

CIBSE **JOURNAL**

#Build2Perform

December 2019

www.cibsejournal.com

SCOTTISH INVENTION

**The sophisticated net-zero energy
strategy at The Event Complex Aberdeen**

**HOW PUPILS SAVED £9,000 BY
ADJUSTING HVAC CONTROLS**

**GETTING A MEASURE OF
EMBODIED ENERGY**

**THE FACTORS AFFECTING
WORKPLACE SATISFACTION**



**Lighting
Special**

BIM Revit Packages

Build better and faster
with a helping hand
from Wavin

Intelligent assistance can double
productivity on-screen and on-site

The unique intelligent design assistance in Wavin's BIM Revit packages can slash project delivery time and costs through more accurate, faster and easier pipe modelling.

The result is 'as-built' designs that reduce risk, eliminate waste and enhance productivity at every stage of a project.

Get your hands on BIM made better
bim.wavin.co.uk



Wake-up call



This year – 2019 – has been the one when the world has woken up to the scale of the damage being done by man to the global climate. Extreme climatic events resulting in devastating floods, wildfires and heatwaves have affected millions around the world, and the growing awareness about the issue is reflected in Oxford Dictionaries announcing that ‘climate emergency’ is its ‘word’ of the year.

The city of Darebin in Australia was the first to declare a climate emergency, in 2016, and Oxford the first British city in 2018. The UK became the first country to declare one on 1 May this year (while Wales and Scotland made separate declarations a few days before). They have now been joined by nine other countries, with Bangladesh becoming the latest last month.

The Scottish government has committed to net zero greenhouse gas emissions by 2045, and one ambitious project from north of the border features on our cover. P&J Live has an innovative energy strategy, which combines an anaerobic digestion plant and combined cooling, heating and power generation plant, with fuel cells to provide energy both for the complex and the local bus fleet.

There was plenty of evidence of inventive thinking in the entries assessed at the judging of the 2020 CIBSE Building Performance Awards. A complete list of shortlisted entries is featured on page 20, and a summary of them on page 18. On page 22 we feature one of last year’s winners – Two Kingdom Street – which won the Energy Management Initiative Award for its demand-driven control strategy.

One area that has to become more prominent in future awards submissions is the whole-life carbon impact of building services. The complexity of measuring embodied carbon means that industry has focused its energies on cutting carbon from operational energy. On page 25, Elementa’s Louise Hamot shares the findings of research into the whole-life carbon of an office refurbishment in San Francisco. The building in question, the headquarters of DPR Construction, happened to win the Project of the Year – International Award in 2017. Hamot used life-cycle assessment software to help break down the carbon emissions of materials identified in the detailed BIM model. She found that building services contributed 40-70% of embodied carbon emissions in a refurbishment or retrofit and 15-50% in a new-build.

We have become used to using the term net zero when considering operational carbon but, as Hamot concludes, we need to be thinking about whole-life carbon too to achieve true net zero carbon.

ALEX SMITH, EDITOR asmith@cibsejournal.com

Editorial

Editor: Alex Smith

Tel: 01223 378034

Email: asmith@cibsejournal.com

Deputy editor: Liza Young

Tel: 01223 378048

Email: lyoung@cibsejournal.com

Technical editor: Tim Dwyer

Designer: James Baldwin

CIBSE Journal is written and produced by CPL (Cambridge Publishers Ltd) Tel: +44 (0)1223 378000. www.cpl.co.uk 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB.

Editorial copy deadline: First day of the month preceding the publication month

The opinions expressed in editorial material do not necessarily represent the views of the Chartered Institution of Building Services Engineers (CIBSE). Unless specifically stated, goods or services mentioned in editorial or advertisements are not formally endorsed by CIBSE, which does not guarantee or endorse or accept any liability for any goods and/or services featured in this publication.

Advertisement sales

Display and sponsorship Jim Folley

jim.folley@redactive.co.uk

Tel: +44 (0) 20 7324 2786

Products & services Jonathan Adebayo

jonathan.adebayo@redactive.co.uk

Tel: +44 (0) 20 7880 6217

Recruitment advertising

cibsejournaljobs@redactive.co.uk

Tel: +44 (0) 20 7880 6215

Advertising production Jane Easterman

jane.easterman@redactive.co.uk

Tel: +44 (0) 20 7880 6248



CONTRIBUTORS



Hywel Davies

How the five-year plan to roll out BIM Level 2 across central government has developed across the sector



Louise Hamot

The challenge of measuring whole-life carbon of services in retrofits and new-builds and how this can be resolved



Dan Reeves

LSE’s sustainability officer on how the institution incorporates wellbeing into its environment



Tim Dwyer

Dampers for the control of fire and smoke in building ventilation systems is the subject of this month’s CPD



CONTENTS

News

6 News

CIBSE Building Performance Awards shortlist; Bolton student accommodation blaze; Grenfell Tower initial findings; smart controls market boom

14 CIBSE news

SLL Young Lighter of the Year winner; climate change work recognition for two CIBSE staff; 2020 training schedule released

Voices

16 Digital evolution

Hywel Davies looks at the progress of the five-year plan to roll out BIM Level 2 across central government projects

17 Feedback

Response to last issue's CHP efficiency article and addressing a VAV knowledge gap

57 Q&A

Dan Reeves, of the LSE, discusses how the built environment affects health and wellbeing

Features

18 Responding to an emergency

The shortlist for the 2020 Building Performance Awards focuses on low energy buildings

22 Fit for a king

Andy Pearson reports on the 2019 CIBSE Building Performance Award-winning 2 Kingdom Street energy project

25 Getting to grips with whole-life carbon

Louise Hamot reports on an Elementa study that attempts to measure the whole-life carbon impact of building services

28 COVER FEATURE Showcasing net-zero

Andy Pearson explores The Event Complex Aberdeen's sophisticated energy strategy, combining anaerobic digestion, hydrogen fuel cells and CHP

33 Joining the elite

Poorly installed cooling systems can have disastrous consequences for energy efficiency and CO₂ emissions. Amanda Birch reports from our REFCOM-sponsored roundtable



Read our Lighting Special

with this issue or online at www.cibsejournal.com

Technical

SPECIAL FEATURES
BMS, controls and monitoring systems

37 News

A round-up of BMS, controls and monitoring system project and product news

38 Factors affecting workplace satisfaction

A major occupancy study by Hoare Lea, supported by UCL, explores the impact of factors affecting the workplace

42 Class control

School teacher Chris Baker explains how he engaged with students to cut energy bills at Parris Wood school by £9,000



57



SOCIAL MEDIA



@CIBSEJournal



CIBSE LinkedIn



CIBSE Journal newsletter



www.cibse.org

FOR CIBSE

Journal production manager: Nicola Hurley
Tel: 020 8772 3697, nhurley@cibse.org

CIBSE, 222 Balham High Road,
London SW12 9BS

Tel: +44 (0)20 8675 5211

©CIBSE Services Ltd. ISSN 1759-846X

SUBSCRIPTION ENQUIRIES

If you are not a CIBSE member but would like to receive *CIBSE Journal*, subscribe now! Costs are £80 (UK) and £100 (international). For subscription enquiries, and any change of address information, please contact Nicola Hurley at nhurley@cibse.org or telephone +44 (0) 20 8772 3697. Individual copies are also available at a cost of £7 per copy, plus postage.

CIBSE Journal, ISSN 1759-846X (USPS 4070) is published monthly by CPL, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK.

The US annual subscription price is £100. Airfreight and mailing in the USA by agent named WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Periodicals postage paid at Jamaica NY 11431.

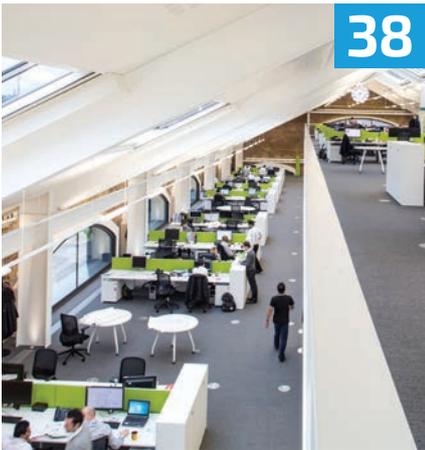
US Postmaster: Send address changes to *CIBSE Journal*, WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA. Subscription records are maintained at CIBSE, 222 Balham High Road, London, SW12 9B, UK.

CREDITS

Cover image David Cadzow P07 Picture Courtesy of ZAK World of Façades Conference P08 iStock.com / Gorodenkoff / MartinPrescott P28 Credit / David Cadzow P47 iStock.com / 1827photography



ABC audited circulation:
17,765 January to December 2018
Printed by: Warners Midlands PLC



CPD

47 Dampers for the control of fire and smoke in building ventilation systems

Focusing on the provision of fire and smoke dampers for ventilation systems to help improve building safety

Classified

52 Products

A round-up of systems and services for the industry

Jobs

56 Appointments

Jobs at jobs.cibsejournal.com

Events

58 Looking ahead

Building Performance Awards 2020; SLL LightBytes; CIBSE training; CIBSE groups, regions and societies



IN BRIEF

Pope backs HFC gases cuts

Pope Francis has given his support to the Kigali Amendment, which sets out a timetable to phase down the use of HFC gases, including as a refrigerant. In a message to the latest meeting of the Parties to the Montreal Protocol in Rome, the pontiff called for the amendment to 'quickly gain universal approval on the part of the whole family of nations'.

He committed the Vatican state to the measures contained in the amendment, adding: 'The Holy See desires to continue giving its moral support to all those states committed to the care of our common home.'

The amendment was adopted in 2016 by 197 countries, which committed to cutting the production and consumption of HFCs by more than 80% over the next 30 years.

BSI's wellbeing in buildings standard

Swansea-based EFT Consult is working with the BSI to produce the UK's first publicly available standard (PAS) to assess buildings' health and wellbeing performance.

The standard will support legislation contained in the Wellbeing of Future Generations (Wales) Act of 2015 by defining good practice in line with the principles of the circular economy standard BS8001. It will apply to all non-domestic building renovations and new-build developments in the public and private sector.

The PAS will allow companies to be measured and assessed against a certifiable code of practice, and recommend a review process for monitoring, measuring and reporting the wellbeing performance in the built environment.

Vaughan joins ChapmanBDSP

Edmund Vaughan has been appointed operations director of ChapmanBDSP after 13 years at Sweco, where he worked on several landmark developments in London.

Vaughan brings expertise in mixed-use developments and of managing retail, residential and educational projects. 'I'm delighted to be joining ChapmanBDSP, which has an excellent reputation for good design,' he said.

HERIOT-WATT EYES NEW CAMPUS IN DUBAI



Heriot-Watt University is to move 4,000 of its students to a new campus in Dubai.

BDP is the architect on the Dubai Knowledge Park educational zone, while Hoare Lea is designing the building services.

Staff and students will move into the new campus building in January 2021.

It will support teaching and research in data science, computing and artificial intelligence; business, accounting and finance; psychology; architecture and design; and construction and engineering.

The Scottish university opened up its campus in 2005 and now operates five across the UK, Dubai and Malaysia.

Green policies on election agenda

Parties set out their 'green' ambitions ahead of this month's General Election

Labour has vowed to deliver nearly 90% of electricity and 50% of heat from renewable and low-carbon sources by 2030 if it wins the General Election. In its manifesto it said it wanted to achieve a 'substantial majority' of emissions reductions by 2030. Labour aims to achieve a net-zero economy 'well before 2050'. It aims to make all new homes zero carbon by 2022, and has pledged a £60bn programme to install energy-saving measures in most of the UK's existing 27 million homes, while its manifesto announced a £250bn 'Green Transformation Fund'.

Ahead of its manifesto launch, the Conservatives had pledged to spend £800m on carbon capture and storage (CCS) by the mid-2020s, double investment in 'green' R&D, to £18bn, by 2024, and increase offshore wind capacity from 30GW to 40GW by 2030.

The Liberal Democrats manifesto targets

a net-zero emissions in the UK by 2045 and a halving of emissions by 2030. It pledges to generate 80% of electricity from renewables by 2030, and retrofit 26 million homes with energy saving measures. It has previously committed to spending an extra £100bn on climate mitigation and adaptation, and environmental conservation; £10bn would be allocated to domestic renewables and £15bn to an 'emergency' 10-year programme to decarbonise heat, reduce fuel poverty and increase efficiency of existing buildings.

The SNP is aiming for a 75% reduction of all emissions by 2030, net-zero carbon by 2040 and net zero for all emissions by 2045.

The Green Party wants to create an annual £100bn 'climate emergency fund' to make Britain carbon-neutral by 2030, including the abolition of gas central heating in new homes. It will also appoint a 'carbon chancellor', tasked with judging economic policies and key government decisions against their likely impacts on the environment.

Political parties offer a forest of ideas

Trees have been thrust into the heat of the General Election, with the Conservative Party promising to plant 30 million a year by 2025 - only to be outdone by the Liberal Democrats, who have pledged to plant twice as many.

The Conservatives say they will spend £640m on trees and restoring peat land, but Labour dismissed the plan and said the Prime Minister, Boris Johnson, had an 'atrocious environmental record'. The Tory fund would cover England, but the party said it would work with devolved administrations in Scotland, Wales and Northern Ireland to increase tree planting.

The Committee on Climate Change has recommended that 30,000 hectares of woodland should be planted annually, but less than half that amount was planted in the UK in the year to March 2019.

Blaze building checked after Grenfell

Investigation into fire at Bolton student flats to look at construction materials used

A student accommodation complex in Bolton that was gutted by fire last month was reportedly clad in a flammable material, but not the same type used on Grenfell Tower.

It is understood that The Cube was clad in a high-pressure laminate (HPL) material made from wood pulp, which is no longer permissible on new buildings.

Greater Manchester Fire and Rescue Service (GMFRS) confirmed The Cube had been checked following the Grenfell disaster to make sure it did not have the same aluminium composite material (ACM) cladding used on the London tower block, where 72 people died in the fire on 14 June 2017.

It added that it was now initiating a 'complex investigation' into the blaze, which rapidly spread outside the top floor of the six-storey building.

'Following the fire, our investigation will consider the materials used within the external wall construction and what, if any, role these materials played in the development and spread of fire,' a GMFRS statement said.

Phase 1 of the The Cube is classified as a high-rise building, but Phase 2 - where the fire took place - is less than 18 metres high, so

is not classified as a high-rise building under post-Grenfell rules. Buildings over 18 metres are subject to additional safety requirements, such as having a fire-fighting shaft and ensuring increased fire resistance in the steel structure.

The owners of The Cube had carried out remedial work on the complex as a result of the 2017 inspection and after a GMFRS request.

Martin Kealey, chairman of the CIBSE Guide E Steering Committee, welcomed the success of the simultaneous evacuation strategy, in which no-one was seriously hurt.

However, Kealey pointed out that CIBSE and



Riba would also like to see sprinkler systems specified on all such types of residential premises.

While the fire alarms were triggered and alerted occupants to the blaze, some students reported that alarms were initially ignored because of the high frequency of false alarms in the building. Kealey suggested the deployment of heat sensors as well as smoke detectors in rooms, to localise smoking-related alerts and minimise false alarms across the premises.

A year ago, government banned combustible cladding in the external walls of new buildings over 18 metres high. However, Kealey said: 'Having an 18-metre rule doesn't fix the problem. It needs to make it clear you can't specify combustible material on high, medium or low-rise buildings.'

Meanwhile, the Fire Protection Association (FPA) has called for a total ban on the use of combustible materials on buildings, irrespective of height. An FPA statement said the fire provided 'a stark reminder that the problem facing UK fire safety is the result of many issues and not just Grenfell-style ACM cladding'.

The FPA is calling for a number of measures, including the combustibility ban to be based on risk rather than height, and the mandating of high integrity alarm systems to avoid false alarms as well as sprinklers in high-risk environments.

Grenfell Tower refurbishment breached Building Regulations

The refurbishment of Grenfell Tower did not comply with Building Regulations, according to the judge leading the inquiry into the June 2017 fire. However, detailed judgment on issues of design, construction, testing and use of building materials will not be delivered until the end of phase two of the inquiry, which starts in January and is expected to take 18 months. Around 200,000 documents have already been assembled for this next phase.

Sir Martin Moore-Bick's 1,000-page report covering phase one of the inquiry was critical of the fire brigade's response, but concluded that the cladding was the 'principal reason' for the speed with which the fire spread. The inquiry chair said the aluminium composite material (ACM) acted as a 'source of fuel', while the fire's progress was accelerated by combustible materials in the insulation and the window surrounds.

The 'decorative' architectural crown of the tower also played a 'significant role in enabling the fire to spread around the building', the report added. There was 'compelling evidence' that Grenfell Tower's external walls did not comply with the Building Regulations requirement to 'adequately resist the spread of fire', but, in fact, 'actively promoted it'.

'There is compelling evidence that Requirement B4(1) was not met in this case. It would be an affront to common sense to hold otherwise,' said Sir Martin, who added that phase two of the inquiry would examine why those responsible for the design of the refurbishment considered the tower would meet that 'essential requirement'.

He did not call for the retrofitting of sprinklers in all tall buildings, but did urge the government to speed up the process of stripping ACM cladding from buildings as 'vigorously as possible', and said 'particular attention' should be paid to decorative features composed of combustible materials.

Sir Martin also said the government should consider whether England should follow Scotland's example and lower the threshold that defines a high-rise building from 18 metres to 11 metres.

Pasetto to chair CWCT

Skanska's head of façades, Saverio Pasetto, has been appointed chair of the Centre for Window and Cladding Technology (CWCT).

The industry body was founded 30 years ago and provides information and training in façades and the building envelope, including curtain walling, windows and cladding.

Pasetto, who is also chair of the Society of Façade Engineering, has more than 25 years' experience working with façades, and has worked for Skanska for more than 12 years.

'I want to ensure we continue to be responsive to the industry, and lead the sector forward, especially in these challenging times, and to encourage new developments and innovation in the industry,' Pasetto said.

'We are continually working to engage with key stakeholders to move the industry forward... and this is a great opportunity for me to use Skanska's knowledge and expertise to influence the façades sector,' he said.



IN BRIEF

London office starts at five-year low

New office project starts in London have fallen to their lowest level in five years, Deloitte Real Estate's Office Crane Survey has found.

Construction started on just 24 schemes, providing 1.8 million ft², compared with 37 schemes, of up to 3.5m ft² in the previous survey earlier this year. Both new-build and refurbished construction declined sharply, with the former down by 54%, and refurbishments 41% lower across central London.

However, Deloitte's analysts said this represented a 'rebalancing' of the market after a period when it reached a three-year high, and was not the sign of long-term decline.

The number of workers from outside the UK has also fallen, to an average of 25% of the London workforce – down from 33% last year. Deloitte also reported an improvement in payment behaviour, with fewer subcontractors having to wait more than 90 or 60 days for payment. More than a third are receiving payment within 30 days.

This survey suggests developers are taking 'time out', but central London still has three million ft² of proposed office space in demolition, indicating 'the next survey could see an uptick in new starts, albeit modest,' a Deloitte statement said.

£500m recovered from Carillion collapse

Liquidators have so far recovered more than £500m after the collapse of Carillion in January 2018, including £88m since last December. Another £10m is expected to be realised from further asset sales and recoveries from debtors, according to an update from the official receiver David Chapman to MPs Frank Field and Rachel Reeves, who chair the Carillion Joint Inquiry.

Carillion was estimated to owe £2bn to 30,000 subcontractors, suppliers and other creditors when it collapsed. The update also revealed that accountancy firm PwC earned almost £44m in fees from its work on the liquidation in 2018, and another £8.5m between January and August this year.

'The complexities of Carillion's structure and dealings, as well as the volume of evidence to be reviewed, are significant and it is not possible to say when we will complete the investigation,' said Chapman.

Manufacturers' data comes under renewed scrutiny

Hackitt Review highlighted inconsistent product performance data

The way manufacturers' product information is presented will be subject to new standards after a review by the Construction Products Association (CPA).

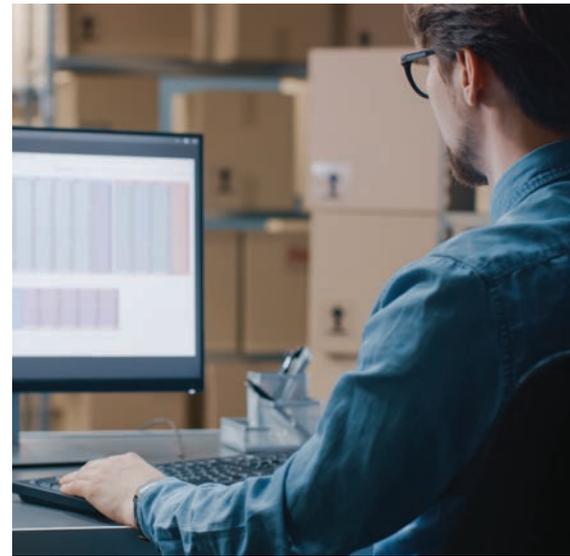
The Hackitt Review highlighted problems and inconsistencies in the way product performance data was presented, so the CPA commissioned NBS to survey more than 500 industry professionals, including manufacturers, merchants, architects, engineers, surveyors, contractors, local authorities and FM providers.

The survey showed that there is a strong preference for information to be supplied in a digital format. There is also a desire for standardised and more complete information, including highlighting applications where the product may or may not be suitable for use.

It also makes clear that there is strong industry support for the introduction of competence levels for those specifying, installing or maintaining products and the systems they make up. An industry code of conduct for manufacturers is also supported by respondents, to ensure that product information

has been verified properly before publication.

'It is vital that everyone in the supply chain can be confident that the information they are using to select construction products is clear, unambiguous, accurate and up to date,' said the CPA's marketing integrity group chair Adam Turk.



Smart meter target 'likely to be missed'

Energy companies say it is highly unlikely that the government's target for rolling out smart meters can be achieved.

Research by the trade body Energy UK suggested the industry would fall short of the ambition to install the meters in 85% of homes and businesses by 2024, which is a revised target from the original aim of providing a smart meter to every building by 2020.

The research, carried out by Frontier Economics, estimated that 'at best, only 68%' of homes and businesses will have a smart meter by 2024, with only one in eight suppliers likely to achieve the 85% figure.

Energy UK has written to the government explaining that consumer appetite for smart meters

has fallen to 'well below the levels previously hoped' and that, so far, just 16.5 million have been installed.

'The energy sector is fully committed to completing the rollout successfully and efficiently, as a crucial step to delivering a modern energy system critical to the delivery of the net-zero [carbon emissions by 2050] target,' an Energy UK statement said.

'It is our shared ambition to ensure that as many households as possible can benefit from smart meters. That is why we have suggested a number of proactive policies the government should implement quickly to drive greater consumer uptake of smart meters, which will be vital to ensuring the successful delivery of the programme over the next few years.'





NOT ALL HYBRIDS ARE A GOOD IDEA...



...but with XBOXER Hybrid ventilation you get the best of both worlds.

All the benefits of a natural system, together with the reassurance of our market-leading mechanical expertise. They even come with a separate quick-fix ceiling bracket which can be installed at 1st fix stage. So when you're ready, they can be offered up to the pre-installed ceiling bracket for simple slab or drop rod installation.

Quick-fix
ceiling bracket
for simple slab
or drop rod
installation



NUAIRE. FOR THE COMPLETE VENTILATION SOLUTION.

T 029 2085 8504 **E** HYBRID@NUAIRE.CO.UK **W** NUAIRE.CO.UK/HYBRID **I** @NUAIREGROUP

xboxer
Hybrid 

IN BRIEF

Smart controls market record

The annual value of the total controls and building energy management systems market in the UK hit a record £734.8m in the second quarter of 2019, according to the latest figures.

The Building Controls Industry Association's (BCIA) Market Information Services figure for Q2 2019 is higher than the previous market high of £705.7m in Q1 2019, representing an increase of 4.1%.

The figures come as new research on the investment potential of smart buildings has been released by management consultancy CIL. Interviews with 150 landlords, property managers, agents and suppliers across North America and Europe showed that 58% of respondents see smart controls and sensors as important in building management, while 92% think spend on such technology is increasing. The study forecasts a growth rate of more than 10% over the next five years.

Visit cilconsultants.com

WGBC sustainable case study library unveiled

The World Green Building Council (WGBC) has launched a new digital case study library showcasing a selection of the world's most cutting-edge sustainable buildings.

Each case study demonstrates enhanced performance in relation to health benefits or achieving net zero operational carbon, as verified by established certification schemes, rating tools or other third-party verification. It will be open for new submissions via the website bit.ly/CJDEC19WGBCnews

CIBSE reveals shortlist for Building Performance Awards



The 13th awards feature two new categories, including Retrofit Project of the Year

The shortlist has been revealed for the 2020 Building Performance Awards, which this year feature new categories including an award for the best Retrofit Project of the Year.

This award attracted a wide variety of entries pertinent to today's engineering challenges, such as a tower re-cladding project.

As well as established names such as Arup, Aecom, Max Fordham, Foster + Partners and Atkins, the shortlist featured other up-and-coming companies for the first time, such as Noel Lawler Green Energy Solutions and Hyspot.

Among the 14 awards is a new category 'Product and Innovation - Wellbeing' that recognises the increasing importance of occupant health and mental wellbeing. High-profile buildings shortlisted include Maggies at the Robert Parfett Building, the Graphene Engineering Innovation Centre, Manchester and the Agar Grove Passivhaus scheme in London.

There are three vying for the Engineer of the Year Award: Aecom's Dave Cheshire, BuroHappold Engineering's Tom Hopton and Tom Naughton of FairHeat.

The ceremony, featuring Baxi Heating as headline sponsor, takes place on Tuesday 11 February. Book a ticket at www.cibse.org/bpa

Shortlisted for the Engineer of the Year are (from top) David Cheshire, Tom Hopton and Tom Naughton

EIB to stop financing fossil fuel projects

The European Investment Bank (EIB) has announced a new climate strategy and energy project lending policy to accelerate clean energy innovation, energy efficiency and renewables. The strategy will see the organisation end financing for fossil fuel energy projects by the end of 2021.

EIB Group financing aims to unlock €1tn (£860m) of climate action and environmental sustainable investment before 2030. All financing would be aligned with the goals of the Paris Agreement from the end of 2020.

The clean energy strategy is underpinned by five key principles, including support for the EU Energy Efficiency Directive and encouraging energy decarbonisation through increased support for low or zero carbon technology. It aims to increase financing for decentralised energy production, energy storage and e-mobility, and invest in electricity grids to ensure continuation of energy supply. There will be a strengthening of cross-border interconnections and support for energy transformation outside the EU.

The TurboChill range from Airedale

With ESEER up to 9.28

TurboCor, turbo charged



TurboChill Water Cooled



TurboChill Air Cooled



TG230



TurboCor Compressor

The TurboChill range is optimized for use with Turbocor oil-free centrifugal compressors, delivering low-maintenance and near-silent cooling solutions. For more information visit airedale.com or call 0113 2391000

Airedale
APPLIED THERMAL INNOVATION

ENGINEERING QUALITY THAT WON'T BE BEATEN



Our NEW high-performance Quinta Ace wall-hung boilers are at the apex of innovation and efficiency.

Built on our pioneering Quinta design platform and with ultra-low Class 6 NO_x emissions, they're way ahead of the pack when it comes to cost-effective, reliable performance.

Quinta Ace boilers are available in 30 to 160kW models, and their ultra-compact size makes them ideal for either small plant rooms or larger cascade configurations. And when in cascade, they're capable of an impressive 1.3MW output, putting them in a class of their own.

Plus, with eSmart inside and a new MK3 controller that's easy to use and easy to commission, our Quinta Ace boilers are precision engineered for whatever the future holds.

All this comes backed up by a 2-year warranty* as standard, extended to 5 years for the heat exchanger,* as well as expert technical support including one-to-one design advice and our extensive BIM library.

Be first in line.

Call **0118 978 3434** or visit **remeha.co.uk**



* Visit remeha.co.uk/customer-support/warranty for details.

CBI wants 'decade of climate action'

Reducing the carbon content of heating is at the heart of recommendations from business body the CBI ahead of this month's General Election.

Director general Carolyn Fairbairn said the new government should embark on a 'decade of climate action', including investment in renewable and nuclear electricity generation, and decarbonising heat and transport networks. Emissions from products imported to the UK should also be included in national greenhouse gas (GHG) accounts, to help towards the 2050 net-zero carbon economy goal, she added.

The CBI wants more support to expand the use of emerging decarbonisation technologies, such as hydrogen and carbon capture, use and storage, and is urging ministers to push for large investments 'sooner, rather than later'. It points out that heating and hot water account for around 15% of the country's carbon footprint.

Radon risk increased by push for building energy efficiency

UCL research says greater airtightness is raising levels of gas linked to lung cancer

Rising levels of radon gas are having an adverse effect on the health of building occupants, according to research carried out by University College London (UCL).

Increased building airtightness to improve energy efficiency is blamed for the rise in levels of a gas that is linked to lung cancer, and which is blamed for more than 1,100 deaths in the UK every year, says the research.

UCL found that 67% of properties with retrofit double glazing recorded greater radon levels than those without similar measures. Testing and inspection firm Bureau Veritas said the UK construction industry should put more radon-monitoring measures in place to assess the risks.

'While the push to make UK buildings more energy efficient has largely been a positive step in the right direction, an unintended and

unexpected consequence has been worsening indoor air quality – particularly indoor radon levels,' said Bureau Veritas principal consultant Ian Mitchell.

'We are encouraging the construction industry to be vigilant, not only in continuously monitoring radon levels, but also in having a robust and effective strategy in place that adequately protects employees.'

Under the Health and Safety at Work Act 1974, all organisations are required to carry out a radon risk assessment. UK workplaces located below ground floors or in an area of high radon activity – and that are occupied for more than an average of one hour per week or 52 hours per year – must carry out testing as part of the radon risk assessment.

Meanwhile, the Ionising Radiation Regulations 2017 (IRR17) require all UK businesses to adhere to a radon exposure limit of 300Bq/m³ in the workplace.



KSB Industrie 4.0 - The Digital Industry

Smart pump sets from KSB are paving the way for Digital Industry. Automated pump sets equipped with the PumpDrive variable speed system and the PumpMeter monitoring unit are ideally suited for connection to other components to form smart networks. KSB's products are already offering the highest levels of efficiency with maximum operating reliability and availability today.

For more information please visit: www.ksb.co.uk - 01509 231872

➤ Our technology. Your success.

Pumps • Valves • Service





LUX Manufacturer of the Year 2018

Have you seen the **light**?

“

“If you always do what you’ve always done, you’ll always get what you’ve always got.”

– Ford

“

If not us, who?
If not now, when?
– John F. Kennedy

”

“

“Insanity is doing the same thing over and over again and expecting different results.”

– Einstein

”



tamlite.co.uk/butterfly

#WorthAnotherLook



IN BRIEF

Help us make your membership fees go further

Every year, CIBSE spends significant resource chasing membership subscription fees. To ensure your fees go towards the things that matter – such as funding our networks, publishing new guidance and supporting the building services industry – please remember to renew your membership by 1 January 2020. Log into your MyCIBSE account to pay online, or call +44 (0)20 8772 3650 to make payment over the phone.

Become a Chartered Engineer next year

Don't miss the upcoming application deadline of 1 February 2020 for the CIBSE Associate and Member grades, with IEng or CEng registration. For details of what you will need to submit, and to access guidance to help you start planning your application, visit www.cibse.org/closingdate. Should you need any advice, please contact our membership team.

Wawryniak wins Young Lighter award

Paper on human-centric lighting in underground transportation earns prize

Anna Wawryniak was crowned the Society of Light and Lighting (SLL) Young Lighter of the Year 2019 at the Lux Awards.

Wawryniak, who works at architectural lighting design consultancy Peter Andres Lichtplanung in Germany, won the £1,000 prize for her video presentation *A light booster metro car for the commuting work force: human-centric lighting in underground transportation*, given in front of a judging panel at LuxLive in November.



Anna Wawryniak

Wawryniak trained as an interior architect at the University of Arts and Design Halle, and graduated with a master's degree in architectural lighting design 2019 at the Royal Institute of Technology Stockholm.

The three other finalists were: Fatemeh Dastgheib, KTH Royal Institution of Technology, for her presentation *Outdoor lighting and perception of safety from a female perspective*; Melissa Kennedy, WSP, London, for *Texture within the light: evaluating the impact of textured light upon the sensual atmospheres within art, architecture and design*; and Nills Voerste, Bauhaus University Weimar, Germany, for *Evidence-based lighting design for urban environments: natural and artificial lighting impacts on people's experiences of public space*.

This was the 25th year of the SLL Young Lighter of the Year awards. They are designed to test not just the finalists' ability to develop a lighting project, but also their presentation skills – an important skill that can make a big difference when communicating theoretical ideas on a lighting project.

View the videos at bit.ly/CJDec19YSSL

New members, fellows and associates

FELLOWS

Leung, Wai Chung

Kowloon, Hong Kong

Shaikh, Mohammed Imran

Mohammed Zubair

Dubai, United Arab Emirates

West, Brian Lee

Abbeyleix, Ireland

Pusey, Sarah

Capel, United Kingdom

Sze, Shing Yau

North Point, Hong Kong

MEMBER

Bell, Kirsty Maree

Poole, United Kingdom

Penny, Stephen Robert

Christchurch, New Zealand

Zara, Enrico

Sydney, Australia

Chalkias, Alexandros

London, United Kingdom

Pallas, Matthaios

London, United Kingdom

Stanislawek, Jan Witold

Reading, United Kingdom

Lee, Chak Yau

Chatswood, Australia

Ng, Kwok Leung

Tin Shui Wai, Hong Kong

Chan, Yui Pan

Nay Tau Kok, Hong Kong

Smart, Iain Douglas

Bristol, United Kingdom

Li, Ho Kwan Edmund

Tai Wai, Hong Kong

Lam, Chiu Yu

Sham Shui Po, Hong Kong

O'Sullivan, Gary

Claremorris, Ireland

Tso, Chun Yip

Tseung Kwan O, Hong Kong

Subramanian, Thiruvankadam

Dubai, United Arab Emirates

Yip, Yuk Cheong

Kowloon Bay, Hong Kong

Lee, Lok Man

Southern District, Hong Kong

Ngan, Hoi Yan

Tseung Kwan O, Hong Kong

Fung, Woon Ming

Kwun, Hong Kong

Leung, Chi Fai

Kowloon, Hong Kong

Longo Bianchi, Fausto

Cork, Ireland

Lo, Cho Hang

Sha Tin, Hong Kong

Fung, Lai Shan

Sha Tin, Hong Kong

Connon, Ben

NT, Australia

Leung, Wai Kwan

New Territories, Hong Kong

Tanase, Mihai

Dublin, Ireland

Tam, Shun Chi

Tsuen Wan, Hong Kong

Sellers, James David

Sheffield, United Kingdom

Bowler, Marianne

Christchurch, New Zealand

Kwong, Wong Man

Diamond Hill, Hong Kong

So, Hoi Ling

Ma On Shan, Hong Kong

Chu, Shu Leung

Tuen Mun, Hong Kong

Leung, Kin Fung

Tai Wai, Hong Kong

Sham, Wo Him

Sai Ying Pun, Hong Kong

Lam, Man Kin

Aberdeen, Hong Kong

Smith, Graeme Stewart

Christchurch, New Zealand

Wardale, Jack

Southport, United Kingdom

ASSOCIATE

Ali, Steve

London, United Kingdom

LICENTIATE

Cheung, Chung Man

Tsuen Wan, Hong Kong

Thompson-Howe, Corey-Amar

Birmingham, United Kingdom

Quilliam, Jan

Bolton, United Kingdom

O'Connor, Thomas

Milton Keynes, United Kingdom

Marley, Liam Thomas

Newcastle upon Tyne, United Kingdom

Hines, Joshua

Birmingham, United Kingdom

Ashton, Joseph

London, United Kingdom

Smith, Jessica

Solihull, United Kingdom

Wilson, Stephen

Essex, United Kingdom

Whittaker, Kadeem

Hessle, United Kingdom

Minhas, Muhammad Azam

Plymouth, United Kingdom

Barron Himsforth, Alejandro

Birmingham, United Kingdom

Motson, Robert

Southampton, United Kingdom

Tibbs, Ben

Newmarket, United Kingdom

Handley, Adam

Monmouth, United Kingdom

Chen, Xilai

Cardiff, United Kingdom

YEN BALL LIGHTS UP CARDIFF CASTLE

More than 100 people attended the CIBSE YEN Regional Ball, organised by the South Wales region, which took place in Cardiff Castle in October.

Special guest speakers Jane Hutt, Welsh Assembly Member, and Sophie Howe, Future Generations Commissioner for Wales, gave impactful speeches on the importance of change in our industry, highlighting the need for diversity, care, innovation, ownership and accountability.

Special thanks go to the event's main sponsors Tamlite Lighting and Lochinvar.



New 2020 CIBSE training schedule released

■ **Part L and heat networks feature prominently in CIBSE courses**

The 2020 CIBSE training schedule has been launched, and includes more than 200 courses covering everything from heat networks and lighting to fire safety and energy efficiency. CIBSE members can now also get 15% off CIBSE training courses.

There are two updated courses for 2020. The **Heat Networks Code of Practice (CPI)** two-day course will give you the skills to implement the new CIBSE Heat Networks Code of Practice by exploring the themes and technical challenges found in the code. After the course, there is an opportunity to take an exam to gain entry to the Heat Networks Consultant register.

The **Energy Efficiency Buildings Regulations: Part L2 2020** focuses on building energy efficiency with consideration to amendments to the Buildings Regulations coming into force in 2020 – for instance, primary energy, instead of CO₂, being used as the metric to assess building performance.

The training programme also includes soft skills courses to strengthen essential workplace skills not specifically related to engineering. To view the full training schedule for 2020 and to make a booking, visit www.cibse.org/training2020

Mylona and Godefroy recognised

Two CIBSE staff members have been recognised for their knowledge and expertise in the ongoing development of climate-change research and policy.

Dr Anastasia Mylona, CIBSE's head of research, has been appointed chair of the advisory board of the centre for doctoral training (CDT) in energy resilience and the built environment (ERBE), a collaboration between University College London, Loughborough and the Centre for Marine and Renewable Energy in Ireland. It is the third phase of the London/Loughborough CDT, set up in 2009 by former CIBSE vice-president Professor Tadj Oreczcyn. See www.lolo.ac.uk/erbe

Dr Julie Godefroy, CIBSE's technical manager, presented the CIBSE Climate Change Action Plan at the Construction Industry Council (CIC) meeting in November. As a result of the meeting, the CIC has established a new Climate Change Panel, and Dr Godefroy has been invited to be the CIBSE representative.

To view the CIBSE climate action plan, visit bit.ly/CJDec19CIBnetzero

IN BRIEF

TM40 webinar available on demand

A webinar introducing the new edition of TM40: *Health and Wellbeing in Building Services* is now available on demand.

It took place on 21 November and was presented by Julie Godefroy, CIBSE technical manager, and gives a summary of what to expect from the new TM40, released in November.

Consideration of building users' health and comfort has always been fundamental to the role of building services engineers. Advances in knowledge and approaches to wellbeing – and the acknowledgement of the significant role the built environment can play in occupants' health and wellbeing, comfort and cognitive performance – have prompted the revision of TM40, first published in 2006.

To listen to the webinar visit www.cibse.org/TM40webinar

Jean Heap Bursary

The 2020 Jean Heap Bursary, which awards up to £4,000 for lighting projects, is open for applications. Launched in 2014 as a tribute to the commitment Heap showed to lighting research and education within the Society of Light and Lighting (SLL), the bursary is open to anyone with an interest in lighting.

The judging panel will be looking for a study or research designed to benefit the industry and SLL. Proposals should also include an outline of why the applicant needs further funding and how it will be used. More information and applications are available at bit.ly/CJDec19JHB and the successful applicant will be announced at the SLL AGM in May.

Digital evolution

How has the five-year plan to roll out BIM Level 2 across central government projects developed across the construction sector? Hywel Davies investigates

In March 2011, the then government's Construction Client Group published its Building Information Modelling (BIM) Working Party Strategy Paper. This recommended 'a series of small but significant steps to enable [delivery of] project information at 'Level 2' of the maturity model over a five-year period'.

Under the 'BIM Strategy', the British Standards Institute (BSI) was commissioned to develop Publicly Available Specifications (PAS) as part of the BIM Level 2 package. PAS 1192-2 was published in 2013 and Part 3, for the operational phase, emerged in 2014. A UK implementation of the data standard, called COBie, was also developed, along with a revision of the CIC BIM Protocol.

By 2016, the basic building blocks were in place for major central government projects to adopt BIM, but universal adoption of 'BIM Level 2' was perhaps still a way off – not least because nobody had a firm definition of what it constituted; certainly nothing firm enough to hold anyone to in a contract.

In 2016, the government's BIM Task Group came to an end and, in 2017, the baton was passed to the new Centre for Digital Built Britain (CDBB), based at the University of Cambridge. This is a partnership between the university and the Department for Business, Energy & Industrial Strategy to understand how the construction and infrastructure sectors could use a digital approach to better design, build, operate, and integrate the built



“Adoption of BIM Level 2 was some way off as nobody had a firm definition of what it constituted”

environment, mapping the path to a 'Digital Built Britain'.

CDBB inherited the BS and PAS 1192 standards and the guidance that the BIM Task Group had produced. It also took on a much wider role, however, in support of the adoption of digital processes across the built environment sector, as part of the Transforming Construction Challenge. Meanwhile, BSI had established a work programme within the International Organization for Standardization (ISO), to transfer the BS and PAS 1192 series into a set of international standards.

The ISO 19650 series is an evolution of UK standards for BIM, for international adoption. The principles are broadly as set out in the BS/PAS 1192 series, although the concept of 'BIM level 2' does not appear in the ISO 19650 series.

Meanwhile, the UK BIM Alliance was formed to bring together interested parties in industry to take forward and really implement what we used to think of as 'BIM Level 2'. Now the UK BIM Alliance, BSI and CDBB have come together to create the UK BIM Framework. This replaces the old BSI

BIM Level 2 website, and provides a coordinated and overarching approach to implementing BIM in the UK. The framework sets out the approach for implementing BIM in the UK, managing information provided by the ISO 19650 series. It includes:

- The published standards called upon to implement BIM in the UK
- The UK BIM Guidance Framework
- Useful links to other resources.

CIBSE guidance on the use of BIM for building services is available through the Digital Engineering Series bit.ly/CJDec19SDE Further details on the UK BIM Framework can be found at ukbimframework.org

We still have a way to go before BIM is widely adopted and making a real contribution to the safety and effective management of the built environment. As the past eight years have shown, this is an evolutionary process, but we need to keep changing and adopting digital processes.

Information management according to BS EN ISO 19650, UK BIM Alliance bit.ly/CJDec19UKBIM

References:

- 1 Information management according to BS EN ISO 19650, UK BIM Alliance bit.ly/CJDec19UKBIM

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

THE ISO 19650 SERIES

ISO 19650-1 & 2 covers the delivery phase of a constructed asset (not just buildings), and follows a sequence of activities for information management during the delivery phase of a project and for each appointment, following the process below.

There is transitional guidance designed for those who have been applying 'BIM Level 2' and the BS/PAS 1192 series to projects. This has been prepared by the UK BIM Alliance and BSI, with the support of CDBB and detailed input from active practitioners.

Work to develop ISO 19650-3, covering the operational phase, is well advanced, with the draft international standard recently published for public comment. Security-minded BIM is addressed in Part 5, which has also been out for comment. Both are to be published in 2020.

- 1 Assessment and need ■ 2 Invitation to tender ■ 3 Tender response
- 4 Appointment ■ 5 Mobilisation ■ 6 Collaborative production of information
- 7 Information model delivery ■ 8 Project closeout

Information management process during the delivery phase of assets

Response to CHP efficiency article, and addressing a VAV knowledge gap

Successful operation

I was encouraged to see the article 'A condensing guide to CHP efficiency' in the November 2019 *Journal*. Over the years, many hybrid CHP/boiler systems have failed to perform as intended because the design did not ensure the CHP operated to deliver its maximum possible heat output – and, hence, electricity output – under all conditions.

It appears Remeha has found a solution to this difficult problem, not only ensuring that the CHP output is optimised by modulating the associated boilers to meet any deficit in load demand, but also ensuring the CHP and boilers operate in condensing mode. Of particular importance is the maintenance of the 30°C temperature difference across the load circuits under all conditions, as the performance of the system is critically dependent on the control of the load circuits to achieve this.

Could I ask that a case example of where this has been successfully implemented be included in the second article in the series? This would help show how the principles used in a successful design can be implemented in practice. Some details of how the load circuits are controlled, and the CHP maintained at full output while the boilers are modulated, would also be informative.

David Palmer

The editor replies: The second part of the article by Ryan Kirkwood will appear in February's *CIBSE Journal*.

CIBSE LinkedIn Group discusses lack of VAV knowledge

There seems to be a thirst for information on VAV systems and, to some extent, staircase pressurisation systems.

Adam Muggleton

Most – or all – technical and degree-level courses in building services are big on the maths and science, but do not adequately address practical applications. Many mechanical and controls engineers do not have a holistic grasp of 'systems engineering', system dynamics or controllability over the lead range.

In the UK, I've seen a worrying lack of knowledge of VAV and stair-press systems by both mechanical and controls engineers. Poor selection of VAV box size; incorrect application of air-quality and mixing-damper control; failure to control supply/extract balance, resulting in space static pressure out of limits, causing unwanted air transfer to/from other spaces and outdoors; incorrect sensing of supply duct pressures, resulting in poor energy performance. I could go on...

Nick Skemp

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, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK.

We reserve the right to edit all letters.

Opportunity knocks

Unless the industry gives young people more opportunities, the skills gap will continue to widen, says CIBSE Patrons chair **Nick Mead**

The Stem charity in2scienceUK recently held its annual celebration at Google's

DeepMind facility, packed with students, supporters, volunteers and sponsors.

The charity was founded in 2010 by Rebecca McKelvey, to give young people from low-income backgrounds an opportunity to gain practical

insight into the Stem sector, as well as the knowledge and confidence to go on to university. It now receives more than 1,000 applications every year – and 75% of the students it supports go on to take degrees in Stem subjects.

'Students from low-income backgrounds face major barriers when pursuing their interests in science, including a lack of experiences outside of school, knowledge of degree options and understanding of the university application process. This leads to low participation in key Stem subjects,' McKelvey said.

A number of impressive young people addressed the in2scienceUK event, and all transmitted their enthusiasm for their work placements in academia and with Stem employers. They were visibly excited by the possibilities, having been exposed to the practical application of technologies such as AI, and hugely grateful to their mentors and volunteers. Showing young people what our technology can do and the difference it makes to communities is crucial if we are to engage with the more diverse audience we need to plug our widening skills gap.

CIBSE Patrons' latest Arkwright scholar Laurie Maddalena has also recently returned from an inspiring trip to Kenya, where he not only helped to build a new classroom, but also taught in the school. He described the experience as 'the most eye-opening of my life'. Maddalena has also had placements with ChapmanBDSP and Sir Robert McAlpine shadowing engineers.

In October, we had the 24th final of the CIBSE Graduate of the Year award at the IMechE and, again, we were treated to a glimpse of the exciting talent coming into our industry.

These are all inspiring and encouraging examples, but we remain woefully short of the numbers we need to keep the industry healthy. At the apprentice level, numbers are dropping because employers continue to struggle to access funding (see September's Patrons' column). That should be a top priority for our government – whoever takes power after the election.

For our part, building services employers should engage with organisations such as in2scienceUK so more young people can be introduced to exciting and worthwhile careers.

● For more information email cbrown@cibse.org



RESPONDING TO AN EMERGENCY

The 2020 Building Performance Awards' shortlist showcases the people and companies that are doing the most to head off a climate emergency by delivering safe and comfortable low-energy buildings. **Alex Smith** reports

There was a sense of urgency among the judges for the 2020 CIBSE Building Performance Awards. Heightened public awareness of climate change and the damage being done to the planet has put the onus on engineers to do everything they can to reduce the impact of buildings on the environment.

Increasingly extreme flooding, heatwaves and wildfires means climate change is rarely out of the headlines, and the issue has become a key battleground in the UK General Election.

At least 40 building services engineering companies have declared a climate emergency and pledged to move towards zero carbon buildings. This year's CIBSE Building Performance Awards shortlist offers an insight into what the industry is doing in response to this man-made emergency.

Reducing the impact on the environment of existing buildings is one of the construction industry's biggest challenges. Nearly two-thirds of the world's buildings will still exist in 2050 so, if we are to meet CO₂ reduction targets and respond to the ongoing emergency, buildings must be made fit, safe and resilient for future generations.

The new Retrofit Project of the Year category is designed to uncover current best practice in the refurbishment of existing building stock. Judges said the best entries in this category demonstrated good, solid engineering that had led to significant energy savings, and a better performing building. 'We're not looking for snazzy,' said one judge. 'We're looking for quality.'

The best entries had generated a culture of performance, learning and feedback, said the judges, who noted the standard of entries proved that even listed buildings could improve performance with a sensitive, quality retrofit.

In the hotly contested categories of the Building Performance Consultancy awards, the judges said the entries showed that the profession wasn't about 'design and walk away' any more. In particular, the judges felt a real buzz from the entries in the 51-300 employees category, and a sense of pride about the work that was being done.

In the Building Consultancy of the Year (up to

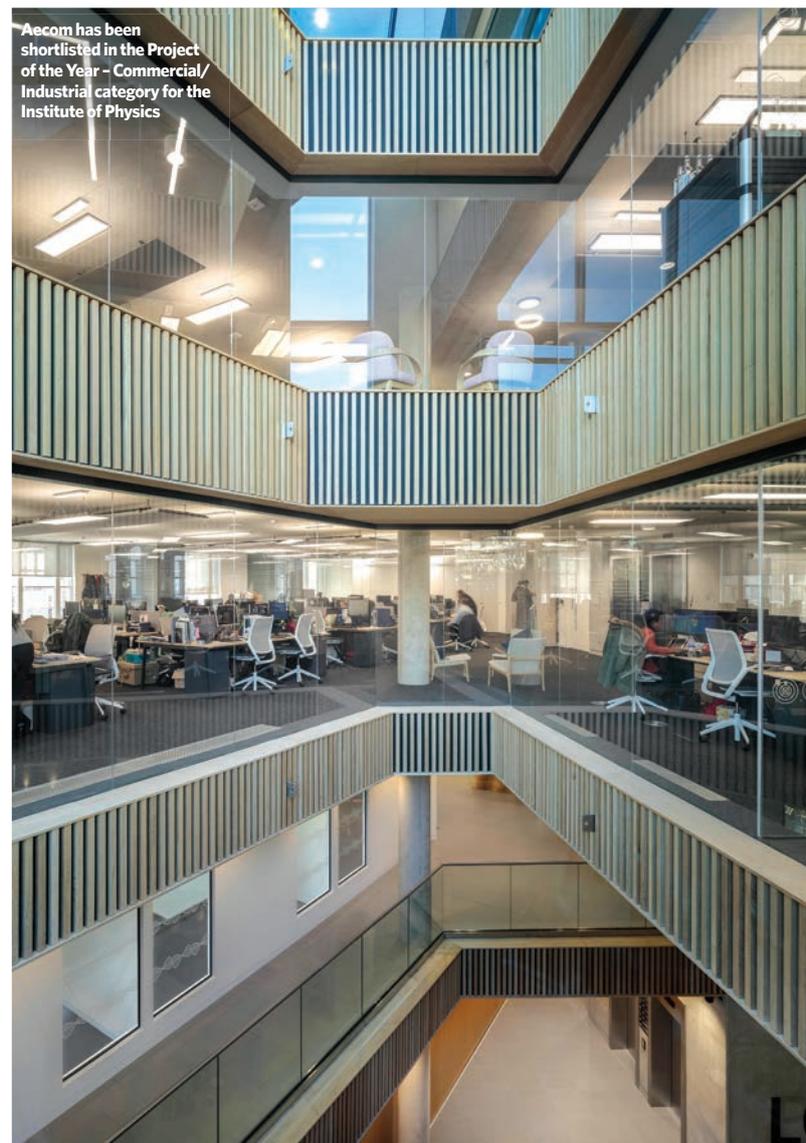
50 employees) the judges said the shortlist was an encouraging mix of niche companies doing well and consultants with best-practice processes.

The judges said it was sometimes difficult to quantify the outcome. 'Some entries had more evidence, but we didn't know if it meant it was a better building,' one remarked.

Another said he would have liked to have learned more about processes, rather than just reading about what engineers did.

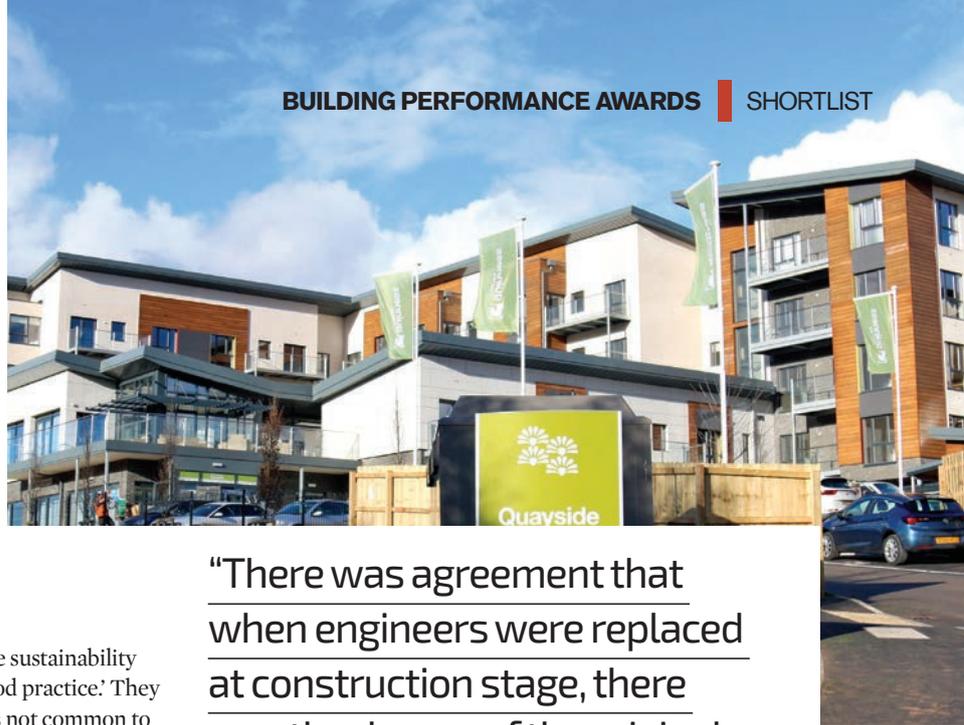
One set of judges said the definition of what constituted environmental performance could have been wider. They saw a lot of focus on indoor air quality and daylighting, but less on other areas of health such as social wellbeing and biophilia.

In the category for Building Performance Consultant (over 300 employees), the judges said all three shortlisted firms had a culture of





Max Fordham has been shortlisted in the Project of the Year – Commercial/Industrial category for Brodick Ferry Terminal



“There was agreement that when engineers were replaced at construction stage, there was the danger of the original design intent and performance objectives being lost”

investment in research and development, and said the sustainability agenda had ‘shone a light on areas of strength and good practice.’ They also found strong client feedback, something that was not common to all entries.

The 2020 awards features two awards for Product and Innovation – one for thermal comfort and one for wellbeing, a new category. The judges said some of the entries in the thermal comfort category, while very good conceptually, would have benefited from more proven data. They said that they would have liked to have seen more environmental performance information, such as levels of embodied carbon.

This point was echoed by judges of other categories, who said they would have liked to have seen more evidence of life-cycle costs. These areas will no doubt gain more attention in future years

as life-cycle data for products and processes become established.

The judges were also struck by the wide range in quality of submissions. One said the way building performance was presented to a non-technical audience was key. ‘Unless complicated technical elements are presented simply there’s a danger the performance targets will never be attained by building users,’ he said.

A number of entries were commended for their honesty in revealing issues post occupancy in ‘insightful evaluations’. Judges also appreciated where consultants had shown how they had engaged with landlords and tenants to improve building performance.

During the judging, there was a healthy exchange of views as to how the industry could further improve the sustainability of the built environment. One judge said that designers should be more proactive in telling clients what they need to do to reduce the impact of their buildings, while another said that for this to happen clients had to recognise fees would need to increase.

There was widespread agreement that when design engineers were replaced at construction stage, there was the danger of the original design intent and performance objectives being lost in the completed building.

The winners of each of the 14 categories will be announced on 11 February 2020 at the Grosvenor House Hotel.

It will be a celebration of engineering excellence in our industry, but it will also be an occasion to remind us of our ethical responsibility towards the environment amid this unprecedented climate emergency. To book a ticket visit www.cibse.org/bpa 

Fairheat has been shortlisted in the Project of the Year – Residential category for Quayside, Totnes



Atkins has been shortlisted in the Project of the Year – Public Use category for The Engine Shed, Scotland’s Building Conservation Centre



CIBSE BUILDING PERFORMANCE AWARDS 2020

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

Congratulations to our 2020 shortlisted entrants

BUILDING PERFORMANCE CONSULTANCY (UP TO 50 EMPLOYEES)

- Banyards
- Box Twenty Consulting Engineers
- Energy Efficiency Consultancy
- FairHeat
- Noel Lawler Green Energy Solutions
- S I Sealy & Associates

BUILDING PERFORMANCE CONSULTANCY (51-300 EMPLOYEES)

- AESG
- Elementa Consulting
- Harley Haddow
- IES
- RED

BUILDING PERFORMANCE CONSULTANCY (OVER 300 EMPLOYEES)

- Atkins
- BuroHappold Engineering
- Cundall

COLLABORATION

- Chobham Farm - FairHeat
- ESFA School Building Framework Project - Bowmer + Kirkland (B+K)/Integrated Environmental Solutions (IES)
- Park View Student Village - Desco

FACILITIES MANAGEMENT

- Ascendas International Tech Park Pune - CapitaLand
- Belgrave House - BNP Paribas Real Estate
- Yale-NUS College

LEARNING AND DEVELOPMENT

- Book 'Building Performance Analysis' - University of Plymouth
- Energy Behavioural Change - Marks and Spencer
- HVAC Centre of Excellence - Air Conditioning and Mechanical Contractors' Association
- The Biophilic Classroom, Putney High School, GDST (Girls' Day School Trust), The Value of Nature in a Learning Environment - RCZM Sustainable Design, Performance + Analysis and Reading University
- The 'Future Offices: Next-Generation Workplace Design' book - AECOM

PRODUCT OR INNOVATION – THERMAL COMFORT

- Air Induction Unit - Ove Arup & Partners Hong Kong
- Atamate Building Control System - Atamate
- Hysopt HVAC Design and Optimisation Software - Hysopt
- OPA2100 ECO ULTRA - Temperzone Australia Pty

In association with:

CIBSE JOURNAL

Headline sponsor:



COMMERCIAL SOLUTIONS FROM BAXI HEATING

Sponsored by:





Join us to celebrate

Winners announced: Tuesday 11 February 2020

PRODUCT OR INNOVATION – WELLBEING

- arbn well - arbnco
- BUS Wellbeing Survey - Arup
- Concept Analysis Tool (CAT) - Atkins
- Neuron Smart Building Digital Platform - Empowering Building Sustainability and Wellbeing through AI & Digital Technology - Arup
- Wise - Swegon

PROJECT OF THE YEAR – COMMERCIAL/INDUSTRIAL

- Brodick Ferry Terminal - Max Fordham
- Graphene Engineering Innovation Centre (GEIC) - Balfour Beatty Kilpatrick - Building Services South
- Institute of Physics - AECOM

PROJECT OF THE YEAR – INTERNATIONAL

- AUT - Mana Hauora (MH) Building, Auckland, New Zealand - Beca
- Hitchcock Center for the Environment, Amherst, USA - BuroHappold Engineering
- Mason Bros., Auckland, New Zealand - Mott MacDonald
- The Sweco Building, Bergen, Norway - Sweco Norway

PROJECT OF THE YEAR – PUBLIC USE

- Bartlett School of Architecture, 22 Gordon Street - BuroHappold Engineering
- Maggie's at the Robert Parfett Building, Manchester - Foster + Partners
- The Engine Shed, Scotland's Building Conservation Centre - Max Fordham
- Ysgol Rhyd y Llan - Atkins

PROJECT OF THE YEAR – RESIDENTIAL

- Agar Grove Estate Regeneration - Phase 1A - Max Fordham
- Park View Student Village - Desco
- Quayside, Totnes - FairHeat

PROJECT OF THE YEAR – RETROFIT

- Appleton Tower Recladding - BuroHappold Engineering
- Bartlett School of Architecture, 22 Gordon Street - BuroHappold Engineering
- Discovery Gardens Retrofit - Griffin Consultants
- Two Pacific Place Retro-fit and Sustainable Development - Swire Properties
- Wilkins Lower Refectory - Burwell Architects

ENGINEER OF THE YEAR

- David Cheshire, Regional Director, Sustainability - AECOM
- Tom Hopton, Associate - BuroHappold Engineering
- Tom Naughton, Associate - FairHeat



@CIBSEawards
#BPA2020 / #BPAshortlist

Book your place now:
cibse.org/BPA

FIT FOR A KING

A forensic study of the data from 2 Kingdom Street in London enabled Cavendish Engineers to pinpoint energy efficiency opportunities, which led to big savings in gas and electricity. **Andy Pearson** reports on an exemplary project that scooped a 2019 CIBSE Award

Two Kingdom Street is a 12-storey, 25,102m² commercial office building in Paddington, west London, that has a Breeam Excellent design rating. It was completed in 2010 and acquired by British Land in 2013. It is currently let to various tenants.

As a relatively recently completed building with a respectable Breeam rating, one might assume that it was relatively energy efficient, and that any initiative to further improve its energy performance would not be cost effective. This was not the case.

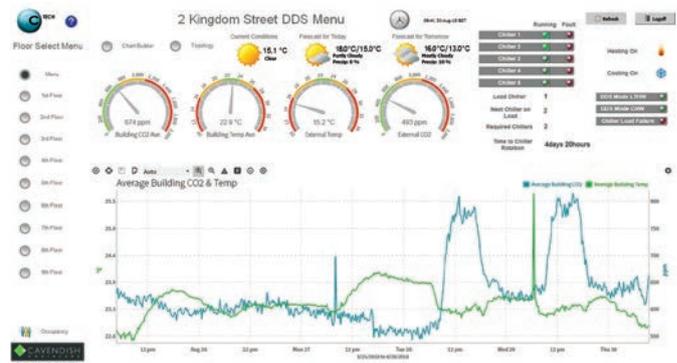
Cavendish Engineers has successfully developed and implemented a demand-driven control strategy for the building that has delivered a 15% saving in gas consumption and a 10% reduction in electricity consumption, with a payback of just 2.5 years.

'There was a misconception that the energy consumption of a building that was only six years old at the time couldn't be improved cost effectively,' says Phil Draper, managing director of Twenty One Engineering. At the time of Cavendish Engineers' initial involvement with the building, Draper was working for Broadgate Estates, managing agent for the property. He later joined Cavendish Engineers as operations director, before setting up his own company, Twenty One Engineering, which is currently working with Cavendish Engineers.

Energy management accolade

Cavendish Engineers' achievement was recognised at the CIBSE Building Performance Awards, where the scheme won the Energy Management Initiative category. Judges said: 'Cavendish Engineers is challenging the notion that modern buildings are always efficient' and said that the entry 'demonstrated both the importance and potential benefits of active, ongoing building management'.

'The project came about because it was apparent to Broadgate Estates that the building's HVAC operation was based on a time schedule and external conditions, and not on the actual demands of the office spaces,' Draper



The dashboard interface of the C-Tech high-level control system, which was integrated into the existing system network and interfaced with the existing Tridium BMS. Top left is a zoomed-in view of the average building CO₂ and average building temperature indicators

explains. 'This had manifested itself with a lack of heating to some office floors, which meant that they were cold in winter.'

The starting point for Cavendish Engineers was to understand where and how energy was being used by the landlord in generating chilled water (CHW) and low temperature hot water (LTHW), and in providing ventilation.

The engineer undertook thermal modelling, and reviewed and monitored the hydraulic and ventilation systems as well as the building management system (BMS) infrastructure and control strategy. 'They went back to basics; they checked the hydraulics and analysed all the circuits. The work they did was in far more depth than had been done before, probably since the original design,' says Draper.

The data gleaned enabled identification of several energy reduction opportunities that could be realised through the modernisation of three core systems, addressing: the control system architecture; air



“The work they did was in far more depth than had been done before, probably since the original design”

handling unit control optimisation; and CHW and LTHW system optimisation. ‘Cavendish set out to optimise the performance of systems that were already installed by introducing a demand-driven control strategy,’ says Draper.

Monitoring operation

A key issue uncovered by the investigation was with the building’s Tridium BMS. This was found to be at its input limit, which was creating control issues on site. To avoid exacerbating this, Cavendish Engineers integrated a new C-Tech high-level control system into the existing system network and interfaced this with the Tridium BMS.

This system gave the engineers the ability to monitor and control key operational assets remotely using internet protocol (IP) environment devices without being locked into using a specific BMS format or manufacturer. ‘The system imports data from the incumbent BMS and field sensors, performs the demand-driven strategy (DDS) calculations, and controls the HVAC assets under its remit – such as adjusting the speed of the AHU motor to meet the demand for fresh air against CO₂ levels,’ explains Draper.

To optimise the air handling unit (AHU) systems, 28 sensors were strategically located throughout the tenancies to measure CO₂, temperature and humidity. To achieve the DDS, the system continually processes input data, which it uses to control the amount of fresh air provided by the AHUs to ensure CO₂ levels never exceed the 800ppm defined by the Well Standard. The AHU supply and extract fans slow down when CO₂ levels drop below 800ppm. This simple solution has resulted in a 35% reduction in AHU energy consumption.

Ensuring comfort

Comfort conditions are maintained on tenant floors using a four-pipe fan coil unit (FCU) system. ‘The building is so well insulated that even in winter when fully occupied it will need cooling every day of the year,’ says Draper. The DDS ensures that the FCU’s CHW and LTHW demands are met efficiently by ensuring large temperature differentials through the hydraulic systems by controlling the pump speeds. ‘The objective of the DDS was to achieve the best possible indoor air quality at an optimised minimum HVAC energy input,’ explains Draper.

The DDS constantly monitors and varies system temperatures. It ensures that in the height of summer, maximum cooling will be delivered to meet demand, but in September when conditions are not as warm, the CHW supply temperature will be allowed to rise. ‘These are not seasonal adjustments – the temperatures will change throughout the day,’ explains Draper. Similarly, the boilers are designed for an outdoor temperature of -4°C, but Draper says you will not need the full output of the boilers, especially if you’ve got heat recovery. ‘You might only need to raise the temp by 5°C, you don’t need a flow temperature of 80°C on a 300kW heating coil; you’ll probably only need 45°C.’

The system constantly reviews and adjusts the plant outputs to ensure the system delivers the design intent. ‘With the right inputs it will deliver the right outputs; it looks at the demand and adjusts the outputs accordingly to get the best efficiency out of the plant,’ Draper says.

A key part of validating the DDS involved using the building’s existing submetering, which was connected to EP&T’s Edge system >>



External view of the 2 Kingdom Street 12-storey office building

» energy monitoring software. Using this system, Cavendish Engineers was able to benchmark the performance of each piped system prior to commencing the works, and again after the works had been completed, in order to validate the modifications.

To commission the ventilation systems, CO₂ readings were taken manually on floors to ensure local sensors were accurate. The exercise ensured that the remote sensors were placed in the areas with highest occupancy density.

Validation

The real validation of the success of the scheme, however, was from tenants. ‘There was zero feedback,’ says Draper. He says this was a positive sign because it shows that comfort conditions have been unaffected by the upgrading of the building’s control system.

In addition to the energy efficiencies achieved, the control platform that governs the DDS uses open protocol devices, as well as the Cloud, to provide a robust and customisable system, but one that will allow open communication with new technologies in the feature.

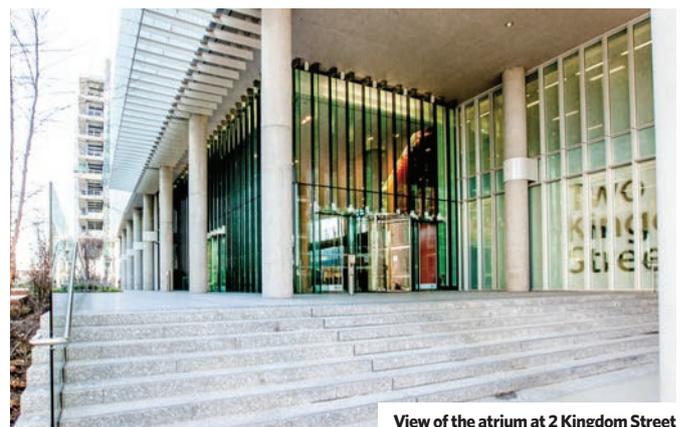
This will enable a condition-based maintenance approach because it will provide early awareness of system inefficiencies or plant failure. ‘This will drive maintenance away from the established planned preventative maintenance format to a truly demand-driven one, where assets are tended as and when they deteriorate, potentially saving money and man hours every year,’ says Draper.

The project was delivered at a cost of £63,630. A 24-month soft landings process is enabling the efficacy of the design to be monitored and improved. It also provides

support for the site team. ‘We are working with the managing agent to see how we can amend CO₂ controls to get further improvements,’ Draper says.

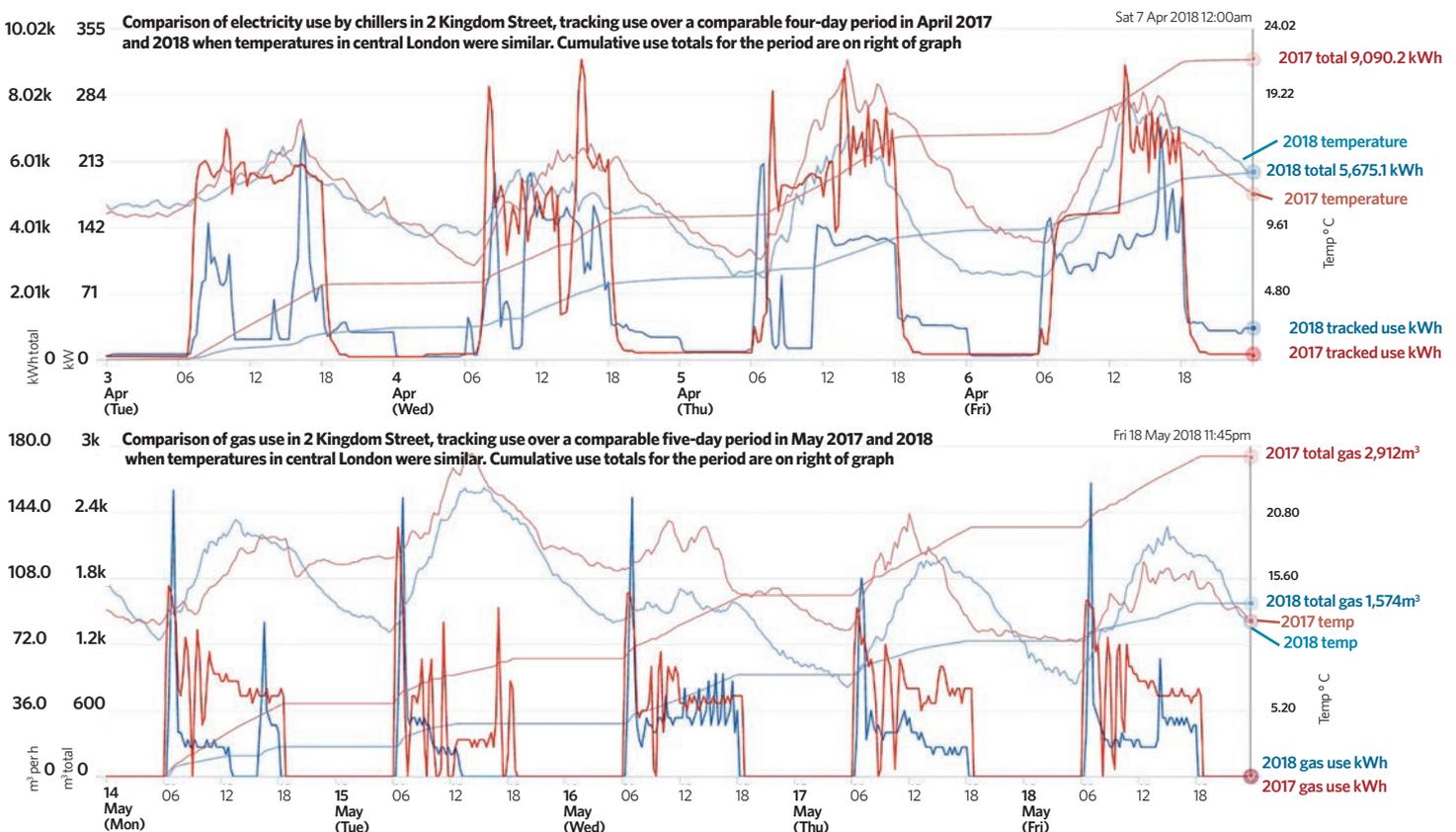
Based on 12 months of energy data up to July 2018, and a net lettable area of 25,102m², the building has an electricity intensity of 88kWh·m⁻² and a gas intensity of 52kWh·m⁻². Benchmarked against a modified Energy Consumption Guide 19 (ECON 19) with tenant consumption removed, a good practice Category 4 building is rated at 235kWh·m⁻² for electricity and 114kWh·m⁻² for gas. ‘Tenant energy use is excluded from the benchmarking process due to the inability of the landlord to control how efficiently their energy is utilised,’ Draper explains.

‘Our modified ECON 19 benchmark removes tenant and irrelevant contributors (humidification, lighting, office equipment, catering, computer room) to generate a “good practice” Category 4 building benchmark of 99kWh·m⁻² for electricity and 107kWh·m⁻² for gas for the building.’ CJ



View of the atrium at 2 Kingdom Street

Figure 1: Comparison of energy use before and after refurbishment



GETTING TO GRIPS WITH WHOLE-LIFE CARBON

Research into the amount of carbon embodied in building services is scarce. Louise Hamot reports on an Elementa study that attempts to measure the whole-life carbon impact of building services

Improving the environmental impacts of the built environment has become a priority given our climate crisis. Greenhouse gas emissions responsible for global warming – measured in carbon dioxide-equivalent emissions – need to be reduced drastically.

The industry has long focused on operational carbon, but has ignored emissions related to the rest of the life-cycle stages of buildings. To make well-informed decisions that will mitigate global warming, engineers, architects and clients need to embrace whole-life carbon emissions.

This term refers to both operational and embodied carbon emissions, from manufacturing, transportation, and constructing, repairing and maintaining a building, through to deconstructing the building and processing waste. This can be quantified through life-cycle assessments.

In the case of building services, engineers have long been considering the operational carbon through the impacts of wider mechanical, electrical and plumbing (MEP) strategies – such as encouraging natural ventilation and free cooling over active cooling – and specifying highly efficient plant.

Recently, there has been a drive to shift the generation of heat to electricity, through the use of heat pumps, rather than gas. This, along with fabric efficiency improvements – which reduce the heating load in the development – and the increasing decarbonisation of the electricity grid have led to reductions in the operational carbon



of developments. However, the whole-life carbon impacts of MEP do not end with operational carbon.

Engineers need to understand the embodied carbon emissions of the systems they design and the products they specify, so that informed choices can be made using ‘whole life’ thinking.

Whole-life carbon study

Globally, there is limited data and information on the embodied carbon emissions of MEP equipment. Elementa Consulting – a member of engineering and consulting firm Integral Group – has completed a research study with the aim of starting to understand the whole-life carbon of electrical, plumbing and HVAC systems compared with the whole-building emissions, and the variance of embodied carbon of MEP products, through a detailed analysis of an office retrofit.

The intention was to develop knowledge of how MEP engineers can prioritise action on embodied carbon and to inform further research streams.

The study was based on an office refurbishment in the USA – the headquarters of DPR Construction in San Francisco, California (see ‘Winning formula’, *CIBSE Journal*, August 2017).

Operational carbon emissions were calculated based on in-use consumption. Embodied carbon for all elements apart from building services were calculated in Tally life-cycle assessment



Embodied carbon of building services compared to the whole building

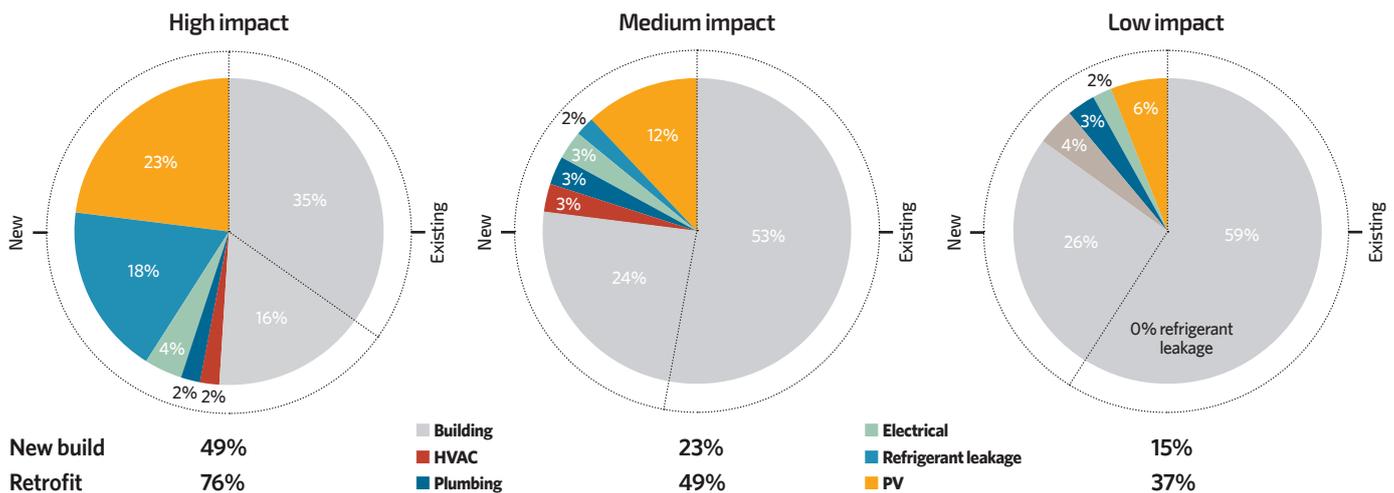


Figure 1: The high impact scenario refrigerant leakage accounts for a large proportion of embodied carbon

"In the case of a refurbishment or retrofit, building services accounts for 40-70% of embodied carbon emission"

» software, and the MEP elements were calculated using the following method:

- All building services elements were included, from cables and light switches to variable refrigerant flow (VRF) systems. The material quantities were taken from a detailed BIM model using a Dynamo script and cross-referenced with schematics and plans.
- One Click LCA life-cycle assessment software was used to estimate embodied carbon of the MEP products (in kgCO_{2e} per product); where information was missing, data gathered from previous studies was used. The 'Life Cycle Carbon Global' tool was used within One Click LCA, as this provided the most available data using a consistent methodology for assessing carbon emissions.
- Assumptions about replacement rate, wastage and transport came from One Click LCA's data.

Building services embodied carbon emissions breakdown

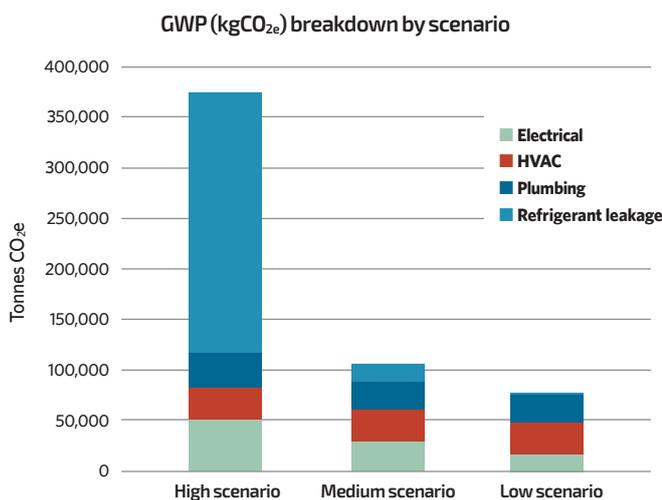


Figure 2: Electrical, HVAC and plumbing have broadly similar embodied carbon emissions

- Generic data from product on the database and specific data were used – through the use of environmental product declarations (EPDs) – with the intention of maximising our dataset.
- Low, medium and high embodied carbon scenarios for building services were created.

The DPR office case study is a retrofit, so to understand the full carbon emissions associated with the original building, the embodied carbon of the existing building was also included in the assessment. These are shown as separate values in Figure 1.

Information challenge

The method above seeks to compensate for the lack of information on building services products. It does this by using all available global data and applying certain factors so that it represents products used in the site location – in this case, San Francisco. Ideally, more data on environmental impacts of MEP products would be available.

There is very little generic data or specific data (such as EPDs) for MEP products. This may be because of a lack of incentives; aside from Bream 2018 – where it only accounts for one credit – few certification schemes mandate embodied carbon calculations of building services equipment.

Often, when manufacturers are asked about environmental product declarations, they either do not understand what they are or just do not have the suitable information. Another hurdle is the lack of consistency across EPD methodologies because of different product category rules (PCRs) and life-cycle impact assessment methodologies.

Building services embodied carbon breakdown - medium scenario

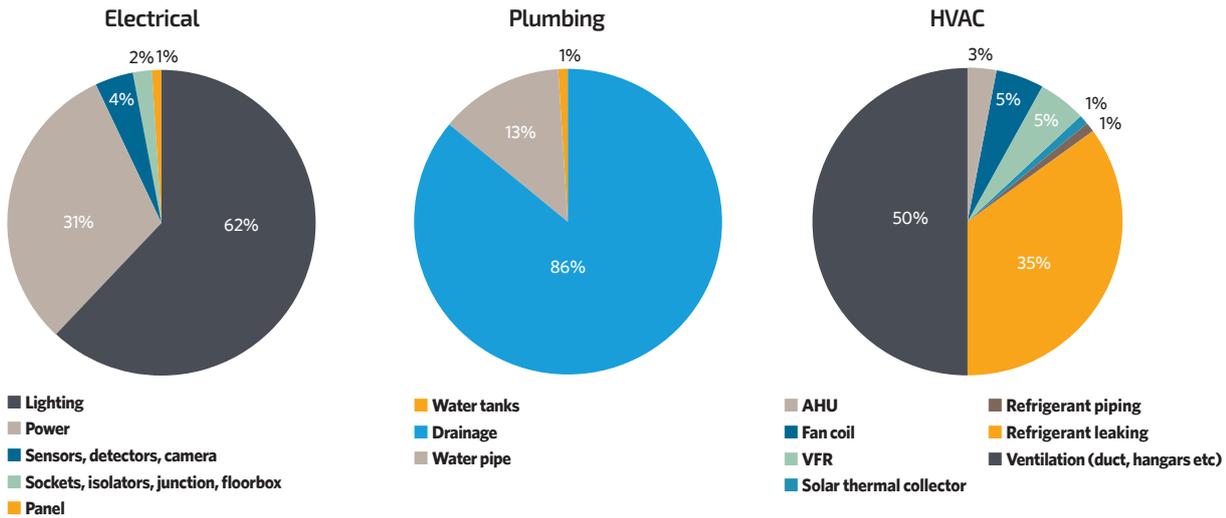


Figure 3: Embodied carbon broken down by building service. The medium scenario is described in Figure 2

The findings

Building services represent a significant proportion of embodied carbon. In the case of a refurbishment or retrofit, building services accounts for 40-70% of embodied carbon emissions. In the case of a new build, building services account for 15-50%, depending on the impact scenario. This confirms that engineers need to engage with embodied carbon, and that there is a need for rule-of-thumb guidance.

Embodied carbon due to the installation of photovoltaics (PV) is included in the percentage figures quoted above, but is required to offset the operational emissions (see Figure 1).

In the high-impact scenario, refrigerant leakage accounts for a large proportion of embodied carbon. This scenario assumes a 10% annual leakage rate and a refrigerant with a global warming potential (GWP) of 2,088 (for example, R410a).

Refrigerant leakage must become the absolute priority of engineers, to make sure they specify products with low-GWP refrigerants – typically less than 150 – and ensure ways to prevent and quickly detect leakage (see Figure 1).

The study revealed that plumbing, electrical and HVAC had fairly similar embodied carbon emissions across high-, medium- and low-impact scenarios, so must be tackled in parallel (see Figure 2).

Assessing the full embodied carbon emissions of the DPR case study showed 53% embodied carbon savings over a new build (for a medium-impact scenario for building services).

The research showed LED lighting systems made up the highest proportion of embodied carbon emissions for the electrical category.

For the plumbing category it was drainage, and for the HVAC category ventilation systems (Figure 3).

Conclusions and next steps

Embodied carbon of MEP is relatively significant, as illustrated in Figure 4, so – as an industry – we must specify systems and equipment that will ensure low whole-life carbon. For more on reducing whole-life carbon read this feature online at www.cibsejournal.com

The DPR case study will not reflect the reality of all office retrofits, or Californian buildings. So it is important to broaden this research to a variety of building typologies, as well as different locations, and create robust and representative benchmarks, to gain a better understanding of the key levers in terms of system strategy and products.

The carbon savings because of onsite PV compensate for the operational carbon, but not all the embodied carbon emissions of the building (see Figure 4). When referring to net-zero carbon, we should clearly understand net-zero operational carbon and not whole-life carbon. Some thinking needs to be done to reduce the remaining emissions linked to embodied carbon and then offset it if there are no other alternatives. □

■ **LOUISE HAMOT** is a sustainability and environmental engineer at Elementa Consulting. Email louise.hamot@elementaconsulting.com

The challenge of net-zero whole-life carbon

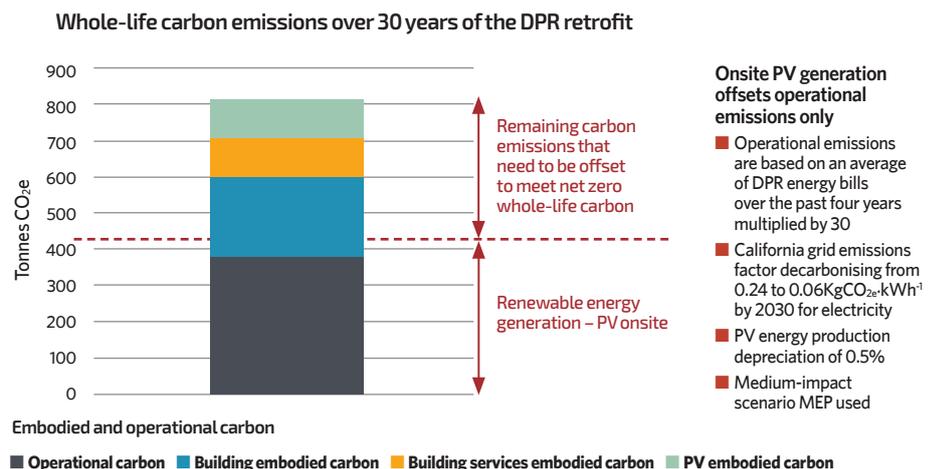


Figure 4: Onsite PVs offset operational carbon but not the embodied carbon



The Event Complex Aberdeen has a sophisticated energy strategy combining anaerobic digestion, hydrogen fuel cells and CHP plant. **Andy Pearson** talks to HDR | Hurley Palmer Flatt about the system design, which also produces hydrogen for a fleet of local buses

SHOWCASING NET-ZERO



Visualisation of the 15,000-capacity arena

PROJECT TEAM

Client: Aberdeen City Council
Developer: Henry Boot
Architect: Keppies
Structural: Blyth and Blyth
Energy Masterplan and Energy Centre M&E: HDR | Hurley Palmer Flatt
Hilton Hotel and Arena M&E: Hulley and Kirkwood
Infrastructure and Aloft Hotel M&E: DSSR
Project manager: Turner and Townsend
Main contractor: Robertsons
M&E contractor: FES

Aberdeen City Council wanted its new exhibition and conference centre to be the most sustainable venue of its type in the UK. As a flagship project, it was essential that the energy strategy for The Event Complex Aberdeen (TECA) – now officially named P&J Live, courtesy of naming rights partner DC Thompson Media – embodied the city’s Sustainable Energy Action Plan.

There were also sound commercial reasons for it to do so: a low carbon footprint is increasingly seen as a critical component in attracting and retaining events at exhibition and conference facilities. The council’s brief to its development partner, Henry Boot Developments, was for a ‘zero carbon’ facility.

By its very nature, an exhibition and conference centre has an extreme energy-load profile. There is a peak load during an event, which drops to almost nothing between events. Unfortunately, it is not a load profile that typically lends itself to the application of renewable technologies. Moreover, the site is located close to Aberdeen airport, so there are restrictions on the use of large photovoltaic arrays, and severe restrictions on the height and location of wind turbines.

The task of delivering on this challenging brief fell to Henry Boot’s energy and engineering consultant HDR | Hurley Palmer Flatt’s Glasgow office.

‘We looked at the constraints of the site; wind and solar were not an option, so we had to figure out how best to develop an energy strategy,’ says Dr David Telford,

director, energy and sustainability, at HDR | Hurley Palmer Flatt.

Designing an energy eco-system

The consultant’s solution is innovative and impressive in its ambition. It has developed what it terms an ‘energy eco-system’ to serve the exhibition and conference centre and two accompanying hotels, constructed adjacent to the facility.

The eco-system’s two principal components on the site are an anaerobic digestion (AD) plant and a combined cooling, heating and power (CCHP) generation plant, which is housed in the energy centre.

The AD plant takes food waste, agricultural waste and crops to produce a renewable biogas, which is then upgraded and cleaned by removing the CO₂, moisture and impurities to turn it into bio-methane for injection into the gas grid. ‘The council had been looking at AD for food waste, but there was insufficient waste to make this viable, so we suggested co-fuelling the plant using crops,’ explains Telford. This solution ensures the digesters can provide enough gas to meet the total annual energy demand of TECA.

A dedicated combined heat and power (CHP) unit provides heat and power to operate the primary and secondary digesters and the gas upgrade equipment. The digestate remaining after AD is returned to the soil as a conditioner, completing the cycle.

Gas output from the AD plant is injected into the mains gas grid. It is an arrangement that enables the gas grid to be used as a fuel store, effectively, and enables the digesters



The distinctive angular façade of The Event Complex Aberdeen

“For the overall viability of the scheme, the whole technology mix had to achieve a reasonable payback”

to continue to digest, even when there is a low gas demand from TECA including its associated hotels. ‘We are injecting green gas into the Grid and taking green gas out of the Grid, so, effectively, we’re using the grid for storage,’ says Telford. There is also a bio-methane supply – sized to meet base load conditions – direct to the energy centre building next to the main arena.

The energy centre houses the CCHP system. Heat and power are generated using fuel cells and more conventional gas-CHP combustion engines. The localised generation provides a resilient solution for TECA by allowing off-grid operation.

Three 400kW_e stationary phosphoric acid fuel cells (PAFC) take the bio-methane gas supply, or grid gas, and ‘reform’ it to a hydrogen-rich gas, which feeds the fuel cells. In the fuel cell, the hydrogen-rich gas is combined with air in an electromechanical process, to produce a maximum output of 440kW of direct electrical current, heat and water. In fact, the fuel cells have been sized to provide sufficient electrical power to meet the total annual demand of TECA.

In addition to the fuel cells, the energy centre houses two 1MW_e conventional internal combustion gas-CHP engines, which are coupled to alternators and heat-recovery boilers. The hydrogen fuel cells and the gas-combustion CHP engines supply heat to the site’s four-pipe district heating and cooling network. Waste heat is used in an absorption chiller to provide the chilled water supply. The building also houses heating and cooling storage buffer tanks, and supplementary gas boilers and electric chillers to help meet peak demands.

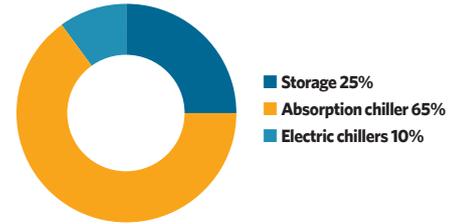
The hydrogen fuel cells will give year-round base load heating and cooling, while the heating and cooling buffer tanks help address the daily demand variation. Seasonal variation is addressed through modulation of the CHP units.

Added resilience

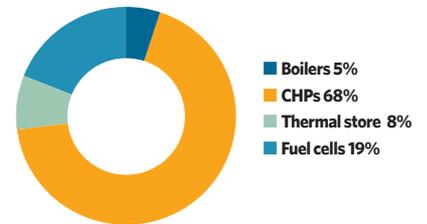
The energy centre is also connected to the electricity grid, to add resilience and ensure sufficient power is always available to meet peak demand. At times of low demand, excess electricity is diverted to onsite hydrogen electrolyzers and their associated compressors, to produce high-grade hydrogen fuel, which is used to power Aberdeen’s bus fleet. When the hydrogen store is full, electrical power is exported to the grid.

With so many different, complementary >>

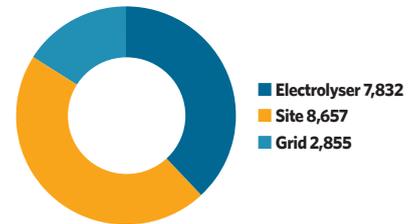
Cooling supply breakdown, by source



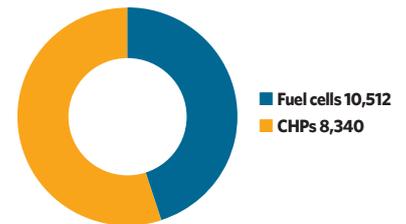
Heat supplied



Generated power destination (values in MWh)



Total power generated (MWh)



» technologies available, a major challenge was to develop a control philosophy to ensure the heating, cooling and power demands of TECA, including the hotels, are met. In addition to ensuring loads are met, the philosophy had to enable the various low carbon technologies to operate efficiently and effectively, to generate maximum possible revenue from the sale of heat, cooling, power and hydrogen.

‘For the overall viability of the scheme, the whole technology mix had to achieve a reasonable financial payback,’ says Telford.

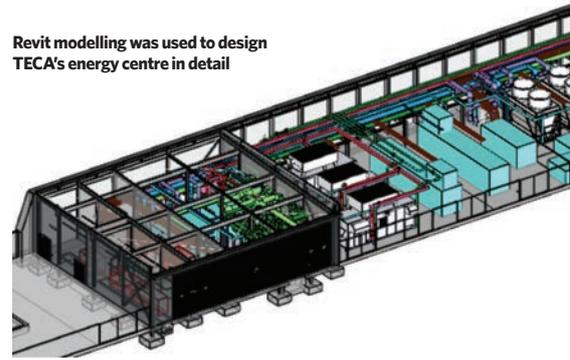
To devise the optimal control solution, HDR | Hurley Palmer Flatt teamed up with the University of Strathclyde’s Energy Systems Research Unit (ESRU) under an Innovate UK-funded Knowledge Transfer Partnership (KTP). The project set out to develop an integrated suite of software tools to model and test hybrid energy centres against a range of demand profiles. The TECA project was used as a case study for the KTP, which received a B rating of ‘very good’. ‘We worked

“Localised generation provides a resilient solution for the event complex by allowing off-grid operation”

closely with academia to expand on the skills we already had in the office,’ says Mark Arthur, mechanical, director at HDR | Hurley Palmer Flatt.

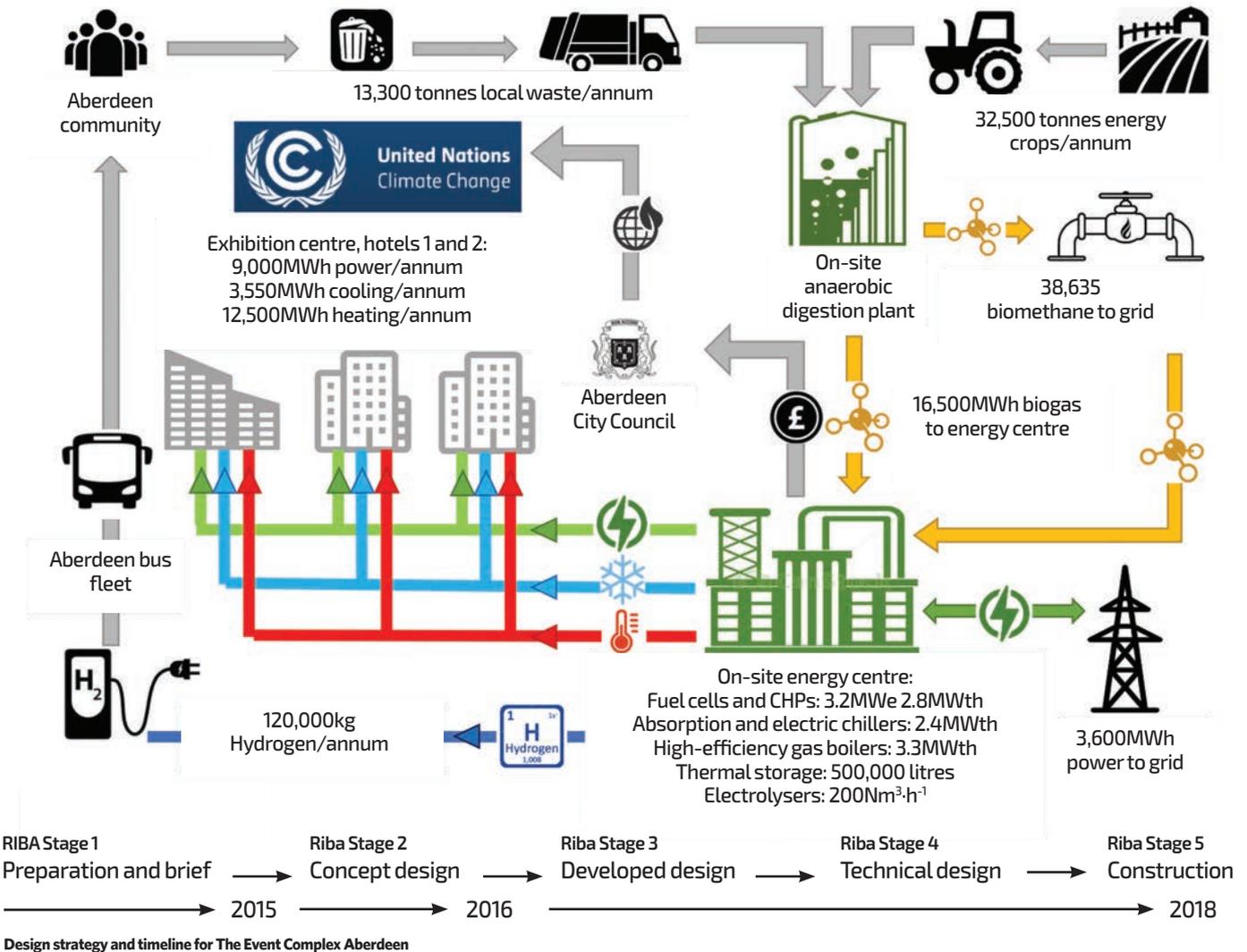
The team was helped in its modelling by demand profiles provided by the original Aberdeen Exhibition and Conference Centre, which TECA has been built to replace. The team also sat down with TECA’s operators to discuss how they planned to use the facility – and which of the event and conference spaces were likely to be in use simultaneously – to build a predictive demand-side model. The

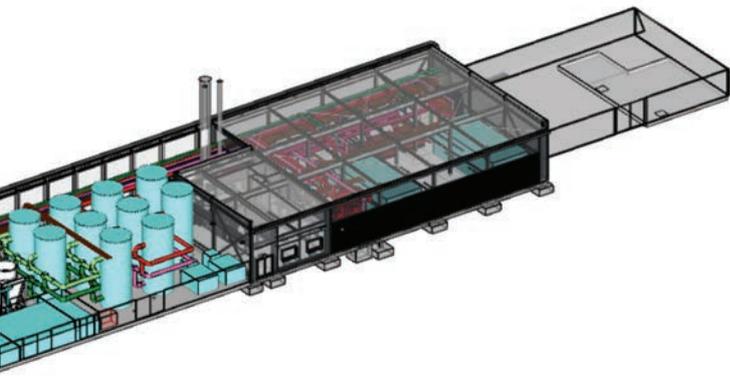
Revit modelling was used to design TECA’s energy centre in detail



modelling enabled the design team to test different operational scenarios, optimise plant sizing, and test the sequencing of different items of plant to best match its dynamic energy demand with supply.

‘New modelling techniques were developed to model the performance of the energy centre systems, enabling it to be reviewed at sub-hourly intervals across an entire year of operation, to optimise system performance,’ says Emma MacLeod, associate director at HDR | Hurley Palmer Flatt. (The control





philosophy is described in 'Control mission'.)

In addition to sizing the plant and devising the optimum control strategy for the development, the design consultant was appointed to carry out the detailed design for the energy centre using Revit modelling. 'We've done everything from RIBA stage 1 "preparation and brief" to RIBA Stages 3 and 4, the "developed" and "technical design"; we even prepared the tender documentation for the FM contract under RIBA stages 6 and 7; "handover and close out" and "in use";' says Arthur.

TECA opened in August 2019 and, appropriately for an exhibition centre, the innovative energy eco-system is itself on show. The city council is using the scheme as a demonstration facility to showcase Aberdeen as a 'world class' centre of excellence for the global energy industry of the future – and with its new arena, exhibition and conference centre achieving net-zero carbon, the city is off to a great start. 



Hoval UltraGas gas-fired condensing boilers deployed as part of the heating system



P&J Live now has the naming rights to the exhibition and conference centre

CONTROL MISSION

The scheme's holistic control philosophy is best described by considering provision of power, heating and cooling separately:

Electrical power

Power is generated by fuel cells and CHP combustion engines.

- The three gas-powered fuel cells operate together to generate a total of 1,200kW_e.
- Fuel cell power generation is supplemented by the two 1MW_e gas-fired combustion CHP units. These run only when there is a demand for heat. In winter, for example, if the demand for heat is high and power demand is low, the CHP engines will run at near full capacity, resulting in a power surplus
- If the surplus available is 'low' (less than around 36kW), power is sold to the grid
- If the surplus is 'medium' (greater than around 36kW), the power is used to operate the electrolyzers to produce hydrogen
- If the quantity of surplus power generated exceeds the electrolyzers' maximum demand (around 1,060kW), the remaining surplus is sold to the grid
- Similarly, when the hydrogen storage is full, all surplus power is exported to the grid
- During periods when the power generated falls below demand, the shortfall is made up of power purchased from the grid.

Cooling system

Three main components make up the cooling system: a 400kW absorption chiller, two electric chillers with a total capacity of 2,000kW, and five chilled-water storage tanks, each with a capacity of 50,000 litres.

- First priority is given to running the absorption chiller, which operates on heat generated by the fuel cells. However, the absorption chiller has a minimum output of 200kW, so if the cooling load is less than 200kW, cooling demand is met from the chilled-water store, or the electric chillers if there is no chilled water stored
- At low load (200kW to 400kW), the cooling demand is met by the absorption chiller alone. There is an option to run the absorption chiller at a higher output than the actual cooling demand to recharge the chilled-water store if it has become depleted
- At medium load (400kW to 2,400kW), the absorption chiller is running at its 400kW capacity, with the remaining load met first by the chilled-water store and thereafter by the electric chillers
- At cooling loads above 2,400kW, the absorption chiller and electric chillers will run at maximum capacity, with the chilled-water store also being depleted as necessary. To ensure these peaks can be met, the chilled-water store will need to be charged in advance.

Heating system

The heating system comprises three fuel cells with a total thermal output of around 600kW_t; two gas-fired CHP units with a total thermal output of around 2,000kW, three gas-fired boilers with a total thermal capacity of around 3,000kW, and five thermal stores, each with a capacity of 50,000 litres.

- The first priority is given to using surplus heat from the fuel cells not being used by the absorption chiller, which means that the available heat varies from 340kW_t to 636kW_t.
- At base load (300kW_t to 600kW_t), heat is supplied by the fuel cells, with the remaining thermal load met by the gas-fired CHPs. Any surplus heat produced by the fuel cells during base load periods is diverted to the thermal stores or, if these are at capacity, it is rejected to atmosphere
- At low to medium loads (600kW_t to 3,000kW_t), the thermal demand is met using fuel cells and the CHP units. The CHP controls allow both gas-fired CHP units to be modulated to satisfy demand within this range; any marginal differences between output and demand are absorbed by the thermal storage
- At medium load (3,000kW_t to 8,000kW_t), the heat produced by the fuel cells and CHP units is supplemented with heat from the thermal stores as needed
- At high loads (8,000kW_t to 11,000kW_t), the fuel cells, CHPs and thermal store are all in use, with any remaining load met by the gas-fired boilers
- At peak loads (greater than 11,000kW_t), demand will exceed the combined maximum output of all heat generating plant. These periods are likely to total fewer than 24 hours each year. At such times, demand can be met by pre-charging the thermal stores in advance of anticipated peaks, and by ensuring that all heat from the fuel cells is used for heating instead of supplying the absorption chiller (the resulting cooling deficit can be made up by chilled water storage or electric chillers).

RAISING STANDARDS WITH REFCOM ELITE

ROUNDTABLE DEBATE

Alex Smith, *CIBSE Journal* • Graeme Fox, REFCOM
Phil Ord, Mitsubishi Electric • Graham Wright, Daikin
John Otterson, Coolair • Wayne Buckley,
Temperature Control • Lee Nicholls, DAIKIN UK
Paul Brant, Adcock • Terry Hussey, London AC

**Hear what these experts had to say on raising standards
in the industry with the new REFCOM Elite standard.**



Better-quality training and tougher legislation to upskill refrigerant contractors were the key messages at *CIBSE Journal's* roundtable in November, held at the Royal Pharmaceutical Society.

The event, sponsored by REFCOM – the register of companies competent to manage refrigerants – focused on the benefits of REFCOM Elite to ensure best practice in air conditioning installation. Other issues debated included: the relevance of the F-Gas registration; making REFCOM Elite mandatory; and educating consultants on specifying the right quality air conditioning equipment to help raise standards in the industry.

Graeme Fox, head of REFCOM Schemes, outlined the background to the register, which began as a voluntary scheme for contractors to show they were working to high environmental standards and were properly trained. After the introduction of the F-Gas regulations, two schemes were formed – the mandatory REFCOM F-Gas certification and REFCOM Elite, the original, more

WHAT IS REFCOM ELITE?

REFCOM Elite membership proves to owners and operators that a refrigeration or air conditioning company:

- Is competent to install, commission, decommission or maintain a system containing refrigerant
- Is a licensed waste carrier
- Can handle refrigerants safely
- Is compliant with all current legal requirements
- Operates auditable procedures for the proper control of refrigerants, and can account for all refrigerant used and recovered
- Uses appropriate, purpose-designed refrigerant recovery equipment
- Performs refrigerant transactions with minimum emissions and is environmentally aware.

REFCOM Elite membership is granted after inspection by an independent third party.

JOINING THE ELITE

Poorly installed cooling systems can have disastrous consequences for energy efficiency and CO₂ emissions. **Amanda Birch** hears how REFCOM Elite can eliminate the risks, in our latest expert roundtable

rigorous voluntary scheme. 'Our concern is that the F-Gas registration doesn't go far enough in terms of improving the industry and policing it,' said Fox. 'We argued at the time with the government that the standard is too low. The F-Gas registration has dumbed down the sector at contracting level and we see a lot of poorly qualified people who call themselves refrigeration engineers when they aren't.'

The roundtable participants agreed that the current situation was a major concern. Graham Wright, chair of the Air Conditioning and Refrigeration Industry Board (Acrib), argued that the F-Gas registration is not an air conditioning qualification. 'F-Gas allows an installer to work on the equipment, but it doesn't necessarily mean that person is qualified to understand how the system works, or assess its energy efficiency or any safety requirements,' said Wright. 'It's brought everyone down to a minimum standard.'

Terry Hussey, director of London Air Conditioning, agreed. 'It's a crash course – five days of training and a person can get a gas certificate,' he said. 'The City and Guilds course required three years of training – this is what should still be required.'

The outcome, according to participants of the roundtable, is that an F-Gas qualified person often has no understanding of how to operate a system, how to interrogate it, and how to fault-find correctly – all essential skills if properly qualified. 'Let's not forget that air conditioning systems are far more sophisticated today than they were 10 years



“While we make quality products, as soon as they are in the field they are only as good as the installation”
 – Lee Nicholls

» ago,’ added Wright. ‘The innovations put into these systems to make them efficient and try to reduce refrigerant charges is substantial. For someone to turn up and say they are an air conditioning engineer is probably pushing the limits of reality, but this happens a lot.’

‘The knock-on effects are not just with the air conditioning systems,’ said Wayne Buckley, managing director of Temperature Control. ‘The efficiency of the building where offices are not cooled or heated properly is also affected. We’ve had to fix faults done by others where equipment hasn’t been installed properly. They’ve put in some gas and they think it’s running, but it’s not. There are cost implications and legal aspects to this.’

Buckley added that backing REFCOM Elite can have its challenges. He said his company works hard to maintain high standards, collaborating with manufacturers to get the highest levels of workmanship, but they are often competing against unskilled contractors who undercut. This can result in unsatisfactory installations of systems, leading to poorly performing equipment, leakages and other problems. He cites an example of a project they lost to another contractor; four years later, his firm was invited to fix an array of major problems.

‘The project cost increased from £1.4m to £2.1m because of the faults, and the systems went from having 10 complaints a day to 10 per year after we had finished,’ said Buckley.

‘Half the pipework had to be changed and fundamental engineering processes weren’t followed, such as understanding pipework schematics, pipework sizes and refrigerant charges.

This is why it’s so important to have a quality product, installed by a quality contractor. Sometimes, the specification isn’t correct, which is often bypassed to get that commercial edge and all the benefits of a proper system are lost.’

Lee Nicholls, director of Daikin Air Conditioning UK, also highlighted that poor workmanship by unskilled installers can damage a manufacturer’s reputation: ‘While we make quality products that are perfect in the factory, as soon as they are put in the field they are only as good as the installation.’

F-Gas requires refrigerant manufacturers to focus on energy efficiency and reduce carbon dioxide emissions to lower their products’ global warming potential (GWP), but as Phillip Ord, head of marketing and sales strategy at Mitsubishi Electric, said, if the system isn’t installed correctly, and isn’t



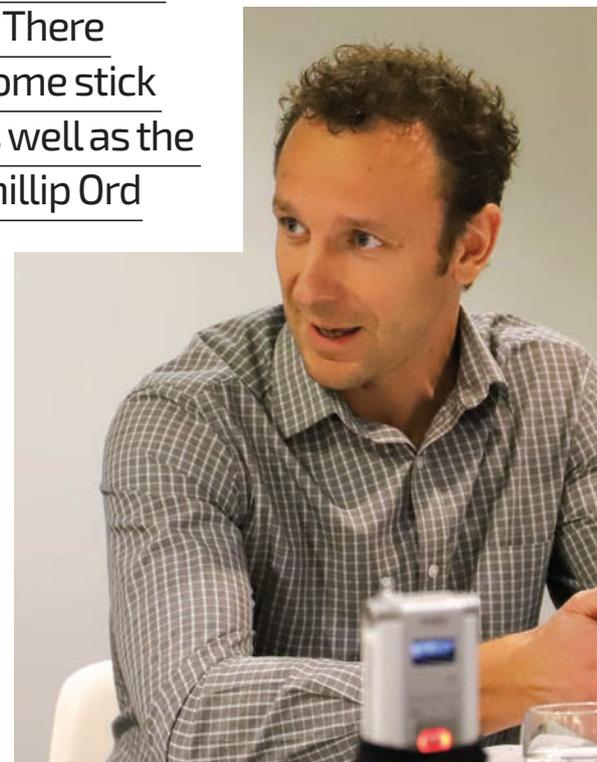
“An F-Gas certificate is different – some consultants don’t understand that”
 – John Otterson

serviced or maintained, then the carbon dioxide running costs over the equipment’s life-cycle will be astronomical.

‘A poorly installed and maintained air conditioning system can result in a 20% to 30% reduction in efficiency of that equipment,’ added Wright. ‘The Institute of Refrigeration has said that a variation of between 5% and 10% on refrigerant charge can change efficiency by at least 10% – and that’s on smaller systems.’

Everyone agreed that problems occurring in the systems can also be the result of insufficient maintenance – such as not cleaning pipework and

“Long term, we need legislation. There has to be some stick involved as well as the carrot” – Phillip Ord





“Our concern is that the F-Gas registration doesn’t go far enough in terms of improving the industry and policing it” – Graeme Fox

filters – can contribute significantly to reductions in an equipment’s efficiency.

‘I’m often asked by members what the minimum qualification is for people to do basic maintenance of filter cleaning,’ said Fox. ‘They want to avoid sending out a qualified engineer and employ cheap labour to do it instead. F-Gas requires a qualified engineer to do the installation, service, repair, maintain and decommission the equipment. Filter cleaning also requires an F-Gas-qualified engineer.’

John Otterson, chair of Coolair, suggested another issue is that many consultants seem confused about the difference between REFCOM Elite and F-Gas certification. A consultant might put into a specification that the contractor has to be REFCOM Elite, but when the consultant is on site and asks to see the contractor’s qualification, an REFCOM F-Gas certificate is shown instead.

‘An F-Gas certificate is different and many consultants don’t understand that,’ said Otterson.

Wright said a way to police this could be to check a contractor’s Construction Industry Council card; if they don’t have one, they are not qualified to do the work.

A more serious issue for consultants to address, said Ord, is that as the GWP of refrigerants is

lowered to use hydrocarbons, the flammability increases. He argued that an F-Gas-qualified contractor is not allowed to install an R-32 refrigerant given the safety concerns of dealing with this equipment.

‘This is where the education of the consultant is necessary,’ said Ord. ‘They need to make sure the contractor is REFCOM Elite certified, because this is a standard whereby the person is qualified to install this hermetically sealed system and commission it.’

‘It’s an important point that industry needs to get its head around because of the environmental consequences of using refrigerants with lower GWPs – the safety criteria has to be clearly understood,’ said Wright. ‘Manufacturers, such as Daikin and Mitsubishi, have done a lot to raise people’s awareness >>



“The City and Guilds course required three years of training; this is what should still be required” – Terry Hussey



“If specifications say that you need to be REFCOM Elite, then there will be a drive for it, which would raise the standard across the whole contracting base” – Paul Brant



"F-Gas allows an installer to work on the equipment, but it doesn't necessarily mean that person is qualified to understand how the system works, or to assess its energy efficiency or any safety requirements"
 – Graham Wright

» of this, but we need the whole industry to get to a certain level to ensure we meet the safety standards.'

Wright and Fox are in discussions with the Department for Environment, Food and Rural Affairs (Defra) about the possibility of implementing training courses on flammability and establishing the skills and level of competency required. 'The F-Gas qualification allows contractors to legally work with R32 equipment, but it doesn't cover people under the Health and Safety at Work Act,' said Fox. 'That's crucial for employers, because they have to be sure a person is competent to carry out the task. If they haven't had any training in flammable refrigerants, and they have been asked to install or service a R32 system, then it's very difficult to prove that competence.'

As Buckley argued, however, to raise standards and competency, they [contractors] need more support from specifiers. 'We've been pushing to get D1+ with Daikin, and Diamond Quality Partner (DQP) status with Mitsubishi, into a specification,' said Buckley. 'But the consultants don't want to do this because of competition; they want to push the market open so they can get the right price, but –



"Sometimes the specification isn't correct, which is often bypassed to get that commercial edge and all the benefits of a proper system are lost"
 – Wayne Buckley

by undercutting the investment – this is failing the construction industry.'

Ord and Nicholls said there's only so much they, as manufacturers, can do on site. They can carry out spot-checks on contractors to make sure installations are done correctly, but they would not be able to audit every site, as there are too many, and not enough REFCOM Elite installers (there are currently 283). Perhaps the solution, suggested Paul Brant, deputy managing director at Adcock Refrigeration and Air Conditioning, is to make REFCOM Elite mandatory. 'The problem is that it's voluntary, so only a small number of contractors will do it,' said Brant. 'We want to make it mandatory to increase the numbers. If specifications say that you need to be REFCOM Elite, and it's policed, there will be a drive for it, which would raise the standard across the whole contracting base.'

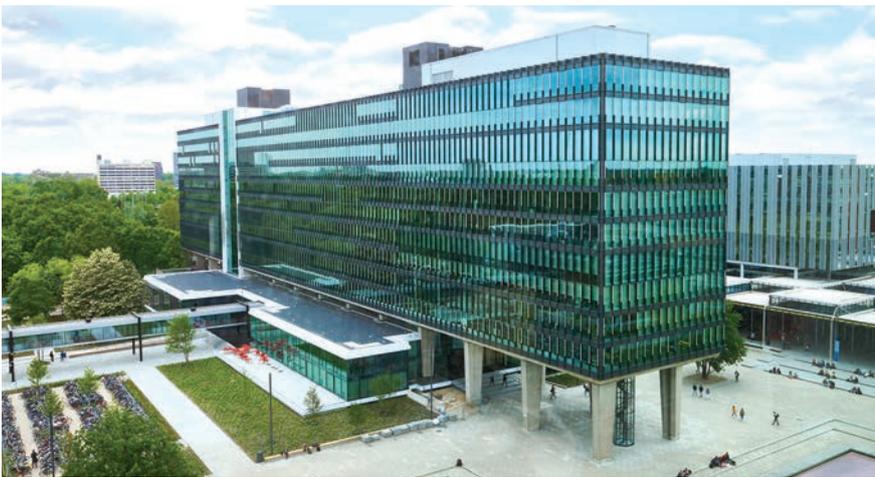
Fox agreed. 'You will get more than the 6,000 [REFCOM installer] companies stepping up, because they will want that business. They will then have to prove they meet that criteria and up their game,' said Fox.

Nicholls supported this move, especially if it raises the industry bar, but upskilling to REFCOM Elite will cost extra money. Daikin's D1 and D1+ partners have a fund that can be used by staff to improve their skills. 'It's crucial that the people who design refrigerant systems understand they are responsible for ensuring the people are qualified to do the job,' said Wright. 'Building Regulations and compliance guides are an opportunity for the industry to grasp this thing and move forward at a more professional level.'

Nicholls added that, to professionalise the industry, the Building Regulations need to be changed, along with the specifications. 'Long term,' said Ord, 'we need legislation. There has to be some stick involved, as well as the carrot. Legislation underpinning consultants' design could make a difference in helping consultants stay strong to be specification compliant when there are commercial pressures.'

'We hope the latest Building Regulations [due end of 2020] will drive that change and mandate upskilling across the board,' said Fox. 'We have to raise standards where we can. It's a really positive sign that we [roundtable participants] are all singing off the same hymn sheet. We now need to get this message out, so the rest of the industry realises it has to get on board.' **CJ**

ATLAS BUILDING GIVEN SUSTAINABILITY BOOST



Controls manufacturer Honeywell has helped Eindhoven University of Technology's Atlas Building to cut CO₂ emissions by 80% and make energy savings for lighting of up to 60%

Rise in sensors prompts CIBSE to publish VOCs guidance

After an upsurge in mostly consumer-targeted internal environmental monitoring devices – particularly in health-conscious commercial office environments – CIBSE has published a technical note on volatile organic compounds (VOCs), to address the effectiveness of the technologies used.

Such devices offer an opportunity for valuable feedback to improve health and wellbeing, but concerns have been raised about their variable quality and the data they generate. This can lead to misinterpretations, false conclusions, and unintended consequences of actions taken to address 'issues' identified.

The CIBSE Air Quality Task Group has reviewed the scientific literature on the most common air-quality sensors found in these devices and prepared short technical notes. These should give some clarity on the technologies used by the sensors, and what they can and can't do.

The CIBSE technical note is intended to raise industry awareness of the benefits and limitations of these devices, and establish criteria on which they should be selected. It also includes a description of target pollutants, and why monitoring them might be useful. To download *Breathe easy – Volatile Organic Compounds*, visit bit.ly/CJDec19VOCS

Easergy P3 aims for easy solution

Schneider Electric has launched its Easergy P3 medium-voltage (MV) protection relay, offering high operational efficiency with digital communication capabilities. According to Schneider, the Easergy P3 is simple to integrate and operate for panel builders and system integrators. It has digital tools to boost efficiency, including Setup Easergy Pro configuration software, and smart advanced functions such as a virtual simulation test. Web configuration and app-based operation and maintenance are also offered. Visit www.se.com/uk/en

ABB's Energy Snapshot assessment

ABB has unveiled an updated energy assessment process aimed at the financial community, energy managers and maintenance teams. With Energy Snapshot, an ABB engineer or approved partner will visit a site to identify up to five motor-driven applications – such as pumps, fans and compressors – that are wasting energy, and highlight which can benefit from retrofitting or upgrading. They will also give an estimate of the energy and CO₂ emissions-saving potential. See www.abb.com

Arbnco energy efficiency platform

Glasgow-based building modelling and simulation company Arbnco has been awarded funding under the government's Boosting Access for SMEs to Energy Efficiency competition. It will develop a digital platform to improve energy efficiency across the 5.7 million small and medium-sized enterprises across the UK, which account for more than 50% of energy use. See arbnco.com/arnb-insight



Trusted Technology Partner

Jan Hansen - Director

www.sav-systems.com

SAV_s

A major occupancy study by Hoare Lea, with support from UCL, has revealed that cultural and organisational factors have the greatest effect on workplace satisfaction, while daylight, indoor air quality and thermal comfort are the environmental factors that have the biggest influence



FACTORS AFFECTING WORKPLACE SATISFACTION

Built environment professionals can learn a lot from post-occupancy evaluation. Asking building users how they feel about space and services can help designers be more conscious of what works well and what does not. Typically, building occupancy satisfaction surveys focus on how physical and environmental conditions affect occupant satisfaction and productivity.

The influence of broader management issues has received less attention by built environment professionals. So, as part of a major workplace satisfaction study at consulting engineers Hoare Lea, an objective was established to understand how organisational factors influence working conditions. This was to complement research on the influence of design and indoor environment quality. The findings show the importance of team engagement and flexible working in the assessment of workplace satisfaction and productivity.

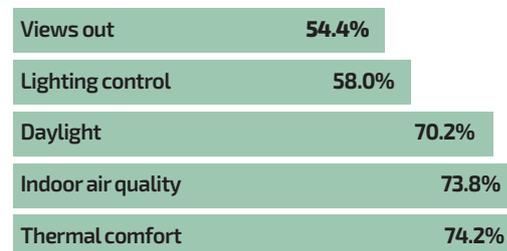
Hoare Lea adapted previous workplace satisfaction survey formats to create a comprehensive questionnaire that covered four categories: impression of the workplace; perception of environmental conditions; the rating of facilities/amenities; and how methods of working are perceived to influence productivity.

More than 500 responses were received from 12 offices, which gave a large sample of data to analyse. A review of the survey results was supported by Dr Marcella Ucci, senior lecturer at UCL, and Yudi Huang, a student on the health, wellbeing and sustainable buildings MSc.

The survey allowed Hoare Lea to ask employees which factors they perceive as having the most impact on their wellbeing and ability to work effectively, and to rate those factors in their office. Statistical analysis was then conducted to ascertain key relationships within the data.

It tested factors such as the influence of the indoor environment on wellbeing indicators, and investigated correlations between various environmental parameters, such as daylight, and satisfaction with temperature. It also compared perceptions of air quality, against actual measured air quality data.

Indoor environment



Space



Management and culture

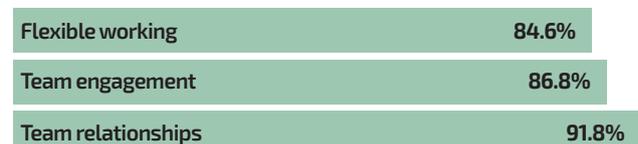
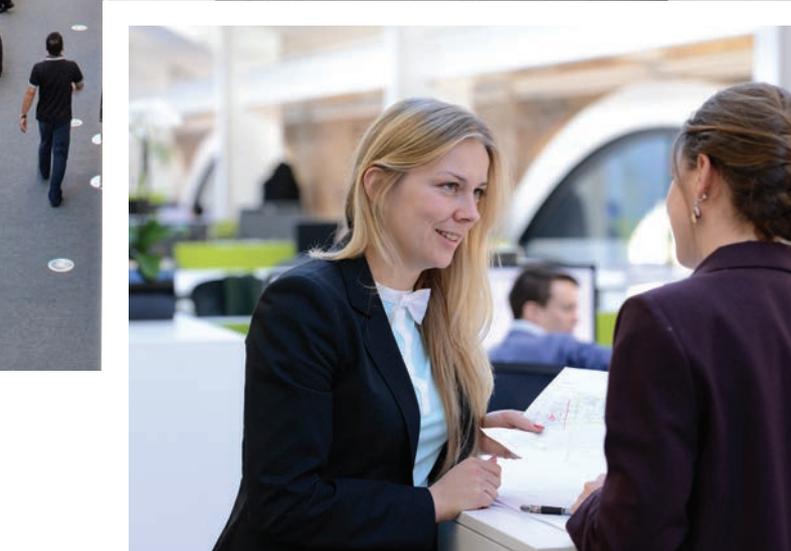


Figure 1: 'Influence on productivity' ratings, showing percentage of respondents stating the influence has a significant impact



Left: Hoare Lea's office in London's King's Cross; its workplace satisfaction study attracted 500 responses from 12 sites

Whether an office was naturally or mechanically ventilated had little influence on whether occupants were satisfied with the indoor air quality. The air-change rates and density of occupants have more significance than the means of ventilation.

There was no great difference in perceptions of indoor environmental quality for men and women. There was some difference across age groups, however; perceptions of influences on productivity diminished with seniority. Younger people across the firm perceived environmental, spatial and cultural factors to have more influence on their productivity than their older peers. So a manager has to be aware that workstyle and environmental conditions may have more impact on productivity than they realise from their own experience.

Statistical analysis conducted by UCL's research student indicated there was a forgiveness effect among occupant responses. That is, overall ratings for a category were generally higher than the average rating of the constituent elements of that category. For example, a respondent may have rated general comfort conditions as very good while their ratings of individual indoor environmental quality parameters do not add up to this overall score. This suggests that while an office occupant may have a gripe or issue about a parameter, they 'forgive' that when they rate it in combination with other parameters and provide a better overall category rating.

The greatest 'forgiveness' effect or tolerance of a category was shown to be people's overall impression of the workplace. So, if the office layout, image and use of space is good, occupants will be more tolerant of, for example, maintenance.

Effective control of comfort was found to be an influential factor in overall satisfaction >>

The survey broadly comprised rating questions, so typically took only seven minutes to complete. Each survey section also included a 'comments' section for respondents to give open-ended comments and justifications for their ratings. Parameter ratings data was then used for comparison across office location, work role, demographic information and facilities in each office. We also looked at interrelations between responses, to establish whether answers/ratings for one parameter had a significant influence on another.

The nature of the survey and extent of responses facilitated an extensive dataset for analysis, both internally, and through Hoare Lea's MSc dissertation partnership with UCL. For Hoare Lea, there were a number of useful messages to take away from the data.

The overall impression of the workplace is largely influenced by three factors: layout; how well it portrays the firm's image; and how well the space is used. Other factors, such as quality of decoration and tidiness, have a secondary influence. The perception of indoor environmental quality is most strongly influenced by thermal comfort in summer and how well comfort is controlled in general. Secondary environmental influences are comfort in winter and indoor air quality.

Self-reported perceptions of health and wellbeing showed strong correlation with satisfaction with other aspects of the office, and overall enjoyment at the workplace. This could suggest that a high-quality physical working environment (good thermal comfort, daylight, air quality, and so on) could contribute positively to a sense of health and wellbeing among workplace occupants.

Feedback comments on health and wellbeing show the value of an office having good amenities, daylight and acoustic conditions, and green plants. People that rate the 'health and wellbeing' characteristics highly are also likely to say they enjoy working at the office.

Average CO₂ reading (ppm) v indoor air quality rating

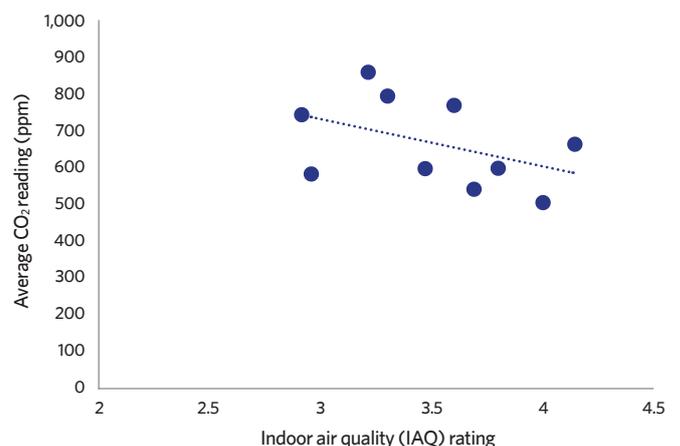


Figure 2: Plot showing relationship between average CO₂ readings (measured during the working day) and occupant ratings of indoor air quality. It shows that there is a mild correlation - for example, as CO₂ concentration decreases the perception of indoor air quality tends to improve

» and perception of health and wellbeing in the workplace and enjoyment at work. So, designers and facilities managers must be mindful that occupants are given appropriate environmental conditions and that these are well controlled and maintained. This need not entail providing individual control.

When rating office facilities, the most influential factors were kitchen, toilets, variety of working areas, and availability of meeting rooms. The number of desks, breakout spaces, and impression of the reception had a secondary influence. This shows that it's more important for designers to consider the range and quality of workplace needs than the provision of individual desks. Indeed, with agile working and hot desking, these priorities will increasingly influence workplace satisfaction.

A specific objective of the survey was to clarify how employees rate a range of parameters influencing the ability to work effectively – for example, productivity. Overall, perceptions of

factors influencing productivity show that cultural and organisational elements – for example, levels of team engagement, team relationships, and the ability to work flexibly – are more impactful than physical environmental factors. Of the physical environmental factors rated, 'thermal comfort and temperature control', and 'indoor air quality' were perceived to be most influential on productivity (Figure 1).

Finally, we compared perceptions of indoor air quality in each office with actual measured air quality. We had access to data using Wi-Fi air-quality sensors that measure concentrations of CO₂, among other things. We wanted to find out if occupant perceptions are good or bad indicators of actual air quality – and there is a positive correlation, albeit mild (Figure 2). In other words, if staff feel the air quality is good, it probably is, but measurement of CO₂ concentrations can highlight whether the ventilation rate is adequate or other factors are at play.

In a separate study by Hoare Lea for a client, complaints of stuffiness highlighted insufficient ventilation rates arising from a defective system. In another office with complaints of stuffiness, it was found that office densities and organisational factors played an important role. **CJ**

■ **ASHLEY BATESON** is a partner at Hoare Lea, **CHRIS POTTAGE** is an associate at Hoare Lea, and **MARCELLA UCCEI** is a senior lecturer at UCL

KEY LESSONS

There are some useful summary insights to be gained from this workplace satisfaction survey.

- Designers and building managers should appreciate the range of physical factors influencing workplace satisfaction and wellbeing. Good overall design, that makes effective use of the space while providing a variety of working areas, are crucial in the modern office.
- Managing thermal comfort, air quality, daylight and acoustic conditions are important environmental considerations, but controlling these effectively has an influence on wellbeing. Climate change, and the predicted increase in frequency of heatwaves, would indicate that limiting overheating in the workplace should be a particular focus for designers and building managers.
- Younger employees are more aware of, or sensitive to, indoor environmental conditions and the quality of facilities – perhaps because they spend more time in the office than their older colleagues. It's important therefore, that designers and building managers engage with those most impacted by the environmental conditions when planning workplace modifications and refurbishments.
- Simple measures – such as installing air-quality sensors to check the adequacy of ventilation rates; giving clarity on how comfort should be controlled; improving maintenance response times; and providing plants in the workplace – can improve occupant satisfaction and wellbeing.



Occupant perceptions of air quality were found to be fairly accurate

The perfect combination..... P-Sensor and the CMR Velogrid



VELOGRID
Velocity Averaging Sensor



P-Sensor

CMR are the inventors and manufacturers of both the P-Sensor and the Velogrid. The Velogrids are made to measure to fit any ductsize up to 3m x 3m and the P-Sensor has a keyboard to easily enter : duct height - width - density - magnification factor and the scaling in m/s - m3/s - m3/h - l/s. It can even work out the Air Change rate. And the BMS gets three linear volume signal outputs of 0..10V 4..20mA and an addressable Modbus rtu bus.

CMR CONTROLS Ltd

22 Repton Court Repton Close
Basildon Essex SS13 1LN GB
www.cmr-controls.com

Tel +44 (0) 1268 287222
Fax +44 (0) 1268 287099
sales@cmr-controls.com



MAX

OUTPUT

MIN SIZE

W – 600mm

H – 505mm

D – 353mm



- Low noise & power consumption
- Modular construction market option
- Independently tested by the BRE
- Ultra-compact MVHR unit
- Easy to install
- High performance

 **Titon**[®]
ventilation systems

THE NEW HRV 1.6 Q PLUS – GET MORE FOR LESS

www.titon.com

CLASS CONTROL

Poor HVAC controls can cost schools thousands of pounds in wasted energy. School teacher **Chris Baker** explains how he engaged with his students at Parrs Wood school to cut energy bills by £9,000 a year after extensive monitoring

There is a huge opportunity for schools to save thousands of pounds in energy bills by making simple adjustments to heating and cooling controls.

The extent of possible savings are demonstrated in a recent study carried out at Parrs Wood High School in Manchester. An analysis of five million data points identified areas of significant energy waste, which enabled the school to reduce its electricity bill by £9,000 – a saving of 7% (equivalent to 31 tonnes of CO₂ per year). The data revealed that 80% of the associated electricity consumption was waste energy caused by HVAC units running outside of occupancy hours because of poor control. Changes to controls reduced this waste to 1%.

The project gave pupils the opportunity to understand the link between poor HVAC controls and carbon emissions. Through the student CO₂ environmental team, they were also able to make a direct impact on energy costs. In fact, they saved £1,000 alone with a bit of lateral thinking and a matchstick.

The study

The analysis looked at 100kW of discrete electrical space heating and cooling units over nine months. Data was logged at two-minute intervals, resulting in five million data points – the equivalent of 20 years' worth of data.

Parrs Wood has recently increased its use of IT¹ and expanded its teaching space. This has resulted in more electrical HVAC equipment, such as air conditioning units for comfort cooling in IT rooms, and heat pumps and electric radiators for conditioning new spaces.



We found space-conditioning equipment to be the most problematic HVAC equipment to control, resulting in long overrun times and considerable wasted energy. It was decided to monitor this equipment.

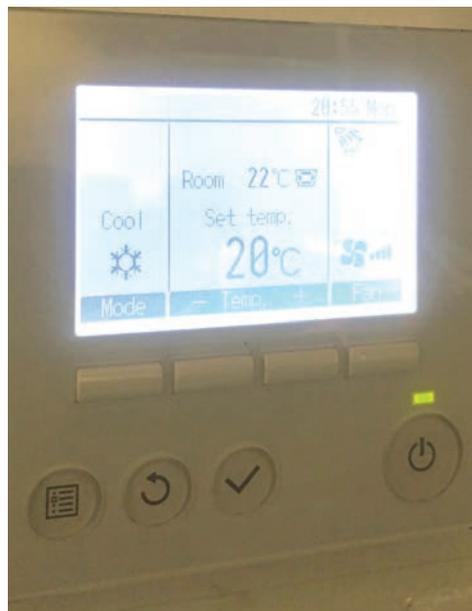
To assess the energy efficiency of controls, low-cost temperature loggers were used to monitor unit operating times. For heat pumps and air conditioning, the compressor was monitored because it is responsible for the majority of electricity consumption. An Excel spreadsheet formula was used to establish the percentage of use occurring in and out of building occupancy, typically from 8am to 4pm. In trials, the accuracy of this low-cost monitoring system was +/-3%.

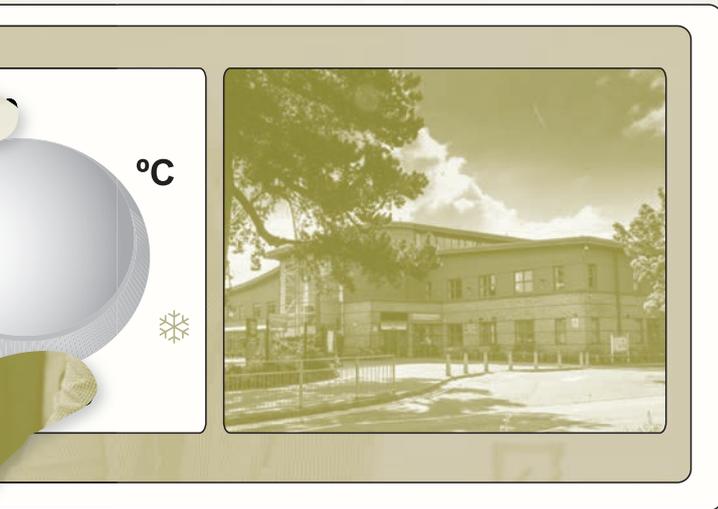
The project also monitored thermal comfort. Air temperatures were logged and classroom occupants were assessed using a thermal

comfort survey based on the BUS occupant survey². It was completed by occupants in classrooms with each of the control types, and the results checked for statistical significance. Allowing occupants on/off control of units resulted in the greatest level of thermal comfort. Other variables, such as setpoint control and fan speed, were found to be less significant. This implies that, despite being shown how to use the controllers, occupants revert to using them for basic on/off control only.

In part, this is explained by the perceived complexity of controls. This was investigated further by testing occupants on the meaning of symbols commonly found on room controllers. The results were checked for statistical significance and showed that teachers and students understood about 50% of the symbols; only service engineers scored 85% or above.

Figure 1: Typical heat-pump room controller for use by occupants





Results and recommendations Air conditioning and heat-pump control in shared classrooms

The classrooms were either heated and cooled by a heat pump, or heated by wet central heating with an air conditioning unit providing comfort cooling. Five common types of control were assessed and, as a minimum, all rooms had a room controller for occupants to adjust. The controls can be divided into two groups: those with full occupant on/off control and those with on/off control limited by a run-on timer.

What to avoid

Full occupant on/off control (ie not time limited): This is the most common way room controllers remain configured after installation and, while it gave high levels of thermal comfort, occupants forgot to turn units off, resulting in long overrun periods. Annual use was 2,750 hours, 80% of which was out of occupancy.

Setpoint control alone: An early version of our BEMS software only allowed occupants setpoint control, not on/off control, so units had to be enabled on the BEMS all day (8am to 4pm). This at least stopped units overrunning outside of occupancy hours. It was hoped that, during the day, occupants would use the room controller to adjust the setpoint, bringing the unit on and off as required. In practice, occupants controlled room temperature using windows, which resulted in units running unnecessarily long hours (80% of occupancy, as opposed to only 33% under the best control).

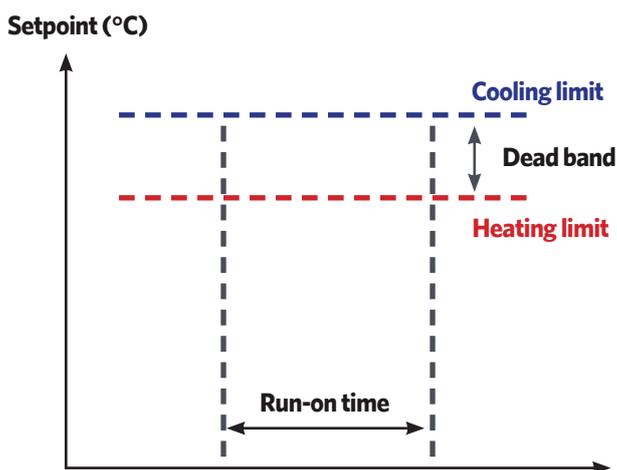


Figure 2: Ideal time- and temperature-limited setpoint control for heat pumps in classrooms

What worked well

Time-limited occupant on/off

control: Allowing occupants to turn units on, but with a run-on time of only two hours, delivers good thermal comfort, but with the advantage of stopping units from running when not needed. This gave the lowest annual operating time of 600 hours (only 33% of occupancy hours during the cooling or heating seasons) and reduced out-of-occupancy waste from 80% to 1%.

Time limiting was achieved in three, equally effective ways: a password-protected run-on time, set on the room controller (only available on more recent models); a ceiling-mounted occupation sensor (some newer room units come with one built in); and, for those connected to the BEMS, software, developed to turn them off after two hours. The BEMS control has the advantage of being able to make adjustments quickly and easily for multiple rooms at once.

Restricting maximum and minimum setpoints:

We found occupants often select excessive setpoints (for example, heating 30°C or cooling 14°C), which increases energy consumption significantly. An in-house survey found extreme setpoints were used because:

- People believed the room would heat or cool more quickly
- People did not dress appropriately for the season
- Occupants become used to controlling temperature using windows, because they are easier to adjust than room controllers
- In schools, occupants change room regularly and may not remain long enough to appreciate the extreme temperatures ultimately achieved (which may be some time later when the room is not in use).

Giving occupants full control of the setpoint perpetuated these practices, despite an educational campaign and posters in each room. Limiting the cooling setpoint to no lower than, say, 24°C – and heating setpoints to no higher than 20°C – encourages behaviour change with regard to clothing and use of windows, and saves significant amounts of energy. Again, this was achieved using password-protected room controllers or on the BEMS. Figure 2 shows the ideal time- and temperature-limited setpoint control.

Electric radiator controls in transient spaces

Four types of controls, three of which



» complied with Building Regulations, were monitored. They can be divided into two groups – those that were easily tampered with and those that were not.

In transient spaces, such as corridors, occupants do not have to endure excessive temperatures for long, and tend to use windows to control temperature. It is impossible for busy staff to check and correct radiator settings on a regular basis, and we found that giving occupants no control at all gave the best results.

The occupant controls outlined below resulted in high annual operating times of around 4,000 hours, with 67% being outside of occupancy. With no occupant control, the annual operating time fell to just 850 hours, with only 1% outside of occupancy. Windows were left open far less frequently and the air temperature log showed it was within the CIBSE recommended range for corridors.

What to avoid

These occupant controls should be avoided: simple on/off switch (non-compliant with the Building Regulations); an override switch (so the unit remains on permanently); time clock; thermostat; night setback temperature. These all resulted in appalling results, despite some manufacturers’ claims that they were tamper-proof (Figure 3).

In an attempt to avoid tampering by occupants, a radio-controlled system was installed, with radiators operated by a central time clock that was not accessible to occupants. However, many of these systems have day and night setback thermostats on the radiator (Figure 4). These are easily tampered with and the night setback temperature was frequently set at its highest level of 21°C so that the unit ran 24/7 trying to achieve this.

“Our national survey of 80 institutions found that 89% suffered similar poor control issues, with the majority blaming contractors for installing over-complicated controls”

What worked well

To remove all occupant control, the student efficiency team locked the day and night thermostats in place using a concealed match stick (day 18°C, night 5°C for frost protection). Their ‘matchlock’ system ensured that, once turned off by the central timer, the units stayed off, saving the school around £1,000 a year with a payback time of just 19 minutes!

That simple time- and temperature-limited occupant control will give the best results in classrooms, and no occupant control will work best in transient spaces seems obvious. What’s not clear is why so many controls are not configured in this way. Some large hotel chains have time-limited controls in rooms, but it is not common practice elsewhere.

We conducted a national survey of 80 institutions (schools, universities, councils, fire and rescue, police and NHS estates), and found that 89% suffered similar poor control issues, with the majority blaming contractors for installing over-complicated controls. The problem is likely to be compounded by regulations such as EcoDesign Lot 20, which assumes more complex controls will result in better energy efficiency.

However, Lot 20 control efficiencies are not measured values, but ‘expected’ ones³ based on the assumption that occupants will adjust them to give optimum performance, which we have shown not to be the case.

Rather than increased complexity, we need standardised simplification of controls, combined with legislation/guidance on how to actually configure them for efficient use. **CJ**

■ **CHRIS BAKER** is a science teacher and coordinator of the student CO₂ efficiency team at Parrs Wood High School.

■ For further information, email c.baker@parrswood.manchester.sch.uk

References:

- 1 Sung-Min Hong et al, UCL (2014). *Improved benchmarking comparability for energy consumption in schools*. London
- 2 Useable Buildings. (2017). BUS occupant survey.
- 3 Electric radiators direct (2017): Lot 20 explained: *what does this mean for electric heating?*



Figure 3: A typical ‘tamper-proof’ cover takes students about 60 seconds to open

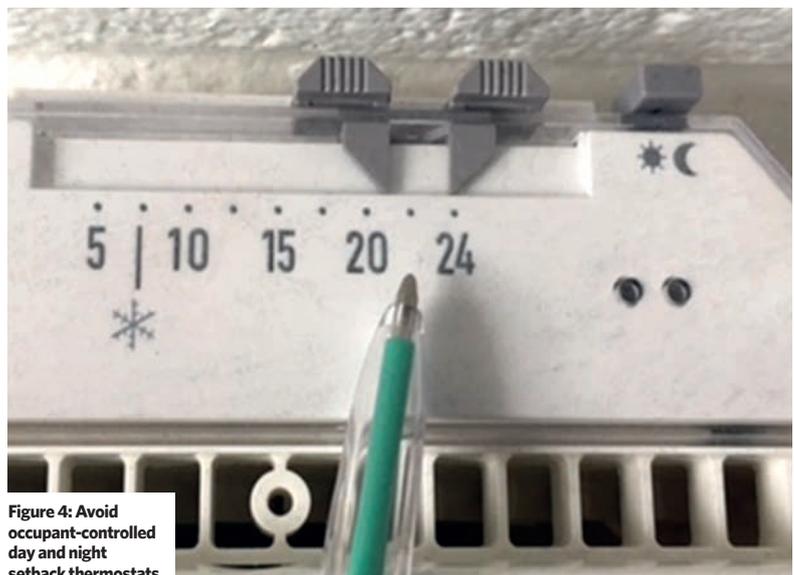


Figure 4: Avoid occupant-controlled day and night setback thermostats

NEW: EFB ULTRA LOW NOX BOILER

With NOx emissions lower than 24mg/ kWh, our new EFB gas-fired condensing boilers qualify for the maximum **2 BREEAM credits**.

EFB boilers can be either wall or frame mounted and at only 440 mm wide and 539 mm deep, provide a compact, space-saving solution for commercial, industrial and large residential buildings. Total frame height is less than 1.8 m.



Find out more:



Check www.lochinvar.ltd.uk for more information or get in touch with one of our territory-based Area Sales Managers



Lochinvar Ltd
7 Lombard Way
The MXL Centre, Banbury
Oxon, OX16 4TJ



+44 (0) 1295 269981
info@lochinvar.ltd.uk

www.lochinvar.ltd.uk

actionair



SmokeCommand

Command smoke and save lives

Visit www.swegon.com/smokecommand to learn more

Swegon



Continuing professional development (CPD) is the regular maintenance, improvement and broadening of your knowledge and skills, to maintain professional competence. It is a requirement of CIBSE and other professional bodies.

This *Journal* CPD programme can be used to meet your CPD requirements. Study the module and answer the questions on the final page. Each successfully completed module is equivalent to 1.5 hours of CPD.

Modules are also available at www.cibsejournal.com/cpd

Dampers for the control of fire and smoke in building ventilation systems

This module focuses on the provision of fire and smoke dampers for ventilation systems to help to improve building safety

Robust compartmentation and smoke control are critical in containing fire and protecting a building's occupants and contents. The consequences of loss of compartment integrity has been tragically implicated most recently in the Grenfell Tower Inquiry: Phase 1 Report¹ that, in the analysis of the expert evidence, suggests a number of factors will have contributed to the loss of effective compartmentation.

This CPD will specifically focus on the provision of fire and smoke dampers for ventilation systems that contribute to delivering a safer built environment by sustaining compartmentation. Oral evidence indicated that it was unclear whether smoke entering some of the lobbies through the dampers in the smoke control system was as a result of the fact that the system was designed to deal with a fire on only one floor, or whether there were non-compliances in the system which led to that smoke spread. The Phase 1 Report found no conclusive proof that there was an issue with fire and smoke dampers.

The control of smoke and containment of fire in the ventilation ductwork in any building are just two of the essential requirements for fire safety. Fire and smoke control systems must be designed, installed and maintained as part of a methodical, holistic and ongoing process. There are several relevant standards and guidelines – some of which have seen very recent updates – that, if properly considered, enable designers and operators to deliver safer systems.

Referring to the 2019 CIBSE Guide E *Fire safety engineering*, for compartmentation to be effective, the enclosing boundaries – such as walls, ceilings and floors – must be able to resist the spread of fire. In terms of dampers, this requires that ducts penetrating fire-resisting boundary elements are provided with fire dampers (or that the ducts are also fire resisting), and that the stability of the structure supporting the fire-resisting boundary (and damper) must be maintained for the required period. Spaces that connect compartments – known as 'protected shafts' – such as stairways and service shafts, also need to be protected to restrict fire spread between the compartments. So, where ducted ventilation services

could compromise the integrity of that compartmentation, fire dampers and smoke dampers can provide a controllable solution.

The principal testing standard is BS EN 1366 *Fire resistance tests for service installations*. BS EN 1366 consists of several parts for different elements of a HVAC system – Part 2 deals with fire dampers and Part 10 with smoke control dampers.

Fire dampers

A fire damper's primary function is to maintain compartmentation and prevent, or impede, the spread of fire through the ventilation ductwork. Fire dampers are designed to allow air to flow through in normal operation but then shut suddenly with a thermal release mechanism at the outbreak of a fire, and are designed to failsafe close. The release mechanism is a thermally actuated device designed to respond to a rise in temperature of the surrounding area and release the fire damper blades at a predetermined temperature. It can interface with mechanical, electrical, electronic or pneumatically operated mechanisms, which are positioned integrally or remotely from the device.



» Fire dampers for use in building ventilation ducts should be CE marked to BS EN 15650:2010 *Ventilation for buildings – Fire dampers* (this standard is currently being revised); as tested to BS EN 1366-2 *Fire resistance tests for service installations – Fire dampers* (this standard excludes dampers in suspended ceilings and non-mechanical dampers); and classified to BS EN 13501-3 *Fire classification of construction products and building elements. Part 3* (this standard is currently being revised).

Fire dampers will resist the progress of the fire in the closed position and have a certified maximum leakage characteristic. The standard BS EN 1366-2 defines the requirements for testing dampers, with a requirement to close within two minutes of the test start. After closure, a 300Pa pressure differential is applied to the damper, and the damper leakage (corrected to 20°C) is recorded during the rest of the test. The largest size of damper on the market must be fire tested. Pass and fail criteria are included in the standard in terms of:

- Integrity, E – the ability to withstand fire when subjected to a furnace-mounted fire-resistance test
- Leakage, S – the ability of the damper to resist the passage of gases or smoke both at ambient temperature and at a set profile of test fire temperatures
- Insulation, I – which assesses the ability of a damper to withstand fire exposure without the transmission of fire as a result of significant transfer of heat. The rating is not required by law for dampers in the UK.

It is common for the UK industry to refer to 'E' classified products as 'fire dampers' and 'ES' classified products as 'fire and smoke dampers'. The principal damper types are described in the panel opposite.

Smoke dampers

The most significant risk for occupants in fires is smoke inhalation. So, when considering smoke and heat exhaust ventilation, an uninterrupted smoke extract path needs to be maintained between the area where heat and smoke is being generated and the outside of the building – this is facilitated through controllable smoke control dampers (often referred to as 'smoke dampers'). As explained in BS EN 1366-10:2011 *Smoke and heat control systems – Smoke control dampers*: 'Smoke control dampers at the fire and along the path have to be open and remain open. Smoke



Figure 1: An example of a fire damper (Source: Swegon)



Figure 2: An example of a smoke damper (Source: Swegon)

control dampers at branches, or on the surface of the duct, along the path need to be closed and remain closed. In fact, if the duct crosses a compartment boundary it becomes part of the fire compartment in which the fire started.' The function of a smoke control damper is to control the flow of smoke and hot gases into, from or within a duct and, if solely a smoke control damper, they do not have to meet the same stringent temperature restrictions as fire dampers. Their simplest application is where they are activated by smoke detectors and close upon the detection of smoke or fire to prevent circulation through the duct. They are also increasingly used as part of an active smoke control system to selectively provide a route to remove smoke from a building. They can be actuated, opened and closed in less than 60 seconds, by external control signals and through a smoke control system. There is no particular failsafe position for smoke dampers.

Smoke control dampers (including fire-resisting types as discussed below) should be CE marked to BS EN 12101-8:2011 *Smoke and heat control systems. Smoke control dampers*; tested to BS EN 1366-10 *Fire resistance tests for service installations. Smoke control dampers*; and classified to BS EN 13501-4:2016 *Fire classification of construction products and building elements*.

Smoke control dampers for ducts are categorised as single-compartment smoke control dampers for use in single-compartment areas, and multi-compartment smoke control dampers for use in multi-compartment areas. Dampers for usage in multiple-compartment applications can also be used as single-compartment dampers. Smoke control dampers, unlike fire dampers, will not have a fusible link and are controllable.

A typical smoke control system with automatic activation and with manual override requires a damper that operates automatically on receipt of a smoke or fire alarm, without any manual action/intervention. In this application, once initiated, the system will allow the damper position to be changed by external input or firefighter's override. Less common are smoke control systems that rely on manual intervention to be put into operation by people on detection of smoke or fire (for example, by pressing a button), leading to a sequence of automatic actions in the operation of the smoke control system. Such systems will still allow the smoke control damper position to be changed by external input/firefighter's override.

There have been updates in 2019 to guidance that covers building fire protection, both in the Scotland Building Standards Technical Handbook, Part 2 and in the England and Wales Building Regulations Approved Document Part B.

The revised guidance on fire dampers and ventilation systems in Approved Documents B1 and B2, which applies in England, has been consolidated into a single section (in both parts). The updated guidance has moved the guidance for the design of blocks of flats from B2 (Buildings other than dwellings) to B1 (Dwellings). Both

sections illustrate guidance for the position of where fire and smoke dampers should be positioned – sometimes in conjunction with ductwork enclosed in a fire-resisting construction. Part B is clear that fire and smoke dampers should automatically operate when smoke is detected by a smoke detector or suitable fire-detection system. This might be through a dedicated damper control panel or building BMS to control the dampers that also provides remote testing and control, in addition to (application depending) allowing firefighter’s override of the dampers.

In common with other guidelines and regulations, AD Parts B1 and B2 indicate that the dampers should be securely fixed within the thickness of the fire-separating elements – this could be, for example, a compartment wall, compartment floor, cavity barrier or construction that encloses a protected escape route or a place of special fire hazard. The damper should be fixed so that expansion of the ductwork will not push the fire damper through the structure.

Appropriate access to the fire damper and its actuating mechanism should be provided for inspection, testing and maintenance. Where ducts pass through fire-separating elements between multiple dwellings, or where there is a sleeping risk, AD Parts B1 and B2 indicate dampers should normally be actuated by both smoke

detectors and thermally actuated devices.

Smoke detectors should be sited so as to prevent the spread of smoke as early as practicable by activating the fire and smoke dampers. AD Parts B1 and B2 notes examples of ‘automatic release mechanisms’ that would automatically trigger that activation:

- Smoke being detected by an automatic device of a suitable nature and quality in a suitable location
- A hand-operated switch, fitted in a suitable position, being operated
- The electricity supply to the device, apparatus or switch failing
- The fire alarm system.

AD Parts B1 and B2 indicates more detailed information on fire dampers and/or fire and smoke dampers is given in the Association for Specialist Fire Protection’s (ASFP) *Grey Book*.³

The rules governing which dampers open/close and how they are controlled may be developed by examining the ‘cause and effect’. So, the building is divided into zones and the zones are normally mapped – for example, into a spreadsheet – and that map is used by to develop a coherent and logical fire and smoke control strategy to maximise the preservation of life. A simple example of the application of smoke control dampers for a basement smoke extract system is shown in Figure 3.

Dedicated damper control panels are normally capable of managing complex ‘cause and effect’ scenarios. Typically, the control can be integrated into the wider BMS that will allow scheduled damper testing and status alerts. Thermal protection is essential for the main control panel, interfacing electronics, network cabling, damper control panel and the damper itself.

To develop the most effective deployment of dampers for fire and smoke control in ventilation systems, it is important to consider risks holistically and develop, and consider, the array of ‘cause and effect’ as early as possible in the design process. That information will drive specification, installation and operation of dampers, controls and actuators. For operational success, the specification should be critically assessed so that the systems maintain appropriate simplicity, ensuring that they not only protect life and property but also reduce the responsibility on firefighters of having to operate numerous override controls.

As with many of the specialist areas in building services, established manufacturers can provide experienced advice on the selection of appropriate equipment to meet the current, and changing, standards.

© Tim Dwyer, 2019.

- Turn to page 50 for references.

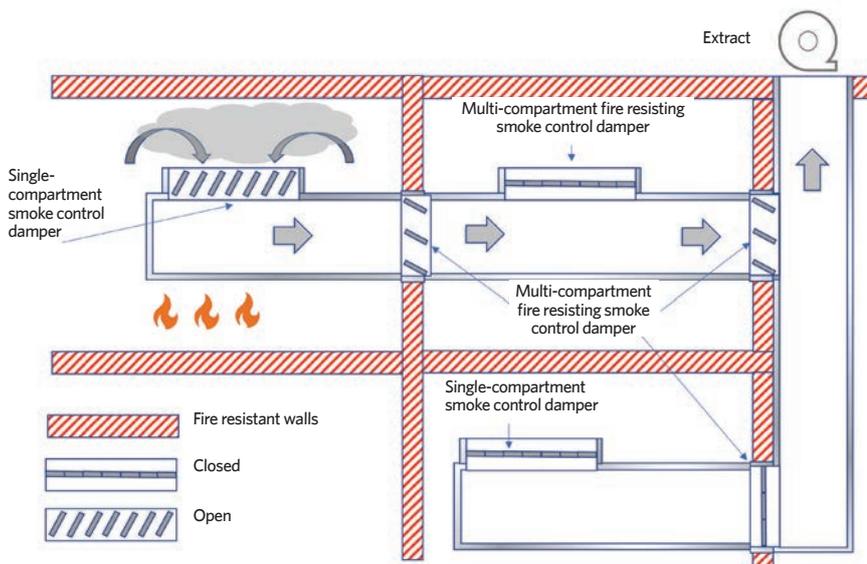


Figure 3: Simple example of the location of dampers for fire and smoke control for a basement application, with dampers set as if smoke is detected in the top left compartment (Source: Swegon)

DAMPERS USED FOR FIRE AND SMOKE CONTROL IN VENTILATION SYSTEMS (SOURCE: CIBSE GUIDE E 2019)

Curtain fire dampers: Interlocking blades which, when open, fold to the top of the assembly, providing the maximum free area in the airway. Blades held open with thermal release mechanism, normally rated at 72°C ± 4K. The blades fall or are sprung to fill the airway to prevent the passage of the fire.

Intumescent fire dampers: These expand by intumescent activity under the action of heat to close the airway in order to prevent the passage of fire. The intumescent materials form the main component for fire integrity. In some instances, this may be supported by a mechanical device to prevent cold smoke leakage. The type of intumescent material selected will influence activation temperatures, and these temperatures typically range from 120°C to 270°C.

Multi-blade fire dampers: These are constructed with a number of linked pivoting blades contained within a frame. The blades are released from their open position by means of a thermal release mechanism, normally rated at 72°C ± 4K. When the release mechanism is activated, the blades pivot and move to close the airway to prevent the passage of fire.

Single-blade fire dampers: These are constructed with a single pivoting blade within a frame. The blade is released from its open position by means of a thermal release mechanism, normally rated at 72°C ± 4K. When the release mechanism is activated, the blade pivots and moves to close the airway to prevent the passage of fire.

Smoke control damper: These are single or multiblade dampers that generally have two positions: ‘open’ to allow smoke extraction or ‘closed’ to maintain the fire compartment.





Module 155

December 2019

» 1. Which CIBSE Guide explicitly covers fire engineering?

- A A
- B B
- C C
- D D
- E E

2. Which part of BS EN 1366 is most appropriate for testing smoke control dampers?

- A 2
- B 4
- C 6
- D 8
- E 10

3. What pressure differential is applied across a fire damper when it is tested?

- A 100Pa
- B 200Pa
- C 300Pa
- D 400Pa
- E 500Pa

4. Which of these is not listed in the article as an example of something that would trigger activation of fire and smoke dampers?

- A Detection of smoke by a suitable automatic device
- B Failure of electricity supply to the device, apparatus or switch
- C Networked smart thermostat
- D The fire alarm system
- E The operation of a suitably located hand-operated switch

5. Which of these properly reflects the example operation of the smoke control dampers in the diagram?

- A Zero single-compartment smoke control dampers open and three multi-compartment fire resisting smoke control damper open
- B One single-compartment smoke control damper opens and one multi-compartment fire resisting smoke control damper opens
- C One single-compartment smoke control damper opens and two multi-compartment fire resisting smoke control dampers opens
- D Two single-compartment smoke control damper open and one multi-compartment fire resisting smoke control dampers open
- E Three single-compartment smoke control damper open and zero multi-compartment fire resisting smoke control dampers open

Name (please print).....

Job title

Organisation.....

Address

.....

.....

Postcode

Email

Are you a member of CIBSE? If so, please state your

membership number:

The CIBSE Journal CPD Programme

By participating in this CPD module, you consent to sharing your details with Swegon. Swegon may contact you via email and/or telephone with further information and technical insight on its services. You have the right to opt-out from such communications at any time.

I understand that I will receive marketing communications from Swegon after completing this module (please tick here):

By entering your details above, you agree that CIBSE may contact you with information about CPD and other training or professional development programmes, and about membership of CIBSE, if you are not a member.

Go to www.cibsejournal.com/cpd to complete this questionnaire online. You will receive notification by email of successful completion, which can be used to validate your CPD records. Alternatively, fill in this page and post it to: N Hurley, CIBSE, 222 Balham High Road, London, SW12 9BS

Further reading:

CIBSE Guide E *Fire Safety Engineering*, 2019 – Provides very recently updated guidance across the whole area of fire protection in buildings.

The Association for Specialist Fire Protection's *Grey Book* provides extensive guidance on manufacture, specification, installation, inspection and verification of fire-resisting dampers.

BESA DW145 *Guide to good practice for the installation of fire and smoke dampers* provides practical guidance on fire and/or smoke damper installation in ventilation ductwork systems.

References:

- 1 Grenfell Tower Inquiry: Phase 1 Report Section 24 – www.grenfelltowerinquiry.org.uk/ – accessed 5 November 2019.
- 2 BS EN 1366-2:2015 'Fire resistance tests for service installations – Part 2: Fire dampers' BSI 2015.
- 3 *ASFP Grey Book Volume 1: Fire dampers (European standards) E (integrity) & ES (integrity and leakage) classified 2nd Edition*, Association for Specialist Fire Protection (ASFP), 2011.



ANDREWS. BUILT TO PERFORM.



Meet the UK's number one team.

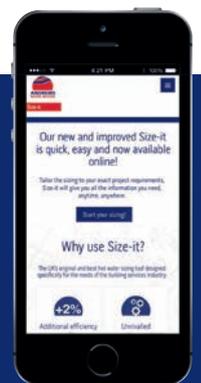
Our diverse range of water heaters are designed for the most demanding of environments, and are the industry's first choice for quality and reliability. Our market-leading experts are at the forefront of setting industry standards, offering unrivalled technical support every step of the way – from design and commissioning, to installation and maintenance.

Call our sales team on 0345 070 1055
or visit andrewswaterheaters.co.uk

Try this on for size...

Size-it, the UK's original and best water heater sizing tool – accurate, easy to use and always up to date with the latest legislative guidance.

Register today at sizeit.co.uk



PRODUCTS & SERVICES



Concord pushes boundaries with Pixier Pod

Concord, Sylvania's architectural lighting brand, has added new iterations of its award-winning Pixier product, further expanding this range of design-led luminaires. The new Concord Pixier Single Pod Recessed is a single light pod suitable for corporate, office and education installations. It has been introduced alongside a wall-mounted version, which allows a consistent design theme to be applied across multiple fitting applications.

Building on the prestigious Lux Award for Interior Luminaire of the Year, the Concord 4 pod Pixier office light represents a breakthrough in innovative architectural design and high-performance output.

The new Pixier Single Pod Recessed is a smaller individual version, providing the option for flush-mounted or pulled out, achieving a true quality light source for circulation environments, which have been lit using downlights traditionally. The additions to the range are available in 3,000K and 4,000K, at 1,800lm and 1,300lm respectively.

■ Visit bit.ly/347hfWc

Adveco FPI range of ASHPs designed to make an impact on energy

Hot water and heating specialist Adveco has introduced the FPI range of commercial-grade air-source heat pumps.

FPI delivers an easy-to-install method for commercial sites to achieve lower-cost water heating or cooling. The compact monobloc design is capable of providing domestic hot water at up to 55°C, or cool water to -7°C for use in fan coils.

Ranging up to a very high coefficient of performance of 4.7, FPI ASHPs can make a real impact on a property's energy consumption.

■ Visit www.adveco.co



Claim Bream points with RHeco

Reznor, part of Nortek Global HVAC, continues its tradition of manufacturing high-efficiency warm-air heating equipment with the introduction of the new highly efficient RHeco series of energy-saving condensing gas-fired unit heaters.

Our ERP-compliant range includes the highly efficient RHeco series of energy-saving condensing gas red unit heaters, which has been ERP compliant for years.

The RHeco units give the highest efficiency levels and substantially reduced CO₂ and NO_x emissions (less than 25ppm). They exceed the requirements of current Building Regulations L2, with thermal efficiencies up to 109% to give exceptional levels of seasonal efficiency. Also, the extremely low-NO_x modulating pre-mix burner enables Bream points to be claimed when applicable.

■ Email erp@nortek.com or visit www.nortek-erp.com



Workplace facilities made easier with Pump Technology

Showers, toilets and changing-room facilities can be fitted into almost any company premises using compact and reliable pumping solutions from Pump Technology.

For fully equipped changing rooms with multiple facilities, the Compli wastewater and sewage lifting station is a proven choice, while the WCFIX Plus offers a powerful 'behind the toilet' solution for single toilets, basin and shower.

■ Visit www.jung-pumps.co.uk



Expert advice is close at hand

The internet may have revolutionised our lives and made swathes of information readily accessible to us all, but it can still be difficult to know which sources to trust and who you should believe.

This is where Grundfos Pumps can help. It has made recordings of some of its in-house experts discussing a range of topics that you can watch at your leisure. A wide range of popular subjects is covered, including heating systems, boiler feed, sensors, temperature control and motors.

The Grundfos for Engineers platform is aimed at engineers working within multiple disciplines – including commercial building services, process industry applications, and water supply and treatment industries – and contains a wide range of additional information that may prove useful.

It is an evolving platform that aims to keep you informed about what is happening in the world of pumps and pump control.

■ Call 01525 850000, email grundfos-uk@sales.grundfos.com or visit uk.grundfos.com or www.grundfos.co.uk/gfe



Myson's updated ULOW E2 has 'summer breeze' function

The new and updated ULOW E2 is the latest product to be introduced to the Myson heating solutions portfolio.

The ULOW E2 uses in-built fans to force convection, and produces up to 60% more heat than traditional radiators. It has intelligent controls, allowing the fans to work on a sliding scale where the water temperature must be 3°C higher than the set point.

Highly flexible, it uses central connection technology that allows any size radiator to be fitted once pipes have been placed. It also has a 'summer breeze' function for air circulation on warm days.

The range of updated heating solutions now comes in nine, rather than seven, sizes, with a height of 600mm and lengths from 400mm through to 2,000mm.

The ULOW E2 is available in one type - double panel with factory-fitted unique top grille and side panels as standard. It also comes with a white electronic thermostatic actuator for even more controllability.

■ Visit www.myson.co.uk

Salt-free softening for the professional installer

For more than 20 years Water-King has been at the forefront of chemical-free, hard-water treatment technologies. While much has changed during this time, Water-King remains the only product of its kind proven by independent laboratory tests to partially soften hot water. Lifescience Products believes this unique benefit - coupled with its maintenance-free, 25-year design life and proven track record across industries and applications - make Water-King the perfect 'fit and forget' alternative to base exchange softening.

■ Call 01608 811707, email sales@lifescience.co.uk or visit www.lifescience.co.uk



Condair launches new humidifier selection tool

Condair is launching a web-based humidifier selection tool, which enables air handling unit (AHU) customers to design a humidification system from within the company's in-house AHU design software.

The API-based system is connected to Condair's global in-house product-selection software, called HELP, so it is updated constantly with all the latest product details.

Condair Configure can even provide advanced calculations, such as pressure drops inherent with any given system design.

Condair Configure is free to use, secure and easy to integrate.

■ visit www.condair.co.uk



Domus Ventilation launches inline filter for improved indoor air quality

Caerphilly-based Domus Ventilation has launched its first inline carbon-filter range, designed to improve indoor air quality by preventing airborne contaminants from entering properties.

NOX-FILT has been designed to work with the company's range of high-performance mechanical ventilation systems, to deliver fresh, filtered air into the main living areas of people's homes.

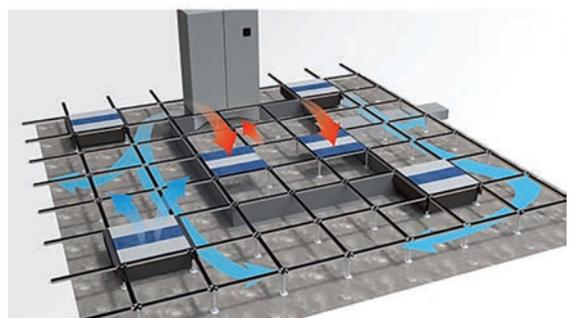
It has no adjustable running functions, and the only maintenance required is a quick and simple filter replacement.

■ Call 03443 715 523, email vent.info@domusventilation.co.uk or visit www.domusventilation.co.uk

Underfloor air conditioning by AET Flexible Space

Underfloor air conditioning systems, used worldwide, make use of the space beneath a 200mm raised-access floor void, to create the air supply route without ducts. This eliminates the need for ceiling-based services and associated duct and pipework. It also allows increased headroom in refurbishments and can reduce height in new builds, bringing dramatic cost savings and tax benefits. Flexible, ideal for workspace, and easy to adapt and maintain, underfloor systems are suited to Cat-A and Cat-B installations. The 'How UfAC Works' section on Flexible Space's website includes a product overview of the different system types: the Cam-C system, a fully underfloor design, ideal for maximising headroom in height-restricted buildings, and the Cam-V system, which allows complete freedom to maximise a floor plate, along with all other components. Interested to learn more? Why not arrange a CPD at your office? The sessions cover how UfAC works; raised-access floor as a duct, and benefits and sustainability, and include a 15-minute Q&A session.

■ Call 01342 310400, email gbt@flexiblespace.com or visit www.flexiblespace.com



Fläkt Woods chooses Danfoss Drives to make buildings safer >

Fläkt Woods has selected Danfoss HVAC VLT variable speed drives for use in its groundbreaking, fully tested and certified, high-temperature fan/VSD range.

Fläkt Woods used its recently updated in-house development laboratory and the expertise of its research and development team to support the deployment of this product solution. Engineers from Danfoss worked closely with their counterparts from Fläkt Woods for more than two years, investigating and evaluating all of the permissible options for controlling fans during fire events.

■ Visit www.drives.danfoss.com



< Waterloo promotes Wardle to sales director and board member

UK air distribution manufacturer Waterloo Air Products has announced the promotion of Andy Wardle to sales director, with a seat on the company board.

Wardle joined Waterloo in 2005 as area sales manager.

As his career developed, he progressed to regional sales manager for the north before taking on his most recent role as head of national sales.

He will be tasked with developing Waterloo's continued growth strategy while leading the national sales team.

■ Visit www.waterloo.co.uk

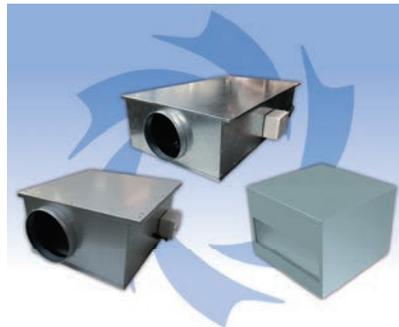


Ducted fan range delivers ultra-low energy use and long-life reliability >

A new range of ultra-low energy commercial extract fans is now available from Dunham-Bush. All fans in the range are ErP compliant and made from high-quality galvanised sheet steel, fitted with acoustic, non-hygroscopic foam and non-overloading '100,000' hour, long-life, ultra-low energy EC fans.

Designed for applications requiring continuity of supply, the eTF series of ducted twin inline extract fans offers duty shared up to 90 l/s and come, as standard, with a combined auto-changeover and speed controller with fault output (ECO-TF). For rooftop applications, eRTF fans offer duty shared up to 900l/s, and are available with weather-protected casings.

■ Call 023 9247 7700, email info@dunham-bush.co.uk or visit www.dunham-bush.co.uk



> Swegon launches AHU Design selection software



Swegon has launched the product selection program AHU Design. This web-based selection tool makes it easy for engineers to design and configure air handling units and carry out advanced energy calculations using built-in modelling to ensure the solution is the right one for the lifetime of the building.

The company's gold, silver C and compact AHU ranges are based on standard designs. This means all data – such as pressure drops and airflows – is

well documented, which allows the system designer to extract the right data for the project in hand.

The smart control functions in the gold AHU come as standard, and means each unit is extremely capable and flexible. There is no need to add expensive extras and conduct time-consuming work. All gold AHUs have also achieved quality certification from Eurovent and the Passive House Institute.

This development is another aspect of Swegon's ongoing commitment to simplify design and installation work for building services engineers and contractors.

■ Visit www.swegon.com/uk/support/software/ahu-design



> Panasonic Introduces a new era of ECOi: the ECOi-W heat pump chiller series

Panasonic has announced its new heat pump chiller series ECOi-W. This new offering provides a wide variety of reliable HVAC chiller solutions.

The range comes fully equipped with high-quality components such as special defrost limiting coils, low noise kits and Blue Fin anti-corrosion coating.

Every model is fitted with a simple, user-friendly control panel that includes an intelligent logic device for inlet water temperature, automatic test operation and night-setback operation to help reduce electrical consumption and noise.

■ Visit www.aircon.panasonic.eu



> Rinnai's energy-efficient multipoint water heater – never run out of hot water again!

Rinnai's 11i A+ rated, continuous flow, gas-fired water heaters – with high energy efficiencies, low running costs and a consistent delivery of temperature-accurate water – are now available for domestic applications.

Rinnai makes more than two million water heaters a year and, as such, is at the forefront of creating unit cost advantages for installers.

Increasingly, installers are recognising the benefits of Rinnai's modern-day variant on traditional water-heating solutions in terms of the cost effectiveness.

■ Visit www.rinnaiuk.com

Vent-Axia named a Business Superbrand for 2019 >

British ventilation manufacturer Vent-Axia is delighted to have been named in the UK Business Superbrand list for 2019. The award follows robust independent research commissioned by The Centre for Brand Analysis (TCBA), which identifies the UK's superbrands in an annual league table. It has been tracking the UK's leading business-to-business brands since 2001, and the ranking recognises the company for quality, reliability and distinction.

Companies with superbrand status are considered to offer customers significant emotional and/or tangible advantages over their competitors.

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



Panasonic offers first CO₂ solution for refrigerated mobile trailer rental >

Panasonic CO₂ cold-chain condenser units were the perfect mobile refrigeration solution for cooling specialists Greencold when it was looking for a reliable, efficient and eco-friendly way to cool and freeze a mobile trailer.

The Panasonic CO₂ units that have been installed in the trailer are compact, lightweight, have low noise levels – a range of 35.5 dB(A) to 36dB(A) – and are designed to fit into smaller spaces, with dimensions of 930mm (h) x 800mm (w) x 350mm (d) and weighing only 67kg.

■ Visit www.aircon.panasonic.co.uk



< Vokèra by Riello launches AquaNova LE

The AquaNova LE, a simple, energy-efficient solution for providing instantaneous domestic hot water to multiple outlets at a high flowrate, has been launched by Vokèra by Riello. With low nitrogen oxide emissions, it is classified under the Ecodesign of Energy-related Product Directive (ErP) Class A, making it fully compliant with the latest ErP Tier 3 requirements. It is ideal for domestic and small, light-commercial applications – such as restaurants and shops – that require an instant and reliable hot-water supply.

■ Visit www.vokera.co.uk or follow Vokèra on Facebook, Twitter and LinkedIn



> DIRECTORY Your guide to building services suppliers

Tel: 020 7880 6245 Email: cibsedirectory@redactive.co.uk

Air Handling



Manufacturer of high quality bespoke AHU's.
Specialists in refurbishment and site assembly projects.
Rapid delivery service available.

Aircraft Air Handling Ltd

Unit 20, Moorfield Ind Est,
Cotes Heath, Stafford, ST21 6QY

Tel: 01782 791545 Fax: 01782 791283

Email: info@aircraftairhandling.com Web: www.aircraftairhandling.com

Energy Efficiency



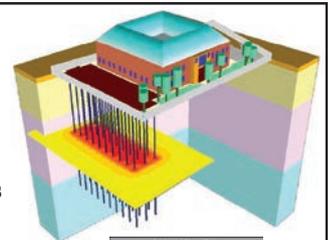
Ground Source Heat Pump Installations

Meeting Renewables Targets

Tel: 02392 450889

Fax: 02392 471319

www.groenholland.co.uk



Consultant

BZKD LIMITED

Electrical Design Support for: Building Services Consultants • D&B Contractors • End Users • Reliable and Efficient Service • HV/LV Power • Temporary Construction Power • Lighting Internal/External • Small Power and Containment • Fire Alarms • CCTV and Security • Survey and Reports • Cost Analysis

CALL: 01386 834 344/07570 724 934
EMAIL: pedmunds91@hotmail.co.uk

Air Conditioning



For total solutions in air-conditioning

E: info@clivetgroup.co.uk

W: www.clivet.com

T: 01489 572238

W: www.versatemp.co.uk

Do you have a new product coming to market or a great service to offer?

To advertise contact us on 020 7880 6245 or email: cibsedirectory@redactive.co.uk

APPOINTMENTS

Tel: 020 7880 6215 Email: cibsejobs@redactive.co.uk

DSSR | CONSULTING ENGINEERS



The Directors are delighted to announce the appointment of two new shareholding Directors with the company as from 1 October 2019.



Gordon Smith was formerly a Regional Director in the Glasgow office and heads up a team of engineers covering a variety of market sectors and disciplines. Having originally joined DSSR on 3 June 1985 as an Apprentice Electrical Engineer, Gordon has a wealth of experience and knowledge which will be of great benefit to the Directors as they move the business into the next phase of DSSR Limited.



David Guilfoyle was formerly a Regional Director in the Manchester office and similar to Gordon, is already actively involved in the running of the office and managing the Manchester engineering teams. David joined DSSR on 27 March 2000 as an Assistant Engineer and during the last 20 years, has played a key role in promoting the Manchester office and winning new business.

Both Gordon and David have already made a huge contribution in growing the business within their respective offices and will continue to build on their successes going forward.

DSSR is a forward thinking, customer focused, award winning company of Consulting Engineers specialising in all aspects of Building Services and Sustainability design. Having been established for over 75 years, with over 100 staff UK wide and offices in Glasgow, Harrogate, London and Manchester, DSSR are positioned perfectly across all major project sectors within the industry to provide sophisticated and sustainable engineering solutions to their clients.



Call for trainers

100s of courses, 1000s of delegates
– CIBSE Training is growing fast

CIBSE Training is always on the look out for new trainers. Can you help?

If you have suitable experience, we'd like to hear from you. Please contact the Training Team at training@cibse.org to find out more.

b-a-r beebey anderson recruitment

Intermediate - Senior Electrical Design Engineer

London £35k - £50k + bens

My client has been established for over 20 years with a network office through the UK and a growing presence in the middle and far east. They work across a diverse portfolio of projects including aviation, commercial, education, healthcare/science, and retail projects, and have recently won one of the largest and most high-profile mixed-use refurbishment projects in Europe Ref: 5556

Senior PH Project Engineer

Berkshire, £45k - £50k + bens

Seeking an experienced Public Health Project Engineer to join a global award winning company. The successful candidate will assist with the delivery of a wide variety of projects for several key clients covering a range of activities from project feasibility through to detailed design and construction support. Fantastic package and support with chartered status offered. Ref: 5729

Senior/Principal Electrical Engineer

London £50 - £65k + bens

Dynamic, innovative and creative does this sound like you? How about working for one of London's most pioneering and progressive MEP Consultancies which prioritise all of the above? You will be working in partnership the world's leading architects on some of the most iconic and complex projects in London and overseas. Ref: 5412

Contract Public Health Engineer

Hampshire, £40p/h

I have a requirement for a Public Health Engineer to work on a temporary contract in Hampshire. You will provide designs through to completion on a number of high end residential projects. The work is detailed design on above and below ground systems. This is a long-term contract with an immediate start. Ref: 5726

Contract Electrical Engineer

London, £43p/h

An Electrical Engineer is required to work on an ongoing basis in London. You will provide electrical detailed design for a large healthcare portfolio which will require you to design and oversee the work which includes, Low voltage, lighting, cable sizing, electrical power distribution and alarm system designs. Applicants must be proficient using Amtech and Revit software. Ref: 5671

Intermediate Mechanical Building Services Engineer

London, £35k - £43k + bens

This is a fantastic opportunity for an Intermediate Mechanical Engineer to join an international building services consultancy who have been established for over 25 years and have won numerous awards, year-on-year for their exceptional work and project delivery. They are looking for an individual to work across several different project sectors including hotels, laboratories, art & leisure, commercial and high-end residential projects. Ref: 5491

For further information and to apply, please call us on **+44 (0)203 176 2666** or email cv@b-a-r.com

Thinking of your future

www.b-a-r.com



The LSE's Centre Building roof terrace

Dan Reeves

Well placed

A decade working in human resources has given LSE sustainability officer Dan Reeves a valuable insight into how the built environment affects health and wellbeing

With a brief that covers traditional building services to beehives, Dan Reeves has a more eclectic remit than many working in the higher education buildings sector. He is currently residences sustainability officer within the estates division at the London School of Economics and Political Science (LSE), with responsibility for embedding sustainability across all eight of the institution's managed halls of residence. As an LSE beekeeper, he also manages the rooftop hive, part of the college's attempt to enhance biodiversity on its estate.

Reeves has a range of experience in higher education building services, having worked on LSE's Breeam- and Ska-certified developments and refurbishment projects. He has also been involved in local air quality studies with Northbank Business Improvement District (BID), and has worked on various energy, waste and water engagement programmes. A decade working in human resources before his sustainability work has also given Reeves insight into the importance of wellbeing, and he has been working with colleagues to develop an LSE Wellbeing Framework.

How important is health and wellbeing to LSE?

It's integral, and something that has grown and evolved over the years in a range of areas of the institution. Initially, the focus tended to be on physical health, but this has developed to encompass mental health, which is a vital aspect of supporting employees and students at LSE. The HR division has done a lot of work on wellbeing and the sustainability team has been active in supporting this as well.

How does LSE ensure good air quality in its environment?

LSE is situated in a very busy part of central London, so air quality is a challenging issue. We deploy building-filtration processes, and use low-to-zero carbon technology to minimise the creation of air pollution from procurement and building energy use. Most staff and students commute via public transport, cycle or walk, which reduces air pollution impacts. We are monitoring air pollution across the campus, to get a greater understanding of localised variations, and we have a large, vertical green wall, designed to capture particulates and so reduce the level of air pollutants. Our most recent Centre Buildings development was very innovative in incorporating a modular green wall on the Mace construction cabins; this is being moved and retained in a new student square soon, in the heart of campus.

How else are you incorporating wellbeing into the built environment?

Elements of wellbeing are incorporated in our new buildings as part of Breeam certification through the provision of cycle facilities, showers and changing rooms, travel plans, and rooftop terracing, with planting to build collective social relaxation spaces. We have a number of building-related social activities – such as rooftop gardening – with which staff and students can get involved, and three very popular beehives, where staff learn about biodiversity, the importance of pollinators, and beekeeping.

LSE has completed two Ska-rated refurbishments and is working on its third. These incorporate wellbeing criteria, such as reduced volatile organic compounds (VOCs) in paint, varnishes and building materials, to improve indoor air quality.

The next development would be to consider biophilic design – how mimicking (or incorporating) natural elements can have a positive impact on the health and wellbeing of building occupants. It is an interesting area that we hope to incorporate into future refurbishments and developments.

What elements of wellbeing are most relevant to the LSE?

Different elements will work in unison, and some will be more relevant to certain groups of staff and students than others. There is a drive to get all of us more involved in physical exercise, which has been tied into nutrition advice – and keeping active fits with our 'active' travel elements of providing onsite showers. It also boosts mental health and wellbeing, so the two are very much intertwined.

LSE has worked on developing social meeting spaces on rooftops and in a new square in the heart of campus, to build social networks and communities.

Could you describe the framework you are working on?

The LSE Wellbeing Standard has elements from the Well Standard, the Ska wellbeing criteria, and my knowledge and experience from having worked at LSE, in a variety of capacities, for 19 years.

I am convinced that the physical estate can actively encourage improved health and wellbeing through biophilic design, the provision of supporting services, and social interaction in collective community building spaces.

NATIONAL EVENTS AND CONFERENCES

Society of Light and Lighting LightBytes series 2019-20

People, Space, Time, Place
30 January, Manchester
13 February, Leeds

The new series will focus on light and wellness, with presentations divided into four sessions: People, Space, Time, Place. This year's expert speakers will be joined by guest speaker Dr Eleanora Brembilla, research associate in advanced building daylight modelling at Loughborough University. www.cibse.org/sll

CIBSE TRAINING

For details, visit www.cibse.org/training or call 020 8772 3640

Air conditioning and cooling systems

2 December, London

Low carbon consultant building operations

3-5 December, London

Building services explained

4-6 December, London

Energy strategy reports

9 December, London

Low carbon consultant design

10-11 December, Birmingham

Electrical services explained

10-12 December, London

Lighting design: principles and application

11 December, London

Air conditioning inspection for buildings

12 December, London

Mechanical services explained

16-18 December, London

Low and zero carbon energy technologies

17 December, London

Building services one-day overview

14 January, London

Heat networks code of practice

14-15 January, Manchester

Low carbon consultant building operations

15-17 January, London

Low carbon consultant design training

21-22 January, London

Heat networks code of practice – half-day update

23 January, London

CIBSE GROUPS, SOCIETIES AND REGIONS

For more information about these events, visit: www.cibse.org/events

South West: membership development lunch

2 December, London

Event to help CIBSE members and non-members learn about process for CIBSE membership, including details of benefits, grades and the different routes to membership.

CIBSE application workshop

3 December, London

Workshop designed to help get your Engineering Practice Report started for Associate and Member applications.

SLL and Scotland: Technical seminar on SLL Lighting Handbook

3 December, Edinburgh

CPD seminar addressing the fundamentals of lighting, lighting technology, a variety of lighting applications and the appendices included in the SLL Lighting Handbook.

HCNE: technical meeting, Part L and potential updates

3 December, London

Presentation by Hywel Davies, CIBSE technical director.

South West: winter social

5 December, Bristol

A pan-professional celebration with CIBSE and ICE members offering a great opportunity to network.

FM Group: Guide M Life Tables launch

5 December, London

Launch of Guide M Life Tables, developed in a cross-industry collaboration with RICS and BESA.

YEN North West and IET: microgrids

5 December, Manchester

Joint IET and YEN event on microgrids, delivered by ABB Collaboration.

South Australia: Christmas lunch

6 December, North Adelaide

With guest speaker Geoff Cooper, and Australia Indigenous Elder.

Western Australia: Christmas lunch

6 December, Crawley

With guest speaker Davina Rooney, CEO of the Green Building Council of Australia.

North East: faulty acoustics

10 December, Newcastle upon Tyne

Presentation by Lawrence Hughes, looking at acoustic design issues, and how to

discuss and manage client expectation.

South West: creating a global data standard – can it be done?

11 December, Bristol

With speakers Andrew Duncan and Tim Burrows, from Arup.

CIBSE Membership closing-date surgery

8 January, London

An opportunity to speak with a professional interviewer, for tips and advice to complete your Engineering Practice Report.

West Midlands: developments in offsite fabrication and pump systems

8 January, Birmingham

An overview of developments in offsite 'skidding' of mechanical systems, with Lee Davies, of GM Treble.

North East: minewater heat potential

14 January, Newcastle upon Tyne

With guest speaker Dr Charlotte Adams.

West Midlands: energy efficiency and the changing world of contracting

22 January, Birmingham

Seminar with Luke Osborne, of ECA, covering the emerging and changing world of the electro-technical sector.

West Midlands: design of an accessible and inclusive built environment

5 February, Birmingham

BS8300 – Code of Practice review CPD seminar with Phil Pearson, of Pearson Consult.

HIGHLIGHTS



Dr Charlotte Adams is guest speaker at a CIBSE North East event on heat and minewater



Davina Rooney will speak at the Western Australia Christmas lunch on 6 December

Building Performance Awards 2020

11 February 2020, London

The 2020 shortlist has been announced – be there on the night to find out who claims the trophies, and celebrate with the best in the industry.

The awards recognise the people, products and projects that demonstrate engineering excellence in the built environment, and are the only industry awards to focus on actual, measured performance outcomes.

With categories including Consultancy of the Year, Collaborative Working Partnership, and Project of the Year for Leisure, Residential and International, these awards are hard won, and offer winning companies high kudos.

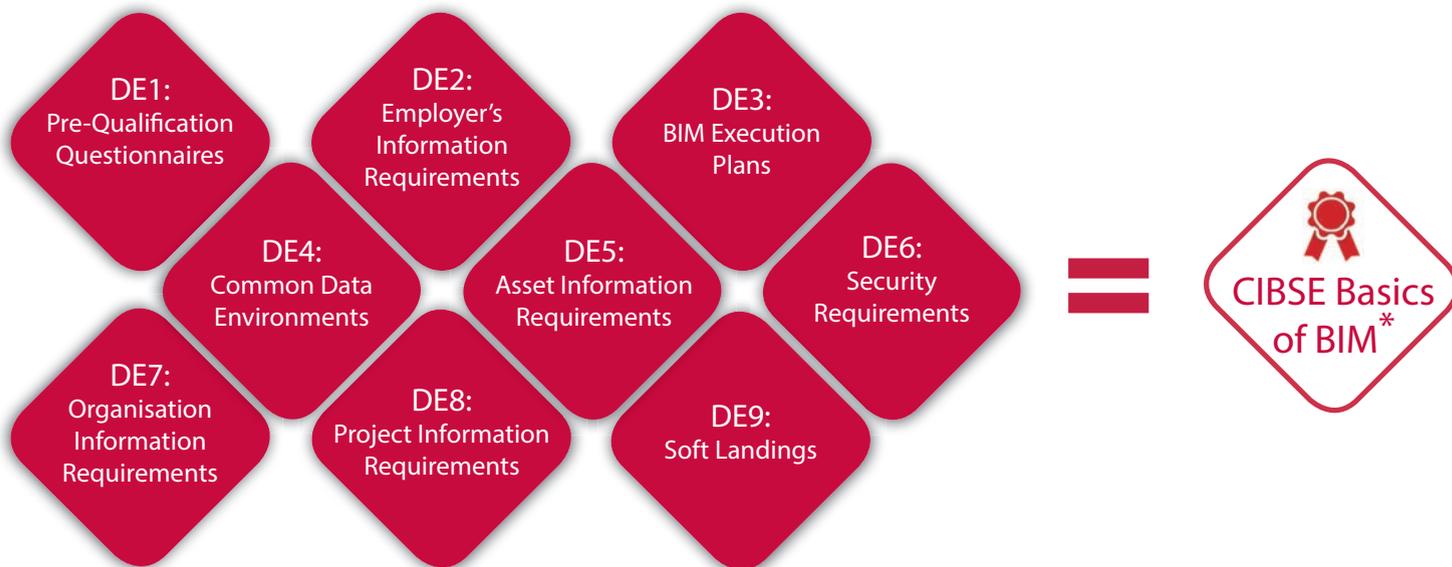
This is an excellent opportunity to see what can be achieved by those who are developing strategies for energy-efficient operation of buildings, designing new builds, and developing products to support them. For more information, visit www.cibse.org/bpa



Gain a certificate in the basics of BIM



The full online learning CIBSE Digital Engineering Series is now available. Complete all nine to be awarded a CIBSE Basics of BIM certificate.



Purchase the full suite of modules and save £100.

Find out more and claim your discount at cibse.org/JournalBIM

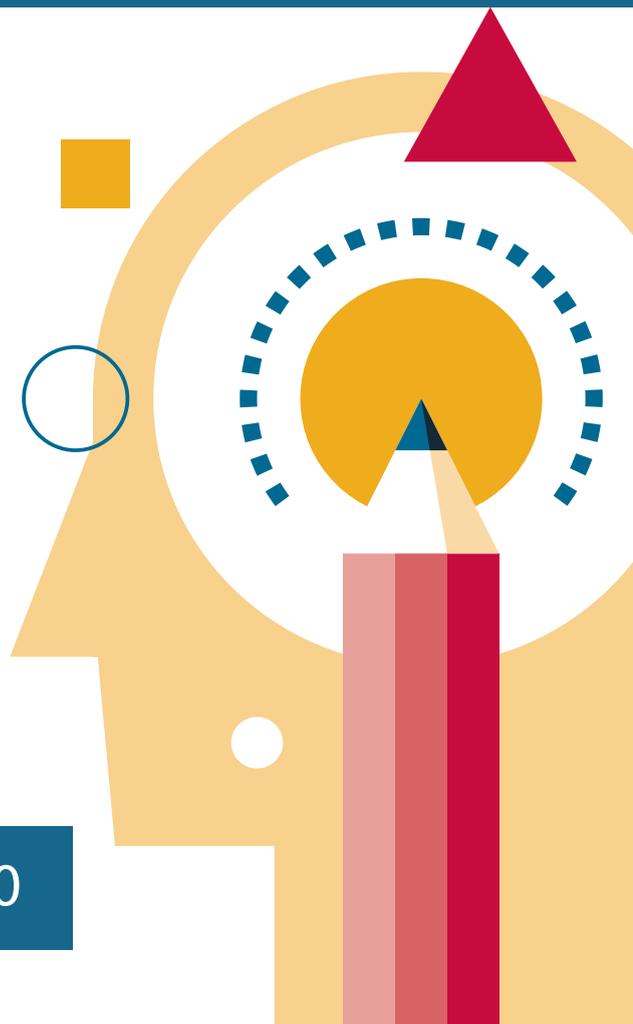


Training Programme 2020

The new 2020 training schedule is now live.

Find training courses to help you develop your skills and grow as a professional in the building services industry.

View now at cibse.org/training2020



CMR

in complete control

CMR Controls manufactures low air pressure and air volume measurement sensors and control systems for standard air conditioning, clean rooms, sterile laboratories, containment facilities, and fume cupboard extract systems.

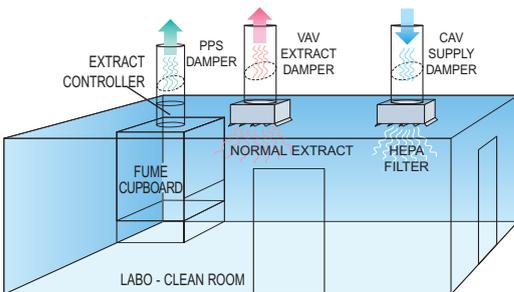


DPM PRESSURE SENSOR

Panel Mount Pressure or Velocity Transducers with remote alarms, analogue and digital interfaces. Traceable calibration certificates supplied as standard.

AIR MANAGEMENT SYSTEM

A complete turn-key system to control room pressure to +/-1Pa. Fume cupboard face velocity to 0.5m/s at high speed and provide constant air changes into the labo - clean room.



DPC CONTROLLER

Fast and accurate controls to drive high speed dampers or invertors. Full PID stand alone controls with BMS interface.

CAV AND VAV DAMPERS

Accurate air flow measurement with the unique CMR Venturi built into the airtight shut-off damper to control room pressure or constant volume.



Metal Damper

PPS EXTRACT DAMPER

Poly-propelene control and shut off valve incorporating the CMR Venturi Nozzle. This is essential when dealing with corrosive extract air especially from fume cupboard systems.



PPS Damper

PRECISION COMPONENTS FOR VENTILATION AND PROCESS CONTROL

CMR CONTROLS

A Division of C. M. RICHTER (EUROPE) LTD

22 Repton Court, Repton Close,
Basildon, Essex SS13 1LN. GB
Website: <http://www.cmr.co.uk>

Tel: +44 (0)1268 287222
Fax: +44 (0)1268 287099
E-mail: sales@cmr.co.uk

