will not be determined by the phase-down process.

Metric for refrigerant global warming potential

Refrigerant charge is now measured in tonnes CO₂e (carbon dioxide equivalent). This is calculated by multiplying the charge (in kg) by the GWP/1,000, and is the amount of CO₂ that would have the same GWP as the refrigerant when measured over 100 years. For example, a 10kg charge of R410A (GWP 2,088) equates to 20.88 tonnes CO₂e, whereas a similar charge of R32 (GWP 675) would be 6.75 tonnes CO₂e.

The same metric may be used to compare the global warming effect of any greenhouse gases – for example, refrigerants, sulphur hexafluoride (SF6), perfluorocarbons (PFCs), methane and nitrous oxide. The chosen time period to compare the CO₂e – in this case 100 years – can make significant comparative differences, since the decay life of gases can be very different. Some F-gases, especially HFCs, are relatively short-lived; others, in particular PFCs and SF6, can remain in the atmosphere for thousands of years.

The metric ‘carbon dioxide equivalent’ does not take account of operational application. This will alter the true comparative life-cycle global warming effect of refrigerants, since seasonal coefficient of performance (SCOP) and seasonal energy efficiency ration (SEER) will significantly affect the systems’ energy use, and these will be dependent on the thermodynamic performance of the refrigerant, as well as the system design and operation.

While a refrigerant such as R32 is still part of the phase-down, it is widely regarded as a



Figure 1: The old system is replaced with a new F-gas-compliant system while using existing pipework, so reducing disruption to existing ceilings and internal fittings that would add additional cost to a replacement project (Source: Daikin UK)

replacement for R410A: it is to be expected, therefore, that its use will be expanded because of the ability to use higher charges, but with lower CO₂ equivalence. R32 systems are already available from some manufacturers (as in Figure 3), with training given to contractors on the differences between existing refrigerants and R32. Many manufacturers are developing R32 systems.

Leak-checking requirements

The new F-gas regulations increase leak-detection obligations, so if a refrigerant has a higher GWP, more leak-checking will be required. For example, regular leak checks by a certified installer are required for systems in which the refrigerant equates to more than five tonnes CO₂e (more than 10 tonnes CO₂e for hermetically sealed systems).

Sales, installation and service processes

While the principles of certification, leak-checking, recovery and logbook-keeping remain unchanged, the new regulation introduces an obligation for certified persons to have access to information and training on correct practices and alternative technologies to replace or reduce use of F-gas. End-users and companies are also required to keep the logs for up to five years.

The onus is placed on any person or company assigning a task to another person or company that is required to be certified to take reasonable steps to ensure certification is in place.

Pre-charged split-type systems that could previously be sold without restriction to end-users may now only be so sold if vendors

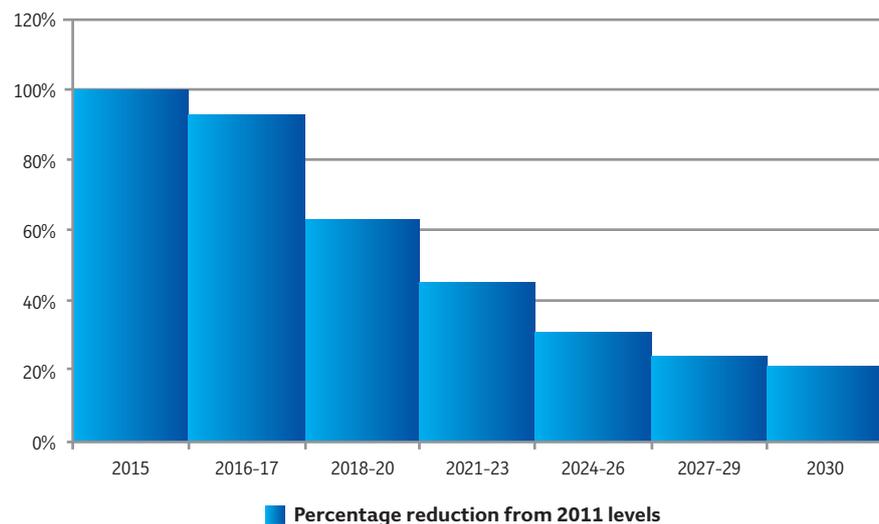


Figure 2: HFC phase-down targets, representing the percentage reduction required to meet the schedule

receive written proof that the systems will be installed by F-gas-registered installers.

F-gas enforcement

The Environment Agency enforces F-gas regulations in the UK, using the following guidelines:

- Provide targeted advice and guidance to an organisation to secure compliance
- Serve an 'enforcement notice' on suspicion of past, present or future contravention
- Serve a 'prohibition notice' for contraventions posing imminent danger of serious environmental pollution.

Fines for F-gas contraventions will not exceed £5,000 in a magistrates' court, but could be unlimited in higher courts. The penalties may appear severe, but the enforcement process generally gives the operative or company the opportunity to rectify errors. The enforcement notice, for example, details suitable remedies and sets a deadline for implementation. A prohibition notice empowers the Environment Agency to insist that an item of equipment – or a whole site – be shut down.

While it is the responsibility of the Environment Agency to manage this process from a legal perspective, it would seem appropriate for specifiers/project managers to confirm the status of those working on site during installation and charging of an HFC system. (There are more than 36,000 F-gas-qualified operatives in the UK, with more being trained.)

Forecasts of emission outcomes

Through the application of the F-gas regulations, the EU predicts that F-gas emissions will be cut by two-thirds by 2030², compared with 2014 levels. The legislation is aimed at stabilising CO₂e levels at just above 100m tonnes by 2030. However, to achieve the EU's roadmap for 2050, additional measures will be required. This suggests a further tightening of F-gas regulations will be inevitable.

Alternatives

In the longer term, manufacturers will be looking to utilise other refrigerants and new compression technologies to meet more stringent F-gas regulations. Already, there are refrigerants with single-digit GWP's. These include HFOs (unsaturated HFCs) and the inorganic compounds such as CO₂, propane and ammonia. HFCs (including R410a and R32) will, however, be supported up to 2050 potentially.

Designers should plan, and specify, the use of the most appropriate refrigerant for the system, while keeping abreast of new



Figure 3: A modern external unit charged and operating with R32 (Source: Daikin UK)

refrigerants with lower GWP as they become available in the market. Products using R32 are already on sale – albeit in small systems. They tend to have a higher coefficient of performance (COP) and energy efficiency ratio (EER) than the R410a equivalents, and alternative refrigerants, such as HFOs – used in chillers – are slowly coming on to the market.

UK-based Gluckman Consulting – in a very recent information sheet⁵ produced in conjunction with the UK government's Department for Environment Food and Rural Affairs (Defra) – states that 'as a general rule, HFCs used in current applications have a better set of properties than the available alternatives'. This could change, however, with future advances in technology. When considering any refrigerants, these must be assessed holistically for operating pressures, energy efficiency, materials compatibility, toxicity, flammability and cost.

Simply reducing the refrigerant charge in a system is good practice (reducing the carbon dioxide equivalent). For example, reducing pipe runs and locating external units around a building, rather than just in one area, can be beneficial.

Assuring future F-gas performance

Manufacturers' systems that involve a totally different approach, potentially with new technologies, can take up to 10 years – and beyond – in development to achieve the necessary efficiency and reliability. However, adapting a current system can be much swifter – potentially three to five years.

Most VRF/V systems are currently specified to operate for up to 15 years. However, many still operate efficiently beyond this. HFCs (including R410a and R32) will be supported up to 2050 potentially, so could, theoretically, be applied for operation over the next 35 years.

However, it would be easier to meet the 2030 phase-down targets by having systems

with a lower CO₂e – and this has led many in the industry to focus on adapting current technologies from R410a to R32. To plan for the application of R32, new system design primarily needs to take into account the lower capacity and higher efficiency of R32. This can be done over the next three to five years – so specifiers can continue to stipulate R410a systems during this period, while keeping track of R32 developments.

Modern systems integrate procedures for actively managing system-leak checking – for example, by using integral routines for some systems, the monitoring becomes a regular maintenance procedure and reduces the opportunity for unnoticed refrigerant loss.

Manufacturers are implementing solutions that are designed to meet the legislation, as well as being mindful that EN378⁶ – the European standard for the design and construction of refrigeration systems – is still to catch up with these changes to F-gas regulations. This is likely to have the most significant impact on larger systems with higher charges.

In the longer term, beyond 2030, HVAC companies will aim to develop new systems – possibly based on different technology – that continue to deliver efficient, reliable HVAC systems at a competitive cost, while also reducing their environmental impact.

© Tim Dwyer, 2015.

- With thanks to Daikin UK for providing core material used in this month's CPD article.

Further reading:

For authoritative guidance on EU F-gas regulations see information sheets downloadable from Gluckman Consulting at <http://bit.ly/fgasinfo>

References:

- 1 European Environment Agency, *Potent greenhouse gases – fluorinated gases in the European Union*, www.eea.europa.eu/highlights/potent-greenhouse-gases, accessed 5 August 2015.
- 2 EU Regulation No 517/2014 on fluorinated greenhouse gases and repealing regulation (EC) No 842/2006, April 2014.
- 3 EC Regulation No 842/2006 on certain fluorinated greenhouse gases, May 2006.
- 4 EC Regulation No 3093/94 on substances that deplete the ozone layer, December 1994.
- 5 Gluckman Consulting, *EU F-Gas Regulation Guidance Information Sheet 29: Low GWP Alternatives*, www.gluckmanconsulting.com/wp-content/uploads/2015/07/IS-29-Low-GWP-Alternatives-v2.pdf, accessed 5 August 2015.
- 6 EN 378:2008+A2:2012, *Refrigerating systems and heat pumps – Safety and environmental requirements*.

Turn over page to complete module ➤

Module 81

September 2015



1. What contribution did F-gas emissions make to European greenhouse gas emissions in 2010?

- A 0.5%
- B 1%
- C 2%
- D 4%
- E 8%

2. Which of these refrigerants has the lowest GWP?

- A R22
- B R32
- C R404a
- D R407c
- E R410a

3. For a non-hermetic system, what is the minimum carbon dioxide equivalent that will require regular leak checks by a certified installer?

- A 1 tonne CO₂e
- B 2 tonnes CO₂e
- C 5 tonnes CO₂e
- D 10 tonnes CO₂e
- E 15 tonnes CO₂e

4. Compared with 2014 levels, by how much does the EU predict F-gas emissions will be reduced by 2030 by the implementation of F-gas regulations?

- A A quarter
- B A third
- C A half
- D Two-thirds
- E Three-quarters

5. What is the latest date that HFCs are likely to be supported in refrigeration systems?

- A 2015
- B 2020
- C 2030
- D 2050
- E 2070

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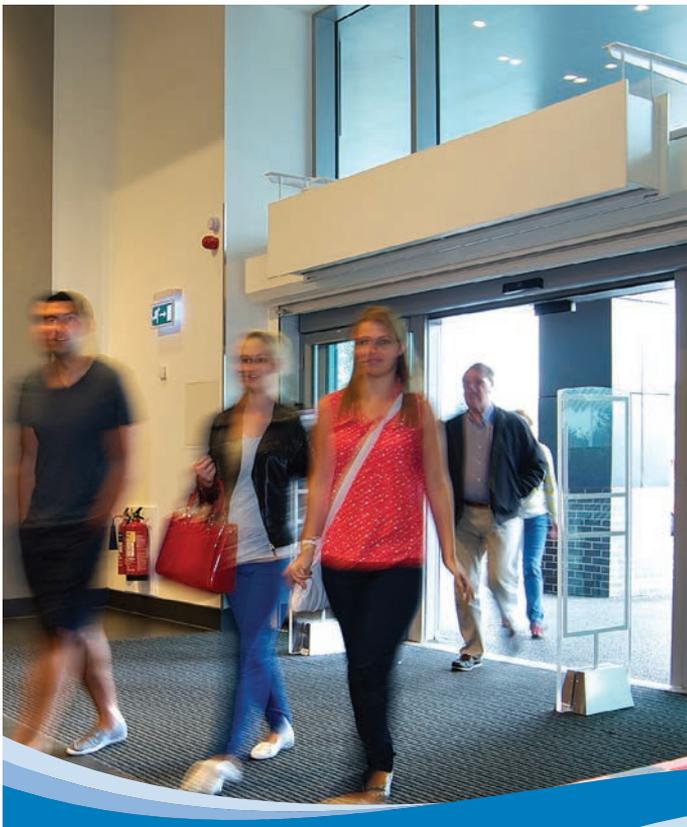
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Zen air curtains, from JS, are helping to maintain a consistent and comfortable temperature for customers and staff at John Lewis’ “at home” stores at Tamworth, Chester, Chichester and Newbury.

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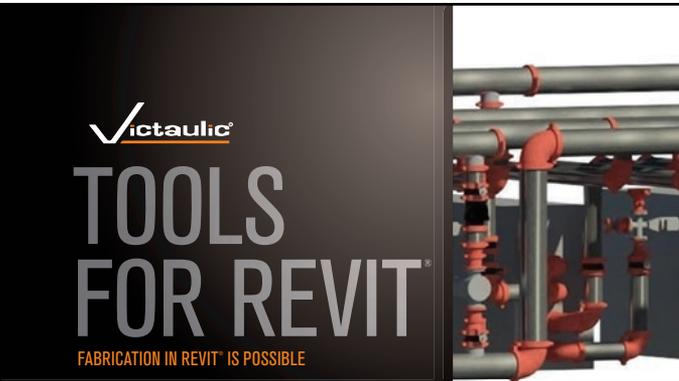
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Atlantic Boilers goes green

A new biodiesel fuel report by Atlantic Boilers is now available to view online. It contains key, up-to-date information for anyone specifying heating systems, especially in low and zero carbon buildings.

The report explains the technology involved in this relatively new industry, which provides a sustainable alternative to traditional fossil fuels and biomass.

It also comes with a guide to the selection of boiler plant and a typical cost analysis compared to biomass.

● Visit www.atlanticboilers.com/bio-diesel-boilers.html

Robur gas heaters at ESS

The full range of Robur's gas heaters is now available in the UK through ESS.

The G series is a condensing space heater with modulating burner and airflow and efficiencies up to 105%.

It has capacities from 30kW to 90kW and air throws of 40m, and is most suited to occupied spaces with high ceilings, such as factories and warehouses.

● Call 020 8641 2346, email info@roburheatpumps.co.uk or visit www.roburheatpumps.co.uk



More dates for PICV CPDs

Marflow Hydraulics has announced new dates in October for its CPD training courses on pressure independent control valves (PICVs).

The free courses are aimed at consultants, designers, specifiers and key influencers who want to specify, purchase or commission PICVs, or learn more about the products.

The sessions are designed to provide delegates with knowledge about: how PICVs work; innovative pipe layouts; and making systems more economical.

● Call 0121 358 2012, email training@marflow.co.uk or visit www.marflowhydraulics.co.uk/events



AMP expands training centre and technical team

AMP Air, one of the UK's leading independent air conditioning specialists, is investing in new training facilities and expanding its technical team.

The Toshiba distributor is doubling capacity at its training centre in Welwyn Garden City – to accommodate up to 16 installers at a time – and is equipping it with examples of the latest VRF, heat pumps and control systems.

The new set-up will enable the company to undertake practical training using working equipment, alongside its existing classroom facilities.

● Call 01707 378 670, visit www.ampair.co.uk or follow @amp_aircon on Twitter

A change of tack for ATAG Heating UK

ATAG Heating UK is to focus on commercial boiler sales and the domestic boiler 'new build' specification market.

To avoid confusion, it will operate under the banner ATAG Commercial and continue to supply the UK industry through the wholesaler distribution network.

ATAG Heating UK's team has been responsible for establishing the brand's reputation for quality, reliability and technical innovation – distributing domestic and commercial boilers.

● Call 01243 815 770, email info@atagcommercial.co.uk or visit www.atagcommercial.co.uk



Air curtain at Marconi House

JS Air Curtains has supplied a bespoke Zen air curtain for use at Marconi House, in The Strand, central London.

The air curtain was specified to match the colour of the entrance to the Grade II-listed building – which contains luxury apartments – meeting aesthetic and functional objectives.

The Zen forms part of JS Air Curtains' designer range and has a contemporary architectural style.

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

Fläkt Woods' second energy symposium proves a success

More than 50 guests attended Fläkt Woods' second Energy Efficiency Symposium in June.

Attendees learned about the critical issue of indoor air quality and the need for good ventilation in schools and education facilities.

The free symposium, which featured CIBSE technical editor Tim Dwyer as a guest speaker, followed the launch of Fläkt Woods' innovative and class-leading eCO PREMIUM energy recovery unit, which is capable of recovering 85% of the thermal energy.

● Visit www.flaktwoods.co.uk or follow @FlaktWoods on Twitter



Theatre revamp is a Capitol idea

The Capitol Theatre, a 1930s art deco building in Aberdeen, has recently undergone a major change. The Category B-listed former cinema and concert venue has been restored at a cost of £35m, and has found a new lease of life as an office. Behind its wonderful façade is a modern 12-storey building that will deliver 75,000ft² of prime office space.

Grundfos Pumps has worked in partnership with consultant TUV SUD and

contractors Emtec Building Services to deliver this landmark project by providing a full range of pump solutions.

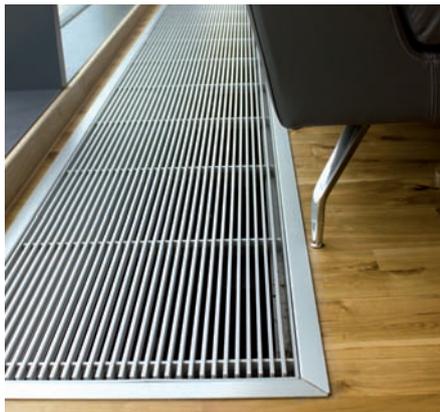


The manufacturer has also provided all the

ancillary needs to take the building into the next stage of its journey.

The Grundfos solution will support all of the building's HVAC requirements, and will meet the water demands of its expected 700 occupants. It will also help to deliver the expected 66.5% reduction in energy consumption.

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



Jaga consulted on Keynsham office

Keynsham Civic Centre is the centrepiece of a regeneration plan for the Somerset town. It has several floors with glass façades, surrounding an atrium, so heat can not only escape through the glass, but each floor would feel the effect of the large atrium space.

To combat this, Jaga recommended its highly efficient Mini Canal trench heaters, which provide a barrier in front of the glass façades to stop heat escaping. The radiators include Jaga's Low-H₂O technology, which saves up to 16% in energy consumption.

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

New home for Kamstrup UK

Kamstrup is a name 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, it also offers a range of meter-reading solutions, from simple to automated.

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



Heat pumps help reduce fuel bills for Hodnet tenants

When Shropshire Housing Group was looking to tackle fuel poverty throughout its housing stock, Ecodan renewable heat pumps helped to ensure a smooth transition for tenants.

Shropshire Housing has 1,300 off-gas properties out of a total stock of around 4,500 homes, mostly built in the 1950s.

The group's housing management staff have received training on the heat pumps, and sheltered housing staff have helped residents if they have had any difficulties in using the heating systems.

● Visit www.ecodan.co.uk



Trios helps West Bromwich bus station improve efficiency

West Bromwich bus station is a major interchange between local bus services and the nearby Midland Metro tramline.

Trios provided it with a new air conditioning system, to replace the old one that used the now-banned R22 refrigerant. Two Mitsubishi Electric City Multi Replace VRF air conditioning units were used for the bulk of the complex. Two Mr Slim split systems were also installed to provide air conditioning to the mobility shop at street level.

● Visit www.triosgroup.co.uk

EcoMesh introduces TES

TES is the temporary storage of thermal energy for later use, bridging the gap between energy availability and energy use.

TES can reduce the chiller size by 50% by spreading the load over a 24-hour period. It also reduces running and electricity costs by using overnight lower ambient air temperature (possible free cooling). It offers smaller roof space and full standby capability using +8-15°C phase change material (PCM) containers for a conventional chilled water applications.

● Call 01733 245 511 or visit www.pcmproducts.net



New HOBO temp/RH logger for mobile devices

The Onset HOBO MX1101 temperature/RH data logger transmits data to mobile devices via Bluetooth Smart technology. It works with the free HOBOMobile app for iOS and Android, making it easy to configure and manage data directly from a phone or tablet.

The MX1101 is ideal for hard-to-access places, such as apartments, laboratories and museum displays.

Users can monitor logger status and read data over a range of 100ft without coming into contact with the logger.

● Visit www.temcon.co.uk/mx1101



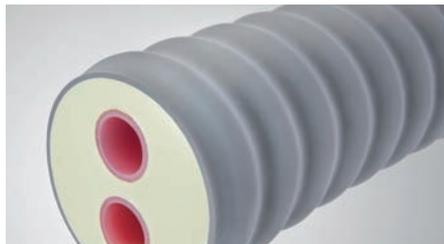
BREEAM Excellent international research centre chooses Remeha biomass heating

A low carbon Remeha biomass heating system has helped the MRC-University of Glasgow Centre for Virus Research achieve a BREEAM Excellent rating for its new £10.4m research and teaching centre, the Sir Michael Stoker Building.

M&E consultant Arup specified a Remeha Gilles HPKI-K 240kW Pellet Biomass boiler, in conjunction with a Remeha Gas 610 Eco Pro high-efficiency gas condensing boiler, to provide reliable, low carbon heating in compliance with Part L of Building Regulations.

Scott Winton, of M&E contractor Crown House, said: 'We were pleased with the full service and in-depth client training that Remeha provided.' The project architect was Sheppard Robson.

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



Rehau launches bigger – and smaller – district heating pipe

Rehau has extended its range of Rauthermex pre-insulated polymer pipework, giving designers and installers of district heating even more ways to improve the efficiency of their systems.

The company has introduced the Rauthermex 20mm Duo and what it describes as the largest twin district heating pipe available in polymer in the UK – Rauthermex 75mm Duo.

Rehau's range of Duo pipes in Rauthermex was previously limited to sizes between 25mm and 63mm.

● Visit www.rehau.uk or follow @REHAURenewables on Twitter

Myson moves into intelligent controls with the iVECTOR

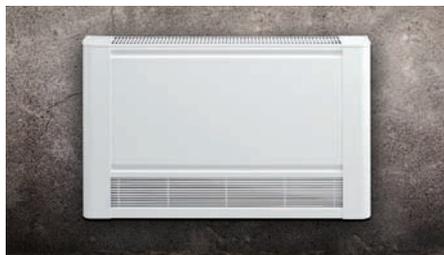
The electronic control system in every iVECTOR fan convactor provides a wide range of easy-to-use heating and cooling operating options.

Its two-tier programming incorporates an 'easy' mode for basic operations and a 'full' mode for more advanced functions, making it a very flexible solution.



In addition, the control's in-built option to link to a building management system makes it the perfect solution for the commercial sector.

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



Safe heating solutions for high-risk areas

The safety radiator from Purmo is a low surface temperature radiator, ideal for areas where safety is key, such as schools and hospitals.

Its high-efficiency panel radiator maintains high heat outputs, while the protective outer casing ensures the surface temperature does not exceed 43°C.

The Purmo is available in single and double configurations – as well as a range of lengths and heights – and comes with a 10-year quality guarantee.

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

Minimise heat loss and maximise savings with Panasonic's new buffer tank

Panasonic's new 50l buffer tank is now available, and is ideal as a volume-extension vessel or low-loss header tank.

The tank is cost- and energy-efficient, and requires little maintenance once installed.

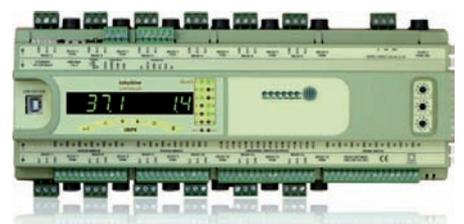
With automated air vent (AAV) capabilities, it will maximise the effectiveness of current



heating applications.

This small tank lends itself to quick and easy installation, is wall-mounted, and is, therefore, perfect for properties where space is tight.

● Visit www.aircon.panasonic.eu



Intelligent control made simple

Resource Data Management's (RDM) range of intuitive controllers and TDB software give you the ability to create bespoke and complex BEMS control solutions easily.

RDM's USB wi-fi adapter allows the intuitive TDB controller to connect to a network; alternatively, the USB wireless mesh access point adapter allows you to log on to 16 wireless probes and 16 wireless devices on a wireless mesh network.

● Call 0141 810 2828, email sales@resourcedm.com or visit www.resourcedm.com/Intuitive-Controllers



Technical assistance provides flawless finish

SANHA was the solution of choice for plumbing installers at a school site in west London. The academic year for Sacred Heart High School, in Hammersmith, was due to begin on 1 September, so completion of its PE and science building needed to be swift.

The experienced team at Rossair specified the pipe-fittings manufacturer, and SANHA's Dave Lancaster provided Rossair with on-site training – plus a 31-point programme on material performance and installation techniques associated with SANHA systems.

● Visit www.sanha.co.uk

New generation of AquaSnap heat pumps with Greenspeed intelligence

Carrier is offering new levels of efficiency and performance for building owners with the launch of a new generation of AquaSnap air-to-water scroll heat pumps with Greenspeed intelligence.

The new 30RQP AquaSnap heat pumps include variable-speed driven fans, brazed plate heat exchangers with asymmetric channels, electronic expansion valves and a full colour touch-screen user display.

They also include an innovative defrosting method that doesn't use any additional energy. This can improve the seasonal COP by 12% compared with earlier AquaSnap models.

● Visit www.carrier.com or follow @CarrierGreen on Twitter



S&S Northern's new energy-saving product showcased by ATL

ATL Commercial Kitchens has developed a fully operational demonstration commercial kitchen to showcase its energy-saving products.

One of the products is S&S Northern's new Merlin CT3000E, which monitors the electrical consumption of equipment under the canopy as well as CO₂ levels in the kitchen.

When the Merlin 3000E receives a signal via the electricity or CO₂, it adjusts the fan speed, resulting in a huge cost saving because fans do not need to be run at full speed all the time.

● Call 01257 470 983, email info@snsnorthern.com or visit www.snsnorthern.com



Remeha Commercial launches new natural gas CHP range

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

The Remeha R-Gen Natural Gas (NG) CHP range includes 26 models with outputs from 20 kW_e up to 2,000 kW_e.

With total efficiency levels of 85-90% – compared with the 40-45% fuel efficiency figure for traditional generation – the Remeha R-Gen NG CHP range offers a potential saving in primary energy of around 30% and a reduction in greenhouse gas emissions of around 20%.

The range also includes two condensing CHP models that offer still higher total efficiencies of 103-104%.

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



Buckinghamshire County Council appoints Rural Energy for £1.3m biomass contract

Leading biomass energy provider Rural Energy has completed the installation of nine biomass heating systems as part of a £1.3m project with Buckinghamshire County Council.

Five stand-alone heat pods – incorporating four 199kW and one 150kW Herz Firematic boilers – were installed into locations such as Buckinghamshire County Museum and Green Park. Heat pods are a compact, prefabricated 'all-in-one' structures, that house a plant room and fuel store. The boilers offer a combined annual saving of more than £30,000 and reduce CO₂ emissions by about 10,400 tonnes.

● Call 0203 189 0676 or visit www.ruralenergy.co.uk

Ghanaian parliament goes paperless with PEL Services installation

PEL Services has completed the contract to design, supply, test and commission the largest ever Bosch DCN multimedia conference system at the Ghanaian parliament debating chamber, in Accra.

Delegates now have all the information they need at their fingertips with touch-screen, interactive multimedia conference devices, which use the Android operating system.

This enables MPs to vote electronically, retrieve documents and share presentations in high resolution.

● Call 0333 123 2100 or visit www.pel.co.uk/sound/digital-conference-congress



PRODUCTS & SERVICES

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Seton shares best practice to achieve award-winning customer service

In June, Seton won the European Catalogue & Mail Order Direct Commerce (ECMOD) Outstanding Customer Service Award.

Chris Humphrey, director of sales and customer service, said: 'We put the customer at the centre and build everything we do around what they want and need. We listen to them through regular surveys and feedback slips.'

Seton was also recently selected to join the Google Certified Shop programme – only available to e-commerce sites that demonstrate a track record of on-time shipping and excellent customer service.

● Visit www.seton.co.uk

Aquatech Pressmain launches new mini pressurisation unit

Only 300mm wide by 200mm deep and 700mm high, the Minipack is available in two versions – a basic controller or a fully enhanced BMS compatible control.

The Minipack 'MP' Series pressurisation unit is designed to maintain a minimum set pressure in a sealed heating or chilled water system.

If high or low water pressure conditions should occur, the boiler/chiller operation can be interrupted via the volt-free contacts provided.

● Call 01206 215 121, email sales@aquatechpressmain.co.uk or visit www.aquatechhpressmain.co.uk



Mikrofill visits Watermoor House

Watermoor House was originally built in 1825 as a private residence, and has an English Heritage Grade II listing.

An Ethos 90kW condensing boiler, coupled with two Extreme 300 hot water loading cylinders, provides a healthier operating system for the residents and a more fuel-efficient plant for the owners.

The new installation was designed and installed by mechanical contractor P&R Heating, based in Stonehouse, Gloucester.

● Call 03452 606 020 or visit www.mikrofill.com



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A lead mechanical design engineer is required to join our client, a leading building services consultancy in Hertfordshire. Working with a vast array of blue chip clients and private investors you will be expected to project manage on large demanding schemes within the Pharmaceutical and Healthcare sectors. Excellent client facing and communication skills are required as well as high expertise in mechanical/HVAC services. This role will allow the right candidate to be fast tracked to become a director within 2-3 years.

**Associate of Building Services
(Electrical)**

Exeter

£50,000-£55,000 Plus Benefits

An award winning multi-disciplinary consultancy is looking for an electrical associate to join their office in Exeter. This is a dynamic role for someone from a building services consultancy background looking to build on the company's successful last twelve months. Due to project wins, you will have the chance to lead large teams to provide innovative, imaginative, cost effective design within the built environment in a range of varying sectors. This is a superb opportunity for a senior engineer looking to progress.

Associate Director (Mechanical Bias)

Surrey

£60,000-£70,000 Plus Benefits

Our client, a small/ medium sized building services engineering consultancy, requires an associate director to join their office in Surrey. You will be expected to manage project delivery, establish client briefs, cost plans and agree key deliverables. The ideal candidate will possess more than 10 years technical expertise within building services design and be able to build long lasting relationships. You will bring strong commercial awareness and exemplary business acumen skills to this role.

**MEP Project Director
City of London**

£90,000-£100,000 Plus Package + Bonus

A large international engineering consultancy based in the City are looking for a Project Director to lead the MEP team. Working on projects within the leisure, residential and commercial sector internationally and in London, this is a diverse role and will appeal to someone who enjoys client facing roles whilst managing MEP teams.

**Contract Electrical Design Data
Centre Engineer**

Central London

£45 per hour

An opportunity has arisen within a well-respected engineering consultancy located in the heart of London, for an Electrical Design Data Centre Engineer. This is an exciting time to come on board with this company who are currently working on some very high profile projects in both Europe and the UK, for the next 12 months.

**Lead Electrical Project Engineer
London Bridge**

£60,000-£65,000 Plus Benefits

A leading consultancy with an international reputation has an opening for an electrical project engineer to lead MEP project teams. This consultancy has a large amount of confirmed work within the Sports Stadia, Leisure and Education sectors thus requiring an engineer to assist the Directors in leading teams and carrying out a client facing role. There is a fantastic opportunity for progression up to Director.

**Lead Sustainability Consultant
Central London**

£50,000 Plus Package

A renowned building services and sustainability practice are looking for a Lead Sustainability Consultant to head a small team of consultants. Fantastic opportunity to be one of the leaders in the development of the sustainability division within this global practice. Candidates will need to be BREEAM Assessors, CFSH Assessors and have experience with energy modelling using IES.

**BIM Coordinator (MEP)
Central London**

£50,000 (Plus Benefits) or £40 per hour

One of the UK's leading multidisciplinary consultancies is looking to add an experienced BIM Coordinator (using Revit MEP) to their team of professionals in their busy London office. You will have the opportunity to work on one of the world's largest and most prestigious hotel projects based in the Middle-East. The preliminary design has already secured nominations and is set to be a multi-award winning project.

**Senior Mechanical Design
Engineer**

Jersey, Channel Islands

£50,000 Plus Benefits Package + Relocation

A multi-disciplined engineering consultancy based on the idyllic island of Jersey are looking for a Senior Mechanical Engineer. This consultancy can offer the opportunity to work on some pioneering building services/ sustainability projects whilst having a great work/life/play balance. This consultancy will assist with relocation.

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For more information about any of these positions, please contact **george@conradconsulting.co.uk** or call **0203 1595 387**

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Senior Electrical Design Engineer

London, £38 - £40p/h

We are working with an International, multi-disciplinary engineering consultancy. Currently they have 20+ offices worldwide and have a reputation for delivering creative and innovative projects. Projects include major healthcare schemes which include labs, research wings, hospitals commercial units and residential areas. You will need to demonstrate your skills as a senior electrical engineer working on healthcare projects. BAR2882/KB

Senior Electrical Design Engineer

Oxford, £35p/h

A unique opportunity has arisen for a Senior Electrical engineer to join award winning consultancy and a front runner of engineering design, to join the Oxford Office. The opportunity lies to work on some of the most complex and iconic buildings in the UK in a host of sectors including; commercial, residential, data centre and mission critical. BAR2889/GD

Principal Electrical Engineer

London, £60 - £70k + benefits

Our client is an international consultancy working on high end residential, education, and healthcare projects. You will lead a team, work directly with clients, and be responsible for the successful delivery of key projects. You will play a key role in driving the company forward. The aim is to hire an additional 30 engineers in the next 12-24 months. In return, you will have very flexible working conditions and be rewarded financially. BAR2857/MO

Mechanical Engineer

London, £55 - £70k + benefits

Our client is a high profile engineering consultancy with a vibrant but professional atmosphere. They require an additional mechanical engineer to specialise on Data Centres projects. Working in a team of 8 you will be client facing and evolve into team leading. You should have 10 years' experience and be educated to degree level. BAR 2870/AA

Lead IES Modeller

London, £40 - £50k + benefits

A new position has been created for an experienced IES modeller to manage the thermal modelling team and coordinate best practices across the 200 strong London team. As a competent user of IES you will be the focus point for advanced simulation, calculations, and production of energy strategies on high profile projects. This is a unique position within modelling to lead and develop a team within a globally recognised design consultancy. BARCB /2817

Senior Public Health Engineer

London, £45 - 50k + benefits

We are working alongside an international award winning multi-disciplinary consultancy. Our client are at the fore front of the building services industry and have worked on some of the most high profile projects both in the UK and across the globe. Due to a number of project wins and planned growth they now require an additional engineer to compliment the team. BAR 2760/JA

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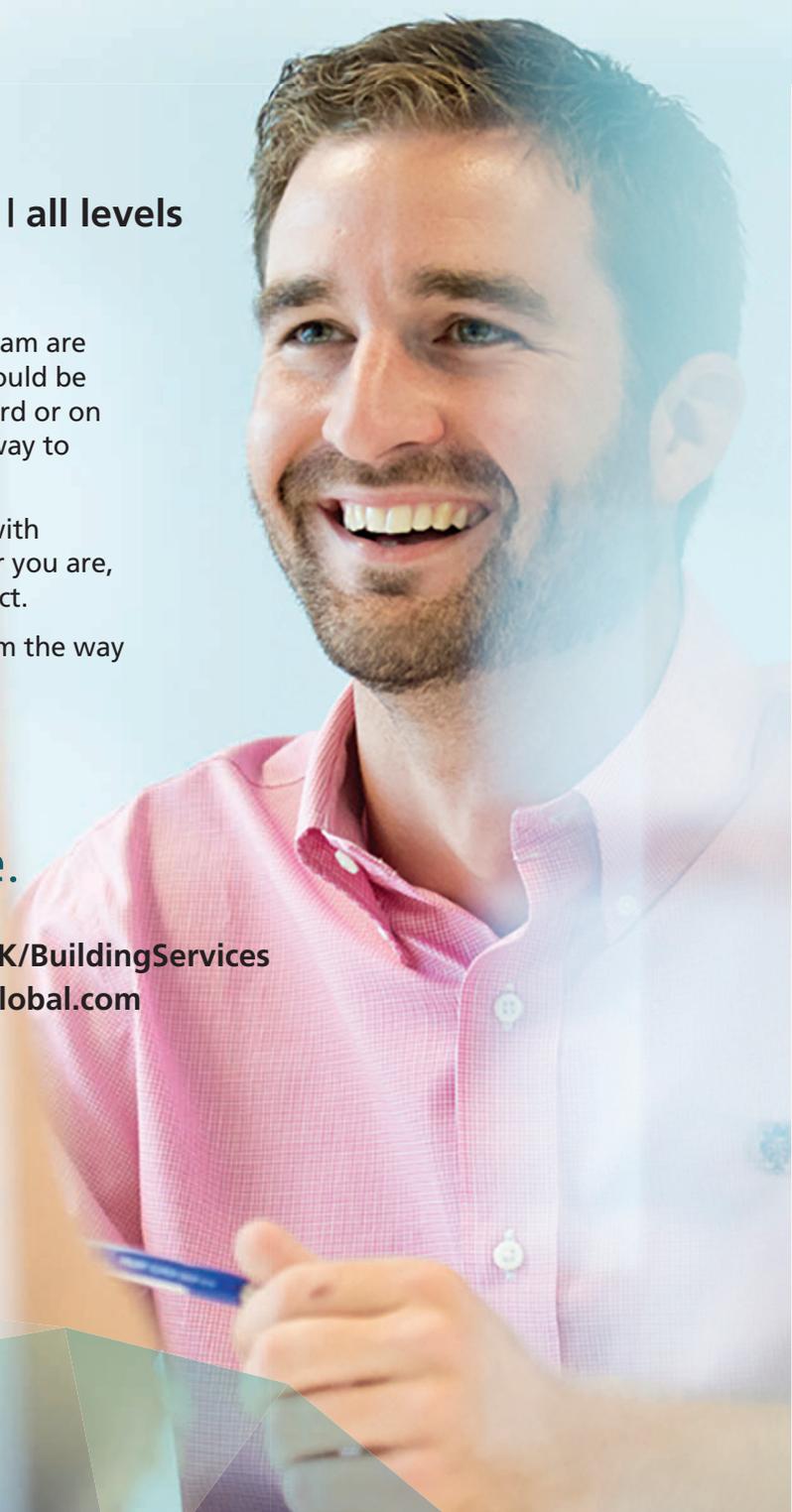
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THROUGH THE KEYHOLE

The build-to-rent market is set to generate over £30bn of new investment within five years. Essential Living's **Ian Merrick** says the economics will only work if apartments are designed with low energy use in mind



Essential Living is a developer and operator of private rental homes in the UK, and claims it is entering the market with a 'full life-cycle' approach to letting. Rather than buying up individual homes built for the home-ownership market, it is looking to create new clusters of homes for rent, as long-term investment opportunities.

With an initial £150m in equity funding from M3 Capital Partners, Essential Living will acquire sites, design and develop properties, and manage them long term. It aims to deliver 5,000 homes over the next decade in London and the South East.

How will you ensure the buildings perform as designed?

Essential Living apartments are all designed and built with one core thing in mind: how they'll be used and operated. Crucially, we will remain in the building, overseeing the performance to make sure standards are maintained. All of our schemes are built to meet the Lifetime Homes and the Secured by Design standards, and – once they are operational – tenants will have access to 24-hour help to avoid small issues turning into a crisis or leading to damage.

Do you have any particular energy/energy efficiency strategy for each design?

All of our schemes will be highly water and energy efficient, so renters can reduce their carbon footprint while benefiting from reduced utility bills.

Our sites will have tailored waste-management plans, which will mean around 85% of a site's waste will be diverted from landfills.

We will use standardised components across schemes – from doorknobs to washing machines – so we can easily replace or swap out damaged components

Another central theme will be low-energy design features in communal areas, such as low-energy lighting and infrared detectors to make sure it only comes on when needed.

Will you encourage occupiers to minimise energy use?

There will be in-built design aspects that encourage renters to use less energy, such as laundry-drying space to reduce the need for artificial methods, and energy-display devices that allow tenants to monitor how much electricity and hot water they are using. We are also hoping to have a home-user guide that will encourage renters to cut both costs and their environmental impact through simple lifestyle changes.

How will you charge for energy use?

We would like to try to combine many of the services into a single payment, so customers know precisely how much money they have in their pocket at the end of the month. The economies of scale obtained through the bulk purchase of energy or broadband services could levy price discounts for customers, while offering a small administrative margin for us.

Are the design and operational teams integrated?

Yes, all of our schemes are designed, built and managed by Essential Living, so the teams at various stages of the scheme's life-cycle are fully integrated.

When it comes to operations, the teams and the tenants will all know what to expect. We will use standardised components throughout – from doorknobs to washing machines – so we can easily replace or swap out

damaged components as seamlessly as possible.

Will you design homes for likely occupants?

Yes. First and foremost our homes are designed for long-term rent, which means spacious, dual-aspect apartments where possible, with designated study areas and communal areas to encourage tenants to make friends in the building.

Schemes will also be designed specifically for various types of tenants. For example, Creekside Wharf, in Greenwich, will have a dedicated block designed specifically for the needs of families. We worked with focus groups to produce design initiatives, such as extra acoustic insulation and bedrooms positioned further away from living spaces for 'early bedtimes', as well as higher, closed balcony balustrades to make them extra safe for children.

Is quality important for your brand?

Absolutely. Renting is currently defined by small-scale, individual operators and tales of poor-quality accommodation, disappearing deposits and unexpected terminations or evictions.

We will be operating and managing the buildings long term, so there will be a strong interest in keeping our customers happy so they want to stay for the duration.

Our ambition is to establish a benchmark for a new breed of professionally managed rental homes, so people will know who we are, what we do and what to expect.

● **IAN MERRICK** is operations director at Essential Living

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. See the programme 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

Air Conditioning Inspection Training

28 September, London

Heat Networks Training

6-7 October, London

CIBSE GROUPS, REGIONS AND SOCIETIES

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

Ireland Region: Annual golf outing 2015

4 September, Dublin

WiBSE role model series: Part 3

8 September, Edinburgh
An evening seminar arranged by WiBSE.

SoPHE: Water leak detection systems

8 September, London
CPD seminar, presented by Aquilar, covering liquid leak detection, pin point location systems and zonal systems.

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.

UAE Chapter and SLL: It's not all about light levels

9 September, Dubai
Presentation by Dan Hodgson, acdc design director, discussing how to think about light surfaces and building up a balance of layers of light.

East Midlands Region: Heat recovery

10 September, Northampton
An evening seminar.

Merseyside & North Wales Region: Mersey Tunnel tour

10 September, Merseyside
An evening seminar.

ANZ Region and AIRAH: Building tuning

10 September, Melbourne
Paul Bannister will discuss how - and where - you look to 'tune' a building, and the benefits of it.

SoPHE Scotland seminar

10 September, London
Introduction of tank-in-tank concept for domestic hot-water services, by ACV. Plus thin-walled stainless steel wastewater pipe systems, by ACO.

East Midlands Region: Family day and heritage visit

12 September, Matlock
Crich Tramway Village visit with a short seminar from Mike Barber, CIBSE Heritage Group secretary.

North East Region: CDM update

15 September, Newcastle upon Tyne
David Carney, of Carney Consultants, will provide an update on the recent changes to the CDM regulations.

ANZ Region - Victoria Chapter: Building energy modelling

15 September, Melbourne
An evening seminar.

SLL and Scotland Region: DIALux evo lighting design software presentation

16 September, Glasgow
Friedrich Bremecker, DIAL America Inc president, will cover the new measures in BS EN12464-1.

SoPHE: Catalytic chlorine dioxide and engineering services

16 September, Manchester
A talk by Peter Tyson, Ian Wedd and Tim Gaston, all of Clearwater Technology.

SoPHE: Sustainable water policy for the UK

17 September, London
Adam Memon, head of economic research at Centre for Policy Studies, will discuss the state of the water sector and water security in the UK.

HCNE Region: Biomass as a heat source for businesses and housing

22 September, Wickham Bishops
Presentation by Innasol, looking at the main driving forces behind biomass in the industry.

East Midlands Region: Gas safety

22 September, Kegworth
An evening seminar.

Lifts Group: CIBSE Guide D 2015 - seminar and launch

22 September, Northampton
CIBSE Guide D Transportation Systems in Buildings has a wealth of information for those involved in transportation system design, installation, commissioning, operation and maintenance.

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 vertical transportation field.

North West Region: Using renewable energy effectively in heat emitters, from Timoleon

24 September, Manchester
An evening seminar.

Darc awards

24 September, London
Lighting awards, supported by the Society of Light and Lighting.

CIBSE student talk and membership briefing

28 September, Liverpool
29 September, London
Discuss your application and interview process with CIBSE staff and registered interviewers.

West Midlands Region: LG8 Lighting for Museums and Art Galleries

30 September, Birmingham
Aspects that should be considered when designing lighting for museums, galleries and historic interiors.

Yorkshire Region: Painful policy? Reducing energy and carbon use

30 September, Leeds
A joint event with Women in Sustainable Construction and Property (WSCP), hosted by BSS, focusing on ESOS and energy management.

SLL and 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 and secondary office spaces.

YEN SW: Speed networking in the built environment

1 October, Bristol
This collaboration of organisations, including YEN, FFT, G4C, IStructE and WIP, brings you the ultimate networking event.

Night of heritage light

1 October
Lighting UNESCO world heritage sites across UK.

YEN London: Paperless office

7 October, London
CIBSE YEN London explores the practicalities of a paperless office in 2015, in conjunction with London South Bank University.

Young Engineers Awards

8 October, London

The event brings together the Graduate of the Year and Employer of the Year awards. The shortlisted graduates will present on a given subject, before the winner is announced.

This year marks the 20th anniversary of the Graduate of the Year Award, which has become one of the most sought-after accolades for young building services engineers.

To see who takes the crown this year, book your place at www.cibse.org/yen

Last year's finalists



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- Michael Dixey, Principal Consultant, **GGR Associates**
- Mark Hawker, Senior Engineering Design Manager - Property, **Sainsbury's Store Support Centre**
- Rick Holland, Lead Technologist – Built Environment, **Innovate UK**
- Paul Littlefair, Principal Lighting Consultant, **BRE**
- Cathy Noakes, Professor, **Leeds University**
- Nina Reid, Director: Responsible Property Investment, **M&G**
- Mike Simpson, Technical & Design Director UK, **Philips Lighting**



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Security of Building Systems & Networks

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Lighting, Wellbeing & Comfort in Buildings

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Drinks Reception –
Building Performance Awards 2016 Shortlist Announced

Wednesday 4 November 2015

Adapting the UK Building Stock to a Changing Climate

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Building Performance Evaluation –
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Innovation & Collaboration in Building Performance

Conference Summary and Networking

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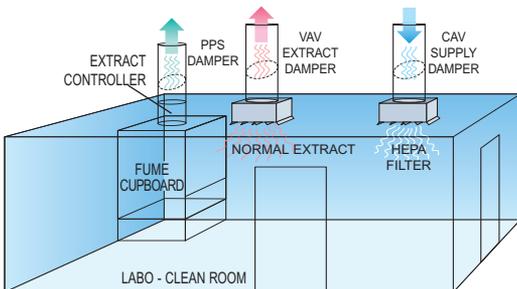


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