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Contingency plan

Resilience is about more than energy efficiency – it's also about making buildings adaptable to deal with future obstacles and opportunities. London's Royal Academy has done just that (page 14). Its new boiler plantroom – which consolidates the heating generation across the estate – allows for the implementation of critical electrical infrastructure upgrades when energy sources change.

The Zig Zag and Kings Gate buildings, in Victoria Street, London, have also been designed with the future in mind (page 18). Not only do they have linked energy centres that enable the transfer of heating and cooling, but the scheme also allows for connection to a district heating network at a later date.

There are many pressing issues around heat networks at the moment, so we have included three articles that examine how to achieve improved performance through correct pipework sizing, good installation, and proper commissioning pre-handover.

There is also a look at upcoming regulations (page 5). We may be Brexiting, but the industry is still responding to the EU and tightening space-heater rules. On page 23, Chris Shelton says a new water-treatment guide is very welcome in an industry with many issues.

LIZA YOUNG, DEPUTY EDITOR **lyoung@cibsejournal.com**

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Towards a healthy bottom line

There's no getting away from the fact that UK buildings are unnecessarily wasteful. The Carbon Trust claims that energy-inefficient equipment causes businesses to waste 20% of their annual fuel bills. As a large user of energy in buildings, heating offers huge scope for efficiency gains. So where to start?

In the many buildings that rely on commercial boiler plant for their heating, the solution can be as simple as an upgrade. Just replacing old or inefficient boilers with modern high-efficiency condensing ones – and adding controls – will deliver rapid energy and emissions savings.

Reliable, well-controlled, energy-efficient heating will also contribute to the comfortable, sustainable environment associated with a healthy, more productive workforce. The latest report for the Green Building Council estimates that staff account for 90% of a building's operating costs. So these health benefits from improved heating efficiency will impact positively on the company's bottom line.

With manufacturers continuing to innovate to answer some of the biggest heating challenges, refurbishment is even easier.

The latest models of condensing boilers easily meet all legislative requirements, with near-maximum gross efficiencies and ultra-low Class 6 NO_x emissions. An even smaller footprint and clever design offers numerous options for space- and energy-saving modular configurations. Because a well-controlled system is key to their efficiency, the newest arrivals have intuitive time and temperature controls as standard.

Increased comfort and wellbeing, improved productivity and profitability – addressing heating efficiency makes everyone a winner.

JAMES PORTER is sales director at Remeha
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remeha

Councils get share of £24m for heat networks

The government has announced that 13 local authorities across England are to receive a slice of just over £24m to help them develop heat networks.

This is the first round of funding from a £320m pot announced last year to support the technology.

Climate Change and Industry Minister Nick Hurd said these projects would 'help deliver low-carbon energy at competitive prices for local consumers'.

Councils submitted applications for funding and nine of the winning authorities will now share just over £24m of capital funding to support the building of their projects. Around £200,000 in early-stage funding will also be given to four other local authorities to develop their plans.

Four projects in London, two in Manchester and one each in Sheffield, Crawley and Colchester are at the construction stage. Support was won at the planning stage for projects in Trafford, Islington, Buckinghamshire and Middlesbrough.

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Rolled out over five years, the scheme should enable up to 200 heat networks to be built and attract around £2bn of wider public and private investment. The current government was aiming to launch the main funding scheme by the end of 2017.

NG Bailey puts 'eco heart' into west London train depot

NG Bailey has completed the design, build and installation of a modular, central boiler plantroom, for a new train-maintenance depot at Old Oak Common Lane, in west London.

Trains using the depot will serve Transport for London's new Elizabeth Line – previously known as Crossrail – which will run east-west across the capital city. The depot has stabling sidings for 33 of the line's 66 new trains, as well as a nine-track operating, maintenance and control building.

NG Bailey is responsible for the £14m mechanical, electrical and plumbing services for the site.

Lee Taylor, director of rail at the company, said: 'This is one of the largest depots to be built in the UK in recent years and sets a new sustainability benchmark that will, undoubtedly, form a blueprint for future depots.'

The plantroom comprises six 24m^2 modules, containing the central boiler plant and pipework, which interface with renewable energy systems.

The Energy Efficiency Directive and space heaters

Dimplex's Chris Stammers assesses the potential impact of Lot 20 on local space heaters in the commercial sector

CHRIS STAMMERS is product marketing director at Dimplex

We are yet to discover the consequences of triggering Brexit, but one thing remains constant across the European Union (EU) – our need to use energy more efficiently. As much as 55% of energy consumed in commercial buildings is used on heating, so it is easy to see where savings could be made.

Lot 20 of the Energy Efficiency Directive (2015/1188) supports the EU's commitment to cut CO_2 and other greenhouse gas emissions by 20% by 2020. It states that all local space heaters – manufactured for sale into the EU after 1 January 2018 – that use electricity, gaseous or liquid fuels, must comply with a minimum efficiency standard. Local room- (or space-) heating products are defined as appliances that heat indoor spaces by generating heat at the same location as it is needed.

In the commercial sector, Lot 20 will apply to local space heaters with 'a nominal heat output of the product, or of a single segment, of 120kW or less' – as long as the main purpose of the product is to deliver heat inside a building. This includes radiators, panel heaters and high-heat-retention heaters, which are specified to deliver reliable heating – with quick warm-up and cool-down – in industrial units, offices, leisure facilities and multiple-occupancy residential buildings, such as student housing. It will also include over-door heaters, commercial fan heaters and air curtains.

For other appliances, the European Commission has introduced an energy efficiency labelling system, to drive the specification of more efficient products. However, electric space-heating appliances are always 100% efficient at point of use, so labelling was inappropriate. Instead, a primary energy-conversion coefficient of 2.5 will be introduced to calculate the seasonal space-heating efficiency of electric appliances. Manufacturers will have to incorporate a range of technologies to enable the products to meet minimum efficiency targets, in line with a complex 'scoring system'.

A series of features may be incorporated into products, all of which 'score' differently according to the 'correction factor' specified within the regulations. For example, entry-level portable products will have to include at least electro-mechanical room-temperature controls under Lot 20.

There is a real opportunity here for electric space heaters, in particular, to drive efficiency through intelligent, adaptive controls. The latest installed products will need to include such things as temperature control with presence or open-window detection, distance control via an app, and even adaptive start control. By developing combinations of these features, electric heating manufacturers can offer specifiers and building managers functional, user-friendly and economical products that comply with Lot 20 legislation.

One size doesn't fit all

Pipework oversizing is a major cause of poorly performing heat networks, says Thermal Integration's Richard Hanson-Graville

There is no doubt that heat networks often perform inefficiently. Meter data regularly demonstrates that most of the energy generated is wasted, to the point where SAP proposals assume only 50% efficiency. Much worse has been recorded. Closer examination of the practices surrounding pipe-sizing in district heating networks has identified flaws in the guidance that result in considerable oversizing of pipes within buildings and excessive thermal losses.

To get to the heart of the matter, pipe-sizing requires two goalposts. One concerning pump energy, where larger pipes reduce energy use and a limit of 200Pa/m is typically used, and one regarding thermal energy, where smaller pipes lose less heat, can respond to instantaneous demands without significant delays, and can maintain enough velocity to clear dirt and air.

It is common to size to 200Pa/m as a rule. The lower velocity limits of 0.5-0.75 m/s in guidance are ignored on the basis that a central filter acts as an escape clause. Hower, the lower velocity limit is important for healthy pipework within buildings. It ensures debris and air are regularly moved by introducing more energetic turbulent flow, so dirt can actually get to the dirt separator.

The 200Pa/m rule takes no account of thermal losses, and is only part of the sizing calculation – it is not the rule by which to size all pipes. That's quite easy to prove by looking at pressure losses for 15mm to 35mm copper tube. If one attempts to stick to 200Pa/m, it also becomes impossible to satisfy minimum velocity requirements. This implies that one should not be using pipes as small as 35mm in a heat network.

Within a building, different rules apply. There is far more pipework surface from which to lose heat and, within a well-insulated building fabric, a heat network acts like a radiator system. If all pipes are systematically oversized, and kept hot at all times through the use of bypasses or trickle, then we have heat networks that overheat the buildings they serve, and which can cost users more than double the energy rate from a traditional boiler. Furthermore, they contain far more debris than they should, with corrosion more of a problem to pipes.

One of the symptoms of a poorly performing heat network is return temperatures measured only a few degrees lower than the flow – such as 80/78°C. This can almost double heat loss when you consider a system should be capable of running with return temperatures below 30°C all year round. A network operating at 80/30°C, rather than 80/78°C, requires far smaller pipes, loses far less heat, is significantly cheaper, and can make use of waste heat and heat pumps.

"The standard methods used to distribute heat within a building need to be revised"

Lengths of flow pipe that can be left to go cold when not being used, should be left to go cold, or timed, as long as domestic hot water (DHW) response times can be satisfied. Any relatively short runs of pipes that are left to go cold should be sized accordingly – to minimise volume by using smaller pipes and maximising velocities within limits. The practice of keeping heat interface units (HIUs) hot all the time should be a last resort, as it simply wastes energy when they are not needed.

It is possible to use pipes as small as 15mm to service properties, while still keeping within standard limits on velocity – both upper and lower (see graph associated with this article at **www.cibsejournal.com**). Pipework of 22mm covers a small group of properties. Yes, there are significantly higher pressure drops – nearer 500 to 1,000Pa/m for 22mm at peak DHW load – but we are talking short runs of pipe, typically less than 5% of total length, so the higher pump energy required for the brief moments of peak DHW load is insignificant, compared with the savings in thermal losses.

Which leads to diversity. For several years, guidance has led one to consult the Danish standards. However, the calculations required to adjust the standard diversity curve to suit various property types are not yet available in English. The lack of simple guidance on how to calculate diversity is a significant factor in pipes, and plantrooms, ending up larger than they need to be.

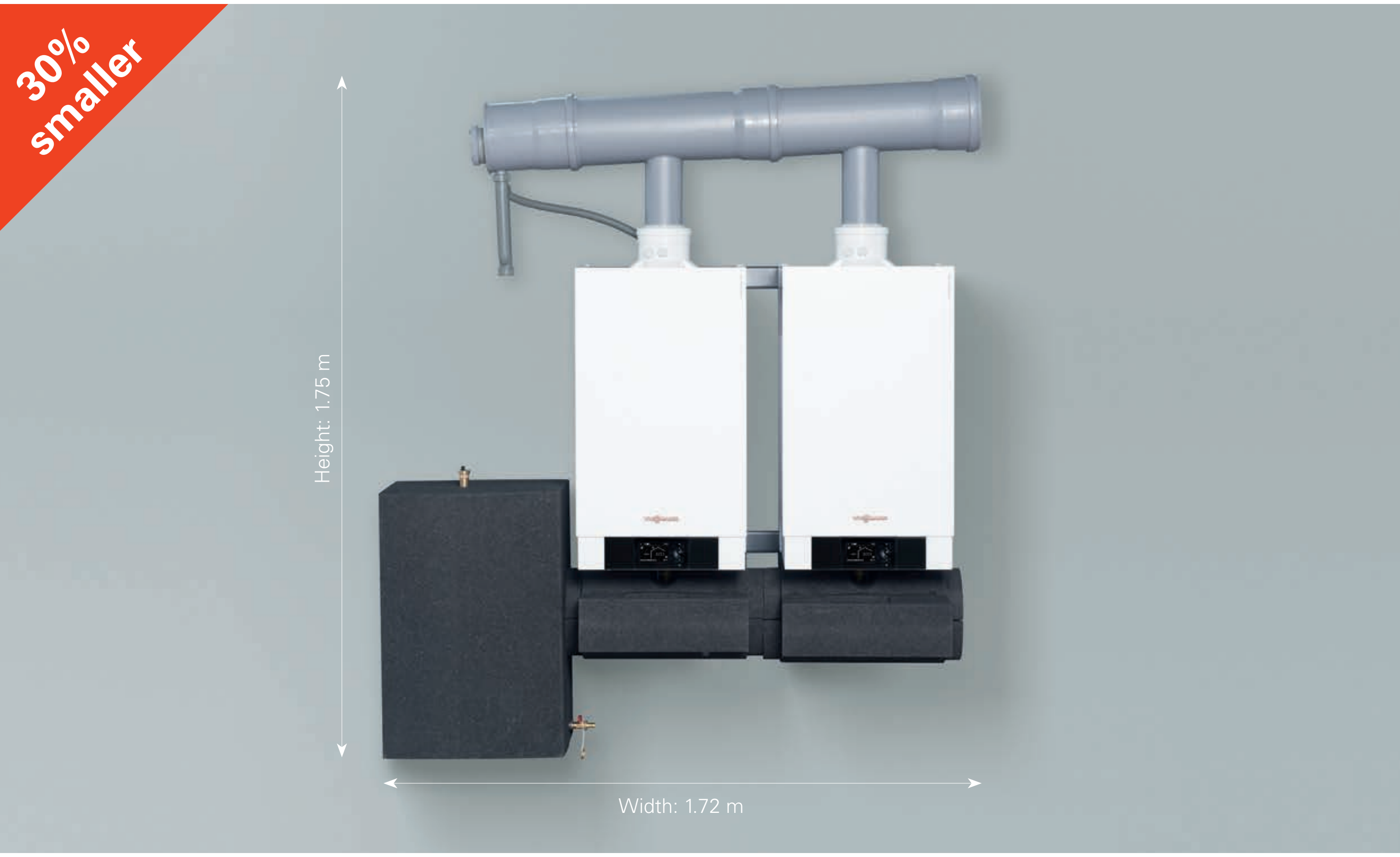
If we are to guarantee that heat networks will perform as efficiently as a domestic gas boiler, the standard methods used to distribute heat within a building need to be revised. It is not enough to rely on designers or installers having the experience to know better than guidance suggests.

We have developed an online tool to help designers size pipes correctly, and to use other control strategies, most notably when it comes to keep-warm temperatures deployed by HIUs. The tool makes full use of diversity calculations and thermal losses based on individual pipe temperatures, to give a feel for losses. Pump energy, boiler sizing, and thermal-store sizing calculations are also included, based Energy Saving Trust trials data.

■ Heat network calculator is at **bit.ly/CJMay17DH1** A study on pipe-sizing is at **bit.ly/CJMay17DH2**

RICHARD HANSON-GRAVILLE is technical manager at Thermal Integration

New Vitodens 200-W cascade 30% smaller, 50 % faster



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What a difference a year makes – for heat networks

With a year's worth of heat networks' performance data, FairHeat's Gareth Jones explains how issues are being rectified before systems are handed over

Quantifying the performance of our buildings has never been more important. This is particularly true when we talk about heat networks.

As essential ingredients of our future energy landscape, it is vital that these systems work as they were designed to do.

A year ago, Guru Pinpoint technology was released to visualise the performance of heat networks in real time (See 'On a mission: using data to optimise heat networks', *CIBSE Journal*, April 2016), and it's changed the way many are designed, specified, commissioned and operated.

We have learned a lot in that year. Unfortunately, we continue to see certificates issued for systems that have not been commissioned correctly.

Using data, we are now able to shine a light on performance from the outset, enabling issues to be rectified before systems are handed over. This is crucial because, on most sites, we typically find one or more systemic issues that will affect long-term performance, and a host of smaller, hidden commissioning-related problems.

How do we know? We have developed a standardised approach to testing performance on all our projects. We inspect every flat and monitor performance under different operating conditions using Guru Pinpoint.

By getting in early and ensuring the contractor rectifies issues before handover, we have seen great results.

A recent scheme has seen volume-weighted average return temperatures drop by 22°C, with volume-weighted average return temperatures from dwellings of 33°C. We reduced losses from return pipework by 75% and saved some £65 per dwelling, per annum.

Thanks to data from sites with issues, we know what can go wrong and where the weak points are. This has enabled us to work with clients to develop standardised design briefs for new developments with heat networks. Specifically, we have developed a design supplement that acts as a bridge between our clients' requirements and the *ADE CIBSE Heat Networks Code of Practice (CP1).*

Historically, concerns about professional indemnity exposure has led many designers to take an overly cautious 'more is better' approach to sizing new heat networks. As a result, they are often grossly oversized.

> "Good network performance can be the norm if we learn from past mistakes"

In most cases, our data shows that peaks are three to four times lower than design. This is having a big effect on the sizing of networks, with a corresponding impact on both capital and ongoing heat costs.

Design consultants have not formerly had the information to enable them to feel comfortable in reducing sizes; this position has now changed. We have found we can strip as much as £2,000 per dwelling from capital expenditure by using data to inform design – despite enhancing specification of the insulation and other items. This results in better, high-performance systems.

We are in the early days of this kind of approach and there is still an education piece to do – and not just with contractors.

Recently, we were presenting the results from a project to a client. A senior technical member of staff was surprised to hear that we were seeing return temperatures in the 30s. We are, in fact, often seeing return temperatures in the 20s, during morning peaks (see Figure 1).

This kind of performance should be the norm – and it can be, if we take a step back and look at how networks are actually performing in practice and learn from past mistakes.

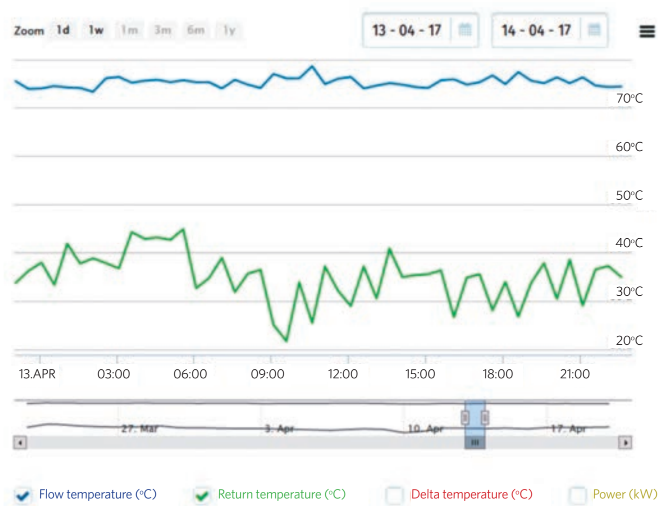


Figure 1: A day's worth of data from a block level meter on a new-build development, from Guru Pinpoint

GARETH JONES is managing director at FairHeat

The tale of the troublesome train sheds

The advent of High Speed Two will require a new generation of train sheds. AmbiRad's Nick Winton looks at radiant heating solutions for these challenging types of railway building

High Speed Two – the proposed new rail link between London, Birmingham, Manchester and Leeds – is expected to cut journey times and ease congestion on crowded lines.

The project's £55.7bn budget covers not only track infrastructure, but also its associated buildings, including the sheds where rolling stock will be housed, repaired and maintained.

Rail sheds are often used intermittently and at irregular time intervals, so heating them efficiently is difficult. They are long and narrow, with large doors at each end that are constantly being opened. The doors often occupy the full width of the building and may be left open for hours, creating a wind tunnel effect where cold air is drawn through the shed at high velocity.

Air infiltration can disrupt comfort conditions, so a heating system must have the ability to recover rapidly and sustain a comfortable environment once doors are closed. Ambient or heated air curtains over – or to the side of – doors can mitigate this.

A cold and wet train entering the shed creates a cold sink, and the fact that maintenance is often carried out at night compounds the inhospitable climatic conditions. Partial occupation means it is important that the heating system can be zone-controlled easily and effectively.

Rail sheds lend themselves to radiant heating systems. Overhead tube heaters, produce infrared heat that is directed downwards by a reflector; it passes through the air without warming it and falls on people on the ground, rather than heating the whole building. By eliminating air movement, convective loss of heat from the body will also be reduced. Radiant heat can be controlled directionally, so only the occupied areas need to be heated.

Heating specifications differ according to the type of engine being housed. Designers have to respond to four types in the UK: steam; diesel; electric with power from the third rail; and electric with overhead power.

In **steam sheds**, the vast amounts of steam released by locomotives is captured by massive hoods in the roof space and released into the atmosphere. When designing a heating system, accounting for these hoods is critical. The majority of work undertaken is at low level, so ensuring heat between the tracks on the platform and in the pits is vital. Some rail sheds are longer than 300m, and using extended lengths of radiant emitter enables heating of long distances between trains.

Bombardier trains undergo maintenance in a train shed

The sheer size of the sheds means heating-system design is paramount to ensuring optimum zoning capabilities, both for operational flexibility and for rapid response to a change in conditions.

Many **diesel sheds** date back to the steam era, so some still lack good insulation. Diesel locomotives also have hoods to collect the fumes from the engines but, because of the contaminated atmosphere in these sheds, gas-fired radiant heating systems have to be designed with a ducted fresh air supply from outside. This ensures the filters within the gas-burners are kept free of diesel fumes. As the majority of work is done at low level, the heating system should operate in different zones.

No diesel fumes means **electric locomotive sheds (power via 3rd rail)** tend to be cleaner and do not require ducted air to the gas burners of a radiant heating system. The work on these trains is primarily at low level.

Electric high speed locomotive sheds (overhead power) are well insulated. The cleanliness within the sheds – compared to diesels – again means there is no need for ducted air to the gas burners. Unlike the previous types of locos, work has to be undertaken on top of the train to maintain the power unit. As a result, the radiant emitter cannot be too close to working areas above trains. This is a challenge for designers – but not insurmountable. An ability to zone the radiant heating is paramount.

Nick Winton is the divisional manager at AmbiRad

Burying an investment, not an expensive problem

The design and installation of pipework is often overlooked in the delivery of heat networks, with potentially catastrophic consequences for performance, says Colin Taylor of Eneteq Services

The quality of the design and installation of pipework is key to the successful implementation and operation of heat networks. If pipework fails, the repercussions for operators can be far-reaching and expensive. A leak that can't be detected, for example, could result in a whole network being isolated and multiple excavations being undertaken to pinpoint the problem.

Heat Networks: Code of Practice for the UK states that district heating networks should last 50 years, but they have to be designed and installed in the right way to achieve such longevity. For those procuring heat networks, this means giving contractors time to understand what is in the ground, to plan pipework routes and logistics, and to ensure accurate monitoring is in place.

Eneteq installer works on joint casings at London Wall Place, Moorgate

One of the key things to understand is that Britain is not Sweden or Denmark, where heat networks are well established. The logistics and site constraints in the UK make installation much more expensive; its cities tend to have narrower streets – much more congested with services – than, say, Gothenburg or Stockholm. For example, Eneteq was appointed for the network installation works at Elephant and Castle, in London, where we had a trench hemmed in by a bus lane and a pedestrian footpath, neither of which we were allowed to use for access purposes. This meant the pipe had to be dropped in one end and manhandled, on pipe bogies, down 280m of trench before it could be welded and jointed.

Despite such complexity in the UK, the time and cost of construction and installation of pipework is generally not considered. Other utilities have to be taken into account when designing a system. In congested areas, heat network pipes will have to be installed underneath other utilities, which means moving pipes carrying water, electricity and gas, and putting them back in place. If we cannot go under the pavement, we have to go into the carriageway, which requires road closures and parking-bay suspensions – and more expense.

Factory-bent pipe installed at Graylingwell Park, Chichester

Logistics of delivery and site storage also need to be taken into account. For example, a Bristol project includes pipes that are 12 metres long and »

Single pipe installed in a fully sheet-piled trench beneath the bus lane in Rodney Road, Southwark

"It costs more to dig up the road to repair a leak than it does to do the job properly in the first place"

> "In the UK, pipe is welded, tested, jointed and buried. It then expands when hot water warms it, resulting in high levels of stress and movement"

» weigh half a tonne each. The trench crosses a roundabout and is to be undertaken in phases, but there is no obvious place to unload and store the pipe and fittings. So consideration must be given to how and where to unload, whether to use a crane, and how the pipe is to be transported to – and laid within – the trench.

When planning, think about additional materials that might be needed on site, and what the lead times are. Will special or bespoke joint casings be required? If so, can these be manufactured on site, or should additional fittings be held there to minimise delays to the programme of works – but with the potential for additional waste?

One consequence of the UK's relative inexperience in this area, compared with Norway and Sweden, is that firms tend to cold lay. This means pipe is put in the ground without being heated before the trench is backfilled – it is merely welded, tested, jointed and buried. Pipes then expand when hot water warms them, resulting in high levels of forces, stress and movement – which have to be mitigated by correct pipe and trench design. In the Nordic countries, contractors install pipework in an open trench, join it together, and – before installing joint cases – plumb it into the return pipe to prove it has no leaks. They then backfill when warm, reducing the stress in the pipework.

The industry is hampered by standard specifications; the majority of mainstream consultants are guilty of 'turning the handle' using the same specification from previous projects, when more understanding of specific conditions is required.

The design and installation of pre-insulated pipe has to be done early in the project. To minimise risk – and, therefore, cost – ground-penetrating radar and trial pits need to be used, especially when a desktop study of existing services shows areas of congestion. Flexibility is needed because we will not fully understand what is in the ground until the trench is open.

Eneteq Services adopts a 'once only' policy on the basis that it costs more to dig up the road to repair a leak than it does to do the job properly in the first place. We itemise every weld and joint. As well as the unique weld number, we record: the type of joint; who did it; the pipe size; how it was tested; whether a non-destructive test (NDT) was undertaken; the GPS coordinates; and how – and when – it was pressure-tested.

Continual leak-detection monitoring is key to a long life expectancy. If the network has been correctly designed – with an accurate 'as installed' wiring diagram – we can pinpoint where leaks occur. Detection involves embedding two wires through the pipework casing. Resistances on the wires are recorded when pipework is installed and commissioned. It is tested when dry, when it is full of cold water and when it is hot – and again three months later. These benchmark readings can be compared with future readings to understand how the network is performing and highlight any areas of concern.

A leak is not necessarily water egress from the service or carrier pipe; it can be groundwater ingress, which – because of its mineral and salt content – is very corrosive to steel. It is highly likely that damp patches will be 'trapped' in the pipes' outer casing during installation; it rains in the UK and water tends to run into trenches. However, if we know where the damp patches are, they can be monitored. They may dry out or disperse, but – if they remain static and there is no oxygen – they will not cause deterioration.

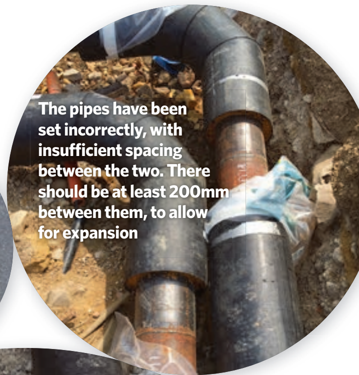
Competent, trained people should install pipework. We send our staff to Sweden or Denmark to work with local contractors in the trench, to improve their understanding of the process and the consequences of poor installation practices. Most failures in pipework result from poor design and implementation. This overlooked area of district heating can be the cause of big losses, both in terms of finance and performance. Remember, the design and installation of pipework are about burying an investment, not an expensive problem.

■ **Colin Taylor** is director and co-founder of Eneteq Services, a specialist designer and installer of heat networks

Chambers of horrors


The outer casing on the 45-degree bend has been cut back, instead of the length of the main pipe being reduced. This will result in expansion movement being applied on the joint casing, rather than the pipe casing


Chamber too small for standard valves, fittings and loose lagging


The pipes have been set incorrectly, with insufficient spacing between the two. There should be at least 200mm between them, to allow for expansion


Insufficient space in culvert to apply the joint casing


Pipes laid over existing low-voltage cables and ducts; one duct has had a section removed because the live cable had insufficient slack to permit the pipes to be laid. A minimum gap of 100mm should be allowed between crossing services

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CREDIT / BURLINGTON HOUSE, ROYAL ACADEMY OF ARTS © FRASER MARR

Academy reward

London's Royal Academy has a masterplan to transform its historic estate. Andrew Brister reveals how new rooftop heating plant ensures services are fit for the next phase in its future

The Royal Academy of Arts (RA), on London's Piccadilly, will celebrate its 250th anniversary next year, honouring its remarkable history as a place to make, exhibit and debate art. To mark the occasion, a stunning transformation of the Academy's buildings will be unveiled, revealing plans to open up the RA as never before.

Led by internationally acclaimed architect David Chipperfield – and supported by the Heritage Lottery Fund (HLF) – the £50m revamp will link Burlington House, on Piccadilly, and the Burlington Gardens building behind, to unite and revitalise the two-acre site.

New public areas will be created, including dedicated spaces for exhibitions and displays of the RA's historic collection, contemporary art projects, and new work by Royal Academicians.

A double-height lecture theatre, with more than 260 seats, will enable the Academy to build on its rich heritage of rigorous and lively debate. New facilities will enable it to offer a better welcome for visitors and there will be an expanded learning programme, as well as more spaces for the RA Schools.

Running alongside the Chipperfield masterplan is a massive gallery refurbishment and plant upgrade programme. The phased delivery has resulted in the mechanical and electrical (M&E) services that supply condition-critical exhibition spaces throughout the building being overhauled. Older equipment nearing the end of its life has been brought up to date, while plant has been shifted away from valuable basement space to new rooftop locations.

Boiler plant modules had to be craned in during the night

'The majority of the galleries were run off old DX [direct expansion] units that were at the end of their useful life,' says Kyle Peters, senior project manager and client representative at the RA.

'We looked to implement a new system that would be more efficient, improve plant life and allow for easy replacement strategies in the future.'

A series of plant pods on the roof has resulted in the DX approach being replaced with chillers and air handling units (AHUs) – with prefabricated sections craned into place at night and between exhibitions of highly prized, indemnified artworks.

The plant upgrade programme has included the first steps in the overhaul of the RA's heat-generation plant, bringing services together into one, newly designed, central plantroom. 'We had a collection of old, very large boilers in the basement of Burlington House,' says Peters. 'We looked at whether to replace them in situ, or to improve the location at the same time.'

With hot water having to travel large distances from the basement to the new AHUs on the roof, it made sense also to relocate the boiler plant, freeing up the basement for future use. 'A previous phase of the works had seen a new plantroom on the roof, for the Sackler Wing, library and print room,' says Peters. 'We have added the new boiler plant alongside, to complete one very large plantroom, running the whole way across the building.'

The RA appointed Arup as services designer on the bespoke heating system. 'The new boiler plantroom consolidates the heating generation across the RA estate,' says Vasilis Maroulas, associate at Arup. 'It centralises the maintenance regimes, liberating space for use as back-of-house storage and RA staff offices, and enabling the implementation of critical electrical infrastructure upgrades.'

Arup considered introducing combined heat and power (CHP) plant, but the lack of a sufficient base load meant that poor financial and carbon savings made it unviable. Instead, the consultant specified that the heating load should be met using 16 Remeha Quinta Pro 115 boilers.

These can supply a total heat output of up to 1.8MW to meet peak demand, and can be turned down automatically as low as 17kW at times of low load. The design called for a large DN200-diameter primary boiler loop pipe to connect to the existing distribution system.

"A series of plant pods on the roof has resulted in the DX approach being replaced with chillers and AHUs, with prefabricated sections craned into place at night"

50 million

The cost of the Royal Academy refurbishment, which is being led by internationally acclaimed architect David Chipperfield and supported by the Heritage Lottery Fund

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The sky's the limit

The RA's new rooftop plantroom – above the Sackler Wing of galleries – is a light, compact space, with floor-to-ceiling glazing at either end. Its long, narrow dimensions presented an interesting additional challenge for Arup and contractor CBRE.

'Given the shape of the Sackler plantroom, the only viable solution was to use modular, wall-mounted boilers,' says Arup's senior mechanical engineer Antaeus Wheatley.

Working with Arup and CBRE, Remeha supplied a bespoke, off-site-fabricated rig solution, to meet the requirements of the project and site. To overcome the constraints of the plantroom, the boilers were arranged in an in-line format.

Arup and CBRE specified designing the rig in four separate modules, to facilitate positioning within the roof plantroom. Each module comprised four Quinta Pro 115 units, shunt pumps, isolation valves, control valves and safety valves, plus flow and return header pipework.

The rig was specially designed to accommodate the additional orifice plates, test points, expansion vessels and increased shunt-pump sizes specified for each boiler on the frame.

'The functional design was set down by the consultants,' says Nick Stevenson, Remeha's prefabrication expert. 'Great care was taken to ensure their requirements were met, to minimise potential snagging time, post-installation. The consultants had specific considerations for maximum turndown ratio, »

» interaction with the building management system (BMS) and pipework design, to fit the distribution system for the rest of the building.'

Access was a major concern in the design phase. 'The roof structure of the plantroom only allowed for a fairly restricted opening without affecting its structural integrity,' says Stevenson. 'Fortunately, we were able to design the four modules such that they could be lowered through that opening – just! Each module was crane-lifted from the courtyard into the plantroom structure on the roof.'

The four modules feature lifting eyes, to ease manoeuvrability through the limited opening in the roof structure into the plantroom. 'The site manager set out specific requirements for handling of the frames, with crane-lifting eyes on each frame, as well as wheels for manoeuvrability when in the plantroom,' adds Stevenson.

Prefab clout

Offsite prefabrication offers a number of benefits for client, contractor and consultant. Although it needs design decisions to be made earlier in the project than with site fabrication, the forward planning pays dividends.

'Physical fit issues are identified and rectified early; more compact designs can often be achieved; production is carried out within a quality-controlled factory environment; end-of-line factory testing offers assurance for function and QA [quality assurance]; site time is reduced dramatically; deliveries are minimised; the need for site skills and personnel are reduced; and hot work on site is decreased,' says Stevenson.

'The major advantage was in terms of time saved on site, and having no hot works taking place on the roof,' says James Buchan, head of projects at CBRE. 'We were able to carry on with other parts of the build, while the boilers were fabricated off site.'

16

The number of Remeha Quinta Pro 115 boilers specified by Arup to meet the RA's heating load

1.8MW

The total heat output of the 16 boilers to meet peak demand; they can be turned down automatically as low as 17kW at times of low load

Delivery of the boiler plant modules had to be carefully coordinated, with the crane time having to fit around the RA's opening times, to keep the galleries fully operational during construction. 'We had to work through the night, craning the modules up between midnight and 8am,' says Buchan.

Future-proofing

The boiler plantroom allows sufficient space for the relocation of existing boilers serving the Burlington Gardens site. All necessary pipework connections are in place, in readiness for this next phase.

'This will save between $50m^2$ and $100m^2$ at Burlington Gardens – space that can be put to other uses – which highlights how a successful services infrastructure strategy can have big benefits beyond energy and environmental considerations,' says Maroulas. Arup is working alongside

Placing boilers on the rooftop has freed up valuable exhibition space

CLOSE CONTROL

The RA features some of the world's most famous artworks and close control of M&E services is needed to protect and conserve its collections. 'We specify that environmental conditions are controlled to 20±2°C and 50±5% RH [relative humidity], which is the standard for indemnified artworks,' says Kyle Peters.

Heat from the boilers is delivered to the AHUs to supply air to the galleries via ductwork to high-level grilles. 'This is the best solution because we need wall and floor space to hang exhibits,' says Peters.

Heating controls are integrated with the RA's BMS. Each boiler module incorporates Remeha iSense Pro controls, pre-wired within control panels with safety interlocks and shut-off switches as specified by Arup. The controls wiring was bespoke, to accommodate the additional pump control, monitoring and water-treatment functions. Control panels came with interconnection boxes, to add flexibility for repositioning.

The multiple-boiler, weather-compensating system maximises operational efficiencies. 'Early analysis of the data shows that the boiler replacement has brought around 10% savings in gas consumption,' says Antaeus Wheatley. This equates to around 50tCO_2/year. 'This excludes electrical energy savings from replacement of pumping equipment, from which we anticipate a further 10-15% in electrical energy savings once the three-port system is replaced with two-port control. It won't be possible to appreciate the combined reduction in energy consumption fully until all major works are completed in the next few years.'

> "The roof structure of the plantroom only allowed for a fairly restricted opening without affecting its structural integrity"

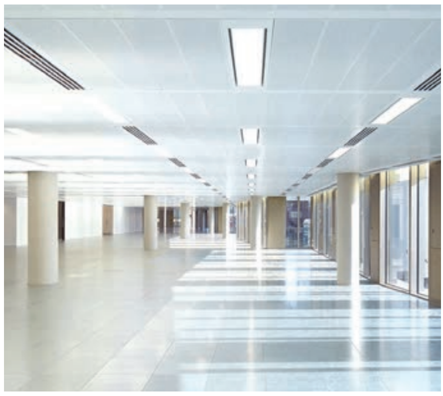
Chipperfield on the redevelopment of Burlington Gardens.

Few among the crowds on the RA's courtyard, waiting for the doors to open, will be aware of the massive undertaking. Indeed, the rooftop plantrooms and flues are invisible from Piccadilly. Thanks to the refurbishment, the RA now boasts space heating and hot water provision that is more reliable, more secure, highly efficient and easier to maintain. The design meets the stringent environmental standards required by the galleries at the Academy, achieving consistent temperatures to protect and conserve its priceless works of art. **CJ**

Secure connection

With linked energy centres that allow the transfer of both heating and cooling, two new buildings in Victoria Street have been designed with the future in mind. Andy Pearson reports

ALL IMAGES / ZIG ZAG: LAND SECURITIES



The saw-toothed façade of The Zig Zag Building in London's Victoria Street

The Zig Zag Building and the adjacent Kings Gate scheme are among the latest additions to the streets surrounding London's Victoria Station. This area – on the doorstep of Buckingham Palace and just down the road from the Houses of Parliament – has been undergoing a transformation. A once battered, congested transport hub is being reincarnated as an urban village of high-quality office buildings, shops, restaurants and apartments. It is – in developer speak – fast becoming a 'destination'.

Leading the area's regeneration is developer Land Securities. Among the latest additions to its growing portfolio of properties are the two new buildings – Kings Gate and The Zig Zag Building. Both stand on the north side of Victoria Street – a site previously dominated by a 1960s concrete and glass office. In contrast to this drab monolith, the new saw-toothed façade of The Zig Zag Building and the staggered spacing of the stone fins on Kings Gate give this new development a scale and complexity more in keeping with the area.

Designed by Lynch Architects and engineered by Sweco, the buildings share a heating and cooling solution that maximises the efficiency of the services installation and minimises demand on incoming services.

As the residential part of the development, the 24,000m^2 Kings Gate has 99 flats set over 14 levels, with restaurants and retail on the ground and first floors. Below ground, the building features five levels of basement, including a car park and cycle store, both shared with the neighbouring Zig Zag Building.

The latter comprises 17,500m^2 of office accommodation spread over 11 floors with basement, ground and first floors occupied by retail and restaurants. It has been designed to Land Securities' criteria for making office buildings more productive and successful places to work. The building has four levels of basement, including plant areas and a subterranean link to the cycle store and car park beneath Kings Gate.

Despite their different uses, Land Securities' brief to the services engineer was for both buildings to have high-quality, low-energy sustainable services. Sweco's approach was to develop an energy strategy that combines the outputs from both buildings' energy systems to minimise the project's carbon emissions and the individual buildings' energy footprints.

> "The building has been designed with the option to operate as a passive or mixed-mode office"

'All options and technologies were considered, with only the most viable and practical technologies selected,' says Gary Callaghan, associate at Sweco, and the project's building services engineer.

Both structures also feature a high-performance building envelope, incorporating passive solar control features.

Designed to meet Code for Sustainable Homes Level 4, the Kings Gate residential building façade has deep balconies on its southern side to help minimise solar gain. The flats are designed to meet overheating criteria using solar shading and natural ventilation; occupant comfort is assured, with comfort cooling offered via energy-efficient DC motor fan coil units. Each unit incorporates: thermostatically controlled underfloor heating; LED lighting; mechanical ventilation; kitchen extract; sprinkler fire-protection; and grey water recycling.

To minimise roof level plant, and maximise the area available for terraces adjoining the penthouse flats, the bulk of building services plant is in the basement. Exceptions are two dry air coolers – serving the landlord's chilled water supply – and plant for the ground-floor retail outlets, mounted on the roof. The building's total cooling load is 600kW and heat demand is 480kW.

A gas-fired CHP engine gives 140kWe power to the building and 207kW of heat. 'The CHP feeds the base electrical load for Kings Gate,' says Callaghan. Heat generated by the CHP is held in a thermal store and used to preheat the domestic hot-water and heating system.

Gas-fired heating boilers and gas-fired domestic water heaters top up heat for the heating and hot water systems. Kings Gate can also export heat to the Zig Zag Building via a heat exchanger and underground pipework.

The building services at the Breeam Excellent Zig Zag Building have been designed to give a full commercial offering to the building's tenants. This includes: a four-pipe fan coil system; a rooftop PV array; LED lighting; a rainwater harvesting system; and two 1,480kW standby generators.

Neil Pennell, head of engineering and design at Land Securities, describes the EPC B-rated Zig Zag as 'the thoughtful building'. 'We focused the design on 10 thoughtful leadership themes, including wellbeing, productivity and fit and healthy staff. High levels of fresh air and natural light, great views, first-class cycling facilities and access to external terraces on most of the office floors all contribute to a happy, healthy and productive workplace.'

As with Kings Gate, The Zig Zag Building has an energy centre in its basement, which includes a gas-fired CHP engine. The Zig Zag Building's unit, however, has more than twice the electrical output of the Kings Gate machine at 307kWe and, unlike the Kings Gate installation, the CHP is also connected to an absorption chiller to generate cooling for the offices.

High levels of natural light contribute to a healthy and productive workplace

'There is not much HWS demand on this building, so the heat generated by the CHP is either used by the absorption chiller or held in a thermal store,' says Callaghan.

Cooling output from the absorption chiller is supplemented by air-colled chillers located on a small roof area at level 10. 'The absorption chiller provides the cooling for the primary chilled water circuit that is topped up with three air-cooled chillers,' Callaghan says. The building has a peak cooling load of 2,430kW and a heating load of 1,680kW.

Pipework links the two energy centres and allows both heating and cooling to be transferred between the two, with any excess relayed across via a heat exchanger on each circuit, depending on demand.

'If the thermal store in The Zig Zag Building is up to temperature, then we can transfer excess heat to the Kings Gate store, or we can transfer the cooling from »

Kings Gate to The Zig Zag Building, if there is an economic reason to do so,' says Callaghan. 'At the moment, the FM team is still getting to know the system so they are only transferring heat.' Load availability and demand will dictate what CHP and transfer occurs between the buildings.

Sharing the heating and cooling is expected to improve efficiency of operation and deliver energy savings of more than 20% from the use of clean energy and renewable systems and a further 10% in carbon savings compared with 2010 Building Regulations' target buildings.

The scheme also allows for future connection to a district heating network and/or to supply heat to neighbouring buildings. 'We have the pipework installed and ready for users to connect to it,' Callaghan says. **CJ**

LONGEVITY OF THE ZIG ZAG BUILDING

The servicing strategy of The Zig Zag Building has been equipped with the facility to be adapted to meet future changes in workplace requirements.

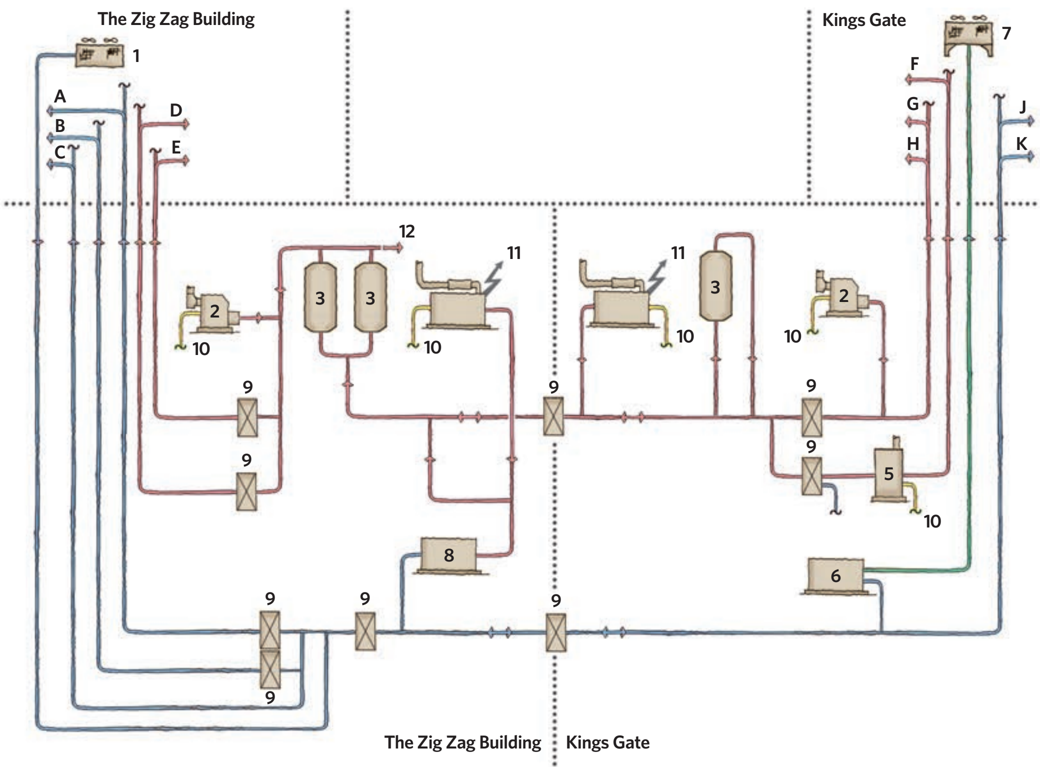
Currently, the building has a conventional Cat A fit-out, designed to operate with a sealed façade. This includes a suspended ceiling and EC/DC variable-volume 4-pipe fan coil units for heating and cooling the offices.

Longer-term, when improvements in the local external air quality are achieved, the building has been designed with the option to operate as a passive or mixed-mode office. The façade allows the solid panels within it to be opened, creating Juliet balconies. Concrete floor slabs have been given a high-quality finish in the tenanted areas, so the soffits can be exposed in the future. In addition, cooling coils have been embedded in the slabs to enable the circulation of chilled water to deal with the office base-cooling load.

It was technically challenging to prove that the cooling coils could be incorporated in a post-tensioned slab, without clashing with the tendons/rebar, while maintaining a flat slab. This required fully designing the rebar and using physical models to prove there was ample room for all elements.

Sweco produced several models for Land Securities to show how the system would work with both exposed slabs and chilled beams. 'The pipes are embedded so that, when the floors are re-fitted, the tenants can remove the fan coil units, and replace them with chilled beams, expose the concrete soffit, and operate the building as a mixed-mode facility,' says Callaghan.

The option of opening the windows will come into play once traffic in central London is predominantly electric, he says. 'Longer-term thinking is very much Land Securities' mindset; it recognises the value of investing in energy-efficient sustainable building assets that can easily be adapted to changes in workplace practice and environmental conditions.'



1 Air chillers
2 Gas boilers
3 Thermal stores
4 Combined heat and power (CHP)
5 Gas HWS generators
6 Water-cooled chillers
7 Dry-air coolers
8 Absorption chiller
9 Heat exchangers
10 Gas supply
11 Electrical output
12 Thermal export potential

A Office tenants' chilled water
B Office landlord's chilled water (AHUs)
C Landlord's chilled water (AHUs)
D Office tenants' heating water
E Landlord's heating water
F Residents' HWS
G Residents' heating water
H Landlord's heating water
J Residents' chilled water
K Landlord's chilled water

Central thermal distribution schematic

ADVERTORIAL

EVOLUTION IS HERE

remeha

THE NEW REMEHA GAS 220 ACE

The new Remeha Gas 220 Ace floor-standing boiler has now been launched. It was given a field test at Samuel Whitbread Academy in Shefford. The response has been very positive, especially when it comes to its compact size and ease of installation.

What's the project?
Following best practice asset management, the school replaced an existing 13-year-old Remeha Gas 210 Eco Pro with Remeha's new, high-efficiency floor-standing condensing boiler, the Gas 220 Ace. Currently operating alongside a Gas 210 Eco Pro, it serves the Arts & Drama block that houses the school's Main Hall, Theatre and Activities Hall.

Super compact and easy to install
The new model builds on proven technology. It offers optimum design simplicity and flexibility – and outstanding performance. The ease of installation certainly impressed heating engineer, Ashley Jones, of Spa Gas. "A lot of thought has obviously gone into the packaging and pallet design to simplify and speed up installation," he said. "Disconnecting the old boiler, unpacking the new model and then positioning it in the plant room took just an hour and a half."

Its innovative new monobloc heat exchanger has an exceptionally high output to physical size ratio.

The reduced footprint and lighter weight are winning features for Ashley. He commented: "It's light and extra-compact, which makes it easy to handle as well as providing more working space. I also like the integrated wheels that make it easier to manoeuvre into its final position."

Simpler servicing and use
The Gas 220 Ace's new 'Click and Go' condensate drain is positioned underneath the boiler, rather than inside. "This is really easy to connect and access," said Ashley, "which means there's no need to dismantle the boiler to get to it when servicing."

Another key feature is the pioneering control platform, which has time and temperature controls supplied as standard. The enhanced, back-lit panel simplifies input and control for end-users, while new parameter codes give heating engineers access to greater technical detail for rapid, straightforward servicing and diagnostics.

Success means satisfied customers
The field test has been an outstanding success and the new boiler has impressed key decision makers. "It's so compact!" commented Tristan Mitchell, Facilities Manager at Galliford Try, facilities management provider for the school. "The smaller footprint gives us greater accessibility within our plant rooms and we also like the enhanced control platform. The new interface allows for faster, clearer and simpler user control. We have already instructed our installer to proceed with the Gas 220 Ace for the remaining four boilers to be installed this year."

Find the right one for every project
The successor to the Gas 210 Eco Pro, the new Class 6 NO_x Gas 220 Ace range is available in 160, 200, 250 and 300kW models, with outputs from 34.7kW to 310kW. All connections and pipework are at the top of the Gas 220 Ace, enabling side-by-side or back-to-back positioning and flexible modular configuration options. With ultra-low NO_x emissions at or below 40mg/kWh, the new Gas 220 Ace is future proofed for emissions regulations.

For further information please visit **gas220ace.co.uk**

"Small, simple and accessible – can't go wrong

TRISTAN MITCHELL, FACILITIES MANAGER AT GALLIFORD TRY

Change is in the pipeline

The new water-treatment guide for commercial heating systems is very welcome in an industry that has no regulations and many issues, according to Sentinel's Chris Shelton

The boiler manufacturers have spoken – or, rather, complained. And for good reason. For many years, commercial heating systems have failed prematurely, broken down, lost energy efficiency or experienced poor performance, and the culprit is often inadequate – or non-existent – water treatment.

In response to these complaints, the Industrial and Commercial Energy Association (ICOM), a not-for-profit trade organisation that promotes the interests of the non-domestic heating market, has launched a water-treatment guide. The aim is to help plant operators, engineers, specifiers and those involved in the maintenance and operation of heating systems, to understand the importance of – and the procedures required for – effective water treatment. It hasn't come a moment too soon.

ICOM's *Water Treatment and Conditioning of Commercial Heating Systems Guide* has been written with the assistance of boiler manufacturers and water treatment specialists. It aims to serve as a guiding light in an industry where compulsory water treatment is entirely absent from, for example, the non-domestic Building Regulations. Treatment regulation would protect end users, equipment manufacturers, specifiers, contractors and engineers involved with heating systems.

The commercial heating systems sector suffers from a lack of regulation

Its absence is perplexing, given the absolute inevitability and highly damaging consequences of poor, or absent, water treatment. Some negative outcomes include corrosion, limescale and biofouling – chiefly in closed heating systems, once-through water heaters and renewable systems, respectively – which can lead to issues such as: degradation of efficiency; increased energy consumption; component wear and tear; reduced heat output; equipment failures; impaired operation; poor water flow; shortened system life; asset depreciation; and system downtime, among others.

Put simply, poor water treatment contributes to inflated life-cycle costs and often inconvenient, extremely expensive remedial works – not to mention the ramifications of being without heating or hot water, which are difficult to calculate but sure to be significant. This is especially the case for schools and restaurants, which may be forced to close temporarily.

The prevalence of such problems in the commercial sector is unknown. Extensive research has not been undertaken, probably

"Poor water treatment contributes to inflated life-cycle costs and extremely expensive remedial works"

ISTOCK.COM / CHIMMY

To request a PDF or hardcopy of *Water Treatment and Conditioning of Commercial Heating Systems Guide*, contact **info@icom.org.uk**

» because of the difficulties presented by the convoluted nature of the commercial supply chain. However, industry feedback suggests poor water treatment is the norm, rather than the exception.

What is certain is that untreated or poorly treated water affects commercial heating and hot-water systems in the same way as domestic systems – the only difference is that the problems caused are more complex, more significant, and vastly more expensive to rectify.

It's worth considering that poor water treatment is still rife in the domestic market; indeed, research and testing by a major boiler manufacturer revealed that approximately 87% of domestic call-outs are for systems without correct water treatment. This is despite fairly rigorous water-treatment obligations laid down in the Domestic Building Services Compliance Guide to Part L. These require chemical cleaning before new boiler installations, inhibitor dosing to protect boilers and system components from corrosion, and the use of certain technologies – such as electrolytic devices – to prevent limescale accumulation in systems installed in areas where water hardness exceeds 200ppm. Keeping all this in mind, it doesn't take a great leap of the imagination to realise that commercial systems are in a far worse regulatory position.

Combating the issue isn't easy; water-treatment specialists continue to work hard to educate and support the industry on effective procedures. However, without regulations to enforce these procedures – in combination with the competitive, bottom-line-driven nature of commercial contracts – such exertions can fall on deaf ears. This is why ICOM's guide is so important.

Prepared in collaboration with a wide range of industry experts, it offers a detailed best-practice benchmark that specifiers, consulting engineers, contractors and installers can refer to with absolute confidence. It also serves as excellent groundwork for the development of formal regulations in the future.

ICOM's 60-page guide covers every aspect of water treatment – from design considerations and written specifications, to issues such as water types, system-fill methodologies, pressurisation and de-aeration. Importantly, it details how the detrimental effects of untreated water on heating systems can be avoided with pre-commission cleaning and flushing, the application of water treatment, and periodic system-water checks.

A best-practice approach to water treatment for closed systems can be summarised in three terms: clean, protect and maintain. First, system water is analysed to determine water quality. Subsequently, the heating system – whether new or existing – is cleaned thoroughly using a chemical cleaning agent designed for the age and type of system. The aim of this is to remove foulants and enable the chemical inhibitor to work effectively. For example, existing systems will require a chemical cleaner able to shift magnetite sludge and corrosion debris, while new systems will need a cleaner designed to remove flux residues, greases and installation debris. The system must then be flushed thoroughly. Cleaning commercial systems can take days, so adequate time should always be allocated well in advance of commissioning.

"Approximately 87% of domestic call-outs are for systems without correct water treatment"

Once clean, an inhibitor – a chemical designed to prevent corrosion and limescale – should be dosed to the system and allowed to circulate thoroughly. To ensure enough inhibitor has been added, a system water check should be carried out using a test kit.

Finally, planned preventative maintenance should be conducted on a regular basis. This involves monitoring system water with test kits to determine conditions within the system. Such a method can also confirm correct dosing levels of inhibitor, catch potential problems early, and deliver recommendations of the best corrective approach, if required. Monitoring can also help to prove that manufacturers' installation, commissioning and warranty conditions have been met – and can supply important data for client and end-user reports.

For all chemicals, ICOM recommends that boiler manufacturers' guidelines about the choice and use of chemicals should always be followed. This is because there is only one minimum-quality standard, applying solely to chemical inhibitors. As a result, many water-treatment products on the market are simply inadequate, unsuitable and, potentially, even harmful to commercial heating systems.

Ultimately, ICOM's paper is a guide and not mandatory. However, those who heed its advice and recommendations stand to gain enormously. This may give contractors, consulting engineers, system designers and all those involved in commercial heating systems the opportunity to stand out in a market that is dogged by poor water-treatment practices.

CHRIS SHELTON is commercial sales director at Sentinel

Continuous water heating more efficient

Rinnai-commissioned life-cycle study compares three options

Continuous-flow water-heating systems can be 7% more cost-effective than stored-water alternatives, according to a new life-cycle study by engineering firm Aecom. Commissioned by water-heating systems manufacturer Rinnai, the study considered two applications for water heating – a campsite and a small, fast-food outlet – and compared three potential solutions: indirect fired, direct fired and continuous flow. Performance of these systems was compared in terms of upfront and whole-life costs, and – for both applications – the continuous-flow system was found to be significantly more cost-effective.

A continuous-flow system is a gas boiler designed to heat mains water instantaneously for supply directly to water fixtures, without storage. Direct-fire systems heat water in a storage container using an internal burner. According to Aecom, they achieve efficiency of around 96%, despite standing losses around three times higher than indirect-storage cylinders. Indirect-fired systems use a separate heat source and storage cylinder.

In both cases, the life-cycle comparison was over 20 years, based on the expected service life. A net present value (NPV) was calculated using a discount rate of 3.5%, an inflation rate of 2% for servicing costs, and projected retail fuel costs, based on Department of Energy and Climate Change figures.

For the fast-food restaurant, it was assumed the system only served hot-water demand. The life-cycle analysis took into account the initial capital costs, expected annual fuel costs and estimated annual servicing costs – which were taken to increase by 2% each year. The annual fuel cost assumed the same daily fuel consumption over the entire year. The servicing cost was based on £130 per boiler, per year, and £160 annually for boiler and cylinder together.

Comparing the three options showed that – over 20 years – a continuous-flow system would score 6-7% lower NPV than both storage systems.

The second study focused on a holiday-camp shower block, serving six showers and four basin taps. The analysis was based on a configuration of four continuous-flow water heaters – each with a nominal output of 48kW. Because of the short run of pipes between heaters and fixtures, the heaters can generate water at 40°C. Risk of legionella is cut by regular flushing of the system.

It was assumed that the bulk of the hot-water demand was from the showers. Each would have a typical flow rate of nine litres per minute. If mixed to 40°C, it would equate to an instantaneous load of around 19kW each. Even with one shower running, the load on a single continuous-flow water heater would equate to an efficiency of 95%, based on the performance curve. As the hot water demand increases, the modular nature of the configuration would mean this level of efficiency could be maintained for the bulk of the demand.

Daily fuel needs for this application are 7% cheaper with a continuous-flow system than for the traditional storage systems. The authors said this was because the use profile was well suited to continuous-flow systems – high, infrequent demand over the day.

Report generated by Dr Michael Lim, Simon Law and Ant Wilson , of Aecom.

Andrews launches updated sizing tool for professionals

Andrews Water Heaters has released a new version of its sizing tool for water-heater specifications – Size-it.

The tool is designed to help building services professionals choose the most appropriate Andrews product for a project; it is available – free of charge – from the company website.

Now accessible online on any device, the updated Size-it tool is faster and can be personalised. It allows users to manage a portfolio of projects and tailor the sizing to their exact property type and hot-water requirements.

Size-it also offers legislative guidance, which can be downloaded as a summary or more detailed report. The calculations used are based on the advice in *CIBSE's Guide G: Public health and plumbing engineering*.

Chris Meir, sales director at Andrews Water Heaters, said Size-it was the first tool of its kind for the UK water-heating industry.

'After recent insight into the needs of our customers, we have made the UK's sizing tool even better,' he said. 'Size-it is now more user-friendly and informative.'

Meir added that, with Size-it, users can save project templates for future jobs, share sizing with others, and earn a 2% heat-efficiency credit.

This applies when a user is assessing the expected performance of water heaters for compliance with *Building Regulations Approved Document L*.

To see the new version of the tool visit **www.sizeit.co.uk**

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