CIBSE JOURNAL

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MAINTAINING BUILDINGS IN LOCKDOWN

LESSONS LEARNED FROM FLORENCE NIGHTINGALE

ACOUSTIC CONSIDERATIONS IN SERVICES DESIGN

FRONTLINE SERVICES

How ExCeL was converted into an NHS Nightingale Hospital in nine days

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Nightingale's legacy

The world is still adjusting to Covid-19. As *CIBSE Journal* goes to press, the UK has been in lockdown for a month, around two weeks behind mainland Europe. China, South Korea and other Asian countries appear to have controlled the spread of the virus, at least for now, and are tentatively emerging from their three-to-four month lockdowns.

The rest of the world is now watching to see whether methods of controlling the virus using testing and contact tracing can be used as a blueprint for opening up other parts of the world. Germany and other Northern European countries with falling infection levels and testing procedures in place are the first European countries to announce the loosening of their 'stay at home' rules.

In the past month, the UK has been preparing for the expected surge in cases by converting conference centres and sports stadiums into temporary NHS Nightingale Hospitals. The naming is apt. Florence Nightingale was born 200 years ago this month, and not only did she tend to the wounded in field hospitals (built during the Crimean War), she was also a pioneer in healthcare design and understood the importance of good ventilation in aiding the recovery of patients and reduction of cross-infection. On page 53, Chris Iddon compares Nightingale's work with today's experts researching the transmission of Covid-19 (on page 7, there are summaries of the latest literature reviews on the virus).

The first – and largest – NHS Nightingale Hospital is at the ExCeL centre in London's Docklands. The transformation from a venue for exhibitions such as FutureBuild – which was held the month before the virus took hold – has been astounding. A mixture of pragmatism and creative engineering enabled designers, contractors, health professionals and the military to convert ExCeL's two 500m-long halls into 80 wards containing 4,000 intensive care unit beds.

Our case study on page 14 features building services engineers from BDP and The RSP explaining how the ExCeL's ventilation system had to be reconfigured to ensure the safety of the patients and up to 16,000 staff.

In the UK, deaths from Covid-19 and new cases have plateaued but not significantly fallen. While some construction companies, such as housebuilders Taylor Wimpey and Vistry, are preparing to resume on site, there is no end to the lockdown in sight for the majority of workers, which means thousands of buildings remain unoccupied. On page 18, we look at the measures that must be taken to ensure the buildings are safe to reoccupy. Without a maintenance plan, the risks of legionella and the corrosion of HVAC systems are very real.

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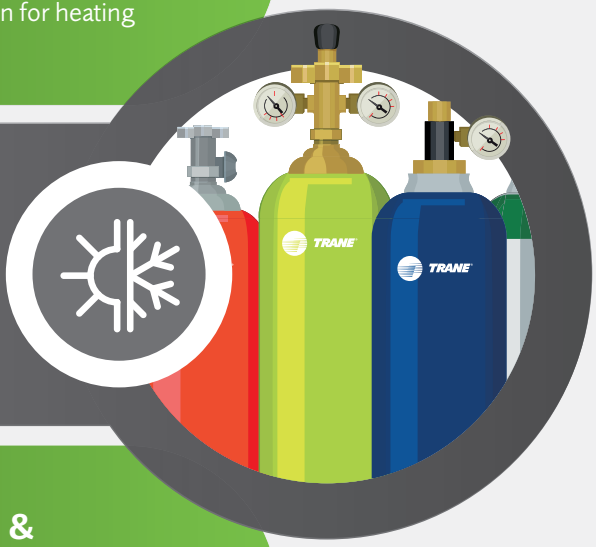

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Boost ventilation to tackle virus, say researchers

Review of literature on Covid-19 finds that ventilation reduces spread risk

Research from the Universities of Oregon and California supports industry claims that air conditioning and ventilation systems can help to reduce the spread of the Covid-19 virus.

In the *Covid-19 pandemic: Built environment considerations to reduce transmission* paper, published in a journal of the American Society for Microbiology, researchers said higher air exchange rates in buildings may help dilute indoor contaminants.

However, they said engineers should ensure there was an adequate amount of outdoor air being brought into the building because simply accelerating recirculation could have the opposite effect.

They also said that Covid-19 particles are too small to be contained even by HEPA and MERV filters, but that proper filter installation and maintenance can help to reduce the risk of airborne transmission.

The review of research on Covid-19 and similar pathogens found that the virus-laden particles can remain airborne for up to three hours.

The North American technical society ASHRAE also believes HVAC systems can help to control the spread of the virus.

'Ventilation and filtration provided by heating, ventilating, and air-conditioning systems can reduce the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air,' it said.

It was responding to calls for systems to be shut down to and pointed out 'unconditioned spaces can cause thermal stress to people that may be directly life threatening and... lower resistance to infection'.

'In general, disabling of heating, ventilating, and air-conditioning systems is not a recommended measure to reduce the transmission of the virus,' ASHRAE said.

In a paper, *Emerging Infectious Diseases,* researchers found Covid-19 aerosol distribution characteristics in a Wuhan hospital suggested transmission distance of the virus of up to 4m.

The Dragon Heart Hospital in Cardiff

BDP behind six NHS Nightingale Hospitals

Multidisciplinary design practice BDP has been involved in the construction of six emergency NHS Nightingale hospitals built to care for Covid-19 patients.

The hospitals are in London, Birmingham, Manchester, Harrogate, Bristol and Cardiff and include the conversion of the ExCeL in London into a 4,000-bed healthcare facility (page 14).

Dragon's Heart Hospital at the Cardiff Principality Stadium (pictured), required tent structures and the repurposing of hospitality suites. BDP worked with Mott MacDonald, the Welsh Rugby Union and Cardiff and Vale University Health Board.

BDP designed the 750-bed Manchester Nightingale Hospital at Manchester Central Convention Complex, which was delivered by a JV between Vinci and Sir Robert McAlpine.

BDP's Bristol studio was involved in converting UWE Bristol Exhibition and Conference Centre, alongside main contractor Kier and, in Birmingham, working under main contractor Interserve, BDP provided the design and engineering to help convert the NEC into a 4,000-bed emergency hospital. In North Yorkshire, it converted the Harrogate Convention Centre into a temporary 500-bed, level-three critical care field hospital, working with main contractor BAM.

REHVA updates Covid-19 document

A second version of REHVA's guidance on protecting buildings from Covid-19 has been published, following industry feedback and the publication of new papers.

The guidance states that SARS-CoV-2 remains active for up to three hours in indoor air and two-to-three days on room surfaces at common indoor conditions .

Atze Boerstra, vice-president at REHVA, said: 'A recent review of the scientific literature led to our conclusion that you can't exclude the possibility that the virus could be transmitted through the air over longer distances (via aerosols).

'That is why we suggest the precautionary principle in buildings that are still occupied.'

The guidance focuses on easy-to-implement measures in existing buildings with normal occupancy rates over the next few months in Europe.

Recommendations apply to buildings other than healthcare facilities operating in a European springtime climate.

Advice has been updated on rotary heat exchangers. It says they should be left on to ensure high ventilation rates, but recommends inspecting heat recovery equipment to ensure there are no air leakages from the extract to supply side.

The guidance recommends that buildings vacated because of the pandemic should operate ventilation continuously at reduced speed.

The latest guidance is available at **bit.ly/CJMay20News1** and includes a 14-point summary of practical measures.

Eurovent issues ventilation guidance

The European HVAC body Eurovent has published guidance to help building owners manage the risk of Covid-19 transmission.

It said the virus was spread by airborne droplets, but added that they 'do not remain in suspension, but generally fall to the ground or land on other surfaces at a short distance from the infected person'.

It said there was currently no evidence that coronavirus can spread through ventilation or air conditioning systems, adding that reducing the concentration of droplets 'can be effectively achieved by correctly operating mechanical ventilation systems'.

It advises building managers to:

- Increase ventilation rates and increase the percentage of outdoor air in the system
- Extend the operation time of the ventilation system
- Check that the ventilation units are properly set up and they are serviced correctly in accordance with the manufacturer's instructions
- Consider maintaining the indoor relative humidity above 30% (where possible).

The guide is at **bit.ly/CJMay20News2**

Clean energy can drive economic recovery

Investment in clean energy could boost the global economy by $98trn and accelerate the financial recovery after the Covid-19 pandemic, according to the International Renewable Energy Agency (Irena).

In its latest *Global Renewables Outlook* report, it stated that the number of jobs in the energy sector could quadruple to around 42 million on the back of clean energy expansion. Decarbonisation will require investments of more than $130trn to deal with the most severe climate impacts, but the agency claims this would be offset by 'massive' socio-economic gains.

It envisages a time when renewables account for 70-80% of energy systems in a number of continents and this would deliver $98trn in GDP gains by 2050 compared with current 'business as usual' models.

Europe needs 'renovation wave'

The Buildings Performance Institute Europe (BPIE) has published a strategy for delivering climate neutrality for Europe's buildings by 2050.

An Action Plan for the Renovation Wave: Collectively achieving sustainable buildings in Europe provides evidence-based recommendations for EU institutions, member states and local authorities, along with private sector stakeholders and engineers.

Executive director Oliver Rapf said it was important to address climate change and support the economic recovery together after the coronavirus crisis 'by getting serious about launching a renovation wave'.

He said the transformation will be in the form of a well-prepared integrative process [that includes] construction and renovation practices, the way buildings are integrated with power and heat networks, strategies to make buildings resilient to the impacts of climate change, the use of digital technologies and how renovations are financed.

Biggest building safety changes in generation

Highrises over 11m must have sprinklers and consistent wayfinding signage

Ambitious steps to reform building safety so residents are safe in their homes were announced by Housing Secretary Robert Jenrick last month.

New measures include mandatory sprinkler systems and consistent wayfinding signage in all new blocks of flats more than 11 metres tall.

The government's construction expert, David Hancock, has also been appointed to review the progress of removing unsafe aluminium composite material cladding from buildings.

Grenfell Tower

The reforms are designed to incentivise compliance and to better enable the use of enforcement powers and sanctions, including prosecution where rules are not followed.

Jenrick will hold a roundtable with mortgage lenders to work on an agreed approach to mortgage valuations for properties in buildings under 18 metres tall.

He said: 'The government is bringing about the biggest change in building safety for a generation. We have made a major step towards this by publishing our response to the Building a Safer Future consultation.'

In its response, the government said that work had begun to establish the Building Safety Regulator in the HSE, who will oversee the safety and performance of all buildings, and promote the competence and capability of those working in the industry.

Jenrick added work to remove unsafe cladding, as well as vital maintenance and repair work, will continue despite Covid-19.

Covid-19 triggers emissions fall

Carbon emissions from the global fossil fuel industry could fall by a record 2.5bn tonnes this year as a result of the coronavirus pandemic.

This would represent a drop of nearly 5% and is triggered by plummeting demand for oil and gas as huge restrictions are placed on travel and industrial processes.

Data gathered by *The Guardian* suggested the biggest annual drop in CO_2 emissions on record – greater than those recorded in all the economic recessions of the past 50 years combined. This will take emissions down to their lowest level in more than a decade.

The International Energy Agency said it expected US energy-related emissions to fall by 7.5% this year and studies suggest Europe's emissions had fallen by more than 50% since countries went into lockdown. That fall is expected to quickly start reversing when restrictions are lifted.

Empty buildings could soon make way for housing under PDRs

CIBSE calls for review of PDR planning policy

Permitted development rights must not sweep away carbon targets

CIBSE has called for a review of permitted development rights (PDRs). It says the policy allowing the conversion of buildings without planning permission risks creating schemes that will require further adaptation to meet net zero standards.

CIBSE said that PDRs meant local authorities were missing out on the chance to set carbon reduction targets and receive contributions towards community projects.

'We support the adaptation and conversion of buildings if it minimises embodied carbon and other resources. However, this must be given proper consideration, as with any design and construction project,' said CIBSE in its position statement *Towards a Better Planning Framework to Address Climate Change*.

The statement was published after the Secretary of State for Housing, Communities and Local Government Robert Jenrick announced government plans to allow empty buildings to be demolished and replaced by new housing.

CIBSE said it was concerned that the proposed plans would have consequences for the safety, health and wellbeing of occupants. It said: 'Adapting and retrofitting existing buildings should be a priority; demolition should be minimised'

In the statement, CIBSE said local authorities should be able to set carbon performance targets beyond national standards; it objects to the government's plan to restrict locally set targets.

The statement calls on the government to announce the steps to net-zero-carbon operational buildings, and says local authorities should be able to ask for evidence of operational performance. It calls for the creation of incentives for applicants to adopt net-zero-carbon standards.

The government should also develop planning guidelines for retrofitting properties in collaboration with heritage bodies, CIBSE said, and that there needed to be an investment in the skills of conservation officers and energy/sustainability officers.

● Read the statement at **bit.ly/CJMay20pos**

Planning peak points to rapid recovery

Construction activity could bounce back rapidly once Covid-19 restrictions are lifted, thanks to a surge in planning approvals recorded during March.

The construction information firm Glenigan said there had been a significant increase in the volume of planning approvals in March compared with any of the previous 12 months. It added that the health, education, and social housing sectors were particularly well placed to recover quickly, and the regions recording the biggest rise in planning approvals were the North East, North West and Wales.

The speed of recovery does, of course, depend on the success of construction-related firms in surviving the lockdown period, with government stimulus packages seen as particularly vital to bolster the confidence of private sector investors.

As *CIBSE Journal* went to press, around 34% of construction work by value was suspended and more than 50% of sites under lockdown. This has led to main contractors furloughing large parts of their workforces and many self-employed workers being laid off.

Payment delays unacceptable during Covid-19 outbreak

Industry leaders are calling on construction companies not to delay payments during the Covid-19 pandemic.

According to an open letter from the Construction Leadership Council (CLC), supported by government, some firms were delaying payment or extending credit terms.

In the letter, CLC co-chair Andy Mitchell said: 'Our Construction Industry Task Force colleagues have brought to our attention that there are a number of businesses that have chosen to unilaterally delay payment or extend credit terms.'

He said: 'We do not believe this is acceptable or appropriate – particularly at this time of great stress.'

The CLC said it was increasingly concerned about the management of payment in the supply chain, and the risk that clients and firms will seek to invoke contractual clauses to the detriment of other firms.

Mitchell said: 'Firms should not be threatening to invoke penalty or other contractual clauses when it should be the priority of all clients and firms to sustain the industry.'

CIBSE technical director Hywel Davies said: 'The need to ensure prompt payment and to keep cash flowing through the construction sector at this time is clear to all.

'The letter points out the vital importance of the industry coming together to fight the coronavirus, our real common enemy.'

In a previous letter to the Prime Minister, the CLC highlighted the importance of maintaining cashflow to ensure the financial health of the industry and called on companies to follow the government's example of continuing to pay suppliers until at least the end of June 2020.

New CIBSE President to make online address

The incoming CIBSE President Stuart MacPherson will be addressing members online following the CIBSE AGM on 5 May.

CIBSE members will be able to watch MacPherson give his presidential address at 5.30pm BST, following the CIBSE AGM at 5pm.

The presidential address will be available as a recording after the event at **www.cibse.org/agm**

MacPherson succeeds Lynne Jack, the first female President in CIBSE's history.

Stuart MacPherson

IN BRIEF

Bursary winner designing for gender equality

The winner of the CIBSE Ken Dale Travel Bursary 2019, Raphael Amajuoyi, used his bursary funding to conduct a study into thermal comfort differences experienced by men and women in offices in London, Doha, San Francisco and Rio de Janeiro. Read the full report at **www.cibse.org/kendale** or watch a summary of the study findings in this short video.

Amajuoyi said: 'The Ken Dale Travel Bursary has been a great experience all around. It has given me the opportunity to explore a research topic, provide detailed analysis of my case studies and report findings to an unlimited audience through CIBSE.'

Applications for the 2020 award have now closed, with the winner expected to complete their research project once it is safe to do so.

CIBSE Membership Survey 2020

All CIBSE members will be invited to take part in our biannual membership survey this month. CIBSE will be seeking your opinion on everything from the value of member benefits to future areas of priority for the Institution. Keep an eye on your email inbox for your chance to inform CIBSE's work over the next two years.

Membership application help

The CIBSE Membership team is ready to support members and applicants in any way it can through the Covid-19 pandemic. From hosting regular webinars on the application process for the Associate (ACIBSE) and Member (MCIBSE) grades at **www.cibse.org/webinars**, to providing one-to-one advice over the phone.

Membership Webinar topics include starting an Engineering Practice Report and ANZ CIBSE membership and professional registration.

For advice or information on achieving membership and registration this year, please call 020 8772 3650 or email **membership@cibse.org**

Message from Stephen Matthews, CIBSE CEO

How CIBSE is supporting members during the Covid-19 outbreak

At this unprecedented time, we are all coming to terms with new working arrangements, routines and ways of conducting business. Inevitably, this 'new normal' is bringing a new package of challenges to our working lives. Like everyone, we at CIBSE are finding our feet with these arrangements and thinking hard about how we can support our staff and members.

First, we are working to ensure staff are connected and supported, and able to fulfil their roles by using Office 365, Teams and our IT system. This is through weekly all-staff meetings, frequent briefings, and team support. We are doing everything we can to ensure CIBSE continues, as much as possible, as business as usual, while reminding staff that their first responsibility is for their own health and welfare.


Stephen Matthews

Second, we want all our members to know we are here to support them. Despite having to cancel meetings and events, we are trying to carry on, finding ways to do this remotely. Our membership department has been working hard to support regions and groups to plan and meet virtually.

Our training team is increasing our online offering, and the introduction of our weekly webinar series will help support your learning needs. This will bring you manageable learning on subjects ranging from the CIBSE climate change action plan, circadian lighting, and heat pumps. Not forgetting our well-established range of webinars and CPDs, available on the *CIBSE Journal* website. All previous webinars are available on demand and there are now 160 CPD modules available to test your learning and help you keep your CPD up to date.

Clearly, these are exceptional times, and we must rise to the new challenges and uncertainties. One thing that I am sure of, is that you all – CIBSE staff and members – have the collective resources to make a difference, and we should take the opportunity to embrace new ways of working, learning and connecting with each other. I am positive that CIBSE and our profession will emerge stronger from this national emergency.

I want to thank you all for your continued contribution, and to let you know my virtual door is always open. Keep safe and strong.

CIBSE ANZ welcomes new chair

CIBSE Australia and New Zealand region has welcomed Mark Crawford as its new chair. Auckland-based Crawford, who is the immediate past-chair of CIBSE Auckland, takes over the role from Paul Angus, who held the post for three years.

Crawford has been involved in the commissioning of buildings in the UK, New Zealand and around the world for more than 28 years. His professional highlights include working on Waterloo International Terminal, the British Library, and the first Greenstar five-star rated buildings in New Zealand.


Mark Crawford

Crawford represents the first New Zealand-based ANZ chair, and will be supported by Sydney-based vice-chair Phil Senn, who makes up the second part of the new ANZ Trans-Tasman leadership team.

He said: 'The spectrum of services that fall under the umbrella of building services is vast, with numerous exciting opportunities. Building services engineers make a difference to virtually everyone's life in some way or other, often without acknowledgement.

'Engineers tend to be modest, but passionate, folk. We all need to channel our energies into our industry. As individuals, we can make a difference. As an organisation we can change lives.'

2018 CIBSE Graduate of the Year Reanna Taylor started her career as an apprentice at NG Bailey

CIBSE launches new Apprentice Award

Prize marks 25th anniversary of the Young Engineers Awards

A new award recognising the contribution of apprentices has been launched by CIBSE. The Apprentice of the Year accolade will form part of the Young Engineers Awards, joining the Employer of the Year and CIBSE ASHRAE Graduate of the Year awards.

Launched to coincide with the 25th year of the Young Engineers Awards, the award will recognise more of CIBSE's early career contributors.

CIBSE President Lynne Jack said: 'It is this new talent that gives us hope of finding innovative solutions to the climate crisis and of having a significant impact on building performance.'

The award is open to apprentices registered on Standards/Frameworks at level 3 and above in building services engineering and related occupations, who started before 1 January 2020. Entrants must submit a three-minute video of themselves talking about 'Why the role of a building services engineer is so important'.

The Employer Award has categories for small, medium and large employers, and an overall winner. The judges will be looking for those who help young engineers to flourish.

The CIBSE ASHRAE Group Graduate Award is for young building services engineers, who must give a presentation on a given topic to a panel of judges. The winner will enjoy a fully paid trip to the ASHRAE Winter Meeting in Chicago, Illinois, in January 2021. The awards are also supported by the Manly Trust.

The awards are delivered in partnership with CIBSE Patrons, and sponsored by Kingspan Industrial Insulation, Baxi and Ideal Commercial Boilers and Swegon Air Management.

- Entries must be received by 3 August 2020
- Full details at **www.cibse.org/yea**

Coronavirus advice and guidance

CIBSE has created a coronavirus (Covid-19) hub for members and staff, containing all the latest guidance, information and press releases relating to the pandemic.

The hub currently includes information about the virus and HVAC systems, a CIBSE statement on academic accreditation and interruption to programme delivery, and press releases calling for engineering support. An information note from the CIBSE Healthcare Group has links to guidance from the government, NHS and the European Federation of Heating and Ventilation Engineers, of which CIBSE is a member.

We also provide details of the construction industry response to the current restrictions and links to further information on business support for the sector. Visit **www.cibse.org/coronavirus**

Please note that, because the pandemic is a rapidly developing situation, the government and NHS websites should also be consulted for any changes.

#WeAreCIBSE – we are delivering excellence in the built environment

CIBSE is encouraging our community to come together to share news on how we have supported society through building services during the pandemic.

We want to hear what resources you have found invaluable, how you may have contributed to the fight against Covid-19.

Using the **#WeAreCIBSE** hashtag across LinkedIn, Twitter and Instagram, please share your experiences.

The CIBSE Energy Performance Group has written a new blog post about how it is using virtual meetings to promote inclusivity. See **www.cibseblog.co.uk**

CIBSE past-president Leeper dies


Donald Leeper

CIBSE is saddened to announce that Donald Leeper, CIBSE President 2005-6, died in April, a victim of Covid-19. His career and service to CIBSE, BSRIA, the CIC and REHVA spanned half a century.

Donald served on the CIBSE Council and Executive Committee in the 1990s and 2000s, and as a vice-president from 1999-2000. He was instrumental, with Graham Manly, in the governance review that created the Board of Trustees. During his presidency, CEO Stephen Matthews was appointed, and he was instrumental in creating YEN.

Donald had a passion for research and served as a member of the editorial panel of *Building Services Journal*. He served BSRIA for many years on various committees and as chair in 1994-5. He was a key contributor to the creation of BSRIA in March 2000.

Donald went to Walpole County Grammar School, and graduated in maths from Imperial College. Following a graduate apprenticeship in mechanical engineering with the English Electric Company, he returned to Imperial as a post-graduate engineer, taking business studies at LSE.

He joined Zisman Bowyer & Partners in 1966, studying building services at the National College. He became a partner with Leslie Zisman in 1973, and supervised the design and installation of engineering services for a number of major buildings, becoming senior partner in 1980.

In 2004, the firm won the CIBSE major project of the year for the new Meteorological Office in Exeter.

He had a very strong ethical approach, and a key theme as CIBSE President was 'trust and money', reflecting continuing concerns with payment practice in the industry. In 'retirement', Donald became involved in REHVA, serving on its board as a vice-president, seeking to promote the engineering profession in a wider European context.

We need a plan

As the first wave of the pandemic subsides, our economy still needs serious support. Hywel Davies considers how we might now meet future demands

Recent weeks have been quite extraordinary. Virtually all economic and social activity not supporting the front line of patient care or maintaining essential services and support for the vulnerable has been confined to our homes or stopped.

In our sector, those that still have work to do have done it at home. But the daily routine of building and refurbishment has largely stopped, along with its supply chains. Cash flow has been severely constrained and workflows drastically restricted. As we begin to contemplate the reopening of sites and projects using revised, leaner working practices and as the supply chain restarts, we must plan ahead, too.

Re-establishing a regular business routine is important, but will take time. And pressing issues that have been pushed out of mind cannot be ignored or forgotten.

The impact of the pandemic has largely removed climate change and carbon emissions from the daily headlines but, as the outbreak comes under greater control, the challenge of climate change remains. Ambitious targets to reduce emissions over the next 30 years still apply in the UK and globally. They have not changed. But the time and resources we have to meet them now are reduced.

Just three months ago, we followed hourly not the latest statistics for Covid-19, but river levels across England and the Welsh Marches. The urgency of further investment in flood defences and mitigation measures to protect homes and businesses has not subsided.

Before Covid-19 swept all before it, there was a growing consensus over air quality in our cities and buildings. Levels of pollution have declined temporarily, but will climb again as swiftly as traffic levels. The crisis has driven business online and cut travel radically as we all use online meeting tools. Will we reassess work and travel habits afterwards with equal radicalism? Most of us do not want to go 'back to normal', but do we know what the new normal will look like?

The lockdown shows how much behaviour change can help to cut carbon emissions and improve air quality, albeit at huge cost. What are the longer-term opportunities for engineering innovation that will enable us to control emissions and improve air quality?

"What are the longer-term opportunities engineering innovations that will enable us to control emissions and improve air quality?"

While the Grenfell Inquiry is suspended as a result of Covid-19, building safety reform remains urgent. There is still considerable work to do both to remediate inappropriately clad buildings and to deliver the wider sectoral reform to which government has committed.

The response of some construction businesses to the lockdown shows the scale of challenge to achieve this. That industry leaders had publicly to call for reasonable behaviour shows the level, scale and difficulty of cultural change truly demanded by the Hackitt Review.

We will emerge from the current restrictions with businesses seriously weakened, reduced demand for engineering services and an engineering workforce with insufficient work. It makes no long-term sense to leave them underemployed. In the 1930s Depression, the New Deal in the USA was a massive programme of publicly funded works to deliver employment and much-needed infrastructure.

Some will doubtless argue that, in the wake of Covid-19, all these targets are unachievable, unaffordable and unrealistic. But we must hold our nerve and, taking the mantra of the current crisis, we must follow science and engineering principles.

We must resume work to tackle the challenges of climate change, flooding and water management, air quality and building safety. If Covid-19 has reduced workloads, we should seize the opportunity to refocus them on these priorities. We need a clear plan to reduce carbon emissions from the built environment. This needs engineering input – ideally publicly funded. We must re-engineer how we safely build healthy zero carbon buildings in the future.

We must recognise some very simple numbers. More than 80% of UK buildings in 2050 are already built, at – or below – 2013 standards. To get anywhere near a zero carbon target we must refurbish them, too.

Giving ourselves Sundays off, we have about 9,000 days. At 27 million homes, that is 3,000 homes a day from now to 2050. Or four times the pre-virus new homes output. We need a zero carbon recovery plan.

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

Listen to Hywel Davies on *CIBSE Journal*'s Covid-19 podcast at **bit.ly/CJMay20HD**

A green recovery

How can we ensure a renewed focus on climate change and other environmental issues after Covid-19, asks CIBSE's **Julie Godefroy**

When the Covid-19 pandemic is finally bought under control, budgets will be stretched, people will be concerned about their livelihoods, and government may be tempted by short-term action and lower standards as a route to economic recovery. We must argue for a green recovery: prioritise economic policies and incentives aligned with climate and environmental goals.

"We will need new ways to value projects to take better account of their environmental and social impacts"

Biodiversity and the climate are still an emergency, and linked to global health

The spread of infectious diseases has long been listed among the global – and UK – health risks from climate change. The recent pandemic is highlighting that:

- The risk of virus transmission from animals to humans increases with degradation of habitats, to which the construction industry contributes through its huge demand for resources
- Air pollution increases respiratory conditions and, therefore, people's vulnerability to coronavirus. Evidence also suggests pollution increases air transmission; virus particles attach themselves to particulate matters, so stay airborne and travel further instead of settling onto surfaces, where they, typically, have a shorter life.

The lockdowns have also accentuated the value of measures with health, wellbeing and environmental benefits in normal situations: urban planning – which allows air circulation and lets sunlight into buildings – and access to outdoor green space close to homes.

What could form part of a green recovery?

A large-scale programme of deep, low carbon retrofit. As the Committee on Climate Change stated in 2019, 'retrofit of the 29 million existing homes across the UK should now be a national infrastructure priority'. It is essential to meet our climate goals, and will contribute significantly to job creation and UK export opportunities. This will require huge development in supply chains to achieve quality and carbon outcomes. We may now have a unique opportunity to start this – for example, with staff who are furloughed, unemployed or at risk of becoming so.

A green recovery doesn't have to cost more

Dealing with climate change later will cost more, so short-term costs should not be a barrier. We will need new ways to value projects to take better account of their environmental and social impacts. For example, new asset-valuation approaches, and planning appraisals that consider outcomes such as resilience and long-term health savings.

We should work with the insurance sector to incorporate not only a building's exposure to climate change – such as flooding risks – but also its contribution to it, to reflect that high-carbon buildings may become stranded assets.

In the shorter term, there are ways to minimise the costs of carbon reduction. CIBSE is exploring several ideas:

- Demonstrating zero carbon at no/low additional costs: with other organisations, CIBSE aims to publicise case studies, including measured building performance and capital costs – starting with the CIBSE awards shortlists and Leti archetypes
- Rethinking the policy and incentive framework: CIBSE will create a list of existing policies and financial incentives that are counterproductive to climate goals, and that should be reshaped or removed.

Get in touch if you would like to contribute or have other suggestions.

What we can take from the pandemic

The pandemic is short-lived compared to the climate-change timeline. It also has a sense of immediacy, making usually unacceptable things acceptable. Moreover, it is associated with hardship for a huge number of people; lockdowns have temporary benefits – such as reducing air pollution and carbon emissions – but they don't represent the scenarios we want to build to convince politicians and the public of the need for action.

The current crisis has useful messages:

- We must be guided by the science and apply prevention measures; late action and cure will cost more. We also need to be more resilient, with more preparation and planning, and buffers in the system
- Our habits and behaviours can change. Examples include: rapid industry adaptation and innovation to respond to urgent healthcare needs; fast-tracked national and global processes for medical research and approvals; and community-led action to support neighbours, the vulnerable and the NHS.

This must be encouraging and allow us to be ambitious.

DR JULIE GODEFROY
is technical manager at CIBSE

RAPID RESPONSE

When ExCeL was chosen as the site for an NHS Nightingale Hospital, the project team had nine days to build a 4,000-bed critical care facility ahead of the expected surge in Covid-19 cases. **Andy Pearson** talks to the key engineers

'It was 6.15pm on Friday 20 March when the phone rang,' recalls Stephen Cowlin, a director of building services consultancy The Richard Stephens Partnership (The RSP). 'It was Ahmed Hassan, head of estates at Royal Free Hospital.' He told The RSP to be at the ExCeL exhibition centre in London's Docklands at 8am the following morning for a briefing with the NHS and the military.

On Saturday, Andrew Panniker, managing director of RFL Property Services explained that the NHS wanted to turn ExCeL into a 4,000-bed Covid-19 surge hospital. The army told Cowlin to treat it as a field hospital that has to be built quickly in response to an immediate need.

'We normally start our design with the Health Technical Memoranda [HTM] and design down from this, with each derogation signed off,' says Cowlin. 'The army's advice was to start with what it had and to work up from that to maximise what can be achieved in the timeframe available.'

The next day, The RSP heard that work was starting on site the following day and that the first 500 beds needed to be ready in seven days' time.

Cowlin says The RSP was asked to get involved because it had previously worked with the Royal Free London, which was initially in charge of getting NHS Nightingale London up and running. When Cowlin, a mechanical engineer, and fellow director Gerry Connor, an electrical engineer, turned up on site on Monday, they met James Hepburn, BDP principal, and his architect director colleague Paul Johnson, along with a small team of experienced healthcare architects and engineers.

BDP's involvement followed a paper it had put together the week before, outlining the potential for convention centres to offer temporary facilities in which to treat coronavirus patients.

BDP's architects had carried out space planning exercises, and concluded that the only facility big enough in London was the ExCeL centre.

'On that first Monday, the brief was: we need 4,000 intensive care unit (ICU) beds all with oxygen, medical air and power,' says Hepburn. NHS England also produced a guidance document for intubated patients [where a tube is fed through the mouth into the trachea], which set out what services each bed bay needed and the size of the bays.

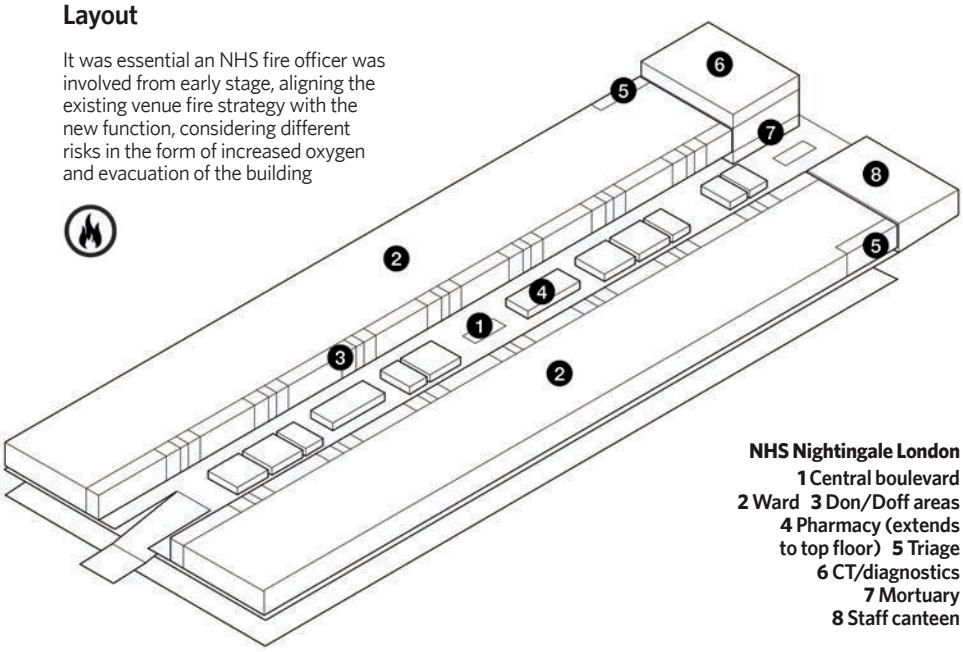
ExCeL comprises almost 90,000m^2 of column-free space, divided into two 500m-long, 86m-wide halls located north and south of a 600m-long central boulevard. The deadline meant the Nightingale project had to use as much existing infrastructure as possible, which included the ventilation system.

When ExCeL is operating as an exhibition venue, giant 25m^{3}s^{-1} air handling units (AHUs) suspended from the roof provide heating, cooling and fresh air to the halls through high-level ducts fitted with high-velocity jet nozzles. Under normal operation, most of the air is recirculated in the AHUs to conserve energy, with air exhausted through passive vents in the 11m-high roof.

Cowlin says everything to do with the ventilation solution was developed in

Layout

It was essential an NHS fire officer was involved from early stage, aligning the existing venue fire strategy with the new function, considering different risks in the form of increased oxygen and evacuation of the building



NHS Nightingale London
1 Central boulevard
2 Ward **3** Don/Doff areas
4 Pharmacy (extends to top floor) **5** Triage
6 CT/diagnostics
7 Mortuary
8 Staff canteen

The same system used to build stands at the FutureBuild conference in March were used to build the hospital bays

discussion with infection control specialists. His solution was to turn the halls' existing AHUs into full fresh units, to supply a total of 300m^{3}s^{-1} fresh air to each hall. Each AHU's recirculation damper was physically blanked off and the roof exhaust vents were locked in a permanently open position. Some of the AHUs also supply the boulevard, so this solution ensures temperature and ventilation can be maintained in this space, too.

The boulevard is classed as a 'clean' space, while the wards are classed as 'dirty'. During an ExCeL exhibition, air would normally spill from the halls through 22 giant shuttered openings into the boulevard. The shuttered openings are now closed and sealed up to a height of 3m (to prevent virus-carrying droplets contaminating the space).

> "The only facility big enough in which to house the 4,000 ICU beds needed to make up the predicted shortfall was the ExCeL centre"

At full capacity, 16,000 staff will move from the clean corridor to the wards through sealed spaces termed Don and Doff rooms. Staff don their PPE in the Don rooms and remove it in the Doff rooms. 'Using a simple arrangement of wall fans and a pressure relief damper, we've ensured the air always moves from the clean corridor to the wards,' explains Cowlin.

Cowlin says because the AHUs are only supplying air to the halls, with no extract, he had to ensure the halls are not pressurised relative to the clean corridor so air is exhausted passively through the roof vents and it is 'encouraged' to leak out through openings in the external wall, where the dirty corridor is located along with the loading bays.

He says Infection Prevention Control (IPC) was not worried about HEPA filtering the exhaust because by the time the air has reached the external wall, it would not contain any infected droplets.

Cowlin says he was initially concerned that he might have to fit a false ceiling in the halls to achieve the air change rate recommended in the HTM for intensive care units.

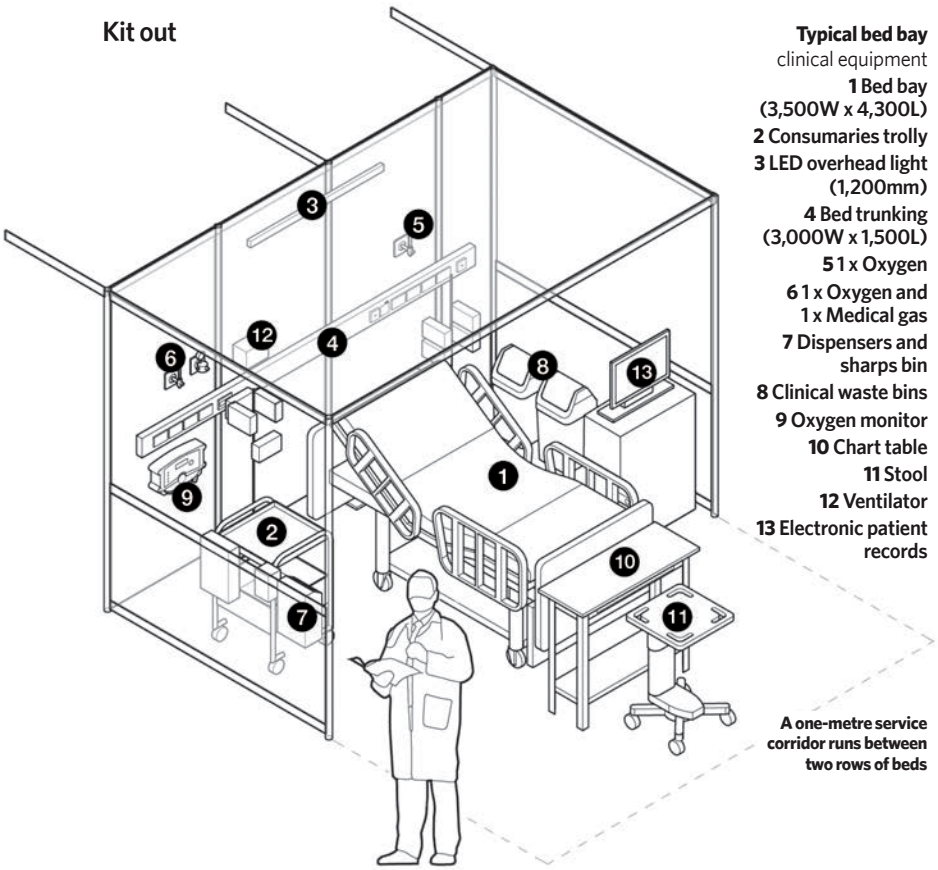
However, because this facility was designed specifically for intubated Covid-19 patients, the air change rate was less critical. 'The advice from IPC was that the virus is droplet-carried rather than airborne and although small droplets can be carried on the air, distances are relatively short so they were not concerned about the need for a high air change rate,' he explains. Fresh air is mostly for staff. 'We did calculations to demonstrate the oxygen enrichment is not needed,' says Cowlin.

Electrical infrastructure

The event halls incorporate an underfloor network of ducts that feed a 5m x 3m grid of floor boxes, most containing data outlets and with the ability to connect to power and water; most boxes also contained a drain.

On day one, BDP's architects set to work developing a bed layout. Working from the east end of the south hall, they positioned the beds in lines of 20 running from the boulevard »

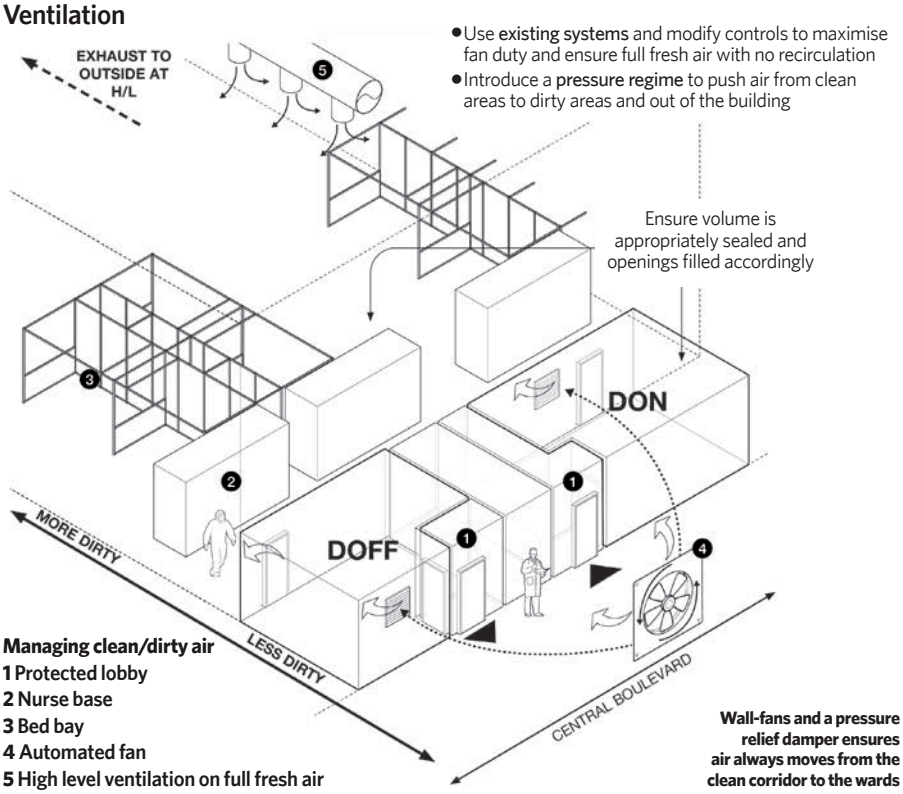
Kit out



Typical bed bay clinical equipment
1 Bed bay (3,500W x 4,300L)
2 Consumaries trolly
3 LED overhead light (1,200mm)
4 Bed trunking (3,000W x 1,500L)
5 1 x Oxygen
6 1 x Oxygen and 1 x Medical gas
7 Dispensers and sharps bin
8 Clinical waste bins
9 Oxygen monitor
10 Chart table
11 Stool
12 Ventilator
13 Electronic patient records

A one-metre service corridor runs between two rows of beds

Ventilation



Managing clean/dirty air
1 Protected lobby
2 Nurse base
3 Bed bay
4 Automated fan
5 High level ventilation on full fresh air

Wall-fans and a pressure relief damper ensures air always moves from the clean corridor to the wards

» to the external wall. The bedheads in one row back onto the bedheads in the adjacent row, and between them is a 1m-wide service corridor positioned above a row of existing floor boxes.

To build the bedheads, ExCeL put BDP in touch with GES, its exhibition stand builder, which uses a component-based system to construct stands. GES demonstrated the system's capability by producing a series of six bays and bedheads. 'The layout worked brilliantly, dictated by the floor box spacing and exhibition kit,' says Hepburn.

Meanwhile, the RSP's Gerry Connor worked with ExCeL to establish how the electrical installation could be quickly repurposed. The north and south halls are each served by five service spines fed by a transformer supplying two 800A and one 400A busbars. The busbars run north-south beneath the hall floor linking the floor boxes via trenches running east to west.

During an exhibition, a tap-off box from the respective busbar enables power to be delivered to the stands using modular wiring terminated with commando sockets; the wiring connects through the floor boxes to a fused switch and then to a floor-mounted distribution board fitted with commando-socket outlets.

Connor decided to use the same system. He located the fused switches and distribution boards in the service corridor between bedheads. Sections of bedhead trunking were assembled on site by the electrical contractor using standard antibacterial dado trunking fitted with outlets for the medical gases and eight double-electrical sockets, nurse-call and a light switch for the bed light.

To enhance resilience, the bedhead was configured so that four of the electrical sockets are fed from one circuit, four from another. 'We reused all of the exhibition kit for speed and flexibility,' Connor says.

The bedheads were estimated to have a 7A load, which will be a significant electrical demand if all 4,000 beds are in use. But, because it was unclear what equipment was to be connected to bedheads it was decided that significant additional electrical loads come with their own power supply, such as mortuary fridges and CT scanners.

Connor also had to enhance the electrical system's resilience. There was an existing life-safety system at ExCeL, but only supplying escape lighting and security. Fortunately, there were two high voltage (HV) supplies. Switching from one to the other takes time because the HV ring needed to be de-energised and then re-energised, so additional resilience had to be added.

'We had to put in a 600kW battery UPS and a 1600kVA generator to support what we called the essential busbar on each of the risers,' says Connor. In total, 7.2MW of UPS and 19.2MW of generator provision will be

The two 500m-long exhibition halls were converted into 80 wards each containing 42 beds

provided to supply the bedheads. The UPS is sized to provide back-up for 30 minutes.

While this was going on a team from D&L Medical, led by Les Hood, was designing the medical gas system to supply the 4,000 beds (see box 'Medical gas').

'There was massive pressure to finalise the services design because all the services all had to be up and out of the floor boxes before they could lay the vinyl floor,' explains Hepburn. BDP put together a series of 'dot drawings' to show: the floor boxes where the ExCeL team had to pull in a water supply and make a drainage connection; which boxes had a UPS-backed electrical connection, oxygen and medical air; and which boxes had a general electrical supply (not UPS-backed).

Hepburn says once installation work started it was 'like an unstoppable juggernaut marching across the floors'. To keep it moving everyone was working 16-hour days.

Hoare Lea was brought on board to witness the designs independently and to take charge of commissioning the installation. It was responsible for the derogation schedule, which lists the reasons why a particular system has not been installed in line with the HTM.

Each derogation is signed off by the authorising engineer for every discipline and by the infection control expert.

NHS Nightingale London opened on 3 April and the first patients to leave were discharged just over two weeks later. After the first few patients were admitted, Cowlin says the temperature in the hall was reduced. Similarly the air change rate has been reduced so that it is just under two per hour. CJ

MEDICAL GAS

D&L Medical developed a solution based on installing a new 108mm diameter oxygen main and a 54mm diameter 4bar medical air main at high level in the car park beneath the halls. Connections from the main feed up through the floor boxes. 'Because we were trying to get this facility open in a week we needed more than 2,500m of 108mm diameter braised-jointed, degreased copper pipe installed along with 5,000m of flexible pipework to make the final bedhead connections,' says Hepburn.

Oxygen is supplied from three new vacuum-insulated evaporator vessels that were being installed adjacent to the venue. The medical air system was to connect to four new triplex compressors.

Stepping up to the plate

The crisis has given us a chance to show how brilliantly we can perform under pressure. Most have risen to the challenge... some have not, says CIBSE Patrons chair **Nick Mead**

The astonishing speed with which the 4,000-bed NHS Nightingale Hospital at the ExCeL centre in London, and others across the country, were completed is an inspiration to us all.

These projects show just what our industry can do. The exemplary collaboration needed to put together such complex and vital facilities in such a short period of time must be a model for us all to aspire to once the current crisis is over.

Building services professionals were part of large, highly dynamic teams that included members of the armed forces, which helped to deliver the first stage of work at the ExCeL in just 10 days. The conversion of one of the NEC halls took just two weeks and was helped along by 60 Gurkhas.

Across the UK, our companies are working flat out to support the NHS, food suppliers, care homes and other essential services, showing how it is possible to harness military-style precision planning to engineering excellence and quickly put complex supply chains together.

However, not everyone has enjoyed the same harmonious atmosphere of co-operation and collaboration. Some supply chains are seeing payments arbitrarily delayed and threats of legal and financial penalties have been issued to contractors reluctant to work because of legitimate site safety concerns.

This prompted the Construction Leadership Council to issue an open letter urging everyone to behave responsibly. Co-chair Andy Mitchell said it was not 'acceptable or appropriate' for companies to unilaterally delay payment 'particularly at this time of great stress'.

It is a great shame that the CLC should feel the need to write such a letter and it should be emphasised that most firms have demonstrated that they understand the importance of working together and supporting their supply chains. However, there is no doubt that some have behaved unscrupulously.

Their actions will be remembered when this immediate crisis is over and we return to the urgent process of delivering procurement and building safety reforms. That is also when we can consign those firms and that kind of behaviour to the past.

We have shown our ability and willingness to collaborate and to work quicker and smarter. Let us build on that and use it as a template for the new construction 'culture' we all want to see.

- For more information about CIBSE Patrons, email Chris Brown at **cbrown@cibse.org**

MAINTAINING BUILDINGS IN LOCKDOWN

Buildings left empty by the lockdown must be properly maintained to avoid risks such as legionella, corrosion and mould. **Liza Young** reports

On 23 March, Boris Johnson announced that the UK would be put into lockdown in an attempt to slow the spread of the coronavirus.

Thousands of buildings were left unoccupied as people were told to work from home, and shops, hotels and restaurants were forced to close. Also mothballed were schools, which had closed to most pupils the previous Friday.

These buildings may be shut now, but they will need to be in a fit state to be occupied when the lockdown is lifted. There are a number of threats to HVAC systems in unoccupied buildings, and without appropriate maintenance regimes, issues such as legionella, corrosion and mould are at risk of occurring.

For building managers, there is plenty of guidance to turn to from organisations including CIBSE, BESA, and BSRIA. 'Guidance, such as CIBSE Guide M, can assist with creating – or adapting existing – maintenance strategies,' says Geoff Prudence, CIBSE Facilities Management (FM) Group chair.

'Tasks should be prioritised using the building operational risk management methodology,' he says, adding that health, safety and welfare considerations should complement statutory requirements, including water hygiene, legionella prevention and testing, and security.

Building owners and operators will need to comply with the Health and Safety at Work Act, and have a legionella risk assessment in place, says Jonathan Gaunt, Society of Public Health Engineers (SoPHE) chair, and associate director at Cundall.

The Health and Safety Executive's *Legionnaires' disease Part 2: The control of legionella bacteria in hot and cold water systems (HSG274 Part 2)*, which should be read in conjunction with the *Approved Code of Practice (ACoP) L8*, states that 'all parts of the system – including storage tanks, water heaters, pipework and components and associated equipment containing water – should be designed to avoid water stagnation by ensuring flow through all parts of the system'.

It also states that infrequently used equipment within a water system should be included on a flushing regime, and outlets on the hot- and cold-water systems should be used at least once a week.

'To manage the risk during non-occupancy, the building owner or manager needs to consider implementing a suitable flushing regime, or other measures such as draining

the system and re-chlorinating prior to reoccupation, if dwellings are to remain vacant for extended periods,' says Gaunt.

'Flushing the system will ensure water is drawn from where it enters the building to the most remote points on each floor, so the slug of water within each main distribution pipe is pulled through the whole system, and fresh water is introduced. All branch pipes should also be regularly exercised to avoid stagnation.'

If the shutdown period is limited to two to three months, as is anticipated with the Covid-19 crisis, Andy Green, technical director at Baxi Heating, advises leaving wet heating systems in operation at a reduced temperature of 14°C. 'This will help keep energy bills down while protecting the building fabric [from damp], and the heating system,' he says.

Green says isolating the heating system and draining it down to save energy costs is a false economy. 'It could introduce air into the system, leading to corrosion within the pipework, not to mention the cost of flushing and re-dosing with suitable inhibitors prior to reinstatement.'

If systems had to be drained, Green says the water would need to be sampled for microbiological growth, and may require chlorination to remove legionella when the system is brought back into operation. The outlets and pipes would need to be flushed through and operational checks carried out (see panel 'Maintenance and reactivation').

'This process is longer and more costly to bring the building back up to full operation, so is inadvisable if the period of shutdown is limited to a few months,' says Green.

If hot-water systems are left full of water with no circulation, there is a greater risk of microbial contamination, says Green. 'This can result in deposits clogging the system and causing corrosion, which will reduce efficiency and could, ultimately, require a system replacement.'

> "If hot-water systems are left full of water with no circulation, there is a greater risk of microbial contamination"

Construction sites

Freddie Valletta, lead engineer at heat network consultant FairHeat, has been issuing advice for developers shutting down construction sites with heat networks.

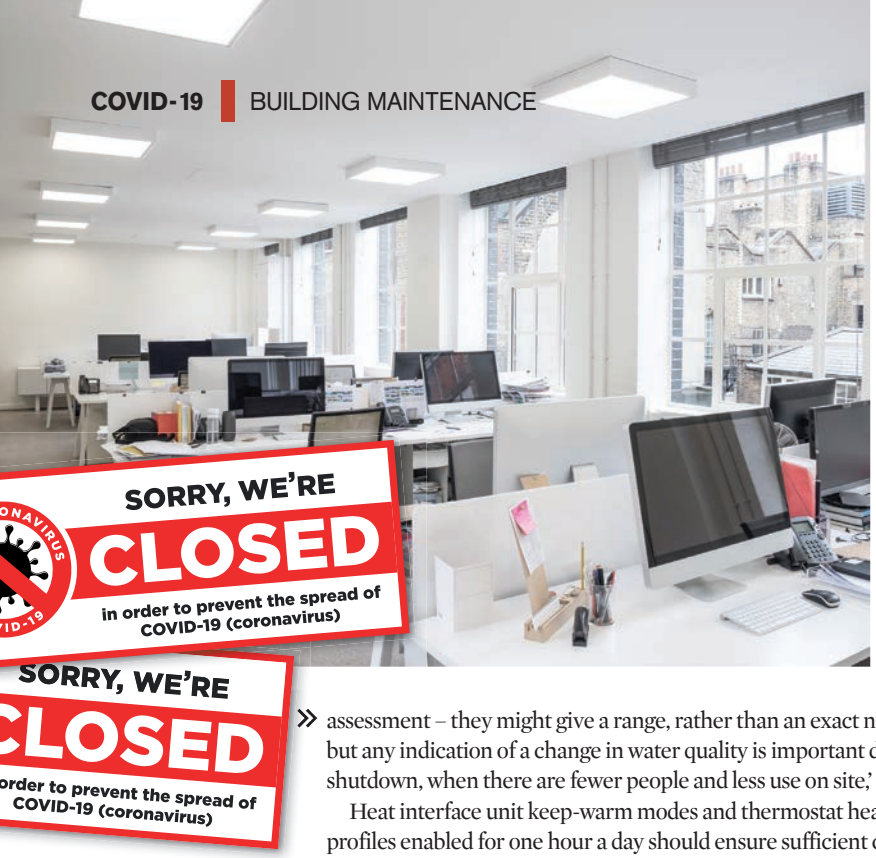
During a shutdown, a circulation plan for low-temperature hot water, boosted cold water and chilled water systems for the whole site – including welfare facilities – is paramount to preserve water quality, says Valletta.

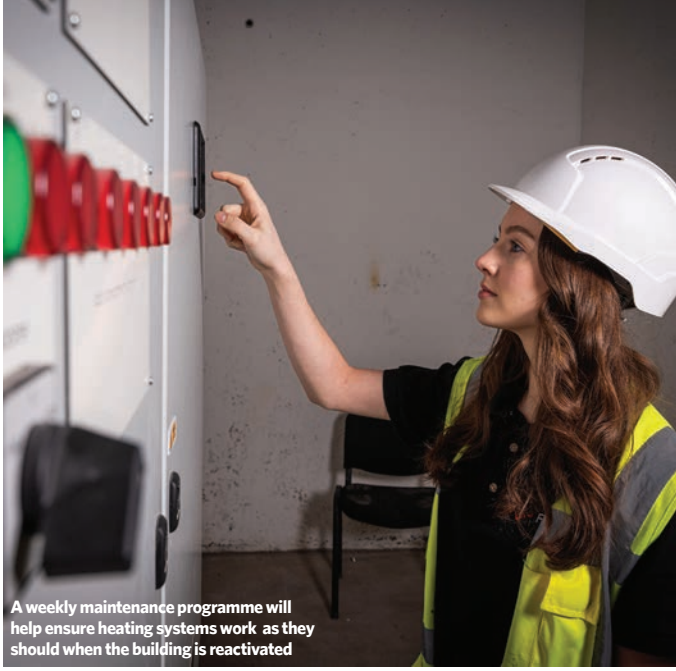
For heat networks, FairHeat recommends inducing circulation for a minimum of one hour per day, as per BSRIA BG50 *Water treatment for closed heating and cooling systems*.

At the same time, water-quality samples should be taken every two weeks in various locations around the network and sent for analysis, as per BSRIA BG29 *Pre-commission cleaning of pipework systems*, so any deterioration in water quality can be picked up as soon as it occurs.

If this is not feasible, onsite test kits can be used, and validation samples taken at the end of the shutdown, to assess system condition, says Valletta. 'The onsite kits won't be as accurate as a laboratory »

To manage the risk of legionella during non-occupancy, a suitable flushing regime or other measures should be considered





A weekly maintenance programme will help ensure heating systems work as they should when the building is reactivated

» assessment – they might give a range, rather than an exact number – but any indication of a change in water quality is important during a shutdown, when there are fewer people and less use on site,' he says.

Heat interface unit keep-warm modes and thermostat heating profiles enabled for one hour a day should ensure sufficient circulation throughout the network and tertiary heating systems, says Valletta.

If this isn't feasible, the furthest rooms on each floor should have hot water enabled at least once a week to ensure network water is circulated to the outermost points. 'The longer the period between circulations, the longer the hot water draws should last for, to ensure suitable circulation is achieved,' he says.

If the electricity supply to the building hasn't been established on a new site, systems may have to be drained, so as much water as possible is removed. When the site commences, the system should undergo filling, pressure testing, cleaning, flushing and, if required, chlorination, as biofilms can develop on wetted pipework exposed to oxygen.

Legionella risk should also be considered in the potable water system, he says, as legionella can develop in stagnant systems. Heat gain from the surroundings can elevate the water temperature and provide a more suitable environment for legionella growth.

To alleviate this, hot and cold taps should, ideally, be run at least once a week to induce flow in the potable water system. 'This can be done in tandem with running the hot water to induce network circulation. If this is not possible, then a legionella risk assessment will need to be carried out post-shutdown, with regards to opening taps to protect those working on site,' he says.

Controls

To help prevent unnecessary energy use, and to reduce overheads during a shutdown or partial closure, it's important to identify areas of non-critical operation and adjust building controls.

Jo Harris, lead author of CIBSE Guide M, advises applying a risk-based approach to maintenance tasks. For example, in unoccupied buildings emergency lighting routines can be risk-assessed, and the three-monthly checks can be postponed and rechecked when reoccupied.

'It's important to protect your maintenance staff too, so the least amount of time they can be in work, the better,' she says.

To protect building fabric while reducing energy, Harris advises maintaining air movement inside buildings, but with reduced air-flowrates from air handling units (AHUs).

'Set them to a building fabric protection setting – not a comfort temperature for occupants – so they are not heating and cooling,' she says. 'It's about keeping buildings ventilated, but not making the chillers or boilers run unnecessarily, because you don't need to comfort cool.'

When occupant numbers are reduced, fewer contaminants would be circulating in the space, so fan coil maintenance in offices could be carried out and then suspended until occupants return, adds Harris. CJ

Key guidance:

- CIBSE Guide M *Maintenance Engineering and Management* – chapters on maintenance strategies and operational risk management procedures
- BESA SFG20 *Planned maintenance* – maintaining statutory/insurance requirements and building security
- BESA SFG20 Core Plus – identifying the tasks required to maintain statutory compliance; the SFG20 Service Model identifies critical and routine tasks
- BESA SFG30 *Mothballing and reactivation* – a step-by-step process for maintaining critical services during low-occupancy periods, including passive fire protection systems; refrigerant gases; electrical and gas service safety checks; ventilation hygiene; systems and lifts
- Health & Safety Executive *Legionnaires' disease Part 2: The control of legionella bacteria in hot and cold water systems* (HSG274 Part 2)
- Water Supply (Water Fittings) Regulations
- BSRIA BG50 *Water treatment for closed heating and cooling systems*
- BSRIA BG29 *Pre-commission cleaning of pipework systems*
- CIBSE Knowledge Series KS21 – guidance on competency and competency management.

MAINTENANCE AND REACTIVATION

Baxi Heating recommends implementing a weekly maintenance programme to ensure heating systems work as they should when buildings are reactivated:

- **Carry out a visual inspection of plant once a week**
- **Allow the domestic hot water to reach pasteurisation temperature (60°C) for one hour once a week to prevent bacteria forming**
- **Keep moving parts, such as pumps, operating for 10 minutes once a week to help prevent seizing. Most control systems will build this into their strategy**
- **24 hours before reactivating the building, bring the hot-water system back up to 60°C; open all the outlets until they reach at least 55°C to ensure all stagnant water is removed; carry out microbiological sampling to ensure there is no contamination of the hot water supply; chlorinate the hot-water system to remove legionella, if needed.**

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Forward thinking

The Institute of Physics' new HQ in London's King's Cross is an appropriate building to realise the organisation's goal of promoting the value of physics to society. Its use of electricity to generate heating and cooling – and limited heat rejection – was ahead of its time. Especially given the likely move away from gas in non-domestic buildings, as legislation catches up with the decarbonisation of the Grid.

Electricity generated by renewables is continuing to drive down the Grid's carbon intensity. But the intermittent nature of renewable sources – as well as the increasing use of heat pumps to heat and cool buildings – could make balancing generation with demand difficult. To combat this, the Green Smart Community Integrated Energy System has been launched in Islington, London (page 42). When complete, the scheme is projected to deliver low carbon heat and power to around 3,500 homes and up to 70 local businesses, through an ambient heat loop that enables the exchange of heating and cooling between buildings on the network.

LIZA YOUNG, DEPUTY EDITOR lyoung@cibsejournal.com

CONTENTS

Driving change and reform

This is the fifth consecutive year that Remeha and Baxi Heating have sponsored *CIBSE Journal*'s Commercial Heating supplement.

Looking back, it's clear that how we heat our buildings has evolved – but the fundamental need to ensure a robust, dependable service is unchanged. Indeed, the Covid-19 crisis has underlined the critical role of heating systems in keeping our hospitals, schools, supermarkets and care homes all functioning safely to protect their occupants and support the nation.

While reliability has assumed increased importance for building owners and occupants, ensuring that the system operates efficiently remains a key requirement to minimise building running costs. Added to this is the wider need to tackle heat energy to meet the UK's 2050 net-zero target.

The past few weeks have shown how admirably the heating and building services industries have risen to recent challenges, resourcefully adapting ways of working, with innovative, rapid solutions to restore heating in essential buildings.

Moving forward, there's the opportunity to drive lasting behavioural change and reform. The uptake of digital technologies has demonstrated that earlier engagement and improved communication across the supply chain is achievable. Better informed, we can put an end to detrimental cost-cutting practices, and establish heating and hot water specification as a binding quality standard (see page 32).

Working collaboratively, with one eye on the present and the other on the future, we can address best practice, continuing to maintain and improve this vital service in UK buildings, and to make positive inroads into our longer-term goal of decarbonising heat.

For more information, visit **www.baxiheating.co.uk**

TOM MURRAY is specification director at Baxi Heating

PROJECT TEAM

Client : Institute of Physics
MEP and structural engineer, façade engineering, geotechnical engineering, acoustics, fire engineering: Aecom
Architect: TateHindle
Contractor: Murphy
Ground source heat pump specialist: GI Energy
Planning consultant: Daniel Watney

A marvel of science

The Institute of Physics' innovative use of ground source heat pumps helped it secure the Commercial/Industrial Project of the Year accolade at the CIBSE Building Performance Awards. Andy Pearson reports

The Institute of Physics (IOP) has an ambition to become a more public-facing organisation, showcasing the impact of physics on the way we live our lives. It's a philosophy the institute was keen to realise with its new £13m headquarters building in the Keystone Crescent conservation area of London's King's Cross.

This five-storey, 1,488m^2 net internal area scheme has been constructed behind a retained brick façade. It features: a basement lecture theatre, exhibition space and plantroom; a ground-floor reception and exhibition area, with workspaces and facilities for local start-up businesses; two intermediate floors of offices; and a top floor of seminar rooms and a council chamber.

The HQ houses education and exhibition facilities for the institute, but its building services feature extensive metering and measurement, so turning the building into a 'living laboratory'.

'We created a higher-spec BMS with multiple monitoring points, over and above what would generally be required to operate the building,' says John Edmondson, associate director of Aecom, the scheme's MEP engineers.

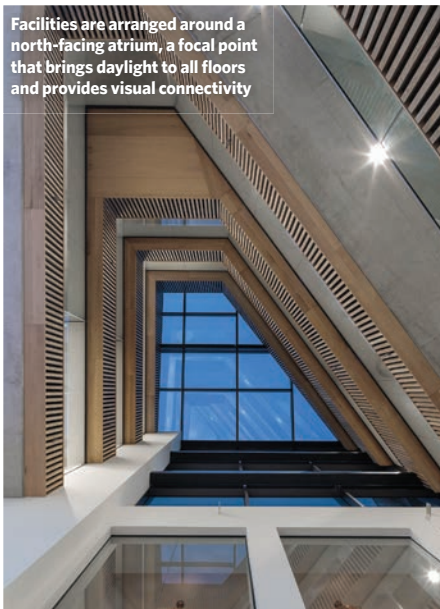
In addition to using the data generated for the day-to-day operation of its headquarters, the IOP is working with partner institutions to enable access to the data for academic study, which will help inform building design and operation for the future. As well as being a living laboratory, the building is a demonstration of sustainable engineering. 'The client wanted it to be highly sustainable and innovative, and to showcase physics and technology in general,' says Edmondson.

Aecom's initial proposals included literally showcasing the engineering, with a glazed plantroom wall opening onto the lecture theatre, with thermochromic

SUCCESSFUL COMMISSIONING

Aecom is working with the design and build contractor, Murphy, and the client to get the seasonal commissioning right to ensure systems are optimised. 'One of the strategies we agreed with the Institute of Physics to help minimise peak heating and cooling loads was to use adaptive comfort control, to enable the internal temperature to swing in a manner similar to that of a naturally-ventilated building,' says Edmondson.

Occupant satisfaction questionnaires were used to garner users' feedback on internal conditions and to track control modifications. 'Initial feedback was important when making adjustments to the set points to achieve a base occupancy comfort aligned with the adaptive comfort standards,' adds Edmondson.



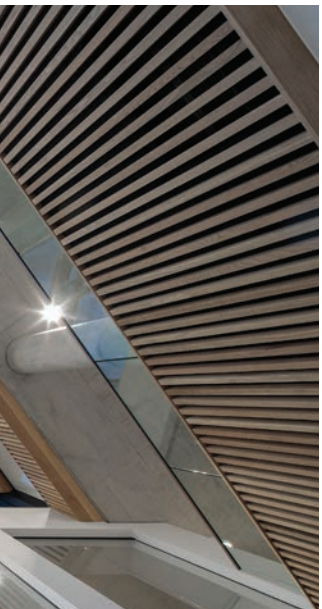
Facilities are arranged around a north-facing atrium, a focal point that brings daylight to all floors and provides visual connectivity

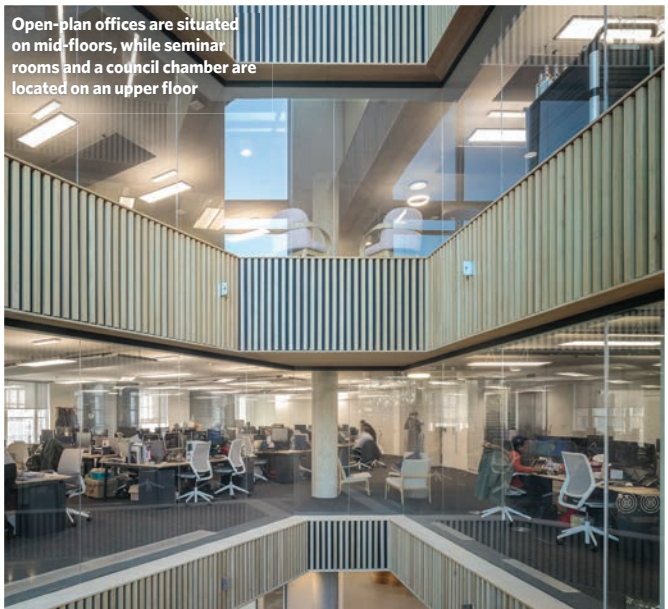
The IOP's headquarters building is a 'living laboratory' for academic research

paint on the pipework and plant. However, cost and acoustic issues meant the proposal would have been prohibitively expensive.

Aecom's actual solution is far more pragmatic. It is based on a mixed-mode ventilation system, exposed thermal mass, adaptive set-point controls and an innovative geothermal pile heating and cooling system using Geokoax ground heat exchangers – the first time the system has been used in the UK.

'The IOP wanted to minimise its impact on local air quality and on the city centre heat island effect, so it opted to use electricity as the main heat-generation medium, rather than onsite combustion. This leant itself to a ground source heat pump-based heating and cooling solution,' explains Edmondson.





Open-plan offices are situated on mid-floors, while seminar rooms and a council chamber are located on an upper floor

The site's location, in a conservation area, prevented a heat-rejection plant from being installed on the roof – although a small PV array was permitted – so all cooling had to be provided by the borehole system. 'It focuses your mind if you know that all you have to provide cooling is a borehole system,' Edmondson adds.

The Geokoax ground heat exchangers are unusual in that their design enables the area of heat exchanger in contact with the ground to be double that of more conventional borehole systems. In a conventional ground source system, a loop of plastic pipe, usually about 32mm in diameter, is threaded down a vertical borehole before being encased in grout to ensure the pipe is in contact with the ground. A heat transfer liquid – usually glycol or brine – is pumped through the pipe to pick up heat from the ground.

By contrast, these heat exchangers are based on a 130mm-diameter, coaxial, pipe-within-a-pipe arrangement, with the smaller return pipe housed within the larger flow pipe. The heat transfer fluid is pumped down the annulus formed between the heat exchanger's larger-diameter outer shell and inner return pipe.

This coaxial arrangement significantly increases the surface area of the heat exchanger in contact with the ground, which is the surface where energy transfer takes place.

To maximise the rate of heat exchange, the probes incorporate helical blades, called turbulators, in the annulus. The turbulators are designed to create turbulence in the heat-transfer fluid, because heat exchange between a fluid in motion and a pipe wall is greater if a liquid is in turbulent – as opposed to laminar – flow. The turbulators, it is claimed, do not significantly increase pumping resistance.

Another advantage of the coaxial heat exchanger design is that the heat exchangers hold around 13 times more fluid than a conventional plastic-pipe-based borehole system. This ensures that, for the same pumped flowrate, the heat-exchange fluid will travel through the annulus at a much lower velocity, increasing the time for heat transfer.

The manufacturer also claims that the increased volume of water boosts the thermal capacity of the system, thereby »

» reducing the number of times the heat pump needs to cycle on and off, improving its performance and lifespan.

The heat exchanger's improved thermal performance enables the depth of borehole required for the IOP's new headquarters to be reduced from 200m (for a conventional thermal pile system) to just 75m, saving on drilling time and cost. 'This was an extremely constrained site in which to drill 10 boreholes, but the system meant the drilling for each borehole could be limited to one day, as opposed to up to the two days it would have taken for a conventional system,' says Edmondson.

The ground source heat pump (GSHP) supplies heating and cooling to the building via underfloor air handling units (AHUs) and perimeter trench heaters.

LIGHTING PHYSICS

In addition to providing a ventilation path, the atrium allows daylight to flood the floor plates to help minimise the need for artificial lighting. 'It's a huge north light that allows daylight to flood the building,' says Edmondson. The lighting system includes addressable and dimmable controls, and the lighting was modelled using dynamic analysis to ensure optimum illumination with minimum luminaires. The controls ensure light levels are lowered when spaces are unoccupied, to help save energy.

The atrium design minimises the need for artificial lighting

In spring and autumn, the building has been designed to maintain comfort conditions using fresh air alone when conditions allow, with what Edmondson describes as an 'oversized' ventilation system to maximise free cooling during the shoulder seasons.

Outside air is drawn into the building through rooftop intake chimneys, where it is less polluted. The chimneys catch the wind and use positive pressure to drive the air down large vertical ducts, which have been integrated into architect TateHindle's design.

The fresh air is distributed on each floor via an underfloor plenum. This houses a mini AHU incorporating a fan and heating and cooling coils. The AHU is supplemented by a perimeter trench heating and cooling system, designed to deal with heat gains and losses at the façade.

Air rises and exits the floors into a full-height atrium, where buoyancy will cause it to rise. An AHU on the roof pulls the vitiated air from the building. A run-around coil removes useful heat and coolth, and uses it to temper the fresh air at the intakes. »

Cost prevented the plantroom from opening on to the lecture theatre

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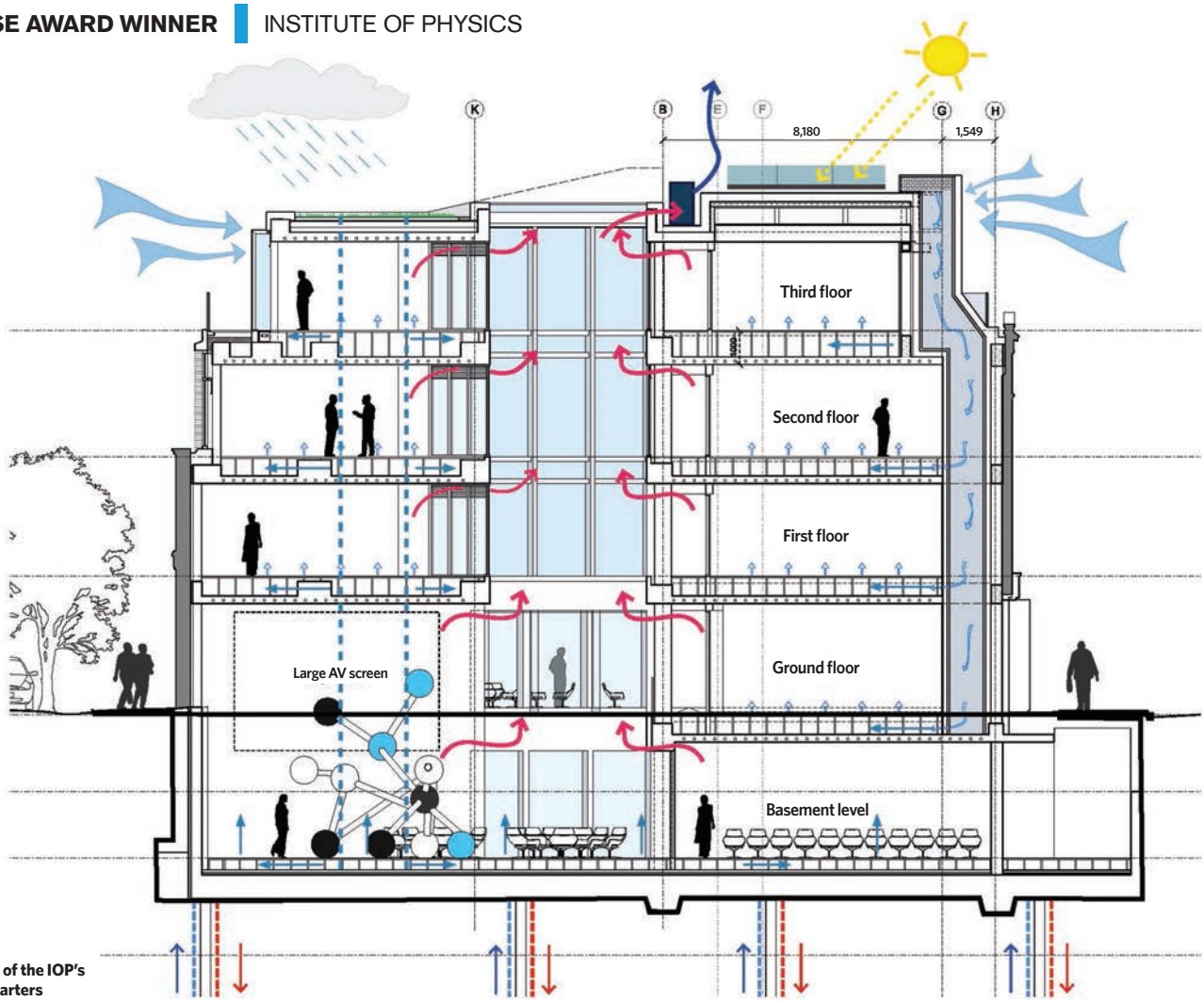


Section of the IOP's headquarters

Aecom used dynamic thermal modelling to determine how much free cooling was available from the ventilation system. 'We increase the volume of fresh air drawn into the building until it reaches the point where it is more energy efficient to turn down the fans and to use cooling coils,' explains Edmondson.

In summer, the GSHP supplies chilled water to the AHUs and perimeter coils at a flow temperature of between 9°C and 14°C, with a return temperature of 17°C. Fresh air rates are minimised in summer and winter based on CO_2 levels. In addition, the building's reinforced concrete superstructure has been left exposed on the soffit of each floor to add thermal mass to the spaces and help mitigate peak summer temperatures.

In winter, the GSHP is the primary source of heat for the building. It supplies heat at 40°C flow (30°C return) to the underfloor AHUs and perimeter heaters. Gas-fired boilers (80°C flow/60°C return) provide top-up heat for cold mornings and heating back-up should the heat pump fail, in addition to heating the domestic hot water.

The geothermal system appears to be working well. Summary data for the first year's operation show the system has an annualised combined coefficient of performance (COP) of 3.4, although this figure is expected to improve over time as systems are optimised. (See panel, 'Successful commissioning' on page 24.)

> "Use of electricity to generate heating and cooling is prescient given the likely move away from gas for heating non-domestic buildings in forthcoming regulation changes"

The strategy of no combustion and limited heat rejection makes this building years ahead of its time. Its use of electricity to generate heating and cooling is prescient, given the likely move away from gas as fuel for heating for non-domestic buildings in forthcoming changes to the Building Regulations.

At the time the project was designed, the carbon factor for electricity was $0.519 kgCO_2 \cdot kWh^{-1}$ in both the London Plan and in the Building Regulations. Now, however, legislation is catching up with decarbonisation of the electricity grid. The carbon factor of grid electricity has recently been lowered in the London Plan to $0.233 kgCO_2 \cdot kWh^{-1}$, to reflect the increased contribution made by renewables – so, on paper, the Institute of Physics' headquarters would appear to perform significantly better now, in terms of carbon emissions, than it did at the time of its design.

It is precisely because the building services design is ahead of its time that this is an appropriate headquarters for an organisation with a mission to showcase the value of physics to society. It is also what made the scheme a worthy winner of Commercial/Industrial Project of the Year at the CIBSE Building Performance Awards. **CJ**

Networks launch green gas grid project

UK network operators are aiming to deliver the world's first 'zero-carbon gas grid' capable of supporting a national rollout of hydrogen-ready boilers.

The 'Gas Goes Green' initiative, led by the Energy Networks Association (ENA) and launched last month, is a collaboration between Cadent, Northern Gas Networks, and National Grid and will form part of the government's strategy for decarbonising heating in buildings.

Former Cadent CEO Chris Train is heading up the project and has been dubbed the UK's first 'Green Gas Champion'. The project will also look at ways of speeding up the use of biomethane as well as hydrogen in the grid.

The initiative said the network would offer a cost-effective foundation for decarbonising heat because 23 million properties and 85% of Britain's homes are connected to the gas grid. It would also be a cheaper solution for consumers than other potential methods of decarbonising heat, the companies argue.

Danfoss offers heat network solution

Heating manufacturer Danfoss is offering bespoke end-to-end solutions for district energy networks (DEN) that can be custom-designed to meet specific project requirements. The firm says a complete package can be provided to optimise heat transfer and system control from the energy source at one end of the network through to end-user level, with solutions incorporating Danfoss VLT Drive variable speed drives for efficient pump control, building connections featuring Danfoss Sondex heat exchangers, an extensive range of control components, and ultrasonic energy meters for accurate billing of energy consumption and system diagnostics.

Greenstar HIUs now BESA registered

Bosch Commercial and Industrial has announced that its Greenstar heat interface unit (HIU) range is now BESA registered, having achieved the UK test standard for both its E Plus and KE Plus products .

The BESA HIU test regime was originally developed to assess UK heat network operating parameters as part of a government research project into heat network efficiency. It calculates the annual volume weighted return temperature (VWART) from the HIU and provides evidence of compliance with other performance and reliability metrics such as speed of temperature stabilisation.

Systems must be maintained to minimise legionella risk in empty buildings

Building closures could lead to legionella outbreak

Commercial buildings at risk during lockdown if not maintained

Industry groups have warned of a possible surge in legionella cases after Covid-19 restrictions are lifted.

With many commercial buildings standing empty because of workers being furloughed or redeployed from home, there is a risk that plumbing and heating systems will become breeding grounds for legionella bacteria that could then be released once reopened, they say.

The Association of Plumbing & Heating Contractors (APHC) said it was important to raise awareness of the risk because the lockdown meant many systems were not being maintained. It pointed out that legionella bacteria multiplies in stagnant water, poorly designed plumbing systems and in water with temperatures between 20°C and 45°C.

'Landlords and employers have a legal duty to assess and control the risk of exposure to legionella bacteria,' said APHC chief executive John Thompson.

The Building Engineering Services Association (BESA) said that owners, landlords and tenants should still be maintaining their buildings during the crisis for security purposes; to achieve statutory compliance; and to protect the fabric and critical systems as well as satisfying any insurance implications.

CIBSE FM Group chair Geoff Prudence said tasks should be prioritised using the building operational risk management methodology in CIBSE Guide M.

BESA said its SFG30 takes users through a step-by-step process for maintaining critical services during a low-occupancy period ready for full reactivation when businesses return.

This includes key elements such as keeping water systems safe and healthy in line with the Health & Safety Executive's L8 rules for legionella control, the association said.

See page 18 for more on maintaining buildings during a lockdown.

HHIC updates Covid-19 advice

The Heating and Hotwater Industry Council (HHIC) has issued updated advice to frontline heating engineers who are still operating during the Covid-19 pandemic.

The recommendations, based on the latest updated government updates, cover tradespeople carrying out repairs and maintenance in people's homes. Such work can continue, provided that the tradesperson is well and has no symptoms and that Public Health England (PHE) guidelines – including maintaining a two-metre distance from any household occupants – are followed.

The HHIC has also advised that no work should be carried out in any household that is isolating or where an individual is being shielded, unless it is to remedy a direct risk to the safety of the household – such as emergency plumbing or repairs – where the tradesperson is willing to do so. In such cases, PHE can provide advice to tradespeople and households.

For more on the latest HHIC updates, visit **www.hhic.org.uk**

Kensa Group secures investment from Legal & General

Ground source heat pump technology specialist Kensa Group has secured investment from Legal & General in a partnership aimed at strengthening the firm's market position and accelerating deployment of its solutions across the UK.

The deal sees Legal & General take a 36% stake in the Kensa Group, and is expected to advance Kensa Heat Pumps' research and development programme, expand Kensa Contracting's district heating shared ground loop array installations, and fund zero-cost heating infrastructure through Kensa Utilities.

The partnership with Kensa complements Legal & General's existing clean energy investment portfolio, and the investment is intended to enable Kensa to grow rapidly in a post-pandemic environment.

According to Simon Lomax, CEO of the Kensa Group, the partnership 'aims to install 50,000 ground source heat pumps in the mid-term'.

Regional Performance Centre Dundee is first building on network

Rehau supplies pipework to Dundee GSHP heat network

Rehau has supplied the pre-insulated district heating pipework for the first stage of a heat network scheme designed to serve Scotland's new Regional Performance Centre (RPC) Dundee and buildings surrounding the £32 million high-tech sports complex development.

The heat network uses three ground source heat pumps (GSHPs) supplied with water from a series of 120 boreholes around 200m deep. The heat pumps supply hot water to the main sports hub building and smaller athletics building through Rauthermex pipework, which is connected to a low-pressure hot water and domestic heat exchanger in each building.

While Caird Park currently delivers 3.5MW of low carbon district heating on site to the RPC, phase two is intended to supply energy to Dundee's social housing, with the aim of alleviating fuel poverty for many of the city's residents.

Code, not compromise

A manufacturing code of conduct would result in transparent specification that would end cost-cutting tendencies, says Remeha's **Ryan Kirkwood**

Optimising the efficiency of heating and hot water systems is crucial to the UK achieving its goal of carbon neutrality by 2050.

Heat pumps, heat networks, hybrid solutions and conversion of the gas grid to hydrogen have all been identified as options to reduce the emissions associated with heat. As manufacturers introduce new technologies and techniques, and engineers make existing equipment more efficient, system design and working practices will evolve rapidly. Unfortunately, as designs grow more complex, the gap between design and as-built performance can increase.

"The industry could establish heating and hot-water specification as a quality standard to be respected"

Respect the specification

As Covid-19 forces the nation to press the pause button, the building services industry can take the opportunity to implement improved ways of working that will help eliminate the performance gap. Specification, the starting point of a project, is the perfect place to begin.

A key recommendation of Dame Judith Hackitt's *Independent Review of Building Regulations and Fire Safety* was for a clearer, more transparent and more effective specification process to put an end to cost-cutting compromises. Consequently, post-Grenfell, we have seen closed specification introduced for fire protection. When it comes to heating and hot water, however, we still see time-consuming, cost-cutting measures that can have a disastrous impact on safety, quality and energy efficiency.

Specification is, arguably, the most important aspect of a project – the result of detailed research, with specified products helping to shape and define a solution. It follows that any divergence runs the risk of affecting the overall efficiency and, ultimately, the safety of the system. For example, if one particular heat interface unit model performs better than another at lower temperature circuits, switching the specified product on a 70°C/40°C heat network design could adversely affect system performance. As a result, the client will not get what has been promised by the architect and/or consultant. Adhering to the specification minimises the risk of issues further down the line, and ensures a system that is compliant and fit for purpose. So how do we safeguard a more effective specification for heating and hot water?

Manufacturer code of conduct

Reforming the way product information is provided by manufacturers and communicated to users would be a good first step, according to a survey for the Construction Products Association.[1] This need for consistency and clarity was identified in the Hackitt Review. The survey calls for the introduction of robust and standardised product and performance information that will give everyone using the data – from architects, engineers and surveyors to contractors, local authorities and facilities management (FM) providers – a clearer indication of applications for which the product may or may not be suitable. It reveals industry support for a manufacturer code of conduct to ensure that product information has been verified properly before publication.

Quality standard

As manufacturers, this is a move we welcome. With clearer, more detailed data enabling more effective product selection, the industry could establish heating and hot-water specification as a quality standard that must be respected. Introducing procurement contracts would provide a new framework to support specification, giving consultants ultimate power and responsibility for the integrity of the project.

Good manufacturers would have a dedicated team of skilled specifiers to offer added support on more complex hybrid designs. Early engagement with them will allow the designer to develop a robust physical specification alongside the design philosophy, rather than ad hoc. Providing manufacturers with a budget for the project at the outset would enable them to design to the specified allocation, so removing the need for cost-cutting practices.

Replacing the equal *or* approved status with equal *and* approved would also help ensure project success, as not all products are 100% 'like for like'. The new requirement would make it possible to swap out a specified product only when it is proven to bring added value or real benefits above the specification. This would need to be recorded as part of the 'golden thread' of building safety information passed on to owners, contractors and FM providers.

Encouraging a whole-life costing approach when selecting equipment would, again, avoid potentially detrimental cost cutting by giving a more accurate assessment of the total cost of a product throughout its lifetime. Putting actions into place now to address best practice will enable us to optimise heat-generation design in our buildings and help our industry to emerge stronger.

RYAN KIRKWOOD is specification manager for Remeha

Reference:

1 Construction product information survey: our initial findings, Marketing Integrity Group, **bit.ly/CJMay20CPA**

Monitoring during Covid-19

Thousands of buildings now stand empty. Demand Logic's **Mike Darby** explains what to look out for when remote monitoring

Before Covid-19, the UK had never experienced such a widespread occurrence of emptied commercial buildings since World War II, resulting in an enforced new approach to building management. But how do you know what you should be managing when you aren't on site?

1 Health and safety
If you have people on site, this is paramount. Monitor hot water, check that it is stored at the right temperature and occasionally pasteurised, and carry out wet systems testing to ensure compliance. Also, check ventilation, temperature control, reduction in recirculation and heat recovery – recent guidance has stressed the importance of well-ventilated spaces during the pandemic.

2 Management of equipment
Much has been switched off to save energy costs, but offline equipment could be at risk of damage if not maintained. Chillers must have crankcase heaters operational; pumps, valves and fan motors can seize if not exercised; and water can stagnate in closed systems leading to bacteria growth and potentially major damage to pipework and equipment.

3 Energy costs
In my experience, no building has ever shut down to a minimum expected level. Why? Usually, because the building management system has behaved unexpectedly causing equipment to operate when it doesn't need to. Only necessary systems should be operating, so as to minimise operating costs.

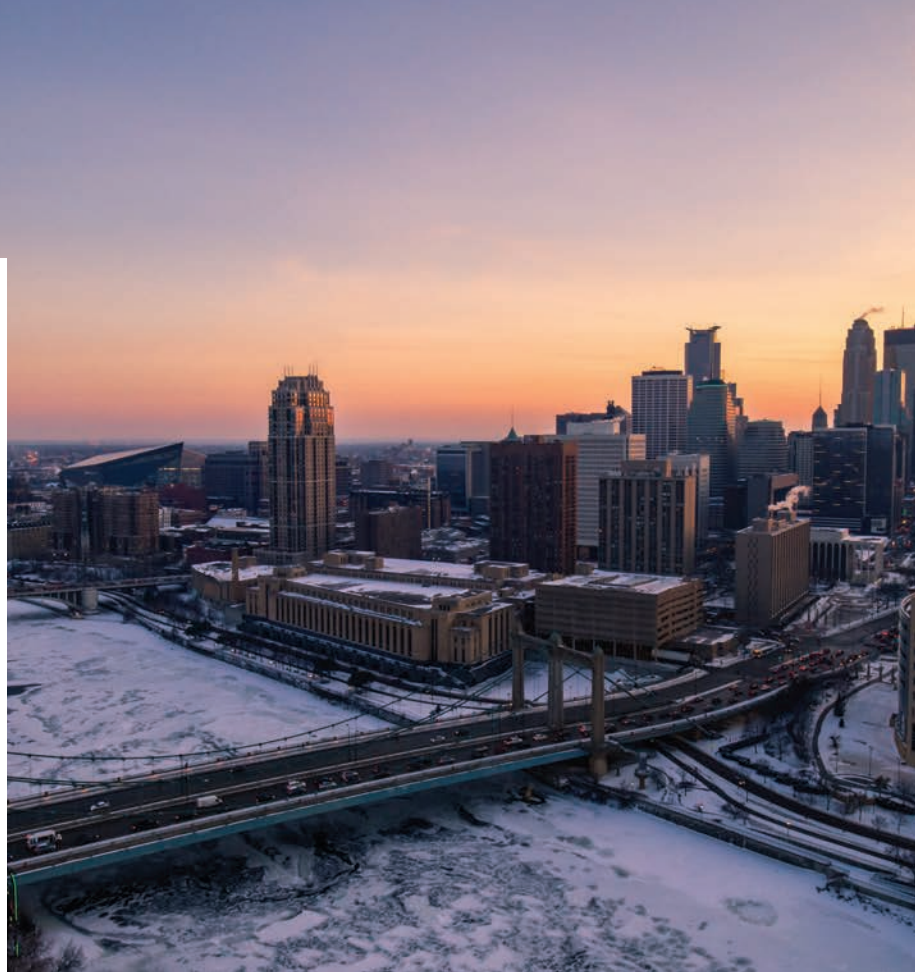
4 Insurance risk
Monitoring building and equipment means you are keeping an eye on your insurance risk. Seizures can lead to asset damage and, potentially, replacement – and a hike in your premium.

5 Business critical systems
Critical systems such as server rooms must remain operational throughout a 'shutdown' to maintain data integrity and use of VPNs, among others. Without these, a tenant's business has increased risk of slowdown or failure. Compounded with the impact of Covid-19, this needs to be avoided.

Mike Darby is CEO and co-founder at Demand Logic

Bridging the gap

In America, an abundance of cheap gas and a high carbon intensity for grid electricity compared with Europe is driving a move towards gas-fired heat pumps in small buildings. Tim Dwyer looks at three papers on the technology that were presented at the ASHRAE Winter Conference in Orlando



In the US, traditional installations of furnaces (for air heating) and boilers (for water heating) are likely to operate at efficiencies in the range of 56% to 70%.

Heat pumps offer equivalent simple efficiencies of more than 100%. The potential savings in terms of energy consumption and fuel cost make them an attractive alternative (whether electrical or gas-fired).

Since the electrical grid carbon intensity is several times that of many European states, the development of advanced, small-scale gas-fired heat pumps can compete, in emissions terms, against electrical heat pumps in many US installations.

Natural gas production in the US has increased six-fold in the past couple of years, and the price of supplied gas has plummeted to as low as it was in the 1970s. With gas, on average, at about a third of the price of electricity – $1.2 per therm (around £0.03 per kWh) versus $0.12 per kWh (£0.09 per kWh) – the gas-fired absorption process can provide a cost-effective and comparatively emissions-effective way to utilise gas for heating and hot water in US homes. In cool and colder climates, the cost spread is closer to four to five times in many locations, so enhancing the relative value of gas.

At the 2020 ASHRAE winter conference, in his presentation *Residential Space and Water Heating with Gas Absorption Heat Pumps*, Chris Keinath, of Stone Mountain Technologies, said a gas-fired absorption heat pump (GAHP) could offer a 'next step in heating efficiency compared with standard furnaces, boilers and water heaters'.

A surprising statistic was that in the average US home the annual heating requirement was five to six times that of the cooling need. This continuing need for heat is an important consideration when considering the capability of an electrified future fed from a 'greener' grid.[1] If there isn't the necessary electrical infrastructure to transmit sufficient power, then less efficient, more polluting fossil-fuel power plants will still need to be brought online to meet heating loads for the foreseeable future.

Keinath explained that current GAHP technology is based on the well-established absorption cooling applications that have been reliably used for more than 50 years. (See *CIBSE Journal* CPD 85 for an explanation of gas-fired GAHP).

Field demonstrations of low-cost GAHP designs are ongoing for space heating and water heating-only applications. Keinath said results have shown they offer a significant reduction (30-50%) in energy when compared with conventional technologies, with a tested annualised fuel utilisation efficiency (AFUE) of 140% for space heating (for a 23.5kW external GAHP). In the US, the AFUE is the standardised ratio of annual heat output to the total annual fossil fuel energy.

Keinath noted the particularly beneficial performance of GAHP at low temperatures. He cited a measured 250m^2 installation that maintained performance during the 'polar vortex' of 2019 in the American Midwest that

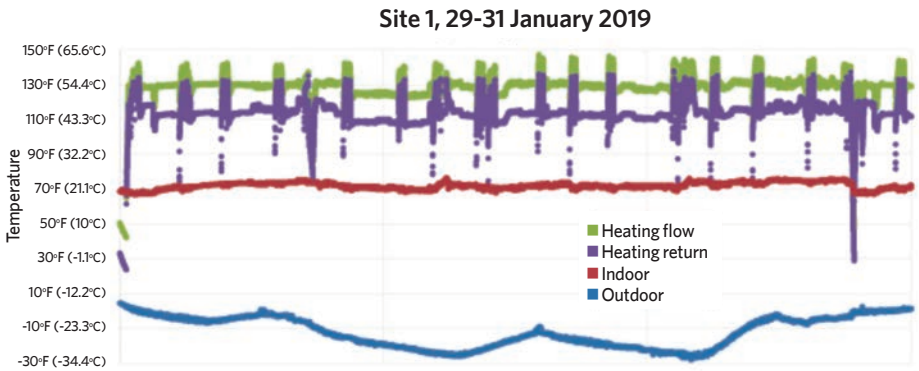


Figure 1: Heating flow and return temperatures for GAHP system during 2019 'polar vortex'. The peaks in flow temperature were when hot water systems were being supplied – supplementary furnace heating was used briefly when outdoor temperatures approached -35°C (-30°F)

Keinath found the performance of a gas-fired absorption heat pump installation stood up to the record low temperatures of the 2019 'polar vortex'

brought the coldest external temperatures for more than 20 years (Figure 1).

In his presentation, *Integrated Gas-Fired Heat Pump Water Heaters for Homes: Results from Field Demonstrations and System Modeling*, Paul Glanville, of the Gas Technology Institute, indicated that gas-fired water heating is used in 62% of US homes, and reported that 95% of those homes in Florida used water heaters of the lowest efficiency.

Considering the average US four-person home water use of 12kWh per day, he compared the measured installed performance of systems based on a number of research projects to provide a simple seasonal delivered efficiency »

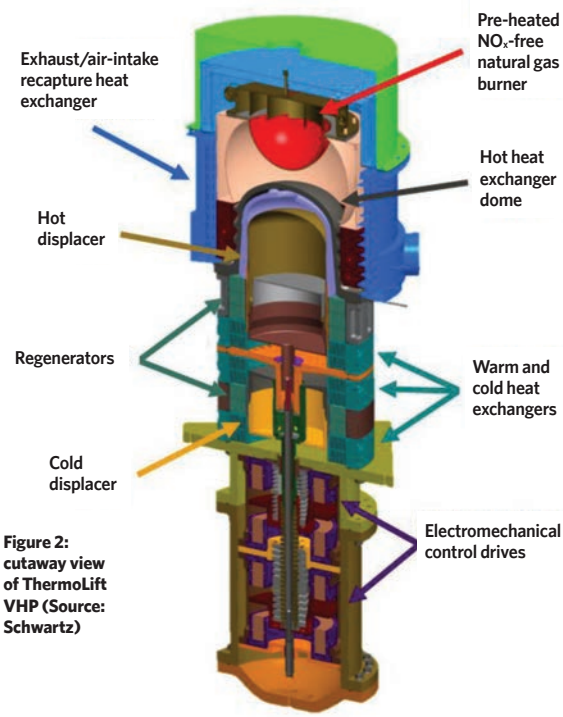


Figure 2: cutaway view of ThermoLift VHP (Source: Schwartz)

» (useful hot water output/energy input).

This included non-condensing storage water heaters that were typically 0.6 efficient (that, for example, make up the majority of installations in homes in Florida), rising up to an efficiency of 0.85 for condensing continuous-flow water heaters.

The efficiencies were shown to drop off significantly for storage systems in households that used less hot water than the average home, presumably as a result of a higher proportion of idling and storage losses. Installations of 'first-, second- and third-generation' GAHP water heaters were shown to have efficiencies of 1.20 or more.

He reported US homeowners typically spent $275 (£220) on hot water heating per year, and was very aware that any new technology had to be moderately priced so that when consumers replaced their failed systems it was not at a much higher cost.

At about $2,200 (£1,780), a gas-fired heat pump water heater (GHPWH) had a retrofit capital cost that was about 20% greater than an electrical heat pump water heater (EHPWH) system. However, a retrofit of an EHPWH in place of a gas water heater would also require upgrades to the electrical service of the water heater (going from 115 to 230 volts AC), which would be a significant added cost to the EHPWH.

Glanville highlighted a new generation of GHPWH that have been used in pilot schemes. They are designed to be a direct physical replacement for internally-mounted storage hot water heaters, and offer significant improvements including a smaller footprint. They have 'smarter' controls, which include more storage tank sensors to allow tighter control of supplementary electric heating and predictive cycling control.

The core gas absorption system included: significantly improved designs to the solution pump; the development of a custom electronic expansion valve; and improvements to the flue gas condensing heat exchange. However, the form factor

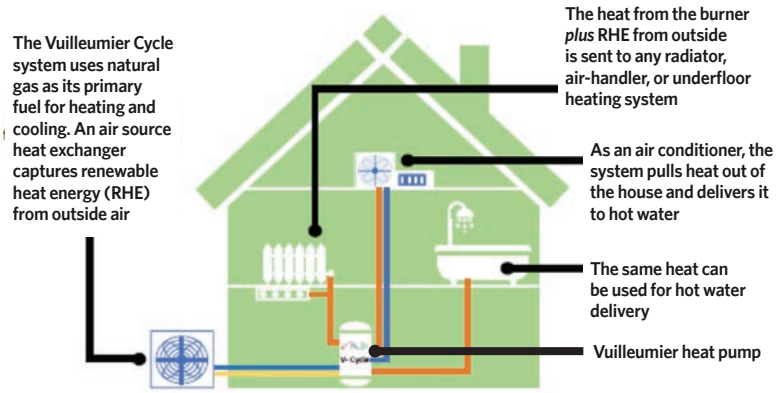


Figure 3: Schematic of Vuilleumier cycle heat pump in a residential application (Source: Schwartz)

of a traditional direct gas-fired storage water heater was maintained – including the 225-litre hot water store.

The pilot systems were installed and monitored in five different Californian homes for 12-18 months (a total of 12,000 operating hours), and Glanville showed the five units (installed in garages) operated effectively with only 1.1% to 6.2% of the annual hot water demand being supplied by supplementary (electrical) heating.

When accounting for the current profile of electrical supplies in the USA (considering an electrical carbon factor of slightly above 0.5kg per kWh), Glanville noted that the CO_{2e} emissions from the new generation GHPWH (with average site COP of 1.5) were approximately the same (and possibly less) than an EHPWH (with average site COP of 3.5).

The Hofbauer Cycle

The presentation by Paul Schwartz of ThermoLift – *A Thermal Compression Heat Pump for Complete Building HVAC* – introduced a new application of technology known as a Hofbauer Cycle that is neither a vapour compression nor an absorption machine, but is a thermodynamic cycle of thermal compression.

The system uses a gas-fired heat engine to operate a cylinder assembly that compresses and expands a working gas within several chambers and then transfers the heat to the water distribution system.

The development of this novel, high-efficiency gas-powered heat pump is an evolution of a Vuilleumier cycle using a working gas of helium (at high pressures), and is capable of effectively providing both heating and cooling from the same device, at constant capacity, even in cold climates and partial load conditions. Tests on a Vuilleumier heat pump, similar to that in Figure 2, at the Oak Ridge National Laboratory indicated COPs of 1.6 at 0°C and 1.5 at -10°C external temperatures for the machines, capable of producing hot water at 74°C.

> "The potential savings make heat pumps an attractive alternative – whether electrical or gas-fired"

The 25kW heating/12kW cooling unit is small, and will be suitable for installation in homes, as illustrated in Figure 3, as well as for commercial and industrial installations (including cryogenic cooling). It potentially offers significant energy and carbon emission reductions. The development of a second-generation device is focusing on component optimisation in anticipation of introduction into commercial markets.

This is a technology to keep in mind for the future, particularly as the driving heat could be derived from renewable sources. **CJ**

References:

1 *DRAFT Northeastern Regional Assessment of Strategic Electrification*, pp13, 2017 **bit.ly/2KfsS54**

Wasted opportunity

If the UK reused waste heat from its buildings and industrial processes, it could be used to supply 14% of the hot water and heating demand in UK homes, says FairHeat's Lina Aglén

So much heat produced in the UK is going to waste. The list of culprits is long: food industries, cement factories, warehouses, leisure centres, sewage plants and waste-incineration sites are among the facilities producing heat that is not used – but it does not have to be that way.

In Sweden, there are several examples of waste heat being reused to produce heating and hot water. The use of waste heat is enabled by the country's district heating infrastructure, which, in 2016, supplied more than 57% of all buildings in Sweden with heat and hot water. Based on statistics gathered from Swedish district heating producers, more than 45% of all the heating generated in 2018 came from sources of waste heat.

District heating, often referred to as a heat network, relies on a network of pipes to transport heat to individual buildings and dwellings from a centralised source of production. Heat exchangers in individual buildings and/or dwellings extract heat from the hot water, and this is then recirculated as cool water to the central production. The source of heat at the central production varies. It can be a boiler or combined heat and power (CHP) system, but it can also be a heat pump or a heat exchanger. These last two examples are highly relevant for waste heat.

I work for a specialist consultancy dealing exclusively with heat networks. As part of my role, I visit existing developments with heat networks, as well as developments under construction. In many cases, the new developments are built with natural gas-based heat networks, despite being next door, literally, to a facility that is generating waste heat. Given the significant impact it has had on heating provision in my native country, I can't help but wonder why more effort has not been made to use waste heat in the UK.

As the potential for waste heat in the UK energy system is largely unknown, I prepared a case study for the CIBSE Technical Symposium that aims to create a basis for discussion around the potential for waste heat in the UK. *Incorporating unutilised waste heat into district heating production*[1] investigates what effect using Swedish techniques for waste-heat recuperation would have on the UK heat supply and its associated emissions.

According to a report from the Department for Business, Energy and Industrial Strategy, published in 2018, net UK emissions in 2016 amounted to 468Mt CO_{2e}. Heat demand is the biggest source of the country's carbon emissions, with about 46% of the heat demand used for space heating and cooling. Figure 1 displays the breakdown of 2016 UK carbon emissions across sectors.

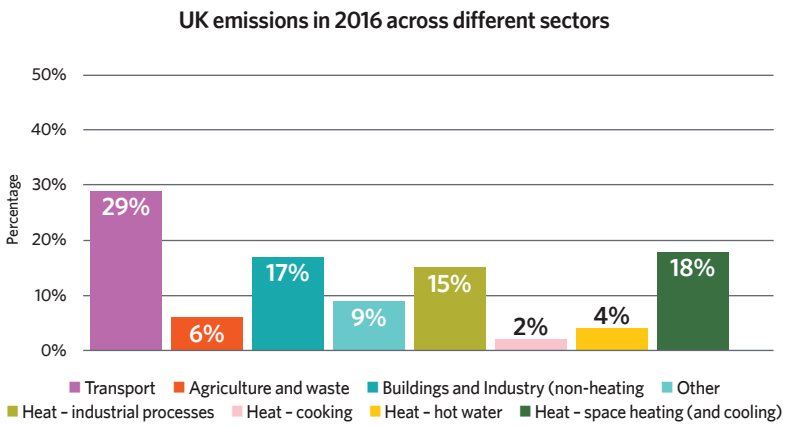


Figure 1: Breakdown of 2016 UK carbon emissions across sectors

To recuperate waste heat from industries, heat extraction can be made possible via a heat exchanger. For industries outside of the metallic, mineral and chemical sectors, the majority of waste heat potential is available in the temperature range of 100°C to 200°C, which is suitable for recuperation into district heating production. An estimated 9TWh of waste heat in this temperature range is currently unused in the UK industrial sector.[1]

One potential approach to recuperating waste heat created in dwellings is through using heat in wastewater. Warm wastewater is created from everyday activities such as showering, washing hands and cleaning

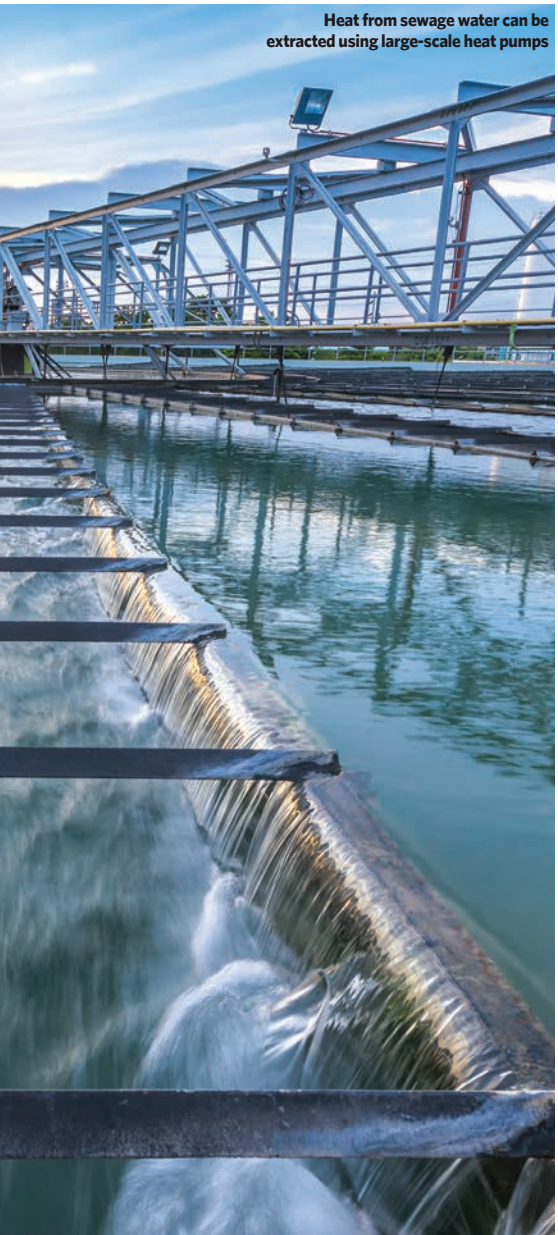
dishes, and residual heat can be recovered in the treatment plant. The treatment process will make use of some of this residual heat to provide optimal process conditions for bacteria and microorganisms. Even after the treatment process, there will be a significant amount of heat that can be recovered. How much will depend on the temperature profiles of the treatment plant and the outlet destination of the treated water.

Thames Water treats the sewage water of 15 million customers, with a significant potential of unused waste heat, which could be extracted using large-scale heat pumps. If a similar ratio of heat available per capacity of treated wastewater was assumed for a plant operating in the south of Sweden, extracting the residual heat in the wastewater treated by Thames Water could provide 10TWh annually.

Heat from waste incineration

In 2018, 10.9 million tonnes of rubbish were incinerated in the UK, but most facilities do not recover heat from the incineration process. Sweden recovers the most energy from incinerated waste in Europe, with about 3MWh of energy recovered per tonne of waste. Reuse of heat from UK waste-incineration facilities is relatively uncommon. There are several UK organisations that pay bodies in other countries to receive large volumes of household waste. Waste-incineration facilities in the UK will increase in the future. To ensure this is done in a sustainable manner, the percentage of recycled materials will need to increase, as well as the amount of energy recovered from each tonne of incinerated waste.

> "In 2018, 10.9 million tonnes of rubbish were incinerated in the UK, but most facilities don't recover heat from the incineration process"



Heat from sewage water can be extracted using large-scale heat pumps

The waste-heat potential from the UK industrial sector, wastewater treatment facilities in southeast England, and heat-recovery potential from existing waste-incineration facilities would be 51.7TWh annually, assuming the performance figures of operational facilities in Sweden.

This equates to 14% of UK homes' total heating and hot-water demand (see Figure 2). By using waste heat to heat UK homes, offices and hot water, the need for natural gas would reduce significantly. By displacing production of heat – away from, for example domestic gas boilers – the total carbon emissions of the UK could be reduced by 3%, despite the study only investigating a limited fraction of the available potential.

Provision of heat to buildings from district heating is targeted by the UK government to increase from 2% in 2018 to 18% by 2050. The investment cost of this will be several billions of pounds, where a significant portion of the capital invested in district heating goes towards enabling the generation of heat. But what if there was no need to generate new heat to supply a district heating network?

To enable this energy to be recovered, there will need to be an incentive. District heating infrastructure will not only enable waste heat to be transferred, but it will also enable one organisation to pay another to buy waste heat. External incentives could help, such as changing how energy efficiency requirements in planning permissions are formulated, and how waste energy and materials are taxed.

As district heating solutions are built, it will be necessary to consider how they interact with existing building stock, infrastructure and surrounding solutions. It makes environmental sense to think of the significant supply of waste heat as a source of production. CJ

LINA AGLÉN is a lead engineer at FairHeat

Reference:

1 Industrial waste heat: estimation of the technically available resource in the EU per industrial sector, temperature level and country, *Applied Thermal Engineering*, 2018

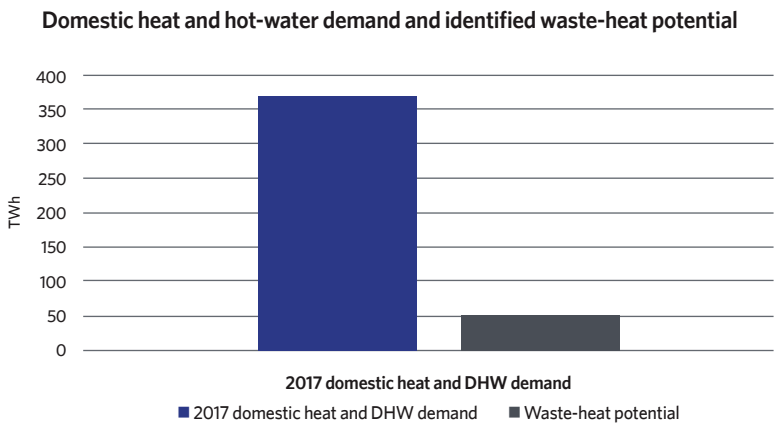


Figure 2: Comparing the identified waste-heat potential against the 2017 statistics for UK domestic heat demand

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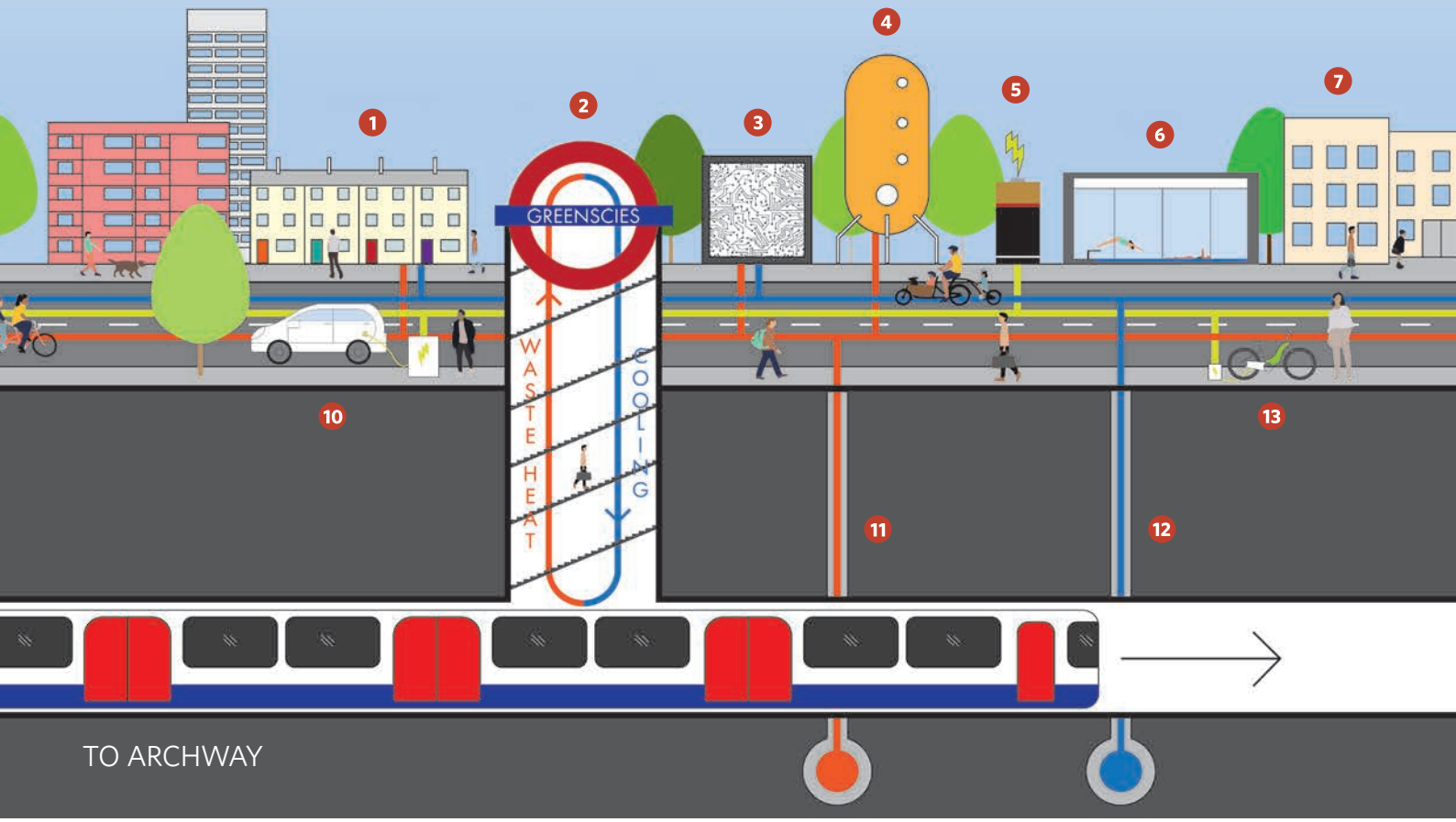
The GreenSCIES ambient heat loop will deliver extremely efficient, low carbon heating and cooling while ensuring the system remains in balance thermally



Intelligence networks

Smart energy projects are being piloted in the UK to find out how buildings and infrastructure can be connected intelligently to provide low carbon heat and electricity. Andy Pearson reports on two pilots: GreenSCIES in Islington and Energy Superhub Oxford

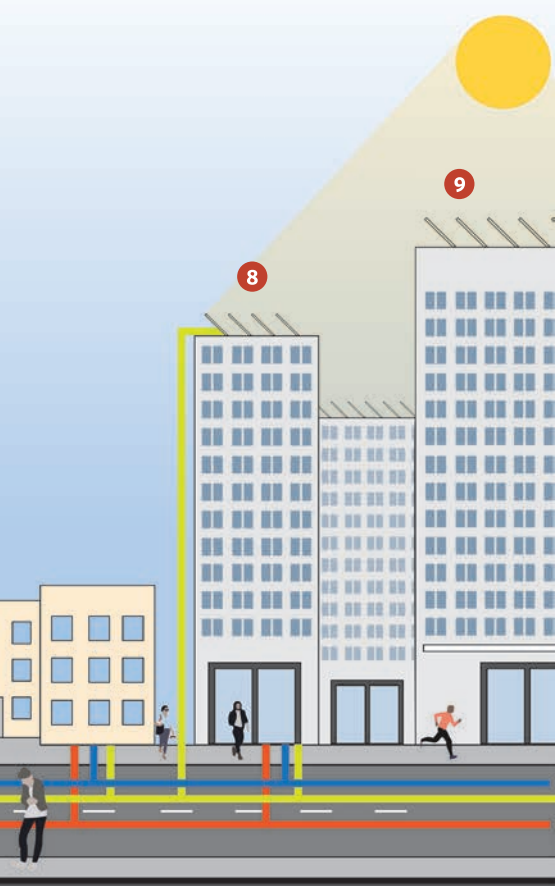
The increasing proportion of Grid electricity generated from renewables is continuing to drive down its carbon intensity – which is good news for the environment. The downside, however, is that sources of renewable energy – such as wind and solar – are intermittent; the more the Grid is dependent on renewables, the more likely it is that there will be large variations in the amount of electricity available.

The situation will be made worse by the progressive move to electric vehicles and the increasing use of heat pumps to provide heating and cooling for buildings, as well as the potential increase in peak loads on the network, making it even more difficult to balance generation with demand.

In Islington, London, the Green Smart Community Integrated Energy System (GreenSCIES) has been launched as one of a tranche of projects assessing the feasibility of using local energy systems in towns and cities to help balance grid demand, improve sustainability and tackle fuel poverty. In Oxford, Energy Superhub – a project using giant batteries– is under construction, with a similar aim.

GreenSCIES, Islington

GreenSCIES has just started its two-year design phase. When complete, it is projected to deliver low carbon heat and power to an estimated 10,000 Islington residents in 3,500 homes, and up to 70



HEAT LOOP CONCEPT DIAGRAM
Heating
Cooling
Electricty
Cullinan Studio GreenSCIES

LONDON UNDERGROUND

TO THE CITY

Key to heat loop concept diagram

1 Households' heat load **2** London Underground vent-shaft heat source **3** Data centre source **4** Thermal heat stores **5** Battery electrical store **6** Swimming pool heat load **7** Schools' heat load **8** PVs **9** Offices and higher education **10** Car-charging electrical store **11** Boreholes' heat store **12** Boreholes' cool store **13** Bike charging/mobility aids

> "AI will help flex electricity demands from heat pumps and EV charging in response to price signals from the Grid, battery storage, and the intermittent output of solar power"

local businesses. It is predicted the scheme will save an estimated 80% of carbon emissions compared with a conventional gas-fired boiler-based system.

The project is a partnership between London South Bank University (LSBU), Islington Council, Transport for London, and a consortium of small and medium-sized enterprises. It is one of 10 local smart energy pilot projects that were awarded a proportion of £21m funding by UK Research and Innovation (UKRI) earlier this year (**bit.ly/CJMay20Smart**).

The starting point was an initial feasibility study by LSBU, which looked at the heating and cooling demand from existing buildings in Islington. Fundamental to the GreenSCIES project is an ambient heat loop, which enables the exchange of heating and cooling between buildings on the network to deliver extremely efficient, low carbon heating and cooling while ensuring the system remains in balance thermally. To help in this task, the system includes hot and cold aquifer thermal storage. 'We did some modelling in Islington based on using an ambient loop to exchange heat between different applications,' says Graeme Maidment, professor of heating and cooling in the School of Engineering at LSBU, and director of GreenSCIES.

Buildings connected to the system will use a heat pump to extract heat from the heat loop or to reject heat into it when operating in cooling mode. The system is an iteration of the building energy network currently in place at LSBU (see 'Intranets for heat', *CIBSE Journal*, May 2019). A major advantage of using an ambient temperature heat loop is the opportunity it presents to capture waste heat from local sources. GreenSCIES is proposing to use a 2km ambient pipe loop to capture waste heat from secondary heat sources, including two local data centres and London Underground's York Road ventilation shaft. In addition, the heat loop will link all 16 of the project's mini-energy centres. The scheme will also connect to solar photovoltaics (PVs) installations, large-scale battery storage, electric vehicle charging points and, of course, to the electricity Grid.

The decentralised energy centres are effectively a 'microgrid', flexing heat pumps, PVs, large-scale battery storage and electric vehicle batteries to enable the system to respond to electricity Grid demand and tariffs. Artificial intelligence will be used to help flex electricity demands from heat pumps and electric vehicle charging in response to price signals from the Grid, battery storage and the intermittent output of solar power.

'By the end of two years, we're aiming to have a shovel-ready design available,' says Dr Catarina Marques, senior research fellow at LSBU. The team wants the project to be tendered and for an energy service company (Esco) to construct and run the system. »

WHAT IS A VANADIUM FLOW MACHINE?

The RedT energy-storage machines employ vanadium ions, in different oxidation states, to store chemical potential energy.

A conventional battery stores chemical energy within an electrolyte solution; a vanadium flow machine contains two different electrolyte solutions, each in a separate tank. When the vanadium flow machine is charged, one electrolyte is positively charged and the other negatively charged. For the battery to provide power, the electrolytes flow through a fuel cell stack on opposite sides of a proton exchange membrane. Their opposite charges create a gradient that drives an external current.

There are two main characteristics, unique to vanadium flow machines, that make them suited to utility-scale storage. First, unlike conventional batteries, power output is independent of energy-storage capacity.

Output depends on the size of the membrane stack (the engine), while the energy-storage capacity depends on the size of the electrolyte tanks. Neither constrains the other, although the ratio of storage to power determines how long the batteries can run without recharging. Power can flow undiminished as long as there is fresh electrolyte to circulate through the stack.

» The impact of LSBU's research for GreenSCIES will reach beyond the capital, and will be applicable whenever there are sources of unwanted heat available. In the West Midlands, the project team is investigating the use of waste industrial heat and energy stored in canal water. It is also looking at using flooded, disused mines in Sheffield, in a similar way to that of the *Mijnwater* (Minewater) project in Heerlen, the Netherlands, which is based around two flooded mineshafts, one kept warm and the other cold to provide seasonal storage.

Energy Superhub Oxford

In Oxford, another UKRI-funded demonstration project is trialling a combination of battery storage and ground source heat pumps (GSHPs) to store energy and help balance the Grid.

The Energy Superhub Oxford is a three-year, £41m scheme based on large-scale battery storage. This demonstrator project includes rapid vehicle charging, hybrid battery-energy storage (a combination of lithium-ion and vanadium flow batteries), low carbon heating and smart energy management, and is anticipated to go live by the end of 2020.

It is being led by battery-storage company Pivot Power, which has already placed an order for the batteries for this project. These are big; the lithium-ion battery is 50MW, housed in 19 shipping containers, and will be linked to a National Grid electricity substation in Oxford. The battery will store energy from the Grid when price and demand are low and supply is high; it will release energy back to the Grid when price and demand are high and supply is low. There is also a 2MW vanadium flow battery – otherwise known as a flow machine – manufactured by RedT Energy (see panel 'What is a vanadium flow machine?'). Unlike lithium-ion, its electrolyte does not degrade with use, so the project will investigate how to integrate the technologies to reduce degradation in the lithium-ion battery.

The scheme also includes electric vehicle charging on a private wire network, to give 25MW of rapid charging for 100 cars, while – on the heat side – the project is installing shared ground arrays for 300 properties, each with its own GSHP. Smart software will manage the energy storage, electric vehicle charging and heat pumps, to help balance the Grid. The heat pumps, manufactured by Kensa, will be controlled using Switchee smart controls linked to a cloud-based platform that combines property information with time-of-use tariffs to produce an optimised heating schedule. The Kensa heat optimisation platform will use the fabric of the property to store heat energy ahead of peak energy times by raising the temperature of the building when electricity is cheap, to allow the GSHP to turn off when the cost of electricity is most expensive.

As electricity will be cheaper when wind and solar generation are high, load shifting heat will help reduce carbon emissions. The system is currently under construction and set to go live at the end of the year. CJ

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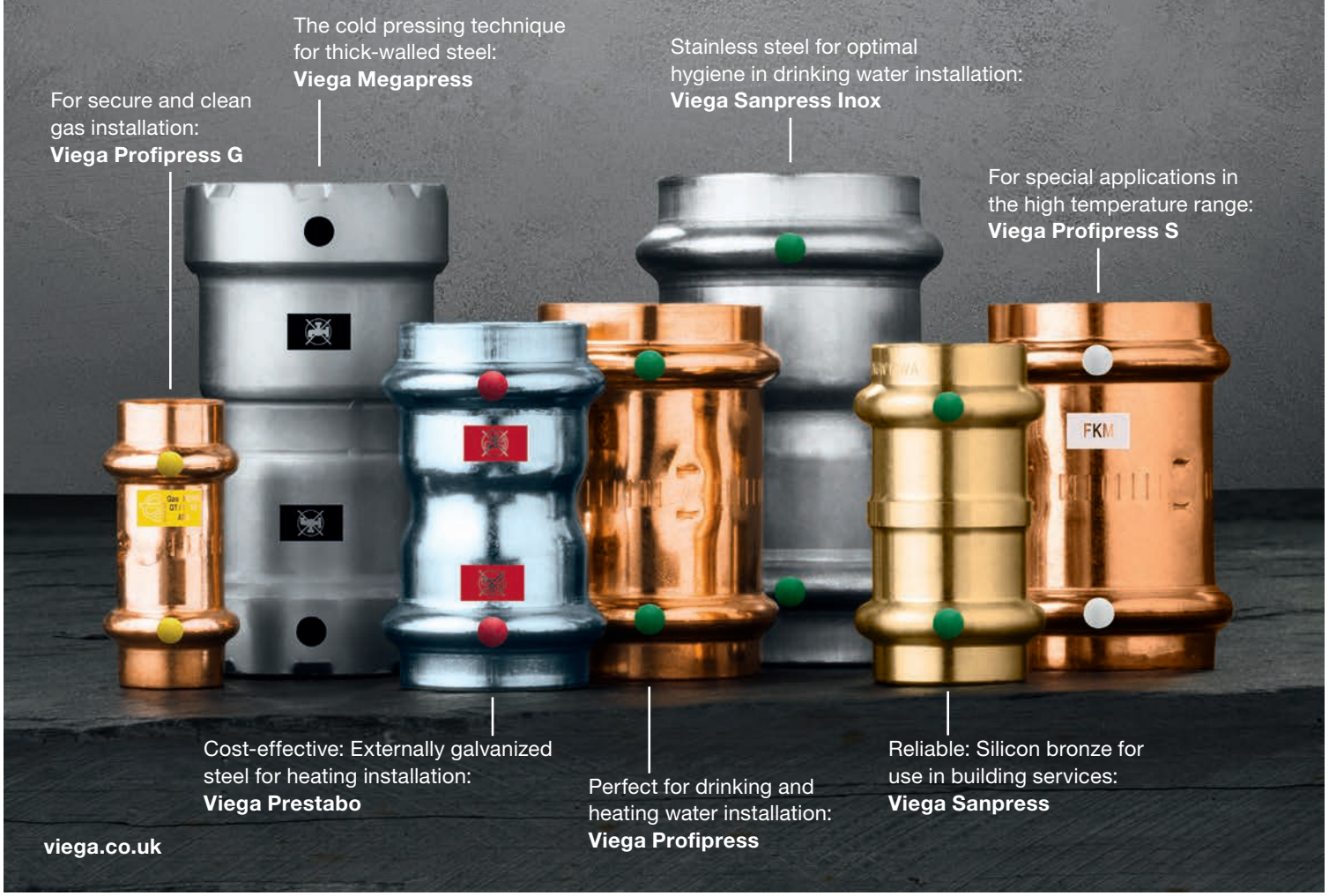

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Multilayer composite polymer-al-polymer pipes for effective water services systems

This module looks at the attributes of multilayer pipework and application methods that have contributed to its widespread usage in building services

For low-pressure heating, cooling, hot and cold water, and drinking water supplies, lightweight, composite polymer-al-polymer multilayered pipes are a commonly used alternative to traditional copper or steel pipework. Multilayered pipes were developed to overcome deficiencies that were apparent in particular applications of simple flexible plastic pipes, while retaining their significant inherent benefits. This CPD will examine the particular attributes and simple application methods that have led to the widespread application of this convenient – and comparatively low-cost, low-environmental impact – lightweight tubing.

Flexible plastic piping became popular in the 1980s and 1990s as an inexpensive alternative to traditional metal pipework systems, offering advantages over other materials, such as flexibility, ease of installation, resistance to freezing and reduced water hammer. Some of the early materials suffered from notable failures. Nonetheless, the significant benefits of simplified installation techniques – driven, in part, by the elimination of hot-working on sites, and the challenges of maintaining an appropriately skilled workforce – led to an accelerating development of safe, flexible, easily cut and jointed plastic piping suitable for many of the fluids used in building services systems. However, the very plasticity of the material meant it was not able to replace the traditional metal materials fully; its ease of deformation required extensive fixing and protection, while it also suffered from poor aesthetic qualities, as it was unable to hold visually acceptable straight pipe runs and properly shaped curves. Probably most technically troubling, though, was the ease with which oxygen diffuses through plastic, producing significant unwanted oxygenation of the water flowing in closed-loop systems. Multilayered pipes were, therefore, developed to overcome these deficiencies.

Multilayered pipes are created with two thin layers of plastic – typically a form of polyethylene (PE) – with an intermediate aluminium layer. To manufacture multilayer pipes, such as that shown in Figure 1, the initially flat aluminium sheeting is drawn onto a glue-covered PE pipe, shaped and welded longitudinally along its face. This welding process maintains the circular section of the pipe (some early pipes used lapped jointing, which caused irregularities). In a continuous process, the aluminium surface is warmed and used to »

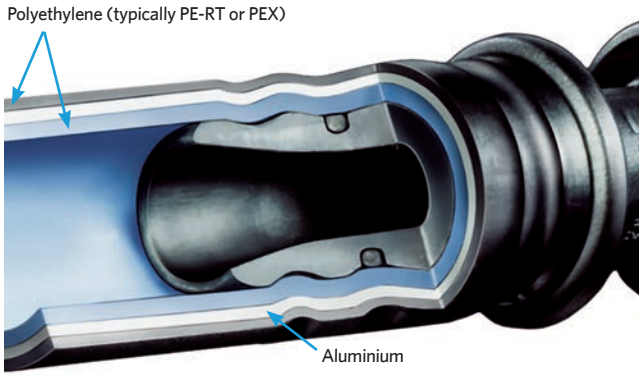

Figure 1: An example of a PE-RT Al PE-RT multilayer pipe with thermal expansion coefficient at 20-100°C – 0.026mm·m^{-1}·K^{-1}, a thermal conductivity at 20°C of 0.43 W·m^{-1}·K^{-1}, and a pipe roughness of 7μm (Source: Geberit)

» extrude adhesive and the final outer plastic layer so as to complete the main pipe construction of polymer-aluminium-polymer (PAP) pipes. The pipe is then printed with identifying information, surface finished, and either coiled or cut into straight standard lengths. The addition of the aluminium layer to what is otherwise, effectively, a flexible plastic pipe transforms the utility of the pipe material. The thin aluminium layer, with a precisely controlled thickness – typically 0.2-0.7mm thick, dependent on manufacturer – prevents the diffusion of oxygen through the pipe wall. (Traditional steel and copper pipes are natural oxygen-diffusion barriers.) The homogeneously longitudinally welded aluminium layer maintains the pipe integrity and allows it to bend equally well in all directions. The aluminium layer also improves the pressure resistance of the pipework, as well as making the pipe more stable compared with simple flexible plastic pipes. The ductile aluminium layer offsets the inherent 'shape memory' of the plastic layers – which, otherwise, can cause recurling of uncoiled pipe – while, at the same time, reducing the sagging that can take place in completely plastic pipes.

The outer plastic layer protects the aluminium layer, preventing corrosion and pitting on the aluminium surface. The inner plastic layer of multilayer pipes has an absolute surface roughness of approximately 0.007mm – similar to that of copper tubing and significantly lower than steel pipe. For turbulent flow, as would be normal in building services applications, surface roughness will affect the pressure drop, particularly in small pipe sizes, and a relatively smooth surface resists the accumulation of contaminants, such as limescale, magnetite and biofilms.

Commonly used plastics in multilayer piping are cross-linked polyethylene (PE-X), polyethylene raised temperature (PE-RT II), and high-density polyethylene (HDPE). PE-RT II was specifically developed to provide strength capabilities comparable to P-EX materials, but without the need for cross-linking. In terms of the overall performance of the complete multilayer pipe, these are all similar, with safe operating pressures in the order of 10bar for most hot- and cold-water systems. (This compares with 30+bar for copper and 60+bar for steel systems.) PE-X cannot be recycled, whereas PE-RT and HDPE are recyclable. Calculations[1] undertaken by the European Plastic Pipes and Fittings Association indicate that the carbon footprint of multilayered pipework systems is substantially lower than comparative copper systems.

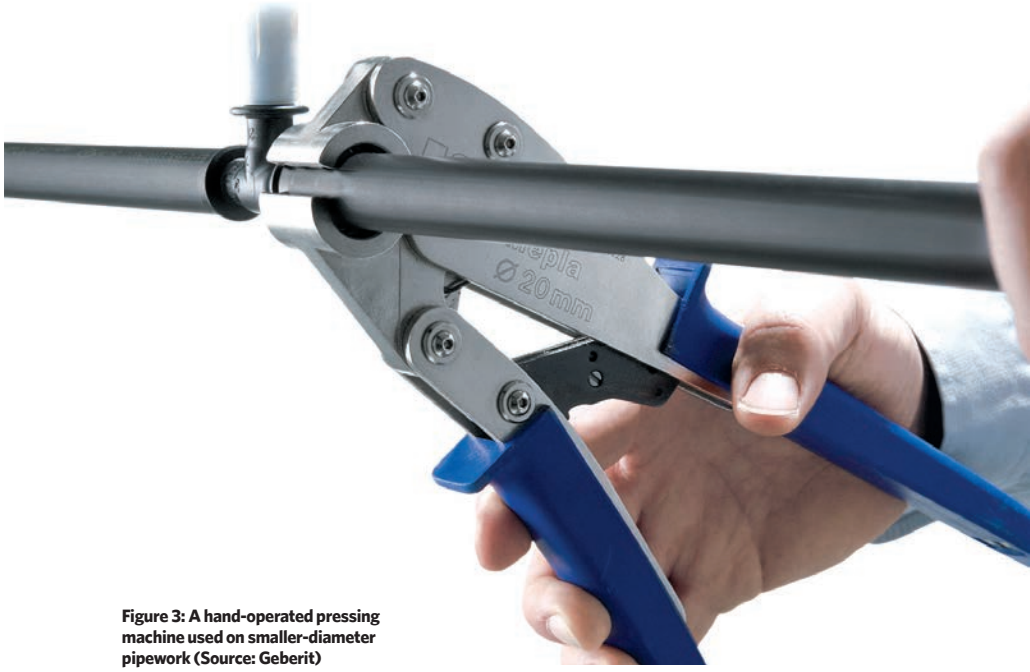

Figure 3: A hand-operated pressing machine used on smaller-diameter pipework (Source: Geberit)

A significant advantage is that the pipes, depending on the manufacturer, are available in continuous rolls – and straight lengths – up to 32mm, as well in sizes up to 75mm outside diameter in standard straight lengths. Laying the pipe from continuous coils without joints eases the installation process by allowing pipes to follow circuitous routes, and reduces the opportunities for problems by using fewer fittings. The weight of the pipes is substantially less than metal equivalents, with far easier handling, and so are commonly used in domestic and commercial applications that traditionally used copper pipe. In domestic and commercial applications, this typically includes heating, plus hot-, cold- and drinking-water systems. (Horizontal fixing centres are typically 30% closer than those for copper pipe.) Although multilayer pipe is designed not to provide a continuous electrical conductor, the aluminium layer allows electronic detection of the pipe after installation.

Plastic pipework used in water down service and wholesome water applications do not need to incorporate an oxygen barrier; however, in domestic and small commercial installations it is common that, for site simplicity, the same multilayer pipe is used throughout many of the systems (although the basic material price is more expensive than simple non-barrier plastic pipe).

Most manufacturers of multilayer pipe systems carry Water Regulations Advisory Scheme (WRAS) approval for use in UK drinking water installations.

Smaller sizes can be formed by hand – typically with a minimum bend radius of approximately five tube diameters – without collapsing the tube, and larger dimensioned pipework (or tighter bends) formed with hand-operated formers or pipe-bending machines.

Using multilayer press-fit systems is considerably quicker than traditional metal installations in terms of preparation and connection. This is partly because the tube preparation is less labour intensive, it has fewer steps, and the component designs and installation methods help to ensure a leak-tight system.

The fittings will typically include arrangements so that pressing tools – such as those shown in Figure 3 and Figure 4 – may only be used correctly, so reducing the opportunity for abortive pressings. Depending on the manufacturer, the fittings are made of a variety of materials, including plastic, brass and stainless steel, with many incorporating components to ensure fast and effective connections, as well

Figure 2: Smaller diameters may be bent by hand (Source: Geberit)

Figure 4: A portable electric pressing machine (Source: Geberit)

as providing positive indication that the fitting has been locked onto the pipework. So, for example - as can be seen in Figure 4 – jaw guides can be moulded as part of the fitting to ensure that the tool is positioned correctly, as well as making sure that the tool does not slip off the fitting when being actuated. Depth guides on the fitting provide visible feedback to help ensure full insertion of the pipe. For a pipe system such as that shown in Figure 1, when the pipe is pressed, the inner plastic tube makes the water seal with the O-ring, and the fitting permanently secures the pipe from being pulled out or rotated. The cutting and connection of these systems is clean, with no consumables and little mess to clean up afterwards.

Pressing or crimping, when completed correctly, produces a robust connection that is leakproof and mechanically sound. Fittings that have been mistakenly left unpressed are typically designed to leak visibly when subjected to low-pressure leak tests, as shown in Figure 5, so that any pressure test cannot be completed successfully until all the connections have been pressed.

Any modern plumbing and heating systems will have a mixture of different metal and plastic components. Although multilayer pipework and fittings systems are generally corrosion-proof or corrosion-resistant, consideration must be given to the remainder of the system. Systems that contain components made from materials that can corrode in poor water-quality conditions or under poor pressurisation (resulting in air ingress to the system) must still be designed and maintained using standard methods. Connections to other equipment will often be made with metallic components (usually a type of brass or gunmetal).

Standard flushing techniques and pre-commissioning would follow best-practice guidelines (such as CIBSE Commissioning Code W), taking account of the reduced exposed surface of metallic surfaces, but still ensuring that no inadvertent damage is caused to other metal and plastic components within the system.

Figure 5: Connections are designed so that uncrimped (forgotten) connections are readily visible when tested (Source: Geberit)

All multilayer pipe manufacturers provide expansion coefficients to allow for accurate calculation methods when working with the material. Allowing for expansion will depend on several variables, which include: temperature of the medium running through the pipe; ambient conditions; locations of branches and bends; and where anchoring brackets may be located. A significant advantage over solid plastic pipes is that multilayer pipe has reduced thermal expansion, with the intermediate aluminium layer maintaining the expansion rate to about 10% of that of a solid PE-RT pipe. Practically, this would mean that a multilayer pipe would expand 2mm for every metre run as its temperature rises from 0°C to 80°C. This compares with 0.9mm per metre for steel pipe and 1.4mm per metre for copper pipe. In the same way that expansion is accommodated in copper and steel pipework systems, there are several techniques that can be employed for long lengths of multilayer pipework – typically through specific bending loops or legs, or by allowing some free movement by design.

Multilayer pipe does not normally provide an electrically conductive pipe system, so cannot be used for equipotential bonding and does not require earthing. To ensure that there is no opportunity for electrolytic action between the aluminium and other metals in components and fittings, the design of coupling fittings must incorporate some form of barrier to ensure that there is no electrical conduction between the pipe system and the fitting.

Corrosion of the outer surface of the aluminium pipe is only likely to occur if the pipes are laid in an aggressive or permanently damp environment, such as swimming pools, production areas with acids or alkalis, and those with permanently wet or condensing environments. The corrosion risk would be to the unsheathed, open cut-pipe sections. In such circumstances, corrosion protection must be provided, such as by using rubber collars, sealing tape or other suitable manufacturer-recommended methods Measures to protect against corrosion are not required if the pipes are equipped with a continuous anti-condensation, or thermal, insulation and so protected from permanent moisture. As with most plastic materials, the pipe should be protected from continued full exposure to direct sunlight to prevent long-term degradation of the plastic material.

Turn to page 50 for further reading and references. »

Module 162

May 2020

1. Which of these were not specifically mentioned as a driver for the development of multilayered pipe?

- ☐ A Existing plastic pipes were not recyclable
- ☐ B Oxygen diffuses through plastic
- ☐ C Plastic pipes were unable to hold visually acceptable straight pipe runs
- ☐ D Plastic pipes can curl due to 'shape memory'
- ☐ E Plastic pipes required extensive fixing

2. What is the surface roughness of the example PE-RT Al PE-RT multilayer pipe?

- ☐ A 2μm
- ☐ B 7μm
- ☐ C 12μm
- ☐ D 17μm
- ☐ E 22μm

3. What operating pressure is associated with multilayer pipe in the article?

- ☐ A 1bar
- ☐ B 10bar
- ☐ C 30bar
- ☐ D 60bar
- ☐ E 100bar

4. Which of these is unlikely to be true for current multilayer pipework system technology?

- ☐ A Bends in smaller sizes can be formed by hand without collapsing the tube
- ☐ B Cutting pipe and connections in these systems is clean, with no consumables
- ☐ C Fittings are probably made of materials including plastic, stainless steel and brass
- ☐ D It is WRAS-approved for use in drinking-water installations
- ☐ E They provide a flexible and adaptable method of equipotential bonding

5. Compared with simple (single-layer) PE-RT pipe, the thermal expansion of PE-RT Al PE-RT multilayer pipe is likely to be which of the following?

- ☐ A 1% the expansion of simple (single-layer) PE-RT pipe
- ☐ B 5% the expansion of simple (single-layer) PE-RT pipe
- ☐ C 10% the expansion of simple (single-layer) PE-RT pipe
- ☐ D 50% the expansion of simple (single-layer) PE-RT pipe
- ☐ E Almost the same expansion as a simple (single-layer) PE-RT pipe

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Further reading:

Manufacturer data is key to interpreting the specific characteristics of different PAP systems.

CIBSE Guide section B1 considers heating systems, including pipework design and expansion (Appendix A1.5).

CIBSE AM14:2010 section 4.3.7 gives an introduction on thermal expansion of pipework.

BSRIA Guide 30/2007 (Section W) provides one of the most complete references for practically sizing basic pipework systems.

References:

1 **www.teppfa.eu/sustainability/responsible-consumption-and-production/environmental-footprint/epd/epd-calculator** – accessed 10 April 2020.

VIESSMANN'S PORTABLE INTENSIVE CARE UNITS TO FIGHT COVID-19

Building on its experience manufacturing cold rooms, Viessmann has designed and developed a modular intensive care unit for Covid-19 patients. The firm converted part of its production facilities in Germany to make the units, which can be set up indoors or outdoors. Viessmann, which sells boilers and heat pumps in the UK, is also manufacturing face masks and hand sanitiser and its boiler business has designed a ventilator. The firm says once special approval has been granted, production of more than 600 ventilators per day is feasible

Cruise ship aircon did not spread coronavirus, research shows

The Diamond Princess suffered a Covid-19 outbreak in January and February 2020

The Diamond Princess cruise ship's central air conditioning system did not play a role in transmitting Covid-19, researchers at the University of Hong Kong have found.

In the *Transmission routes of Covid-19 virus in the Diamond Princess cruise ship* paper, the authors state that the long-range airborne route was absent in the outbreak, and that most transmission occurred through close contact and fomites.

The researchers analysed information about the cases to infer transmission dynamics and potential modes of transmission. Their research involved retrieving the quarantine details and the ship's 14-day itinerary, and researching locally confirmed cases associated with the ship.

After obtaining the design of air conditioning and sewage treatment of the ship, they back-calculated the dates of infection from the epidemic curve and compared them with the start of on-board quarantine.

They found that major infections started on 28 January and completed by 6 February for passengers, except those who stayed in the same stateroom with infected individual(s). No other confirmed cases were identified among the disembarked people in Hong Kong, except an 80-year-old passenger.

Infections in crew members peaked on 7 February, suggesting significant transmission among them after quarantine on 5 February.

Read the report at **bit.ly/CJMay20ship**

Star warns against cutting back FM

Star Refrigeration is urging customers to carry on with planned plant maintenance during the pandemic, warning that deferring refrigeration engineer site visits could have an adverse effect on equipment.

The company recommends all current preventative maintenance schedules are followed for as long as possible during the Covid-19 crisis.

It is continuing to offer support services for existing customers in the food production, processing, storage and distribution sectors, in line with government guidance, as well as providing critical repair and maintenance services for cooling systems in key industries, including healthcare and IT/communications.

James Ward, operations director, said: 'Our experience demonstrates that a lack of refrigeration plant maintenance can lead to longer periods of downtime at the point of failure. Without ongoing preventative maintenance, customers increase the risk of unplanned downtime due to faults and poor running conditions. Plant repair and downtime create additional costs and can have a significant detrimental effect on business.'

Restrictions eased for Aermec

Italian air conditioning firm Aermec has been granted authorisation from the Italian authorities to supply goods for a wide range of projects and continue manufacturing chillers for critical applications.

All air conditioning companies in Italy were instructed to close in March in a bid to combat Covid-19. However, some restrictions are now being lifted, and Aermec and other selected firms will be able to continue operations by supplying specified products, including those destined for critical applications.

Refrigeration and AC 'essential services'

The International Institute of Refrigeration (IIR) has called for refrigeration and air conditioning to be designated as 'essential services' during the Covid-19 crisis.

It said that without refrigeration, vital food supplies would be lost and that the healthcare sector relied on the technology to preserve pharmaceutical products and medicines – particularly vaccines.

Many of the industry's 15 million-strong workforce are carrying out essential work to support hospitals and nursing homes. It added that, without refrigeration, the internet would collapse in minutes.

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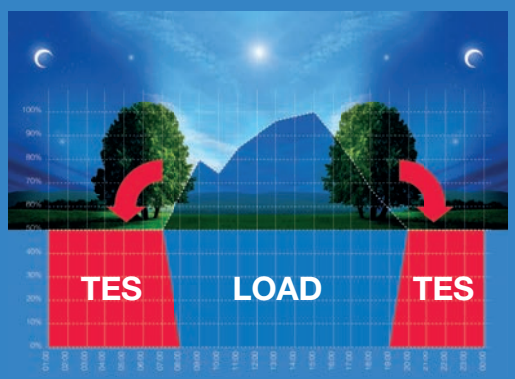

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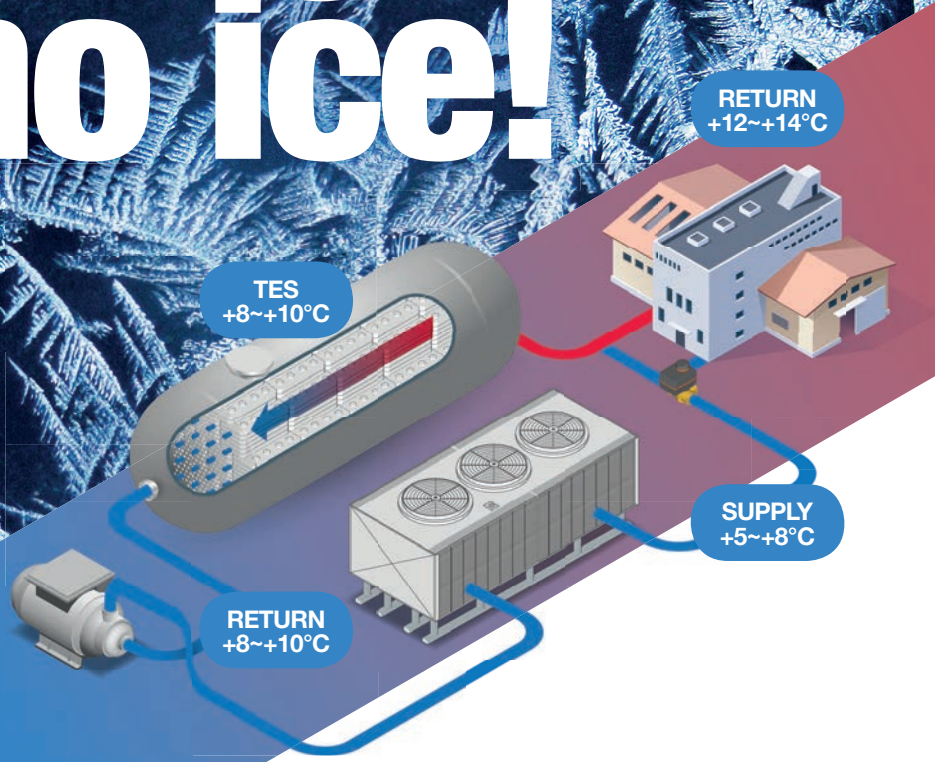

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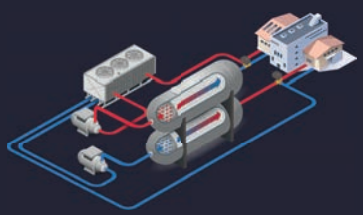
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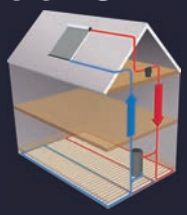
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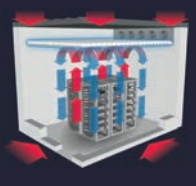
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Nightingale's notes still make vital reading

Florence Nightingale's books on nursing continually emphasise the importance of ventilation. Chris Iddon believes her work is particularly pertinent for those servicing buildings during the current Covid-19 pandemic

The 200th anniversary of the birth of Florence Nightingale takes place this month and it is testament to her legacy that she remains a symbolic characterisation of the nursing profession, with the recent opening of NHS Nightingale Hospitals in the UK.

She is credited with being the founder of modern nursing, but less well known is her work on ventilation and hospital design – and it is perhaps apt that, in these challenging times, the rapidly completed hospital is named in her honour (see also Florence Nightingale: nurse and building engineer, *CIBSE Journal*, June 2015).

It is worth contemplating why Nightingale's work on ventilation is less celebrated when the opening chapter of her seminal book, *Notes on Nursing* – first published in 1859 – focuses not on patient care, but on ventilation.[1] She writes: 'The very first canon of nursing... keep the air he breathes as pure as the external air, without chilling him.'

Nightingale continually emphasises the importance of ventilation in ensuring the swift recovery of patients and reducing cross-infection. She had considerable first-hand experience of the reduction in infection rates and health benefits provided by improved ventilation. This was at a time when germ theory was not well established; in the mid-19th century, it was acknowledged that – as well as expelling exhaled carbon dioxide – other unhealthy organic miasmas should be removed as quickly as possible.

Nightingale wasn't the first to identify the importance of ventilation in hospitals. Her conclusions in *Notes on Nursing* were the culmination of 15 years' work initiated by David Boswell Reid. His comprehensive ventilation systems were devised for hospitals in London, Copenhagen, Chicago and New York, long before the Crimean War (1853-1856) thrust Nightingale into the spotlight. However, she used her high profile to promote the need for ventilated wards.

There is important crossover in these times of a pandemic. Ventilation and air quality have not received the kind of exposure in the popular press as energy efficiency in recent years, yet it remains fundamental to the delivery of good indoor health and wellbeing.

"Nightingale had experience of the reduction in infection rates and health benefits provided by improved ventilation"

Nightingale's experience during the Crimean War of dealing with cross-infection – which was responsible for 80% of deaths – TB and other infective diseases would, I am sure, focus her attention on the ventilation design of all newly built wards. Without the kind of understanding of microbes and viruses that we have today, it was evident to her that ventilation was a primary solution to reduce cross-infection.

The primary means of transmission of the SARS-CoV-2 virus is believed to be through contact with contaminated surfaces or by large virus-laden droplets emitted by infected individuals. However, work undertaken on viral transmission over the past few decades, especially in the wake of the Sars epidemic in 2002-04, has looked at the role of virus-containing aerosols that may become entrained in air plumes and remain airborne for several hours, travelling much further than the 2m social-distancing requirement. »

Engraving, from 1873, of Florence Nightingale, who lived from 1820 to 1910

CHRIS IDDON, MCIBSE is chair of the CIBSE Natural Ventilation special interest group

An engraving showing Florence Nightingale in one of the wards of the hospital at Scutari during the Crimean War

» Bourouiba and Asadi postulate that such aereolisation could well be a route of transmission of SARS-CoV-2,[2,3] although it is important to understand that the further away from the source, the more diluted the virus will become.

Linsey Marr, a professor at Virginia Tech with expertise in airborne transmission of infective diseases, outlined in a recent tweet thread the implication of what this may mean.

At close range (imagine a plume of cigarette smoke), the concentration of airborne virus will be quite high. As you get further from the source, the concentration falls off rapidly. If you are close, you are much more likely to inhale the virus. You are also more likely to be sprayed by large droplets that land on your face, which doesn't happen if you're further away.

Viruses in small droplets can float around in air for many hours, but they will probably be quite diluted unless you're in a small confined space. You could inhale these, but it's much less likely than if you're close to the person.[4]

The key here, with respect to ventilation design, is the reference to a small confined space. Risk of infection is exposure × time, so it stands to reason that, in a poorly ventilated space, there is an increased risk of exposure time to virus-laden aerosols that are not being diluted sufficiently.

It is important to note that, because SARS-CoV-2 is a novel virus, there is little empirical proof that transmission can occur by exposure to such aerosols, with some circumstantial evidence beginning to emerge.[5,6,7,8,9] Nevertheless, we do have evidence that Sars and other viral infections do transmit via this route.

Nightingale did not understand fully about germ theory when promoting good ventilation design. Likewise, even if we do not know definitively that SARS-CoV-2 may transmit in this way, it is important that we, as building service engineers, give appropriate consideration to buildings being repurposed to house Covid-19 patients, to ensure ventilation solutions provide the maximum dilution possible, to help reduce infection risks.

We know that ventilation in some buildings is less than adequate, especially where occupants do not fully understand the principles of the ventilation design . So we should, where possible, remind building occupants to open vents and windows (taking care not to compromise pressure isolation areas) to ensure adequate ventilation and, in mechanical systems, turn off recirculation in HVAC, and increase ventilation rates where possible. It may just help reduce infection risk by ensuring adequate dilution of any airborne viral presence.

References:

1 F Nightingale, *Notes on nursing: what it is, and what it is not*, Harrison London, 1860

2 L Bourouiba, Turbulent gas clouds and respiratory pathogen emissions – potential implications for reducing transmission of Covid-19, *JAMA*. Published online 26 March 2020. doi:10.1001/jama.2020.4756

3 Sima Asadi, Nicole Bouvier, Anthony S Wexler and William D. Ristenpart (2020), The coronavirus pandemic and aerosols: does Covid-19 transmit via expiratory particles?, *Aerosol Science and Technology*, doi: 10.1080/02786826.2020.1749229

4 L Marr, Twitter, April 2020 **bit.ly/2VeOaog**

5 J Lu , J Gu, K Li, C Xu, W Su, Z Lai *et al* (2020), Covid-19 outbreak associated with air conditioning in restaurant, Guangzhou, China, 2020, *Emerging Infectious Diseases*. **bit.ly/CJMay20Idd2**

6 N Van Doremalen *et al* (2020), Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1, *New England Journal of Medicine*. doi 10.1056/NEJMc2004973 **bit.ly/CJMay20Idd3**

7 H V Fineberg, Rapid expert consultation on the possibility of bioaerosol spread of SARS-CoV-2 for the Covid-19 pandemic (1 April 2020). **bit.ly/CJMay20Idd4**

8 Guo Z-D, Wang Z-Y, Zhang S-F, Li X, Li L, Li C, et al. Aerosol and surface distribution of severe acute respiratory syndrome coronavirus 2 in hospital wards, Wuhan, China, 2020. *Emerg Infect Dis*. 2020 Jul [13-04-2020] **bit.ly/CJMay20Night1**

9 Lidia Morawska, Junji Cao, Airborne transmission of SARS-CoV-2: The world should face the reality, Environment International, Volume 139,2020,105730 **bit.ly/CJMay20Night2**

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A new guide, addressing issues of noise, ventilation and overheating for homes has been launched by the Association of Noise Consultants. Working group chair **Dr Anthony Chilton** explains how critical it is to consider the acoustic strategy at the design stage

This is the first guide to consider acoustics alongside ventilation for IAQ and overheating

MAKING A NOISE ABOUT ACOUSTIC DESIGN

Several years ago, in *CIBSE Journal*, I wrote about how overheating and poor indoor air quality in new homes was being exacerbated by occupiers not opening windows because of environmental noise.

High external noise levels can make opening windows undesirable, leaving occupants with no viable means to control summertime temperatures. Reluctance to open windows can have a knock-on effect on indoor air quality, when background ventilators are not sufficient to disperse pollutants.

Noisy mechanical ventilation systems can create a further issue, with research showing that occupants will turn off plant equipment if they find it too loud. Faced with these facts, it was clear guidance needed to be developed.

The Association of Noise Consultants (ANC), in collaboration with the Institute of Acoustics (IOA) launched the Acoustics Ventilation and Overheating (AVO) Residential Design Guide at the beginning of the year.

We received a considerable amount of support and interest from other organisations, including CIBSE.

Joining up the dots

The new guide provides a resource for practitioners and designers to balance the interdependence of noise, ventilation, and overheating in the acoustic assessment of new residential developments. Previously, there was no guidance available that considered acoustics along with ventilation for internal air quality and for mitigating overheating.

The indoor environment is determined by air quality, thermal comfort and acoustic conditions. The AVO guide brings these key issues together in a way that we haven't seen in any other international guidance. It aims to promote a collaborative design process, with good communication and timely coordination between disciplines.

This includes being aligned with the integrated design approach advocated by the *CIBSE TM60: Good practice in the design of homes*.

Members of the ANC's AVO group with Anthony Chiltern holding the guide

An example-led focus

Included in the guide is a worked example that sets out the typical design process in terms of:

- The activities that would be undertaken by the acoustic consultant
- The information that the acoustic consultant should be supplying to other members of the design team (for example, where simple opening windows are not likely to be a viable means to control overheating)
- The information the acoustic consultant may need from other members of the design team to make their assessment (for example, the area of façade openings and how frequently and for what duration they are required to be open to meet the overheating criterion).

Key considerations

We acknowledge, on challenging sites, it may be necessary to develop the design iteratively to arrive at a scheme that best addresses acoustics, ventilation and overheating.

The guide shows passive ventilation solutions, with a higher level of sound insulation than simple opening windows. These include the use of balconies/winter gardens, attenuated windows and acoustic louvres. **CJ**

DR ANTHONY CHILTON is a senior partner at Max Fordham. He chaired the Association of Noise Consultants (ANC) member companies that collaborated to produce the Acoustics Ventilation and Overheating (AVO) Residential Design Guide

Links

- The AVO guide can be viewed at **bit.ly/CJMay20Aco**
- A video from the launch event is at **bit.ly/CJMay20Aco2**

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Future homes standards for a net-zero future

This module explores the proposed revisions to regulations relating to environmental performance of domestic buildings

This CPD will consider the drivers for the proposed 2020 revisions to regulations governing the environmental performance of homes. This article principally considers areas that are associated with the thermal building regulations.

Under the terms of the 2016 Paris Agreement,[1] the majority of world states that are responsible for almost 97% of global greenhouse gas emissions agreed to become net-zero emissions economies by the end of this century, setting a 2050 target of reducing greenhouse gas emissions to 80% below 1990 levels. This was based on the goal to limit global warming to 'well below' 2K above pre-industrial levels by the end of this century – a limit that had gained popularity following economic modelling reaching back 40 years by 2018 Nobel economic science prize winner William D Nordhaus. The UK, responsible for about 1.55% of global emissions, had already set a target of 80% emissions reduction in the Climate Change Act 2008, and this was the driving force behind compliance targets within the built environment. Subsequent international research on the impact of climate change confirmed that small island states and low-lying countries would be inundated with sea water as higher temperatures caused more ice to melt and the seas to expand. Preventing global temperatures from rising beyond 1.5K would significantly improve their outlook. The *IPCC Special Report on 1.5°C*,[2] released in December 2018, effectively confirmed that the target must be a much more demanding 1.5K. As a result, the UK Climate Change Act was amended in June 2019 so that the net UK carbon account for the year 2050 is set to be 'at least 100% lower than the 1990 baseline'.

To determine how the UK can achieve this target, the UK government, in conjunction with the Scottish and Welsh Governments, commissioned research into what measures will be required to contribute to net-zero homes by 2050. The results showed that for the UK to achieve the new goal, many of the solutions cut across the multitude of contributing systems, and that 'fully integrated policy, regulatory design and implementation is crucial'.[3] Each government is looking to update the Building Regulations to set stricter compliance targets on the construction industry. Homes account for 20% of greenhouse gas emissions in the UK,[4] and this has provided the focus for the first set of consultations on future building performance legislation.

The UK government's first-stage consultation on the path to develop the England Future Homes Standard closed in February 2020, and principally focused on updates to Approved Documents Part L (Thermal) and Part F (Ventilation) of the Building Regulations for new residential developments. These are intended to encourage market and supply chain development, while representing a significant improvement on 2013 compliance. The consultation on the England Future Homes Standard presents a view of how government envisages residential buildings in 2025, and shares technical foundations with the Welsh Government's near concurrent consultation on the Approved Documents Part L and Part F of the Building Regulations in Wales. The 2020 revisions to Part L and Part F are »

» positioned as a 'meaningful and achievable' stepping stone to the 2025 standards.

It is proposed that new developments meeting the future 2025 regulatory requirement would produce 75- 80% less carbon dioxide emissions than those built to the 2013/14 Part L requirements. To achieve this, the final specification is likely to include low carbon heat technologies, such as heat pumps; waste-water heat recovery; and triple glazing and minimum standards for walls, floors and roofs that limit heat loss – potentially augmented by building-integrated photovoltaic (PV) power generation. The expectation is that with a future decarbonised electricity Grid, homes built to the meet the 2025 standards will become net-zero carbon over time, with no need for further adaptations or changes, as they will not be reliant on fossil fuels for their heating.

The consultation documents introduce a notional building design – including example heating methods and fabric – that is used to provide a performance target for compliance with the building standards, primarily in terms of Target Emission Rate (TER) and Target Primary Energy Rate (TPER), so as to align with those of the EU Energy Performance of Buildings Directive and determined through a calculation by SAP 10.1 (consultation version of the standard assessment procedure).[4] Depending on the specific defined regulatory 'option', the document defines values for fabric thermal performance; air leakage characteristics; ventilation method; heating method; heat emitters; shower flowrate; lighting intensities and efficacies; waste-water heat recovery; and the provision of a PV array. Table 1 summarises the main fabric proposals. Thermal bridging values (tabulated in table R2 of SAP 10.1 documentation[5]) are given for the two options (with many Option 1 'psi' junction heat loss values below those of Option 2). Compared with the previous values (SAP 2012 Table K1) the psi values are most significantly reduced in specific elements creating junctions with the external fabric (such as at lintels, eaves and gables). The notional reference buildings all incorporate large (low temperature) radiators.

Conformance of a design is primarily determined in terms of not exceeding the emissions and primary energy consumption of the notional building, while also keeping within the limiting U-values and air permeability set by the proposals. The Target Fabric Energy Efficiency (TFEE) rate of the previous incarnation of the regulations has been edged out by the modest improvements in the minimum standards for fabric performance, and is replaced by the total notional building performance (which includes a combined fabric and system performance). This has caused some concern – including in official consultation responses from CIBSE,[6] RIBA[7] and the Mayor of London[8] – as improvements over earlier standards using this technique may be largely delivered through changes in carbon factors (of the energy supply) rather than improvements to building performance itself. However, compliance requires meeting the targets for both the emission rate as well as the EPBD-compliant primary energy use, so as to provide a measure to limit the opportunity for thermally ineffective fabric designs. The 89.5% SEDBUK condensing gas boiler that is used in all options of the notional base case has caused some debate, as its inclusion might inadvertently normalise a natural gas boiler as being considered a 'low carbon' heat source – this is, of course, not the intent.

The ambition of the 2025 Future Homes Standard is to futureproof the design of new dwellings, and although other fuels – such as from a decarbonised gas network – may have a role to play in the future of heat, the emphasis appears to be mainly on electrical energy and heat network schemes. However, as identified in the Welsh consultation, 'the significant transition to low carbon heat requires the market

Building specification		Reference TFEE	Notional building			Minimum fabric requirements			
			England		Wales	England		Wales	
		Part L 2013/2014	Proposed Part L 2020		Proposed Part L 2020	Part L 2013	Proposed Part L 2020	Part L 2014	Proposed Part L 2020
			Option 1	Option 2	Options 1 and 2				
U-values ($W \cdot m^{-2} \cdot K^{-1}$)	Walls	0.18	0.15	0.18	0.13	0.30	0.26	0.21	0.21
	Party walls	0	0	0	0	0.20	0.2	0.2	0.2
	Floor	0.13	0.11	0.13	0.11	0.25	0.28	0.18	0.15
	Roof	0.13	0.11	0.11	0.13	0.20	0.16	0.15	0.13
	Windows	1.4	0.8	1.2	1.3	2.00	1.60	1.6	1.4
	Doors	1.0	1.0	1.0	1.0	2.00	1.60	-	-
Air permeability ($m^3 \cdot h^{-1} \cdot m^{-2}$ at 50Pa)		5	5	5	5	10	8	10	8

Table 1: Comparison of fabric performance parameters for England (Part L 2013), Wales (Part L 2014), and Part L proposals for 2020

UK homes account for 20% of greenhouse gas emissions

for technologies such as heat pumps, as well as those qualified to install these technologies, to be significantly developed'. This is somewhat echoed in the CIBSE feedback[6] to the Future Homes Standard consultation extolling that 'heat pumps are designed, specified, installed and operated correctly to deliver energy and carbon savings, and avoid high bills for the consumer'. The proposals also include a 'householder affordability rating' to prevent potential use of inappropriate – and possibly low capital cost – systems that then burden the occupier with high running costs. The details of this rating have yet to be developed.

The proposals for the 2020 England regulations presents two alternative options for consideration. Option 1, 'Future Homes Fabric' and Option 2 'Fabric Plus Technology', with target reduction in carbon emissions compared with 2013 standards of 20% and 31% respectively. Since the notional building fabric parameters (summarised in Table 1) are less demanding for Option 2, the performance benefits of Option 2 must be delivered through the active building systems that will, in many cases, be reliant on the inclusion of a PV array to ensure compliance, particularly if a natural gas condensing boiler is used. (The Option 2 notional building includes a $6.5m^2 \cdot kW^{-1}_p$, PV array of an area equivalent to 40% of the building foundation). There are many systems permutations that could meet whichever option is developed into the final standard from this consultation; many of the solutions would be likely to include heat pumps, as explored in the manufacturer example illustrated in *HVAC Specification Under New Regulatory Standards*.[9]

In December 2019, the Welsh Government published its proposal[10] to update Part L and Part F of the Welsh Building Regulations. Wales is aiming for a 95% reduction in greenhouse gases from 1990 levels by 2050, as recommended by UK CCC.[3] There are many technical and philosophical similarities between the consultation documents for the England Future Homes Standard and the Welsh Government's consultation; however, the Welsh proposals are more ambitious. It has two options for consideration – the first being a 37% reduction in CO_2 from new dwellings, compared with the current standards, and the second requiring a 56% reduction. Both options maintain the same fabric standards (see Table 1), and both options include the same PV as in the England notional proposals for Option 2. The Wales Option 2 performance standard notional building additionally includes mechanical ventilation with heat recovery (MVHR) and a higher rating of waste-water heat recovery system. Option 2 is clearly to encourage designers to explore opportunities for low carbon environmental systems that would likely include high performance heat pumps.

Regardless of the specifics of the notional buildings, the key message is that compliance with both the England and Wales proposals is based on meeting performance targets in reducing emissions and primary energy consumption.

The consultation presents a view of how government envisages residential buildings in 2025

Scotland is aiming to achieve net zero by 2045, five years earlier than England – in line with the UK committee on Climate Change (CCC) recommendations,[3] which identified that Scotland has a greater relative capacity to remove emissions than the UK as a whole. Coincident with this, the Scottish Government has an extremely ambitious legally-binding target for 2030 of a 75% reduction in emissions compared with 1990. The Scottish Government announced at the start of 2020 that regulations will be developed so that all new homes will use renewable or low-carbon heating from 2024.[11] It might be reasonable to expect that the proposed update to Section 6 of the Building Standards technical handbook for domestic buildings, supporting the Building Regulations in Scotland, will be more challenging than proposals set by the central UK or Welsh Governments.

In the absence of an executive since January 2017, the Northern Ireland Department for the Economy 'has been considering how to advance proposals for an energy strategy that will enable new and challenging decarbonisation targets'. Northern Ireland recently closed a call for evidence[12] as the first stage in the process of developing an energy strategy.

By the time the details discussed in this article become law – scheduled before the end of 2020 – the specific proposals are likely to change following collation and processing of comments resulting from the extensive consultation exercise. However, no matter what the detail, the trajectory will be the same, as building operation heads towards a net-zero future.

Turn to page 62 for references.

Module 161

May 2020

1. What is the proportion of global greenhouse gas emissions that is represented by the current world states included in the Paris agreement?

- ☐ A 1.55%
- ☐ B 2%
- ☐ C 75%
- ☐ D 80%
- ☐ E 97%

2. What percentage reduction in emissions are envisaged through developments that meet the 2025 regulatory requirements, compared with the earlier 2013/14 requirements?

- ☐ A 1.55-2%
- ☐ B 25%
- ☐ C 50%
- ☐ D 75-80%
- ☐ E In excess of 97%

3. Compared with the values used in the TFEE, which of the proposed U-values for the notional buildings shows the largest proportional reduction?

- ☐ A Wales – doors
- ☐ B Wales – floor
- ☐ C Wales – roof
- ☐ D Wales – walls
- ☐ E Wales – windows

4. Which of the following elemental psi values was noted in the article as having the largest reduction in its SAP 10.1 benchmark value compared with SAP 2021?

- ☐ A Corner
- ☐ B Flat ceiling
- ☐ C Flat roof
- ☐ D Lintels
- ☐ E Windows

5. Where is there a legally binding target to reduce emissions by 75% within the next 10 years?

- ☐ A All UK
- ☐ B England
- ☐ C Northern Ireland
- ☐ D Scotland
- ☐ E Wales

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References:

1 *The Paris Agreement*, United Nations Framework Convention on Climate Change,
2 *Global Warming of 1.5°C*, The Intergovernmental Panel on Climate Change, **www.ipcc.ch/sr15/** – accessed 19 April 2020.
3 *Net Zero – The UK's contribution to stopping global warming*, UK Committee on Climate Change, 2019, **www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/** – accessed 19 April 2020.
4 *UK housing: Fit for the future?*, UK Committee on Climate Change, **www.theccc.org.uk/publication/uk-housing-fit-for-the-future/** – accessed 19 April 2020.
5 **www.bregroup.com/wp-content/uploads/2019/10/SAP-10.1-01-10-2019.pdf** – accessed 19 April 2020.
6 *Part L and Future Homes Standard Consultation - CIBSE Response*, CIBSE , 2020, **www.cibse.org/getmedia/b365476d-1a0c-4ac4-a133-3e6aab84bbe6/Part-L-and-FHS-Consultation-CIBSE-Response.pdf.aspx** – accessed 19 April 2020.
7 **www.architecture.com/-/media/GatherContent/Test-resources-page/Additional-Documents/RIBAFutureHomesStandardResponsepdf.pdf**, RIBA – accessed 19 April 2020.
8 **www.london.gov.uk/sites/default/files/fhs_consultation_response.pdf** – accessed 19 April 2020.
9 *HVAC Specification Under New Regulatory Standards*, Glen Dimplex 2020, **www.gdhv.co.uk/future-homes-standard-download** – accessed 19 April 2020.
10 Consultation Document – Changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for new dwellings, Welsh Government, December 2019, **https://gov.wales/sites/default/files/consultations/2019-12/consultation-document-building-regulations-part-l-review.pdf** – accessed 19 April 2020.
11 **www.gov.scot/news/new-build-homes-to-be-more-energy-efficient/** – accessed 19 April 2020.
12 **www.economy-ni.gov.uk/sites/default/files/consultations/economy/energy-strategy-call-for-evidence.pdf** – accessed 19 April 2020.

› Product of the month

Penny drops as AET Flexible Space offers solution to historic building restoration

Unique underfloor AC system works well in old buildings where a lowered ceiling would reduce natural light levels

The restoration of historic London building Pennybank Chambers has made use of AET Flexible Space's underfloor air conditioning (UfAC) system so contemporary office space can be built into the original brick façade. The system means the new upper office floors benefit from generous natural light from the full-height ceilings and original windows.

The unique UfAC system uses the void beneath the existing raised access floor to create the air ventilation path, eliminating the need for high-level, ceiling-based services and the associated duct and pipework. This enables floor-ceiling heights to be maximised, and works extremely well in older buildings such as Pennybank Chambers, where a lowered ceiling would partially obscure the original windows and reduce natural light levels.

The floor-supply high-level return conditioned air module (CAM-V) units used at Pennybank Chambers distribute conditioned air into the space via the fantiles, which are recessed into the raised access floor. AET was able to use its specially designed TU350 slimline fantiles to accommodate the very shallow, existing 170mm floor void.

"The modular and flexible design minimises waste and energy consumption"

The used room air is then returned back to the CAM unit at high level, where it is reconditioned. The slim line TU350 fantiles were installed seamlessly into the new metal-tiled floor fitted throughout Pennybank Chambers' office space.

There is a considerable amount of flexibility as to where these fan terminals can be placed, allowing for easy reconfiguration depending on the particular needs or layout of an office.

Fantiles units are modular in their design, so offer huge CAT-B savings when reconfiguring the workspace compared with ceiling-based systems, which cannot be quickly or easily repositioned. The modular and flexible design also minimises waste and energy consumption.

For maximum flexibility, each fan terminal is supplied with onboard 'fatronic' controllers, which allow for personal, end-user fan speed and temperature setpoint adjustment.

Meeting rooms and cellular spaces can be controlled via AET's Flextouch wall-mounted controllers, which allow end users not only to adjust the fan speed and temperature, but also to monitor and control carbon dioxide and humidity levels.

Call 01342 310 400, email gbt@flexiblespace.com or visit www.flexiblespace.com

Pump Technology introduces its smallest wastewater lifting station yet ›

New from Jung Pumpen is the Hebefix Mini, which at 396mm (l) x 176mm (w) x 135mm (h) is easy to fit into spaces where other units won't – for example, below kitchen sinks, in tea rooms, or in domestic applications.

Part of the Hebefix family, the Hebefix Mini has many features, including: an integral pump capable of pumping up to 5m; a pressure-tight tank; a carbon filter; fitting kit; and alarm options.

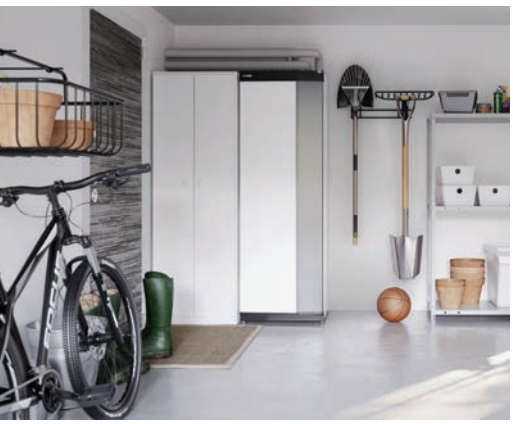
Visit www.pumptechnology.co.uk or call 0118 9821 555

Waterloo – a business continuity update ⌄

We are still operational across all departments and are continuing to support our customers, take orders, and manufacture and deliver products where customers' sites remain open. Currently, there are no increases in product lead times and our logistics network is delivering its standard next-day service.

We are maintaining a strong focus on providing a safe working environment for our employees, adapting our processes and working procedures to ensure we follow government guidelines.

Visit www.waterloo.co.uk, call 01622 711500 or email sales@waterloo.co.uk



‹ The future of heating: NIBE S-Series

With integrated flow meters, the new S1155 and S1255 range from NIBE can now log delivered energy, allowing consumers to easily view heat generation and understand performance within their indoor climate system.

New installer features enable remote diagnostics of systems and fault-finding, reducing the need for unnecessary site visits. For simple and quicker diagnostics, new circulation pumps with Linbus connectivity communicate with the heat pump to detect faults within the system and create useful alarms.

Call 0330 311 2201 or email customer.services@nibe.co.uk

New software launch for DMTouch

Resource Data Management (RDM) has announced a major software launch for DMTouch. Delivering more than 130 new features, powerful enhancements and changes – and with the ability to communicate across open protocols – software version 3.1.0 is aimed at further strengthening the market position of the DMTouch, which already has a 10.1-inch touchscreen. Boasting the highest number of new features in a single release to date, the new software is compatible with RDM's soon-to-be-released Bluetooth Mesh technology.

A large proportion of the new features enhance the user experience, making it even faster and slicker for them to access data and manage devices across their building or site. RDM says users will benefit from a faster set-up time, streamlined navigation, and a more detailed display of data. As a time-saving measure, auto-populating of data, mimics and disciplines have been added.

Visit www.resourcedm.com

Rinnai open for business

Rinnai UK remains open for business throughout the current coronavirus situation, with staff able to take orders or enquiries via telephone or online.

We believe it is critical and a duty to do our part in helping stop the transmission of Covid-19. We have staff who can – and are – working from home, and business is continuing as usual via phone and internet.

Rinnai has very good stock levels of all units in the range, plus spares and accessories.

Call 01928 531 870 or 0203 903 9030 or email info@rinnaiuk.com

High-efficiency Carrier chillers chosen for new MRI scanner

A new multimillion pound MRI scanner facility at NHS University Hospital of Wales, Cardiff, is being cooled by high-efficiency chillers from Carrier. The chillers deliver a combined cooling capacity of 900kW, and provide the stable, reliable cooling required to maintain the high-tech diagnostic equipment in peak condition.

With Carrier's Greenspeed intelligence, the chillers have variable-speed water pumps and condenser fans to match cooling output to current load conditions precisely. This allows the system to operate with outstanding part-load efficiency.

Visit www.carrieraircon.co.uk or follow @Carrier on Twitter

Make the right choice with the Grundfos Product Center

The Grundfos Product Center is a bespoke online search and sizing tool to help users choose the right pump to meet their needs.

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The hub attracts people with a broad range of interests in delivering pump solutions – from family homes, to commercial buildings and industrial applications, as well as clean and wastewater solutions.

This flexible platform is available whenever needed, and can be used for a variety of requirements, including sizing pumps, browsing the Grundfos product catalogue, finding appropriate replacement pumps, or sourcing pumps for handling specific liquids.

Regardless of the application, this is designed to be the definitive, one-stop shop for all things Grundfos related.

Visit www.grundfos.co.uk/gpc

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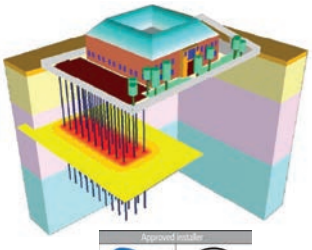

EVENTS

Event details are correct at the time of going to print but, please note, as a result of the ongoing coronovirus (Covid-19) situation, they may be subject to change. For updates, please check cibse.org/training and cibse.org/events for CIBSE groups and regional events. CIBSE has a range of online learning courses available to support your learning. Visit cibse.org/training-events/online-learning

CIBSE AGM

5 May

The CIBSE AGM will be followed by an address from incoming president Stuart MacPherson.

This event will be held online. Details will be available at **www.cibse.org/agm**

CIBSE ASHRAE TECHNICAL SYMPOSIUM

14-15 September, Glasgow

The CIBSE ASHRAE Technical Symposium will now take place 14-15 September at the University of Strathclyde, Glasgow. This year's theme is 'Engineering buildings, systems and environments for effective operation', and presentations will include case studies, research papers and poster presenations. Topics already confirmed include: heat networks for a low energy future; solar and passive strategies towards net zero; hydrogen and thermal batteries for low-impact buildings; IAQ – novel methods for evaluation, assessment and control; intergration of fire safety and smoke control; and tall and mega-tall buildings – reality of net zero.

Booking is now open at **cibse.org/technicalsymposium**

BUILD2PERFORM LIVE

24-25 November, London Olympia

Registration is now open for the 2020 Build2Perform Live event and exhibition. The free two-day event will feature more than 80 hours of CPD, 160 speakers and 70 exhibitors, as well as the announcement of CIBSE awards winners **www.build2perform.co.uk**

CIBSE MEMBERSHIP BRIEFINGS

CIBSE will continue to support those wishing to progress their membership, and will be hosting membership briefings as webinars. The main focus of the sessions will be on applications for the Associate and Member grades and registration with the Engineering Council at Incorporated Engineer and Chartered Engineer levels.

For more details and dates, visit the CIBSE website at **bit.ly/CJMay20Event1**

CIBSE TRAINING

Because of coronavirus, CIBSE Training is currently unable to offer classroom training. The team is working hard to find a safe solution by running the training online.

Please check **cibse.org/training** for updates.

ONLINE LEARNING

CIBSE has a portfolio of online learning courses, which contain interactive content with quizzes and additional resources to support your learning. Choose from core engineering modules, Digital Engineering (Basics of BIM) modules, and soft skills modules to enhance and support your development.

CIBSE #GrowYourKnowledge Webinars

CIBSE has launched a free webinar series, taking place every **Thursday at 11am**. It is designed to support the CIBSE community in maintaining its CPD remotely.

Each webinar features a 20-45 minute presentation, ending with an interactive Q&A.

All previous webinars are available on the **#GrowYourKnowledge** GoToWebinar channel 24 hours after recording.

Upcoming webinars include:

7 May – Becoming a CIBSE Fellow
14 May – Heat Pumps: specification, integration and whole-life impact

Previous webinars include:

- **CIBSE symbols: a new digital tool**
- **Routes to membership**
- **Cicadian lighting for health and wellbeing**
- **CIBSE climate action plan**
- **TM40 (2020) Health and wellbeing in building services**

To register for the webinars, visit cibse.org/growyourknowledge

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The CIBSE Young Engineers Awards recognises excellence and showcases diverse, hard-working graduate engineers and apprentices, and the success stories of past winners.

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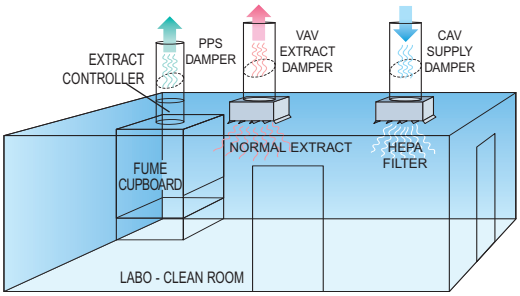

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