JOURNAL CIBSE

CIBSE

The official magazine of the Chartered Institution of Building Services Engineers

February 2015

TREASURE TROVE
Energy savings revealed by ESOS audits

GOLDEN HANDSHAKE
CIBSE recognises influential lighter Hugh Ogus MBE

CENTRE STAGE

How services design at the Liverpool Everyman Theatre wowed the critics

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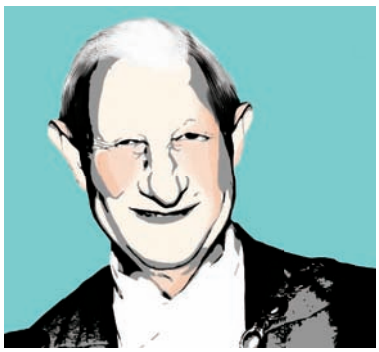

Hugh Ogus MBE became the ninth lighter to be awarded a CIBSE Gold Medal – page 42

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LEARNING

CLASSIFIED

PEOPLE AND JOBS

CIBSE JOURNAL

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The fab four

Reading media coverage of the 2014 RIBA Stirling Prize winner – the new Liverpool Everyman Theatre – you would hardly know that a building services engineer had any involvement at all. Architect Haworth Tompkins has been rightfully praised for, among other things, the selection of materials and finishes and retention of the spirit of the original theatre, but there is barely a reference to one of the building's major achievements – the passive-led services strategy.

In fact, the judges praised its 'naturally ventilated auditoria' and concrete labyrinths to 'supply and expel air' and the most distinguishing features of the theatre are defined by the services. The 105 panels on the façade, showing life-size images of native Liverpudlians, provide essential shading to the interior, while four large chimneys – dubbed John, Paul, George and Ringo – are fundamental to the operation of the natural ventilation system. This worked so well in the summer that the operator never once had to use air conditioning to cool theatregoers in the auditorium. Our feature on page 54 explains how the engineering excellence of Waterman Building Services helped shape the theatre's design.

It's too early to say whether 20 Fenchurch Street – aka the Walkie Talkie – will win any design awards, but it has already garnered thousands of column inches because of its controversial form and façade.

> Some of the most distinguished features of the theatre are defined by its environmental strategy

Last year Julie Futcher and Gerald Mills used thermal modelling to reveal the environmental impact of new towers in the City. Such was the response to the article that Futcher started conducting guided walks through the Square Mile, which we describe on page 38.

Owners of property estates in London, and beyond, will now be considering their response to the Energy Savings Opportunity Scheme (ESOS), which requires all organisations of a certain size to conduct an energy audit. We followed ESOS Lead Assessor Sebastian Gray on an audit of a Marriott Hotel to find out what kind of energy-saving opportunities will be available to clients (page 30). Gray is accredited through CIBSE and there are now set to be 300 CIBSE ESOS assessors by April, making the Institution one of the leading providers on the scheme.

A new category for building operation at the Building Performance Awards recognises the importance of facilities management in minimising carbon. Good luck to those shortlisted for the awards, which will be preceded by an address by top architect Ken Shuttleworth (page 12).

Alex Smith, editor
asmith@cibsejournal.com

CIBSE BUILDING PERFORMANCE AWARDS 2015

Recognising the people, products and projects that demonstrate engineering excellence in the built environment

LAST CHANCE TO BOOK

Join us to celebrate the achievements of professionals delivering energy efficiency across the built environment

- Guest speaker Ken Shuttleworth, Founding Partner, Make Architects
- Host, Steph McGovern, business reporter and former Young Engineer for Britain
- Charity casino - funds raised going to the CIBSE Benevolent Fund
- Winners announced and celebrated across 14 categories
- Networking opportunities with over 700 professionals from across the full supply chain

TUESDAY 10 FEBRUARY 2015 GROSVENOR HOUSE, LONDON

"Our clients really enjoyed last year's Building Performance Awards. It's a great celebration of the industry's achievements."

Ian Gratte
Group Managing Director,
Gratte Brothers

NEWS

All the latest news from around the building industry

In brief

AC BLAMED FOR SPACE STATION EMERGENCY

A possible leak of ammonia from an onboard air conditioning system caused the evacuation of part of the International Space Station, NASA has confirmed.

In what turned out to be a false alarm, sensors detected toxic ammonia apparently leaked from the air conditioning, forcing six US astronauts to take refuge with their Russian colleagues.

However, the all clear was later given by Mission Control – which described the incident as 'unscheduled excitement' – and the American crew members returned to their own area.

CHICAGO SHOW BREAKS RECORDS

Even before the 2015 AHR Expo opened at Chicago's McCormick Place last month, its organisers announced that it had broken three all-time records. The Expo boasted 2,100 exhibiting companies, together occupying more than 480,000 ft^2 – both record figures for what is claimed to be the largest HVACR event in the world.

The Expo – now in its 67th year – was set to be at least 10% larger than the previous biggest show, and to feature 8% more exhibitors than last year's event in New York City.

The total of 380 new exhibitors, and 592 international companies, from more than 30 countries, represents a 16% increase on the previous record.

AHUS SPECIFIED FOR PUBLIC HEALTH ENGLAND

Bradford-based Mansfield Pollard has been appointed by Whitehead Building Services to design and install bespoke air handling units at Southmead Hospital, as part of a £25m investment in the consolidation of pathology services with Public Health England.

Mansfield Pollard supplied 15 air handling units, each of which had to comply with stringent HTM03 hospital specifications. They were installed to serve the hospital's main office and pathology laboratories.

Energy networks need £40bn investment – DECC

PI-LENS / SHUTTERSTOCK

Spending required to integrate renewables into power infrastructure

A report from the Department for Energy and Climate Change (DECC) has highlighted the vital role energy networks will play in the UK's future energy strategy. It estimates that more than £40bn will need to be invested in the infrastructure by 2020.

Delivering UK Energy Investment: Networks estimates that more than £34bn will be needed for electricity networks, and a further £7.6bn for gas. DECC says the spending is necessary to enable networks to accommodate more renewable sources, improve efficiency and security, and keep energy costs as low as possible.

The department also funded heat network feasibility studies, carried out by 91 local authorities, and its report says these projects could attract between £400m to £800m in new capital investment.

'By delivering energy through efficient heat networks, this potential infrastructure investment will directly benefit local communities and curb rising energy costs for thousands of people,' said Tim Rotheray, director of the Association for Decentralised Energy, formerly the CHP Association. 'However, achieving this will depend on the right policies being in place.'

The report added that investing in energy networks would support up to 9,000 jobs and contribute an estimated £5bn in exports over the next two decades.

Efficiency sidelines power stations

Energy efficiency measures and the use of decentralised power generation has allowed the UK to avoid building 14 new power stations, according to a report from the Association for Decentralised Energy (ADE).

Invisible Energy – Hidden Benefits of the Demand Side was unveiled by energy secretary Ed Davey. It claims that investment in demand-side reduction has cut end users' annual energy costs by £37.2bn, and reduced the need to build the equivalent of half the UK's current power-generating capacity.

'Cutting energy waste using demand-side services delivers economy-wide benefits: Supporting 136,000 jobs, cutting carbon emissions by 462m tonnes a year, and reducing our dependence on imported energy by two thirds,' said Tim Rotheray, director of ADE.

However, the association accused successive governments of repeating the same mistakes with energy policy by 'overlooking the substantial contribution that users and individual actions can make'.

Rotheray claimed that, by 2020, a decentralised strategy could save consumers a further £5.6bn a year.

Industry research highly ranked

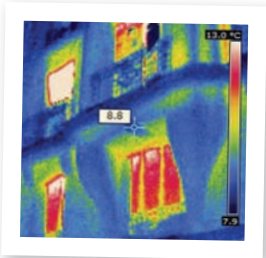

IMAGE POINT FR / SHUTTERSTOCK

Electrical and electronic engineering featured highly in the recent Research Excellence Framework (REF) results, which determine the level of research funding allocated to the UK's higher education institutions.

Almost 7,000 impact case studies, written by more than 52,000 staff at 154 institutions, were submitted in a bid to receive a share of the total taxpayer-funded pot of around £1.6bn annually, for the next six years.

The University of Oxford received the highest grade-point average in 10 of the REF's 36 units of assessment, with Imperial College London the top-ranked multidisciplinary institution.

Medical and life sciences scored highest in terms of overall research quality and will receive the most funding. However, electrical and electronic engineering, metallurgy and materials chemistry, physics and mathematical sciences led the way for physical sciences, and are also expected to receive generous funding allocations.

See page 24 for Paddy Conaghan's article on disseminating research among practitioners.

UP ON THE ROOF

A Sky Garden at 20 Fenchurch Street, which spans three floors and offers 360˚ panoramic views over London, has opened to the public. The 45,000ft² attraction has been designed as a naturally ventilated space, using thermal and computational fluid dynamic modelling to minimise energy use. Photovoltaic cells in the roof also contribute to its low carbon footprint. Two lifts carry visitors to a landscaped garden with a café, bar and restaurant. Building services was designed by Hilson Moran.

DECC to probe biomass boilers' poor performance

- **Review finds biomass boiler operating below efficiency required by RHI**

Commercial biomass projects are underperforming by as much as 20%, according to a report published by the Department for Energy and Climate Change (DECC).

Biomass installations account for more than 90% of payments under the government's Renewable Heat Incentive (RHI) scheme, but underperformance 'appears to be widespread' the study said.

DECC admitted that this was leading to higher carbon emissions than predicted.

The RHI has paid out more than £130m to biomass installations, but total payouts could eventually top £10bn as payments are guaranteed for 20 years.

To qualify for RHI payments, a biomass boiler needs to operate at a minimum of 85% efficiency for converting fuel to energy, but the average rate of the installed boilers surveyed was 66.5%.

The desk-based review, produced by Steve Luker Associates for DECC, also showed that the highest average rate achievable was 76%. Industry observers have expressed alarm at the potential waste of public money and blame a lack of standards and regulation.

Incorrectly sized biomass boilers will perform poorly and will actually increase emissions

'Incorrectly sized biomass boilers will perform poorly and will actually increase emissions. Allowing system thermal losses to be typically 50% of the energy input cannot be acceptable,' said David Frise, head of sustainability at the Building & Engineering Services Association (B&ES).

Frise said the RHI was a positive initiative, but had led to a worrying amount of mis-selling and unrealistic expectations.

'Some installers are obviously overstating potential performance by talking in terms of boiler combustion efficiency,' he added.

The Microgeneration Certification Scheme regulates domestic biomass installations and commercial systems up to 45kW capacity.

However, almost 90% of all commercial biomass boilers are above that threshold so are, effectively, unregulated.

DECC said it would now carry out more work to 'fully assess the performance of biomass boiler systems and installer competency'.

Additionally, CIBSE recently published *AM15 Biomass Heating*, which is designed to help engineers make informed decisions on biomass boiler system design.

ESOS gathers pace

CIBSE has predicted that over 300 Energy Savings Opportunity Scheme (ESOS) Lead Assessors will appear on its register by April.

ESOS requires large organisations to have a detailed audit of their buildings, industrial processes and transport to find out how they can save energy.

CIBSE's register of Lead Assessors has passed the 150 mark, and Professor Andrew Geens, head of CIBSE Certification, expects to see another 150 names on the list by April.

CIBSE has also applied for its assessors to carry out ISO50001 Energy Management audits – an alternative route to ESOS compliance, along with Display Energy Certificates and Green Deal Assessments – which, if successful, will be useful for those in the next registration cycle.

Turn to page 30 for more on ESOS assessments.

£2m fund to boost collaboration

Innovate UK is to spend up to £2m on feasibility studies exploring how to extend the use of collaboration in the construction supply chain and improve the flow of information between project participants.

Formerly known as the Technology Strategy Board, Innovate says the current supply chain is fragmented, with 'many layers of subcontractors and suppliers', which leads to construction clients being 'removed from those who deliver projects on site'.

'This lack of integration within the supply chain is leading to lost opportunities for innovation and increases in efficiency,' it said.

Innovate is seeking proposals from the industry that encourage the creation of more integrated, collaborative supply chains. Suggested projects are open to companies of any size working in collaboration. They are expected to run for six to 12 months, with total costs ranging from £50,000 to £150,000, although Innovate said larger projects could be considered.

Businesses could receive up to 70% of their eligible project costs, and are invited to apply, from 9 March, at **https://interact.innovateuk.org**

In brief

ENERGY CONSUMPTION FALLS AT RATE OF 2% PER YEAR

Energy consumption has fallen by an average of 2% in eight of the last nine years, according to a DECC report.

Consumption in the domestic sector has also fallen by 17% since 2004, the Energy Efficiency Statistical Strategy 2015 has said.

The average standard assessment procedure (SAP) rating has risen from 45 (band E EPC) to 59 (band D EPC) between 1996 and 2012, while 74% of new homes in 2014 were rated A or B.

For non-domestic buildings, 16% of EPCs were rated as the lowest category in 2014, which is down from 18% in 2009.

DECC has commissioned the Building Energy Efficiency Survey and the National Energy Efficiency Data-framework, to get further data on actual energy use in non-domestic buildings.

BT AWARDS £26m SOLAR CONTRACT

A contract for the Martlesham solar farm project in Suffolk has been awarded to UK Sustainable Energy.

The £26m deal is intended to provide power for the BT Adastral Park site, located nearby, which is the company's key research facility in the UK.

According to the contract, all of the Adastral Park site's power must be provided by the installation for the next 20 years.

In addition to Martlesham, the company will also use output from its recently completed 8MW, 16-hectare Brightwell solar farm.

SCOTLAND'S FIRST 'GAS TO GRID' PROJECT GOES ONLINE

The first 'gas to grid' anaerobic digestion (AD) project has been completed in Coupar Angus, Perthshire.

AD is a natural process where organic material is broken down by bacteria to produce biogas.

Recent headlines about plummeting milk prices have emphasised the need for farmers to diversify their businesses. Using slurry, silage and crops grown specifically for AD could mean advantageous, long-term supply agreements for farmers.

Also, the by-product of AD is an organic fertiliser that can be returned to the fields.

NAO slams government bill payment record

Report uncovers failure by Whitehall to hit five-day target

The government is failing to back up its commitment to pay 80% of undisputed invoices within five working days to help support SMEs, according to a report by the National Audit Office (NAO).

The government has pledged to pay invoices more quickly than the 30 days required by law, but the NAO believes the policy is boosting the working capital of main contractors rather than benefiting smaller firms further down the supply chain.

'Businesses told us they welcome the government's commitment to pay invoices early. However, there has been a disappointing lack of effort to check whether the implementation of the policy is actually helping SMEs,' said NAO boss Amyas Morse.

'We are also seriously concerned about the prompt payment performance figures publicly reported by departments. These were overstated by the four departments we looked at. It remains to be seen whether the changes proposed in the Small Business, Enterprise and Employment Bill, and secondary legislation, will be enough to bring about improvements,' added Morse.

GUNNAR PIPPEL / SHUTTERSTOCK

Central government spends £40bn a year on goods and services, of which about £4.5bn is spent with SMEs. The NAO found that the four departments it audited were taking between three and seven weeks to pay 80% of the value of paper invoices. Government suppliers could benefit from reduced interest costs of up to £88m a year if government departments did pay within five working days, it found.

The NAO criticised the 'centre of government' for showing 'little strategic leadership in relation to prompt payment in the public sector'. It recommended that the Cabinet Office set out the principal objectives of the five-day payment commitment, its benefits and costs.

University green league hit by boycott

Plymouth University, University of Worcester and Manchester Metropolitan University have filled the first three places in an annual league table ranking environmental performance in Britain's universities.

But the number that took part in the People and Planet University League was nearly half that of 2013, with 82 out of 151 universities not participating.

The *Guardian* reported that Oxford and Cambridge had boycotted the survey because they felt it did not recognise the difference between older and newer institutions, while Cambridge and Goldsmiths both said it was too burdensome.

The survey looks at green policies and measures performance to determine whether institutions should be deemed First Class, 2:1, 2:2, or third. The lowest performers are deemed to have failed.

The performance section includes the measurement of carbon reduction, water reduction and waste and recycling.

'It has driven sustainability in universities,' claimed head of sustainability at CIBSE, Sara Kassam, who was previously sustainability and energy manager at UEL. 'Actual measured performance in areas such as carbon reduction is vital,' she said.

But the overall league table is not an exact science, said Kassam. 'It's difficult to compare institutions as they are so different, and self-reporting can vary.'

Carbon reduction data used in the survey already exists, as managers have to return figures to the Higher Education Statistics Authority.

Colleges must focus on energy efficiency

Amid the furore around the 'green league', we shouldn't forget that promoting and publicising the performance of universities in the area of carbon reduction is still hugely important, said Sara Kassam.

The Higher Education Funding Council for England has taken its eye off the ball. After requiring all universities to have a detailed carbon management scheme, signed off by the governing body in 2010, it hasn't followed up with any monitoring of progress against the reduction targets set. As a result, the initial momentum has slowed, with some universities making significant reductions, while others no longer make carbon management a priority.

This is a missed opportunity to encourage the sector to play its part in meeting national carbon reduction targets as well as making the most of the benefits that carbon management of estates bring.

open 4 innovation

niagara forum 2015

hilton london metropole april 19 - 21

Are you ready for truly open systems?

The era of the Internet of Things (IoT) has arrived – a time when openness and connectivity are vital to realizing operational efficiencies in commercial buildings.

The Niagara Forum 2015 will be the place to learn what truly open systems can achieve and how to make the most of the opportunities offered by the IoT.

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Now is the time to get ready for a new kind of open system that can harness the power of the Internet to create an efficient, productive and usable built environment. Register now at **www.niagaraforum.eu**.

TRIDIUM

Falling oil price puts pressure on renewables

The recent falls in oil prices are making prospects for renewable technologies more uncertain, according to David Pepper, managing director of boiler and water heater manufacturer Lochinvar.

'With the oil price at its lowest level for four years and the government's renewed commitment to shale gas and nuclear energy, renewables are becoming a tougher sell,' said Pepper, who has recently joined the CIBSE Board.

Speaking at the opening of Lochinvar's new multiple product training facility at its Banbury headquarters, he said the market for energy saving technologies was, on the other hand, strengthening.

'Most commercial building owners still want to insulate themselves from the price volatility in the market. What goes down will almost certainly go back up again,' he said.

Top architect to be guest speaker at CIBSE awards

Ken Shuttleworth to attend prestigious annual event

One of the world's leading architects, Ken Shuttleworth, has been announced as guest speaker at the CIBSE Building Performance Awards on Tuesday 10 February 2015, in London.

With a career spanning 40 years, Shuttleworth has delivered a portfolio of iconic, innovative and sustainable buildings.

In 2004, Shuttleworth founded Make Architects – an award-winning, employee-owned practice that has a reputation for design excellence. Before that, he built up a portfolio of experience as a director at Foster + Partners, where he worked on some of the world's most recognisable and groundbreaking buildings.

Fast-forward 11 years since Make's inception; Shuttleworth continues to lead the practice and acts as guardian to the 168-strong staff with studios in London, Hong Kong, Beijing and Sydney. He oversees the design development of every Make scheme, and the practice has won numerous projects and accolades across a wide range of sectors both in the UK and overseas.

The practice has completed 44 major schemes to date, including: the Copper Box, Queen Elizabeth Olympic Park; Dunbar Place, Hong Kong; The Gateway Building, University of Nottingham; and the widely acclaimed City of London Information Centre.

Make has a further 24 projects on site, including: 5 Broadgate; Rathbone Square; London Wall Place; and St James's Market in London, as well as The Temple House Hotel in China.

Central to Shuttleworth's design philosophy is an unwavering emphasis on smart environmental design, driven by the continuous innovation in pursuit of sustainability, energy efficiency and economy of means.

You can view the shortlisted entries and book a table at **www.cibse.org/bpa**

Green Deal assessments riddled with errors

- **Assessors were difficult to find and showed a lack of interest or enthusiasm**

A 'mystery shopper' exercise analysing consumers' experience of Green Deal assessors has revealed serious variations in the quality of the service offered, and major discrepancies in the data used to recommend home improvement measures.

These inconsistencies have led to inaccurate specifications and, therefore, inflated running-costs for consumers, said researchers.

The investigation, carried out by ICF International for the Department of Energy and Climate Change (DECC) showed that participants often experienced problems simply finding a Green Deal assessor 'willing and able to perform an assessment'.

'Numerous calls were required to secure a booking; some participants could not secure four assessments and, therefore, dropped out of the research,' the report recorded.

Some people reported 'a lack of interest or enthusiasm on the part of many assessors'.

The report found that the information systems directing Green Deal customers to assessors 'were not sufficiently accurate or localised to be useful'.

An analysis of assessments showed 'many differences' in the values recorded by different assessors for the same property, including mistakes in total floor area and the energy efficiency rating of building fabric and technologies.

As a result, the Energy Performance Certificate (EPC) rating varied by 11 points on average in each dwelling.

London is world's most expensive place to build

Central London is now the most expensive place in the world for building projects – partly because of poor productivity, according to design consultant Arcadis.

London has now overtaken Switzerland at the top of the table in the company's annual International Construction Costs Report, which compares building costs in 43 countries. The UK as a whole was ranked eighth, with costs predicted to rise by a further 3% this year.

'The cost of construction in London has been heavily impacted by high specification levels in many of the city's developments, topped off by the fact that its prime residential property is reaching a capacity ceiling, leading to significant cost inflation over the past year,' said Arcadis head of strategic research, Simon Rawlinson.

'This is bolstered by the UK construction industry being much less productive than its US and European peers, and the fluctuation in global currencies.'

RADEK STURGOLEWSKI / SHUTTERSTOCK

Engineers named in 2015 New Year Honours list

Construction industry experts have been recognised in the Queen's New Year Honours list.

Paul Ekins, professor of energy and environment policy at University College London, was made an OBE for services to environmental policy. He was a member of the government's sustainable energy policy advisory board from 2003-07, and a specialist adviser to the joint parliamentary committee on the 2007 climate change bill.

Jane Wernick, founder of Jane Wernick Associates, was made a CBE for services to structural and civil engineering. She is a member of numerous panels, including EDGE and Building Futures.

WSP senior civil engineer Claire Gott, and TrustMark chair Liz Male, were made MBEs for, respectively, services to civil engineering, and to construction and consumer protection.

Others honoured: Kevin Myers, Health and Safety Executive deputy chief executive, CBE; Paul Madden for services to environmental protection and sustainable development, OBE; Stephen Fox, BAM Nuttall, CBE; Andrew Wyllie, Costain chief executive, OBE; Paul Sheffield, managing director of Laing O'Rourke's European operations, CBE for charity work, plus his contribution to the industry; Peter Rees, former City of London chief planning officer, CBE; Steve Quartermain, the government's chief planner, CBE.

Pettigrew steps down as B&ES chief executive

'Amicable departure' after 18 months in charge

Roderick Pettigrew has resigned as chief executive of the Building & Engineering Services Association (B&ES).

President Andy Sneyd explained that the departure was an 'entirely amicable one', and he thanked Pettigrew for the 'valuable contribution he had made during his quarter of a century with the association'. He added that interim arrangements were already in place that would ensure B&ES continued to operate effectively – and to serve the interests of its members – while the search for a new chief executive takes place.

These arrangements include the formation of a strategic and operational board. This will be under the chairmanship of the president and comprise the officers, finance committee chairman John Miller, finance director Ray Barraclough and Bruce Kirton, chief executive of Welplan, the association's main commercial subsidiary.

'At the top of the new board's agenda will be key issues surrounding membership and marketing, the development of the association's skills base, and the future of vocational education and training across building engineering services,' said Sneyd.

With a background in law, Pettigrew joined what was then the Heating and Ventilating Contractors' Association (HVCA) in 1990, as a commercial and legal adviser. Four years later, he was appointed head of the commercial and legal department.

He was promoted to the post of deputy chief executive in 2008, and became chief executive in July 2013.

Hirigoyen takes over at UK-GBC

Julie Hirigoyen has been appointed chief executive of the UK Green Building Council. Currently UK head of sustainability for international property consultants JLL, she will take up the position in April, replacing outgoing chief executive Paul King.

Hirigoyen was managing director and founding partner of Upstream, a sustainability strategy consultancy that was acquired by JLL in 2007. She was promoted to international director in 2010, and joined the UK Executive in 2011, before becoming UK head of sustainability in 2013. She has played a key role in JLL's sustainability strategy, overseeing a significant change programme over the past seven years.

'We've come a long way over the past decade, with sustainability now a mainstream concern for many organisations involved in the built environment,' Hirigoyen said.

'The next step requires mass uptake of sustainability solutions across the entire property life-cycle, breaking down silos and deploying systems thinking to achieve radical change.'

Movers and shakers

Send your job moves to **editor@cibsejournal.com**

Mike McDonagh

Grontmij hires team leader for Manchester

Grontmij has appointed Mike McDonagh MCIBSE to lead a new building services team at its Manchester office. McDonagh – who has previously worked for WSP, Regas, Hurley Palmer Flatt, and Halcrow – has spent more than 20 years in property and building services. Geoffrey Palmer, Grontmij's director for energy, planning and design, said: 'His experience will help our diversification agenda.'

T D Gerard Canisius

WSP appoints UK fire head

T D Gerard Canisius has joined WSP as the UK head of fire engineering. He joined from URS, having previously worked at the BRE for more than 15 years. Canisius has worked on several big fire engineering projects in the UK, including Paddington Crossrail Station, Heathrow, and the A55 tunnels in north Wales. His appointment follows that of Hay Sun Blunt to head up WSP's London fire team.

David Healy

WSP London recruits technical director

David Healy has been appointed technical director for WSP's London team. He joins the professional services company from Crown House Technologies, having previously worked for Arup and Max Fordham. Healy has more than 10 years' experience in the industry, and led the building services design for the Shard. He gained a PhD from the University of Cambridge, where he researched computational studies of two-phase flows.

David Philp

Government BIM expert in Aecom switch

David Philp has been appointed Aecom's director of BIM for Europe, Middle East, Africa and India. He joins from Mace, and will continue his part-time secondment to the UK government's BIM Task Group. Philp, who will work alongside David Bennison, head of the region's technology & data solutions group, said: 'The fact that Aecom's design, build, finance and operate model encompasses the entire asset life-cycle is exciting.'

powerstar

STORAGE

MAKING RENEWABLE ENERGY RELIABLE

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Committee seeks more members

New members are being sought by the CIBSE Professional Practices Committee, which advises the board and the President on professional practices of building services engineering. This includes maintaining the code of conduct and administering the disciplinary procedures.

The committee is made up of 10 corporate CIBSE members, who meet three times a year at CIBSE's offices in Balham, and sometimes hold ad hoc meetings.

To apply, you will need to be a CIBSE Associate, Member or Fellow with an interest in maintaining professional standards. Email a brief CV and why you are interested in the position to Carilyn Clements, director of membership, at **cclements@cibse.org**

Ready, steady, light!

Entries are now open for the Society of Light and Lighting's 2015 Ready Steady Light competition. Up to 17 teams will compete to design an exterior lighting scheme in three hours.

Entry, which costs £150, is restricted to one team per organisation of up to five people, led by an SLL member.

The event will be held on 24 March, at Rose Bruford College, Sidcup. For more information visit **www.cibse.org/sll**

Cutting-edge research to be showcased at symposium

Simple buildings, better buildings? Delivering performance through engineered solutions

The 2015 CIBSE Technical Symposium is fast approaching, and the papers are going through a final review by the 60-strong scientific committee.

Now in its fifth year, the symposium will be at University College London on 15 and 16 April. Thanks to sponsorship and the support of a university host, event costs have been kept to a minimum. However, there has been no skimping on the quality of papers and presentations, and an unrivalled range of material will be available as well as opportunities for networking and discussion.

There will be more than 50 presentations over the two days, with speakers from around the world offering insight into cutting-edge research, application and development in the expansive area of building services engineering.

There will also be a mock legal arbitration at the end of day one. This will give a realistic – and entertaining – insight into the increasingly litigious activity that can derail unsuspecting building services engineers. The protagonists will be lawyers cross-examining a contractor, a designer and an expert witnesses. Proceedings will be overseen by a senior industry arbitrator.

Meanwhile, the CIBSE Schools Group, CIBSE Natural Ventilation Group, and the International Building Performance Simulation Association will all lead focused technical sessions.

A reception at the end of the first day will be held at Millbank Tower, and will provide an opportunity to mingle with delegates, speakers, and senior industry members.

For details, and to book for two days of CPD and networking, visit **www.cibse.org/symposium**

Young achiever with head for business scoops CIBSE award

A commercially-minded young engineer has won the achievement in management and enterprise accolade at the Yorkshire Young Achievers Awards.

Andrew Hudson, managing director of G&H Sustainability, was given the award for his efforts in developing the division of the G&H Group.

The award recognises the best examples of entrepreneurial spirit and management skills needed to succeed in today's highly competitive business environment.

Judges were impressed by Hudson's vision to approach the G&H Group in 2011 with the idea of setting up a sustainability business, specialising in low carbon building technologies. In addition to this, he completed his MEng in building services engineering, and graduated from Goldman Sachs' 10,000 Small Businesses programme.

Hudson (above, centre) is also chair of the CIBSE Yorkshire region's Young Engineers Network.

Trainee engineer top of the class after Five Counties win

- **Awards aim to promote merits of the profession and encourage more to join**

A trainee mechanical services engineer has won the CIBSE Five Counties Award for the West Midlands, in recognition of her achievements in the Ordinary National Certificate Building Services course.

Lauren Jones, of multidisciplinary design and engineering firm Morgan Sindall Professional Services (MSPS), was nominated by the South & City Birmingham College, where she studies.

She said: 'The awards are very well-respected across the industry, and I believe the recognition will benefit my future career.

'There aren't enough young people pursuing engineering, and the awards are a great way to advertise this worthwhile profession.'

The awards – which have been running for more than 30 years – were presented at the CIBSE West Midlands annual dinner. They aim to promote the profession and encourage more young people into the industry.

Simon Steed, associate director for building services at MSPS, said that trainee internships were vital for the industry: 'As well as offering a good opportunity to young, budding engineers, it is critical that we support training programmes in order to attract intelligent and enthusiastic young people into engineering.'

Lauren Jones at the CIBSE West Midlands dinner

In brief

READ ALL ABOUT IT

A new edition of the *SDAR Journal* is now available.

Published jointly by the Dublin Institute of Technology and CIBSE Ireland, this edition includes papers on interior lighting design, the implementation of ISO50001 in sports stadia, and a case study of a BIM-based HVAC manufacturing process.

SDAR Journal is free, and can be read at **arrow.dit.ie/sdar**

SAVE THE DATE

The CIBSE Building Performance Conference and Exhibition will be returning to the QEII Centre in Westminster on 3-4 November 2015. The conference will deliver 10 hours of CPD focusing on efficient design, construction, maintenance and operation of buildings. For more information on attending or exhibiting visit **www.cibse.org/conference**

CIBSE ANZ launches soft-landings strategy

In response to the ongoing challenge of creating buildings that deliver on their promises, the Australia and New Zealand CIBSE region is staging a series of seminars to launch the ANZ Soft Landings Framework.

This seminar series aims to highlight the benefits of applying the framework to support building design and delivery.

The series will be led by Roderic Bunn, principal consultant at BSRIA, and Hywel Davies, CIBSE technical director, will co-present on the subject of building logbooks.

Bunn, recognised as a leading authority on soft landings, is an excellent communicator, and has received widespread acclaim for the 2010 ANZ seminar series.

The ANZ Soft Landings Framework has the potential to revolutionise the building procurement and delivery process in Australia and New Zealand, and these seminars provide an opportunity for members to take a leadership position. The seminars will be held on:

- 10 March, Perth
- 12 March, Melbourne
- 16 March, Auckland
- 19 March, Sydney

A celebratory dinner and awards evening officially launching the framework will take place on 20 March, in Sydney. It will be attended by several CIBSE board members, including President, Peter Kinsella, and CEO, Stephen Matthews.

On the night, there will be a presentation of awards to students and young engineers, as well as fundraising on behalf of the CIBSE Benevolent Fund.

The ANZ Soft Landings Framework can be found at **http://bit.ly/15ruK4j**

This version of the framework has been developed and tailored to the needs and specific contexts of Australia and New Zealand.

Industry remembers BSRIA's strategic thinker

Graeme Baker, former chief executive of the Building Services Research and Information Association (BSRIA), died on Christmas Eve 2014. He made an outstanding contribution to advancing the technology and practices of the construction industry sector concerned with environmental services in buildings.

Baker joined the Heating and Ventilating Research Association, the forerunner of BSRIA, in 1967. He was recognised for his efforts in encouraging research teams to disseminate their findings, and promoting the uptake of these by industry. As a result Baker was widely consulted, informally, by a number of government departments.

While he was at the helm of BSRIA, the association won many contracts from the European Commission, as well as the UK government, increasing the availability of research results to industry. He also encouraged industry to use the Research Association for investigations, and for equipment and systems tests, which were valuable in strengthening the technological base of the sector. In later years, his involvement in pan-industry bodies led to Baker being consulted by industry and government leaders, and this continued after he retired, in 1999.

Baker – who thought clearly and strategically, and was generous in his support of others – was made an OBE in 1998. He was also granted an Honorary Fellowship by CIBSE.

New Members, Fellows and Associates

FELLOWS

Berry, Steven Graeme
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Clarke, Iain Norman
Bedford, UK
Clifford, Emma
London, UK
Couch, Tristan
London, UK
Foreman, Alexander Graham
Harold Wood, UK
Gilder, Walter Percy
Melton Mowbray, UK
Green, Simon Clifford
Herford, UK
Hamilton, Marian Frances
London, UK
Hickerton, George Parry
St Albans, UK
Jones, Gary Leonard
Southampton, UK
Luk, Wai Chung
NT, Hong Kong
Moraitis, Haris
Doha, Qatar
Naylor, John Charles Russell
London, UK
Parsloe, Christopher John
Totland Bay, UK
Sutcliffe, Peter John
South Croydon, UK
White, Graeme Clayton
London, UK
Williamson, Austin Lance John
Rayleigh, UK
Yee, Kwong Fai
NT, Hong Kong

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Amissah, Raphael Nuamah
Smethwick, UK
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Auty, Mark Edward
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Baker, Christian
London, UK
Buczkowska, Anna
Edinburgh, UK
Buesa Castro, Armando
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Burczyk, Piotr
Northwood, UK
Butler, Ellis James
London, UK
Cannam, Celine
London, UK
Cashmore, John
Cradley Heath, UK
Cassidy, Bernadette
Belfast, UK
Chan, Wai Ki Kelvin
Mongkok, Hong Kong
Chan, Siu Hei
Aberdeen, Hong Kong
Chan Sui Ko, David
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Chiu, Kwok Keung
Tai Kok Tsui, Hong Kong
Chow, Kin Ho
Tsuen Wan, Hong Kong
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Horsham, UK
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Thatcham, UK
Cox, Steven
Badminton, UK
Crossan, James
London, UK
Crump, Simon William Potton
Sandy, UK
Cuninghame, Craig
Manchester, UK
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Bristol, UK
Davis, Michael John
Tonbridge, UK
Davison, James
Sunderland, UK
Donald, Thomas
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Dreyer, Ryan Joel
Beckenham, UK
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Manchester, UK
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Newton Abbot, UK
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Bromley, UK
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Edinburgh, UK
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London, UK
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Heaton, Edward
Witney, UK
Hui, Wing Lun Elvis
Sheung Shui Wai, Hong Kong
Hui, Chun Kit
Yuen Long, Hong Kong
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Hussain, Bilal
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Uckfield, UK
Jackson, Robert
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Quatre-Bornes, Mauritius
Shaikh, Mohammed Imran Mohammed Zubair
Dubai, United Arab Emirates
Sheffield, Craig
Manchester, UK
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Nottingham, UK
Stapleton, Patrick
Brentwood, UK
Stevenson, David James
Lisburn, UK
Storer, Allan
Glasgow, UK
Tai, Sabrina Chi Yue
Hong Kong, Hong Kong
Tam, Ming Hong Willie
NT Hong Kong, Hong Kong
Tam, Kwan Yiu
Kowloon, Hong Kong
Thompson, Hugh Lennox
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Varekamp, David
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Basingstoke, UK

Tales from Chicago

SoPHE cements links with US plumbing professionals

To further develop the CIBSE Society of Public Health Engineers (SoPHE), Steve Vaughan, of the SoPHE technical committee, attended the American Society of Plumbing Engineers' (ASPE) 2014 convention, in Chicago.

Now in its 50th year, ASPE has more than 6,000 members worldwide, and Bill Hughes, ASPE president, explained how the ASPE 2012-15 Strategic Blueprint has positively shaped the society's progress in recent years.

Its objectives include reaching out to contractors, building stronger relationships with the inspector and regulatory community, and fostering relationships with other international organisations.

There were more than 1,000 seminars at the conference, but the 'Global Thinking and Local Action for Water' talk – by Dr Saburo Murakawa, Dr Kanako Toyosada and Dr Cheng-Li – made the biggest impact.

It included an overview of activities undertaken by the Asia Saving Water Council, which acts as a platform to share updated water-efficiency information and technology. It is currently focused on academic activities from universities or researchers – and projects supported by governments or enterprises – to help developing countries such as Vietnam.

Vaughan's visit gave him a valuable insight into the US plumbing design and installation industry. He felt the UK was more advanced in areas such as water conservation and reclaimed water systems, but fell behind on design code or guides.

SoPHE plans to continue engaging with similar societies at an international level.

PAPA BRAVO / SHUTTERSTOCK

In brief

SOUTHERN REGION 2015 YACHT RALLY ON RIGHT COURSE

The CIBSE Southern Region 2015 Yacht Rally will take place on Saturday 6 June 2015. The event is open to all connected with building services, and will be held in the eastern Solent, following a challenging course using only wind energy.

A dinner and prizegiving will be held in the evening, on the viewing platform of Portsmouth's Spinnaker Tower. From this vantage point, 100m above the water, there are spectacular views of Portsmouth, the Solent and the Downs.

This is a great social event for sailors and non-sailors. If you can put together a team, need a boat, would like to crew on a boat – or if you just want to come along for the view – contact **d.pope@popeconsulting.co.uk** soon, as numbers will be limited.

MAINTAINING STANDARDS

Knowledge of new standards is essential if engineers are to stay at the top of their game. **Hywel Davies** flags up revisions to those supporting the European Energy Performance of Buildings

The Energy Performance of Buildings Directive (EPBD) sets out the terms for calculating and certifying the energy performance of buildings. It is the reason for whole-building calculations and for Energy Performance Certificates. It sets requirements for member states to follow, even if it allows them some discretion to specify the details. One of these requirements relates to the way that energy performance is calculated.

Under Article 3, member states must 'apply a methodology for calculating the energy performance of buildings in accordance with the common general framework set out in Annex I.' It provides for the methodology to 'be adopted at national or regional level' – which is just as well because it allows for separate regulations and standards in the four parts of the UK.

Annex I sets out a 'Common general framework for the calculation of energy performance of buildings', which covers heating, cooling, domestic hot water, lighting, insulation, internal loads and air-tightness. It stipulates that member states' methodology should take into account European Standards and 'relevant EU legislation, including [the Renewables Directive]'.

The energy performance directive does not require member states to adopt European Standards, but there is an increasing tendency for the EU to use standards to support the implementation of European legislation. Although member states currently have scope to adopt their own methods, that scope is increasingly constrained by emerging standards.

As well as adopting the EPBD in 2003, the Commission instructed the European Standards body, CEN – of which the British Standards Institution (BSI) is the UK member – to develop a set of standards on the calculation of energy performance. The first instruction was issued in 2004, and the standards were published in 2007-8. In 2010, when the recast EPBD was adopted, CEN was issued with further instructions to revise the original standards. This took the form of a 'standardization mandate for the elaboration and adoption of standards for a methodology calculating the integrated energy performance of buildings and promoting the energy efficiency of buildings, in accordance with the terms set in the recast of the Directive'. Since then, CEN has been busy working on the revised standards, and the first drafts are now out for public enquiry.

MARC BRUXELLE / SHUTTERSTOCK

European standards can creep up on the building services industry

CURRENT DRAFTS FOR PUBLIC ENQUIRY

prEN 16282, Equipment for commercial kitchens: Components for ventilation of commercial kitchens
This standard is in nine parts, dealing with various aspects of kitchen ventilation, as follows:

Part 1: General requirements, including calculation method
Part 2: Kitchen ventilation hoods: design and safety requirements
Part 3: Kitchen ventilation ceilings: design and safety requirements
Part 4: Air inlets and outlets: design and safety requirements
Part 5: Air duct: design and dimensioning
Part 6: Aerosol separators: design and safety requirements
Part 7: Installation and use of fixed fire-suppression systems
Part 8: Installations for treatment of cooking fumes: requirements and testing
Part 9: Capture and containment performance of extraction systems - test methods

See the various parts of EN 16798 in the online version of this article at **cibsejournal.com** or via the app at **cibsejournal.com/app**

This may not seem to be of the most immediate concern to *CIBSE Journal* readers. However, these standards have a habit of creeping up on the industry. Under public procurement law, public purchasers are expected to specify by reference to standards – and, as the BSI has to adopt all European Standards as British Standards, they find their way into public purchasing.

Under the Construction Products Regulation, CE marking against a European Standard or Technical Approval is now mandatory. So for all the talk of standards being voluntary, they are unavoidable for construction products. The mandate for the energy performance standards says clearly that standards 'increase the transparency, accessibility and objectivity of energy-performance assessment in the member states, facilitating the comparison of best practice and supporting the internal market for construction products'. This sets out a clear direction of travel for the EPBD-related standards.

Standards are written by committees, drawn from all of the CEN members, with input from participating standards bodies. They are also open to public enquiry, when anyone is allowed to review the standard and suggest improvements or changes.

Once the comments are collected, the technical committee has to work through them and address each one before producing a final draft. Until recently, that would then go for a formal, and final, vote. But now, if there are no significant technical changes at the enquiry stage, that formal vote may not be required. The public enquiry stage is, therefore, very much a case of 'speak now, or forever hold your peace'.

CIBSE is represented on the BSI committee responsible for these

standards. However, it is neither reasonable nor realistic to expect one volunteer expert to read all the standards, and to anticipate all the potential improvements, and then convey them all to the committee. Public comment is just that, and it is the opportunity for all those who may have an interest to contribute to improving the drafts.

Currently, there are a number of drafts dealing with energy performance of buildings, at various stages of public comment. These are all parts of EN 16798, covering various aspects of ventilation and calculations relating to building performance.

There are also nine parts of EN 16282, dealing with ventilation of commercial kitchens, which are all out for comment, with a closing date in early March [see panel 'Current drafts for public enquiry']. For CIBSE to contribute to the development of these standards, we need contributions from members, too.

This is a chance to influence what goes into the standards. Miss it and the next chance could be a little while coming around.

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

Letters

This month, a reader discusses the causes of operational failure of buildings – and their solutions

Dr Mashford has to repeat Innovate UK's findings, and her article, 'Voluntary DECs can fill the gap' (*CIBSE Journal*, December 2014), gives sensible ideas for getting closer agreement between early estimates and later, measured, display energy certificates – but one can suggest other causes and solutions.

On estimates, the first problem is the lack of a definite brief. This is partly because clients won't decide in detail what they want to do with a building, and partly because – in many commercial cases – there is no way they can predict how it will be used.

The second problem is that the building design and an agreed theoretical use can never be complete when the building is offered to Building Control for approval. Often, the details of the HVAC system – and even its type – simply can't be thoroughly worked through.

The third problem is that the trade does not yet have an agreed energy-use computing program into which accurate building fabric, dimensions, occupancy profiles, use, and building HVAC systems can be fed. Given this program, it would be simple to allow for later, measured occupancy.

It would be best to retain a benchmark approach for the imponderables at the approval stage, and to separate all 'extras' – such as kitchen and on-floor relaxation stations – in the main analysis. The suggested program could then be used to recalculate energy against the actual use. Given adequate benchmarks – and honest input at the approval stage – there should be much closer agreement with later measured performance.

There should be a requirement for much more detailed sub-metering. On a typical office floor, for instance, power for HVAC equipment, lighting and all client uses – such as IT, tea urns, copiers and fax machines – should be measurable separately. Simply monitoring a client's so-called small power convinces many to alter their operational approach.

As always, the devil is in the detail, because engineering is all about detail, no matter how sensible the concepts may be.

John Moss MCIBSE
Consultant, building performance and systems, Arup

CIBSE Journal welcomes readers' letters, opinions, news stories, events listings, and proposals for articles.
Please send all material for possible publication to: editor@cibsejournal.com, or write to Alex Smith, editor, CIBSE Journal, CPL, 275 Newmarket Road, Cambridge, CB5 8JE, UK. We reserve the right to edit all letters.

WHO TO TRUST WITH HOUSING STANDARDS?

As the Code for Sustainable Homes is wound down, **Richard Hodkinson**, managing director at Hodkinson Consultancy, explains what this means for the future of house building in the UK

The Department for Communities and Local Government (DCLG) plans to cap all housing standards and consolidate them within Building Regulations. At the same time, it intends to prevent local authorities from imposing their own standards. As part of this process, the Code for Sustainable Homes is being wound down. Without a robust set of Building Regulations that incorporate up-to-date environmental standards, the performance of housing will be reduced, and there will be no driver for innovation. These changes are being brought forward quickly before replacement standards are ready.

The standards being wound down are not just about energy, but include a wide range of housing issues – for example, sustainable materials, daylighting, overheating, internal air quality, sound insulation, ecology and waste management. There are significant gaps between the current standards and those being proposed. The existing quality agenda is being dismantled, and there is uncertainty about the outcomes that will result. For many of us who have been in the vanguard of improving housing standards, this kind of dismantling – and stepping back from improvements already secured – is very disappointing.

The Code, previously EcoHomes, acted as a pathfinder, assisting performance improvements in firms. Although it has been criticised for constraining innovation, there is little hard evidence. There is strong evidence, however, that it focused product suppliers and designers on improvements beyond Building Regulations. As DCLG failed to update the Code continually, it became outdated and, therefore, less relevant to the innovation aspirations of the industry and its customers.

STEVE MANN / SHUTTERSTOCK

Greater market differentiation may emerge between low-cost, mass-market housing and high-quality homes

We need a vision for the next generation of housing standards. The current debate seems to be about reducing standards rather than creating an innovative, world-leading industry.

Many technical issues for housing impact on each other. For example, overheating, daylight, ventilation and energy efficiency are interrelated. The proposed standards do not jointly deal with these. We need regulatory balance between interconnected issues for optimised design. Without this, designs will become distorted as Building Regulations are prioritised.

Housing could be built at lower cost within a deregulated system. The question is one of quality and providing homes fit for the future, with increasing environmental aspirations for wellbeing and efficient, high-quality living.

It is likely that greater market differentiation will emerge between low-cost, mass-market housing – built only to minimum Building Regulation standards – and housing built by companies concerned with a product that meets customer aspirations. These homes will be to standards in excess of those proposed. There is a real opportunity for some housebuilders to provide premium, high-value homes.

> For many of us who have been in the vanguard of improving housing standards, this kind of dismantling is very disappointing

What will be the process to encourage innovation for a successful industry in the long term? These changes will need to be addressed through robust technical work rather than by lobby-group pressure. Links between industry and academia, to draw on wider research funding, will be crucial.

The Building Regulations Advisory Committee and National House-Building Council will have key roles, and much of the future regulatory outcomes will rest on their shoulders. Professional institutions such as RIBA, RICS, CIBSE and CIOB will need to cooperate if they are going to have a significant input on housing standards.

So, who to trust with housing standards? It seems perverse to stop local authorities applying their local housing standards when the replacement national standards through Building Regulations are not ready, and do not match current achievements. If councils have no power, DCLG seems unprepared, and the updated Building Regulations are not ready, individual professional action is going to be increasingly important.

The future success of housebuilding will largely depend on how well it responds to these changes. Design quality will be less of an assessed process, and innovation less focused. With the loss of alternative frameworks, there will be greater emphasis on specialist technical training to produce high-quality homes. Professional institutions will have a very significant role in – and responsibility for – providing this guidance.

The future housing market will need the professional judgement of specialists in setting the agenda for technical improvement and producing high-quality homes.

● **RICHARD HODKINSON** is managing director at Hodkinson Consultancy

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PANNING FOR GOLD

Research that could improve building performance is being lost to construction for want of a method to disseminate it. **Paddy Conaghan** says professional institutions can help close this knowledge gap

The past 12 months have been an eye-opener for me. I spent much of it reading research papers, as part of the Research Excellence Framework (REF) built environment panel.

As one of the panel's few non-academics, it was a pretty daunting prospect. In total, we looked at 3,900 research outputs – five years' worth – each of which had to be double-read and scored against strict criteria laid down by the Higher Education Funding Council. My share was more than 300 papers, and a further 100 or so other academic submissions.

I started off sceptical and prejudiced, reasoning that research must be largely irrelevant and esoteric because so little of it ever reaches those of us in practice. The reality was totally different, and the experience was transformational.

The range of subjects was immense, even among the papers chosen for me, which amounted to less than 10% of the total. Many were cross-discipline collaborations – and not just between construction professions; they stretched into fields such as medicine, epidemiology, sociology, material science and… well, you name it!

About 60 of the outputs I read would offer novel and important knowledge in practice – for example, key insights on many causes of the 'performance gap', which are not well evidenced or understood outside of academia.

Worryingly, about half of these papers covered urgently-needed knowledge. There was a group that dealt with the effects on city dwellers of inappropriate building forms, urban heat islands, and climate change – and that predicted increasing levels of heat stress and related deaths. Then there was another group of papers that dealt with mitigation measures.

As a reader of *CIBSE Journal*, you'll doubtless be aware of some of these issues from the magazine's far-sighted coverage in 2014. However, not much key academic work was featured. It seems clients and the construction professions may be rolling out urban flats that are destined to become death traps, because we know no better.

The recently published results of the REF built environment panel rated nearly 30% of the outputs as 'world-leading'. A further 40% were of 'international excellence' in terms of their originality, significance and rigour.

This stream of research comes at a cost of about £220m in the five-year REF period, and is largely funded by UK taxpayers. So the country's built-environment research is a huge seam of gold – for which we've already paid – but which we are not mining! Why?

Because there is a difficult-to-bridge gap between the academic and practice communities. Academic papers are not easy reading, and which practice has time to sift through 800 of them every year – even if they knew where to look?

It seems to me that this gap is the natural domain of our professional institutions – and I'm not alone. In 2014, Paul Morrell chaired the Edge Commission on Future Professionalism. A recurrent theme in the inquiry's consultations was whether the institutions discharged the role of learned societies; weak links to research communities were particularly noted.

> The UK's built-environment research is a huge seam of gold – for which we've already paid – but which we are not mining! Why?

The 2014 REF rated 90% of the research carried out by the University of Bath's department of architecture and civil engineering as either 'world-leading' or 'internationally excellent'

I'm not looking to make our institutions whipping boys for a wider dysfunctionality in which we all share some blame. However, if much of the $40m of annual research output is not reaching its prime audience – an industry noted for its poor research record – the loss of this world-leading knowledge is doubly frustrating.

There is a clear incentive for research universities to be involved in dissemination because this would be an 'impact', which is valued when it comes to research funding. However, the construction institutions need to help bridge the gap because they alone can reach 450,000 professionals.

As a practitioner, I know that reproducing raw research papers would be about as welcome as a double Dutch version of Kakfa's *Trial*. However, if the institutions sifted the 800 papers produced each year to identify 50-100 of the most important, then grouped them into, say, 20 themes and reported the key findings as a two-pager – published quarterly as a 'digest' – this would provide five key insights, four times a year. I could deal with that!

These digests could also offer institutions a new annual subscription stream – from firms, rather than from individuals. It's a win-win situation; it satisfies an urgent need for research dissemination, while simultaneously creating a new income opportunity.

● The 2015 CIBSE Technical Symposium, which encourages industry practitioners, researchers and building users to share experiences and develop networks, will be held at University College London on 16 & 17 April. For more details, visit **www.cibse.org/technical-symposium-2015/about**

● **PADDY CONAGHAN** FCIBSE is a consultant with Hoare Lea

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Following the release of the Action on Air Quality report, **Shaun Fitzgerald** discusses the implications of its recommendations for schools, care homes and health clinics

On 8 December 2014 the House of Commons Environmental Audit Committee published its report 'Action on Air Quality', prompting a host of headlines in the UK press.

The report recommended that new schools, care homes and health clinics should be built away from pollution blackspots, and that any redevelopment of such existing buildings should only be approved if it reduces pollution exposure for the users. The report also suggested that schools already sited near pollution hotspots should be fitted with air filtration systems.

However, there are other recommendations that are potentially more powerful. The first states that 'government should, without any further delay, introduce a national framework for Low Emission Zones, with common metrics and a national certification scheme for vehicles meeting particular air quality standards, to facilitate their widespread adoption'. The gravity of this recommendation is worth reflecting on.

Fundamentally, occupants of schools and health clinics typically spend less than a third of their day in these buildings. Therefore, if one considers the overall health impact on an individual, the exposure to pollutants at other times of the day needs to be considered. It is unrealistic to contemplate air filtration systems for all domestic dwellings in a city in the foreseeable future.

Therefore, the first – and arguably the most important – recommendation on the framework for Low Emission Zones – is key to the improvement of health. If it is implemented, then what does that mean for the location of schools, health clinics and care homes? There are other factors worth considering before reaching conclusions and making statements.

We would encourage new schools to be built away from busy roads even with the implementation of Low Emission Zones and new standards on air quality. It would make natural ventilation easier because the immediate outside noise levels would be lower, enabling low-energy, stimulating environments to be accessed by more children. Crucially, it would improve safety near the school.

> Locating a care home in a busy environment might actually be more stimulating for residents than one hidden away in a quiet cul-de-sac

The overall environment for health clinics would also be improved. However, there are aspects of care homes, which warrant further thought. Siting one in a busy environment might actually be more stimulating for residents than one hidden away in a quiet cul-de-sac. I don't necessarily think a care home overlooking a concrete underpass would be ideal, but the bustle of life can be important.

The sad thing about the report is that questions remain about whether the government will actually do anything. This is the third report on air quality in five years. The main recommendations for the government in 2010 and 2011 were not implemented.

This time, the authors are asking ministers to take the situation and their recommendations as seriously as they do. It should not need a European court case to focus government attention on air pollution.

The siting of new care homes needs careful consideration

ANTHONY RICHARDSON / INSAGO / SHUTTERSTOCK

SHAUN FITZGERALD FCIBSE is chief executive of Breathing Buildings

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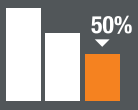

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GIVING BUILDING SERVICES DESIGN THE ATTENTION IT DESERVES

Design management should be focusing more on building services according to **Jackie Portman**, who says there should be a new discipline devoted to the management of MEP design

Historically, design management consists of monitoring drawing, document and schedule completion against a planned release schedule. This approach is crude and superficial, giving an approximate guide to progress without consideration of the design activity itself.

The most serious inadequacy is the inability to predict the impact of any changes. Design alterations are an unavoidable outcome of the ill-defined nature of design problems. These are frequently caused by the client's instruction – for example, a change/clarification of the brief – or by the designer in eliminating an error or improving the design.

Design management issues cannot be resolved by squeezing the design process, achieving the same milestones with less information, or by making autocratic decisions to change design sequences. Non-existent or ineffective design management results in extended timescales and poor quality of information. Any unresolved design issues have to be answered at some point, possibly during installation or, in the worst case, when a building is operational.

Jackie Portman's book on the subject went on sale in July 2014

There have been numerous efforts to place design on a higher intellectual level, and to develop it as a discipline with its own structure, methods and vocabulary.

The methodologies for design management are inherently complex and exacerbated by the highly dynamic nature of the construction industry, the iterative nature of any creative process and the reworking that inevitably must be planned for.

The increasing number of specialisms, coupled with a tendency for participants to work in silos, provides further challenges. Furthermore, design management is increasingly becoming a contractor-led process, which may be a new scenario for some of the parties involved.

Typically the building services installation is worth 30-60% of the

WHY BUILDING SERVICES NEEDS TO BE MANAGED

Building services engineering systems are dynamic
Building services engineering systems have to react both to changes in external conditions and the patterns of behaviour inside a building – all of which are constantly changing.

Occupant subjectivity
Some aspects of the outputs of the building services engineering design are open to end-user scrutiny and personal judgments, which need to be managed as a part of the process.

End-user behaviour
Controlling the performance of building services is not just down to the installed building services engineering equipment and their controls. The design will be based on defined patterns of occupancy, such as: density and duration of people in areas of building; the ratios between men and women and able-bodied and disabled; assumptions about portable equipment – for example, those plugged into electrical sockets or connected to water outlets; and the nature of the finishes, including colour, density, texture and material, to walls, floors and ceiling.

Maintainability
Building services engineering systems are the only active components in an otherwise passive structure. The continual ability of the systems to perform interactively is of vital importance to operational requirements. When a building is put into use, its building services systems have to perform day-in, day-out for the life of a building and hence require ongoing attention. Shortfalls in design will be visible sooner or later.

Sequencing of the design process
Construction should be multidisciplinary but, in reality, the architect and the structural engineers still tend to lead the planning process, with the building services engineering systems expected to fit into their solutions.

Design responsibility
Building services engineers usually produce drawings and a specification to obtain a tender. These should be coordinated with the architectural and structural engineering solutions. Generally, building services engineers do not produce construction or installation drawings. Their deliverables usually state the requirements passed on to subcontractors in terms of design responsibility. In contrast, architects and structural engineers more often produce drawings and specification for contractors and subcontractors.

Energy consumption
Building services systems are a major consumer of energy. The current focus on sustainability and the green agenda means that more attention is being paid to operational efficiency of systems, the selection of materials and the management of end-user expectations.

total value of a contract, but often literature on design management bundles building services up with other disciplines and does not recognise its unique features and idiosyncrasies (see panel below).

Successful design management is about managing the process. This needs leadership, which in turn means excellent interpersonal skills. It's about listening to, responding to, and understanding others, so that problems are more accurately analysed. This means the corrective actions are more likely to remove the difficulty or resolve the problem.

Design management is not the same as project management. Project management focuses on a wider range of administrative skills but is not normally sympathetic to the peculiarities of delivering a fully coordinated functioning design.

It does not take into account the factors that may have an impact on designs such as the changing requirements of clients and external issues.

● **JACKIE PORTMAN** is a design manager

Design life expectancy

Building services engineering plant, equipment and systems are typically designed to function in a building for a lifespan of 20-25 years – at the most. However, in reality, this could be less, as changes in legislation or technological advancements make them obsolete.

This contrasts with structural and civil engineering solutions, which are usually designed for a much longer lifespan. Accordingly, the building services engineering design, at the outset, needs to take into account the likelihood that they will be upgraded or replaced; this includes considering how plant and equipment can be removed from the building, responsibly disposed of, and replaced, while still taking into account the continuing operation of the building during the disruption.

THE TREASURE HUNT

With more than 150 people already on the CIBSE register of Lead Assessors, the uptake of ESOS is gathering pace. **Liza Young** takes a tour of the Marriott Heathrow Hotel to find out what assessors look for during an energy audit

> The first telltale sign of an inefficient plantroom is the heat that often hits you from poorly insulated, exposed piping

In its first month of operation, the Energy Savings Opportunity Scheme (ESOS) is rapidly gaining traction, as more assessors register to become ESOS Lead Assessors.

ESOS requires large organisations to have a detailed audit of their buildings, industrial processes and transport, to find out how they can make energy savings. These audits must be carried out by approved assessors (see panel 'ESOS nuts and bolts'.

CIBSE's register of Lead Assessors has passed the 150 mark, and Professor Andrew Geens, head of CIBSE Certification, expects to see 300 names on the list by April.

'It has grown quite quickly, which addresses one of the concerns of the Department of Energy and Climate Change – that not enough people would get onto the registers to meet the obligations under the regulations,' says Geens.

This is just as well, because there is less than a year to go until eligible organisations must demonstrate compliance with ESOS regulations by having an ESOS report.

Sebastian Gray, director at GEA Consulting, was one of the first CIBSE Lead Assessors. He has yet to carry out an ESOS assessment, but – as a Low Carbon Energy Assessor – has undertaken assessments for Display Energy Certificates (DECs).

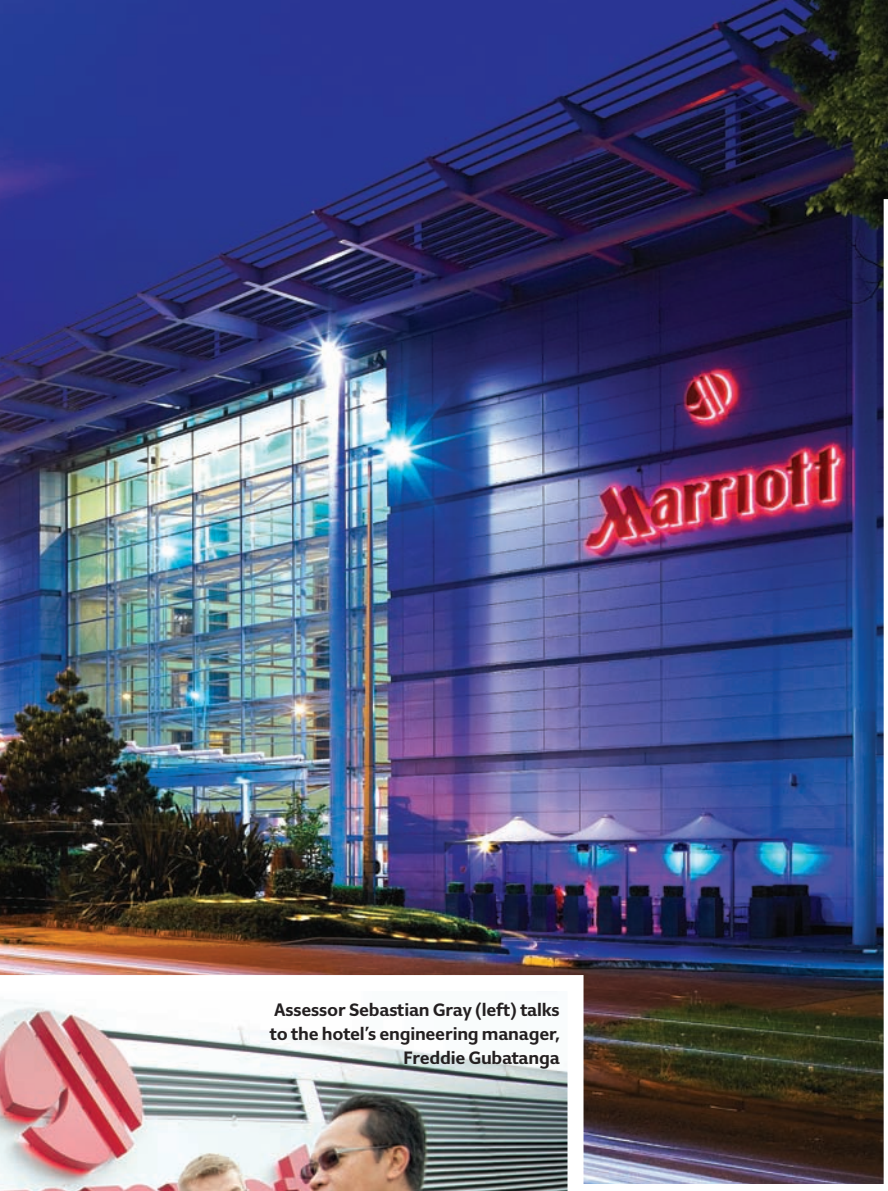
The inspection process is similar; however, the compliance route for an organisation will depend on how many sites it has – the fewer buildings, the more suitable it will be for a DEC assessment – for the building element of their ESOS reporting.

CIBSE Journal recently joined Gray on a DEC assessment at a Marriott Hotel at Heathrow, where he identified energy-saving opportunities that may be found under ESOS.

Geens says it is up to Lead Assessors, such as Gray, to sell ESOS recommendations as

'irresistible opportunities' for the company director, who – under the requirements of the regulations – has to sign off the report. 'ESOS is mandatory, but whether companies act on the report will be down to the skill of the Lead Assessors in making a good enough case – not just in identifying opportunities, but also in signposting how it can actually be achieved and funded,' he adds.

Gray agrees. 'Everyone continues showing everything in carbon, but a director looking at the bottom line wants to know how much it's going to cost, and the return on his investment,' he says.



Assessor Sebastian Gray (left) talks to the hotel's engineering manager, Freddie Gubatanga

The heat is on

'Before I step into a plantroom, I brace myself,' says Gray. The first telltale sign of an inefficient plantroom is the heat that often hits you from poorly insulated, exposed piping, and Gray estimates that, every year, £100 is wasted for every 10 metres of bare pipe. Hot valves can also set off alarm bells, he adds, but this can easily be solved with valve bags or end caps.

Gray checks the condition of the boilers and hot-water systems at the London Heathrow Marriott, looking for signs of poor upkeep, rusting or leaking.

Important pieces of kit to upgrade are variable speed drives on water pumps, he says. These are easy to install and – with a payback period of three to six months – are a quick win, instantly saving both energy and money.

Kitchen devils

When it comes to energy consumption, the biggest shock for most people is seeing the figures for kitchens, says Gray. The worst-performing ones are often found in schools, restaurants and hotels.

'I always ask the chef if they have a deep-fat fryer, and what time they turn it on. Almost always, the answer is: "When the chef comes in, at five or six in the morning",' says Gray. 'It takes 50 minutes to heat up a deep fat fryer, so if they're not serving until lunchtime, that's a huge waste.'

Gray's eye for detail is apparent when he spots a gas hob on, but not being used, in one of the Marriott's kitchens. 'I can stand here all day to see how long it takes before the hob is used. All I can see now is money going down the drain.'

Staff engagement is a useful tool for dealing with situations like this, says Gray.

THE NUTS AND BOLTS OF ESOS

ESOS is a mandatory energy-assessment scheme for UK companies with 250 employees, or a turnover of more than €50m, or an annual balance sheet total of €43m.

The scheme was established by the government to implement Article 8 (4-6) of the EU Energy Efficiency Directive, which applies to businesses and not-for-profit organisations.

Eligible organisations must carry out audits of the energy used by their buildings, industrial processes and transportation.

They must make sure that at least 90% of total energy consumption is subject to either an ESOS-compliant energy audit, a DEC, a Green Deal Assessment, a certified ISO150001 energy-management system, or a mix of all four.

Businesses must notify the Environment Agency that they have undertaken an ESOS assessment by 5 December 2015, and then do one every four years.

An unused gas hob left on is 'money down the drain'

Director of engineering Jim Shields, with Gubatanga

The hotel could prevent solar gain by installing reflective coating on front-entrance windows

He advises devising a kitchen energy plan, to identify frequently used equipment, and putting up a building energy cost indicator (BECI) chart, which shows how much can be saved by switching off appliances.

Another thing to be considered is the fitting of sub-meters to monitor energy consumption and tackle wasted energy more effectively.

'A lot of the things we recommend are quite cheap and easy to implement, but they are impactful,' says Gray. 'Knowing that the water tap costs £6.50 an hour to run makes staff more inclined to turn it off.'

Public areas

Bathroom lights at the Marriott are fitted with movement sensors, but Gray suggests more savings could be achieved by the hotel fitting percussion or infrared taps, to reduce water use. He also advises replacing paper towels with efficient hand dryers.

At the hotel's swimming pool, the biggest issue to look out for is thermal stratification. This natural process can result in dramatic differences in temperature from floor to ceiling, and from wall to wall.

Gray says the telltale signs of poor pool ventilation and humidity control are damp, peeling paintwork, rust, and mouldy pool covers. He also checks whether heat recovery is fitted to pool water and pool-water heating.

Gray checks for hot valves in the CHP plantroom

CIBSE's key role in approving ESOS Lead Assessors

Lead Assessors are already reporting a high level of activity around the Energy Savings Opportunity Scheme (ESOS), according to Professor Andrew Geens, with many companies getting in contact to scope out what they need to do, and the costs involved.

Head of CIBSE Certification Geens says the institution is well on the way to having the biggest register of Lead Assessors.

The list of qualified and approved people has passed the 150 mark, and a further 100 have already undertaken CIBSE's ESOS Lead Assessor training. By April, Geens expects there to be 300 on the register.

Between CIBSE and the Energy Institute – plus the other professional bodies that are supporting ESOS – Geens expects that the number of Lead Assessors needed for UK companies to meet their regulatory obligations will be achieved.

'I am very pleased by the response so far,' he says. 'It has been encouraging people – who have been waiting to see how the scheme develops – to look at those already committed and get involved.'

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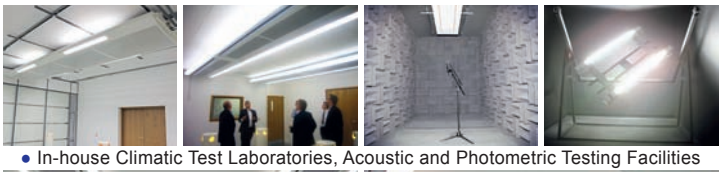

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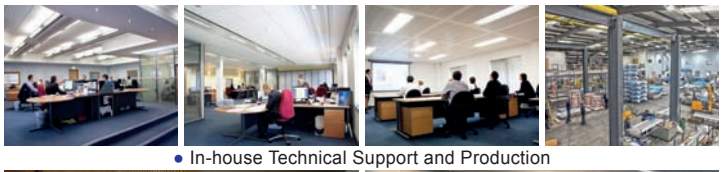

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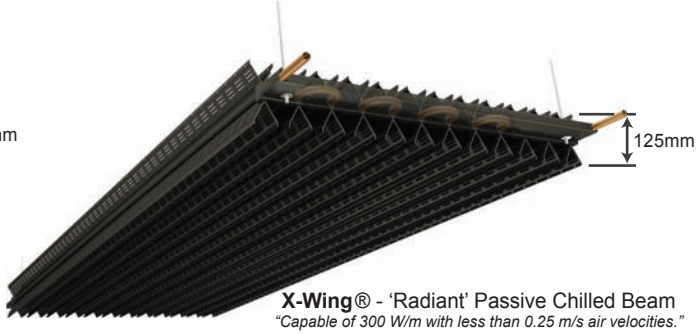

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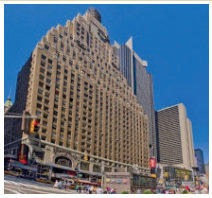

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Gaps in gym doors can affect HVAC systems

> People think audits are quite scary – but I'm not here to scare you; I'm here to show you where you can save money

Remembering the small things

As he walks through the building, Gray – from time to time – slides his clipboard into gaps between doors. 'If you can see through the crack between the doors, then air can pass through it,' he says.

Door seals, especially in heavily air-conditioned areas – such as a gym or swimming pool – could make a huge difference to the effectiveness of a building's HVAC system.

Gray says energy and cost savings can be found in the simplest things, such as turning off unused computer monitors, or switching a vending machine's lights to LEDs.

'We had fluorescent tubes plugged in, which were heating the things we were paying to keep cool. It's just common sense,' adds London Heathrow Marriott engineering manager, Freddie Gubatanga.

On a larger scale, Gray recommends that the hotel puts reflective coating on its front-entrance windows, to prevent solar gain, and continue with plans to install solar panels and mini wind turbines on the roof.

Get involved

Gray says ESOS is a more advanced version of DEC because it provides a more in-depth energy assessment, with recommendations. He adds: 'People think audits are quite scary – but I'm not here to scare you; I'm here to show you where you can save money.'

Gray believes the scheme has 'plugged the gap in the private sector' by allowing assessors to tell private companies to sort out their energy. ESOS is clearly gathering pace in the UK. **CJ**

- To find a CIBSE ESOS Lead Assessor, or if you are interested in becoming one, visit **www.cibseenergycentre.co.uk/esos**

The client perspective

After inspecting downlights – which are soon to be replaced with LEDs – Freddie Gubatanga, engineering manager at the London Heathrow Marriott, abseils down the hotel's lobby wall to join Gray for a DEC audit.

A hands-on man, Gubatanga is always looking for ways of cutting carbon at the building, and has already overseen the installation of LEDs throughout the seven floors of the 22,000ft^2 hotel.

However, he says it is often the little things that make a big difference; for example, using old kitchen cooking oil to fuel incinerators saves the hotel £4,000 a year, while an on-site 600W wind turbine powers the LEDs in a rooftop Marriott logo, which is estimated to save 12 tonnes of carbon dioxide emissions per year.

The rooftop greenhouse – which provides the hotel's three kitchens with fresh herbs and vegetables, all year round – is heated by the same hybrid wind turbine/solar PV system, and more PVs are used to power the parking meters. The hotel also has two electric-car charging points.

Gubatanga says sustainability has become a great way of bringing staff together and engaging with the local community. The hotel's green committee – which includes everyone from the general manager to human resources – helps to uphold Marriott's 'green culture'. The involvement of managers means the message filters down through the organisation.

Creating a greener, more sustainable environment is part of Gubatanga's daily, weekly and monthly routine, but the true driver is seeing financial savings. 'You need to challenge the director of finance and show how much can be saved on the energy bill,' he says. So it's important to present the results from a financial perspective, making sure all requested investments can be backed up.

Marriott's director of engineering, Jim Shields, says: 'In terms of kilowatt hours, the CHP uses more gas than it provides in electricity created. But if you convert its return on investment with the heat recovery you get, it would pay for itself in three years. That's a payback of £123,000 per year.'

Shields builds occupancy information into the budget to show how savings are achieved, based on energy use at different times of the year.

Gray and Gubatanga inspect the hotel's PVs

An electric-car charging point at the Marriott

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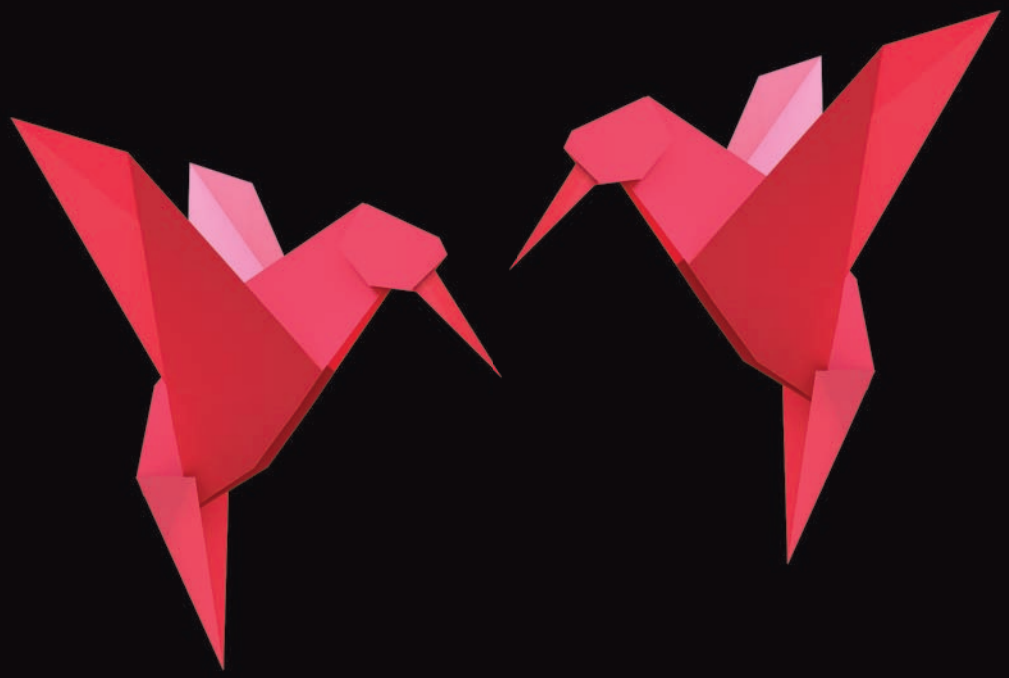

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THE FACTS OF LIFE

A new tool will enable software designers to embed Life Cycle Assessments data and costs in a BIM model. **Andrew Cooper** and **Daniel Doran** report on how Impact could help save money and cut embodied carbon

> Embodied carbon from the production and transport of construction materials is all upfront, contributing towards global warming before the building is opened

The need for more housing and commercial space will make it very difficult for the UK to reduce its carbon emissions in line with targets under the Climate Change Act 2008. This is partly because government and the building sector has largely ignored the issue of embodied carbon.

The reasons for this were put eloquently by Guy Battle, of the Sustainable Business Partnership, in the August 2014 edition of *CIBSE Journal*. He pointed out the difficulties of measuring embodied carbon and obtaining transparent, comparable data. However, 10% of all UK emissions are associated with the manufacture and transport of construction materials.

To appreciate how significant this figure is, it is worth considering that the operation of all UK buildings currently accounts for around 40% of emissions. The construction of new homes in 2013 made up 0.5% of total housing stock, while new commercial buildings amounted to about 1% over the same period. That means, at a growth or replacement rate of only about 1.5%, new buildings and refurbishments are already accounting for 10% of all emissions. Governments of all colours are committed to increase the rate of building, so this figure is likely to grow.

This 'imbalance' occurs because embodied carbon from the production and transport of construction materials is all upfront, contributing towards global warming even before the building is opened.

To help reduce energy consumption and emissions, and improve energy security, the government has, among other things, introduced the Energy Act 2011 and minimum energy performance standards (MEPS), which are due to come into force by 2018.

Research by CO_2 Estates suggests that industry will need to spend £29bn on energy-conservation measures to meet these new standards, resulting in a saving of almost 18m tonnes of CO_2 per year from the operation of buildings. However, by the time we factor in increases in emissions as a result of embodied carbon, we do not know what the impact of this spending will be in terms of the net gain or reduction of emissions, and over what period.

These emissions from increased construction are contributing to climate change right away, whereas operational emissions are released gradually, over the life of the building. The climate-change effect of upfront emissions will be worse than gradual ones, even if the total is the same.

Consider the urgency involved in reducing greenhouse gas emissions. Put that alongside the rate of building globally, as the world's population increases, and as the economic fortunes of developing countries improve. It is simply not possible to ignore the issue of embodied carbon and achieve wider emission-reduction targets.

Some might say the writing is on the wall, and that we need to undertake routinely a life cycle assessment (LCA) before any construction or major refurbishment. If that

EUROPEAN STANDARDS

The European Standards body, CEN, has produced a number of standards addressing sustainability of buildings and life cycle assessment, through Technical Committee 350. See http://bit.ly/1JsejBh for further background, and http://bit.ly/1CJcspn for an overview of the standards.

HELP FROM CIBSE

CIBSE has recently published *TM56 Resource efficiency of building services*, which looks at the issue of embodied energy in buildings, and summarises the tools currently available.

is the case, engineers of all disciplines will need to consider the environmental impact of materials as part of the procurement process.

This is why CIBSE and WRAP collaborated on *TM56 Resource Efficiency of Building Service*, which was launched in December 2014. This explores the impacts of building services in terms of manufacturing, construction, maintenance and disposing of the equipment at end of life

There are already tools and data sets available to do LCAs. This work is often part of a wider benchmarking exercise, such as obtaining credits for BREEAM or LEED. It is generally undertaken by niche consultants and academia, and, as a result, the fees can be high. Simple economics dictates that – if fees are high and the assessments are not mandatory – developers will not do an LCA where more cost-effective options are available. However, a new tool has been developed to make these measurements more affordable.

PVC pipes and straw differ in their embodied energy

MILA ZED / SHUTTERSTOCK

Enter Impact

Impact has been developed as part of a three-year project, funded by the Technology Strategy Board (TSB) and involving BRE and Willmott Dixon methodologies, IES software and AEC3.

It is a specification and database for software developers to incorporate into their tools, to enable consistent LCA and Life Cycle Costing (LCC). Open to all suitable software developers, Impact allows users to attribute environmental and cost information to drawn or scheduled items in a Building Information Model (BIM). Put simply, it takes quantity information from the BIM and multiplies this by environmental impact and/or cost 'rates', to produce an overall impact and cost for the whole – or selected part – of a design.

The aim is to integrate LCA, LCC and BIM. By making Impact – and, in particular, the BRE database on environmental impacts – more widely available, the reasons for not having an LCA measurement, as highlighted by Battle, are likely to be removed or reduced.

The use of Impact should reduce the cost of assessments, and encourage its take-up; BRE is offering additional BREEAM credits – under the Material 1 scoring – where Impact has been used. An initial review suggests that the tool will also satisfy the current whole-building LCA requirements of LEED.

The LCA of building services

It is widely accepted that building services are an important source of embodied impacts from construction. To understand the overall life-cycle consequences of a building, it is important to include building services when carrying out an LCA. For example, if a project team opts for natural ventilation and minimising artificial lighting, this will typically require a narrower floor plate.

This, in turn, will often affect the ratio of floor space to envelope, potentially resulting in more materials being used in the construction of external walls and other parts of the building fabric. This will, typically, result in higher embodied impacts.

However, the increase may be offset by the reduction in embodied impacts from building services – achieved through the significantly fewer components specified in naturally ventilated buildings, not to mention reductions in operational energy. As such, a net benefit can be demonstrated for the building. Unfortunately, if building services are not included in the LCA, the potential net benefit cannot be demonstrated, and the natural ventilation-based design may appear worse.

To carry out a building LCA, background data – known as environmental product declarations (EPD) – are required for each of the products/systems specified. To make informed comparisons, EPD are required not only for the products/systems specified, but also for any alternatives considered during the design process.

This implies that a comprehensive resource of comparable EPD for all products/systems typically specified is required. Moreover, the resource needs to be in a format that is useful to building designers. In the UK, this has existed for some time for building fabric, in the shape of BRE's Green Guide – and, more recently, Impact tools – but none exists for building services.

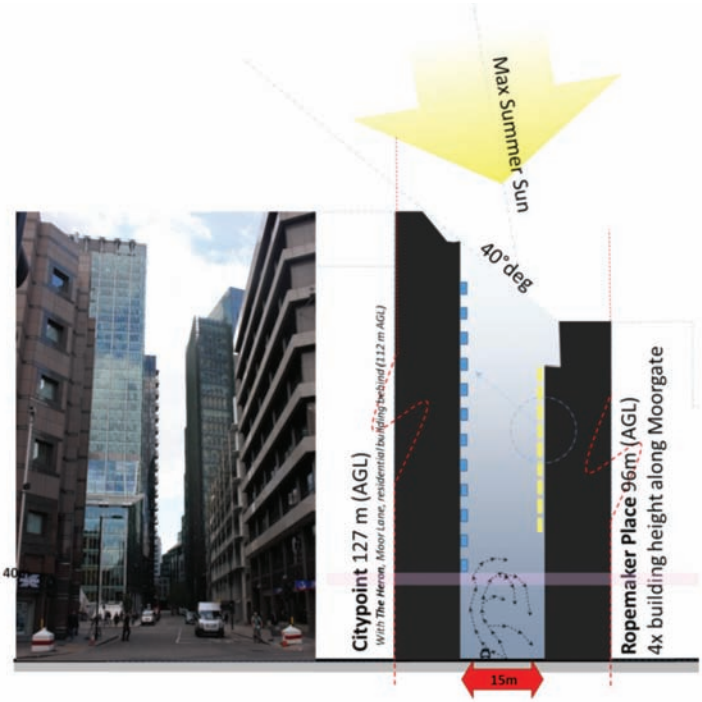
Unfortunately, this lack of data may lead some building LCAs to rely on assumptions about the constituent materials within the various components/systems. Results derived from this kind of approach are likely to be subject to a high degree of uncertainty.

Many components – for example, fan coil units, chillers, boilers, valves, AHUs, luminaires, comms and fire devices – are complex, and highly engineered from a wide range of substances using intensive techniques. They are also sourced from a complex international supply chain. Without intimate production knowledge, it is very difficult to make estimates with an acceptable level of certainty. As such, results derived from these methods should be used with caution.

Poor-quality data will still yield results – the consequences of which may not be apparent to those who are not expert in LCA – and this could delay the realisation, by the industry, of the need for good-quality data. Until a robust source of building services LCA data/EPD is available, BRE believes it is preferable to exclude services from building LCAs.

To resolve this issue, BRE is open to partnering with manufacturers and designers to produce a data set – and it hopes this can be realised in the near future. **CJ**

● **ANDREW COOPER** is an independent property and energy consultant
● **DANIEL DORAN** is a senior consultant at BRE, leading for the Impact project



Limited sunlight penetrates the canyon of buildings on Chiswell Street

Walking AMONG GIANTS

London's tall buildings are often designed in isolation, with no thought of how they will affect the surrounding environment. **Julie Futcher** and **Gerald Mills** have devised a walk that explains the impact on the city's climate

Our walk takes us through a part of London being transformed by the addition of very tall buildings to a familiar, urban landscape consisting mainly of buildings of 24m or less.

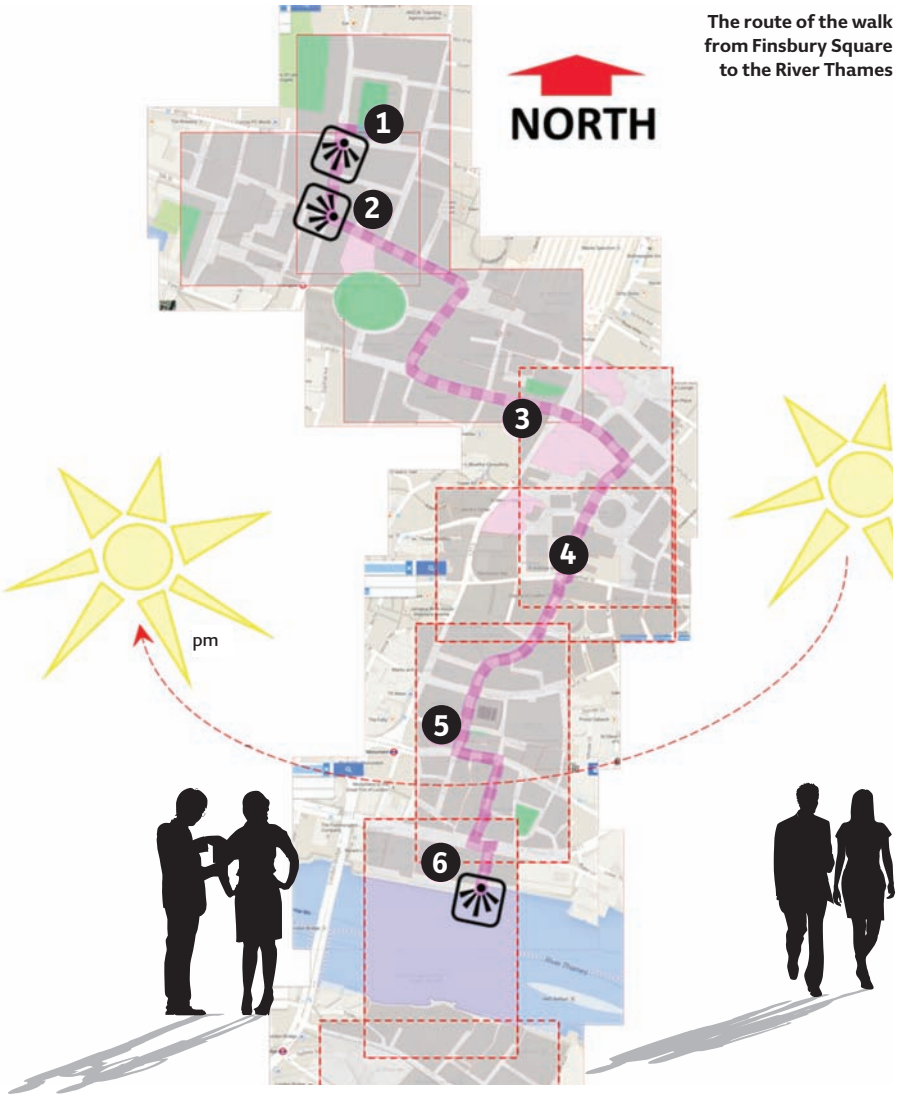
While these new buildings in the City of London have energy management systems that are 'state of the art' – and are often treated as exemplars of modern design – there is a debate going on about how these constructions fare when in situ; that is, when surrounded by other buildings.

There appears to have been little consideration of the impact of these buildings, either on neighbouring structures or on the outdoor climate.

Our field trip takes a path from Finsbury Square, through the 'eastern cluster' of tall buildings, to the bank of the Thames. Walking this route exposes the pedestrian to a great range of microclimates created by the built landscape. Along the way, we observe the impacts of the changing landscape and speculate how the existing – and planned – buildings affect each other.

At the outset, it is worth reminding ourselves of a few controls on the climate at the Earth's surface, and how decisions on built form and function can affect these. First, the intensity of solar radiation is controlled mainly by the altitude of the sun, which is a function of time and latitude. London lies at 51.5°N; New York, by comparison, lies at 40.7°N.

The effect of a building is to redistribute the available solar energy by intercepting the beam and generating a shadow at the



The route of the walk from Finsbury Square to the River Thames

rear. In cities, buildings vie for this resource, and create complex shadow (and reflection) patterns that shade – and may illuminate – open spaces and other buildings

Second, airflow near the surface of the Earth is greatly disturbed by the presence of buildings; in general, airflow near the ground is slowed in cities, but it is also more turbulent. A pedestrian will experience lulls and gusts, depending on the ambient wind velocity and on the dimensions and juxtaposition of building clusters.

Third, the fabric and structure of a city affects the heating of the near-surface air. Urban surfaces are generally dry, with little vegetation, so available energy is used to warm the overlying air, rather than to add moisture. Moreover, the urban surface is faceted, and each facet 'sees' only a portion of the sky; as a result, the city surface exchanges energy with itself and retains heat better than if it were flat (this is a major reason for the urban 'heat island' effect).

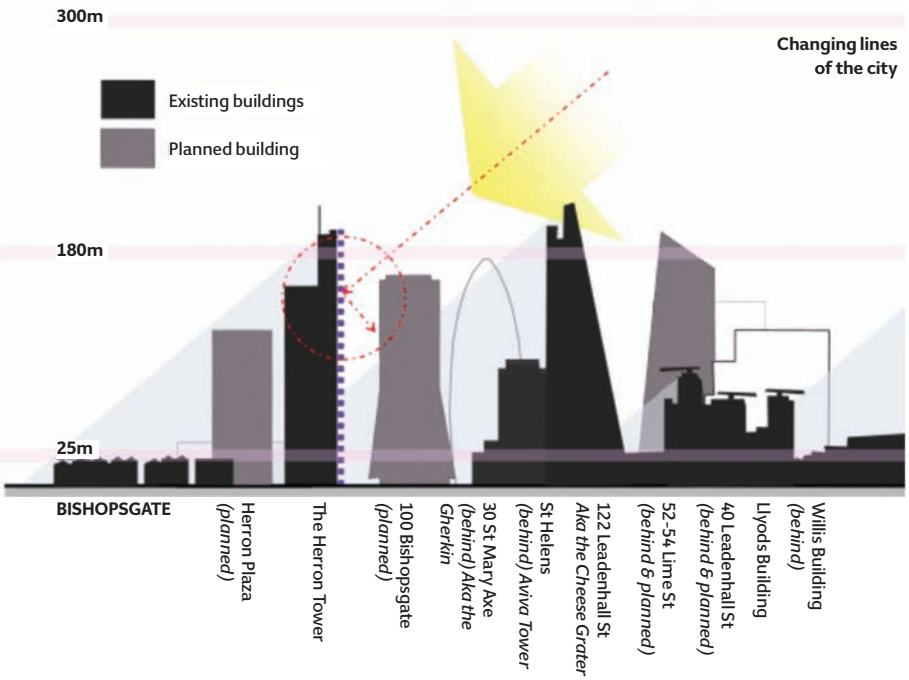
Finally, humans add heat and moisture – plus a host of air pollutants – to the urban atmosphere, mainly via buildings' heating/cooling systems, and vehicles. As a result, urban areas have distinct climates, different in nearly every respect from that observed at standard weather stations – such as those at Heathrow Airport.

1 **Finsbury Square.** The first stop is an open, green square, just on the border between the borough of Islington and the City of London. The width of the square is about 120m, and the surrounding buildings are all approximately the same height (25-30m), and are continuous along the length of the roads on each side.

The square's dimensions allow it an expansive view of the sky – so it receives sunlight for much of the day – but provides little shelter from the wind. Much of the central square is covered with grass, which moderates the surface temperature. In addition, there are trees to offer shade, and to screen the area from traffic noise and pollutants. We would expect this square to warm and cool more quickly than other, more densely built, parts of the city.

We walk south toward Moorgate, via a typical city street – terraced buildings of uniform height, separated by a street about as wide as the buildings are tall – an urban canyon. There is no vegetation along its length, and a great deal of pedestrian and vehicular traffic uses this route.

The north-south orientation of the street, and its dimensions, mean that it is almost always in shadow, except around noon. All the buildings here have a commercial function, and are occupied during the daytime. The offices on the west side get morning sun and are warmed, while those on the east side are in shadow during the morning – and vice versa in the afternoon. This street offers some shelter from the



> One should note the glass canopy that extends from the façade of the Cheesegrater, and shelters the ground from fast-moving air streaming down its face

SEE FOR YOURSELF

The authors will be organising a walk through the City at 1pm on Saturday 21st February. Email julie@climate22.com for details

Julie Futcher is an architect at Urban Generation and Gerald Mills is an urban climatologist and lecturer at University College Dublin

prevailing westerly winds, which also means that the pollutants from vehicles can accumulate near breathing level.

We proceed eastwards, to South Place.

2 South Place, looking towards Ropemaker Place

Looking west along Chiswell Street, the urban landscape has changed significantly; very tall buildings, many clad in glass, form a narrow canyon.

At ground level, there is little solar access as the buildings on the south side shade the façade of those on the north side for much of the year. You can make out the balconies of an apartment block on the south-side façade that will rarely experience direct sunlight because of its aspect; one wonders if these balconies are much used.

This building acts as a shading device for the glass-walled office across the street. Is there a case for the position of these building types to be reversed, so that the offices get the shade needed and the apartments receive sunshine?

We turn left down Bloomfield Street towards London Wall. You may feel a sharp increase in wind as the prevailing westerly airflow is channelled along this thoroughfare. The buildings on this street are lower, and many are of pre-1960s construction; the differences may be best illustrated by the windows, which can be opened, allowing for natural ventilation, but also potentially introducing outside noise and polluted air.

This street curves southwards toward Bishopsgate, and the cluster of tall buildings that are redefining the urban landscape of the City of London.

100 Bishopsgate will soon shade Heron Tower's PVs

3 The Heron tower

At the corner of Wormwood Street and Bishopsgate, we have a good view of the Heron Tower, which is remarkable only for its size, standing more than 180m tall. On its south façade, embedded in its glass wall, are photovoltaic cells that allow it to gather nearly 2.5% of its energy via on-site renewables. However, there is no right to solar energy, and the building planned for 100 Bishopsgate will shade this energy-generating façade, instantly neutralising a

significant part of its 'green' credentials.

The route continues south along Wormwood Street, then right into St Mary Axe, which brings us past Norman Foster's building – 30 St Mary Axe (the 'Gherkin'), with its unusual, aerodynamic shape. Its tapered form ensures that, despite its height, the view of the sky vault at ground level is relatively expansive. On the few occasions when rain falls on calm days, the shape of the building creates a halo effect on the ground, as the slight bulge in its envelope shelters the surrounding ground.

4 The corner of St Mary Axe and Leadenhall Street

This is the heart of the eastern cluster, with an assortment of very tall buildings, including two of Richard Rogers' designs – the Leadenhall Building (the 'Cheesegrater'– Rogers Stirk Harbour + Partners) and the Lloyd's Building (the 'inside-out building').

The juxtaposition of tall buildings here creates a great variety of conditions on the ground, depending on the direction of the wind and the position of the sun. In some places, the wind is squeezed between buildings, creating a Venturi effect and unpleasant gusty conditions at the ground. One should note the glass canopy that extends from the façade of the Cheesegrater, and shelters the ground from fast-moving air streaming down its face.

There is a small square at the intersection here, which has seating, but one wonders how much it is used because it offers little protection from the elements. A new tower planned for this area (52-54 Lime Street), will change the climate dynamics of this area yet again.

The route continues onto Fenchurch Street, which takes us to another recent addition to the tall buildings of London.

5 Philpot Lane

At 20 Fenchurch Street is a remarkable building by Rafael Viñoly; clad in glass, its floorspace increases with height – to maximise the value of office space – thereby creating its distinctive shape and moniker, the 'Walkie-Talkie'. Atop its 37 storeys is a restaurant and garden that are open to the public.

To ensure its completion, the City of London became a partner to acquire the 'right to light' of affected buildings. However, it was not its shading effects that gained international attention – quite the reverse; during a sunny September 2013, the solar beam on the curved, south-facing façade was concentrated and reflected downward, onto the pavement and buildings of adjacent Eastcheap. The intensity of the solar energy was sufficient to melt parts of a Jaguar car, to singe carpet in a barber's shop and even to cook eggs.

Some have blamed global warming for the event, but the cause was immutable solar geometry and a lacuna in design thinking; along with the Heron Building, it demonstrates the relationship between buildings in an urban setting. It has taken a major investment to fix the problem.

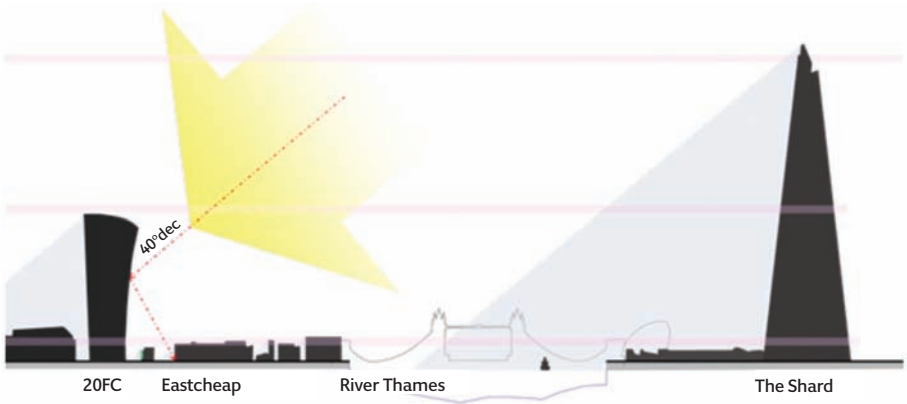
We continue along Eastcheap, turning onto St Mary's Lane, crossing over Lower Thames street, and down to the Thames, shown in a north to south cross-section of the Thames – extending from 20 Fenchurch Street to The Shard – below. The arrow depicts the altitude angle of the sun at noon, at the time of the summer equinox.

Wind speeds increase in gaps between buildings

6 Overlooking the Thames and The Shard

The final stop is on the Thames embankment. On the far side of the river, the 300m-tall, glass-sheathed Shard rises impressively above the surrounding landscape. Its shape belies its immensity; its shadow at noon will extend more than 350m for half of the year.

Further east along the Embankment, you can see the Strata building to the South. It has three turbines at roof level, which can access the much-faster winds that gust above the rooftops of buildings. If the heights of the surrounding buildings increase, of course, this renewable resource will become diminished. In any case, since its completion, the blades have barely turned! **CJ**



How the curved facade of 20 Fenchurch Street reflects solar beam, and the Shard's long shadow

A shining EXAMPLE

Jill Entwistle talks to Hugh Ogus MBE, who – last year – became only the ninth lighter to be awarded a CIBSE Gold Medal

> You're in this world and you may not change it, but you can help make it better for other people. It's about doing something for society – otherwise there is no society

To be a little reductive, there are two sorts of people who achieve gongs and long strings of post-nominals: those who pursue status for its own sake, and those who gain them almost by default, their main driver being a belief in service.

Hugh Ogus – recipient, in 2014, of a rare CIBSE Gold Medal, the institution's highest honour – is, without doubt, in the second category. 'I've found that, if you go to meetings – and take part and speak up – you end up as chairman,' he says, with typical self-deprecation. 'But if I get involved with something, I give it my attention, or there's no point in being there.

'If there's a job to be done, I'm probably the one that will volunteer to do it. I think it's something in the blood. You're here in this world and you may not change it, but you can help make it better for other people. It's part of my core belief. It's about doing something for the society you live in – otherwise there is no society.'

A former vice-president of CIBSE, and an ex-chairman of the Lighting Division – now the Society of Light and Lighting (SLL) – Ogus was awarded the gold medal for 'exceptional services to the institution'. It is only the 30th to be presented since 1912 – and only the ninth to be awarded to a lighter.

To complete an honours hat-trick last year, Ogus was also made an Honorary Fellow of the SLL, and given an Honorary Fellowship of the City and Guilds of London Institute.

So how do you start out as a graduate in French and end up – in addition to the above – as an MBE, CEng and with the right to drive sheep over London Bridge?

Ogus actually wanted to study physics, his best subject, but was dissuaded from doing so by a somewhat myopic physics teacher – who was also the careers master – in 1949. 'I was avidly reading up on everything I could about all these fantastic developments arising out of the invention of the transistor,' recalls Ogus. 'I told him I wanted to be an electronics engineer; he said he didn't think there was much future in that.'

So, French it was, and then – via a graduate recruitment programme – to Philips, where 'personnel' was staggered to discover at the interview that Ogus could not only read a drawing, but also a circuit diagram. 'Could he start the following Monday?' they asked.

He worked there for 10 years, progressing from what was then the lighting fittings department to running his own department making specials, before moving to fluorescent lamps. Curious and eager to learn, Ogus found Philips an ideal workplace.

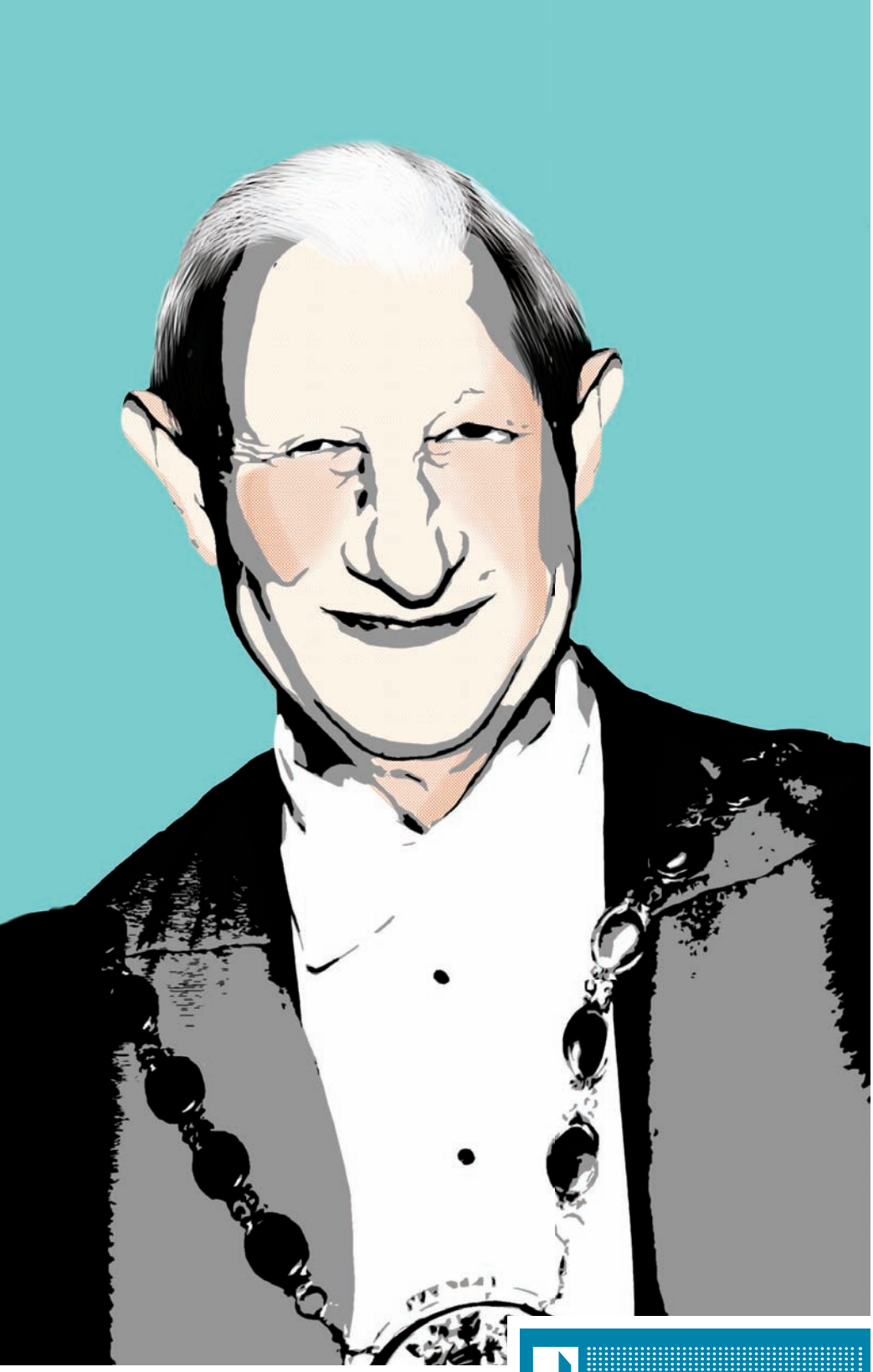
'It was very personal, and there were lots of opportunities for getting involved and finding things out,' he says. 'I was able to go to Eindhoven and see developments. It was when triphosphors were just beginning to come through. It was a fascinating time.'

After five years at a company called Salamandre – a cable-trunking specialist that also made the shells for batten fittings for lighting companies – Ogus moved to electrical company Poselco in 1973. He was managing director there until 1987 and then became chairman, remaining with the firm until 2000.

This brisk run-through of Ogus's commercial career only accounts for part of his considerable achievements. If one were to look for a theme, it would be education; perhaps not entirely coincidentally, his mother and wife were both teachers.

Outside of lighting, he has made a considerable contribution to a cause close to his heart – the Mary Hare School in Newbury – which caters for children with profound or severe hearing loss using an auditory-oral method. Ogus became a governor in 1970, as a result of his association with Poselco's then owner, George Mansell, who had a profoundly deaf son, and who was instrumental in establishing the school on its current Berkshire site.

Ogus was chairman of the charity for 16 years and became its vice-president in 2008. There is now a primary, as well as secondary



school, and Ogus's work for the charity was a significant factor in his being awarded an MBE in 2012. The other reason for his inclusion in that year's Queen's Birthday Honours was his work with the Lighting Education Trust (LET).

While at Philips, Ogus – like many employed in lighting – had done a City & Guilds (C&G) course at Borough Polytechnic, which subsequently became London South Bank University. However, the C&G courses began to disappear some years later, as companies became increasingly reluctant to release staff for a day a week.

CAREER TIMELINE

Education:
Queen Mary University of London – BA (Hons)

Career:
2000-10: DSG Asia/Galaxy Consultancy (Hong Kong) – non-executive director
1994-96: CIBSE – vice-president
1993-94: Lighting division (now SLL) – chair
1973-2000: Poselco Lighting – managing director; chairman from 1987
1968-73: Salamandre Metal Works – commercial director
1957-67: Philips (Lighting Division) - various progressive junior management positions

This was a worry for the Lighting Industry Federation (LIF), now the Lighting Industry Association. 'At that stage, I was on the LIF council, and it was quite concerned about the demise of basic education and initial training in lighting,' says Ogus.

Eventually, the LIF set up its own certificate course. 'I took over as chair of education, working closely with former South Bank lecturer David Pritchard, and then with training director John Frost, to get the course up and running – and, subsequently, to establish the Advanced Certificate. That was my first experience of lighting education.'

Crisis management

The next potential crisis in lighting education was a threat to the future of the MSc Light and Lighting course at The Bartlett, University College London. Philips, the sole sponsor, was pulling out and David Loe – who had established the course in 1987 and remained as director – was moving on.

The origin of the LET, which was to come to the rescue, lies in a chance meeting, on a train, between Ogus and Kevin Mansfield – now the course director – who brought the problem to his attention.

At the next LIF council meeting – after a plea by David Rowden, then managing director of Holophane – pledges were made by many companies to provide a modest sum, initially over a five-year period, as industry support. The LIF council and director Ernest Magog thought the project should be administered as a charity through the professional institutions.

'All eyes fell on me,' says Ogus, 'as I had held the council's chair of education for many years, and was CIBSE vice-president and recent Lighting Division chairman, during which time I had signed a memorandum of understanding with the Institution of Public Lighting Engineers [now the Institution of Lighting Professionals (ILP)].'

CIBSE and the ILE became joint trustees of the project, and Ogus became the third trustee because the Charity Commission insists on a 'natural person'. 'I wasn't looking for a job,' he says, 'as I was just completing a year as Master Lightmonger, and thought I ought to devote some time to my ailing business. I was persuaded that I would just be overseeing an annual grant.

'I found enthusiastic support from the CIBSE council and its president, David

Hugh Ogus (centre) receives his gold medal from CIBSE President Peter Kinsella FCIBSE (right) and Kevin Kelly FCIBSE

> We always had the idea that a first degree in architectural lighting would be important. This move only to employ graduates is becoming the case with all consultancies

Lush, and the ILE council and its president, Mike Simpson, as well as practical backing from Andrew Ramsay, CIBSE secretary, who registered the charity.'

Inevitably, the role turned out to be rather more than simply overseeing an annual grant. The LET could have just quietly carried on, ensuring the future of the MSc course, but it was clear that lighting design was flourishing as a profession and that there was a paucity of educational provision.

'I had a couple of very good people working with me,' says Ogus. 'David Rowden has always been very encouraging, and so was Vic Neale, formerly of Philips and a very inspirational teacher. He felt that the LIF certificate only went so far and that more needed to be done.'

Discussions with South Bank University led to the launch, in May 2000, of the LET Diploma, a distance-learning course – currently taught by Barrie Wilde – that has proved attractive to designers and architects. 'It is ideal for those who want to get more involved in lighting,' says Ogus. 'They find that it's the only thing on offer to them where they can get a detailed understanding. A growing number of people from overseas say there's nothing like it in their country.'

The idea of making it a first degree – the key qualification that architectural lighting still lacks – was considered, but it was decided that the profession hadn't matured sufficiently to make that viable.

'It wasn't what we wanted,' says Ogus. 'It was people either within – or coming into – the industry that needed to do the course, rather than undergraduates. There wasn't enough knowledge or awareness in schools for people to choose it as a career.'

Five years ago, however, the situation changed when – at a lighting teachers meeting at CIBSE – Dominic Meyrick, Hoare Lea Lighting partner, said that his firm would no longer employ non-graduates. 'We always had the idea that a first degree in architectural lighting would be very important,' says Ogus. 'This was one of the catalysts. This move only to employ graduates is becoming the case with all the consultancies.'

The milestone of a pure first degree in architectural lighting has yet to be reached, but the process is well under way. Brunel University agreed to a 'bolt-on' arrangement for its product design course, and the first graduates emerged this autumn.

'We have been working with them on the accreditation of a course that will become a fifth option on the product design course – lighting design,' says Ogus. 'That will probably be two or three years down the line.' However, as he retired as LET chairman in 2013, that particular torch has now passed to the current incumbent, Bob Venning.

Charity work

Ogus is also passionate about his involvement with the Worshipful Company of Lightmongers, an archaic-sounding institution that achieves a great deal for charity. 'Livery companies are much misunderstood,' Ogus says. 'The general attitude is that they're dining clubs for rich people – which they're not. Between them they give around £50m a year to charity, and they're responsible for 120 schools around the country, plus a number of universities.'

The Lightmongers gives more than 20 education awards – far more than most livery companies – to, among others, London South Bank University, the LET Diploma, Rose Bruford College, and the Bartlett. Another of its prizes goes to the optometry department at City University, which is currently working with the Bartlett on research projects.

In recognition of his work with the company, Ogus has become a Freeman of the City of London – and earned the ancient right to drive a sheep over London Bridge!

'Looking back on it, my physics teacher probably did me a favour,' Ogus says. 'I had a wonderful time reading languages, but I've also been able to do everything I wanted and had a fantastic career, which has been very enjoyable.

'The lighting industry gave me a living, and it's always seemed the right thing to do, to put something back.' CJ

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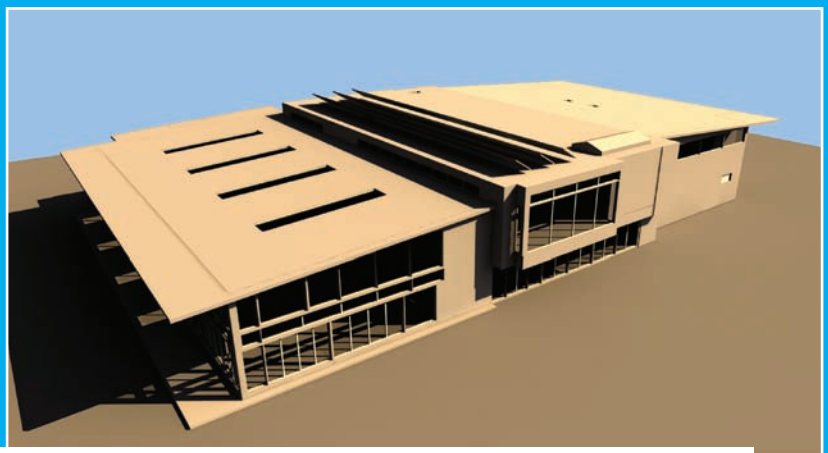

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A POWER OF GOOD

There have been some important changes to the British Standard covering electrical installations. ECA technical director **Jim O'Neil** outlines key elements of Amendment 3 to BS7671:2008, which came into effect on 1 January 2015

This article first appeared in the December 2014 issue of *ECA Today*.

GLOSSARY OF TERMS

Escape route (see section 3) – The path to follow for access to a safe area in the event of an emergency.

Risk assessment (see section 4) – The management of Health and Safety at Work Regulations 1999 require employers and self-employed people to assess risks to workers, and others, who may be affected by their work or business.

In early 2015, a free e-risk assessment will be made available to ECA members. This will allow risk assessments to be created and saved electronically.

Skilled person (electrically – see section 5) – Person who possesses – as appropriate to the nature of the electrical work to be undertaken – adequate education, training or practical skills, and who is able to perceive risks and avoid hazards that electricity can create.

Auxiliary circuits (see section 9) – Circuits for transmission of signal intended for control, detection, supervision or measurement of the functional status of a main circuit.

Dates of implementation

The key dates for implementation of Amendment 3 of the BS 7671:2008 Requirements for Electrical Installations are:

1 January 2015 – BS7671:2008+A3 is published. Installations designed after this date may comply and be certified to these new standards, or be designed and certified to BS7671:2008+A2 for a maximum transitional period of six months

1 July 2015 – Installations designed after this date must comply fully with BS7671:2008+A3

1 January 2016 – Regulation 421.1.200 comes into full effect; this doesn't preclude conformity beforehand.

1. New numbering system

The decimal-point numbering system now represents '100' numbers as CENELEC-harmonised references and '200' numbers as UK-only regulations. This system has been used for new regulations. Existing regulations will only adopt this once they have been significantly rewritten.

2. Consumer units in domestic premises (421.1.200)

Because of the number of consumer-unit fires reported within domestic premises, consumer units and enclosures shall now be manufactured from non-combustible material – for example, metal – or be installed within a non-combustible enclosure or cabinet with sufficient space around them (132.12 accessibility of electrical equipment).

Consumer units and switchgear shall comply with BS EN 61439-3. There is an extended period to 1 January 2016 for the full implementation; however, this doesn't preclude adopting this sooner.

3. Wiring systems in escape routes (521.200)

The hazards created by the collapse of wiring systems within escape routes during a fire will now inhibit the use of plastic clip, cleats, ties or PVC trunking and conduit as the sole means of support in these areas. If these methods are used, the cables must be restrained by metallic, fire-resistive supports. This applies to all escape routes, irrespective of any classification.

4. RCDs

A number of changes make reference to the use of RCDs:

Additional protection (411.3.3)

The definition 'skilled or instructed person' has been deleted. This change doesn't affect the requirements for socket outlets in dwellings, only in commercial and industrial buildings. Therefore, additional protection by means of a 30mA RCD shall be provided for:

(i) Socket-outlets with a rated current not exceeding 20 amps (an exception applies if a detailed risk assessment is produced, or the socket is correctly labelled and identified for a particular item of equipment); and

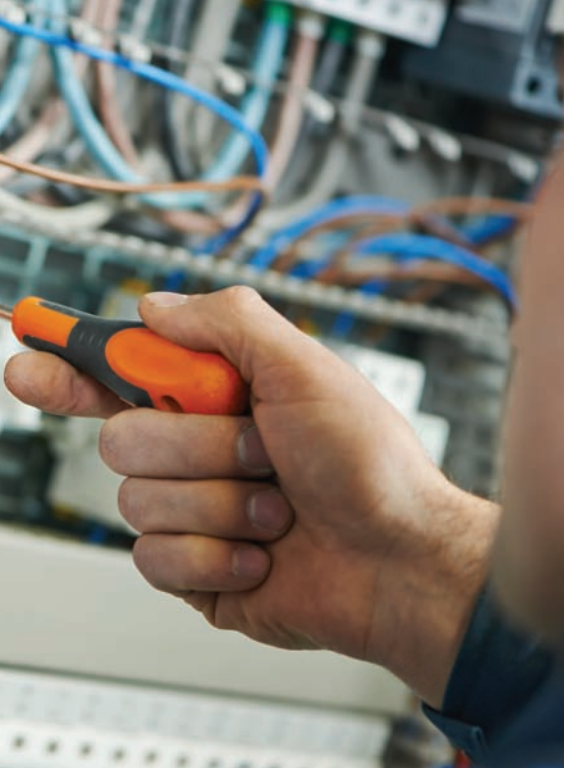
(ii) Mobile equipment with a current rating not exceeding 32A for use outdoors.

Special locations (701.411.3.3)

Low-voltage circuits that pass through zones 1 and 2 (special locations), irrespective of whether they directly serve equipment in these zones, are to be 30mA RCD-protected.

Generating sets in parallel with normal supplies (551.7.1)

RCDs used as additional protection on circuits connecting the generator set to the



DMITRY KALINOVSKY / SHUTTERSTOCK

installation shall now disconnect all live conductors, including the neutral.

5. Inspecting, testing and certification

Chapter 61 makes a new reference to 'skilled person (electrically)', which has the added condition of the person being competent in inspection, testing and certification work.

The schedule of inspections has been replaced for new work. Supplies up to 100 amps (domestic or similar) have a new, more detailed schedule of inspections. For installations greater than 100 amps, a model list of items that require inspection during initial verification is in Appendix 6. This list – along with a documented risk assessment of any permitted exceptions to the list – must be appended to the electrical installation certificate, and the declaration signed.

Condition reporting now requires the inspection of electrical equipment within roof spaces. There are also additions to the inspection schedule for supplies up to 100 amps.

6. Protection of cables in walls, floors and ceilings (522.6)

This section has been rearranged and modified to make it clearer to understand. Amendment 3 stipulates that all installations with cables buried at a depth of 50mm or less – which includes cables installed in partitions constructed of metallic parts, irrespective of the depth – should have 30mA RCD protection, unless other methods detailed in 522.6.203 have been applied.

7. Maximum Zs values – tables 41.2 to 41.6

The maximum values have been lowered to take into account the minimum voltage factor 'Cmin'. For a low-voltage supply, Cmin is given the value 0.95.

8. Compatibility (512.1.5)

The designer of the installation must ensure that the installed fixed equipment is designed and manufactured in accordance with the Electromagnetic Compatibility (EMC) Directive. Installations composed solely of CE-marked apparatus would conform to this directive. The designated 'responsible person for the fixed installation' has the duty to provide all the required documentation upon request. It is an obligation to identify the 'responsible person' before modifications to the installation take place (as specified by EMC Directive 2004/108).

9. Auxiliary circuits (557)

This section excludes specific product or system standards, for example those within BSEN 61439. It does, however, cover issues such as AC and DC power supplies for auxiliary circuits, protection against over-current and the wiring systems, in order to limit dangers or incorrect operation to the controlled system if a fault occurs.

10. Luminaires and lighting installations (559, 714 and 715)

Section 559 now only covers the general requirements for lighting and luminaires in fixed installations. Outside lighting installations and extra-low-voltage lighting installation requirements have been moved to Part 7, within new sections 714 and 715, respectively.

Changes to Section 559 include cables passing through luminaires, which must be protected against the effects of heat and UV radiation. In addition, where connections are not provided within the luminaires, a suitable means of connection must be made, as listed in 559.5.4.

Luminaires for display stands must now have protection against electric shock. This is provided by either SELV or PELV, or with the additional protection of a 30mA RCD.

Additions have been made under section 715 regarding isolation, switching and control of ELV lighting installations.

Other changes to consider: Chapter 44 – Protection against voltage disturbance and electromagnetic disturbance

There is now a requirement to calculate the impedance of sub-station earths to ensure the earth potential rise (EPR) does not exceed a dangerous level. Calculations must be made in accordance with BS EN 50522.

Chapter 717 – Mobile or transportable units

Additions have been made to the design of these installations, so that the characteristics to the number of supplies in which the unit may be connected are considered.

521.10.1 – IP Rating of trunking

For a trunking system to meet IP4X, all related components to IP4X must be installed. For site-fabricated joints, the installer must confirm the completed item meets at least IPXXD.

- ECA has developed a suite of information about Amendment 3, including a factsheet and video, that can be downloaded from the ECA website at **www.eca.co.uk**
  Join ECA as a free Client Associate
  For more on this topic, as well as free technical, H&S, BIM and sustainability advice call ECA Membership on: 020 7313 4800 or visit **www.eca.co.uk/client** quoting CIBSE.

GLOSSARY CONTINUED

522.6.203 (see section 6) a cable shall:
(i) Incorporate an earthed metallic covering that compiles with the requirements of these regulations for a protective conductor of the circuit concerned, the cable complying with BS 5467 BS6724, BS7846, BS8436, BSEN 60702-1; or
(ii) Be installed in earthed conduit complying with BS EN 61386-21 and satisfying the requirements of these Regulations for a protective conductor; or
(iii) Be enclosed in earthed trunking or ducting complying with BS EN 50085-2-1 and satisfying the requirements of these regulations for a protective conductor; or
(iv) Be provided with mechanical protection against damage sufficient to prevent penetration of the cable by nails, screws and the like; or
(v) Form part of a SELV or PELV circuit, meeting the requirements of Regulations 414.4

Cmin (see section 7) – The minimum voltage factor to take account of voltage variations, depending on the time and place, changing of transformer taps, and other considerations. The introduction of Cmin has altered time and current characteristics for RCDs and protective devices, resulting in changes to figures and tables throughout. In addition, a new table for BS88-2 fuses has been added.

PLUGGING INTO FINANCE

Hitachi's first train-manufacturing plant in Europe features a large PV array costing nearly £1m. Photon's **Jenny Palfreyman** tells *CIBSE Journal* how technical and financial barriers were overcome

Hitachi Rail Europe's new £82m manufacturing facility in Newton Aycliffe, County Durham, will be used to build new Intercity Express trains for the Great Western and East Coast Main Lines.

There was a requirement from the planners to include a 1MW photovoltaic (PV) array on the 44,000m² building, which potentially meant a high capital cost for Hitachi. Photon Energy, in partnership with Macquarie Lending, were able to come up with a financial package that enabled Hitachi to avoid the large upfront costs.

Jenny Palfreyman is a senior engineer at Photon. She explains how it overcame the technical challenges of such a large installation, and discusses the innovative lending model that moves costs out of the capital budget.

What were the technical challenges of such a large array?

The interaction between the PV mounting system and the roof sheet was critical. There are warranties from the roof manufacturer, Euroclad, and mounting system supplier, K2 Systems, that must be maintained, and it is vital to have agreement on fixing methods from both parties.

The roof on this project was particularly lightweight. Not only did the installed weight of the PV system have to be taken into account, but also that of the modules and mounting system, when they were being loaded onto the roof. Packs and pallets had to be split and loaded onto ply sheets, to spread the weight and avoid any issues with excess point loading.

Because of the size of the roof, it was important to reduce both the DC and AC cable runs to minimise system losses. The system was connected into four low voltage panel boards in the building, enabling us to reduce the length of DC cables coming off the roof. Inverters were installed on top of the internal plant rooms, allowing the AC runs to be short as well.

> The financing solution allows Hitachi to achieve the BREEAM Excellent rating while not paying for the PV system directly

How were the PVs funded?

Macquarie was brought in by Photon when it was clear that Hitachi wanted a funded solution, and it agreed to provide the finance. Photon is one of four UK installers that carry out these types of installations for Macquarie.

The cost for this project is just under £1m. Payment is made in two stages, with the first released after the system is commissioned, and the second after three months' successful operation. During this period the performance ratio – which compares the generation of the system to the irradiance level – is monitored. A performance ratio target must be achieved before the second stage payment is released.

Who maintains the PVs?

As the PV system is Macquarie's asset, it is responsible for maintenance. Macquarie has a contract with a firm that will both monitor the system for faults and provide preventative and responsive maintenance.

Who is responsible if the performance drops?

Performance of all solar PV systems decreases slightly over a 20-year project, but this is accounted for in Macquarie's financial model. Product warranties allow for any significant performance drops – caused by product fault or failure – to be rectified at no extra cost.

What happens at the end of the PV's life?

PV modules and all components are covered by the WEEE Directive, which is met through the PV Cycle scheme, ensuring they are fully recyclable at the end of life. The reality of this project is that the ownership of the asset transfers from Macquarie to Hitachi after 20 years, which means the system is expected to be left operational for at least 40 years.

Will the Photon funding model be employed again?

Yes, Macquarie has an initial tranche of £50m to be spent on this model and, if successful, the fund is likely to be increased. Photon is actively seeking other clients interested in a financed PV system and low-cost solar electricity.

Would Hitachi have gone ahead with the PV option without the financing?

The PV system was required as part of the planning conditions for the building. However, Hitachi also wanted to achieve BREEAM excellence, which the financing solution allows it to do without paying for the PV system directly. Instead Hitachi pays a discounted rate of about 6p/kWh for the solar electricity, which it commits to buying for 20 years under a Power Purchase Agreement. After that, ownership of the PV system reverts to Hitachi.

This month: Everyman Theatre Liverpool, CHP monitored in Glasgow, and heat pumps in Manchester concert hall

PUMP IT UP

Heating and cooling at the Royal Northern College of Music Concert Hall now relies on a reversible heat pump with recovery wheel. **Linden Shuttleworth** reports on its benefits

As part of the recent transformation of the Royal Northern College of Music's Concert Hall, in Manchester, Fläkt Woods supplied a range of highly efficient air-comfort equipment, including three eQ air handling units (AHUs), and two ReCooler heat pumps.

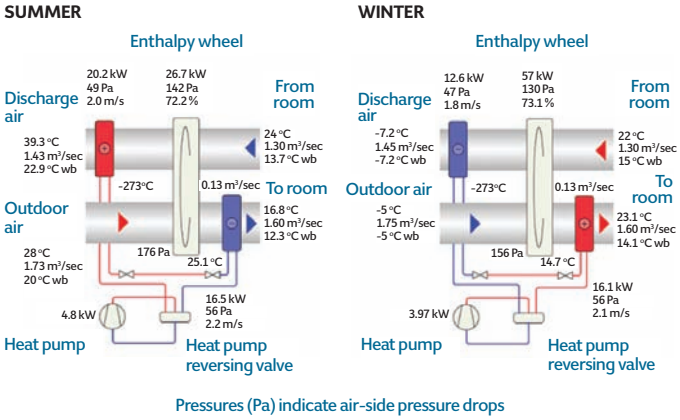
The refurbishment project at the venue took place between January and November 2014, with the concert hall's capacity rising to 750. As a result of this increase, there was a requirement for supplementary heating and cooling.

Instead of replacing the main boiler or chiller plant, Fläkt Woods' ReCooler HP units were specified to provide all the required heating and cooling, in conjunction with the air-handling system.

Mechanical consultant for the refurbishment was Elaine Bissell, of Booth King Partnership. She said: 'We knew from the outset that replacing any of the main heating and cooling plant was not an option, so we looked to the ventilation system to provide the increased requirement for heating and cooling. The units are highly efficient, and offer an incredibly neat and tidy install.'

The packaged AHU removes the need for an additional chiller, condenser or boiler, which, consequently, eliminates the requirement for any interconnecting pipework. This was an especially important feature for the college, as Bissell explained: 'One of the units was sited on a rooftop garden area, which is regularly used by staff and students at the college. Running lengths of pipework across the roof would have been unsightly and made

> The design removes the need for an additional chiller, condenser or boiler, which eliminates the requirement for interconnecting pipework



Combining an enthalpy wheel (exchanging sensible and latent heat between two airstreams) and a reversible heat pump provides heat recovery throughout the year

access difficult, which further cemented the AHU with integrated heat pump and thermal wheel as an excellent choice for this project.'

How it works

The unit has been designed to incorporate a reversible heat pump and a recovery wheel, to provide a number of benefits. These include: quick and simple installation; extremely high efficiencies; and year-round energy recovery.

The unit uses a DC inverter scroll compressor, which helps it to achieve a coefficient of performance (COP) up to 6.5, as well as full control of output from 10% to 100%.

This allows more precise temperature control and so has greater opportunity to maintain occupants' comfort levels more effectively than traditional fixed-speed systems. The unit could achieve COPs of up to 30 with the thermal wheel/heat pump combination, depending on conditions. The COP of 6.5 can be reached under normal UK conditions, with outside air at -5°C, air supplied by the unit at 24°C, and return air from the room at 20°C.

The thermal wheel is 80% efficient, so is able to meet much of the heating demand before the heat pump is activated.

The wheel is hygroscopic, giving both latent and sensible recovery.

The manufacture estimates that using the AHU with integrated heat pump and thermal wheel reduces energy by 30% compared with traditional, non-electric heating and cooling systems. **CJ**

LINDEN SHUTTLEWORTH
is product sales manager for Fläkt Woods UK

The concert hall's capacity rose to 750

LEADING MAN

Four ventilation chimneys named John, Paul, George and Ringo are central to the environmental strategy at the Everyman Theatre in Liverpool, which wowed critics at the Stirling Prize. **Andy Pearson** reports from the front row

The judges' citation for the winner of this year's RIBA Stirling prize makes clear that Waterman Building Services' low energy servicing strategy – as much as Haworth Tompkins' striking architecture – was the reason for their decision to award the best building of the year prize to the Everyman Theatre, in Liverpool. They praised its 'naturally ventilated auditoria', applauded the use of concrete labyrinths to 'supply and expel air', and described the design as 'exceptionally sustainable'.

The judges' comments should come as no surprise to the design team; from the outset, sustainability was integral to the concept of the new building. The original Everyman Theatre opened in 1964, converted from the shell of a 19th-century chapel.

Over time, however, the fabric of this much-loved institution deteriorated badly, while the increasing needs of its users meant the space was no longer viable.

Originally, the plan was to build a larger theatre on a new site, but Haworth Tompkins argued successfully for maintaining an important sense of continuity by reusing the existing, compact, Hope Street site.

To accommodate the new building on an area of just 1,610m^2, the shell of the existing structure was carefully dismantled to allow most of the chapel's bricks to be salvaged for

use in the theatre's reincarnation. Haworth Tompkins designed the new Everyman Theatre to derive as much functionality from the building as possible, while incorporating the best-loved features of its predecessor – all within a similar volume.

The outcome is that the building's public spaces – including the foyer and bars – have been arranged in a series of half-level floors, set around the perimeter, to create what the architect describes as 'a continuous winding promenade, from street to auditorium'.

In addition to the main auditorium and the catering spaces, Haworth Tompkins has also managed to slot in numerous creative spaces, including a rehearsal room, workshops, an audio-visual studio, a writers' room, and a community studio.

Externally, the most striking architectural features are the theatre's main, west-facing elevation, and four, giant, cylindrical chimneys, perched on the roof.

The attention-grabbing west façade is formed from 105 movable, aluminium sunshades. These are set in three rows, running the length of the elevation, and each one features a life-size portrait of a contemporary Liverpool resident, cut out of the metal sheet.

In contrast, the restrained red brick of the north, east and south elevations help the building sit comfortably with its listed neighbours. That same red brick is also used to form the four giant chimneys, which are a key component of the auditorium's natural ventilation system.

The 400 seat auditorium is at the heart of the 4,690m² building, literally and

PROJECT TEAM

- **Client:** Liverpool and Merseyside Theatres Trust
- **Architect:** Haworth Tompkins
- **Services engineer:** Waterman Building Services
- **Acoustic engineer:** Gillieron Scott Acoustic Design
- **Structural engineer:** Alan Baxter Associates
- **QS:** Gardiner and Theobald
- **Theatre consultant:** Charcoalblue
- **Contractor:** Gilbert-Ash

COSTS

- **Basic building cost:** £2,300/m²
- **Services cost:** £500/m²

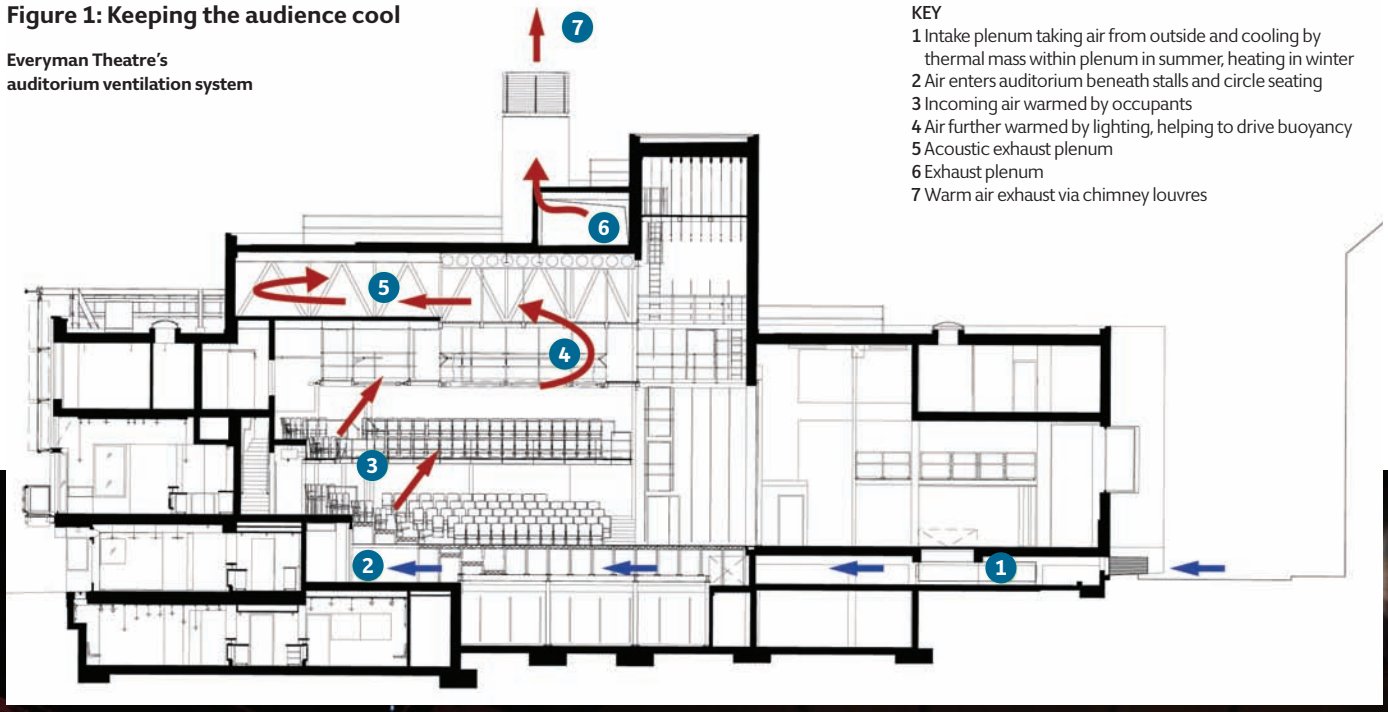
metaphorically. It has been designed to accommodate a 'thrust' stage (one that extends into the audience), which is encompassed on three sides by seating to recreate the intimacy of the old Everyman Theatre. This familiarity is enhanced by the use of reclaimed bricks from the original theatre, which are exposed in the new auditorium's walls.

As well as giving the auditorium a worn, cosy ambience, the reclaimed bricks add thermal mass to the space, as part of the theatre's ventilation strategy.

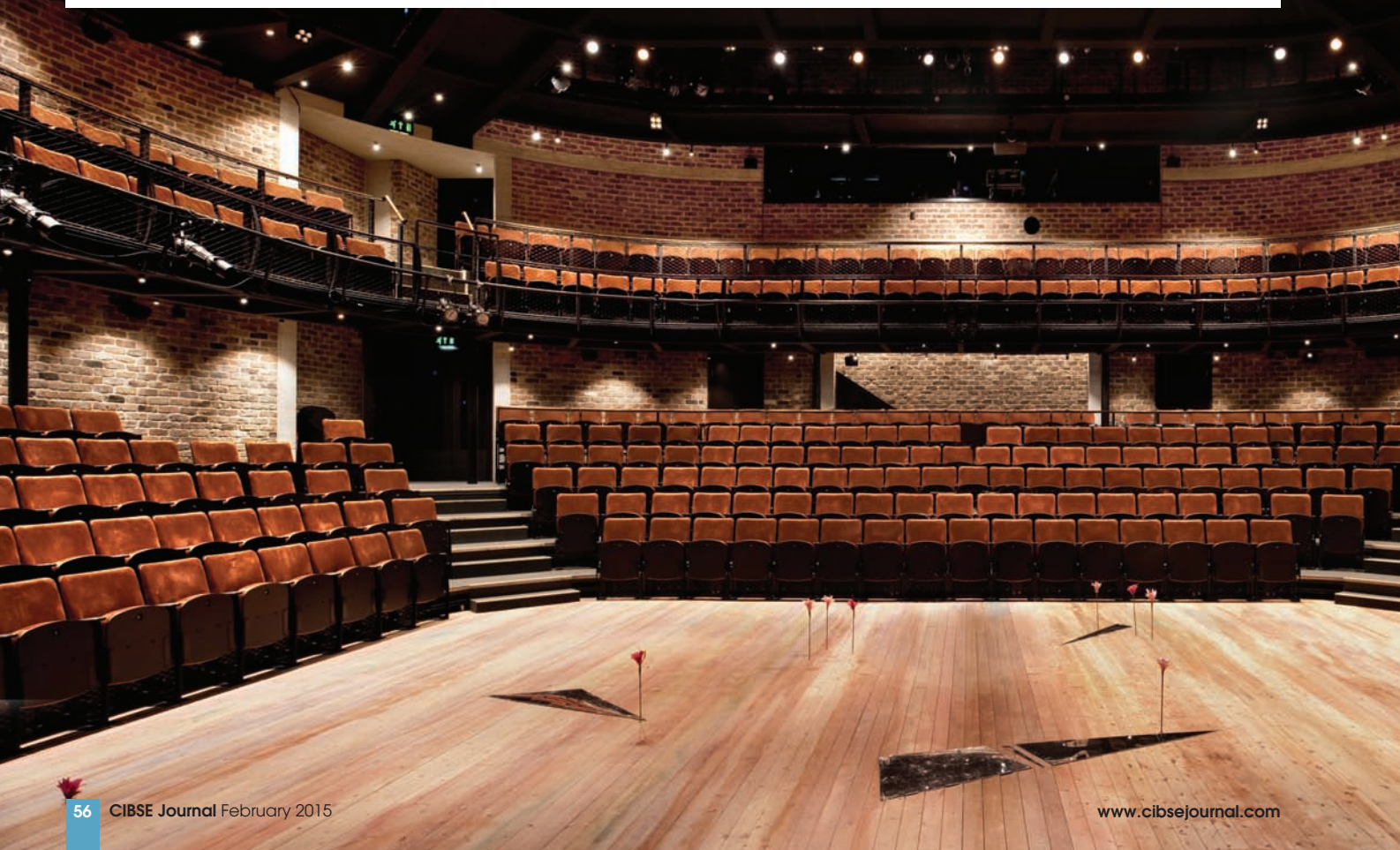
'The client wanted a very, very sustainable, low energy theatre, so natural ventilation was seen as the obvious solution,' says Jonathan Purcell, director of building services for Waterman's, who was charged with developing the ventilation solution for the windowless, artificial environment of the theatre's auditorium. 'We had to find a way to ventilate what is essentially a black box.'

Figure 1: Keeping the audience cool

Everyman Theatre's auditorium ventilation system



KEY
1 Intake plenum taking air from outside and cooling by thermal mass within plenum in summer, heating in winter
2 Air enters auditorium beneath stalls and circle seating
3 Incoming air warmed by occupants
4 Air further warmed by lighting, helping to drive buoyancy
5 Acoustic exhaust plenum
6 Exhaust plenum
7 Warm air exhaust via chimney louvres



Cooling the stalls

The design team's aim with the auditorium ventilation strategy was, according to Purcell, 'to provide a nice, clean, swept path for the air to enter the space at low level, then meet very little resistance as it is allowed to rise from low level to high level in the auditorium; and, finally, to provide a simple route out through the roof-top chimneys'.

As a result, fresh air enters the building through an inlet louvre on Arad Street, a quiet road at the rear of the building. It then passes through acoustic attenuators and into a giant, concrete-encased plenum, constructed beneath the workshop area behind the theatre's stage.

'We've got a massive cavern of concrete in contact with the ground, which we use to cool the supply air in summer before it enters the auditorium,' Purcell explains. From here, the air passes beneath the stage, through secondary attenuators, and into a horseshoe-shaped plenum beneath the banked rows of seating lining the auditorium walls.

The fresh air finally enters the auditorium through a series of perforated grilles beneath the seating. Heat given off by the audience, and from the theatre lighting, increases the buoyancy of the air, causing it to rise upwards through the lighting gantries to an acoustically attenuated 2.5m-high exhaust air plenum. A giant duct, which doubles back on itself, then delivers the air from the plenum to the four louvred chimneys – nicknamed John, Paul, George and Ringo by the design team – where it is exhausted (see Figure 1, cross-section drawing).

The auditorium is lined with 25,000 red bricks, reclaimed from the old theatre, that add to the space's thermal mass

For the system to work effectively, Waterman's had to generate enough buoyancy to drive a sufficient quantity of air through the auditorium to keep conditions comfortable for the audience.

The air inlet size and location was set – its dimensions defined by the street, basement and ground-floor slab levels. Building Regulations requirements for fresh air of 10 litres per second per person for a capacity audience of 450 people, plus 40 staff and actors, set the minimum quantity of supply air at $5m^3/s$.

As a result, the only variable open to Waterman's in developing the auditorium ventilation solution was to adapt the height and diameter of the four chimneys, to produce a solution capable of maintaining excellent air quality and of dissipating heat gains from the space.

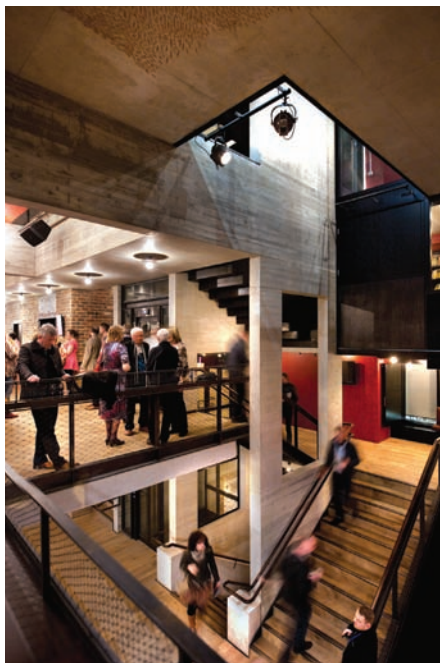
Lighting is the biggest heat source within the auditorium. The stage has 140kW of lighting installed, of which approximately 65kW will be on at any one time during a production. Occupants and other heat sources contribute another 50kW of heat.

'We did a huge amount of modelling work to establish the size, open area, and height needed between the inlet and tops of the chimneys to drive the stack effect to pull air through the auditorium,' explains Purcell.

Fortunately for the design team, these early modelling studies showed that the fresh air requirement of $5m^3/s$ would be sufficient to flush the 115kW heat gains from the auditorium.

Thermal dynamic simulation modelling was used during the design development to assess conditions inside the auditorium throughout the year. The cooling solution was modelled between the months of May and September to see where the temperature peaks were occurring. 'Once we found this out, we used computational fluid dynamics (CFD) to model the space at these particular moments in time,' Purcell says.

Thermal mass helps keep the auditorium cool in summer. 'CFD modelling predicted that we'd get a temperature drop of between

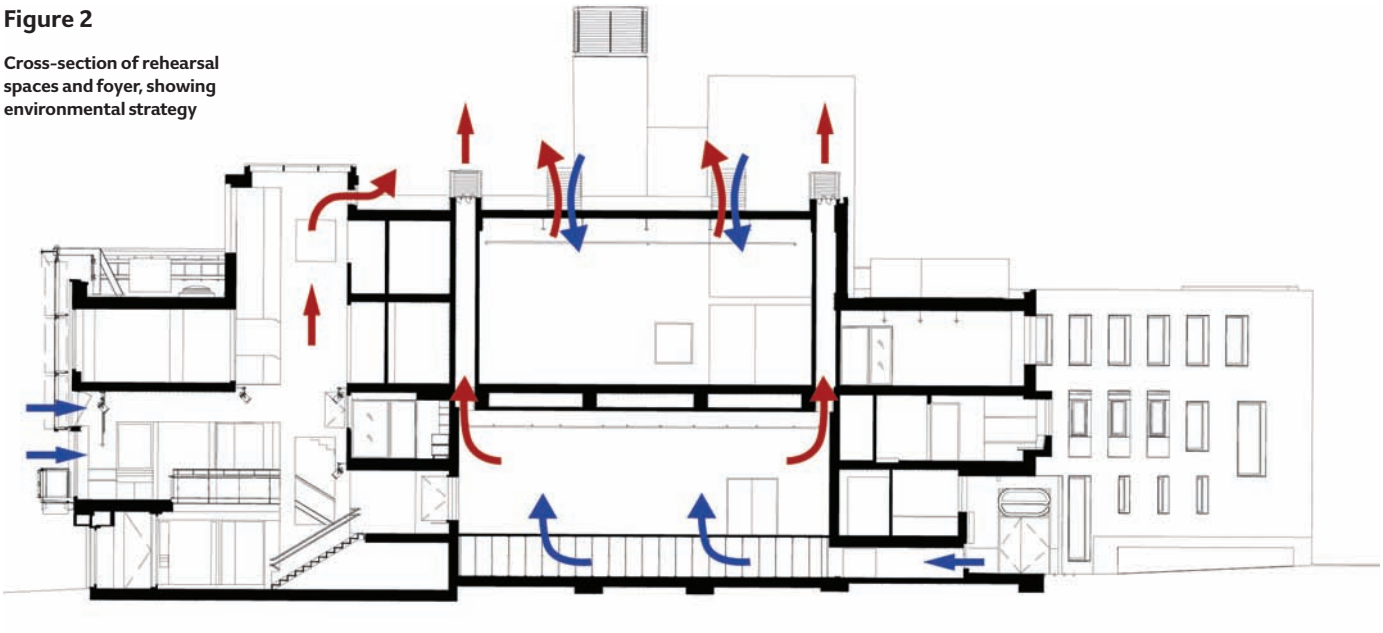


The theatre's public spaces are arranged in a series of half-level floors set around the perimeter

Fresh air enters the theatre through an inlet louvre at the rear of the building

Figure 2

Cross-section of rehearsal spaces and foyer, showing environmental strategy



The restrained red brick helps the new theatre building to sit well with its listed neighbours

2.5°C and 3.0°C as a result of the thermal mass,' says Purcell. In addition to the concrete air-intake plenum, 25,000 bricks reclaimed from the old theatre line the auditorium and add significantly to the thermal mass of the space.

'The only bit of the auditorium enclosure that is lightweight is the roof structure, but we were not too worried by that because – once the air has risen to high level – it is drawn out of the auditorium by the chimneys,' says Purcell.

A night-time cooling strategy helps purge the inlet plenum and auditorium structures of heat in summer.

The auditorium modelling also highlighted the problem of insufficient air movement around the upper level gallery seating. 'When we modelled the air flow, we found that it by-passed the galleries altogether,' says Purcell.

Vomitories (entrances between seating) at the front of the stage, and a corridor beneath the galleries, meant that it was impossible to create a fresh-air path from the plenum beneath the banked seating to the galleries. Instead – in a minor deviation from the natural ventilation strategy – a small, low-speed transfer fan is used to drive air through a ducted system, which links a small plenum beneath the galleries to the large plenum beneath the main auditorium seating.

Using detailed modelling demonstrated to Waterman's that the natural ventilation strategy would be sufficient to keep conditions comfortable in the auditorium throughout the year.

The theatre's trustees, however, were sceptical, and sought the reassurance of additional cooling measures as insurance against the failure of natural ventilation to keep the audience comfortable. As a consequence, two air handling units (AHUs) – complete with direct expansion cooling systems connected to air source heat pumps – are hidden away in the plenum beneath the stage. These have yet to be needed.

'Last year was the warmest on record, and the theatre operated all year on full natural ventilation, without need to resort to cooling – even during a Saturday matinee,' says Purcell.

An array of actuator-controlled dampers within the basement and high-level auditorium regulates the airflow through the auditorium. In winter, the fresh-air rate is kept to a minimum by carbon dioxide and temperature sensors.

'When you have the heat load from the audience and from the theatre lighting, the space does not need heating,' says Purcell.

BREEAM DATA

[taken from Haworth Tompkins BREEAM case study]

- **Predicted electricity consumption:** 86.76KWh/m²
- **Predicted fossil fuel consumption:** 186.51 KWh/m²
- **Predicted energy generation by CHP:** 29.18 KWh/m²
- **Predicted percentage of WC water use provided by rainwater collection:** 45%

LOW IMPACT CONSTRUCTION

- **Demolition waste:** 90%+ recycled
- **Construction waste:** 89% recycled

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ENVIRONMENT
ECONOMICAL
EXPERTISE

The giant chimneys – nicknamed John, Paul, George and Ringo – which help ventilate the theatre

TEMPERATURE CONTROL IN THE AUDITORIUM

- Below 21°C, the AHU heating is on
- Between 21°C and 24°C, the actuator behind the intake louvres gradually opens to increase the ventilation rate.
- At temperatures above 24°C, the AHU fan will start to boost the ventilation rate
- Should the temperature rise above 26°C, the auditorium will switch to mechanical cooling, closing the fresh air louvres and running the heat pump in cooling mode

The designers have, however, made clever use of the AHU to preheat the auditorium ahead of shows in winter – reversing the cooling heat pump enables the unit to provide heating without needing to run the boilers. A fully automated control system based on threshold temperatures regulates air flow (see panel, left).

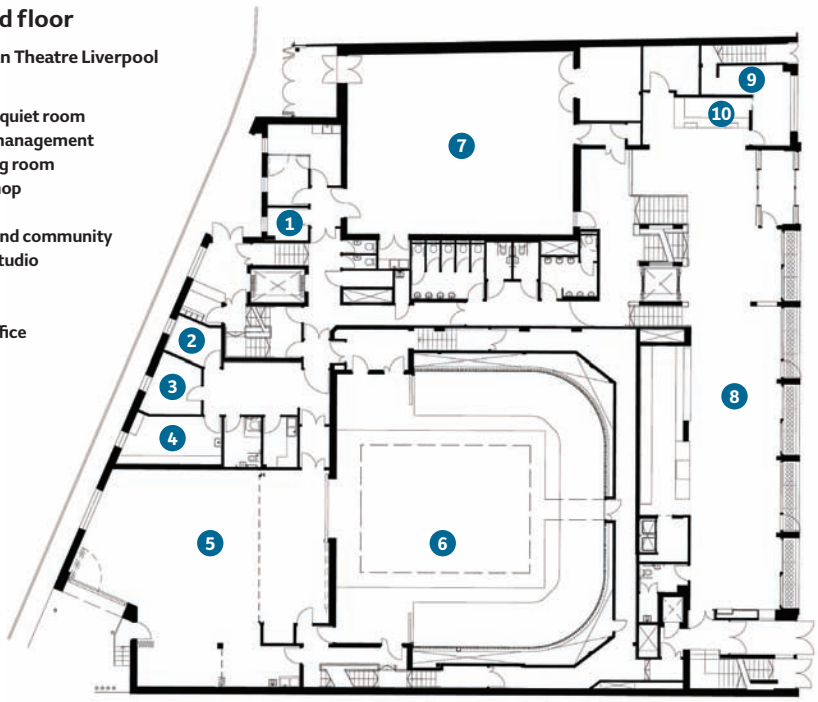
Backstage

In addition to the auditorium, the low energy servicing strategy means that the community room – which doubles as rehearsal space – and the main rehearsal room are also naturally ventilated.

Ground floor

Everyman Theatre Liverpool

1 Office
2 Actors' quiet room
3 Stage management
4 Dressing room
5 Workshop
6 Stage
7 Youth and community (Y&C) studio
8 Cafe
9 Office
10 Box office



> Last year was the warmest on record, and the theatre operated all year on full natural ventilation, without need to resort to cooling, even during a Saturday matinee – *Jonathan Purcell*

The community room ventilation system is similar to that of the main auditorium, with a street-level air intake delivering air to the space through a series of floor grilles, with air exhausted through two, roof-top chimneys. Unlike the main auditorium, however, the room also includes trench heating to pre-heat incoming air during the winter.

The main rehearsal room is ventilated using roof-mounted windcatchers to both supply and extract air from the space. The room's ventilation is supplemented by opening terrace doors to the Arad Street façade, while radiant panels provide heat to the room. The foyers, too, are naturally ventilated via opening sliding windows in the front façade. The warmed air from these spaces rises up and out of the building through a large lightwell. The only principal space to be mechanically ventilated is the basement bistro (see Figure 2, cross-section of rehearsal spaces and foyer).

Solar gains and glare to the foyer and bars are kept to a minimum by the 105 aluminium, life-size-portrait shutters. The shades, which rotate around a central pivot, are positioned by occupants opening a window, manually moving the shade, and then locking it into position. In practice, this means each screen is set at a different angle, at different times of the day, to create a dynamic façade.

'The users have bought into this solution completely; on grey days, most of the shades are open, while on sunny days the façade is a wall of Liverpudlians,' says Purcell.

These quirky sunshades and the building's natural ventilation strategy have helped the new Everyman Theatre to achieve a BREEAM excellent rating. The building also includes: a gas-fired micro CHP engine, sized to meet the building's hot-water demand for toilets, showers and catering; a daylight-linked LED lighting scheme to all public spaces; and rainwater-harvesting for toilet flushing. No wonder the Stirling Prize judges described the building as 'exceptionally sustainable'. **CJ**

TOO MUCH OF A GOOD THING

CHP is often seen as a 'golden ticket' that ensures a pass in SBEM. This loophole is driving an increase in specification at the expense of energy efficiency and operational costs, says **Steve Hunt**

Accrington & Rossendale College has a small CHP, aligned to its energy requirements

The regulatory framework introduced to improve the sustainability of the built environment over the past 20 years has put a clear focus on energy efficiency. The Simplified Building Energy Model (SBEM) is at the heart of this, ensuring compliance with Part L of the Building Regulations, target emission rate (TER) requirements and EPC certification, using one, accountable methodology.

It has been a very successful model; however, a major flaw relating to the specification of combined heat and power systems (CHPs) leaves the door open for inefficient buildings to pass straight through to compliance without accounting for their emissions.

Loophole

Championed by the government as a solution to the heating and power needs of larger buildings, CHPs that have been correctly engineered to fit the requirements of an installation enable buildings to generate their own heat and power, taking pressure off the National Grid. That's particularly beneficial at a time when the UK's generating capacity is low because of the decommissioning of coal-fired power stations.

In many cases, CHPs have been correctly specified to make buildings more energy self-sufficient. However, the drive to encourage more CHPs has been built into the SBEM model to such a degree that they are often now perceived as a 'golden ticket' – one that will ensure a building passes the calculation automatically, regardless of any other heating or power systems that are also, or subsequently, specified.

Therein lies the loophole: there is nothing in the SBEM calculation that prevents a CHP from being specified with inefficient electric heating systems, which are costly for the end user and power-hungry carbon emitters.

Worse still, there is no legislative requirement for the CHP to be commissioned or used after the build programme, which enables specifiers to pass SBEM on the back of installing a CHP, without delivering any of the grid-capacity benefits that the 'golden ticket' approach was designed to provide.

Appropriate specification?

The difficulty is not with the technology, but with the possibility of a CHP being inappropriately engineered for the needs of the building in question.

For example, as consultants, we have recently specified a CHP for Accrington & Rossendale College, a further and higher education institution in Lancashire. It will not generate more power than the college needs, so it offers an efficient solution, which will also provide around 40% of the building's heating requirements.

> Some specifiers are more concerned with the SBEM pass than they are with genuine environmental performance

In this scenario, the CHP will help the college to pass SBEM, while ensuring it is operationally and financially viable in the long term. Often, however, CHPs are not specified with the building's electrical load – or the occupier's operational needs – in mind; they are simply put into the building, without good engineering reasons, as a guaranteed SBEM pass.

Frequently, this results in a CHP that is too large for the building, producing up to 90% more power than the installation needs. It may, therefore, be so inefficient to run that it is subsequently switched off.

Worse, even, than CHP specification that is badly engineered to deliver too much power, are the CHPs specified as a cynical ploy to avoid the additional build costs of a more environmentally progressive approach.

Installing a CHP without any intention of running it avoids the capital costs of putting in the pipework infrastructure of a more traditional system, and allows the building to pass Building Regulations – but it fails to deliver the promised energy efficiency.

Unfortunately, some specifiers are more concerned with the SBEM pass than they are with genuine environmental performance and, as a result, I am aware of several projects where a CHP has been installed, but not commissioned.

Oversimplified

As a profession, it is vital that the building services sector delivers the spirit of SBEM and doesn't simply comply with its requirements.

CHP is an important technology but, if used inappropriately, it will not offer the benefits that it has the potential to provide.

STEVE HUNT FCIBSE is managing director at Steven A Hunt & Associates

THE BALANCE OF POWER

The Victorian heart of Notre Dame school in Glasgow

By integrating a ground source heat pump and CHP into a Victorian retrofit, Glasgow City Council has managed to cut energy bills by £48,000 and reduce carbon emissions by 90,000 tonnes. Baxi's **David Shaw** explains how a robust design and soft landings helped create a template for future school refurbishments

Five Dachs mini-CHP units were commissioned for Notre Dame's upgrade

The refurbishment and re-engineering work at Notre Dame Primary school, in Glasgow, has produced a solution to a problem that has given many building services engineers sleepless nights: how to get ground source heat pumps (GSHPs) and CHP to work together effectively.

Both are highly effective carbon-saving technologies, but they are not always good bedfellows, because they each need sizeable heat demand to operate at their best.

Criticism of GSHPs has been increasing because many have had operating problems in the UK – often due to inappropriate specification or poor installation. In some cases, wrongly sized heat pumps have frozen the ground as they try to extract too much energy in an incautious attempt to meet the heat demand from a building.

By solving two problems at once – getting the best out of GSHP technology and marrying it successfully with CHP – Glasgow City Council (GCC) has created a design model for the rest of the industry to follow, and produced some impressive energy cost savings and cuts in carbon emissions.

Built in 1894, the school's original Victorian building is still very much at the heart of the school complex, which is – after extensive refurbishment and the addition of a five-storey extension – now home to Notre Dame, St Peter's primary and the former Anderson Street Nursery, renamed Elie Street Nursery.

Up to the 1930s, the building was heated by ducted warm air fed by a steam-driven air pump, after external air was drawn in through furnace coils. The warm air was then pumped from the basement of the building to the classrooms, as part of a 'downdraught ventilation' system. This approach was subsequently discredited because of its detrimental impact on children's health, and a single-pipe heating system – with cast-iron 'Princess' column radiators – was introduced before World War II.

A major part of the recent refurbishment focused on reducing the school's carbon footprint, and GCC's engineering department took the opportunity of installing and test a combination of low carbon technologies. 'The aim of the project was to create a model that all future schools in Glasgow could seek to emulate, in terms of carbon reduction and electricity costs,' says Bob McNair, lead mechanical engineer on the project, and a member of the council's development and regeneration team.

The old building was gutted and rebuilt. The best architectural features were kept and restored, including the original 'Princess' cast-iron radiators, which were rebuilt and pressure tested to 6 bar before being placed back into the refurbished building.

Underfloor heating was chosen to optimise space, and is used in the main dining room, the gym, and the large nursery. The operating temperature of the

school heating system is 45°C, and lends itself to underfloor heating and low surface temperatures for the radiators, which makes them safe for the children. The carbon footprint is lowered by using GSHPs, while electricity bills are considerably reduced by CHP, compared to the more conventional approach of making gas boilers the lead heating technology.

Five Dachs mini-CHP units, supplied and commissioned by Baxi Commercial Division, were specified as part of the upgrade. These are controlled in two banks – one of three units and one of two. They produce 27.5kW of electricity during the day (16.5kW at night) to satisfy the requirements of the school buildings.

The Dachs CHP array operates as the lead heat source, in tandem with the Ciat GSHPs. Modulating gas boilers act as backup and, so far, have only been required during the very coldest months. There are three heating modes: summer, winter and holiday, with the winter mode using the standby boilers as the main source of heat.

The full CHP array is worked very hard during the winter months, but even at times of low heat demand – for example, in summer – it continues to operate, and any heat not required for hot water is diverted to replenish the GSHP system. The combined running hours of the CHP compensate for the high maximum electrical loads from the GSHPs and their borehole pump (90.5kW).

In practice, the high electrical load seldom occurs because the Ciat GSHPs come on in four stages, depending on demand. The GSHPs are only enabled by the BMS, so their on-board controls are able to manage the running of the scroll compressors.

The GSHP draws its energy from 100m-deep boreholes and, by replenishing these, the CHP ensures there is a steady supply of heat during times of high demand.

The CHP is monitored remotely by Baxi via a modem link installed in the plantroom, and the operating data is shared with McNair so he can fine-tune the system – for example, to make sure the boilers don't kick in too early, which would take the heat demand away from the CHP and the renewables.

The old, external plantroom was reused for the CHP, boilers and an gas-fired storage water heater, with another small room built for the GSHPs and the heating pumps. This separation is important because it removes the hydrocarbon fire risk from the gas-fired equipment in the old plantroom.

Mechanical ventilation has had to be fitted in the classrooms, even though they retained the high ceilings, because restrictions placed on the design by Historic Scotland would not permit natural ventilation ducts to penetrate the roof spaces. Again, however, McNair innovated; he used mechanical ventilation to boost the thermal output of the cast-iron radiators, with tempered air supplied from heat recovery units, installed in the attic, between the columns of the radiators. This effectively supplements the reduced output from the radiators due to the reduction in mean temperature (75°C to 40°C).

The site is now home to two primary schools and a nursery

The use of mechanical ventilation also satisfies the requirements of the advisory Building Bulletins on the design of classroom ventilation.

A 5,000-litre heat store, which can accept hot water from any of the three heat sources, helps to keep the array running smoothly. This means long running hours for the CHP and a generous supply of 'free' electricity as a result.

The loading and unloading of the heat store was modelled to ensure the CHPs could easily charge and discharge the tank during most of the working year. The gas fuelled domestic hot water heater is also preheated by the heat store.

> The CHP is monitored remotely by Baxi via a modem link installed in the plantroom, and the operating data is shared with McNair so he can fine-tune the system

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Item	Averages from 12 GCC primary schools (built since 2004)	Low Carbon Trust Exemplar School (built 2008)	GCC's Notre Dame (built 2013)	Best value
Area	3,786m²	3,786m²	3,783m²	
Heating	Boilers	Boilers, solar thermal, PV array, and building well insulated	CHPs, GSHPs and building well insulated	Notre Dame
Electrical – $kWh \cdot m^{-2} \cdot year^{-1}$	69	36	27	Notre Dame
Mechanical – $kWh \cdot m^{-2} \cdot year^{-1}$	176	122	93	Notre Dame
CO_2 Usage/year	116 tonnes + 143 tonnes = 259 tonnes	145 tonnes	134 tonnes (when on CHPs and GSHPs) 153 tonnes (when on boilers)	Notre Dame
CO_2 Savings		114 tonnes CO_2 /year	125 tonnes CO_2 /year	Notre Dame
Utility costs assessed at: 2.5p/kWh Gas 13.5p/kWh Electricity RHIs @ 8.4p/kWh	£59,000/year	£31,000/year	£33,800/year (without RHIs) £11,800/year (with RHI payments)	Notre Dame
Savings on averages from GCC primary schools per annum	N/A	£27,400	Without RHIs: £25,200 With RHIs: £48,200	Notre Dame

The relative performance of Notre Dame School

With electrical costs currently almost four or five times that of gas, there is a major incentive to maximise energy savings. So, when Notre Dame Primary school was handed over, in August 2013, the BMS was adjusted periodically to optimise electrical savings and to maximise CHP running hours.

At first, these objectives seem to contradict each other; however, both the GSHP system and the heat demand from the school's heating and hot water can be optimised if the CHPs are the prime source of heat, and are capable of being modulated to suit the school's electrical power demand.

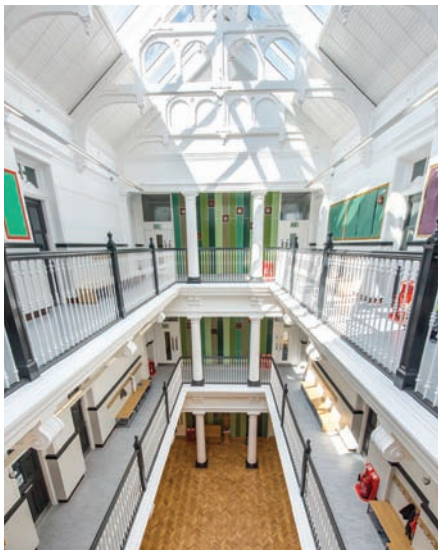
Notre Dame came top in a comparison of electrical consumption with 29 other GCC schools in May 2014. It was benchmarked against St Constantine's Primary, which is a similar size, but – unlike Notre Dame – has no community activity or weekend occupancy. So, despite the additional loads and heating demands, Notre Dame still performs better – the telling point being that St Constantine's has no CHP and no renewables.

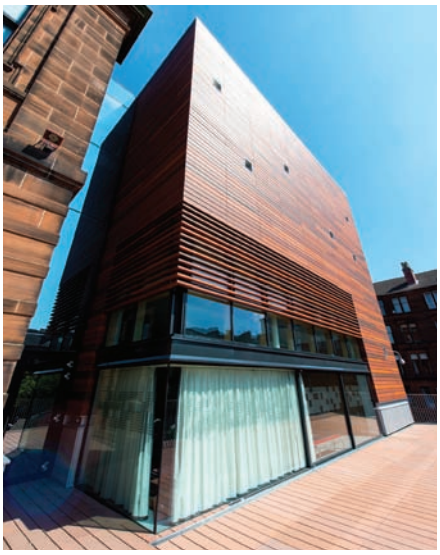
McNair calculates that Notre Dame will avoid more than 90 tonnes of CO_2 emissions annually, thanks to the combination of CHP and GSHP. He also expects it to achieve a running-cost saving of at least £48,200 a year, including the anticipated repayments from the Renewable Heat Incentive (RHI) scheme.

'Multi-module CHP units were considered to be the most effective solution to avoid the inefficiencies of modulating engines,' McNair says. 'This will also optimise the total electrical running hours of the GSHPs, and cut the electrical bills still further.'

In short, McNair believes that the Notre Dame refurbishment project will provide very valuable lessons for Glasgow City Council 'and, hopefully, small-scale CHP will be used more and more within the council's property'. **CJ**

Many of the school's period features were retained (left) and sit well with the modern extensions





PUTTING THE HEAT ON CHP

Planners and building regulations are driving the uptake of small-scale CHP, but there is a risk that performance will fall short if they are not properly specified and monitored. **David Shaw**, business development manager for Baxi-SenerTec UK, offers advice on optimising CHP

The widespread uptake of in-building, small-scale combined heat and power (CHP) – up to 50kW electrical output – is being driven by Building Regulations Part L and local authority planning requirements.

However, it is unethical to specify CHP to gain planning permission if the heat it produces is not required. Dumping waste heat is happening in far too many projects, which means CHP is not always generating the savings of which it is capable.

It is crucial for CHP to be sized properly because, to deliver the maximum return, it must be running for the highest possible number of hours, so that it generates as much electricity as possible.

According to Building Regulations, CHP must be sized to provide 'not less than 45% of the annual total heating demand' – which includes space heating and domestic hot water – 'unless there are overriding practical or economic constraints'.

Accurately calculating the performance of a building over the year is critical to ensure sufficient running hours can be achieved to meet the annual heat requirement. In too many cases, the CHP ends up oversized for summertime loads, resulting in either non-operation of the CHP, or the heat produced being dumped to ensure it carries on generating electricity.

CHP must be the lead heat generator so that all of the heat and electricity it produces is used in the building. The cardinal sin is to design for peak demand with a bit extra 'for luck' – a nasty habit of heating system designers, who calculate the heat demand from the building, size the equipment to meet peak demand, and then add an additional percentage of capacity to allow for exceptional circumstances, which, in all probability, will never occur.

CHP must be sized properly to deliver maximum returns

This is catastrophic for CHP, as it means the system will be grossly oversized.

Design engineers must ensure the CHP is sized to deliver the base load of the building, with boilers acting as backup to cover peak periods. There is no feed-in tariff for exporting CHP-generated electricity to the grid, so the system must ensure all the electricity produced is used inside the building. This is only possible if the person designing the system and commissioning the CHP understands how the building is to be used. An early conversation with the controls engineer, to make sure the BMS is set up with CHP in mind, is also crucial.

CIBSE's *AM12 Combined heat and power for buildings* urges designers to seek the advice of CHP suppliers 'at an early stage of the design'. Otherwise, the CHP specialist won't know how the building is going to be used, and what the appropriate solution should be.

At Notre Dame Primary school, in Glasgow, the CHP works hard even during the summer months, because the heat it produces is diverted into the ground to replenish the energy source for the ground source heat pump system. This was only possible because the CHP team worked closely with the renewables engineers from the outset. (See 'The balance of power' on page 65.)

> **CHP must be the lead heat generator so that all of the heat and electricity it produces is used in the building**

One way of making sure the CHP is working hard is to install a buffer vessel. By diverting heat that would otherwise not be used into a large water store, the design team can ensure the CHP continues to run and the hot water is stored, to be drawn off for use in the building when required.

Financial grants

Many clients can claim an Enhanced Capital Allowance (ECA) if the CHP they buy and install meets the requirements of the CHP Quality Assurance (CHPQA) scheme. In order to do this, the installation has to show that it is achieving a minimum Quality Index (QI) – an indicator of energy efficiency and environmental performance. This, in turn, ensures that performance goals are reached and a good return on investment is delivered for the end user.

The Building Regulations require that CHP plant in new and existing buildings should have a minimum CHPQA QI of 105, and power efficiency greater than 20% under annual operation. An engineer with CHP expertise should remain involved well beyond handover to ensure the system continues to deliver.

Baxi-SenerTec supplies its Dachs CHP engines with a modem, so the system can be monitored remotely and data shared with the building operator, to help them improve performance and meet running-cost goals. This helps prove an installation continues to meet QA standards. It also gives the team an opportunity to measure the 'spark gap', an assessment of the economic benefit of CHP.

We continually look at the price of generating heat and electricity using CHP on site and compare it with the cost of generating it separately through conventional means – for example, gas-fired boilers and grid-sourced electricity. The design team must factor the 'spark gap' into their calculations.

In the end, it comes back to good, sound engineering and establishing an accurate heat-load profile for the building, so you know how much electricity the CHP will generate. **CJ**

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Integrating low carbon heat sources into heat networks

This module examines the application of condensing boilers alongside solar thermal and gas absorption heat pumps for effective, carbon-efficient heat networks

The recent publication of the draft *Heat Networks: Code of Practice for the UK*, by CIBSE and the Combined Heat and Power Association (CHPA), has highlighted that the proper application of heat networks requires a thoroughly considered approach, to ensure that the installation will properly meet a real need, rather than provide a token 'greenwash' to a project.

Referring to the recent draft code of practice (CoP), this CPD will draw on the experience of a major supplier of systems for heat networks – particularly for multi-tenanted residential applications – to consider the application of condensing boilers, alongside solar thermal and gas absorption heat pumps (GAHP), as a means of providing a source of heat that is not only effective, but also carbon efficient.

Heat networks can provide an attractive solution for residential landlords. They remove gas appliances from dwellings, improving safety and removing gas systems that would otherwise require annual inspection. The simpler maintenance requirements – particularly of the 'heat interface units' that replace individual boilers – mean that the need to access tenants' properties is reduced. Such networks allow pre-payment for energy, and will often include home energy displays that help tenants visualise and regulate their energy use. Experience has even indicated that some landlords are using these systems to check on vulnerable tenants, enabling them to determine when there is no metered energy use. The overall energy savings from heat networks allow the incorporation of renewable heat sources on a larger scale than would be practical on individual properties, helping landlords meet their obligations and providing opportunities to help tackle fuel poverty.

The path to successful integration of a heat network, whether serving a single building with multiple tenants or spanning a larger site or conurbation, is mapped out in some detail in the draft *Heat Networks CoP*[1] – the proposed developmental stages are abstracted from that document and shown in Figure 1.

To ensure the greatest opportunity for operational savings (and success) avoid oversizing, both in the heat network and final heating systems. This will ensure a thoughtful, well-informed calculation and design process, using good-quality data to predict reliably or – better still – apply measured local records to determine the system demands. This will also deliver a system that is more controllable, and will require less maintenance than one that is oversized. If a heat network is being added as part of a refurbishment project, the thermal elements of the building are likely to be improved, so reducing the loads and consequent system demand from those historically recorded. This necessitates calculation/modelling based on the

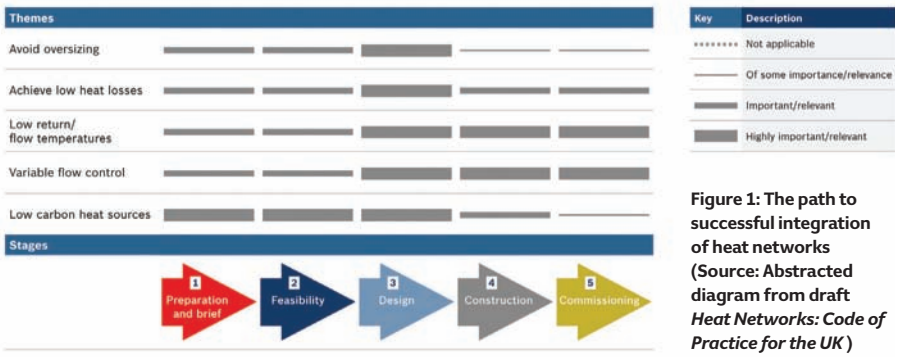

Figure 1: The path to successful integration of heat networks (Source: Abstracted diagram from draft *Heat Networks: Code of Practice for the UK*)

realistically deliverable improved thermal properties. Where the existing heating system has been designed for the conventional 82°C flow and 71°C return, it is usually possible – with appropriate variable volume control – to reduce the flow rates to provide 80°C/60°C radiator circuit temperatures, resulting in only a small loss of output, typically about 12.5% for these temperatures.[1]

For a new construction, low flow and return temperatures are the default option. This will allow heat sources, such as heat pumps, and CHP with condensing heat exchangers – as would be used where combined heat and power provides the heat source – to work at higher efficiencies. However, if there were a specific available source of higher-temperature heat – that is, higher exergy – it would be appropriate to consider the benefits of reduced flow rates resulting from the availability of a higher flow/return temperature difference.

The relationship between the flow temperature, the heat interface unit (HIU) and type of heat emitter is key during design. The secondary systems accessing the distributed heat through HIU, as in Figure 2, will determine the minimum flow water temperature in the mains network. In smaller systems – with losses less than 10% in the main network – a flow temperature approaching 65°C to 60°C is used as a starting point in establishing suitable operational conditions. A HIU is selected that can give the desired domestic hot water (DHW) flow rate at the outlets – the plate heat exchanger within the HIU and the primary flow temperature will dictate the flow rate from the taps. If the DHW load can be successfully supplied in a domestic installation, it is likely that the HIUs would be able to meet the heating load. The type of heating employed by individual consumers will also influence the flow temperature – in most cases, flow temperatures should be the minimum required to meet the demand, and the flow/return temperature difference maximised. The heat emitters are selected taking into account the lower mean temperature and installation practicalities. Despite the benefits of operating at low flow water temperatures, underfloor heating might not always be physically practical or cost effective in a particular application. Radiator systems may need to be larger to give the same output as at the traditional flow/return temperatures of 82°C/71°C at the reduced flow temperatures.

In practice – and particularly for smaller networks – the temperature difference will vary greatly. When there is a DHW demand from an individual HIU, the return may be

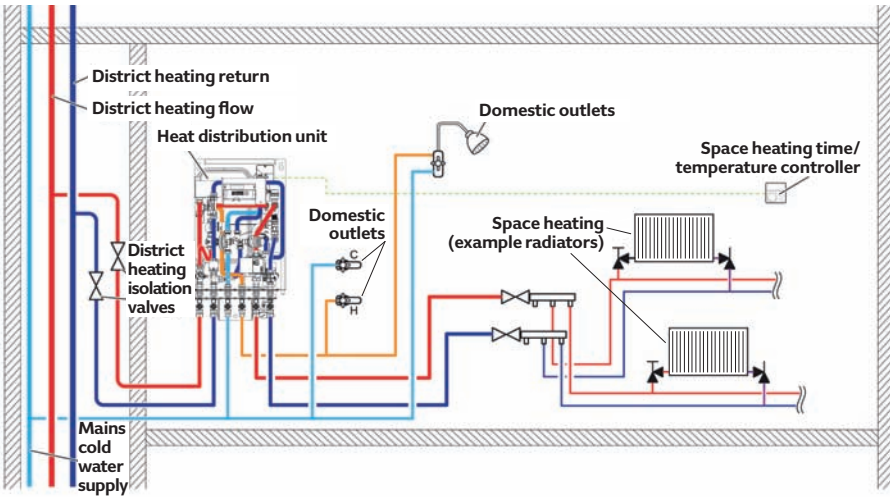

Figure 2: Example of distribution of heat to individual consumer from heat network (Source: Based on Bosch Commercial and Industrial Heating illustration)

as low as 20°C, but during heating it will be higher – for a radiator heating system it will typically be around 50°C. Some HIUs can optimise the return temperature from the heating by varying the flow rate. Employing variable flow systems to deliver the heat to the final load provides the opportunity for variable speed pumping – and resultant pump energy savings – as well as ensuring that a high temperature difference is maintained between the flow and return water. This will ensure that the maximum practical potential heat is extracted from the primary heat network – so maintaining low return water temperatures – plus better efficiency from boilers and renewable heat sources, as well as reduced system losses. Where a heat network is retrofitted to a building with existing heating systems (the HIU 'substituted' for an individual boiler), experience has shown that the flow/return temperature difference can vary from about 7K to 30K, depending on the type of load at the time.

The application of a low-carbon heat source is, of course, fundamental to planning the route towards a low-carbon solution. If, for example, there was the available resource of so-called 'waste' heat – with appropriate exergy –from a local power plant, industrial process or geothermal source, then this is likely to shape the brief for any subsequent heat network. In reality, however, such accessible heat is a rare commodity, so opportunities for alternative 'low carbon' sources can be employed, often in combination with fossil-fuelled technology – so-called 'bimodal' systems. Solar thermal panels and gas-fired air sourced heat pumps are two frequently used low-carbon heat sources.

These are typically arranged using two buffer vessels, one dedicated to the renewable

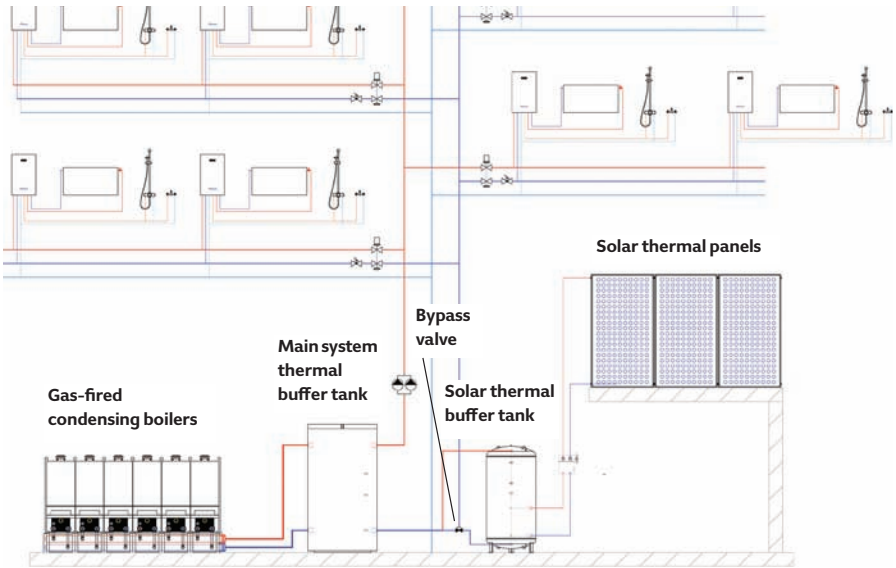

Figure 3: Example simplified schematic of a heat network with gas-fired condensing boilers and solar thermal panels heat source (Source: Bosch Commercial and Industrial Heating illustration)

heat source, with a bypass arrangement, and the other used as the main buffer for the heat network. This is shown as a simplified schematic for a gas-fired condensing boiler and solar thermal panel heat source in Figure 3. The solar thermal panels will charge the solar thermal buffer tank when the solar irradiance is sufficient to increase the temperature of the water in the buffer tank (up to a safety maximum). The return water from the network draws water through the buffer when it is advantageous to do so – that is, when the temperature in the top of the buffer is, typically, 5K warmer than the return temperature from the heat network. The buffer temperature will reduce until it is less than the return, and the buffer will then be bypassed by the heat network return. This cycle will repeat, depending on the availability of the solar resource.

The solar thermal buffer vessel will typically be a coil heat exchanger, as this is suited to keeping the glycol-filled solar circuit separated from the network water within the buffer. To establish a suitable buffer size, simulation software – such as the commercial T*Sol or freely available RETScreen – may be used to explore the benefits of different buffer sizes. For example, this might examine the benefits of larger storage against physical constraints and capital investment.

A GAHP-led system is shown in Figure 4. The heat pump acts as the lead heat source, with top-up from the boilers as necessary. The gas-fired air-sourced heat pump will feed into the GAHP buffer tank, and will be sequenced by the controller based on the temperature within the GAHP buffer (using multiple temperature sensors in the buffer). As soon as the temperature at the top of the buffer is higher than the return from the system, the bypass will activate, sending the flow through the GAHP buffer. A greater output from the GAHP will ensure that the proportion of heat supplied by the gas-fired condensing boilers will be reduced.

When selecting the required capacity of the GAHP, it is necessary to consider carefully both the base load, and the peak load, while also considering what level of capital investment is appropriate.

The capital cost of the gas-fired air-sourced heat pump will be greater per kW than a condensing gas boiler, so to deliver a return on investment (ROI), the heat pump should operate at full load for the maximum number of hours per year. For example, it would make little financial sense to size the GAHP to meet the peak load that might only be experienced a few days in a year. It is better for the GAHP to be sized to meet the bulk of the load – perhaps up to 60% – to ensure that payback times are realistically feasible. This, of course, may be modelled.

Figure 5: Application of heat network with integrated gas-fired condensing boilers and GAHP (Source: Bosch Commercial and Industrial Heating illustration)

Buffer sizing for GAHP has some 'rules of thumb' – for example, 300 litres per GAHP unit – and so is relatively straightforward, but any reputable manufacturer will be able to provide extensive advice on application.

The main buffer vessel on the heat network is there to provide storage capacity for peaks of demand. The main buffer vessel will even out transient demand on the heat sources, allowing boilers to come into operation and get up to temperature. This also ensures there is no noticeable change in the delivered performance to the end user – the DHW will be particularly sensitive to the availability of network heat, whereas heating is less demanding, since the thermal inertia of the building and the heating systems will mean that small dips in performance could go unnoticed. The main buffer vessels are typically sized to give 10 minutes of peak diversified demand capacity.

Control modules to ensure effective operation are available as part of a manufacturer's integrated bimodal solutions, so maximising the proportion of lower-carbon heat.

Both in new and refurbishment projects, pre-fabrication delivers the advantage of keeping all the main fabrication – including 'hot works' – away from site. This gives benefits in cost, tenant disruption, and health and safety. It avoids many access issues in existing boiler rooms and can mean that plant is tested before arrival on site. An example prefabricated plantroom will contain boilers, buffer, pumps, expansion vessels and controls. It would be craned into position with loading hooks, to deliver a system such as the example in Figure 5.

More detailed design for heat networks is discussed extensively in the freely available CIBSE/CHPA publication draft *Heat Networks: Code of Practice for the UK*, and in the recently published BRE document *A technical guide to district heating*, where wider applications of networks are discussed – much of which is relevant to the heat networks in multi-tenanted buildings.

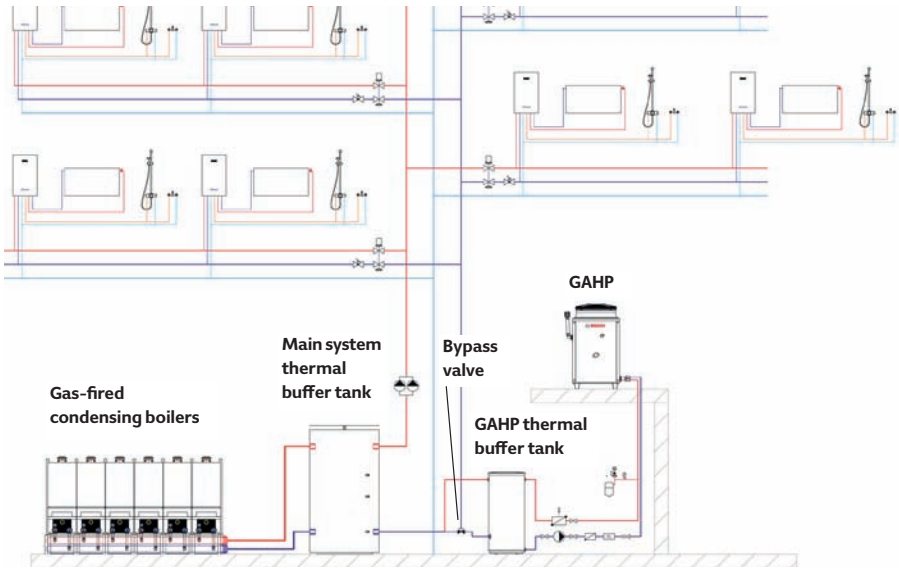

Figure 4: Example simplified schematic of a heat network with gas-fired condensing boilers and gas-fired air-sourced heat pump (Source: Bosch Commercial and Industrial Heating illustration)

References:

1 Draft *Heat Networks: Code of Practice for the UK*, CIBSE/CHPA, 2014.

Turn over page to complete module

Module 73

February 2015

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1. In *The path to successful integration of heat networks*, at what stage does the assessment of low-carbon heat sources become highly important?

- ☐ A Preparation and brief
- ☐ B Feasibility
- ☐ C Design
- ☐ D Construction
- ☐ E Commissioning

2. In the article, what is the lowest return temperature from a HIU that may be experienced in a system supplying the heat for domestic hot water?

- ☐ A 7°C
- ☐ B 20°C
- ☐ C 30°C
- ☐ D 50°C
- ☐ E 60°C

3. What application, mentioned in this article, could RETScreen software be used for?

- ☐ A Determining the return water temperature
- ☐ B Evaluating the performance of a HIU
- ☐ C Establishing data to size the solar thermal buffer
- ☐ D Determining the pumping requirement at reduced temperature differences
- ☐ E Assessing the acoustic screening requirements for the GAHP

4. In the example application discussed in the article, what is a typical temperature difference between solar thermal buffer and return water that would signal the advisability of using the stored hot water?

- ☐ A 1K
- ☐ B 3K
- ☐ C 5K
- ☐ D 7K
- ☐ E 10K

5. In the systems discussed in this article, which of these is likely to be the primary purpose of the main buffer vessel?

- ☐ A To store the heat from the solar thermal panels and so reduce peak loads
- ☐ B To facilitate a higher flow water temperature than that of the normal 82°C
- ☐ C To provide (approximately) 300 litres of storage per boiler
- ☐ D To even out peaks in demand and improve the service to the end user
- ☐ E To meet 60% of peak load

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Cemfree cement-free concrete wins Skanska's award

Skanska UK, the world's leading construction group, has awarded its coveted Supply Chain Green Solutions Award to Cemfree, the first truly sustainable, structural concrete. Invented and developed by David Ball Group, a Cambridge-based, research-led company, Cemfree is a zero-cement, structural concrete. It uses a by-product of other industries to provide up to a 95% reduction in CO_2, compared with ordinary Portland cement (OPC). If Cemfree was used at capacity in the UK alone, it would account for a saving of 2,100,000 tonnes of CO_2 a year.

● **Call 01223 911123, or email victoria@kisscom.co.uk or justine@kisscom.co.uk**

New sizes of Tectite Sprint expand connectivity options

Tectite Sprint, the innovative, metal, push-fit plumbing system from Pegler Yorkshire, has been making installers' lives easier for almost a decade. Now three new sizes – 35mm, 42mm and 54mm – have been added to the existing options of 15mm, 22mm and 28mm, opening up the award-winning solution to yet more applications. Tectite Sprint combines the best of both worlds for contractors and installers, says Tectite product manager, Janette Henwood. 'Not only is it a robust, high-performance system, with a long working life, but it is also quick and easy to install.'

● **Visit www.pegleryorkshire.co.uk**

Kingspan KoolDuct puts on a show at National Theatre

The Kingspan KoolDuct, low air-leakage, pre-insulated air-distribution system has been used in the National Theatre's £80m redevelopment of its iconic building on London's South Bank.

Designed by architects Haworth Tompkins, and project managed by Lend Lease, the 'NT Future' redevelopment will transform the facilities that the National Theatre offers to its audiences and artists, and enhance its relationship with the environment.

The development also aims to reduce the theatre's energy consumption by at least 20%.

● **Call +44 (0) 1544 387 384, email literature@kingspaninsulation.co.uk or visit www.kingspaninsulation.co.uk**

Veolia helping UK businesses to achieve cost-effective energy efficiency through Esos-compliant energy assessments

Environmental solutions provider Veolia is encouraging large businesses to sign up for an energy audit to meet the demands of the Energy Savings Opportunity Scheme (ESOS). The mandatory energy assessment is designed to encourage the adoption of energy-efficiency measures in the UK's non-domestic sector. It requires large businesses to employ an approved assessor to conduct a comprehensive energy audit by 5 December 2015, and every four years thereafter.

● **Visit www.veolia.co.uk or follow @VeoliaUK on Twitter**

The choice is clear with the Grundfos Product Center

The importance of having a single source of reference to help you choose the best pump is not lost on Grundfos. For many years, its product portfolio was supported by industry-leading online and off-line pump-selection tools WebCAPS and WinCAPS. After extensive development, the recently launched Grundfos Product Center has built on the positive elements of its predecessors, and incorporated new aspects that will make this pump selector the tool of choice.

● **Call 01525 775 347 or email ldingley@grundfos.com**

Energy efficiency key at Bryanston School

CP Electronics has supplied passive infrared (PIR) and microwave detectors to the new music department at Bryanston School, near Blandford Forum, Dorset. Installed by Ringwood-based Accolade Building Services, CP's controls provide accurate and easy adjustment of light levels. They control T5 fluorescent luminaires with digital Dali ballasts, to provide absence detection and daylight linking in the music rooms and teaching spaces, using EBDSPIR and MWS3A detectors.

● **Call 0333 9000671, email enquiry@cpelectronics.co.uk or visit www.cpelectronics.co.uk**

Don't lose sight of the non-domestic RHI

Euroheat's Simon Holden is urging industry to reap the benefits of the non-domestic Renewable Heat Incentive (RHI) market while tariffs remain favourable. 'On 28 November, the government announced the latest non-domestic RHI tariff reduction,' said Holden (pictured). 'We were expecting 20%, but – at only 10% – returns on investment are still looking favourable. For example, with a 199kW boiler, the upper end of the RHI, owners will still receive £432,032 over the 20-year life of the scheme – a considerable return.'

● **Visit www.euroheat.co.uk**

S&P appoints new H&V national sales manager

Lee Page (pictured) has been appointed heating and ventilation (H&V) national sales manager for S&P. He has a wealth of experience working with contractors and consultants to ensure their H&V projects go to plan and meet all the design requirements. Page will work with S&P's regional sales managers to help build momentum on major projects and specifications. Eugene Scotcher, S&P's managing director, said: 'This new role will greatly assist S&P to focus more on specifications for ventilation projects within the commercial H&V market.'

● **Call 0845 4700074, email ahowie@solerpalau.com or visit www.solerandpalau.co.uk**

Elco UK lines up a strong back four

Elco UK has supplied four R3604 gas-fired condensing boilers to Armstrong Fluid Technology, as part of a 4,000kW low temperature hot water (LTHW) packaged plant room. The containerised system has been installed at Chelsea FC's training ground, in Cobham, serving the under-pitch heating coils. The floor-standing R3604 boilers were specified by Richard Jackson, senior mechanical engineer at the Anslow Partnership, who said: 'Chelsea FC has a policy of keeping energy use to a minimum and is very conscious of the environment, so the R3604 boilers were chosen because of their high efficiency and class-leading, low NO_x levels.'

● **Visit www.elco.co.uk**

Limescale solution that is fit for a gym

A popular London-based leisure and fitness club has finally won its battle with limescale deposits and lime bloom in its changing and shower facilities, thanks to the installation of KalGUARD, a scientifically proven electrolytic device from Sentinel Commercial. Shower heads, cubicle walls and tiled flooring have all benefited from the eradication of limescale accumulation, ensuring that the facility maintains its well-earned prestigious reputation – an important factor in such a highly competitive market.

● **Call 01928 704330, email customer.services@sentinel-solutions.net or visit www.sentinelprotects.com**

Harmer drainage solution for Salford student accommodation

Harmer Stainless Steel Spa Channels, from Alumasc, have been chosen to provide a robust drainage solution for stylish new student accommodation in Salford.

The £3m student block, X1 Chapel Street, was developed by Bardsley Construction on behalf of X1 Developments, and was completed in September 2014.

Situated on the busy Chapel Street, in Salford city centre, the new building is five storeys high, and houses 102 student apartments, three self-contained studio apartments, and four self-contained live/work units, plus a residents' gymnasium and retail space.

Contracted merchant suppliers BSS Industrial, in Manchester, supplied more than 50 linear metres of Alumasc's bespoke stainless steel spa channels for bathrooms across the entire project, after a previous supplier failed to deliver a successful solution. The channels were installed by specialist contractor Lorne Stewart.

The project is one of the UK's first installations of the new Harmer Stainless Steel Floor Drainage range, which was recently added to Alumasc's already extensive portfolio of drainage solutions.

● **Call 0808 100 2008 or visit www.harmerdrainage.co.uk**

LG brings in the big guns

LG's latest 25kW, ceiling-concealed duct unit has wide appeal for the retail and hospitality markets – as well as many others. The technologically advanced unit has been introduced to extend LG's range of split and multisynchro systems. The new UB85.N94 system offers a wide outdoor range of -20°C to 48°C cooling, and -18°C to 18°C heating. Incredibly economical, with a COP of 3.25 and EER of 2.81, the new unit will quietly produce the best indoor ambience at a maximum operating power level of 65dBA.

● **Visit http://partner.lge.com/uk or follow @LGUK_B2B**

New electric boiler range launched by Atlantic

Atlantic Boilers, of Lancashire, has added a comprehensive selection of electric boilers – from 1kW to 980kW – plus water heaters of 445ltrs/hr to 7520ltrs/hr to their range.

Models include the HBI-S20 Electric combi boiler, and the Multi-Elec Compacte floor-standing boiler with a small footprint. It is economic to install and run, and has no flue requirements. Designed for any heating system, it has a maximum working pressure of 4 bars, from 36kW to 72kW.

● **Email info@atlanticboilers.com or visit www.atlanticboilers.com**

Hamworthy products are a great match for University of Nottingham sports pavilions

A £4m development project at the University of Nottingham has resulted in the construction of two 800m² pavilions at the Riverside Sports Complex – formally Grove Farm – adjacent to the River Trent. J Tomlinson, Integrated Building Solutions chose Hamworthy's condensing water heaters and wall-hung condensing boilers to provide an efficient and reliable heating and hot-water solution that will satisfy the requirements of this project.

● **Call 01202 662 510 or email pr@hamworthy-heating.com**

CP Northern helps control lighting at Langley College

The installation of a range of lighting controls at Langley College, supplied by CP Northern, is helping East Berkshire College to reduce its energy costs and carbon footprint by optimising the use of lighting in key areas. Langley is the largest campus of East Berkshire College and the centre for most of the main vocational courses, which all have specialist facilities and equipment. The lighting control upgrade focused on spaces where opportunities for energy saving had been identified.

● **Call 0845 0755 884, email sales@cpnorthern.co.uk or visit www.cpnorthern.co.uk**

CE marking boosts damper demand

Market-leading damper manufacturer Actionair has had a surge in demand for its SmokeShield PTC range after the introduction of mandatory CE marking in the UK. It is now compulsory for a wide range of building services equipment to bear the conformity mark, putting dampers and all life-safety products under particular scrutiny. All Actionair products have been subjected to rigorous testing and third-party verification in preparation for this major change, which was designed to impose stringent quality standards across Europe.

● **Visit www.ruskinuk.co.uk**

Klima-Therm and LH announce three new appointments

Klima-Therm and its sister company LH, the Wimbledon-based air conditioning and chiller specialists, have announced three appointments as part of a strategic growth plan. Michael Craig (pictured, left) is the new sales and service manager, while Andrew Mayo has been appointed as customer liaison manager, and Julie Clamp (pictured, right) as business support coordinator.

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

Mikrofill at Newport Girls' High School

Commercial boiler manufacturer Mikrofill Ethos was chosen by Telford-based mechanical contractor Dodd Group to supply progressive fuel-efficient plant for an extension, and parts of the original building, at Newport Girls' High School, in Shropshire. This included two Ethos FS350 kW stainless steel condensing boilers with dual-burner technology and a turn-down ratio of 20 > 1. The boilers, with a seasonal efficiency of more than 96%, were unvented by a Mikrofill pressurisation package incorporating the 'EFD' expansion vessel and service drain valve.

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

Sika Sarnafil specified for NHBC Milton Keynes

The head office of the National House Building Council (NHBC), in Milton Keynes, now includes 800m² of Sika Sarnafil Plus roofing, with a 20-year guarantee. Installed by Hertfordshire-based Itech Roofworks and main contractor Winter Refurbishments, the work was needed to address water ingress issues. The NHBC wanted a full guarantee in respect of waterproofing, which resulted in Sarnafil being specified.

● **Call 01707 394 444, email sarnafilroofing@uk.sika.com or visit www.sarnafil.co.uk**

Care home improves its energy efficiency with Remeha

Remeha's Fusion Hybrid bivalent heating system has been installed at Lake House, in Adderbury, Oxfordshire, as the most energy-efficient, low-carbon solution for the 43-bed care home. The bespoke system comprises three 35kW Fusion gas absorption heat pumps, two Quinta Pro 45kW boilers on cascade and a twin-coil buffer vessel. It is integrated through a building management system and operated via the Remeha Touch touchscreen control panel. Graham Hipwell, of the Orders of St John Care Trust, said: 'We are very pleased with the performance of the Fusion Hybrid system and the savings that it is delivering.'

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

Specflue to launch new generation of heating interface units

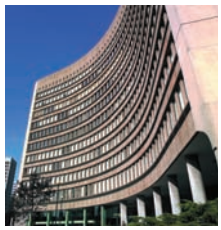
Specflue will launch the next generation of heating interface units (HIU) at Ecobuild 2015 in March. Manufactured by Thermal Integration, the new, intelligent HIUs have been designed for better performance and ease of use, while delivering all the benefits of the traditional HIU.

Full features will be revealed at the show, but include innovative digital controls to improve the management of heating and hot water in properties connected to a communal heating system using a central boiler. The tools will enable greater unit efficiency and management of temperature, pressure and flow rates.

Specifiers visiting stand N6140 will also be able to talk to the technical team behind Specflue's renewable heating range, which includes thermal stores, solar panels, pellet boilers and stoves.

● **Call 0800 902 0220 or visit www.heatweb.com**

Under-floor air conditioning offers flexibility for height-restricted refurbishment



AET Flexible Space supplied and commissioned additional under-floor air conditioning systems to the seventh and ninth floors of 12-storey Tricorn House, in Birmingham. It also fitted out equipment for the ninth and 10th floors of the multi-tenanted office space. AET Flexible Space continues to work with Commercial Estates Group to provide low energy air conditioning and thermally comforting solutions for the building.

● **Call +44 (0)1342 310400, email lucy@flexiblespace.com or visit www.flexiblespace.com**

Sanha fittings installed at leading educational hub

Sanha's innovative press-fitting system was specified in a major new Manchester Metropolitan University student union building. The company's experienced technical assistance and comprehensive application training allowed building services engineers CM Oxendale to carry out a stress-free installation. The substantial project required more than 3,000 metres of pipe, including Sanha's stainless steel gas pipes, up to 108mm, and copper press fittings up to 108mm. Heating, plumbing, ventilation, air conditioning and control systems were also installed in the state-of-the-art facility.

● **Visit www.sanha.co.uk**

Airedale exhibits at Data Centre World

Leading manufacturer of chillers, precision air conditioning, IT cooling, air handling systems and controls solutions, Airedale, will showcase its innovations at Data Centre World at London's ExCel in March. They include the award-winning SmartCool chilled water PAC – which provides up to 30% more cooling per kW/m^2 than rival systems – Airedale's free-cooling chillers with low global-warming-potential refrigerant R1234ze, and the AireFlow indirect adiabatic AHU which offers huge free-cooling potential.

● **Call 0113 239 1000, email connect@airedale.com or visit www.airedale.com/cibsedcw**

Elta focuses on cost-effective and high-performance IAQ

For Elta Fans Residential Division, the 2015 Ecobuild exhibition, at London's ExCel in March, has taken on added significance after major investment in the firm, the appointment of Colin Hone as UK sales manager, and the creation of a new sales team. Hone said: 'Our company is all about providing exceptional indoor air quality (IAQ) in the most cost effective way. The focus [of Elta Fans' stand] will be on our latest range of decentralised mechanical extract ventilation (dMEV) units. The Mori dMEV unit has achieved exceptional performance results in independent testing.'

● **Visit www.homevent.co.uk**

Monodraught offers Cool-phase with Salix finance funding

The recent Carbon Trust annual survey showed that energy costs are a key issue for most small and medium-size enterprises, and corporate organisations. So Monodraught has joined forces with Salix Finance to help public sector organisations take a lead in tackling climate change by dramatically increasing their energy efficiency through the installation of Monodraught's Cool-phase system. Salix Finance's interest-free capital for the public sector can enable the installation of modern, highly energy efficient technologies, such as Cool-phase, which can help to reduce energy costs.

● **Call 01494 897 700, email melissa.vanegas@monodraught.com or visit www.monodraught.com**

Rinnai – fit for fitness clubs

Rinnai's Infinity range of continuous-flow, gas-fired water heaters are engineered to guarantee the highest efficiencies – and the lowest running costs – of any commercial water-heating system. One fitness club recently replaced its wasteful, stored hot-water system with three Rinnai Infinity HDC 1500i units. Accurately sized and installed on a return system, these happily provide for 12 showers and seven wash hand basins, as well as a kitchen sink at the club. Rinnai HDC 1500 internal and external models turn in an impressive 105% net efficiency, in accordance with BS EN 677.

● **Visit www.rinnaiuk.com**

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Jaga Heating is a breath of fresh air for school

James Aiton Primary School, in South Lanarkshire, recently underwent a £7m rebuild, and was equipped with a biomass boiler to reduce its carbon emissions. It also needed an efficient heating and ventilation system, and the school became the first in Scotland to use Jaga Heating's unique Oxygen technology. The Oxygen refreshers' decentralised supply units – built into Jaga's low-H_2O radiators – bring in outside air, filter it, and then create a controlled cycle of clean air. A master control can regulate the intake of air based on CO_2 levels, and expel stale air outside.

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

New Stannah lift – for those awkward spaces

The New Stannah Piccolo lift could be described as a hybrid. With sliding doors, fully automatic cabin and landing controls, and fabulous finishes, it looks like a passenger lift, and would complement any interior design scheme. But it also delivers all the benefits of a platform lift: compact shaft size; minimal pit and headroom; and use of a single-phase power supply, so lowering running and maintenance costs. It can be accommodated in surprisingly small spaces and lends itself equally well to upgrade and new-build projects.

● **Call 01264 339 090 or visit www.stannahlifts.co.uk/platform-lifts/vertical/piccolo.asp**

Myson's ULOW-E2 – technology in motion

Against a backdrop of rising energy prices and better property insulation, Myson's ULOW-E2 ensures heating systems are both highly effective and efficient. Designed to work with lower system temperatures, and to produce high heat outputs from smaller sizes, the ULOW-E2 uses E2-Technology to switch automatically between static and dynamic operation in a single heat emitter. Static operation allows the ULOW-E2 to operate as a traditional radiator, while dynamic operation will activate in-built fans, significantly enhancing the heat output.

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BAR2996/JA

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BAR2335/MA

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35,000 AED per month, Dubai

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BAR1768/PA

Mechanical Design Engineer

Berkshire/London, Circa £33p/h

Our client is a 30 year old privately owned consultancy that are opening new offices as a result of a steady increase in workload. They require a chartered engineer that has a complete understanding of Hevacomp for a 4 year long contract. IES, Revit and CAD experience wold also be beneficial.
BAR2269/MA

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Mr Antony Small, Senior Mechanical and Energy Engineer,
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Practical controls for HVAC systems
12 February, Manchester

Energy efficiency building regulations: Part L
12 February, Birmingham

Lighting design: principles and application
13 February, London

Fire risk-management system: PAS 7 2013
13 February, London

Designing water-efficient hot & cold supplies
17 February, London

25 ways to save energy in your building
18 February, London

Emergency lighting to comply with fire safety requirements
19 February, London

Introduction to electrical services in buildings
20 February, London

Mechanical services explained
24-26 February, Manchester

Understanding and application of psychrometric charts
24 February, London

Introduction to commercial building services
25 February, London

Fire safety codes for building design and management: BS9999
26 February, London

ENERGY ASSESSOR TRAINING

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

Energy savings opportunity scheme (Esos) training
9 February, Leeds

EPC Training
10-11 February, London

Energy savings opportunity scheme (Esos) training
23 February, London

CIBSE GROUPS, REGIONS AND SOCIETIES

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

West Midlands Region: Leadership and Motivation of People
4 February, Birmingham
An evening presentation from Dennis Beard (Dennis Beard Consulting).

CIBSE Membership Briefing
5 February, Leeds
A briefing focusing on applications for the Associate and Member grades, and Registration with the Engineering Council at the Incorporated and Chartered Engineer levels. The session is an opportunity to meet members in your region, and attend a CIBSE presentation covering the main points of the application process. This will be followed by group or one-to-one discussions with CIBSE staff.
www.cibse.org/briefings

North East Region: Annual Dinner
6 February, Newcastle upon Tyne

South West Region: Annual Dinner
6 February, Bristol

East Midlands Region: Thermal Imaging
10 February, Kegworth
An evening seminar.

CIBSE Lifts Group: AGM and evening meeting
10 February, London

North East Region: 'DIN SPEC Story' – Biologically Effective Illumination
10 February, Newcastle upon Tyne
An evening presentation by Henrik Clausen.

HCNW Region: Work, Career and Inclusivity
12 February, London
A joint event with WiBSE – a series of short talks and discussions, sharing ideas about how we manage today's high-pressure workplaces and busy home lives.

YEN North West Region: Herz Valves Seminar – Energy Efficient Balancing in Variable Volume Systems
19 February, Manchester
Representatives from Herz present a technical seminar on topics such as the principles of flow rate and pressure distribution in a system, resistance in systems, and pump sizing, as well as key points from the BSRIA guide to energy-efficient pumping systems.

West Midlands Region: Office Lighting LG7 and Outdoor Lighting LG6 Guide Updates
25 February, Birmingham
A joint SLL evening presentation by Simon Robinson (WSP) and Alan Tulla (Alan Tulla Lighting).

HCNW Region: Institutions in Construction – The Challenges & Opportunities
26 February, London
Gay Lawrence Race gives her personal view of the challenges and opportunities ahead for institutions in construction, and how women can flourish in the industry.

Society of Light and Lighting Masterclass
26 February, Leeds
This year's masterclass series theme is 'Light for Life', focusing on the relationship between light and wellbeing. With speakers Helen Loomes, from Trilux, Kevin Stubbs, from Thorn, Darren Smith, from Philips, and Dan Wills, from Helvar.
www.cibse.org/sll

ANZ NSW Chapter: Soft Landings
3 March, Sydney
Soft landings raises awareness of performance in use in the early stages of briefing and feasibility, involving the end user from concept design onwards, and helping to set realistic targets.

East Midlands Region: HWS Loading Principles
3 March, Northampton

Home Counties North West Region: Visit – The Crystal – The Future of Cities?
7 March, London
An engineer-guided tour of Siemens 'The Crystal'. The Crystal exhibition centre achieved BREEAM Outstanding accreditation and LEED Platinum.

North East Region Technical Meeting: Swegon Air Academy
10 March, Newcastle upon Tyne

Fresnel Lecture
10 March, London
An SLL Lecture, in celebration of the International Year of Light and the 200th anniversary of Fresnel's Wave theory. Lecture delivered by Peter Phillipson.

EcoBuild, 3-5 March, ExCel London

The sustainable design, construction and energy event returns to ExCel for another year. Visit the new-look, interactive CIBSE stand – at number NN3080 – where the Institution will be hosting one-to-one membership workshops and showcasing its latest projects.

The free-to-attend conference programme, accredited by CPD Certification Service, will deliver practical and applied information, focusing on key issues for sustainability professionals, including sessions with Sir John Armitt, former chair of the Olympic Delivery Authority; Lord Deben, chair of the Committee on Climate Change; and architect Ian Simpson, who will be hosting a session on tall buildings.

Particular highlights will include: a refurbishment and retrofit seminar, featuring a presentation from the 2015 CIBSE Building Performance Award Refurbishment Project of the Year winner (Tuesday 3 March, 12.30-2pm); and the successful energy-management strategies seminar, with a presentation from the CIBSE Building Performance Award Carbon Champion winner (Wednesday 4 March, 12.30-2pm).

For more information and to register, visit **www.ecobuild.co.uk**

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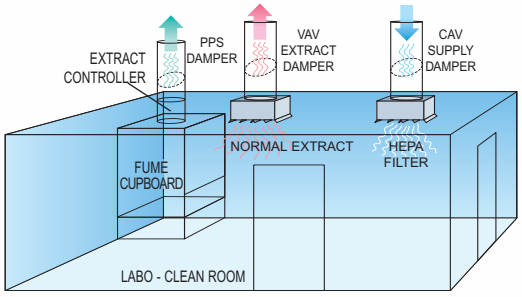

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