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The interview with Andy Wall, managing director of SES Engineering Services (page 26), ends on a very telling note. With the increasing complexity of services, Wall said, the M&E contractor could end up being the principal contractor. He was only half joking.

The design for the services of the 2.7km-long Queensferry Crossing, on the River Forth in Scotland, shows the importance of expertise in this sector. SES' strategy of prefabricating the services modules at two offsite facilities – in York and Scotland – saved the project huge amounts in costs and man hours. The design would have been very

difficult without the application of BIM. The repetition of the modules' design making up the bridge deck made it possible, and by flatpacking the services components in the Yorkshire factory – ready for assembly in Scotland – all the deliveries could be made using only two lorries driving just 500 miles.

Air quality features prominently in the news at the moment. As we go to press, the High Court has told the government it must release its air-pollution strategy on 9 May. Ministers had lodged an application to delay its release until after the General Election, which is due to be held on 8 June.

In our ventilation and air conditioning special (page 31), we have a round-up of some of the latest initiatives to tackle poor air quality in the built environment. Last month, a working party made up from the medical and building sectors was launched to look at the impact of indoor air pollution caused by faulty boilers, open fires and other items not directly connected with services – such as air fresheners and kitchen products.

We also have a summary of the papers that tackled ventilation, air movement and air conditioning at last month's Technical Symposium. It is vital this research gets widely shared within the industry and, in the coming months we will focus on the technologies that are likely to change the way we design and procure services in future. For more highlights of the symposium, turn to page 18.

Also in this issue, there is a snippet from Apple, about the services design at its new headquarters in California. Little has been revealed of the Foster + Partners building, but on Earth Day last month Apple revealed that the main building will be naturally ventilated for nine months of the year, and that external air would be the dominant form of cooling and used to chill water running through tubes embedded in concrete. Hopefully, we will see Apple presenting its paper at the 2018 Technical Symposium...

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

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Advertisement sales

Sales manager: Jim Folley

Tel: 020 7324 2786

Email: jjim.folley@redactive.co.uk

Sales executive: Darren Hale

Tel: 020 7880 6206,

Email: darren.hale@redactive.co.uk

Senior sales executive: Paul Wade

Tel: 020 7880 6212

Email: paul.wade@redactive.co.uk

Advertising production: Jane Easterman

Tel: 020 7880 6248

Editorial advisory panel

George Adams, engineering director, Spie Matthew Hall

Patrick Conaghan, partner, Hoare Lea Consulting Engineers

Rowan Crowley, managing director, CIBSE Services

Chris Jones, Fläkt Woods

Philip King, director, Hilson Moran

Nick Mead, engineering consultant

Jonathan Page, building services consultant engineer, MLM

Geoffrey Palmer, director, Sweco

Dave Pitman, director, Arup

Christopher Pountney, senior engineer, Aecom

Paul Reeve, director, ECA

Andy Ford, director of research, School of Built Environment and Architecture, LSBU

Gethyn Williams, regional director, Amerlux

Hannah Williams, mechanical engineer, Atkins

Ant Wilson, director, Aecom

CONTRIBUTORS



Hywel Davies
CIBSE's technical director explores directors' duties regarding the risks linked to climate change



Mark West
The Hoare Lea director explains the lessons he learned when a specification job went wrong



Liza Young
Our deputy editor reports from the Technical Symposium on the latest cutting-edge research



Tim Dwyer
The Journal's technical editor looks at safe and effective systems for supplying potable water



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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

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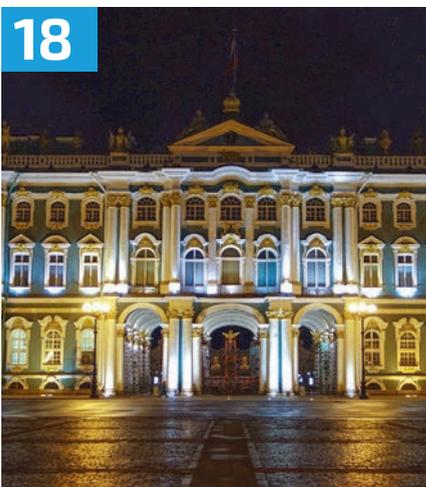
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Publication of Clean Growth Plan postponed by election

Minister promises document will be 'robust and ambitious' when published

The General Election on 8 June is being blamed for the latest delay to the government's Clean Growth Plan, also referred to as the Emissions Reduction Plan.

It was originally due to be published last year, but was delayed because of the EU Referendum. The plan is designed to explain how the government intends to meet the targets set in the Fifth Carbon Budget, which seeks to limit the UK's annual emissions to 57% below 1990 levels by the year 2032.

Climate Minister Tony Hurd had promised the plan would be released by the end of the first quarter, but the pre-election 'purdah' has put it on hold again. Defra's 25-Year Environment Plan could also face further delays, according to parliamentary sources.

Hurd told the Business, Energy and Industrial Strategy committee there was 'still a bit more work to do' in getting cross-government approval to release the plan. But he claimed it would be 'robust and ambitious', and would help to underline the UK's leadership position on tackling climate change.

There were 'huge new opportunities' in low-carbon heating, energy efficiency services, and advanced manufacturing', added Hurd.



The UK still largely relies on combustion of gas, oil and biomass to generate its heat

Icing on the BIM cake

CIBSE's new BIM software plug-in, BIMHawk, has won the BIM Initiative of the Year Award at the 2017 H&V News Awards in London.

It is recognition of the work that CIBSE and NG Bailey's design manager, Paul Marsland, have put into developing BIMHawk, which was released in November 2016.

The freely accessible, web-based system and software plug-in digitises and manages the creation of standard parameters for BIM objects. It allows authorised users to create or upload product data templates (PDTs) corresponding to real-world products, with a full set of industry-recognised parameters ready to be filled in. The model can then be imported into BIM platforms, without disrupting the rest of the design.

BIMHawk removes the need to create new models from scratch for every element of a design, or to edit generic or existing models that are not compatible and do not use the same parameters.

Carl Collins, CIBSE digital engineering consultant, said: 'It is the fruit of many years' – and many peoples' – hard work, and to be able to offer this for free to all is a great satisfaction in itself. To have received this award really is the icing on the cake.' To find out more, visit www.bimhawk.co.uk

● The BESA Gold Award was awarded to Ant Wilson, Aecom director, who was made an MBE in the New Year's Honours 2017.

SES WINS BIG BANK JOB

Design for
One Bank Street



SES has been appointed by Canary Wharf Contractors to deliver shell and core mechanical services to the 27 floors of One Bank Street, an office scheme in London Docklands.

SES will be the lead coordinator for the main mechanical plantrooms and will provide converted consultant models to all other trade contractors, working closely with Canary Wharf Contractors to fulfil the BIM requirements.

To meet the development's tight schedule, SES will make extensive use of its offsite manufacturing facility, Prism, to design and deliver nearly 100 bespoke HEX units, as well as pumps, skids and prefabricated pipework.

Read our interview with SES' Andy Wall on page 26.

RHI delay provides 'breathing space'

'Drafting issues' have held up reform of the Renewable Heat Incentive (RHI) regulations, which will now be postponed until after the General Election on 8 June.

While it is unhappy about the delay, the Heat Pump Association (HPA) said it could prove beneficial for those hoping to complete projects with high heat demands (more than 100kW), which will be limited under the reform package.

'This offers some breathing space to complete larger domestic installations before the introduction of heat-demand limits, while still benefiting from the new tariff rates,' said HPA president Mike Nankivell.

The HPA believes the policy itself will not change, but the law will be re-worded.

Britain goes coal free

The UK had its first working day without coal-generated power since the Industrial Revolution on 21 April, National Grid said.

The previous longest stretch was 19 hours, last May. National Grid believes this latest record is 'a sign of things to come', as coal is phased out in favour of renewables.

'It is a clear message to any new government that they should prioritise making the UK a world leader in clean, green, technology,' said head of energy Hannah Martin.

Coal accounted for just 9% of electricity generation in 2016 – down from 23% the previous year – and Britain's last coal-fired power station is due to close in 2025.

ABB wins bus charge contract

ABB has won a contract to supply electric bus-charging infrastructure for a fleet of Volvo vehicles – operated by Transdev Blazefield, in Yorkshire – from 2018. The firm will provide three charging stations and an electricity substation for a bus station serving Harrogate.

This will be the first electric bus project in the UK to use 'opportunity charging' (OppCharge), where buses are topped up while waiting at stops equipped with fast-charging infrastructure. The process takes just 3-6 minutes.

As well as enabling zero-emission public transport, OppCharge allows the size of batteries on board electric buses to be reduced. This lessens the weight of the buses and thereby improves the energy efficiency of the bus network.

EX-MINISTER LAUNCHES BUSES POWERED BY BUILDING PVs

Eco-friendly bus operator Big Lemon has converted two 25-seater buses to run on electricity derived from solar power. More than 120 photovoltaic panels have been installed on its depot in Brighton, where the buses will be charged at night.

In summer, excess electricity will be pumped into the grid, while the buses will draw some electricity from the grid in winter. But it is expected that the panels will generate more electricity than the buses need. Leeds-based bus manufacturer Optare carried out the conversions.

Former transport minister Norman Baker, managing director at the Big Lemon, said: 'You spend half your life at work, so you'd better do something you believe in and I believe in the Big Lemon.' At the Department for Transport, he oversaw the Green Bus Fund and increased electrification of the railways.



'Shock taxes' threaten solar growth

Solar campaigners say cuts in subsidies and rising business taxes threaten the market's future, just as the renewable energy sector is enjoying a sustained period of economic growth.

According to the Office for National Statistics (ONS), the industry achieved a turnover of £43bn in 2015 and employed 234,000 people. Solar power also hit a new high of 8GW output on 9 April, while the UK has just experienced its first full working day without coal-generated power since the Industrial Revolution.

However, the Solar Trade Association (STA) said the number of UK installations has fallen by 81% compared with last year, because of the cut in the government's Feed-in-Tariff (FIT) subsidies. Many businesses are also facing rate rises of up to 800%, which will reduce their ability to invest in new systems.

STA chief executive Paul Barwell said solar was being 'needlessly impeded by shock taxes, red tape and by a serious failure in the only remaining supportive policy'.

He said this risked the UK industry being left behind 'while other major economies strengthen their stake in a booming world market', and he called for legislation to stop 'the extreme and anti-competitive business-rate hike for rooftop solar'.

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Resilient construction sector defies expectations

Infrastructure expected to be sector's main growth engine

The construction industry is predicted to grow by 1.3% this year and is showing resilience in the face of Brexit jitters, according to the latest Construction Products Association (CPA) forecast.

The CPA also said output would rise by 1.2% next year, and by 2.3% in 2019, but there are considerable differences between sectors. Infrastructure is expected to be the industry's main growth engine, driven by the £300bn National Infrastructure and Construction Pipeline, over the next four years. A 34.5% increase in infrastructure projects for the energy, rail and water sub-sectors will offset expected falls in commercial and industrial construction, it added.

Housebuilding is expected to remain a key source of growth, with private housebuilding rising by 7.2% between

2017 and 2019, underpinned by upward house prices, demand from first-time buyers and Help to Buy equity loans.

'Construction output has been sustained post-referendum, primarily due to projects signed up to before June 2016,' said the CPA's economics director Noble Francis. 'Activity is expected to remain strong in the first half of this year.'



Electric replacements 'flout law'

The Building Regulations are being disregarded in the rush to replace gas boilers with electric heating, according to industry campaigner Peter Thom, of Green Heat.

Thom has written to the Secretary of State for Communities and Local Government, Sajid Javid, pointing out that the trend towards electric heating will drive up carbon emissions. He adding that it ignores new lower-energy ratings aimed at meeting the new Minimum Energy Efficiency Standards (MEES).

Thom condemned the practice of marketing electric panel heaters as a replacement for gas heating 'which is clearly not even permissible'. He urged Javid's department to issue new guidance to property agents, lawyers and consumers explaining the 'consequences of non-compliance', pointing out that properties should not be rented out if they breach MEES.

Public sector clients slow to adopt BIM

Building information modelling (BIM) was only used on 38% of centrally funded government work in the year after it was made mandatory for all public sector projects, according to the *Construction Manager (CM)* annual BIM survey.

One in four public sector clients admitted they did not ask for BIM and more than six out of 10 said they had not made it a requirement since the mandate came into force in April 2016. Just one in 10 private sector clients demanded Level 2 BIM on all projects. Half didn't ask for it at all and, as a result, many small contractors have not made the necessary first steps towards adopting it.

The *CM* survey showed the industry's professions are embracing BIM more enthusiastically, with 61% saying they had 'some confidence' – and 22% saying they were 'confident to fully confident' – in BIM's effectiveness. Although 39% said they had 'little or no confidence', that is an improvement on the 48% who felt the same in 2016.

Small firms enjoy rising workloads

Despite growing concern over skills shortages and the cost of labour and materials, workloads for small construction firms continued to rise in the first three months of 2017, according to the Federation of Master Builders (FMB).

Only 5% of its members expect to see their activity slow in the coming months, but 85% told the FMB's latest trade survey that material prices would rise in the next three months.

'Workloads rose in every part of the UK, with particularly positive results in the devolved nations,' said FMB chief executive Brian Berry. 'It's encouraging that smaller construction firms aren't sensing any drop-off in demand for their services.'

The FMB warned that the survey was taken before the announcement of a snap General Election, 'which may well cool consumer demand in the coming months', and Berry urged firms to be 'cautious in their optimism'.



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MPs fear Apprenticeship Levy will not address UK skills gap

All-party education committee says government must focus on outcomes

The Apprenticeship Levy was launched in April, and aims to generate £2.5bn from large employers to fund three million new apprenticeships by 2020.

However, a critical report from the all-party Education Select Committee described it as a 'blunt instrument' that would not tackle the skills gap. It said the number of apprentices would rise, but not necessarily in the sectors and regions where they were most needed.

The committee called on the government to focus on 'outcomes' – for example, judging the success of apprenticeships by 'whether individual apprentices secure employment' – and to consider restructuring the levy on a sectoral and regional basis.

Education committee chair Neil Carmichael said ministers should recognise that apprenticeships were a means to an end, and 'not an end in themselves'. He urged them to focus on areas of the economy 'where training is most needed, and ensure quantity does not trump quality'.

One of the trade associations spearheading the development of apprenticeships in the built environment sector said it understood the committee's concerns, but added that the levy itself was not the problem.

'We have been stressing all along that this is not a numbers game,' said Tony Howard, director of training at the Building Engineering Services Association (BESA). 'The focus of the funding needs to be not only on key industry sectors where there is a skills shortage, but also where that shortage is likely to have the most impact on the economy.'

'This includes many engineering professions where shortages and quality issues are hampering delivery of key building and infrastructure projects.'

Howard added that the government could improve the system by allowing levy payers to pass on more than the 10% of their funds they are currently allowed to share with their supply chains.

'Many major contractors have said they would happily invest in their supply chains by helping subcontractors grow their skills base,' he said. 'So we would urge the government not to curb their enthusiasm and be more generous with the amount they can pass on.'



Sloppy specification costing billions

Poor workmanship, sloppy specifications and an inefficient procurement process are costing clients billions of pounds every year, according to a new survey by the Specialist Engineering Contractors' (SEC) Group. Only 27% of councils in England use the government-approved PAS 91 standard pre-qualification questionnaire (PQQ) to assess contractors, and only 11% insist that their Tier One contractors use standard questionnaires to appoint their supply chain, according to the research.

SEC said needlessly filling in questionnaires and duplicating PQQ exercises was costing contractors more than £1bn every year – money that offers no benefit to the industry or its clients, and that simply serves to reduce profitability. It is lobbying the government to make use of PAS 91, a regulatory requirement under the Public Contracts Regulations 2015.

Tackling this issue could make quality savings of between £7bn and £12bn a year, according to a separate report from the Chartered Quality Institute Construction Specialist Interest Group, which said ensuring only suitably qualified contractors were appointed was key to achieving uplift in quality.

Only 6% of local authorities use trade association membership as their main way of establishing contractor competence, while 18% rely on references and around 20% simply use companies they have appointed before.

IN BRIEF

New buildings services director at Sweco



Craig Wilson has been appointed Sweco UK's building services director in the north of

England. He joins the company after working as a director for several consultancy practices. Wilson has 35 years' experience in design management, leadership and technical delivery of large-scale projects in the UK and abroad, and will work with Sweco's buildings teams in Manchester, Leeds and Newcastle.

Lab gains Bream and Leed top scores

The GSK Carbon Neutral Laboratory for Sustainable Chemistry has achieved Bream Outstanding and Leed Platinum certifications. Aecom delivered the M&E services for the University of Nottingham project, which includes a carbon-neutral lab powered by solar energy and biofuel, and captures excess heat for use by adjacent buildings. It is designed to use minimal energy and employs natural ventilation, wind catchers, and water-leak detection and sustainable drainage systems. See 'Chemical equilibrium' in the April 2017 *CIBSE Journal* Education Facilities Special.

Tributes paid to witty and kind colleague



Waterloo Air Products technical manager Wander ter Kuile has died after a brave fight with

cancer. Born in the Netherlands, Wander moved to Britain aged 11. He joined Waterloo in 2006, after working for Vokes and Altair, and was an engineering ambassador to Cove School. Waterloo's chair, Rick Edmondson, said: 'He generously shared his unbelievably wide and deep knowledge. He was also good fun to work with – witty, kind and supportive, and an excellent friend and colleague. We will miss him.'



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IN BRIEF

Expansion of CIBSE's digital offering

CIBSE has released the latest publication in its Digital Engineering (DE) Series. *DE4: Common data environments* joins existing titles *DE1: Pre-qualification questionnaires*, *DE2: Employer's information requirements*, and *DE3: BIM Execution plans*.

DE4 is intended to help those who specify, commission and use common data environments (CDEs). It is based on BS 1192:2007+A2:2016 and PAS 1192-2:2013, and gives guidance on how data can be added and retrieved from a CDE, and the principles behind their use. No single way of delivering a CDE exists. It can be based on the use of folders, an electronic document management system (EDMS) or a bespoke cloud-based solution. The chosen method will depend on the nature and scale of the project.

The CIBSE series has been created to help the built-environment supply chain tackle the practical challenges of digital engineering. The latest edition is available to members for £25 (£50 to non-members). Visit www.cibse.org/des

CIBSE reaches out to students

The CIBSE Membership team has been visiting UK colleges and universities that run building services engineering, construction and the built environment, and accredited courses.

Achieving Level 3 or above in these subjects meets the academic requirements for EngTech registration, while accredited university courses meet the criteria for IEng and CEng registration. CIBSE talks to students about the benefits of membership, the importance of being registered, and the application process.

Thank you to: Southampton City College; Mid Kent College; Uxbridge College; Trafford College; The College of Haringey, Enfield and North East London; City of Liverpool College; Leeds College of Building; York College; New College Nottingham; Colchester Institute; and Loughborough, Brunel, Cardiff, De Montfort, London Southbank, Heriot Watt, Northumbria and Reading universities.

Engineering an economy that works for everyone

CIBSE has its say on delivering affordable energy and clean growth for the UK

Improving energy efficiency and resource productivity needs to be a priority for the UK government, CIBSE has stated – particularly in buildings and energy networks.

It was responding to a Department for Business, Energy and Industrial Strategy consultation on building a modern industrial strategy, to improve living standards by increasing productivity and driving growth across the country. The consultation was published before Prime Minister Theresa May called the snap General Election for 8 June.

CIBSE contributed to the response – led by the Royal Academy of Engineering – as part of a consortium of 38 professional engineering institutions. It urged the government – through the Emissions Reduction Plan – to deliver a stable energy strategy that will create both the confidence and certainty to attract the investment needed to meet the UK's Climate Change Act and Paris Agreement obligations.

A systems approach needs to be taken, CIBSE continued, to ensure the country has a decarbonised, integrated, affordable and secure energy supply. Energy policy tends to be approached in silos, addressing carbon and the environment, security and cost separately, resulting in policies that can pull against each another. Specific recommendations include

enforcement of Building Regulations and a focused drive on decarbonisation of heat.

Other highlights of the response include: taking a broader view of education to develop skills; supporting local innovation; improving access to public procurement projects for SMEs; developing regional

infrastructure strategies; and investment in research. To read the full response, visit: www.raeng.org.uk



Membership deadline looming

The closing date by which engineers based in the UK can next apply for the Associate (ACIBSE) and Member (MCIBSE) grades is 1 August 2017. Applicants must ensure their submission includes:

- Application form, signed and checked by their sponsor
- Work experience listing/CV
- Practice report (4,000-5,000 words)
- Organisation chart
- Development action plan
- Qualification certificates, if required, signed by their sponsor
- Relevant fees

For details of the requirements and application process, visit www.cibse.org/membership

If you are looking to gain IEng or CEng registration – but are unsure if you satisfy the requirements – get in touch with details of your academic qualifications. We can advise the best route to registration. If you do not have

academic qualifications, you can still gain IEng or CEng by completing a technical report or undertaking further learning.

Applicant help pages are at www.cibse.org/applicanthelp, and member briefings and webinars are at www.cibse.org/briefings. For further information, contact membership@cibse.org or +44 (0)20 8772 3650.



Not long left to send your application



In the spotlight

The Society of Light and Lighting (SLL) has published a new introductory guide to lighting.

LGO Lighting Guide 0:

Introduction to light and lighting is based on chapter one of the forthcoming, updated edition of the SLL Code for Lighting. It has been produced as a free, stand-alone document as an introduction to light and lighting for those with a general interest in the subject.

The guide looks at the issues affecting the quality of lighting and task performance, as well as how light affects people's behaviour, safety, and perception of objects and space. The final sections focus on lighting and health, as well as cost and pollution issues.

The guide is available on the CIBSE Knowledge Portal at www.cibse.org/knowledge

Last year's
YEN Awards
finalists

What's the good in going green?

The winners of the Green Infrastructure Design Challenge, organised by CIBSE and ARCC, will be announced at an event during Green Sky Thinking Week in May.

Entitled 'Exploring green infrastructure as a building service', the event will look at the design, engineering and maintenance requirements of bringing green infrastructure into buildings as a service. There will be talks by leading experts, while the Design Challenge entries will be showcased, before the winners are announced.

Submissions for the challenge had to demonstrate how indoor and outdoor green infrastructure can contribute to the health, wellbeing and productivity of staff, while improving a building's energy efficiency and climatic resilience.

The event will take place on 19 May, from 10am to 12pm, at Build Studios, 203 Westminster Bridge Road, London. To book your place, visit www.cibse.org



YEN Award winner will bag trip to 'Windy City'

Two runners-up to receive cash bursaries from The Rumford Club

Engineers are invited to enter the 2017 CIBSE Young Engineers Awards, for a chance to win a trip to the ASHRAE Winter Conference in Chicago.

The annual CIBSE ASHRAE Graduate of the Year Award is one of the industry's most sought-after accolades, celebrating the industry's best examples of young engineering talent. In addition to the winner's prize, The Rumford Club presents cash bursaries to the two runners-up, and all other finalists receive £100 each, courtesy of the Manly Trust.

Any engineer who has graduated in a building services-related field – either at undergraduate or postgraduate level – in the past two years is eligible to take part.

Meanwhile, there are three categories in the Employer Award, giving small, medium and large firms the chance to demonstrate how they invest in their young engineers' career progression.

Enter the CIBSE Young Engineers' Awards at www.cibse.org/yea and, for more information, email yea@cibse.org The presentation ceremony – sponsored by Andrews Water Heaters, CIBSE Patrons, Swegon Air Management, and Kingspan, and supported by the Institution of Mechanical Engineers (IMechE) and ASHRAE – will take place on 12 October, at the IMechE.

The judging panel includes the presidents of CIBSE, ASHRAE and the IMechE, along with the current Graduate of the Year Antoni Sapina Grau.

Read our Q&A with the 2016 Graduate of the Year winner on page 57.

Future Designs team in second Ready, Steady Light win

Future Designs celebrated its second success in three years at the annual Ready, Steady Light event, organised by the Society of Light and Lighting (SLL) with Rose Bruford College.

The competition – now in its 15th year – took place at the Sidcup-based college in March, when 13 teams vied to design and set up temporary exterior installations in only 180 minutes.

Kent-based Future Designs was awarded the Peer Prize, with WSP Parsons Brinckerhoff taking the Technical Prize, and Light Bureau the Artistic award. The judging panel for the Technical Prize was chaired by SLL president Jeff Shaw, while SLL president-elect Richard Caple chaired the Artistic Award on behalf of the International Association of Lighting Designers (IALD).

Each team, led by an SLL member, was allocated a site on the college campus at random. Focusing on return-to-basic engineering and design, they then overcame challenges to light each site using designated equipment, without a budget and within time constraints.

Ready, Steady Light is supported by the IALD, with further support and equipment from Philips, Lee Filters, Whitelight and Erco. The teams came from: Llumarlite; Lighting Projects; Marcus Stefan Lighting Design; Future Designs; WSP Parsons Brinckerhoff; DPA; UCL; Into Lighting; Arup; Light Bureau; Studio 29; Philips; and Hoare Lea. Visit www.sll.org.uk for more information.



Paul Flatt's interview in last month's *Journal*

This month, a reader applauds Paul Flatt, and CIBSE LinkedIn Group members discuss starting a Part L group

Think commercial

What an excellent piece of advice to the whole of the CIBSE engineering profession from Paul Flatt ('Value judgements', *CIBSE Journal*, April 2017): 'It's back to making sure engineers are commercial.'

This I applaud. Engineers – in particular, building services engineers – are in a preferred position to hit all the buttons on whole life-cycle cost analysis; many client types are very interested in operational costs – hotel, airport and data-centre operators to name but a few.

Over the years, providers of engineering consultancy services have let go of their commercial input. I urge CIBSE to rekindle efforts in this regard.

Vincent Fogarty AMCIBSE

CIBSE LinkedIn Group discusses the potential of a Part L focus group

Chris Yates

This is a straw poll to see if there is an appetite for a group focused on Part L1 & L2 and its equivalents in the devolved regions. A special interest group may provide a good forum for peer review of this essential, yet flawed, process.

Graham Smith CEng FCIBSE

The controls aspects of the compliance guide, some of which relate to the minimum requirements and efficiency credits, are very poorly written and not representative of current technology, in my view. A focus group might bring about long-needed change.

Ian Walker

Will be interesting to see how life develops if we no longer have to be EU compliant, for better or worse.

Ben Abel

This would be a good idea, as there are many grey areas in Part L that – as an industry – it would be good to form a consensus on how best to tackle them.

Michael Hardman

I believe there is a focus group from a team at Sweco that is engaging with the BRE to tackle this issue. I also believe there are exemptions from the normal algorithms used if specific project calculations can be demonstrated to BRE to be more suitable.

Julian Sutherland

I agree Part L has a few issues, but let's remind ourselves of its purpose. It is a much-simplified and rather blunt compliance tool. I would like to suggest we ignore the peculiarities of Part L and start more meaningful conversations about total energy consumption and whole-building performance. This would generate meaningful design-led conversations about how to reduce energy demand and optimise system performance. Let's talk design metrics, which are directly comparable with building utility meters and how to predict performance better. kWh/m² of treated floor area would be a good place to start.

CIBSE Journal welcomes readers' letters, opinions, news stories, events listings, and proposals for articles.

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or write to: Alex Smith, editor, *CIBSE Journal*, CPL, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK.

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THE STOVE GUARD EXPERTS

How I learned to keep records and hold my nerve

Hoare Lea's Mark West explains the lessons he learned after a unique specification job went wrong on an important 50,000ft² office project

When I joined the industry in the early 1980s, things were arguably far more relaxed than they are now. On the whole, stuff got sorted by standing 'toe to toe' with contractors in site meetings when there was any dispute.

One of the key messages I got from our Partners was to avoid unique specification where possible, and to rely on performance parameters to describe products. It made sense, and it made you think harder about describing what you expected, so it was clear to the reader. I could also see the need to take greater care in drafting and to use consistent and correct terminology.

I was asked to take the lead on a 50,000ft² new office project and, as a senior electrical engineer, was keen to show I could run the job, as well as lead my own discipline. The building – on a difficult sloping site with lots of planning constraints – was technically challenging, but we faced that challenge with a friendly, regional project team.

The original client – a small outfit – sold the development just as the team progressed into detailed design. The new owner was a nationally renowned developer, and brought one of the best-known property consultancies with it. All of a sudden, our cosy little design team was awash with lawyers, project managers, and facilities management advisers. Pretty much every aspect of the design was challenged. The M&E solutions were a focus of attention. Partners were wheeled in to ensure the new client got the best advice. We were to have four-pipe fan coils and the comfort cooling was to be controlled by the building management system (BMS). The building contractor was soon to be appointed and we were about to embark on a major redesign, based on new criteria, enhanced flexibility for subdivision, and a closing window of opportunity for change.

It was the first four-pipe fan coil design we had done in the office, and the first commercial scheme we had tackled that incorporated a BMS. All wiring and heavy electrical kit for mechanical controls were to be specified by the project electrical engineer – me – and my mechanical colleague had been drawn to a BMS system that promised a cost-effective commercial solution. Weeks of design culminated in production of detailed drawings, as well as particular and standard specifications for M&E subcontractors to price. Good job – or so I thought. So what went wrong?



"All the fingers were pointing at me, but it didn't feel as though it was my mistake"

Three weeks before practical completion (PC) was due to be granted – with a pre-let tenant itching to get access to start fit-out, and heavy penalties should PC be delayed – I took a phone call from the mechanical subcontractor's site manager. He said we needed four cores in the bus cable between the fan coil controllers, and there were only three. The cable I specified was installed and the controls manufacturer said it didn't meet their requirements. He needed an instruction to change the bus cable between all the 400 fan coils in the building. I went straight to site and, sure enough, the cable was what I had specified – and it only had three cores, not four.

I remember I had been sent a generic cable specification by the controls manufacturer to incorporate into my tender documents. I took 30 copies of their fax and sent it to the subcontractor.

The atmosphere became very tense as everyone started to realise where this might go. I checked my 'compass' with one of our Partners, who gave me the reassurance I needed to hold my nerve. All

the fingers were pointing at me, but it didn't feel as though it was my mistake – although there were too few cores in the bus cable. What I had specified was correct and met the controls manufacturer's requirements at the time I drew up the specification – so what changed?

I remembered a technical query (TQ) sheet, from months before, that described a change the subcontractor wanted to make to a communication device in the control system. The site manager confirmed the two things were linked, and that the supplier had changed the cable requirements at the same time. The subcontractor hadn't picked it up and continued to install the cable I specified.

The following weekend, the entire bus-cabling installation was replaced to ceiling-void-mounted and recessed-wall-mounted perimeter fan coil units. The site was flooded by 200 electricians and 8km of cable was removed and replaced. PC was achieved and my client remained penalty free.

Had I given in to the pressure and issued an instruction to replace the original cables, I have no doubt there would have been lengthy delays and it would have been messy. I learned the importance of keeping records and to hold my nerve when those around me are relying on me. It was very uncomfortable, but a huge lesson I will never forget.

MARK WEST
is a partner
at Hoare Lea

A climate of risk

Hywel Davies explores an emerging aspect of legislation: directors' duties in relation to climate change risks

It is some 30 years since climate change was first seriously discussed by world leaders. In a speech at the Royal Society in 1988¹, Margaret Thatcher acknowledged that changes in population, agriculture and use of fossil fuels might 'have unwittingly begun a massive experiment with the system of this planet itself'.

At the second world climate conference in Geneva in 1990², she explicitly called for precautionary action in response to changes in the atmosphere. And, later that decade, the Kyoto conference agreed on measures to reduce carbon emissions.

But, as we all know, global carbon dioxide levels continue to rise, with growing evidence of changes to the global climate. The Conference of the Parties in Paris in 2015 made further commitments to reduce global emissions, but average global temperatures continue to rise, and extreme events also appear to be occurring with increasing frequency.

As well as considering the impact on our communities, wider national society and globally, we need to consider the potential impact of climate change on our businesses. And this is not just something for casual consideration. There is a growing argument that directors have a statutory duty to pay attention to the potential risks that climate change might pose to their businesses.

This recently had considerable attention from senior lawyers and business leaders in Australia. Last October, the Australian Centre for Policy Development (CPD) – an independent, non-partisan and evidence-based policy institute, working in conjunction with the Future Business Council – ran a roundtable on climate risks and directors' duties. This featured senior leaders from the Australian fund management community, along with senior lawyers.

To prepare for this event, the CPD commissioned legal opinion on the extent to which Australian corporate law permits (and indeed requires) directors to consider climate change when making decisions about strategy, performance and risk disclosure. Key findings suggest that:

- Climate change-related risks would be regarded as foreseeable by courts, and so are relevant to a director's duty of care and diligence, where those risks might affect the interests of the company
- Where climate change-related risks are – or may be – material to the interests of the company, directors are not legally restricted from taking into account



“Directors could be found liable for breaching their duty of care in the future”

climate change and related economic, environmental and social sustainability risks

- Company directors may – and, in some cases, should – consider the impact of climate change-related risks on their businesses
- Directors who fail to address climate change-related risk now could be found liable for breaching their duty of care and diligence in the future.

The opinion was prepared by Noel Hutley, Special Counsel, who said that 'it is likely to be only a matter of time before we see litigation against a director who has failed to perceive, disclose or take steps in relation to a foreseeable climate-related risk that can be demonstrated to have caused harm to a company.'

This shows that directors should be considering climate change-related and other relevant environmental, social and governance issues that might influence the long-term performance of companies, a view supported by the roundtable.

The discussion is not confined to the antipodes. This summer, ClientEarth³, the UK environmental lawyers who have twice won court judgements against the UK government on air quality, complained to the UK's Financial Reporting Council (FRC) on the omission of climate risk reporting from the annual reports of two oil and gas companies: SOCO International PLC and Cairn Energy PLC. Commenting on the Australian roundtable, Alice Garton, senior lawyer at ClientEarth, said: 'This is the latest clear example of the growing consensus around the duties of company directors to adequately assess and disclose the risk to their business posed by climate change.'

Directors should assess and report on climate-related risks to investors. If they are more mindful that future emissions reduction regulation may affect their business, they should seek advice. And, given the contribution of the built environment to global emissions, this is an opportunity for many readers who need to be on hand as directors wake up to this duty. Otherwise, we can be certain that others will be.

References:

- 1 See bit.ly/CJMay17risk1 The speech is worth reviewing, not only for the environmental aspects towards the end, but also for the comments on scientific research funding earlier.
- 2 See bit.ly/CJMay17risk2
- 3 ClientEarth is part of the Commonwealth Climate and Law Initiative (CCLI), focused on Australia, Canada, South Africa and the UK. The CCLI is examining the current laws in place in these countries and what they mean for company directors.

Change pump specifications or face total wipe-out

Some wet wipes may be flushable, but that doesn't stop them clogging up pipes and burning out pumps. Dutypoint's Tim Eagle says specifications need to change to account for the high volumes entering systems

Much has been written about the impact of 'flushable' wet wipes on water utility companies – but their effect on buildings, from a service and performance point of view, has been largely ignored.

Reports of major sewer blockages have become more commonplace, with images of giant 'fatbergs' providing great media fodder. Wet wipes are very much part of this narrative; while they are hugely detrimental to our sewer systems, they can also cause major issues for building services managers. Until wet wipes are fundamentally redesigned – which isn't likely to happen any time soon – the emphasis will be on dealing with the problem in the most cost-effective and efficient way possible.

The term 'flushable' – while technically true in some cases – is, at best, misleading. By encouraging this method of disposal on their packaging, manufacturers of wipes are portraying their products as convenient, no-mess and harmless alternatives to traditional cloths and liquids. However, wipes are extremely difficult to pump and can even cause issues when flowing through gravity systems. In many instances, they are causing blockages and having a major impact on building infrastructure systems before they even enter the main sewer system.

Wet wipes are a particular problem in mixed-use buildings, where there is limited control over what the occupants put into the foul-water system. Made of a non-woven fabric, similar to that used in nappies and tumble-dryer sheets, wipes are causing serious damage in the depths of a building's infrastructure and creating huge maintenance bills. They are particularly problematic in relation to pumping systems, with issues ranging from a drop in optimal performance to complete systems failure caused by blockages. These failures can lead to the closure of buildings and exorbitant repair costs.

Problems are exacerbated in buildings like student accommodation, conference, sports and leisure facilities, social housing complexes, schools and universities, where the water systems are particularly open to misuse.

In one case, a student accommodation block in Southampton suffered repeated blockages and poor system performance, despite numerous warnings and



“Pumps that would have been able to cope previously are no longer able to do so”

notices to the occupants highlighting the problems caused by flushing wet wipes.

The storage tank in a 45,000-litre foul-water-pumping station was repeatedly flooding and, after several hours investigating through the night, the pumps were discovered to be totally blocked and burned out. The system was cleaned and found to be full of wet wipes, which had caused the pumps to fail. Replacement pumps were installed so the building could continue to operate with minimum downtime – but the fault occurred again. Again, the cause of the problem was found to be wet wipes.

The original pumps had an 80mm solids-handling capacity, which is usually adequate for foul-water applications. The specification was increased to 100mm for the replacement pumps – but the problem persisted and was only resolved by installing heavy-duty, submersible pumps with knife-blade cutters.

In instances where there is an unusually high volume of wet wipes entering the system, this is the only way to break down the wipes and stop them from clogging the system. The cost of finding a problem-free solution was more than £30,000. It goes without saying that this was not a cost-effective way to deal with the problem.

There is every indication that these kinds of problems will continue to happen, so there needs to be a shift in the way pumps are specified from the outset. This is crucial, to help mitigate unexpected costs and ensure disruption is minimised.

As the student accommodation example illustrates, pumps that would have been able to cope previously are no longer able to do so. A different approach is required at the design stage.

While knife-blade cutters help to chop up the wipes, being able to do this before they reach the pumps can be even more effective in solving the problem. Some firms are developing a pre-treatment 'muncher' system that will put less pressure on the pumping mechanism.

In the absence of a significant shift in people's behaviour – or wet-wipe manufacturers changing the way their products are made – the emphasis will be on adjusting specifications to ensure buildings can continue to operate.

TIM EAGLE
is technical sales
engineer at Dutypoint



BACK TO THE FUTURE

Holistic design, resilient retrofitting techniques and wellbeing were major topics covered at the seventh annual CIBSE ASHRAE Technical Symposium. **Liza Young** reports

We need to look more to the past than the present to get a more resilient future. That was the advice of Sergio Fox, winner of the accolade for most effective delivery of material at the technical symposium held at Loughborough University on 5-6 April.

Fox presented case studies on Russia's Winter Palace, in St Petersburg, and Arne Jacobsen's town hall in Rudersdal, Denmark. He said a lack of fundamental climatic control principles often leads to over-simplification by architects or over-complication by engineers.

He said the Winter Palace – or at least the southeastern corner, where Fox carried out a pilot project from 1996 to 2006 – had survived fires, revolution and wars, but had trouble surviving a 1945-50 'modernisation' of the building's climatic-control system. The temperature varied from 11°C to 26.5°C, relative humidity was 17-60%, while the air change rate was a mere 0.5 per hour.

As a result of these variations, the priceless paintings were suffering 'artwork stress'. But, by using the building's original ventilation method – a triple-duct system integrated into the wall – and applying humidity buffering using materials that absorb and desorb water

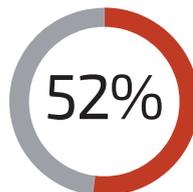
vapour from the air, considerable economic and technical advantages were gained, compared to a standard air-conditioning approach.

Rudersdal Town Hall was also designed with natural-ventilation features but, in 1940, the engineer added extract ventilation to the roof space, which caused draughts and control difficulties for 70 years. 'The combination of the two concepts was an indoor-climate disaster for the occupants, and official complaints are registered from 1944 onwards,' said Fox, whose pilot project in 2014-15 – based on the architect's original intentions – solved the technical issues. 'Problems happen when you divorce systems design from the architecture, so always create holistic designs,' he added.

Tim Bowden, director at Ramboll, also stressed the importance of 'looking back to go forward'. When working on improving poor comfort conditions at Liverpool Cathedral, he discovered original building designs in a local records office. These showed a large air-duct system underneath the cathedral, which Ramboll used to circulate warm air from the air handling units.

Bowden said the building – which was built in phases over a 70-year period – had a different heating approach in each phase, and that the existing heating system in the nave had not worked since 1954.

Initially, Ramboll developed a small trial area, monitoring it over a heating season, before rolling out the approach across the whole area. 'As building services engineers, we should be involved from cradle to grave,' said Bowden. 'We have to think about what happens when we change something, and how it will be operated afterwards.'



The proportion of days each year that planned new-build scheme Archer Lane, in Sheffield, would overheat in the current climate (top) and in the 2080s (bottom)

Let's put people first

In his presentation – which was voted most significant contribution to the art and science of building services engineering – Ashley Bateson,



Sergio Fox helped stop 'artwork stress' at St Petersburg's Winter Palace



Ewan Jones



Jonathan Atkinson

partner at Hoare Lea, said engineers were responsible for the health and wellbeing of building occupants. 'When designing buildings we – as engineers – need more emotional intelligence, and we need to see the building from the users' perspective,' he said.

Millennials, in particular, are interested in wellbeing and self-improvement, Bateson added. Consequently, many clients are now starting to focus on health and wellbeing, driven by greater awareness of their links to productivity, corporate reputation and occupant satisfaction. Factors affecting satisfaction include lighting, office layout, density, amenities, indoor air quality, thermal comfort, noise and ergonomics, he said.

Environmental measures aren't the only barometer of a building's success, added Bateson; TripAdvisor comments by guests were taken into account in the post-occupancy evaluation (POE) of South Place Hotel in London. 'We can see a trend towards measuring the success of a building based on people's experiences.'

Social websites 'calling out' poor environmental quality in buildings might spur on landlords to improve conditions, to avoid bad publicity from tenants.

Bateson said engineers need to be involved with the façade strategy, and drill down into the detail to avoid overheating caused by vast expanses of glazing, as well as the location of windows for optimum daylight.

Early input, greater integration of design disciplines and better client aftercare were integral to this, he added. 'We need to see the building as a service, not just a product.'

Resilience with low-energy design

Haniyeh Mohammadpourkarbasi, of Beverley Clifton Morris, described how life-cycle costing using the British Standard toolkit had yielded significant cost saving from improved fabric and envelope design, and specification, reducing the heating requirements and meeting the new Greater London Authority (GLA) energy-plan requirements.

By generating an elemental capital and life-cycle cost (LCC) saving analysis for a 25,445m² residential development in London, over a 30-year period, Mohammadpourkarbasi compared the cost difference of a minimum GLA-compliant design – 35% carbon emissions below Part L – with a Passivhaus (PH) design. She said building offsite to PH standard saved about £889,000 – or £32 per m² – at the construction stage, while the LCC savings were more than £1.5m – or £55 per m² – compared to the GLA design compliance.

'We do not need complicated building services to achieve comfortable >>



Rajat Gupta

“Problems happen when you divorce systems design from the architecture, so always create holistic designs”

BUILDING RESILIENT CITIES

With 26 million more people expected to be living in cities by 2050 – when 41 'megacities' (defined as those with more than 10 million inhabitants) will be in existence – it is important to ensure they are resilient, said Ingleton Wood's Robert Diamond. Presenting his blueprint for an interconnected resilient city – based on aspects of seven cities around the world – cities should be built with people, rather than institutions, in mind.

Jonathan Atkinson, of Carbon Co-op, challenged the notion of the 'smart city', which he said was 'a marketing term used by multinational technology companies'. 'Smart city solutions are brittle, prone to failure, and lack replicability and durability,' he said, urging the audience to consider a smart city as less of a top-down, planned approach and more of a collaborative, open-source system.

COOLING THE TUBES

The Metropolitan Integrated Cooling and Heating project considers cooling and ventilating London's underground tunnels while recovering and re-using waste heat to supply a district heating network (DHN).

Gareth Davies, from London South Bank University, said the ventilation shaft would operate in supply mode to provide cooling during the summer months, and in extract mode during winter. The recovered waste heat will be transported as low-temperature heated water – ranging from 5°C to 20°C – between the ventilation shaft and the DHN.

The DHN is planned to operate with a flow temperature of 70°C and a return temperature of 40°C, so the waste heat must be upgraded to an appropriate temperature using a heat pump, added Davies.



Sofie Pelsmakers



Sergio Fox

» temperatures, good indoor air quality and low-energy buildings. This can be achieved with a fabric-first approach,' she said.

However, Sofie Pelsmakers, from the University of Sheffield, said low-energy design could negate any financial benefits if designers fail to assess and mitigate potential overheating risk. Modelling results at Knowle House, a Passivhaus retrofit project in Sheffield, showed that overheating risks exceeded the acceptable level of comfort (15%) when retrofitting to PH standards in 2050 and in the 2080s (22%). Thermal modelling results from a planned new-build project in Sheffield were even more shocking. Pelsmakers, using the PH overheating metric, said

AN ELECTRIC FUTURE?

Ewan Jones, of Aecom, called for the introduction of a revised carbon factor, and noted the increasing divergence between the Part L CO₂ factors and real CO₂ emissions of buildings. He said the calculated grid carbon intensity of a recent 12-month period was 42% lower than the figure used in Part L, and that this trend was set to continue.

Rajat Gupta, of Oxford Brookes University, discussed the energy resilience achieved with solar PV and smart storage in 82 houses in a socially-deprived area in Oxford. During the summer period, the daily average PV electricity generation was close to households' daily average demand, but a mismatch between peak demand and peak generation meant PV electricity was able to offset only a moderate proportion (39%) of household electricity demand.

Storage increased self-consumption of PV electricity and further offset grid demand through discharge of stored excess PV electricity, although only marginally (6%).

Archer Lane would overheat for 32% of days annually in the current climate, and for 52% in the 2080s.

Using CIBSE Guide A 2006 overheating criteria, overheating – in current climate – was predicted to reach 18% of the annual occupied hours in bedrooms, and 12% in living areas. In the 2080s, overheating periods were projected to be up to 34% in bedrooms, while indoor temperatures were forecast to be higher than outdoor temperatures during simulation tests for the hottest day of the year. Pelsmakers said the most effective mitigation strategies were solar shading and reducing glazing g-values. The results were passed on to the architect for consideration. 'People think we want lots of free heat, but – after applying these principles – they realise what the real impact is,' said Pelsmakers, who added that some people got compliant designs by tinkering with occupancy levels. 'People are assuming they're OK, but they are fooling themselves. By working together these problems can be solved,' she added.

Technological drive

Opening the last day of the symposium, ASHRAE president Tim Wentz called on engineers to embrace the potential of technology to deliver more comfortable and effective buildings. Referring to what he believes is an imminent 'golden age' for engineering, Wentz listed psychology – and its role in occupant satisfaction – as a growing area for building services engineers, as traditional disciplines are increasingly taken over by computers.

He urged engineers to avoid 'Catnap' – cheapest available technology, narrowly avoiding prosecution – and embrace the opportunity to build better buildings in a 'built environment renaissance'. CJ

■ Papers will be at cibse.org/symposium soon

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EFFICIENCY DRIVE

Jaguar Land Rover's new engine-manufacturing facility won Project of the Year: Commercial/Industrial at the CIBSE Building Performance Awards 2017. **Andy Pearson** explains why it deserves the accolade

Designed in 2012, the first phase of Jaguar Land Rover's (JLR) Engine Manufacturing Centre set the benchmark for low carbon and sustainability in a manufacturing environment.

Located on the i54 Business Park near Wolverhampton, the carmaker's brief to project architects Arup Associates was to create 100,000m² of production space; deliver a showcase for sustainability through design, operational and process performance; and achieve a Breeam Excellent rating.

The first phase of the project is based on three linked, rectangular buildings, each measuring 180m x 135m. One of these houses the machining hall, where the engine block, head and crank are precision made. The other halls house the assembly operations, where component parts are put together to produce a finished engine. In plan, the machine hall and the first assembly hall are offset, and linked at one corner by a two-storey staff-support and administration building.

All the buildings feature glazed façades – an architectural solution intended to blur the boundary between production and support spaces, and to enhance communication between staff working in the different areas. The glazing also enhances the working environment by offering views onto the landscaped surroundings and, importantly, allows daylight to enter the huge halls.



PROJECT TEAM

Building services engineer: Ove Arup & Partners
Building owner and occupier: Jaguar Land Rover (JLR)

Project manager: Stace

Quantity surveyor: Davis Langdon

Brief consultant and architect: Arup Associates

M&E engineer: Ove Arup & Partners

Contractor: Interserve Construction

Facilities manager: Jaguar Land Rover (JLR)



approximately 20°C. The other half of the volume is make-up air needed for the oil-mist extract system,' explains Hives. Oil mist is created by the milling machines, so a local extract system is installed to prevent this vapour from entering the production space. In addition, a small quantity of fresh air – equivalent to about 0.25 of an air change per hour – is introduced to the hall for the occupants.

Hives says the huge volume of air in the machining hall means temperatures 'tend to be relatively stable'. In winter, heat given off by the process equipment helps maintain a steady temperature; top-up heat is supplied by indirect, gas-fired heater batteries in the AHUs. Arup opted for gas heating because the building size means pipe runs are long, and heat losses and pump losses would have been



“There is no provision for make-up air because of concerns that unfiltered air would introduce particulates that could affect machining tolerances”

significant if a water-based system was used.

If the hall gets too warm in summer, vents in the north-light windows can open to let out the hot air trapped beneath the roof. 'This facility is there in case it's needed to deal with future changes to the manufacturing process,' says Hives. There is no provision for make-up air. This is partly because of concerns that unfiltered air entering the space would introduce particulates that could affect the machining tolerances – which might also have an impact on the clinically clean production process.

To ensure there is no airborne contamination, the supply of air to both halls is filtered to class F9.

The engine assembly halls are heated using air; however, they also have 2MW of cooling installed. Both heating and cooling are supplied using a displacement ventilation system. The halls' huge volume is reflected in the 71m³/s of air supplied to each one by five AHUs via displacement terminals. The air is used to maintain a steady temperature and most air is recirculated, with only a small proportion of fresh air introduced for the occupants. To maximise flexibility in positioning and relocating process plant, the displacement terminals are located 3m above the shop floor. The assembly halls have a target temperature of 20°C at 3m above the floor, rising to 26°C at high level.

To maintain production flexibility, all services are generally routed through a zone 7m above the floor. 'We had a 2m space for services distribution, which we shared with Jaguar Land Rover's process services, before we reached the 2.5m structural zone beneath the roof,' says Hives. These high-level services were supplied as prefabricated modules to minimise the amount of work carried out at height, increase the speed of installation, and ensure the quality of workmanship.



For the three main buildings, the daylight perimeter is enhanced by north lights set into the building's saw-tooth roof profile. 'We were keen to introduce natural light throughout the halls, to provide an appealing daylight working space and, by daylight dimming the lighting, it helps save energy, too,' says Philip Hives, an associate at Arup and the project's building services engineer.

To meet JLR's sustainability objectives, the glazing – along with the rest of the building fabric – exceeds the minimum elemental U-values in the Building Regulations. The high levels of energy used by manufacturing processes, and the subsequent heat gains, meant there was little benefit in improving the fabric energy performance further.

The buildings are supported on a steel frame; the structural grid for the machining hall is 30m x 15m, while the assembly halls have a 30m x 30m grid to maximise options for reconfiguring the assembly line.

The machining hall is heated, using an all-air system, via 84 terminals located 3m above the shop floor; six air heating units (AHUs) supply 85m³/s of air to the space. 'Roughly half the volume of air supplied is needed to maintain the hall's temperature at

Renewable energy

As part of the scheme's low-carbon design, the buildings feature a roof-mounted photovoltaic array. The design team built upon an earlier low- and zero carbon energy study by Arup, which established roof-mounted PV and solar thermal installation as a favoured option for carbon savings. More detailed option studies examined the viability of different sizes of PV arrays, including one covering the entire roof, which would save more than 2,000 tonnes of CO₂ emissions per year and have a simple payback of 8.5 years. JLR funded this option, and the 21,000 panels – the largest rooftop array in the UK at the time of installation – can deliver a peak of 5.8MW of power.

A more unusual source of electrical energy is supplied by the dynamometers, which are used to test a sample of engines from the production line by imparting a resistance to check their performance.

Other renewable technologies incorporated into the project include solar thermal panels to heat domestic hot water for the central facilities building. Panel payback was estimated to be 10 years for the installation sized to match the building's 70kW base load for domestic hot water.

The central facilities building also features a transpired solar collector wall to preheat the supply air to the staff changing facility. This consists of a skin of dark, perforated, profiled steel cladding, which is installed on the units' south-facing wall in place of standard cladding. The outer steel skin is separated from the inner, insulated wall by an air cavity. As sunlight strikes the outer skin, solar energy is absorbed, warming the perforated steel skin and, subsequently, the boundary layers of air in contact with the inside and outside of the steel. A fan draws the warmed air out of the cavity and, as it does so, the air in the outer boundary layer is drawn into the cavity through the hundreds of perforations in the outer skin, to increase the amount of heat collected by the system by up to 50%.

The fresh air preheated using the solar wall is ducted to the intake of the changing room AHU. 'The changing room's heat load was compatible with the maximum area of façade available on the facilities building's southern elevation – and because the area is operational 24 hours a day, it helps to maximise the opportunity for free heating,' Hives says. Top-up heat is supplied by heater batteries from a small LTHW system serving the support area.

The transpired solar collector contributes to preheating 5m³/s of supply air. If the technology had been used to preheat air supplied to the main halls, it would have needed to preheat approximately 71m³/s.

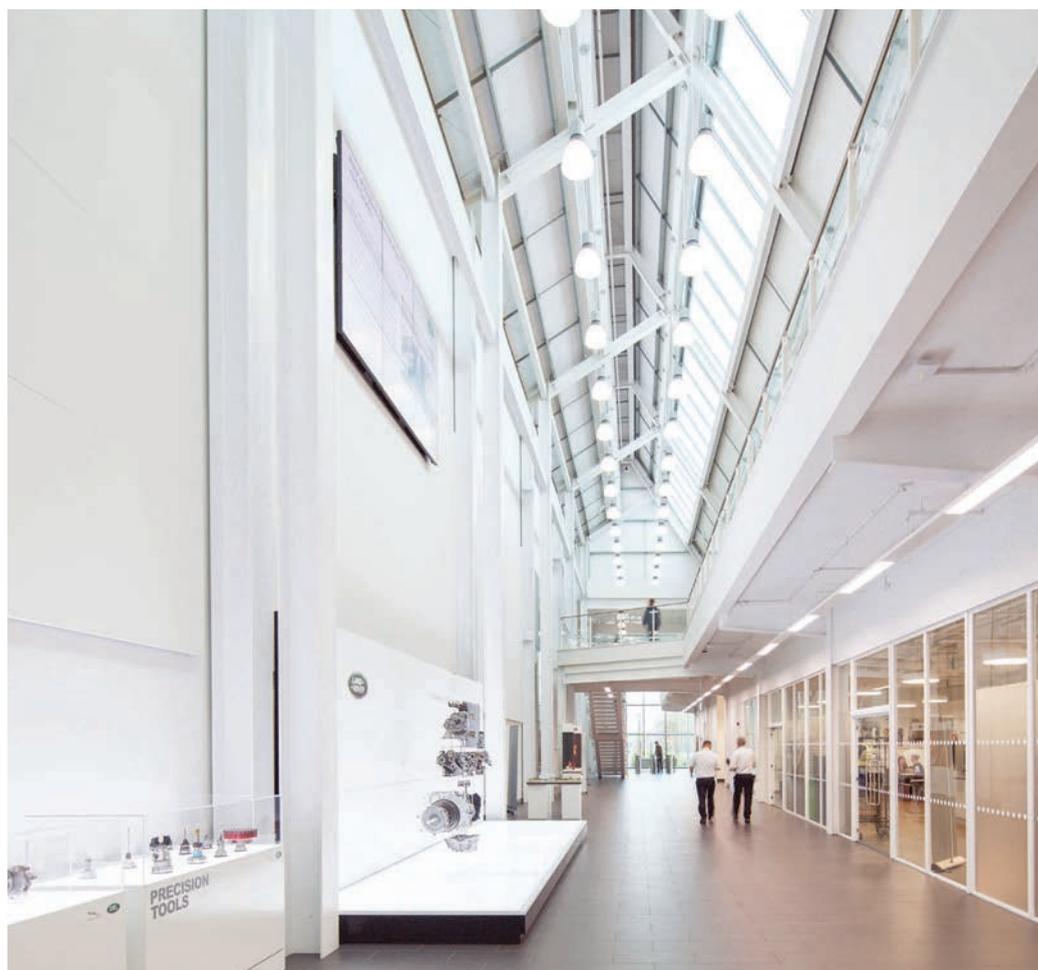
Monitoring

An energy-management system is being used both to monitor consumption and target improvements by JLR, with input from Arup's building performance and systems specialists. The sophisticated network enables separate metering of building systems all the way down to individual AHUs; it also meters the process energy used at each stage of production.

To optimise building performance, JLR commissioned Arup to monitor the building throughout the seasons. These findings were used to target energy improvements. Soft Landings is used on the project. Interserve and MEP contractor Interserve Engineering Services took the lead in managing the commissioning of their respective works, which began with the advance planning for their input during handover and for the subsequent two years. They demonstrated the systems to the client in readiness for handover, and remained involved beyond that to offer support during the liability period.

The controls installer, Schneider, took the lead role in managing interfaces between the building management system (BMS) and other systems, and was responsible for the metering and energy management system (EMS). This was successful in ensuring systems were functional at handover; they were then extensively

"The weekly sharing of BIM models meant potential conflicts and clashes were identified early and more easily resolved"





commissioned during the process fit-out. This has allowed the refinement of controls and metering, so the BMS and EMS now function in accordance with JLR's specific needs.

'There was a very good energy management system put in along with the BMS to allow Jaguar Land Rover to monitor what is happening within the building and to highlight areas that can be improved,' Hives says. 'The building is performing well – better than we predicted it would – and Jaguar Land Rover is making continuous improvements to bring loads down even further.'

The judges for the 2017 CIBSE Building Performance Awards were impressed with the scheme, describing it as: 'One of the most comprehensive entries received for an outstanding project, particularly in considering how the building could contribute to the reduction of emissions associated with "process" energy.' 

■ See all 2017 CIBSE Award winners at www.cibse.org/bpa

PREPARING FOR CHANGE

While Arup Associates and building services engineers Arup were developing the building design, Jaguar Land Rover was finalising the production layout. Building information modelling (BIM) was critical in enabling this parallel working. The weekly sharing of BIM models between the building design team and the company's process team meant potential conflicts and clashes were identified early and more easily resolved. 'We used the BIM model to identify service routes and clashes, so that we could issue early instructions to move services equipment in the model before it became an issue on site,' says Hives.

Main contractor Interserve aided development of the BIM model, with the early selection of specialist suppliers and manufacturers so that their requirements could be integrated into the design. A detailed procurement programme gave the designers and client team dates by which final information was required, to help them focus on decisions that affect the critical path.

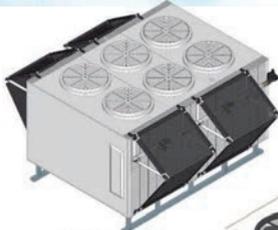
At later design stages, the fabricator's model for steelwork was federated and used as the basis for coordinated working drawings of the engineering services. This meant precise and accurate information could be made available to the MEP supply chain as the basis for designing and prefabricating the high-level services distribution modules in the halls.

The use of BIM throughout the design and build process means there is now a BIM model that accurately reflects the building and its engineering services – one that also includes the complete installation of production equipment, which is proving invaluable in managing operation of the facility.



ADIABATIC AIR INLET COOLING

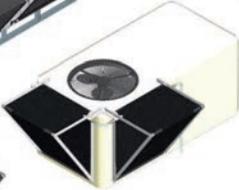
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A



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STRETCH FORTH

Services on the new Queensferry Crossing show there is no limit to the opportunities presented by coordinated BIM design and prefabrication. Andy Wall, of SES Engineering Services, talks to **Alex Smith**

Andy Wall's first major job as the new managing director at SES Engineering Services could not be more far reaching. The M&E contractor is providing services for the new 2.7km-long Queensferry Crossing, spanning the Firth of Forth. Positioned upstream from the iconic Forth railway bridge, the new road crossing will be the longest three-tower, cable-stayed bridge in the world when it opens this summer.

There are three towers more than 200m high – the north and south towers are 202m and the central tower is 210m – and 23,000 miles of cabling support the 122 sections making up the road deck. SES was appointed by main contractor Forth Crossing Bridge Constructors (FCBC) to install services, and the complexity and scale of the project is reflected in its £20m contract.

The final design for FCBC was undertaken by a joint venture comprising Sweco (formerly Grontmij), Gifford, Ramboll, and Leonhardt Andra and Partners.

Wall was yet to be appointed when SES successfully tendered for the Queensferry Crossing – he joined in August last year – but he is clear about what enabled the company to win the project. It was the focus on BIM and prefabrication, he says, which enabled SES to come up with a prefabricated services strategy that reduced costs, programme time, and the amount of labour hours spent working at height.

‘On every project we look to come up with a prefabrication strategy, which takes as much of the work offsite as possible,’ says Wall. The company’s 15 years’ experience of BIM helped to coordinate the complex cable and pipework runs within the modules, says Wall. ‘We carry significant inhouse design resource, a fairly significant BIM team and we’re BIM Level 2 accredited.’

SES saw the opportunity to prefabricate the majority of services on the bridge using its Prism prefabrication and offsite manufacturing facility, even though the offsite business is primarily aimed at services for buildings, not infrastructure. This was an ambitious project for SES. The crossing its first foray into bridge building, and it meant the company had to open an offsite facility away from its Yorkshire Prism facility for the first time.

The bridge is serviced with a complex array of pipework, and cabling. As well as a BMS, there are services for CCTV, fire-alarm and security systems, and a water pipe to enable deck washing at regular intervals across the bridge. There is ductwork for a dehumidification ventilation system to prevent corrosion in the cable stays and deck steelwork. Corrosion has been a significant and costly issue for the adjacent Forth Road Bridge, which had no



CREDIT PICTURES: COURTESY OF TRANSPORT SCOTLAND



dehumidification system installed when it was built 50 years ago.

There is substantial lightning protection and extensive lighting, which includes 2.7km of deck edge lighting as well as illumination of the towers and bollard lighting.

Using its BIM software SES was able to optimise pre-designed containment systems carrying the cables and pipework. The cables were installed within trays in the bridge deck modules and plugged into corresponding services in other modules.

There were 372 7m-long modules in total and 54 3.5m modules. The steelwork for the modules was sourced from the local supply chain. The steel for the cable-stayed bridge (CSB) deck sections was made in China and shipped to Rosyth close to the northern end of the bridge. Concrete was poured onto the CSB decks within a casting shed after which they were relocated to the finishing area.

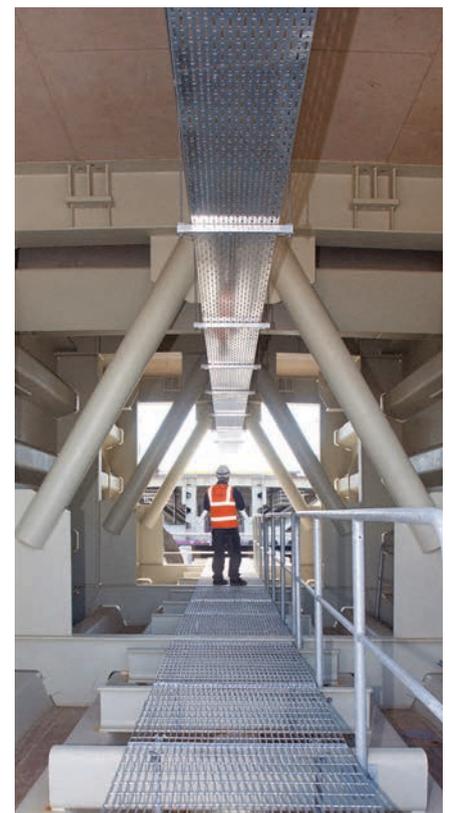
SES fitted services and cable trays into ‘flatpack’ steel frames at its York factory, and transported them to Scotland where they were assembled at SES’s onsite Prism factory. The prefabricated modules were then hoisted up onto the CSB decks and slid into position on ramps.

Normally the modules would be assembled at Prism’s base in Yorkshire, but by completing the second stage in Scotland, SES significantly cut transport delivery times and costs on this project.

This is the first time SES had created an assembly facility outside York. By taking this approach, SES says it minimised waste and

transport. It claimed it only required two lorries travelling 500 miles to deliver the modules. If the services modules had been transported from York, SES estimates 60 lorries would have been required travelling 24,000 miles.

Once the services modules had been installed the completed CSB decks were taken out by barge onto the River Forth



23,000 miles

The amount of cabling supporting the 122 sections that make up the road deck of the bridge, which has three towers, each measuring more than 200m high

“Buildings are so complex now we are becoming the most important member of the team”- Andy Wall



» before being lifted by crane into position and connected to adjoining CSB decks. The only services that had to be fitted in situ on the bridge were the sub-mains cables, which were jointed at 48 points at varying intervals.

With such a large project, SES potentially had an issue with manning two Prism factories simultaneously. By prefabricating the bulk of the services in the York factory, it meant there was a less complex process of installation at the Scottish site. SES originally had three Prism staff at Rosyth, but eventually the factory was handed over to a SES team of locally upskilled labour, and the original Prism team could return to Yorkshire.

The 2.7km bridge is considered part of the adjoining motorway and, in terms of illumination, is defined as 'rural', so there is no need for overhead street lighting. However, there was still a substantial requirement for lighting, as indicated by SES's £2.25m lighting contract.

A total of 386 bollards, mounted 1m above the road surface, along part of the bridge carriageways, provide illumination for drivers, while – within the decks – 2,026 luminaires will provide lighting for those servicing electrical equipment and the dehumidification plant.

The 3m acrylic windshield is designed to keep the bridge open in the event of strong gusts. For aesthetic reasons, it has 2,610 LED linear fittings installed, to provide a continuous strip of light across the Forth. The three towers are lit by floodlighting provided by various 1kw and 2kw metal halide lights.

SES claims that use of prefabrication and BIM enabled installation to be reduced to two hours per module. It calculated that its 100,000-hour build time was around 25,000 hours less than if it



2 lorries

The number of vehicles, travelling 500 miles, that were used to transport all of SES's 'flat-packed' services modules from its York factory to Scotland

£2.25m

The lighting package value to SES. The 2.7km bridge is considered part of the adjoining motorway and, in terms of illumination, is 'rural', so needs no street lighting

built the bridge using onsite methods.

Wall also stresses how much BIM helped with cost predictability and waste reduction, significantly strengthening SES's business case when tendering. Reducing the amount of work at height was also hugely important for the bridge team.

'From a health and safety perspective, we have taken work into a safer factory environment,' says Wall. 'This commitment to offsite engineering dramatically reduced the need for working at height.'

Wall says SES will continue to look at

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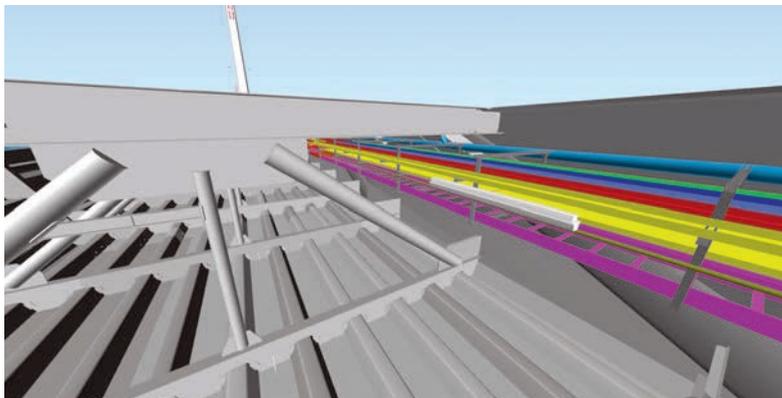
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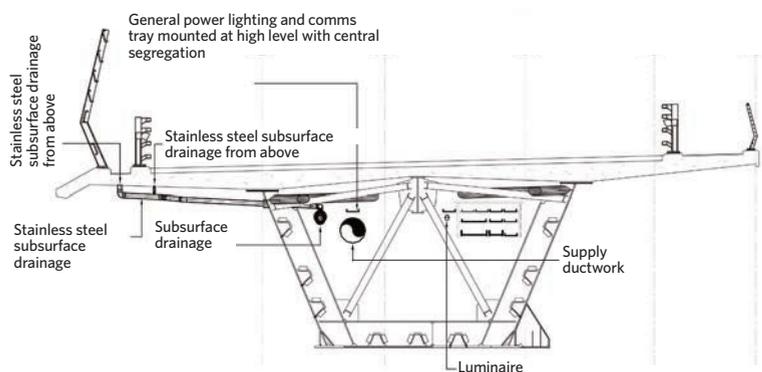
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BIM drawing showing containment trays in the cable-stayed bridge deck



Section view through road deck

opportunities to prefabricate. He estimates that 90% of all its projects have some element of prefabrication, with some contracts being 50-60% modular.

But Wall warns that clients must be prepared to allow companies such as SES to get involved earlier in the design process, to reap the full benefits of prefabrication.

'The world is slowly moving towards 3D modelling and prefabrication,' he says. 'In terms of buildability, coordination, cost and design, the earlier we can get involved the more benefit we will bring.' CJ

PROJECT TEAM

Main contractor: Forth Crossing Bridge Constructors (FCBC) – a consortium of Hochtief, Dragados, American Bridge and Morrison Construction is building the bridge and connecting roads

Specimen design: Jacobs Arup Joint Venture on behalf of Transport Scotland

Final design: Design joint venture comprising Sweco (formerly Grontmij), Gifford, Ramboll, and Leonhardt Andra and Partners, on behalf of FCBC

Client: Scottish government

BEYOND THE FACTORY GATES

The Queensferry Crossing is a high-profile project for SES, but it is not the firm's strategy to actively seek civil engineering projects of this scale. Wall says key sectors targeted by SES include commercial, mixed use, student accommodation, residential, university, research and development, high-tech and pharmaceutical projects.

Wall says that investment in BIM and prefabrication means it is well placed to bid for complicated M&E projects. 'In the high-tech sector, we can deliver design solutions to customers where products are particularly complex,' he says. 'We see ourselves as an engineering business first. Our expertise in building physics gives us the opportunity to get in early and influence the programme – and, ideally, add in prefabrication where there is repeatable work.'

Complex schemes that SES has worked on include bio-containment laboratories for The Pirbright Institute, and the Citylabs science and research centre in Manchester. It recently won a contract with Canary Wharf Contractors to deliver shell and core mechanical services to the 27 floors of the One Bank Street commercial building. SES will be lead coordinator for the main mechanical plantrooms and supply converted consultant models to other trade contractors, to fulfil the BIM requirements. The Prism offsite manufacturing facility will design and deliver nearly 100 heat exchange units, plus pump skids and prefabricated pipework.

Wall says that SES is keen to grow business in London and has boosted its team in the capital since the Wates takeover in October 2015: 'On average, our MEP packages are £5m – but, in London, they are £10-15m.'

With buildings becoming so complicated, Wall predicts that M&E contractors will take more and more responsibility for the design and construction of building services. 'They are so complex now, that we are becoming the most important member of the project team,' says Wall. 'I can see us being the principal contractor soon,' he adds with a smile. 'And that is the aim.'

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Indoor air pollution is focus of new initiative

A new working party to address the challenges of indoor air pollution and its impact on health launched in April.

It was initiated at the Better Homes, Better Air, Better Health event in London, bringing together experts from the medical and built environment sectors.

The focus of the working party will be to identify knowledge gaps, give recommendations for immediate policy action, and foster innovative solutions to indoor pollution issues.

Its members include the Royal College of Paediatrics and Child Health, the Royal College of Physicians (RCP), the Building Research Establishment, and the Adaptation and Resilience in the Context of Change network.

The initiative represents a move away from the current focus on outdoor pollution, which is thought to be a direct cause of 40,000 deaths every year.

Professor Stephen Holgate, the RCP's special adviser on air pollution, said: 'When we think about air pollution, we naturally focus on air travel, busy roads or factories.' However, he added, 'kitchen products, faulty boilers, open fires, fly sprays and air fresheners can cause poor air quality in our homes, workspaces and

schools. We need to take action now to protect future generations.'

The launch of the group comes at a time of increased focus on air quality. A recent High Court ruling found that the government was failing to address the seriousness of air pollution, and rejected its plans to tackle the issue as 'far too leisurely'. London's mayor, Sadiq Khan, has also made cleaning up the capital's air a priority.



Magic model measurement aims to turn cities into HVAC systems

Air monitoring is to start this summer, as part of a project that aims to establish whether cities can function with no air pollution or heat-island effects by 2050.

Managing air for green inner cities (Magic) is being run as a joint collaboration between the Universities of Cambridge, Surrey and Imperial College London and is supported by a number of industrial partners. It is funded by the Engineering and Physical Sciences Research Council (EPSRC).

The project is in the initial research phase, but aims to develop an integrated suite of models – air quality, reduced order and cost benefit – and associated management and decision support tools. These are intended to allow cities to develop their own heating, ventilation and cooling systems, coupled with natural systems. The aim is that cities will no longer be dependent solely on traditional mechanical ventilation systems.

The first field research will take place at a London South Bank University site in Elephant and Castle. Indoor and outdoor sensors will be placed in, and around, a naturally ventilated building to capture pollutant levels, and air flow and weather data.

In parallel with this field study, detailed numerical modelling will be carried out at Imperial College, along with validation experiments to further understand air movement using the wind tunnel at the University of Surrey and through water bath experiments at the University of Cambridge.

More information about the project can be found at www.magic-air.uk

Pupils across England at risk from air-pollution levels

Thousands of children at schools and nurseries in England are being exposed to illegal levels of harmful air pollution from diesel vehicles, according to a new report by Greenpeace and *The Guardian*.

The study, published in April, shows that the risks are spread across the country, from Poole to Hull. It used the government's pollution modelling for 2015 to identify all schools within 150 metres of a road where nitrogen dioxide (NO₂) is above the legal limit of 40µg/m³. It identified more than 1,000 nurseries, catering for 47,000 babies and children. In addition, 2,091 schools, nurseries, further education centres and after-school clubs are in a risk zone, the study revealed.

Monodraught releases new IES components

IES and Monodraught have released new performance components for Monodraught's hybrid thermal-mixing ventilation system. The components are available in the IES virtual environment software suite, which features a library of predefined 3D component representations of Monodraught systems. These can be dragged from a catalogue of products onto a building model constructed within IESVE.

Using this, a client can assess the performance and energy savings offered by a system in an open and transparent way. The analysis tools in the suite give the user a visual insight into the performance of the systems. Textures on the suite also allow architects and designers to understand the aesthetics of systems, and how best to integrate them into a building.

Hitachi makes sense of VRF draught problems

Hitachi reports success with its 'cold draught prevention' system, which has been used with variable refrigerant flow (VRF) systems to improve working conditions and productivity of staff. It has also reduced client complaints and engineers' call-outs.

VRF systems typically control their output based on the inlet temperature of room air. At times of low heating demand, this means air is supplied to the room at temperatures that can cause discomfort by creating a cold draught. As a result, occupants adjust the thermostat to increase the temperature, which ironically causes greater discomfort as well as increasing energy use and costs.

By adding a sensor to measure the (off-coil) room supply air temperature – together with sensors on the coil itself – it is possible to set a minimum supply temperature to avoid cold draughts.

GILBERTS KEEPS AIR FRESH FOR LAKELAND BOAT MUSEUM

Gilberts Blackpool has supplied ventilation louvres for a new £16m boat museum on Lake Windermere, in the Lake District.

The Windermere Jetty, Museum of Boats, Steam and Stories will replace existing facilities, and the exhibits will be rehoused in a cluster of buildings. Its external façade – of a steel framing system with a copper-profile, rain-screen skin – has been fitted with 28 Gilberts flanged ventilation louvres, with a volume control damper. These integrate into the external soffit zones for airflow and ventilation of the main exhibition spaces.

A 75mm blade pitch in the single-core louvres helps deliver weatherability and a free-ventilation area of 50%.



Apple claims HQ is largest nat-vent building

Apple's new headquarters in Cupertino, California, will be the largest naturally ventilated building in the world, according to the American technology giant. The 175-acre Apple Park campus – designed by British architect Foster + Partners – will require no heating or air conditioning for nine months of the year, Apple claims.

Dan Whisenhunt, vice-president, real estate and development, revealed the cooling strategy in an Apple video released on Earth Day (22 April). 'We run chilled water tubing through the concrete mass and then use outside air to be the dominant cooling system,' he said, 'and you're using very little energy to get the temperate water to do this.'

The office complex will be powered by 100% renewable energy and feature 17MW of rooftop solar, according to Apple, whose employees were due to start moving into the building last month. At the centre of the complex is a 2.8 million ft² circular building, clad in curved glass panels. The inner part of this building is a 30-acre park, with fruit trees and winding pathways, inspired by fruit orchards of California.

Apple Park also includes a visitor centre – with an Apple Store and cafe open to the public – a 100,000ft² fitness centre for employees, research and development facilities, and a theatre named after Apple founder Steve Jobs.



Apple's new HQ in Cupertino, California

New anti-corrosion coil-protection treatment for heat exchangers

An after-sales service to extend the life of heat exchangers in HVAC equipment has been launched by cooling systems manufacturer Airedale International.

The firm now offers anti-corrosion treatment to maximise the efficiency and performance of air conditioning systems, such as heat exchangers, evaporator coils, condenser coils in external chillers, condensers and dry coolers.

Corrosion is the No 1 cause of efficiency loss in heat exchangers, typically when they are exposed to extreme weather and pollution.

Aluminium heat exchangers and coils are relatively resistant to corrosion, even without any type of coating. However, the harsh conditions in certain air conditioning applications often require additional protection – for example, those in offshore or coastal applications, power plants, industrial environments, urban dense applications, and any areas that have high levels of airborne pollutants.

Protecting aluminium coils can triple the lifetime of a heat exchanger and prevent early deterioration, capacity loss and the need for coil replacement. Applied protection could also save up to 30% on annual energy costs.

Airedale offers three corrosion treatment plans that promise to protect, refresh and renew coils in heat exchangers that are between three and eight-plus years old.

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FRESH THINKING

Policy-makers and researchers will converge at the Ventilating Healthy Low-energy Buildings event. Benjamin Jones and Maria Kolokotroni look ahead

An important conference on ventilation this autumn will give policy-makers the opportunity to hear about the latest research in this increasingly important area of services engineering. The Ventilating Healthy Low-energy Buildings' conference – hosted by the Air Infiltration and Ventilation Centre (AIVC) – will be held in Nottingham on the 13 and 14 September.

The UK rejoined the AIVC – the International Energy Agency's information centre for energy efficient ventilation – last year. Its membership is funded by CIBSE, and supported by the CIBSE Natural Ventilation Group, and one of the many benefits is the sharing of information about the research and legislative programmes of the 15 member countries. This is fed back to CIBSE, its special interest groups and other relevant organisations, and is important because the need to reduce the energy demand of buildings is reflected in the legislation and policies of many countries.

However, there is international concern about the adverse effects of low-energy buildings on occupant health and comfort. These issues are being considered by some energy conservation initiatives for buildings, such as the Energy in Buildings and Communities (EBC) programme¹.

The minimisation of health risks and the preservation of thermal comfort require the careful design and implementation of ventilation strategies and systems. Many factors must be addressed to achieve this goal, such as: limiting occupant exposure to indoor and outdoor

pollutions; determining metrics capable of assessing indoor air quality; identifying factors causing overheating; and increasing envelope and ductwork airtightness.

It is this that defines the core theme of the 38th AIVC conference. A sub-theme is the need to convert academic research into usable design guidance and policy advice, and this has guided the choice of invited speakers. It is hoped that academics, policy-makers, and practitioners will come together to discuss key research themes.

The conference will run three parallel tracks; one will cover ventilation, indoor air quality (IAQ) and health relationships – the subject of the AIVC's latest technical note², which prioritises household pollutants by their effect on health. However, we still need to identify measured pollutant concentrations in buildings, concentration-response relationships, emission rates from building materials and activities, and pollutants that can be used as markers, so they can be measured and used to control ventilation systems.

A second track will discuss ventilative cooling – the application of ventilation to cool indoor spaces and reduce overheating risk in buildings. The programme will run with Venticool (venticool.eu), the international platform to accelerate the uptake of ventilative cooling.

The third track will cover air tightness, which remains important if we are to meet building energy-reduction targets. It will be run with TightVent Europe (tightvent.eu), a platform for knowledge exchange.

The two-day programme will include presentations by researchers and practitioners from more than 20 countries. There are also opportunities for sponsors, who will be acknowledged in the programme and during the conference. More information is available on the conference website at www.aivc2017conference.org 

DR BENJAMIN JONES, University of Nottingham, and Professor Maria Kolokotroni, Brunel University

References:

- 1 Ongoing projects in the Energy in Buildings and Communities Programme bit.ly/2pBge4R
- 2 AIVC. TN 68: Residential Ventilation and Health. Air Infiltration and Ventilation Centre; 2016.

KEYNOTE SPEAKERS

Dr Sani Dimitroulopoulou, senior environmental scientist, Public Health England's environmental change department. Work covers air quality, ventilation and population exposure.

Professor Cath Noakes, director of research, School of Civil Engineering at the University of Leeds. Research includes the modelling of airborne infection transmission in healthcare environments.

Professor Tadj Oreszczyn, CIBSE vice-president and a former member of the UK Department of Energy and Climate Change scientific advisory group.

Peter Rankin, principal building services engineer, Department for Communities and Local Government, with responsibility for AD F of the Building Regulations.

Professor Paul Ruyssevelt, professor of energy and building performance, UCL Energy Institute. The UK's representative on the executive committee of the International Energy Agency's Energy in Buildings and Communities Programme.

Ant Wilson, director in Aecom's building engineering team, leading sustainable development, advanced design and applied research work.

Air of authority

Ventilation, air movement and air conditioning research was well represented at the recent CIBSE ASHRAE Technical Symposium. Here is a summary of the papers and presentations, which can be followed up online

Cooling and recovery of heat from railway tunnels for district heating

Gareth Davies, London South Bank University

The Metropolitan Integrated Cooling and Heating (MICAH) project investigates the feasibility of combining cooling and ventilation of London's Underground tunnels with recovering and reuse of the waste heat, to supply a district heating network. Davies discussed how waste heat, upgraded by heat pumps positioned in tunnel ventilation shafts, could be used in district heating and cooling networks. He explained the benefits and showed schematics for a possible cooling and heating system.

Replacement of district cooling network with chillers in 70-storey tower in Chicago

Benjamin Skelton, Cyclone Energy Group

When a new building management team for a residential tower in Chicago discovered a \$500,000 annual bill for chilled water, it approached the Cyclone Energy Group for help in reducing the cost. It recommended installing a chiller on the roof, to replace the district cooling system. Skelton explained how the \$2.6m investment created annual savings of \$327,000.

Temperature adjustments for design data for urban air conditioning design

Stefan Vandaele, University of Manchester/Daikin

A look at urban radiant temperature and how it is affected by solar absorption of urban buildings and the shading effects. Vandaele explained how this 'surface urban heat island' is important for air conditioning plant situated in areas exposed to solar irradiation. The paper examines these effects and proposes how the engineer can take them into account in their designs.

Noise, ventilation and overheating in residential developments

Nick Conlan, Association of Noise Consultants/AVOG

The work of the acoustics, ventilation and overheating group at the Association of Noise Consultants was introduced by Nick Conlan. This aims to ensure that acoustics are properly taken into consideration when devising

ventilation strategies. Conlan says there is insufficient guidance on the indoor ambient noise levels that should be achieved in residential developments where measures are required to control overheating. The working group's design guide will clarify definitions of ventilation and overheating, and will aim to give quantitative guidance on assessing internal noise levels when windows are open or other means of controlling overheating is required.

Passive ventilation with heat recovery in an urban school: performance in use

Tom Lipinski, Ventive

This pilot study examines the performance in use of a passive ventilation system with heat recovery in a school. The research concentrates on three areas: indoor air quality; airflow and heat recovery; and operational framework. It looks at factors influencing performance, such as user behaviour. Research into airflow and heat recovery gave a good indication of the system's capabilities, yet the study was unable to verify the performance under the high-airtightness scenario.

Case study demonstrating how hybrid ventilation and natural cooling deliver resilient high-performance buildings

Nick Hopper, Monodraught

The paper references case studies of a classroom occupied by 30 children and two adults, and an office in the west of England, fitted with a Monodraught hybrid thermal mixing system and cool-phase hybrid system respectively.

Replace refrigerant-based cooling with low-level supply of efficient indirect evaporative cooling

John Hammond, consultant

This presentation was based on a paper by Hammond, which concluded that evaporative cooling systems with a suitable wet-bulb effectiveness - coupled with a low-level supply air distribution system - can provide satisfactory cooling. His paper says energy savings of more than 50% are possible when compared with refrigerant-based, water-cooled or air-cooled systems.

■ To read the papers, visit www.cibse.org/symposium



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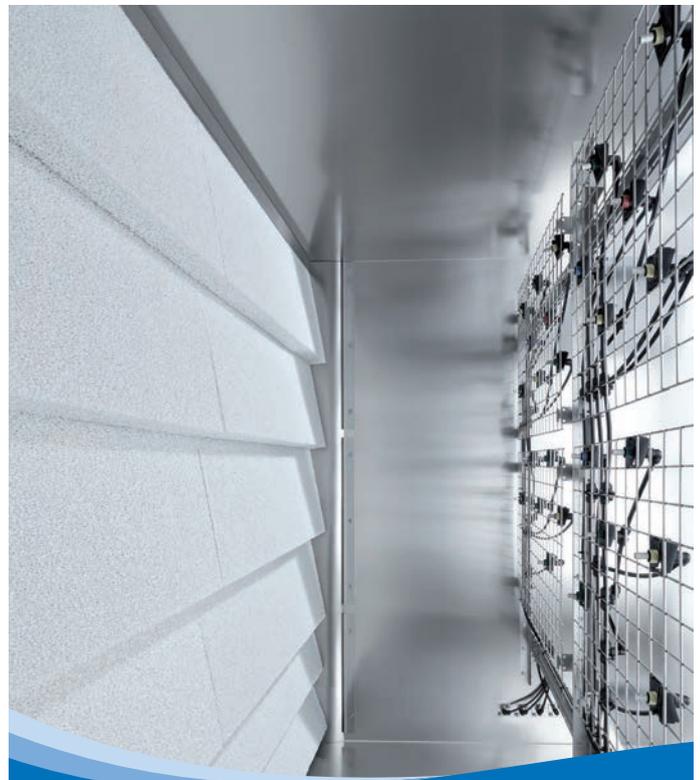
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The number of chemicals looked at by a team from the US National Institute of Standards and Technology to find a replacement for the widely used R410A



30%

The price increases by UK refrigerant suppliers on medium to high GWP refrigerants at the start of April

COLD CASE

Short of reinventing the laws of chemistry, refrigerant gas choices in the future will be severely restricted, says **Ewen Rose**

Finding a 'new' refrigerant gas with all the desirable properties of chemical stability, low toxicity and a low pressure vapour compression cycle – not to mention being non-explosive – has long been the Holy Grail of refrigeration engineers, but the trail remains cold.

A team from the US National Institute of Standards and Technology (NIST) looked at no less than 60 million chemicals to find a replacement for the widely used R410A, and found only 27 'suitably efficient' fluids – all of which were at least slightly flammable.

The NIST team said it was 'disappointed and surprised' that it failed to find any ideal refrigerant that combined low global warming potential (GWP) with other desirable performance and safety features, particularly as flammability immediately disqualifies a substance from use on safety grounds, in the US and in many other parts of the world.

'It is highly unlikely that any better-performing fluids will be found, and unknown risks associated with the lesser-known fluids may further reduce the list,' the NIST researchers said.

Disappointing

'There is no perfect, easy replacement for current refrigerants,' said NIST chemical

engineer Mark McLinden. ‘Going into the study, we thought surely there has to be something else. Turns out, not so much. So it was a bit surprising, a bit disappointing.’

Veteran observers of the air conditioning and refrigeration (ACR) sectors would not have been surprised. Few industries have been so severely buffeted by changes in environmental legislation.

The industry was hit particularly hard by the banning of CFCs in the 1980s and 90s to save the ozone layer; and then found that the ‘ozone friendly’ HFC alternatives they were urged to adopt – including the aforementioned R410A – were also to be phased out because of their GWP.

Even chemistry fans struggle to keep up with this saga. For example, R12 was long considered the ‘perfect’ refrigerant, but it was a CFC – and the industry has been trying to replicate its effectiveness ever since. R134a took its place in many larger AC systems, but it is also due to be removed because of its relatively high GWP. So the search is on again.

The parallel between owners of diesel cars and refrigerant users is clear – both are feeling not a little betrayed.

2018 will be another key year in this turbulent history, as many popular gases become subject to tight new quotas. As a result, equipment owners face a ‘perfect storm’ of higher prices for those gases being phased out, the growing probability of having to replace equipment, and the introduction of potentially more toxic and flammable alternatives, requiring more investment in safety measures and staff retraining.

Under the terms of the European F-Gas Regulation, by 2030 only 21% of the HFCs currently in use by the industry will be allowable. However, of far more immediate concern is the next stage in the phase down, which requires EU member states to cut HFCs (already banned in cars) by 37% by the end of this year. As a result, many are bracing for a chaotic 2018 as the refrigerant market, effectively, falls off a cliff.

UK refrigerant suppliers responded with 30% price increases on medium to high GWP refrigerants at the start of April. The next few years will see further increases as the impact of the legislation takes hold.

It is the high GWP gases, like R404A, that are currently most affected, with prices double what they were this time last year, but the price of medium GWP gases like R410A will also rise sharply next year, as the phase down gathers pace and strict quotas come into effect. The effective price increases on R404A and another high GWP gas R507 was more than 60% in a month, reflecting growing fears of a supply crunch next year.

Yet even this timetable may accelerate because of the ‘Kigali Accord’ signed in the Rwandan capital last year by 197 nations. This is an amendment to the Montreal Protocol and ties all developed economies into phasing down HFCs from 2019. Most developing countries will freeze the level of HFC quantities in 2024, and the rest will follow in 2028. This means the cut to 21% by 2030 will instead become 15% – and possibly sooner.

Acceleration

‘What we have learned from the original Montreal Protocol process is that the dates can be changed quite easily,’ said former Institute of Refrigeration President Andy Pearson. ‘This acceleration also happened with HCFCs and I expect the same will happen with HFCs – their removal will happen more quickly than the current timetable suggests.’

He added that the original plan for CFCs was to cut them by 50%, but suddenly they were gone completely.

Per Jonasson, President of the European industry body AREA, has warned that time is now running out for end users to switch to lower GWP refrigerants and said they must take immediate action.

The speed with which different types of HFC are removed from use is based on their CO₂ equivalent GWP properties, so some lower GWP gases can act as interim replacements. R404A has a high GWP of 3,922 and will, along with all other refrigerants with a GWP above 2,500, be banned in new stationary refrigeration equipment from 2020.

But companies are still building R404A equipment and engineers are still specifying it. Even more alarming, 2020 will also see a ‘service ban’ on systems using more than 10kg of R404A (as well as R507 and R422D), which means such equipment will quickly become unusable.

“By 2030, only 21% of the current amount of HFCs in use by the industry will be allowable”



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A more detailed analysis of types of refrigerant and their specific reduction dates compiled by Kool-Therm will be published in next month's CPD section of *CIBSE Journal*.

The European manufacturers' body EPEE estimated that European supermarkets, for example, would need to convert or replace 50% of their R404A systems in order to reduce their HFC use in line with next years' quota cuts. Nobody believes they have done anything like this amount of replacement work – so there will be a crunch and a scramble for diminishing supplies.

Refrigerant history is repeating itself with end users burying their heads in the sand just as they did initially over the CFC ban and, more recently, when R22 – the HCFC 'interim' gas – was phased out. So what is the

“Some CFCs, for example, could live on in the atmosphere for 10,000 years – hence the ozone damage”

direction of travel? There are long-established alternative fluids like hydrocarbons (HCs), ammonia and CO₂, but all have some problems associated with toxicity, flammability and higher operating pressures. There is no known non-flammable alternative for 410A, for example.

CO₂ has been widely adopted in new supermarket refrigeration systems despite initial difficulties with operating pressures; and ammonia has been a successful refrigerant in large systems for generations despite its toxicity. There are some 'retrofit' gases like R448A and R449A, which both have medium GWP; however, these will also – eventually – be phased out.

Capacity

Sticking with HFCs is still an option for now, as long as you can keep GWP low. R32 is gaining in popularity, particularly with manufacturers of smaller 'split' AC systems. It is one of the ingredients that make up R410A, but has a GWP of just 675 – approximately one third of R410A – and has higher volumetric capacity, meaning system charges can be reduced to help further with meeting tightening HFC quotas.

Others are, however, pinning their hopes on the emerging hydro fluoro olefins (HFO) market. HFOs are thermally stable and consist of an 'unsaturated HFC molecule', which gives them a very short



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atmospheric life – just a few days compared to the hundreds of years of the most global warming gases. Some CFCs, for example, could live on in the atmosphere for 10,000 years – hence the ozone damage.

There are two main HFOs in use, R1234ze and R1234yf, with the former considered a promising 'like for like' alternative to R134a in new water chillers. They are included in a new refrigerant classification A2L designating 'mildly flammable' gases and have been mandatory for all new cars since January 2017.

However, HFOs are not 'drop-in' replacements so anyone designing a system today that might need to use HFC gas should consider the cost implication of that system being ripped out and replaced with one

specifically designed to operate with HFOs in a few short years.

Manufacturers also keep repeating dire warnings about people attempting to use the wrong gas in their equipment – there have already been deaths associated with fraudulent refrigerant use.

The UK is already playing a key role in addressing safety concerns around the world, thanks to its experience with safe refrigerant handling as overseen by statutory certification body Refcom, operating since 1994. Refcom works with the Environment Agency to ensure the F-Gas regulations are properly enforced and refrigerant reclamation carried out, and now accounts for more than 80% of the mandatory

company certificates covering the UK refrigerant handling market. This background meant its experts were asked to help set up an international 'driving licence' for refrigerant handlers – on behalf of the United Nations Environment Programme (UNEP).

'UNEP is increasingly concerned about the alternative and flammable gas 'knowledge gap' in many parts of the world,' said former AREA President Graeme Fox.

'We live in dangerous times, but it is usually lack of training, knowledge and understanding – rather than deliberate mischief-making – that leads to problems with refrigerants. As an industry, we can make a difference, through UNEP, by improving awareness and training,' added Fox, who is senior mechanical engineer at the Building Engineering Services Association (BESA).

The long-term future looks a bit less safe; a bit toxic and (mildly) flammable, but the alternatives are out there.

It is the short-term bumps that the ACR sector will have to navigate with real care, and anyone designing a system today – expecting it to operate beyond 2020 – needs to make some careful choices. **CJ**

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Safe and effective systems for the supply of potable water in buildings

This module looks at solutions for effectively delivering potable water to new and existing buildings, and explores the benefits of using metal pipework with press connection joints as part of the system

This article explores some of the key factors that influence the successful supply of potable water to buildings, and considers the benefits of employing metal pipework with press connection joints as a means of distribution.

Clean drinking water, and water classed as potable, is a requirement for maintaining the health of building occupants. Regulations that complement – or lead – national regulations are produced under the auspices of the European Union (EU), which, in turn, draws on the guidance from the World Health Organization (WHO). WHO has very recently (2017) updated and republished its *Guidelines for Drinking-water Quality*¹ and – although it clearly states that ‘nature and form of drinking-water standards may vary among countries and regions’ – there is a common, universal, base standard.

This very accessible WHO document not only gives the limit values for aspects (microbial, chemical and radiological) that will affect human health, but also includes acceptability aspects (taste, odour and appearance) that are aimed at the whole gamut of water-supply systems, ranging from those serving large metropolitan areas through to the domestic outlets in individual dwellings. It defines the roles and responsibilities for those involved in the chain of ‘drinking-water safety management’, from the country and regional ‘environment’ agencies that oversee the accumulation, storage and distribution of water, through to the water agencies, vendors and end consumers. Each will have a significant impact on the healthy supply of water, and the guidance gives a detailed framework for the proper management of the water supply at each stage of its journey to the consumer. Of particular interest to the building services community is the specific note that ‘significant adverse health effects have been associated with inadequate plumbing systems within public and private buildings, arising from poor design, incorrect installation, alterations and inadequate maintenance’.

The principal 2017 alterations to the WHO guidance feature updates for

a number of potential contaminants, including lead. Additional guidance on risk management and monitoring of lead is provided, alongside new guidance on microbial risk assessment. This covers the positive or negative influences of aggregating multiple barriers for overall water-treatment performance, and microbial-detection and data-collection methods.

The 1998 European drinking water directive² drew on the WHO guidelines. This provided a minimum standard across the EU for water for human use – for drinking, cooking, preparing food and domestic use. This quality level must be observed at all water-delivery points, whether for hot or cold water. In the UK, water designs must comply with the minimum requirements of British Standards, Building Regulations (Building Standards in Scotland), the Water Supply Regulations 1999, and the Water Supply (Water Quality) Regulations 2000. These, in turn, draw significantly on the EU and WHO standards. (CIBSE Guide G *Public health and plumbing engineering*³ gives an extended commentary on legislation, standards and codes.)





Figure 1: An example range of press fittings used for copper pipework. The green dots indicate that the fittings are suitable for drinking water, while yellow is used for gas installations and red for heating (Source: Viega)

- » As discussed in CIBSE Guide G, the main aim of the UK water regulations is the prevention of contamination. That contamination can occur in many ways – for example, by:
- Ingress into the systems, such as from bird droppings in uncovered storage cisterns
 - Use of unsuitable materials of construction – for example, the use of lead-based solder in copper pipe joints
 - Cross-connection with unwholesome water – such as recycled greywater or rainwater
 - Backflow – contaminated fluids being drawn back into drinking-water systems from other pipework or outlets

Storage and assembly

All components of a drinking-water installation must be supplied to the building site in a hygienic state. In the manufacturing processes, dry leakage tests are preferred, to exclude the opportunity for microbial risk developing in the tubing. If residual water is left in a fitting after a leakage test using water, it is possible that micro-organisms will establish during potentially long storage times, particularly in the summer months. For example, a manufacturer reports that the drinking-water installation at a clinic has had to be continually disinfected with chemicals since 2006, because the newly installed pressure-booster system was contaminated with *Pseudomonas aeruginosa* bacteria when it was supplied and commissioned. This organism can cause a wide range of infections, particularly in those with a weakened immune system⁴. The contamination is thought to have been caused by a wet leakage test in the

factory. Residual water in carbon steel pipework (prior to filling the system) can also accelerate corrosion and affect the life expectancy of the piping. This can be particularly significant in ‘thin-walled’ piping.

The storage of pipes and fittings should always be carried out in a way that excludes any penetration of dirt and contaminated water. Because building phases often last for long periods of time, there is a great risk of contamination occurring in the components, even before the system is commissioned. In Germany, dry leakage tests have become standard in large installations such as hospitals or hotels, because of hygiene concerns. Pipes can be supplied fitted with end stoppers, so that hygienic transportation can be guaranteed. Similarly, protective caps – for sealing riser pipes during assembly – reduce the risk of contamination from dust and chemicals, such as timber treatments, insulants and surface finishes. Although such contamination is normally not considered critical in terms of microbiology, it may require a significant flushing effort to clean such deposits from the network of pipes before operation. The flushing of the installation should take place as late as possible in the contract period, prior to handover.

Repair works and additions to existing systems can be far more critical in terms of hygiene. As a result, the risks for drinking-water quality – and, as such, the safety objective of ‘health’ – may need to be considered more critically during work on older systems, or when dealing with operational breakdowns, than during installation work in a new build. For example, a qualified fitter should know to wash their hands thoroughly after working with contamination – for example, in an existing drainage system – before continuing to work on a drinking-water installation. Appropriate hygienic procedures should be in place to ensure fittings and pipework that are subsequently used for work on existing pipe have the same rigorous control – in terms of storage and disinfection – as would have been essential in the original installation and proving process. Some fittings manufacturers supply their products in individually controlled packaging, and the fitting should only be removed directly before use, which means they require no disinfection.

Pipe material

The choice of the material for an installation is made using technical and economic aspects. Materials and products must meet the particular requirements, as determined by local needs and the properties of the water. CIBSE Guide G recommends that, before the type of material for the piping of a water-distribution system can be selected, the following must be considered:

Characteristics of the water supply

- What is the degree of alkalinity or acidity? Neutral is represented by pH7; a pH above 7 is alkaline, and below 7 is acidic
- Consider the air, carbon dioxide and mineral content



Figure 2: A cutaway of a tee connection, showing the jaws of a hand-held pressing tool

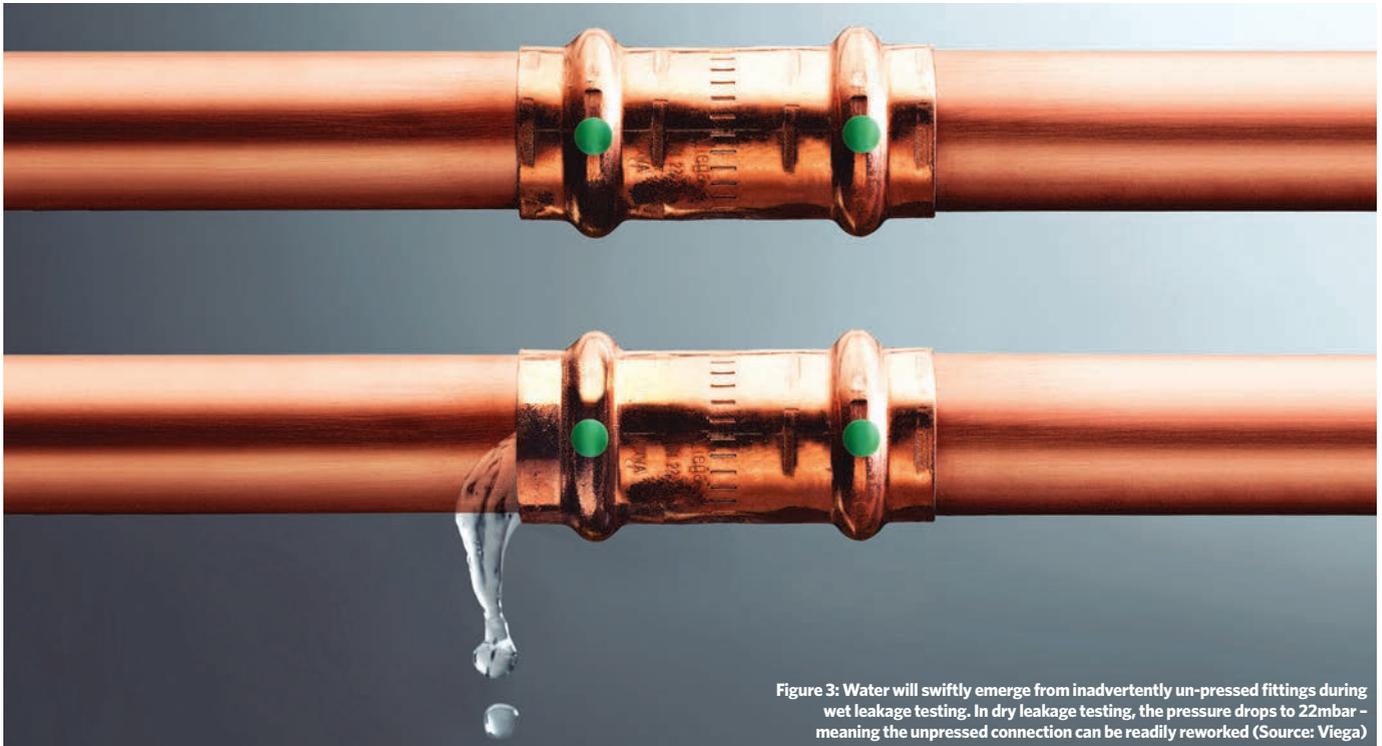


Figure 3: Water will swiftly emerge from inadvertently un-pressed fittings during wet leakage testing. In dry leakage testing, the pressure drops to 22mbar – meaning the unpressed connection can be readily reworked (Source: Viega)

- The water-supply company can usually furnish all this information. If it is not available, water analysis should be carried out by a qualified laboratory

Relative cost of materials

- Consider the relative costs of the various suitable materials – for example, requirements for bracketing

Ease of replacement

- Can the material be obtained in a reasonable time, or must it be shipped from localities that might delay arrival for months?

Inside dimensions

- Although the same nominal size, the actual inside dimensions of pipes and fittings of different materials may differ. This can have a significant effect on sizing, because of the variation in rates of flow for the same design velocity

Coefficient of friction of materials

- The roughness or smoothness (coefficient of friction) of the pipe will have a marked effect on pipe sizes and operational performance

Materials typically used for potable-water supply pipework include copper, stainless steel and various plastics, including cross-link polyethylene (PE-X), thermoplastic (ABS), medium-density and barrier polyethylene (MDPE), polybutylene and multilayer pipes (such as PE-X/aluminium/PE-X).

There are particular applications for which metal pipework is a preferred option. For example, where having fewer fixing points along the pipe length is beneficial; where there is limited space to allow for pipework expansion; where improved resistance to fire is an advantage; or, simply, for aesthetic purposes. There can be advantages when combining two systems – using copper or stainless steel for the underfloor and riser pipes (offering benefits such as rigidity and continuous earthing potential), and then employing the flexibility of plastic distribution pipes on the final pipework to outlets.

Press fitting for metal pipework

In the UK, the use of press connection technology – such as the range shown in Figure 1 – has become more common over the past 10 years, having been widely employed in Germany and other parts of Europe for more than 50 years. Press fitting can offer a fast and easy method of connecting pipework as a fire-risk free alternative to soldering, brazing and welding – and it eliminates the need for ‘hot work’ permits to work. This can be particularly beneficial in confined spaces or

sensitive buildings – such as heritage sites – where hot works are impractical or deemed to present an excessive risk.

Press connection can be used on copper, steel and stainless steel pipe, and some specialist alloys. Using a handheld tool (such as that shown in Figure 2 – either manual, cordless or mains-powered), the fitting is pressed around the pipe. The speed of fitting – including the advantage of the installer working at the point of installation, rather than shuttling back and forth to machinery in another location – and reduced mess (swarf, oil, sealing hemp from threading or grooving) are often cited as key benefits of employing press fitting.

It is also considered to be at least 30-50% quicker than brazing or soldering, and up to 60% quicker than threading or grooving for thick-walled steel tube. Another key practical benefit reported by operatives is the ability to work on existing systems while the pipework is still wet.

Most manufacturers’ press connections include mechanisms to readily detect when the fitting has been installed without having been finally fixed by being pressed (as in the example in Figure 3). Otherwise, there is a risk that a fitting could have been temporarily located where the o-ring would maintain a marginal mechanical fixing, but – when the system is subsequently charged to working pressure – the fitting and pipe will come apart.

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- Turn to page 48 for further reading and references. >>



» Module 111

May 2017

1. In what year did WHO most recently update its *Guidelines for Drinking-water Quality*?

- A 1999
- B 2000
- C 2006
- D 2014
- E 2017

2. What contamination was identified in a system that was thought to be due to residual water left over from factory testing?

- A *Pseudomonas aeruginosa*
- B *Pseudomonas agarici*
- C *Pseudomonas aurantiaca*
- D *Pseudomonas oryzae*
- E *Pseudomonas plecoglossicida*

3. In the section of Guide G, as referred to in the article, which of the following is not explicitly mentioned as requiring consideration before the piping material can be selected?

- A Characteristics of the water supply
- B Coefficient of friction of materials
- C Ease of replacement
- D Inside dimensions
- E Physical strength of materials

4. What is the approximate speed benefit of press fitting over threading or grooving for thick-walled steel tube, as cited in the article?

- A 30% quicker
- B 40% quicker
- C 50% quicker
- D 60% quicker
- E 70% quicker

5. What colour dot is used to indicate that a press fitting is suitable for potable water?

- A Blue
- B Green
- C Red
- D White
- E Yellow

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Further reading:

The relevant UK legislation relating to drinking water is available through a single web page overseen by the Drinking Water Executive at www.dwi.gov.uk/stakeholders/legislation/

The UK Water Regulation Advisory Scheme publishes a very accessible book, *Water Regulations Guide*, that contains well-illustrated guidance to the requirements for hot-, cold- and drinking-water services (see www.wras.co.uk/consumers/resources/publications/water_regulations_guide/)

CIBSE Guide G 2014 *Public health and plumbing engineering* is a good up-to-date guide to this area, with an updated approach that addresses criticisms of earlier editions that had been thought to oversize pipework.

And, of course, the WHO document is freely available on its website, alongside a whole host of supporting reports and guidelines.

References:

- 1 *Guidelines for Drinking-water Quality*, 4th Edition with 1st addendum, World Health Organization, 2017.
- 2 Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption.
- 3 CIBSE Guide G, *Public health and plumbing engineering*, CIBSE 2014.
- 4 www.gov.uk/government/collections/pseudomonas-aeruginosa-guidance-data-and-analysis - accessed 28 March 2017.



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PRODUCTS & SERVICES

Universal truly reversible fan coil



The reversible fan coil unit developed by Advanced Air – which can have its handing easily changed in the factory or on site – has had further refinements added to speed up this process.

Pre-wired looms for both right-hand and left-hand mounting of the control box are included as standard within the fan coil unit. Push-fit connectors ensure that the electrical connections are easily and quickly

made, either in production or when changing the handing in the factory or on site.

As well as moving the coil through 180°, the control box needs to be repositioned so that the handing change can be completed. The casing of the fan coil unit has identical side panels, pre-punched to accept the control box on either side – that is, left handed or right handed. A blanking plate is fitted and acts as a cover over the holes that are not being used.

■ Visit www.advancedair.co.uk



AET flexible space fantiles boost airflow to Sky Central meeting pods

AET Flexible Space, provider of underfloor air conditioning systems, has supplied 40 innovative, low-energy fantiles for the flexible meeting pods at Sky Central media campus.

The building in Osterley, west London, is the result of a multidisciplinary collaboration of designers and engineers, including AL_A, PLP Architecture, Hassell, Arup and Mace. The design brief was to create a highly flexible, connected space with a focus on wellbeing.

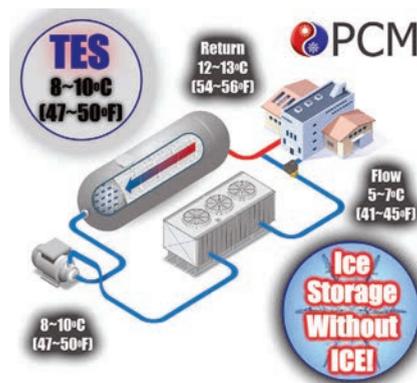
■ Call +44 (0)1342 310 400 or email lucy@flexiblespace.com

Thermal energy storage (TES) >

Phase change materials (PCM) store and release thermal energy during the process of melting and freezing – and the latest range of PCM solutions between -100°C and +885°C offers new application opportunities.

The excess capacity of existing +7°C water chillers can be stored in +10°C PCM containers overnight, using lower ambient and lower electricity costs. This efficiently stored and lower-cost energy tops up the day peak loads, saving considerably on running costs

■ Email info@pcmproducts.net or visit www.pcmproducts.net



Save time on site with new Hero Plant from Danfoss

Danfoss has developed Hero Plant, a pre-fabricated flushing bypass arrangement for larger plant devices, such as air handling units, heat exchangers and heater batteries. It combines isolation, drain strain and a flushing bypass assembly with Danfoss's AB-QM pressure-independent control. This creates a ready-to-install solution that saves time on site and eliminates the need for 'hot works' permits and the associated site-safety concerns.

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



Trigon XL is top of Class 6

The launch of Elco's Trigon XL floor-standing boiler, which has been awarded a Class 6 NO_x rating, has emissions as low as 34mg/kWh.

Achieving a Class 6 rating with NO_x emissions less than 40mg/kWh demonstrates Elco's manufacturing expertise and highlights how the Trigon XL is future-proofed against any upcoming tightening of standards.

The rating also helps specifiers when assessing project criteria under Breeam, with three credits available if a building achieves less than 40mg/kWh.

■ Visit www.elco.co.uk

Dunham-Bush fan coil units provide comfortable ambience at new residential development

Dunham-Bush has supplied more than 290 Cougar and Puma fan coil units (FCUs) to Woodford Heating and Energy, for installation at the Morello Quarter residential development in Croydon. The scheme is a joint venture between Redrow Homes and regeneration specialist Menta, under the banner of Menta Redrow.

The Cougar FCU is a slimline (180mm deep), waterside control chassis unit with EC motors, designed specifically for this type of application, with simplicity of access for cleaning or replacing filters. Puma FCUs are vertical, waterside control chassis units with EC motors, and have been installed in the reception and lift areas.

■ Email info@dunham-bush.co.uk



✓ **New close-control adiabatic humidifier is also very hygienic**

The new Condair DL in-duct adiabatic humidifier offers accurate humidity control normally only available from steam humidifiers, but with the low-energy performance and evaporative cooling benefit of a cold-water system. It also has many anti-microbial features that make it one of the most hygienic humidifiers on the market.

The Condair DL is a hybrid humidifier that combines spray and evaporative technologies to maximise moisture absorption and offer humidity control at +2% RH.

■ Visit www.condair.co.uk

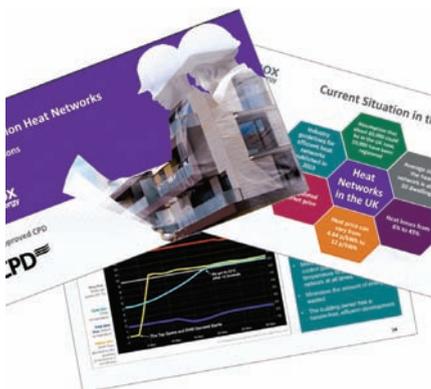


✓ **Heat network seminar accredited by CIBSE**

With the introduction of a new UK test standard for heat interface units (HIUs), and advances in technology, the district-heating market is progressing rapidly. So Evinox Energy has updated its CIBSE-accredited CPD seminar, to explore the topic in depth. It identifies key technical considerations that are fundamental to improving user satisfaction levels and the overall efficiency of a network.

Entitled 'Next generation heat networks - key considerations', the seminar offers credits towards consulting engineers' continuing professional development (CPD). It is ideal for M&E consultants, developers and housing associations, and can be held at clients' premises or at the Evinox Energy offices in Chessington, Surrey. Speakers are experienced in heat networks and have professional qualifications. A certificate will be given to all attendees for obtaining CIBSE CPD points.

■ Call 01372 722277 or visit www.evinoxenergy.co.uk



BakerHicks appoints James Howles as sector director for rail

Multidisciplinary design and engineering business BakerHicks has appointed James Howles as sector director for rail.

Howles, who has held senior positions within the rail sector for the past 14 years, is tasked with expanding and diversifying the company's rail portfolio, which includes some of the UK's largest and most complex overground and underground rail projects - including the upgrade of Whitechapel Station. He joins BakerHicks from SNC-Lavalin - formerly Interfleet - where he was director for rail infrastructure, with a particular focus on the electrification market.

Howles has been working in the rail industry since joining AMEC-Spie - now Colas Rail - in 2003, going on to deliver a number of complex, high-value rail projects in the UK and Europe for White Young Green and Aecom.

He brings with him invaluable expertise gained on the Great Western electrification, Midland Mainline electrification, and North West power-supply upgrade programmes.

■ Visit www.baker-hicks.com



◀ **Ferroli boilers bring significant energy savings for Portsmouth City Council**

By replacing its aged boiler plant with three Ferroli Prextherm RSH Tonda 1400kW steel-shell boilers, Portsmouth City Council has made significant energy cost savings of nearly £30,000 per year - and reduced the energy demands of the council's civic centre building.

A direct working relationship the local authority had with the boilers' manufacturer, Ferroli, meant that all questions and issues were swiftly resolved, and the timescale of the project was met.

■ Call 0330 205 0002, email commercial@ferroli.co.uk or visit www.ferroli.co.uk

✓ **Hitachi's Utopia splits improve air quality at Logicool**

Specialist climate control distributor Logicool Air Conditioning & Heat Pumps has expanded its operations as a result of continued growth. It has recently established a need for an air conditioning solution to improve the indoor air quality and working conditions at its warehouse.

As Hitachi's leading reseller in the UK, Logicool approached Hitachi for a solution. Its new Utopia ES split system was specified and installed in Logicool's Swadlincote warehouse.

■ Call 01628 585 394 or visit www.hitachi-aircon.com



^ **Complete HVAC support from Encon Insulation**

Independent distributor Encon Insulation has set up a dedicated technical support team, to work alongside its internal sales specialists and provide customer service to its HVAC customers. The new team, which boasts more than 100 years of industry experience, offers end-to-end technical advice.

The team is made up of five members, who will be on hand to offer expert guidance from the earliest design stages of a project, through to on-site support and handover.

■ Visit www.encon.co.uk



HygroMatik showed its sustainable air humidification solutions at ISH 2017

HygroMatik presented its new and well-established products at ISH 2017 in Frankfurt. The company's stand featured some of its most recognised products, such as the energy-efficient adiabatic high- and low-pressure nozzle systems - HPS and LPS - as well as isothermal electrode and heater-type steam humidifiers.

HygroMatik also showcased its water-softening and reverse-osmosis systems, which guarantee hygienic water treatment, while reducing downtime and maintenance costs.

■ Call 02380 or email info@hygromatik.co.uk

Mikrofill supplies plantroom upgrade at Leasowes High School

After a dilapidation survey by Dudley Metropolitan Borough Council, it was decided to upgrade the LPHW & HWS equipment at Leasowes High School, in Halesowen. The existing atmospheric heating boilers were replaced with six Mikrofill Ethos 130kW wall-mounted condensing boilers. With a total modulation of 60>1 (780>13kW), the new installation ensures that the building's heat load is accurately achieved at all times.

The HWS requirement for the kitchen and main block was catered for by the installation of an Extreme 500-litre loading cylinder. Fed via an indirect primary circuit of 80/50°C, the loading cylinder optimises the boiler's condensing mode and produces more than 2,500 l/hr at 60°C. In addition, a Mikrofill 1,200/2 pressurisation package unvented the existing LPHW circuit.

The new design was carried out by in-house DMBC engineers within the Corporate Landlord Services department and the installation was by long-standing West Midlands-based contractor TDR Mechanical Services.

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



Scottish students win by degrees

The Scottish Property Awards, which recognise the best in new commercial buildings, achieved its highest number of entries this year. Nine shortlisted schemes battled it out in the Student Accommodation Development of the Year category, but Holyrood North Residence Hall - at the University of Edinburgh - was eventually crowned the winner.

Grundfos Pumps, which supplied a complete pump solution for this project, was delighted to hear the result.

The win was not a huge surprise, as the development encompasses an architecturally wonderful building that will be home to 480 postgraduates. It makes great use of materials and has been meticulously designed. It incorporates a communal kitchen that breaks down into eight, 60-person sub-kitchens - the first of its kind in the UK, and ideal for encouraging students to interact and socialise.

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

Helvar shines bright with Illustris touch-control panel

Helvar has launched Illustris, a Bluetooth-connected, touch-sensitive panel that comes in glass or plastic. It offers stylish, simple control of Helvar lighting control systems and Dali Type 8 colour devices for human-centric lighting applications.

Illustris is a versatile solution for office, education and healthcare applications. It includes a scene control panel and a full-colour and colour-temperature control panel. Users can edit scenes from the Illustris panel or the app for effective lighting control.

■ Call 01322 222211 or visit www.helvar.com



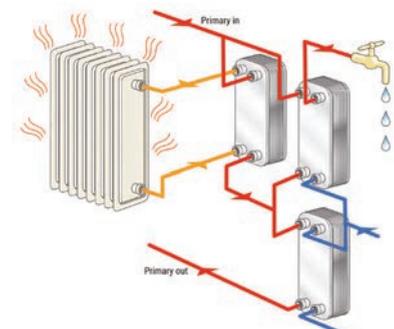
Swept two-stage unit reduces return temperatures

Substations and HIUs in heat network installations can be arranged in parallel or in a two-stage set-up. The two-stage system is commonly used in heat networks to reduce the returned water temperature. Returned water from the radiator circuit heat exchanger is used to preheat the domestic hot water. The proportion of heat used for preheating and post-heating respectively is set in such a way as to make the most efficient use of the return temperature from the radiator circuit.

The primary return flow from the radiator heat exchanger is mixed with the primary flow from the after-heater. The mixed flow enters a third heat exchanger - the preheater. Its main purpose is to preheat the cold water before it enters the after-heater and is therefore called a two-stage system.

The tap water unit is schematic two, but it will be executed as one two-stage unit.

■ Visit www.swept.net



Staying in shape with Kingspan KoolDuct

Thanks to the design of the Kingspan KoolDuct system and KoolDuct panels, delivery partner cg3 Systems has achieved a millimetre-perfect HVAC fit-out of a new multimillion pound sports and leisure complex in Northern Ireland. Opening this summer, phase two of the Newry Leisure Centre is part of Newry, Mourne and Down Council's aim to create a modern facility. Built to a high specification, the building promotes accessibility and functionality.

■ Call 01544 388 601,
email info@kingspaninsulation.co.uk or
visit www.kingspanindustrialinsulation.com



Liverpool Town Hall chooses Smith's Caspian Concealed

The M&E team at Liverpool City Council has selected 20 Smith's Caspian Concealed fan convectors to keep its Grade I-listed, 18th-century town hall warm this winter. The Universal was developed for this project and is now regularly specified as part of the heating solution for listed buildings such as churches, hotels and other commercial premises.

Sales and marketing director Jim Bennett said: 'Liverpool City Council needed a bespoke solution from Smith's that could address and resolve all the heating challenges this project entailed. With Ray Black, the council's mechanical maintenance manager, the team at Smith's discussed producing a fan convector to meet the precise specifications required. Liverpool City Council was keen to progress the installation of the 20 Caspian Concealed fan convectors and we were able to meet their demands fully, and on time.'

■ Call 01245 324 900
email sales@SmithsEP.co.uk or
visit www.SmithsEP.co.uk



Zumtobel creates luminous and open environment for university's new physics centre

When Durham University wanted to create a light and open new building in which to house its Ogden Centre for Fundamental Physics, Zumtobel was chosen as the sole lighting supplier for the project. It provided the luminaires for the interior and exterior areas of the £11.5m development, which includes 80 new offices for the university's professors, lecturers, doctoral students, postdoctoral researchers and support staff, as well as for visiting academics.

■ Call (0)1388 420042
email: info.uk@zumtobelgroup.com or
visit www.zumtobel.co.uk

Nittan smoke detectors protect Italian Unesco world heritage site

Nittan fire-detection equipment has been installed in the Piazza del Duomo – a Unesco World heritage site in Pisa, Italy – as part of an integrated fire and security system designed and installed by Nittan agent EL.MO.

Nittan devices were specified for this prestigious project because of their exceptional reliability, compatibility with EL.MO's FX series of analogue addressable control units, and their unique features, such as a 360° Omniview LED indicator.

■ Visit www.nittan.co.uk



Nuaire's carbon filter works harder

IAQ-Box is an exciting advancement in carbon filtration. Designed to complement its mechanical ventilation with heat recovery (MVHR) range, Nuaire's IAQ-Box removes 99.5% of nitrogen dioxide (NO₂) from the air, making it the most effective system available, as verified by the BRE.

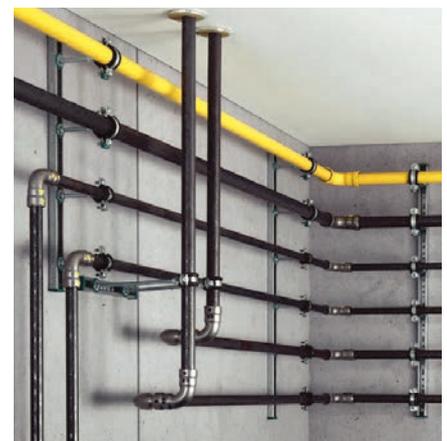
Available in single and double width, the IAQ-Box offers greater flexibility. The double system has a greater surface area to remove more NO₂ and give the lowest air resistance possible, for a quieter-running MVHR system.

■ Visit www.nuaire.co.uk

Viega brings Megapress technology to the UK market

Global manufacturer of piping systems Viega has introduced Megapress G connectors to the UK market, bringing the benefits of the Megapress technology to those working with gas installations. Megapress G 'cold' pressed connectors have been tested and Kitemark-approved for natural- and liquid-gas applications, as well as for heating oil, diesel fuels, compressed air containing oil, and technical gases. The Megapress carbon-steel press-connection system offers an effective alternative to traditional methods.

■ Visit www.viega.co.uk



CP Electronics grows Scotland team in response to new legislation ✓

CP Electronics has appointed Brian Hedley as area sales manager for projects, backed by Neil Baldwin - delivering support for its green-i range of controls - and John Peter Haughey, who will deliver technical support and commissioning. Together, they bring more than 30 years' experience to the team, and will enable CP Electronics to take advantage of new energy-efficiency regulations, introduced towards the end of last year.

■ Visit www.cpelectronics.co.uk



New facilities at 'well lit' medical centre ✓

Luceco has supplied an LED lighting solution for an extension at Honiton Surgery, in Devon, to meet the needs of visitors and staff. Its LuxPanels are safe and easy to install, and offer up to 50,000 hours' working life. IQ Engineering, based in Newton Abbot, offered consultancy services for the building work, which includes six new consulting rooms, as well as treatment, waiting and meeting rooms. Installation of the electrical services was carried out by REF Electrics, of Taunton.

■ Call 07890 320 152 or email Zoe.nh@luceco.com



✓ **Meet Hamworthy Heating's stainless family up close**

Commercial boiler and hot-water specialist Hamworthy Heating is taking its range of stainless steel boilers and calorifier - the Stainless Family - on the road. From June 2017, the company's van - driven by Hamworthy's commercial heating and hot water experts - will be touring the UK to show customers the benefits of stainless steel in the components of boiler and water heaters.

■ Call 01202 662 500, email sales@hamworthy-heating.com or visit www.hamworthy-heating.com/roadshow



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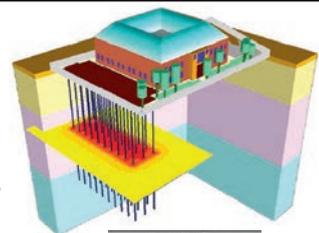


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Associate Director Mechanical Croydon, £70-75k + bens

A 30 strong consultancy that focus on education, residential, healthcare, retail and commercial (offices, large scale fit outs) are looking to expand their team further. You will oversee all mechanical building services projects, management delivery teams and staff, engage with stakeholders, chair leadership meetings, develop new and existing business relationships and mentor staff. This role is for an ambitious, entrepreneurial person who is looking to grow an already successful company. Ref: 4256

Principal/Associate M&E Engineers Dorset, Up to £55k + car + bens

With an ever increasing order book of high profile and interesting commercial / retail / high end residential projects, a principal design consultancy are seeking experienced building services design engineers with excellent client facing and team leading skills to join their company. With a forward thinking approach to engineering you will be part of one of the UK's most successful building services teams. A relocation package could be possible for the right person. Ref: 4038

Senior Mechanical Engineer Central London, £38 - £42 p/h

An award winning consultancy that is at the forefront of designing building high performance buildings with a focus on sustainability. An opportunity has arisen for a Senior Mechanical Engineer to join the well-established team in London. You will have the opportunity to work on some of the most iconic buildings across the globe that are pushing the boundaries of design within the built environment. Ref: 4281

Senior Electrical Engineer Dorset, £30 - £36 p/h

Successful international firm of MEP Consulting Engineers looking to bolster their design team and take a lead on a number of high profile projects. Candidates require 5 years experience in the UK Building Services Consultancy industry, ideally you will be CAD literate and have a solid design/calculation background undertaking design of LV distribution, lighting, fire alarms, and security systems in commercial/retail/high end residential sectors. Ref: 4297

Director of Transportation London, £70-90k + car + bonus + bens

A specialist rail or aviation lead is sought by one of the UK's leading engineering consultancies'. You will have extensive experience delivering projects from inception, had full responsibility for business development, financial accountability and developing MEP teams. This is a significant position for somebody to develop the transportation division of this highly successful company. A future ownership position is possible for the right candidate. Ref: 180417

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Associate Electrical Engineer - London
£60k to £65k plus benefits

A technically strong electrical engineer is required for an award winning multi-disciplinary consultancy to lead a team of electrical engineers. Ideal candidates will have proven project experience and be capable of getting the best out of junior engineers. This consultancy can offer a quick and structured path to Associate Director.

For more information please contact
Martin Bell on 01728 726120

Senior Electrical Design Engineer - Warrington
£45k to £50k plus benefits

Internationally recognised multi-disciplinary consultancy is currently recruiting for an experienced electrical design engineer to join a multi-disciplined team of 20+. Projects involve a number of high-profile schemes on both a national and international scale. Benefits include funding and support for engineers to progress within their career and gain professional status.

For more information please contact Ben
Thompson on 0113 457 0079

Senior Mechanical Design Engineer - Salford
£42k to £47k plus benefits

This globally recognised consultancy intend to make their Salford office the largest team in the North of the UK. This role has come available due to an increased workload and a number of prolific projects in the pipeline. Benefits include pension, healthcare, life assurance and 2 paid professional fees.

For more information please contact Ben
Thompson on 0113 457 0079

Electrical Associate - Newcastle
£50k to £57k plus benefits

An electrical Associate is required for an award winning multi-disciplinary consultancy. You will join their successful Building Services team and play a key role in the delivery of their projects worldwide. Ideally you will be a Chartered Engineer with a strong commercial awareness, sound technical knowledge and have a passion for design.

For more information please contact
Claire Wells on 0131 240 1260

Intermediate Electrical Design Engineer - Glasgow
£30k to £37k plus benefits

A successful multi-disciplinary building services consultant requires an electrical design engineer. The ideal candidate will have a degree in electrical engineering with strong technical skills and a good understanding of all MEP disciplines. Our client offers career progression and the opportunity to become Chartered.

For more information please contact
Claire Wells on 0131 240 1260

Principal Design Engineer (M or E) - Hampshire
Circa £55k plus benefits

A highly respected M&E contractor, known for their high quality design, is offering an experienced design engineer the chance to develop their own team within this newly opened office. Working on a huge variety of work, you will have the independence to run your own projects. This is a fantastic opportunity not to be missed!

For more information please contact
Jessica Davey on 01728 726 120

Associate Electrical Design Engineer - Oxford
Circa £60k plus benefits

An award winning building services consultancy, with a vast portfolio of clients, is looking for a highly experienced electrical engineer. This is a rare opportunity for a versatile design engineer with acute technical ability and the charisma to win work. Candidates will be rewarded with the autonomy to run their own projects and teams as they deem appropriate, offering quick career progression if they impress.

For more information please contact
Jessica Davey on 01728 726 120

Senior Mechanical Design Engineer - Kent
£40k to £50k plus benefits

A small building services consultancy based in Kent is now looking for a strong senior engineer to join their team at a time of planned expansion. With a strong surge of repeat business within the residential, commercial and rail sectors you will work alongside an associate in running of projects from concept to completion. Candidates have a chance to be part of a growing company and will be rewarded for loyalty over a series of years.

For more information please contact
Martin Bell on 01728 726120

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Top of the class

After winning the CIBSE Graduate of the Year Award 2016, Antoni Sapina Grau, of WSP Parsons Brinckerhoff, shares his enthusiasm for the future of building services

Antoni Sapina Grau joined WSP Parsons Brinckerhoff as a graduate engineer, having obtained an MSc in building services engineering with sustainable energy at Brunel University London. Before that, he had completed a BEng in architectural engineering at the Polytechnic University of Valencia. Grau worked on construction and building services projects in Spain, Mexico and the UK before joining WSP. As a graduate, he has qualified as a Breeam Associate, Low Carbon Consultant and LCIBSE. He was also part of the team that won last year's Teambuild Construction Competition UK.

Q What was it like to win the Graduate of the Year 2016 award?

A It was amazing. It makes you analyse the journey you've taken and encourages you to keep moving forward. The whole process has been an adventure. Being shortlisted was something to celebrate in itself, but winning was something I'll never forget. The award has bestowed on me a sense of responsibility. I hope it's the beginning of an amazing journey.

Q How was the ASHRAE Winter Conference in Las Vegas?

A It was one of the best experiences of my life. I was shocked by the numbers of people, the size of the showrooms and the range of seminars. I never thought building services could create something like this. I encountered so many people from different backgrounds. It was a chance to meet young engineers from ASHRAE, as well as to share opinions and experiences. Of course, as the event was in Las Vegas, I decided to go 'all in' with the opportunity.

Q How well are engineers adapting to digital ways of working?

A It's all about a process. There are many types of engineer out there. New digital technology requires new ways of working. We're seeing more collaboration and project management combining teams from different fields, such as architects and structural engineers. This is because technical data crosses over between disciplines. Also, technology allows us to work on the projects on site, rather than from the office full-time. The market is calling on us to collaborate with partners across the world – and engineers have to be ready to do that.

Q Do young engineers have an advantage here?

A Maybe, because some of us used certain technology while we were studying. But, it also comes down to personality types. To learn something new you need to apply yourself. I think people can learn at any age – and, to be honest, being able

to use agile digital solutions in the workplace is the minimum expectation for young engineers today. In some ways, it raises expectations even further.

Q What are you working on now?

A On an incredible project for Harrods. It's been an excellent experience. I remember visiting Harrods for the first time with my family when I was 14, and now I'm part of the engineering team improving the energy performance of this historical building. That's why this is a very special project for me.

Q What are the biggest challenges in building services design?

A I think one of the biggest challenges right now is the transition to building information modelling (BIM). It's going to be tough to implement and use BIM because of its complexity. We have to do it carefully – step by step – to make sure we orientate our business correctly. Also, technology is making the market more competitive, and building services engineers are under pressure to be more efficient and sustainable.

Q What would you like to do in the future?

A I want to keep developing myself. I love to get involved with big projects. For that reason, I want to participate in an international project, to learn different ways of working. At the moment, building services is a worldwide concept that is used everywhere. I want to be part of projects in different countries, be familiar with new regulations and new ways to do business.

Q What advice would you give to a young person considering a career in building services?

A Being a building services engineer involves much more than being stuck in an office all day. It allows you to meet clients, make presentations, visit sites and, sometimes, travel abroad. There are so many aspects to the role. Regulations are becoming stricter, deadlines are tighter and equipment is more complex. Our market requires lots of new engineers to handle this. Building services has given me so many amazing experiences and, each day, I'm more and more convinced that it's a great career choice.

■ **ANTONI SAPINA GRAU** is a graduate engineer at WSP Parsons Brinckerhoff

■ The Young Engineers Awards are now open for entries at www.cibse.org/yea

INTERNATIONAL AND NATIONAL EVENTS/ CONFERENCES

CIBSE AGM

9 May, London
Plus address by incoming President Peter Wong.
www.cibse.org/agma

BIM Roadshows

16 May, Leeds
12 June, London
Presenters demonstrate real-world application of digital technologies and work-flows.
www.cibse.org/BIMroadshows

Exploring green infrastructure as a building service

19 May, London
Part of Green Sky Thinking Week, winners of the Green Infrastructure Design Challenge, organised by CIBSE and ARCC, will be announced.
www.cibse.org

CPD TRAINING

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

Ground water source heat pump schemes 1

9 May, London

Ground water source heat pump schemes 2

10 May, London

Low-carbon buildings for local authorities

11 May, London

Design of ductwork systems

12 May, London

Fire sprinkler systems: design

18 May, London

Lighting design: principles and applications

19 May, London

Building services explained

23-25 May, Bristol

High voltage (11kV) distribution and protection

2 June, London

Building services one-day overview

2 June, London

Variable flow water system design

9 June, London

Understanding psychrometric charts

13 June, London

ENERGY ASSESSOR TRAINING

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

LCC building design and EPC

9-10 May, Newcastle

ISO 50001

9-11 May, Sheffield

Heat networks

16-17 May, London

Air conditioning inspector

19 May, Birmingham

LCC building operation and DEC

23-25 May, London

Heat networks

6-7 June, Sheffield

LCC building operation and DEC

7-9 June, Leeds

LCC building design and EPC

13-14 June, Birmingham

CIBSE GROUPS, SOCIETIES AND REGIONS

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

Home Counties North West – Membership briefing sessions

8 May, London
10 May, St Albans

Guidance on Associate and Member grades applications.

CIBSE YEN South West – CFD and the Everyman Theatre

10 May, Bristol
Examining CFD as a design tool, and what made the Everyman sustainable.

West Midlands: The biomimetic building

10 May, Birmingham
With speaker architect Michael Pawlyn.

SoPHE: Thermal balancing

11 May, Oxford
Presentation by Overtop UK.

SLL and CIBSE HCNW – Lighting paper for health and wellbeing

12 May, Milton Keynes
Sophie Parry looks at the Well Building Standard and SLL Lighting Guide 7: Offices.

South Wales – Membership briefing

15 May, Cardiff

UAE: Technical seminar

16 May, Abu Dhabi
Organised by the CIBSE Abu Dhabi Chapter

WiBSE – Diversity and inclusion

16 May, Leeds
PricewaterhouseCoopers hosts an event to discuss, diversity and inclusion in property and construction.

SoPHE: Combating legionella – the engineering solution

17 May, Manchester
Presentation by Adrian Lee, Gebr.Kemper UK & Ireland.

West Midlands: Technical seminar on smart cities

17 May, Birmingham
With speaker Hywel Davies, CIBSE technical director.

CIBSE FM and ASHRAE Group: The growing importance of air filtration and the influence of the new ISO 16890 – PM1

18 May, London
Hosted by Camfil, with speakers Dr Chris Ecob, of Camfil, and Simon Birkett, of Clean Air in London.

SoPHE: Hydration in the workplace

18 May, London
With speaker Andrew James, of Zip Water UK.

SLL Masterclass

18 May, London
Last in the lighting knowledge series, focusing on Human Responses to Light.

HCSE: How could BIM and building physics shape the world in 2050?

18 May, Croydon
With Catherine Simpson.

HCNW: Healthcare and net zero

18 May, London
Frank Mills, from CIBSE Healthcare Group, on how hospitals can be 'net zero'.

SLL AGM, awards and presidential address

25 May, London
Incoming president Richard Caple's address, plus lighting awards.

HCNW: Walking tall

27 May, London
Two-hour walking tour with Julie Fletcher.

HCNW: Lighting paper, street lighting and wildlife

1 June, London
Mary Rushton Beales, of Lighting Design House, explores streetlighting.

SoPHE AGM and technical evening

13 June, London

SoPHE: Submersible Pumps

15 June, London
With Richard Sutton and Michael Rayment, of Jung Pumpen.

HIGHLIGHTS



Peter Wong will deliver his presidential address – London, 9 May



Cathy Simpson on how BIM could shape the world – Croydon, 18 May

Online learning

New modules an alternative to classroom courses

CIBSE has launched new modules in its Online Learning portfolio, which offer a practical, flexible and convenient alternative to classroom courses. The units have been designed by a collaborative group of building services consultancies and contractors, peer reviewed and tested.

Each module gives a thorough understanding of a subject, with seven hours of structured learning and a bank of material available for further reading. The supporting interactive elements will help guide you through the subject matter and ensure you finish the module with an excellent grasp of the topic.

CIBSE currently offers 13 online courses, each consisting of seven hours of content, knowledge quizzes, and supporting materials, including a glossary of terms. For more information, visit www.cibse.org/online-learning





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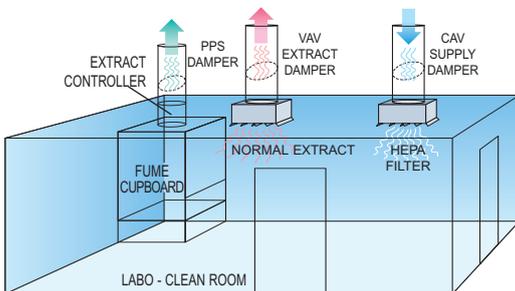


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