

# cibse

Journal

CPD Special

November 2024  
www.cibsejournal.com

## CPD Directory

The latest company listings from CIBSE

**Three new CPDs:**

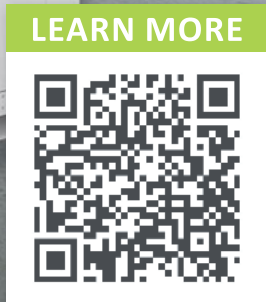
Decarbonising heat

Lighting urban settings

Design for manufacture  
and assembly



# AMICUS ALTUS R290 HEAT PUMP



**Suitable for two-pipe and four-pipe configurations.  
A solution for every environment. Call us today on 01295 269981**



info@lochinvar.ltd.uk  
lochinvar.ltd.uk



# Safety measures

**T**he concept of continuing professional development (CPD) is believed to have developed after World War II, when it was recognised that professionals needed structured learning after their formal education. The introduction of the Building Safety Act 2022 is considered one of the most significant changes to Building Regulations in the UK since the emergence of CPD.

The recent findings from the final report on the Grenfell Tower fire highlights the importance of our members understanding safety in the design and construction of the projects we deliver. As such, they are expected to log at least one semi-structured activity on building safety. The other mandatory semi-structured activity is on sustainability. Government targets seem to ebb and flow, but, ultimately, we need to strive towards improving the energy efficiency of new and existing buildings.

This is a reminder that we should all be maintaining a log of our CPD activities regularly, whether via CIBSE's mycareerpath or in your own personal format. Recording activities and reflecting on them has a positive impact on your own professionalism. It allows you to identify knowledge gaps and helps you to progress your career development.

Semi-structured activities include supplier webinars, CIBSE events, or internal company presentations. These will help focus learning and development on the two key industry issues, ensuring building services engineers deliver more efficient building designs and stay informed on the latest technology and techniques in building safety. This will not only improve engineers' competence, but will also be beneficial to our clients and, ultimately, the future occupants of the buildings we design.

CPD can be carried out in many forms, and activities include structured courses, semi-structured webinars, mentoring, reading, or simply learning on the job.

I would like to thank and welcome those in the Australia & New Zealand (ANZ) region who, earlier in the year, attended our webinar on CPD and are now committed to annual audits of their members. This includes the introduction of a specific ANZ CPD Tracker tool, to allow members to keep on top of their required 150 hours over three years, with a minimum of five hours in any given year on their CPD records. The requirements are stipulated by the local state-based governments in the region – for example, the Board of Professional Engineers, Queensland – and are honoured by CIBSE.

Please note, there are currently no plans in the UK and other international regions to specify the number of hours of CPD our members are required to undertake. ●

● **Stephen Page CEng MCIBSE, CPD Panel chair and associate mechanical engineer, AtkinsRéalis**

## Supplement

www.cibsejournal.com  
#Build2Perform

## Editorial

Editor: Alex Smith  
Tel: 01223 378034  
Email: asmith@cibsejournal.com  
Tel: 01223 378048  
Technical editor: Tim Dwyer  
Reporter: Molly Tooher-Rudd  
Designer: Kevin Reed  
Chief sub-editor: Jo Halpin

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



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

## Advertisement sales

**Display and sponsorship** Jim Folley  
jim.folley@redactive.co.uk  
Tel: +44 (0) 20 7324 2786  
**Products & services** Daniel Goodwin  
daniel.goodwin@redactive.co.uk  
Tel: +44 (0) 20 7880 6217  
**Recruitment advertising**  
cibsejournaljobs@redactive.co.uk  
Tel: +44 (0) 20 7880 6215  
**Advertising production** Jane Easterman  
jane.easterman@redactive.co.uk  
Tel: +44 (0) 20 7880 6248

The opinions expressed in editorial material do not necessarily represent the views of the Chartered Institution of Building Services Engineers (CIBSE). Unless specifically stated, goods or services mentioned in editorial or advertisements are not formally endorsed by CIBSE, which does not guarantee or endorse or accept any liability for any goods and/or services featured in this publication. We remind all readers that it is their responsibility to verify advertisers' products claims.

## Credits

Cover iStock.com / alvarez  
P4 iStock.com / RealPeopleGroup / Eloi\_Omella / Cunaplus\_M.Faba / A stockphoto  
P19 iStock.com / bombermoon

## Contents

### 4 Enhanced CPD directory

Profiles of organisations providing CIBSE-accredited modules on topics including heat pumps, lighting, fire and safety

### 15 CPD: Decarbonising heat: developing effective clean heat standards

### 19 Q&A: Cutting carbon at an affordable cost

Four engineers on how manufacturers are working to achieve decarbonisation goals at an affordable cost

### 23 CPD: Perception of safety in artificially lit urban settings

### 27 CIBSE CPD providers

Listing of the organisations that are providing CIBSE-accredited modules

### 31 CPD: Accelerating modern methods of design and manufacture in buildings





CIBSE Journal has more than 200 CPD modules available to complete at [www.cibsejournal.com](http://www.cibsejournal.com). Our website makes it easier than ever to continue your professional learning online.



# CIBSE CPD Directory

This directory lists all the accredited organisations providing modules on a range of areas, including electrical, fire, lighting and sustainability

All the CPD courses in this directory have been approved by CIBSE. They are reviewed and assessed to ensure that the technical content is of a high standard and offers valuable CPD to delegates.

The directory of CPD course providers has been compiled to assist members of the Institution in identifying suitable courses in respect

of their CPD needs. The directory embraces many different areas suitable for CPD and will continue to be updated to incorporate new entries and revisions.

Members of CIBSE are required by the Code of Professional Conduct to maintain their professional competence, but this should also apply to any professional working in the industry.

The directory will help you find suitable CPD to assist with your ongoing career development.

For guidance on what constitutes different CPD activities and how to go about recording your CPD, visit [www.cibse.org/cpd](http://www.cibse.org/cpd)

Here you will find CIBSE's online portal – mycareerpath – which lets you record your CPD in one place and link your progress to set objectives.

## 2G Energy



2G Energy is a leading manufacturer of combined heat and power (CHP) systems, producing and installing thousands worldwide. The firm specialises in the supply of high-efficiency CHP systems for natural gas, biogas and hydrogen, with a power range of between 20kW and 2,500kW.

Hydrogen as a fuel source provides one of the most viable pathways to a net zero world. It is possible to ensure the energy supplied is net zero by changing the gas input to green hydrogen.

2G Energy has been installing and operating 100% hydrogen CHPs worldwide since 2012, providing large proportions of an organisation's electricity and heat while helping it reach its net zero goals.

Learn about how our pioneering technology works, and how our technology has helped industry reach net zero, by signing up for our live and virtual hydrogen CPD, approved by CIBSE. Email or call us to arrange a time suitable for you.

● Phone: 01928 718533  
Email: [sales@2-g.com](mailto:sales@2-g.com)  
Web: [2-g.com](http://2-g.com)

ACV



● Phone: 01383 820100  
 Email: [uk.sales@acvuk.com](mailto:uk.sales@acvuk.com)  
 Web: [acv.com/gb](http://acv.com/gb)

ACV has been designing, developing, manufacturing and distributing heating and hot water products for commercial and residential heating since 1922. It specialises in stainless steel products and is home of the patented tank-in-tank concept, which gives a safe, clean and reliable domestic hot water performance to match the largest of hot water demands.

The company's motto 'Excellence in hot water' is not only reflected in its product range, but also in its technical support. ACV has been delivering CIBSE-accredited CPD seminars for many

years, sharing its specialist hot water knowledge.

Its course *Factors driving material selection for hot water storage products* is suitable for anyone involved in the management of domestic hot water in commercial buildings, including consultants, contractors and specifiers.

A previous course attendee said: 'Very informative and useful content on the effects water quality can have on the materials commonly used in the manufacture of hot water tanks, and how careful product and material selection can help to minimise these risks.'

Advanced Air UK



● Phone: 01842 765 657  
 Email: [sales@advancedair.co.uk](mailto:sales@advancedair.co.uk)  
 Web: [advancedair.co.uk](http://advancedair.co.uk)

Advanced Air has been designing, developing, manufacturing and distributing fire safety and air distribution systems for more than 50 years. We're passionate about our industry, and love sharing our insight, knowledge and ideas.

We offer two CIBSE-accredited CPD seminars – available in-person or online – which are ideal for construction contractors, specifiers, installers, and other industry professionals.

● *Fire and smoke damper legislation, installation and CE marking*

Covers fire dampers under BS EN15650/EN1366-2 and smoke dampers under BS EN12101-8/EN1366-10, and takes an in-depth look at classification codes.

● *Electronic pressure independent control in fan coil units (FCUs)*

Covers motor technology, ECM vs Epic, the benefits of pressure independence in FCUs, and hints for better FCU system design.

AIC Heating UK



● Phone: 0300 303 4169  
 Email: [stephen.wilson@myaic.co.uk](mailto:stephen.wilson@myaic.co.uk)  
 Web: [myaic.co.uk](http://myaic.co.uk)

AIC Heating UK recently introduced an extended range of Aurax reversible commercial heat pumps with outputs from 21–710kW, using low global warming potential (GWP) refrigerants such as R454B and R290.

This is our core product range, but we also offer a bespoke range up to 1,200kW. In addition, we specialise in a hybrid solution that allows the decarbonisation of existing buildings.

All of our renewable technology is complemented by the introduction of our *StorEn* energy storage system with integrated intelligent energy management system.

AIC is a specialist in stainless steel and offers a complete range of gas commercial heating and hot water products ranging from 24–1,260kW output from a single boiler, which can be cascaded for higher output projects.

It also manufactures fully stainless-steel hydraulic cascade systems up to 900kW, to complement the Nesta Chrome wall-hung boiler.

All AIC boilers are built around the firm's self-designed and in-house manufactured stainless steel fire tube heat exchanger. This ensures high efficiency and reliability, achieving NOx class 6 and high modulation ratio, up to 10:1.

Airedale by Modine



● Phone: 0113 2391000  
 Email: [connect@airedale.com](mailto:connect@airedale.com)  
 Web: [airedale.com](http://airedale.com)

Airedale by Modine offers a choice of free, hour-long, CIBSE-approved CPDs, covering a wide range of legislative, environmental and technological topics related to cooling, ventilation and general HVAC.

We have significant experience in the data centre, healthcare, pharmaceutical and telecoms industries, and our courses are suited to consultants and engineers in the HVAC industry or looking to join the industry.

Delivered by our experienced HVAC engineers, we can tailor courses to specific needs and offer a mixture of practical and theoretical courses. Our CPDs are available at a time to suit you, and can be done remotely.

Below is a selection of our most popular courses, but contact us to discuss your needs:

- *Data centre advanced cooling technology*
- *CRAH v fan wall*
- *Optimising data centre cooling system performance using dedicated controls platforms*
- *Data centre chillers*
- *F Gas Level 1 (legislation and A2Ls)*
- *F Gas Level 2 (Global implications and alternative refrigerants)*
- *Eco-design: chillers and tier 2*
- *HTM 03–01 (2021): healthcare*
- *BS EN 1886:2007*
- *Energy efficient design of air handling units*

**Altecnic UK**



● Phone: **01785 218200**  
 Email: **marketing@altecnic.co.uk**  
 Web: **bit.ly/altecniccpd**

Altecnic, part of the Caleffi Group, is the UK's top provider of hydronic solutions for commercial and domestic applications, exceeding industry standards for trade merchants, original equipment manufacturers, engineers, and specifiers.

The Altecnic Academy is an innovative online learning platform tailored to professionals in the plumbing and heating industry. It offers various e-learning courses, prioritising key industry subjects.

For face-to-face CPD bookings, please

reach out to us at [marketing@altecnic.co.uk](mailto:marketing@altecnic.co.uk).

The Altecnic Academy is invaluable, giving industry members convenient access to relevant courses. Our current CIBSE-accredited CPD course offerings include:

- *Modern solutions for domestic water services (new)*
- *Dirt and air in commercial systems (new)*
- *Efficient system design using electronic heat interface units (HIUs)*
- *Legionella considerations for building reactivation.*

**Armacell**



● Phone: **0161 287 7100**  
 Email: **info.uk@armacell.com**  
 Web: **armacell.com**

Armacell UK offers a series of CIBSE-approved lunchtime seminars ideal for mechanical service engineers. Courses are held at engineers' offices, with a buffet lunch. Training options include:

- **Mechanical services insulation:** types of mechanical services insulation for HVAC-R pipe and ductwork and equipment, plus key considerations when specifying insulation.
- **Building Regulations and environmental design:** the regulations and standards governing pipe and duct insulation, including BS 5422, plus environmental considerations and assessment methods when specifying thermal insulation for building services.
- **Protection against corrosion:** what is

corrosion, why does it occur, what are the effects, and how can you prevent it? Benefits of flexible elastomeric foam insulation.

- **Acoustic insulation of building services:** noise control on building services. Reduction of noise issues from process pipework, waste and drainage pipes, ductwork and associated equipment.
- **Passive fire protection of building services:** what is passive fire protection? Products used to protect wall and floor penetrations, and the correct testing and certification of these. Best system solutions for different types of applications. Building Regulation requirements for services passing through walls and floors.

**Armstrong Fluid Technology**



● Phone: **0161 223 2223**  
 Email: **ukhvacsales@armstrongfluidtechnology.com**  
 Web: **armstrongfluidtechnology.com**

Armstrong Fluid Technology is a leading global player in HVAC. It designs and manufactures innovative fluid flow equipment and high-efficiency energy solutions for a broad range of applications, including district energy, data centres, fire systems, gas transmissions, high-rise, and mixed commercial buildings.

The firm's solutions deliver optimum lifetime building performance with the lowest first cost and life cost. Armstrong is committed to helping building owners, consultants, specifiers and energy managers find low-cost solutions for reducing energy consumption and carbon emissions. Its expertise comes from an understanding of end-to-end fluid systems and

the integration of fluid dynamics, heat transfer, variable speed, and demand-based controls, which is the focus of its CIBSE-approved CPDs:

- A whole-life sustainable approach to pump and equipment selection without compromising on redundancy
- Meeting the needs of the building life-cycle through innovative approaches to variable speed pumping
- Pump basics and variable speed pumping
- Why district energy? Guaranteeing performance and where it is heading

The company can provide free, one-hour 'lunch and learn' sessions at your offices or at any of its UK sites.

**Arrow Valves**



● Phone: **01442 492128**  
 Email: **sales@arrowvalves.co.uk**  
 Web: **arrowvalves.co.uk/education/cpd**

Arrow Valves manufactures innovative water-related products that comply with the latest water regulations.

All team members are BPEC qualified in water regulations, and our resident expert, Adrian Reeve – along with the technical team – bring more than 20 years of combined industry experience.

We offer two CPD-accredited seminars, available free of charge:

- **Water regulations:** learn how to interpret water regulations and choose the correct backflow prevention methods.
- **Heating:** understand hot water efficiency and safety, covering key system design considerations.

Choose from two delivery options:

- Onsite seminar: we will visit your offices to deliver a tailored CPD seminar for your team (remote learning via Zoom also available)
- Arrow Academy training days: join us in-house for expert-led seminars, a factory tour, and product demonstrations.

**Why attend?**

- Stay compliant: ensure you meet the latest water regulations.
- Enhance knowledge: gain insights into system design, efficiency and safety.
- Free and flexible: benefit from expert-led training at no cost, either on site or remotely. Book your seminar today and stay ahead with the latest industry knowledge.

**Belimo**



● Email: [sales@belimo.co.uk](mailto:sales@belimo.co.uk)  
 Web: [belimo.com/uk](http://belimo.com/uk)

Belimo is the global market leader in the development, production and sales of field devices for the energy-efficient control of heating, ventilation and air conditioning systems. The focus of our core business is on damper actuators, control valves, sensors and meters.

We offer a range of CIBSE-accredited CPDs to develop further knowledge on HVAC and fire and smoke products. All our speakers are highly experienced in their specialist fields; many having spent 20-30+ years in the HVAC controls industry.

CPD seminars can be held online or at a company's premises, or at the Belimo Customer Experience Centre at our Shepperton offices.

- *Fire dampers in HVAC systems*
- *Improving performance; saving energy in heating; cooling systems*
- *Evolution of pressure independent control valves*
- *Sensors in HVAC systems*

**Carrier Solutions UK**



● Email: [Samuelsaunders@carrier.com](mailto:Samuelsaunders@carrier.com)

Carrier is a global leader in the design and manufacture of innovative HVAC solutions. In the UK, the commercial HVAC business is represented by two market-leading brands – Carrier and CIAT – supplying air conditioning, heating and air handling equipment solutions and support services.

Willis Carrier invented modern air conditioning 120 years ago, launching an industry that would fundamentally improve the way we live, work and play. CIAT has more than 90 years' expertise in manufacturing air handling solutions for the commercial, residential, healthcare and industrial sectors.

Through Carrier and CIAT, we offer a wide range of hydronic and airside CPD courses, covering topics such as:

- Application and design of heat pumps, chillers
- FCU and AHU indoor air quality
- HVAC industry legislation.

Our presenters have wide knowledge of and experience in the HVAC industry, so they can deliver our CIBSE-approved CPDs with consistent, high quality. Our CPD material is reviewed regularly to ensure it continues to be engaging and relevant, and that it supports learning, so attendees can achieve the highest levels of information retention.

**Condair**



● Phone: +44 (0)1903 850200  
 Email: [uk.sales@condair.com](mailto:uk.sales@condair.com)  
 Web: [condair.co.uk/CPD](http://condair.co.uk/CPD)

Manufacturer of commercial and industrial humidity control systems, Condair is offering three CIBSE-approved CPD training sessions – either face to face, in a client's office, or via an online presentation.

The three CPD seminars are:

- *Humidification and psychrometrics* – offering an overview of humidification, an explanation of psychrometric calculations, and detailed analysis of humidifier product selection, demonstrating the pros and cons of each technology.
- *Dehumidification and drying psychrometrics* – covering dehumidification processes and calculations using a psychrometric chart;

an explanation of dehumidifier types and technologies; product selection and sizing information; and a comparison of different technologies.

- *Using humidifiers for evaporative cooling in AHUs* – learn the psychrometrics of evaporative cooling, the benefits and limitations of using evaporative cooling in AHUs, and the three main AHU evaporative cooling strategies. Also analyse the energy consumption figures behind three real-life case studies, and compare the different technologies available.

**Corsair**



● Phone: 01295 267021  
 Email: [p.taylor@corsairengineering.co.uk](mailto:p.taylor@corsairengineering.co.uk)  
 Web: [corsairengineering.co.uk](http://corsairengineering.co.uk)

Corsair designs and manufactures a wide range of bespoke kitchen ventilation solutions, making everything in house, and is ideally located to serve the whole of the country from its central manufacturing facility in Banbury, Oxfordshire.

Our seminar covers current legislation and technical developments relating to the design of kitchen ventilation systems, based on DW172 and other relevant publications.

Subjects covered include: canopy design rules and ultra violet filtration, (which removes grease and odours from exhausted air, eliminating fire risk and odour nuisance which helps overcome planning restrictions); and self-contained

recirculation systems, which need no ductwork out to atmosphere, making them ideal for basements and kitchens in high-rise buildings. Other subjects include:

- Ventilated ceiling systems
- Supply air options
- Solid fuel cooking
- Fire suppression.

Recent case studies show how design issues were resolved. The seminar is delivered by Peter Taylor, who has been involved in the kitchen ventilation industry for more than 35 years.



**Crane Fluid Systems**



● Phone: 07713781806  
 Email: [ngibson@cranebsu.com](mailto:ngibson@cranebsu.com)  
 Web: [cranefs.com](http://cranefs.com)

Crane Fluid Systems provides a range of dynamic control valves, alongside general valves, suitable for chilled heating and domestic services. CPDs include:

- *Proportional balancing*: within the commissioning process. Applies to constant and variable flow heating and chilled water systems.
- *Thermal circulation valves – protection against legionella*: how to eliminate *legionella pneumophila*, which causes Legionnaires' disease, from domestic hot water systems. Covers high-risk systems, growth considerations, and counteractive processes and measures that can be implemented,

primarily thermal circulation valves.

- *Variable volume system using differential pressure control valves (DPCVs)*: covers application, selection and commissioning.
- *Variable volume system using pressure independent control valves (PICVs)*: covers application, selection and commissioning.
- *Variable volume system using DPCVs and PICVs*: a combination of the above modules.
- *Digitising hydronics*: the relationship between BMS and smart buildings and hydronic control/balancing. Understanding Modbus/BACnet communication to achieve remote commissioning, delta T monitoring, and control and data analytics.

**Daikin Applied**



● Web: [daikinapplied.uk/cpd](http://daikinapplied.uk/cpd)

Daikin Applied (UK) (formerly McQuay UK Ltd) is the market leader in energy-efficient commercial and industrial air handling units (AHUs), chillers and heat pumps. We specialise in large-scale bespoke projects, from data centres and hospitals to pharmaceutical facilities and process cooling.

Our CPDs are relevant, up to date, highly technical, and informational. They can take place at your chosen premises or virtually. Available seminars from Daikin Applied (UK) are:

- *Optimising air handling unit design for energy efficiency and carbon footprint* – NEW; CIBSE-approved

- *Air handling unit compliance to HTM-03-01(2021)* – CIBSE-approved
- *The benefits of air handling unit refurbishment in healthcare facilities* – CIBSE-approved
- *Heat pumps and chiller market trends* – CIBSE-approved
- *Virtual factory tours of our European chiller, inverter and AHU factories.*

**Domus Ventilation**



● Phone: 03443 715523  
 Email: [vent.sales@domusventilation.co.uk](mailto:vent.sales@domusventilation.co.uk)  
 Web: [domusventilation.co.uk](http://domusventilation.co.uk)

Established more than 30 years ago, Domus Ventilation manufactures high-quality and solution-based ventilation products for the domestic and light commercial building industry.

At the heart of the company's product range are high-performance mechanical ventilation systems, including HRXE-HERA and HRXE-AURA mechanical ventilation with heat recovery (MVHR) and the energy efficient CMX mechanical extract ventilation (MEV) units, which boast the best specific fan power on the market.

Domus Ventilation is also renowned for its award-winning ducting systems, which offer improved system performance through their

exacting tolerances and engineered fit, which minimise pressure drops and virtually eliminate air leakage.

The company's reputation for quality products is further enhanced by excellent technical support from a dedicated, in-house team offering a range of services – from duct take-offs and estimations, to Revit MVHR and MEV system drawings – all free of charge.

Domus Ventilation also provides a detailed Specification Guide and offers several CIBSE-accredited CPD courses, including Residential ventilation principles and building regulations.

**DosaFil**



● Phone: 0345 605 0405  
 ● Email: [cpd@dosafile.co.uk](mailto:cpd@dosafile.co.uk) or [hello@dosafile.co.uk](mailto:hello@dosafile.co.uk)  
 ● Web: [dosafile.co.uk](http://dosafile.co.uk)

DosaFil offers the commercial heating sector a free CPD that shows why most treated closed heating and chilled water systems fall foul of corrosion, scale, bio-contamination and suspended solids, and explains how to address the challenges.

The reason is the prevalence of ineffective water treatment practices in the commercial and industrial HVAC industry. This technical training provides essential information to system users on how to manage and control water quality using a combination of the best available specialist conditioning equipment and chemical treatments. It includes unique training on how to

remediate systems online, avoiding costly downtime and offline cleaning methods.

DosaFil manufactures its own range of conditioning devices, which combine chemical dosing, side-stream filtration, and continuous air removal. Its team has more than 40 years' combined experience in industrial and commercial water treatment and management.

DosaFil's CPD is available to all CIBSE members and individuals working in the mechanical, electrical and plumbing sector, and can help delegates achieve CPD targets. DosaFil will deliver the training at a site most convenient to delegates.



### Enwa Water Technology UK

ADVANCED WATER TECHNOLOGY



- Phone: 01530 830354
- Email: [uksales@enwa.com](mailto:uksales@enwa.com)
- Web: [enwa.co.uk/cibse-approved-cpd-seminar](http://enwa.co.uk/cibse-approved-cpd-seminar)

Enwa's CPD is *The importance of effective filtration and water treatment for heating and cooling systems*.

The seminar focuses on filtration and water-quality requirements for modern HVAC systems, with reference to BSRIA and VDI guidelines, and includes:

- Key issues that threaten new-build and refurbishment projects, and a demonstration of how to identify and reduce these risks
- The positive impacts of effective water treatment and filtration on performance,

resilience and lifespan, illustrated through case studies

- The role of automation, effective control and management, and how shortcomings in design and procurement can adversely affect project commissioning, completion, warranty, and legacy stages
  - The impact on life-cycle costs, energy efficiency, and the environmental implications of failing strategies.
- We provide a free, one-hour lunch and learn session at your office or online sessions.

### FIRESAFE



- Tel: 01706 227935
- Email: [enquiries@firesafeductwork.co.uk](mailto:enquiries@firesafeductwork.co.uk)
- Web: [firesafeductwork.co.uk](http://firesafeductwork.co.uk)

Firesafe Fire Rated Ductwork are fire-resisting ductwork specialists. Creators and IP holders of the Queen's Award-winning Caswell Firesafe brand, we are CIBSE Patrons and members of ASFP, ADCAS, BESA and SMACNA.

Since January 2024, CIBSE has designated Building Safety CPD activity a mandatory requirement for its members. This one-hour, CIBSE-approved, interactive CPD is delivered via MS Teams by our expert team, including the chairs of the ASFP TG6 Technical Committee and BSI FSH 22/9 Ductwork Committee.

We provide comprehensive technical content, with practical and insightful guidance, on fire-resisting ductwork. Highly relevant to MEP

consultants, fire/mechanical engineers, HVAC designers, project managers and associated building services professionals, topics include:

- What is fire-resisting ductwork? Explanation of construction types
- Applications, including fire resisting, smoke control, and commercial kitchen extract
- Test standards criteria for A,B and C duct tests; stability, integrity and insulation
- Specification and certification to BS 476:Part 24, EN1366-1&8 and EN 12101-7
- Classification standards, EU/CPR regulations and certificate of conformity
- Function and installation of ductwork supports, fixings and penetration seals.

### FloControl



- Phone: 01282 564425
- Email: [CPD@flocontrol.ltd.uk](mailto:CPD@flocontrol.ltd.uk)
- Web: [flocontrol.ltd.uk](http://flocontrol.ltd.uk)

FloControl has been providing CPDs across the UK, remotely and at your place of business, for more than a decade. It excels in the education and information of valve sets, hydronic valves and building services applications.

The most popular CPD is the *Detailed exploration of variable flow systems*, looking at the design and operation of pressure independent control valves (PICVs) and efficiency within a system.

In recent months, a second CPD was accredited by CIBSE and a course on *Commissioning hydronic systems with ultra-low flow PICVs* is now available from FloControl.

The CPDs from FloControl refresh your knowledge of balancing and control principles of constant and variable flow systems, and help you understand dynamic valve terminology and technology, as well as develop strategies to deal with common building services hydronic design challenges.

The second CPD goes into further detail about PICV functionality, the definitions, practices and challenges of ultra-low flow systems, and the three system components that influence ultra-low flow application commissioning. Both are bookable on the FloControl website.

### Grundfos



- Email: [grundfos-uk@sales.grundfos.com](mailto:grundfos-uk@sales.grundfos.com)
- Web: [grundfos.com/uk/contact](http://grundfos.com/uk/contact)

As the world leader in pump technology and water solutions, Grundfos has extensive experience in the design and application of pumping systems in every type of building.

It has developed a library of CPD training modules specifically for engineers involved in the design, construction and management of sustainable commercial buildings.

Our CPD modules are fully endorsed by CIBSE and are structured to help engineers understand, specify and manage the most energy- and water-efficient pumping systems for every type of commercial building – from hospitals and restaurants to office

buildings, major residential developments, and modern mixed-use complexes.

Subjects covered include wastewater handling and removal, fire protection, pressure boosting, the application and benefits of offsite-built modular pumping systems, and how digitisation and the new generation of 'intelligent' pumps can transform performance in new and existing installations.

Get yourself, and your building, up to speed – check out the full range of Grundfos CPD training modules for energy efficient, sustainable commercial buildings.

**Hamworthy**



● **Kevin Potter, national sales manager**  
**Phone: 07957 815391**  
**Email: [kevin.potter@hamworthy-heating.com](mailto:kevin.potter@hamworthy-heating.com)**

Hamworthy Heating is a UK manufacturer of low carbon heating and hot-water solutions.

As part of our commitment to empowering our customers with the right advice, specification and knowledge for their heating and hot-water projects, we offer several CIBSE-approved CPD seminars, led by our expert team.

We can offer our CPD seminars online, or in person – at our site or yours. Topics include:

- *Introduction to heat pumps: technology and principles*
- *Best practice in domestic hot water (DHW): design and solutions (module 1)*
- *Best practice in DHW: safety, water treatment and legislation (module 2)*
- *Best practice in DHW: sizing (module 3)*
- *Boiler controls: unwiring the jargon*
- *New boilers on old heating systems: hydraulic designs*

**Humidity Solutions**



● **Tel: 01372 571200**  
**Email: [info@humidity-solutions.co.uk](mailto:info@humidity-solutions.co.uk)**  
**Web: [humiditysolutions.co.uk](http://humiditysolutions.co.uk)**

Humidity Solutions provides bespoke humidity control solutions across a wide range of commercial and industrial applications.

We offer CPD presentations on humidification and dehumidification, covering both sides of humidity control in depth. Each presentation includes a brief look at psychrometrics, the importance of humidity control, sizing, technology, and advice from our experts, who have decades of experience in the industry.

Seminars are available as hour-long 'working lunches', with refreshments provided by us when presented in person, or online via a webinar. Each one includes a Q&A session to ensure your team gets the answers they need.

To book a CPD presentation with our humidity control experts, contact us today.

**Ideal Heating Commercial Products**



● **Richard Brown, head of specification sales**  
**Phone: 07718 192161**  
**Email: [richard.brown@idealheating.com](mailto:richard.brown@idealheating.com)**  
**Web: [Idealcommercialheating.com](http://Idealcommercialheating.com)**

Ideal Heating Commercial Products is the UK's leading commercial heating manufacturer of high-efficiency commercial heating solutions.

Our CPDs can be delivered online or in person, at your premises or at one of our Centres of Excellence in Hull, Leeds, Luton and Dalgety Bay.

- *Understanding refrigerants and how they affect the choice of commercial heat pumps.* New for 2024. Looking at refrigerants – synthetic and natural options – and how they affect the choice of commercial heat pumps for different applications.
- *Heat networks and heat interface units (HIUs):* understanding heat networks and the role HIUs play in ensuring thermal comfort and

the efficient operation of the network.

- *Low carbon systems: appliances and applications using heat pump technology.* Topics include the mechanics and operation of heat pump systems; the types of heat pumps available; and the importance of correctly sizing heat pumps.
- *An introduction to plantroom surveys:* the stages involved in surveying a plantroom, with particular focus on retrofit boiler installations.
- *A review of commercial boiler heat exchanger materials:* a focus on materials and their maintenance, covering not only the different materials for heat exchangers, but also how to look after them.

**IMI**



● **Email: [marketing.uk@imiplc.com](mailto:marketing.uk@imiplc.com)**  
**Web: [imi-hydronic.com/engb/continual-professional-development](http://imi-hydronic.com/engb/continual-professional-development)**

IMI is committed to making complex HVAC concepts simple and intuitive, providing practical solutions that help you stay ahead in the industry. Our CPD courses offer targeted insights into balancing and control, pressurisation, and water quality.

- *Principles of pressure maintenance:* this course explains the critical role of pressurisation in HVAC systems, introducing the concept of dynamic pressurisation and its impact on system performance. You'll also learn about optimal pressurisation placement and best practices for commissioning.
- *Expansion vessel sizing:* we break down UK standards and European norms for sizing

expansion vessels, guiding you through the equations and methods recommended by CIBSE. You'll leave with a clear understanding of how to apply these principles in real-world scenarios.

- *Minimum controllable power in variable flow systems:* This explores how seasonal load variations impact flowrates and system stability. It covers the performance differences between DPCVs, PICVs, SMART valves, and standard control valves, giving you the insights to maintain room-temperature stability. Our CPD courses provide practical, actionable knowledge in a straightforward, easy-to-understand format.



**IWTM**



● Phone: 020 8255 2903  
 Email: [alexis@iwtm-uk.com](mailto:alexis@iwtm-uk.com)  
 Web: [iwtm-uk.com](http://iwtm-uk.com)

IWTM is the world leader in chemical-free water treatment for closed-loop networks and has been in operation in the UK for more than five years. It offers CPDs on the design, maintenance and operation of chemical-free water treatment for closed-loop networks.

With water being the lifeblood of a hydronic system, the quality of that water is critical to the operating efficiency and life of the components and network. Chemical-free water treatment offers a host of advantages over traditional regimes and is seeing huge growth in retrofit and new projects.

IWTM's CPD introduces chemical-free water treatment, its component parts, its design, operation and maintenance, and the water standards it achieves, including VDI2035.

Topics covered:

- What corrosion is and what causes it
- The technology behind chemical-free water treatment
- Standards; introducing VDI2035
- Product selection
- Installation and maintenance
- Benefits/advantages
- Case studies.

**Jaeggi**



● Phone: 07368 915586  
 Email: [dan.turner@jaeggi-hybrid.ch](mailto:dan.turner@jaeggi-hybrid.ch)  
 Web: [jaeggi-hybrid.co.uk](http://jaeggi-hybrid.co.uk)

Jaeggi invented and patented the hybrid dry air cooler in 1988, and has been forging forward in the field of cooling and heat rejection ever since.

Our main areas of operation are: data centre cooling, process cooling (including food and pharma) and manufacturing.

Our CPD will discuss the best design and selection practices for data centre cooling systems and potential applications of hybrid cooling across multiple sectors. Topics include:

- The use of hybrid dry coolers in liquid/immersion cooling systems
- Guidance through more hygienic and efficient technology created to reduce PUE and WUE

in building design and equipment selection.

- Features and benefits of hybrid cooling systems
- The advantages of deluge wetting systems compared with spray systems
- Legionella safety of deluge wetting systems
- Comparisons between softened water and reverse osmosis for deluge water cycling
- Design and optimisation of compressor-less systems using ASHRAE-permitted envelope temperatures
- Intelligent controls that can be tailored to suit site/customer requirements
- Operational cost calculations with estimations of pay-back periods.

**Jaga UK**



● Phone: 01531 631 533  
 Email: [cpd@jaga.co.uk](mailto:cpd@jaga.co.uk)  
 Web: [jaga.co.uk/cpd](http://jaga.co.uk/cpd)

Jaga UK is the go-to company for dynamic heating and cooling convectors that optimise renewable energy. Providing high outputs at low flow temperatures, its compact, energy-efficient emitters are the perfect heat pump partner.

Jaga UK offers two, free, CIBSE-accredited one-hour CPD seminars, in-person or via Teams.

- *Emitters: considerations for low flow temperature heating:* England's Building Regulations stipulate a maximum flow temperature of 55°C for new and replacement wet-space heating systems, recommending 45°C for heat pumps to maximise efficiency. This seminar offers guidance on selecting emitters for low-temperature systems,

avoiding overly large radiators, and maximising system performance. You'll learn how flow temperature affects efficiency, exploring emitter types and their performance at lower temperatures, including those that can provide cooling too.

- *Design and specification of trench climate convectors:* Covers the design and specification of trench convectors for heating, cooling and ventilation, the different types of trench convectors, their applications, and how to select the right unit for your project, including calculating outputs, working with low flow temperatures, and incorporating options such as curves and lighting.

**Kohler**



● Phone: 01256 386700  
 Email: [uksales.ups@kohler.com](mailto:uksales.ups@kohler.com)  
 Web: [kohler-ups.co.uk/ups-academy-cpd](http://kohler-ups.co.uk/ups-academy-cpd)

Kohler Uninterruptible Power (KUP) has extensive knowledge and experience of designing, specifying, configuring, installing, commissioning and servicing critical power protection solutions across a wide range of applications.

KUP offers a range of free 'lunch and learn' technical CPD seminars, aimed at consultants and electrical engineers, that can be held at a client's site or online.

It also runs full-day UPS Training Academy CPD-certified courses across the UK, which are free to attend.

The courses are designed to improve understanding of the most recent power-protection specification and selection requirements. CPD topics include:

- *Designing resilient UPS systems*
- *UPS – fault clearance and neutral earthing*
- *Emergency lighting*
- *UPS room planning and considerations*
- *UPS for healthcare (new for 2023)*
- *Using a UPS as secondary source for safety services*
- *UPS battery technology*

**Lochinvar**



● Phone: **01295 269981**  
 Email: [info@lochinvar.ltd.uk](mailto:info@lochinvar.ltd.uk)  
 Web: [lochinvar.ltd.uk](http://lochinvar.ltd.uk)

Lochinvar manufactures and distributes a wide range of equipment for commercial and industrial heating and hot-water applications. The current product range includes heat pumps, solar thermal systems, gas-fired water heaters and boilers, as well as associated ancillaries.

Lochinvar has provided CIBSE-accredited CPD seminars for many years, and its aim is to maximise the value to its audience by frequently reviewing and acting upon attendee feedback. Current sessions include:

- *Heat pumps for commercial heating and hot-water and cooling applications*

- *Sizing and selection of direct gas-fired water heaters*

Lochinvar is working on new CIBSE-accredited CPD content to offer insight into the latest industry trends and technologies. Keep an eye on the training section of its website to sign up for existing sessions and be the first to know about new content.

**Munters**



● Phone: **01480 432243**  
 Email: [info@munters.co.uk](mailto:info@munters.co.uk)  
 Web: [munters.com/en-gb](http://munters.com/en-gb)

Munters' CIBSE-approved CPD seminars give a comprehensive introduction to dehumidification and, now, humidification theory.

With our newly launched humidification CPD, you will learn about the impact of moisture, combating seasonal fluctuations, and how to achieve the most cost-effective and energy-efficient climate solution for you or your customer.

Our CPDs can cover:

- Dehumidification or humidification theory
- Basics of humidity and use of psychrometric chart
- Methods of dehumidification or humidification and its benefits

- Dehumidification or humidification in industry – case study examples
- Energy-saving technology and applications
- Implications of high and low relative humidity on materials, manufacturing, and human health

Suitable for consultants and industry professionals, these seminars are held either in person, at your office, or online. Munters can provide a free lunch (subject to conditions – ask for details).

Book a CPD now at [go.munters.com/HumidificationCPDSeminar](http://go.munters.com/HumidificationCPDSeminar)

**Smith Brothers**



● Phone: **0116 222 7300**  
 Email: [aquatechnik@sbs.co.uk](mailto:aquatechnik@sbs.co.uk)  
 Web: [aquatechnik.co.uk](http://aquatechnik.co.uk)

Smith Brothers offers a 45-minute CPD course on the fundamentals of multilayered composite pipe (MLCP). This session provides a concise and practical introduction to MLCP, covering its key benefits, applications and installation methods. Designed for building services professionals, the course outlines how MLCP combines the strengths of metal and plastic piping to deliver improved durability, flexibility, and ease of use.

Participants will gain insights into MLCP's use in potable water, heating and gas systems, as well as its environmental and cost advantages. The session will also include technical details on the pipe's structure, performance characteristics and connection techniques, so engineers and

contractors can make informed decisions for modern construction projects.

*Introduction to multilayered composite pipe (MLCP)* equips attendees with the knowledge to enhance system efficiency and compliance with industry standards. It covers:

- Benefits
- History
- Material composition
- Terminology
- Standards
- Applications
- Joining methods
- Comparison with traditional joining methods
- Design considerations.

**Socomec**



● Phone: **0333 015 3002**  
 Email: [info.uk@socomec.com](mailto:info.uk@socomec.com)  
 Web: [socomec.co.uk](http://socomec.co.uk)

Regardless of industry or sector, everyone is now required to undertake CPD. The updating of skills and knowledge is critical for keeping abreast of industry changes, maintaining professional competence and ensuring that qualifications do not become obsolete.

Socomec offers seven comprehensive professional development seminars, delivered by highly experienced, critical system application engineers.

Hosted at your offices for between 4 and 40 participants, the seminar takes approximately one hour and you will receive an individual presentation pack and certificate upon completion.

Topics include:

- *Energy storage*
- *Power monitoring: causes, effects and solutions*
- *Automatic transfer switch essentials*
- *The application of 3 and 4 Pole STS units*
- *General introduction to UPS systems*
- *The benefits of modular UPS systems*
- *Earthing and neutrals within transformers and transformer-less UPS.*



## Swegon



● Phone: 01634 981400  
 Email: [marketing.uk@swegon.com](mailto:marketing.uk@swegon.com)  
 Web: [swegon.com/uk](http://swegon.com/uk)

At Swegon, we help you create indoor spaces that empower individuals to think, feel, and perform at their best. We offer a comprehensive range of CPD technical training, in person, live online and on demand.

Our CPD training focuses on sustainability, safety, and creating great indoor climates, and equipping professionals with the knowledge to deliver outstanding results. Highlights from our training catalogue include:

- **Heat pumps and net zero:** Delve into achieving

net zero emissions in commercial heating and cooling

- **Sustainable room terminal selection:** Explore energy use and life-cycle costs, comparing grills/diffusers and chilled beams for ventilation
- **Fire dampers and controls:** In-depth knowledge of fire dampers, covering installation and specification best practices. Discover our full range of CPD technical training programmes on our website.

## Systemair



● Phone: +44 7475 886642  
 Email: [cpd@systemair.co.uk](mailto:cpd@systemair.co.uk)  
 Web: [systemair.com](http://systemair.com)

Systemair has led the world in energy efficient ventilation products for more than 50 years. Offering a range of accredited CPD technical training courses in person at your offices, in our expo centre in Birmingham, or online - at times and days to suit you. We can also tailor specific sessions with in-person training to help expand knowledge even further.

- **Energy-efficient ventilation:** ventilation running costs and carbon footprint savings using demand-control EC motor technology and energy-recovery components.
- **Low energy air conditioning with indirect adiabatic cooling:** alternative methods of air conditioning that can reduce or eliminate

the use of refrigeration-based cooling.

- **Residential ventilation and MVHR:** introduction to different types of residential ventilation systems and how they are designed and integrated into a building.
- **Swimming pool ventilation and heat recovery:** technical seminar suitable for mechanical and electrical services engineers designing swimming pool hall ventilation systems or carrying out energy surveys on pools.
- **Passivhaus ventilation systems:** design and comparison of ventilation systems for Passivhaus buildings.
- **Smoke control systems:** the principles of design and control of smoke systems.

## Uponor



● Phone: 01923 381212  
 email: [customersupport.uk@uponor.com](mailto:customersupport.uk@uponor.com)  
 Web: [uponor.com](http://uponor.com)

Turn knowledge into power with Uponor's new CPD on heat networks.

GF Building Flow Solutions (formerly Uponor) offers a CPD and training programme that provides consultants, contractors, and building services and mechanical engineers with valuable insights into plumbing, radiant heating and cooling, and local heat distribution solutions.

Building on the success of previous CPD seminars, the manufacturer recently announced its most recent CIBSE-approved CPD, *Minimise the heat and energy losses of heat networks*, which focuses on a number of key areas associated with this important topic.

The comprehensive CPD discusses the

different types of heat networks and their role in reaching net zero. It also covers relevant legislation and advises how to optimise their performance through the use of efficient, pre-insulated pipe systems.

As one of the leading manufacturers of solutions for the delivery of safe drinking water, as well as energy-efficient heating and cooling systems, GF Building Flow Solutions experts are available to visit preferred sites to deliver the hour-long CPD, or can arrange for it to be delivered online.

You can register for the CPD seminar by completing a registration form at [uponor.com/en-gb/specification/cpd-page](http://uponor.com/en-gb/specification/cpd-page).

## VEXO



● Email: [cpd@vexoint.com](mailto:cpd@vexoint.com)  
 Phone: 01767500150  
 Web: [vexoint.com/cpd](http://vexoint.com/cpd)

Vexo International offers a superior range of water-quality products for HVAC efficiency through side-stream filtration, smart BMS controls, and additives.

It offers a CPD on closed system water treatment, which can be delivered in your office, via MS Teams, or at its premises in Biggleswade.

The CPD covers the importance of maintaining water quality in closed systems, the impact on energy efficiency, and system

longevity. Participants can learn about best practices for water treatment, the role of inhibitors, and the benefits of side-stream filtration.

The seminar is designed for mechanical engineers, facility managers, and anyone involved in building services maintenance.

To arrange a seminar, contact Vexo International for more details. Lunch and Learns are also available for parties of six or more.



**NIBE**



# Our most powerful Exhaust Air Heat Pump yet

## S735 Exhaust Air Heat Pump



### INTEGRATED SOLUTION

Our compact indoor solution for the provision of heating, hot water, and ventilation.



### NATURAL REFRIGERANT

R290 refrigerant for reduced environmental impact.



### PERFORMANCE

Combining ventilation heat recovery with heat pump technology to deliver high seasonal performance and economic operation.



### SMART VENTILATION

Smart ventilation based on temperature, humidity and CO2 levels with myUplink smart home.



### EXCEPTIONALLY QUIET OPERATION

New design for low noise level, 49dB(A) nominal sound power level

Discover Exhaust Air Heat Pumps at [nibe.co.uk](https://nibe.co.uk)



@NIBEenergy



NIBE (GB)



nibeenergyuk



nibe-energy-systems-limited





**Continuing professional development (CPD) is the regular maintenance, improvement and broadening of your knowledge and skills to maintain professional competence. It is a requirement of CIBSE and other professional bodies. This Journal CPD programme can be used to meet your CPD requirements. Study the module and answer the questions on the final page. Each successfully completed module is equivalent to 1.5 hours of CPD. Modules are also available at [cibsejournal.com/cpd](http://cibsejournal.com/cpd)**

# Decarbonising heat: developing effective clean heat standards

This module considers a recently published international handbook promoting clean heat standards across the globe

**H**eat production represents a significant portion of global CO<sub>2</sub> emissions. While cost-effective clean heat solutions exist, barriers such as high upfront costs and lack of market certainty hinder their widespread adoption. Successful clean heat standards place an obligation on heating sector participants to deliver cleaner solutions while providing flexibility around how they achieve these targets. This CPD largely provides a summary of a recently published international handbook that is aimed at accelerating the rollout of suitable clean heat standards across the globe.

Clean heat standards function by placing a performance requirement on key market participants, compelling them to increase the uptake of clean heat solutions. Unlike equipment standards that regulate individual appliances or buildings, clean heat standards target broader fleets of equipment or the operations of energy suppliers. There are several clean heat standards already in place or under development. In the UK, for example, it is hoped that the Clean Heat Market Mechanism<sup>1</sup> (CHMM), which will introduce a rising market standard for heat pumps as a proportion of fossil fuel boiler sales, will be in place in 2025, while, in the US, a few states have embarked on setting sector-specific obligations for energy utilities. A recent report<sup>2</sup> by European 'clean heat' industry groups drew on an extensive survey<sup>3</sup> of 12 EU member states, and determined that the few policy frameworks in place to support wide-scale clean heating and cooling were not yet strong or consistent enough. To accelerate the design of standards, the Regulatory Assistance Project (RAP)<sup>4</sup> – an independent global non-governmental organisation (NGO) – has created a freely accessible handbook<sup>5</sup> as a resource for the development of properly considered, holistic clean heat standards. The handbook proposes four steps as a route towards a successful design of a standard.

The first step, 'Assess the potential role', emphasises the importance of a thorough evaluation before implementing a clean heat standard. This evaluation should encompass a comprehensive understanding of the existing heat decarbonisation landscape, including the challenges, policy gaps and potential equity implications. This highlights the dominance of fossil fuels in the heating sector as a primary challenge. While the specific situation varies across jurisdictions, it notes that transitioning to renewable heat requires significant effort, as well as substantial policy and market reforms. Understanding the existing heat consumption patterns across

different sectors – such as residential, commercial and industrial – is crucial for determining the scope of a clean heat standard. A nuanced approach is advocated to clean heat solutions, recognising that a single solution might not fit all contexts. While electrification through heat pumps is often touted as a key pathway, the handbook acknowledges the importance of considering the existing electricity grid's carbon intensity. In regions with carbon-intensive electricity generation, a rapid and large-scale shift to heat pumps could inadvertently increase emissions. Therefore, policymakers should carefully assess the electricity mix and consider complementary measures, such as accelerating renewable energy deployment in the power sector.

Beyond the technical aspects, the handbook delves into the barriers hindering the adoption of clean heat solutions. These barriers encompass a complex interplay of factors, including high upfront costs for clean heat technologies, challenges in accessing financing – particularly for low-income households – and a lack of awareness or information about available options. It emphasises that addressing equity concerns should commence right from the outset. Recognising that access to affordable heating is already a challenge for many, policymakers are urged to design clean heat standards that do not exacerbate existing inequalities. This involves understanding the specific needs and barriers faced by vulnerable communities, such as low-income households, renters, and residents of remote areas, and incorporating measures to ensure they benefit from the transition to clean heat.

It acknowledges that there will be a need to critically assess the effectiveness of existing clean heat policies in addressing the identified barriers. This involves evaluating the performance of subsidy schemes, carbon taxes, emissions trading systems, and energy efficiency obligation schemes. For instance, while subsidies can help offset the upfront costs of clean heat technologies, the handbook cautions that their effectiveness depends on factors such as programme design, accessibility, and the adequacy of funding. Similarly, while carbon-pricing mechanisms can incentivise cleaner choices, their impact on low-income households needs careful consideration, potentially requiring complementary measures to mitigate any regressive effects.

The handbook advocates identifying the specific policy gaps that a clean heat standard would address and how it would complement existing initiatives. For

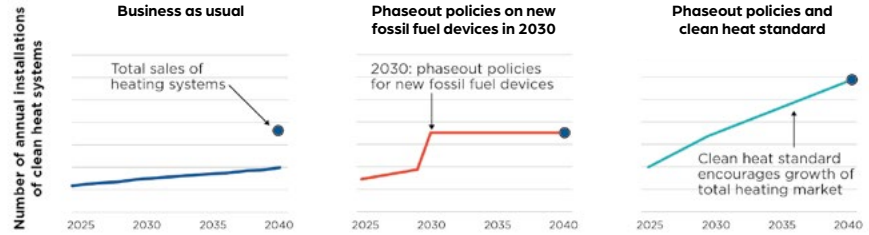
example, while carbon taxes and emissions trading systems provide a price signal, they might not guarantee a specific trajectory for clean heat deployment. Similarly, phaseout policies can be an effective way to reduce fossil fuel heating system sales, but they might not achieve a rapid, complete replacement, as illustrated in Figure 1. This is because of the long lifespan of heating systems and continued installations before the phaseout takes effect.

A well-designed clean heat standard can provide this missing trajectory, ensuring a predictable and consistent pathway for decarbonising the heating sector. Distributional impacts should be considered, ensuring that the costs of compliance do not disproportionately burden low-income households, and that the benefits of clean heat reach vulnerable communities. Addressing equity concerns may involve incorporating sub-targets for low-income households or designing complementary policies to mitigate potential cost increases.

The second step the handbook proposes, 'Design the obligation', outlines the critical considerations for structuring the core requirements of a clean heat standard. This includes determining which market bears the obligation to drive the adoption of clean heat solutions. The focus is provided on two primary categories: energy companies and heating appliance manufacturers.

Energy company targets include gas distribution utilities, providers of delivered fossil fuels (such as heating oil and propane), bioenergy firms and electricity companies. This choice presents complex trade-offs. Targeting upstream companies, such as wholesalers, could offer greater leverage and administrative capacity, but might require navigating interstate commerce regulations, particularly in the US. Conversely, downstream retailers, while benefiting from direct customer interactions, might lack the resources of their larger upstream counterparts.

Targeting heating appliance



**A phaseout policy alone might not be enough to swiftly introduce clean heat systems. Combining a phaseout with a clean heat standard can accelerate this transition, ensuring a more competitive market and faster adoption of clean technologies.**

**Figure 1: Clean heat standards with phaseout policies for fossil fuel heating appliances – an illustration of potential impacts (Source: Clean Heat Standards Handbook,<sup>5</sup> RAP, 2024)**

manufacturers (such as with the UK CHMM) would directly influence the production side of the equation, incentivising manufacturers to ramp up the production of cleaner heating technologies, such as heat pumps. However, implementing this approach necessitates addressing the potential for importing fossil fuel appliances from regions without similar standards, which could undermine the policy's intended effects. Additionally, size exemptions may be considered for smaller manufacturers based on sales thresholds, to avoid placing disproportionate burdens on them. Crafting these exemptions carefully is crucial to prevent loopholes that could compromise the standard's effectiveness.

Establishing a clear and achievable target for clean heat deployment is fundamental to the success of any clean heat standard. The target metric should align with the overarching goals of the standard. For instance, if the primary objective is to reduce greenhouse gas emissions, expressing the target in terms of emissions reductions would be logical. However, if the focus is on promoting specific technologies, the metric could be tailored to track technology adoption rates. A particular UK initiative (not mentioned in the handbook) is the Boiler Upgrade Scheme (BUS)<sup>6</sup> that promises £2bn of grant funding allocated for air source, ground source and water source

heat pumps, plus biomass boilers. However, such a technology-prescriptive scheme misses the opportunity of promoting equally valid variants of heat pumps such as exhaust-air heat pumps (EAHPs), an example of which is shown in Figure 2.

While aligning the long-term target with broader climate objectives is vital, there will probably be a need for a phased approach. The initial phases might involve relatively modest targets to allow the market to adapt and avoid sudden cost increases for consumers. Providing certainty about the long-term trajectory and incorporating mechanisms such as banking can encourage continued investment in clean heat solutions.

Beyond setting the overall target, there are additional constraints and sub-targets required to address equity concerns and promote a diverse portfolio of clean heat technologies. Recognising that low-income households often face the greatest barriers to adopting clean heat technologies, sub-targets should be included to ensure that these households benefit from the standard. These sub-targets could mandate obligated parties to achieve a certain percentage of their clean heat deployments within low-income communities, or offer additional incentives for doing so. This approach helps counteract the risk of clean heat benefits accruing primarily to higher-

**Figure 2: An example of an exhaust-air heat pump (EAHP) charged with R290 (propane) delivering heating, hot water and ventilation in one package, with a SCOP of 4.29 and a measured noise level of 49dB(A) (to EN12102). This is aimed at apartments and new-build houses up to 160m<sup>2</sup> (Source: NIBE)**



1. Discharge air
2. Air from occupied spaces
3. Inverter controlled compressor
4. Refrigerant evaporator
5. Control interface
6. Diverter valve to switch between heating and DHW
7. Main controller
8. Expansion tank and water pump
9. Connections for heating flow and return, hot and cold water

income households that can more easily afford the upfront costs.

Policymakers can use sub-targets to foster the development of specific technologies deemed crucial for long-term heat decarbonisation, even if those technologies are currently less commercially viable. Conversely, caps can be placed on technologies deemed to have a limited role in the long-term transition, or which pose potential environmental or social risks. For instance, the use of certain biofuels might be capped to mitigate concerns about sustainability and land-use competition.

There must be a transparent and inclusive process for defining eligible actions, potentially allowing for revisions based on technological advancements and market feedback. This iterative approach ensures that the standard remains responsive to emerging technologies and avoids locking in specific pathways prematurely.

Step three in the handbook, 'Create Flexibilities', focuses on incorporating flexibility mechanisms into clean heat standard design. Three key flexibility mechanisms are identified:

- **Banking and borrowing:** This allows obligated parties to adapt to variations in market conditions and project timelines by carrying forward those excess credits to meet future obligations. This incentivises early action and provides a buffer against future uncertainties. Conversely, borrowing allows entities falling short of their targets in a period to defer some of those obligations to the next period – although this needs careful management to prevent delaying overall progress. Setting caps on borrowing and potentially imposing penalties for its use can mitigate this risk.
- **Trading compliance credits:** Recognising that the cost of implementing clean heat measures can vary significantly across different contexts, these would properly incorporate trading mechanisms. Horizontal trading permits obligate entities to exchange compliance credits among themselves, allowing those achieving reductions at a lower cost to sell credits to those facing higher costs. Expanding the scope to include vertical trading – where accredited non-obligated entities can generate and sell credits – can further enhance cost-effectiveness and stimulate broader market participation in clean heat activities. Establishing clear rules and potentially creating dedicated trading platforms can facilitate efficient market operations.
- **Buyouts and alternative compliance mechanisms:** Buyout provisions can provide a safety valve for obligated parties facing exceptionally high compliance costs. These provisions allow

entities to pay a fee in lieu of directly implementing clean heat measures.

However, to prevent buyouts from undermining the standard's effectiveness, it is crucial to set the buyout price appropriately and, potentially, cap the proportion of obligations that can be met through buyouts. Additionally, dedicating buyout revenues to fund clean heat projects implemented by a designated delivery agent can help ensure that the policy's overall impact remains aligned with its objectives.

The final stage – step four, 'Ensure compliance' – considers the mechanisms that underpin the successful implementation and enforcement of a clean heat standard. There are several key considerations for establishing a robust compliance framework with clear administrative structures. A specific entity, such as a government agency or regulator, should be designated as the scheme administrator that plays a central role in overseeing the standard's implementation – including setting detailed rules, managing data collection and reporting, and ensuring compliance with the established framework.

It is important to provide the administrator with the flexibility to adapt to evolving circumstances and refine implementation details through secondary legislation or administrative decisions. This flexibility allows for adjustments based on market dynamics, technological advancements, and lessons learned during the implementation process.

There are actions with directly measurable impacts, such as sales figures for clean heating appliances, and those requiring indirect measurement methods, such as greenhouse gas emission reductions. Indirect methods may include 'deemed scores' that assign predefined emission reduction values to standardised clean heat actions. For instance, a specific type of heat pump installation could be assigned a predetermined emission reduction score based on its technical specifications and average performance estimates. Deemed scores require robust verification mechanisms to prevent gaming the system by prioritising installation speed over quality. An alternative indirect tool is to employ 'metered methods' that rely on actual energy consumption data to determine the impact of clean heat actions. This approach, while more complex and data-intensive, offers greater accuracy, especially for large or complex installations where standardised assumptions might not hold true.

Accounting rules will be required to address the long-term impacts of clean heat actions. This includes assigning appropriate lifetimes to different measures and

potentially discounting impacts over time to reflect the time value of emission reductions. Additionally, the rules should provide guidance on addressing the rebound effect, where energy efficiency improvements lead to increased energy consumption owing to changes in consumer behaviour.

Recognising that clean heat standards often operate within a broader policy landscape, any methods should account for additionality – ensuring that the credited emission reductions are genuinely attributable to the clean heat standard rather than other policies or autonomous market trends. This might involve adjusting targets based on the projected impact of complementary policies or requiring obligated parties to demonstrate the unique contribution of their actions. Effective enforcement mechanisms are crucial for ensuring that obligated parties take their clean heat obligations seriously, and it is important to establish clear and sufficiently stringent penalties for non-compliance. Setting the penalty price appropriately – high enough to discourage non-compliance but not so high as to be unachievable – is essential. Penalty enforcement should be transparent and prompt, potentially requiring obligated parties to compensate for missed emission reductions in addition to paying financial penalties.

While penalties serve as a deterrent, there is potential for incorporating positive incentives to reward overcompliance and further drive clean heat investments. This could involve financial rewards for exceeding targets or allowing obligated parties to bank excess credits at a premium rate for future use. By carefully designing and implementing these compliance mechanisms, policymakers can create a robust framework for accountability, transparency and, ultimately, the achievement of clean heat objectives.

In conclusion, the handbook highlights that clean heat standards are promising tools for accelerating the transition to cleaner heating systems, but their success requires a comprehensive policy approach. Policymakers will need to tailor the design of standards to their specific contexts, considering local heating sector characteristics, equity implications, and potential interactions with existing policies. This will involve addressing barriers to clean heat deployment, ensuring equitable access to affordable solutions, and leveraging market forces through flexibility mechanisms and robust compliance frameworks. ●

© **Tim Dwyer 2024.**

● **This CPD article is principally drawn from the freely downloadable *Clean Heat Standards Handbook*<sup>5</sup> by Marion Santini and team at the Regulatory Assistance Project.**



# Module 239

November 2024

**1. What is a clean heat standard primarily designed to do?**

- A Ban fossil fuel use in residential buildings
- B Place performance requirements on market participants to increase clean heat adoption
- C Promote the widespread use of heat pumps only
- D Reduce the cost of heating systems
- E Regulate the use of electricity in homes

**2. Which of these is noted as a significant barrier to the widespread adoption of clean heat solutions?**

- A High operational costs of clean heat technologies
- B High upfront costs and lack of market certainty
- C Insufficient market demand for clean heat solutions
- D Lack of awareness about the environmental benefits
- E Limited availability of renewable energy sources

**3. According to the handbook, what is one key consideration before implementing a clean heat standard?**

- A Ensuring a significant amount of grid electricity is 'green'
- B Increasing the lifespan of fossil fuel heating systems
- C Increasing the production of biofuels
- D Reducing the cost of electric heating appliances
- E Understanding of the existing heat decarbonisation landscape

**4. Which of these technologies is not currently included in the UK BUS?**

- A Air source heat pumps
- B Biomass boilers
- C Exhaust-air heat pumps
- D Ground source heat pumps
- E Water source heat pumps

**5. What is a recommended method for ensuring equity in clean heat standards?**

- A Implementing flat taxes on all heating appliances
- B Mandating a single clean heat solution for all contexts
- C Reducing the cost of compliance for larger companies
- D Removing subsidies for high-end heat pump installations
- E Setting sub-targets for clean heat deployments within low-income communities

Name (please print) .....

Job title .....

Organisation .....

Address .....

Postcode .....

Email .....

Are you a member of CIBSE? If so, please state your membership number: .....

**The CIBSE Journal CPD Programme**

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

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

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

**References:**

- <sup>1</sup> [bit.ly/CJNov24CPD1](http://bit.ly/CJNov24CPD1) – accessed 6 September 2024.
- <sup>2</sup> *How can Europe fill the clean heat gap*, [bit.ly/CJNov24CPD2](http://bit.ly/CJNov24CPD2) – accessed 6 September 2024.
- <sup>3</sup> [bit.ly/CJNov24CPD3](http://bit.ly/CJNov24CPD3) – accessed 6 September 2024.
- <sup>4</sup> [bit.ly/CJNov24CPD4](http://bit.ly/CJNov24CPD4) – accessed 6 September 2024.
- <sup>5</sup> [bit.ly/CJNov24CPD5](http://bit.ly/CJNov24CPD5) – accessed 6 September 2024.
- <sup>6</sup> [bit.ly/CJNov24CPD6](http://bit.ly/CJNov24CPD6) – accessed 6 September 2024.



# Cutting carbon at an affordable cost

Decarbonising buildings while ensuring they are affordable and healthy is a challenge facing today's manufacturers. We ask four how their technology aims to achieve these goals





James Henley, chiller product manager, Daikin Applied UK  
[daikinapplied.uk](http://daikinapplied.uk)

**The best solutions are holistic ones that look at the building as a complete system and deliver on several fronts**

**Q: How do we decarbonise buildings without adding cost?**

**A:** CIBSE President Fiona Cousins has challenged the industry to 'reimagine building performance' by taking a broader view of how building services engineers can contribute to better health, wellbeing and social outcomes for people through addressing key metrics such as air quality, acoustics, lighting, and biophilia – while still saving energy and cutting carbon.

Daikin Applied (UK) recognises the best solutions are holistic ones that look at the building as a complete system and deliver on several fronts, including reduced upfront and operating costs.

One significant recent development is the wider use of R32 refrigerant in our commercial heat pump range. With a global warming potential of 675 – a third of the more commonly used R410A – R32 makes a significant difference to the environmental impact of our equipment.

By deploying this in conjunction with highly energy-efficient operation, the industry can reduce the carbon footprint of many types of building. R32 also allows for a smaller charge of refrigerant, which creates other efficiencies and reduces installation and service costs.

We have also developed more modular solutions for water-to-water heat pumps.



This allows the required capacity to be reached by combining smaller units, piped together and controlled as a single system. Modular construction also makes it easier to transport, handle and position units, but still offers all the advantages of plug-and-play installation and commissioning. In addition, it makes it easier to match operating patterns to the specific heating and cooling loads of the building. This reduces running time and energy use, and improves long-term reliability – which helps keep down costs.

Remote monitoring is another way to minimise spending. We can alert clients to potential problems before they become serious and adjust operating parameters without more costly onsite intervention.



Paul Williams, product manager at Domus Ventilation  
[domusventilation.co.uk](http://domusventilation.co.uk)

**For maximum energy efficiency in new builds you should consider a mechanical ventilation with heat recovery unit**

**Q: How do we ensure buildings are healthy without compromising on energy efficiency?**

**A:** Indoor air pollution can be up to five times higher than that of external air. Sources are widespread, but include cooking, cleaning products, furniture, and outdoor emissions entering our homes. Plus, there's condensation and mould to contend with in the winter months.

Poor indoor air quality has been linked to an increased risk of respiratory and cardiovascular illness, cognitive impairment and certain cancers. England's *Chief Medical Officer's Annual Report 2022 Air Pollution* stated: 'The role of ventilation is central to reducing unavoidable indoor air pollution.'

Mechanical extract fans can be an effective form of ventilation that use very little energy, although the specific fan power (SFP) is something to consider. We design our fans with as low an SFP as possible, to optimise energy efficiency, especially when it comes to continuous-running extract fans such as dMEVs. The dMEV-NICO, for example, has a very low SFP of between  $0.16W \cdot L^{-1} \cdot s^{-1}$  and  $0.28W \cdot L^{-1} \cdot s^{-1}$ .

For maximum energy efficiency in new builds, though, you should consider a mechanical ventilation with heat recovery



(MVHR) unit. When you use extract fans or mechanical ventilation extract-only systems, you not only exhaust the stale air outside, but also the heat with it.

This can be avoided by using an MVHR unit, which combines supply and extract ventilation in one system. They extract the stale air from wet rooms and transfer the heat from that air to the fresh air being drawn into the building via a heat exchanger. The filtered, pre-warmed air is then distributed around the home.

The heat that would have been lost is regained. In the case of our HRXE MVHR range, these recover heat with up to 95% efficiency, making them highly effective.





Chris Caton, product director,  
commercial, Ideal Heating  
[idealheating.com](http://idealheating.com)

**The hybrid heating system makes considerable steps towards decarbonised heating, but with a more affordable price tag**

**Q: How do we make sure the decarbonisation of heat is affordable?**

**A:** Decarbonising heating in our buildings, primarily through the replacement of natural gas boilers with heat pumps, is a key government goal. Heat pumps are up to a third more efficient than gas boilers, so require less energy to run.

However, the capital cost of heat pumps is more than comparable gas boilers and, despite their efficiency, running costs are higher because of gas being cheaper than electricity in the UK. (The average unit rates under the price cap that came into effect in October 2024 are 6.24p per kWh for gas and 24.50p per kWh for electricity.)

On the plus side, heat pumps have a long lifespan and minimal moving parts to replace or maintain – but costs remain a real stumbling block for many. Meeting the heat load of an older, poorly insulated property can also be expensive from a heat pump alone, typically because of the size and fabric of the building. Even in properties where retrofitting insulation and improving airtightness is possible, the cost of doing so may be prohibitive.

A compromise can be achieved that makes considerable steps towards decarbonised heating, but with a more affordable price tag: the hybrid heating



system, with heat pumps as the primary heating system and gas boilers as the 'top up' at times of high demand or when external temperatures are particularly low.

Cascading, wall-hung commercial condensing boilers such as our Evomax 2, or the floor standing Imax Xtra 2, are ideal for hybrid systems, as a higher modulation ratio is achieved, so gas use is far more efficient. A large single boiler would cycle on and off, using more fuel than necessary.

This hybrid approach is one of the reasons our Ecomod heat pumps have been designed to be installed alongside other Ideal solutions.



Dan Turner, solutions sales manager  
at Jaeggi [jaeggi-hybrid.eu](http://jaeggi-hybrid.eu)

**Our hybrid coolers operate with minimal water use and use less electricity compared with traditional systems such as cooling towers and chillers**

**Q: How do we decarbonise buildings without adding cost?**

**A:** Jaeggi Hybrid technology provides energy-efficient cooling systems that reduce the need for carbon-intensive energy sources. Our hybrid dry air coolers combine the benefits of air-cooled and water-cooled systems, delivering heat rejection with significantly reduced water consumption and energy use.

This technology is especially valuable in the context of HVAC systems across commercial and industrial/manufacturing facilities – and, in particular, data centres, which are often major contributors to carbon emissions because of their high energy demands.

Traditional cooling systems rely heavily on water or refrigerants, which can have a large carbon footprint. Jaeggi's hybrid coolers, however, operate with minimal water use and use less electricity compared with traditional systems such as cooling towers and chillers. The reduction in energy consumption directly translates to lower CO<sub>2</sub> emissions, especially in regions where electricity is generated from fossil fuels. Additionally, by operating in hybrid mode, these systems optimise their performance based on ambient conditions, further minimising resource use and maximising efficiency.



By using Jaeggi's hybrid coolers, buildings can reduce their reliance on carbon-intensive energy grids and move towards achieving net zero carbon targets. The ability to integrate renewable energy sources, such as solar or wind, amplifies the environmental benefits of these cooling systems. Furthermore, their scalable design makes them suitable for a wide range of building sizes and types.

Jaeggi supports the decarbonisation of buildings through energy-efficient, low-water and highly adaptable cooling solutions that reduce carbon emissions and facilitate the transition towards sustainable, eco-friendly building operations.



# URBAN LIGHTING

Creating well lit spaces to encourage social interaction



View our  
**URBAN SECTOR**





CPD programme  
Lighting



# Perception of safety in artificially lit urban settings

This module explores research on the effects of urban lighting, with a particular focus on how humans perceive it in terms of safety

Urban lighting significantly influences our perception of safety, security and overall quality of life. This CPD article draws on current Society of Light and Lighting (SLL) guidelines, plus themes and findings from recent research papers on the effects of urban lighting, to explore the human perception of safety in artificially lit urban settings.

The history of artificial lighting at night (ALAN) in public spaces dates back centuries. Early forms of public lighting can be traced back to ancient civilisations, which used oil lamps and torches to illuminate streets and public spaces. In the 15th century, London and other English cities implemented regulations requiring residents to light their homes at night, but this was primarily for safety and security reasons rather than a formal public lighting system. The development of gas lighting in the 18th and 19th centuries marked a significant advancement in public lighting. Cities such as London and Paris began to install gas streetlamps that provided more consistent illumination, and these systems were maintained professionally, marking the beginning of modern public lighting infrastructure.

The temperature and intensity of light influence perceptions of brightness and safety. Studies,

including that by Li *et al*,<sup>1</sup> consistently show that warmer colour temperatures (lower Kelvin values) generally enhance feelings of safety, even at the same illuminance levels as cooler light. This could be because warmer light is less disruptive to natural circadian rhythms and is associated with more relaxing environments. Some studies suggest the spectral sensitivity of human vision under low-light conditions (mesopic vision – see boxout) might mean that ‘whiter’ light sources could offer better visibility for certain tasks. But existing metrics, such as lux (lx), that focus on light intensity might not accurately reflect human perception of brightness, as they don’t fully account for the interplay of rod and cone cells at night. A certain lux level might appear brighter to a person with a higher density of rod cells compared with someone with a lower density. To address this, researchers are exploring more sophisticated metrics that consider the interplay between rod and cone cells.<sup>2</sup>

An important aspect of ALAN is that it is a significant environmental stressor impacting biodiversity and human health. As discussed in SLL LG21,<sup>3</sup> to protect the night-time environment, it is best to avoid installing exterior lighting unless absolutely necessary. Unshielded urban lights create a diffuse glow in the sky, negatively affecting nocturnal habitats

**Continuing professional development (CPD) is the regular maintenance, improvement and broadening of your knowledge and skills to maintain professional competence. It is a requirement of CIBSE and other professional bodies. This Journal CPD programme can be used to meet your CPD requirements. Study the module and answer the questions on the final page. Each successfully completed module is equivalent to 1.5 hours of CPD. Modules are also available at [cibsejournal.com/cpd](http://cibsejournal.com/cpd)**



and species adapted to natural light cycles. According to a 2022 study: 'A recent skyglow model suggests that about 80% of the world's population now lives under light-polluted skies... which poses a serious threat to biodiversity and human health.'<sup>4</sup> Even dim ALAN can disrupt melatonin production in various species, affecting crucial day-night cycles, the study suggests: 'ALAN can also suppress melatonin, known as the night hormone, in various vertebrate species even at skyglow-like low light levels (0.01-0.03lx)... This may inhibit crucial day- and night-time cycles.'<sup>4</sup>

However, there are many applications that would normally deserve at least some investigation around the appropriate application of external lighting, such as on roads, cycle routes and pathways, to ensure safe movement. It might also be considered to enhance security by enabling surveillance in areas such as car parks, and allow work to be carried out in places such as transport hubs.

Additionally, exterior lighting can extend the use of outdoor facilities, such as sports pitches, and prolong economic activities in areas such as town centres, as well as highlight landmarks or structures, including historic buildings and bridges.

As discussed in the SLL Code for Lighting,<sup>5</sup> while lighting can play a role in crime prevention, its effectiveness is not guaranteed. Increased lighting can deter crime by making it harder for criminals to operate undetected and by boosting community confidence. However, lighting

alone may not directly reduce crime rates. To be effective, lighting must be well designed, providing adequate illumination, uniform distribution, minimal glare, and a suitable light spectrum. This allows people to identify potential threats and take action, while also enabling witnesses to provide accurate information to authorities. Ultimately, the effectiveness of lighting in crime prevention depends on various factors, including the type of crime, the community's overall environment, and the presence of other crime-prevention measures.

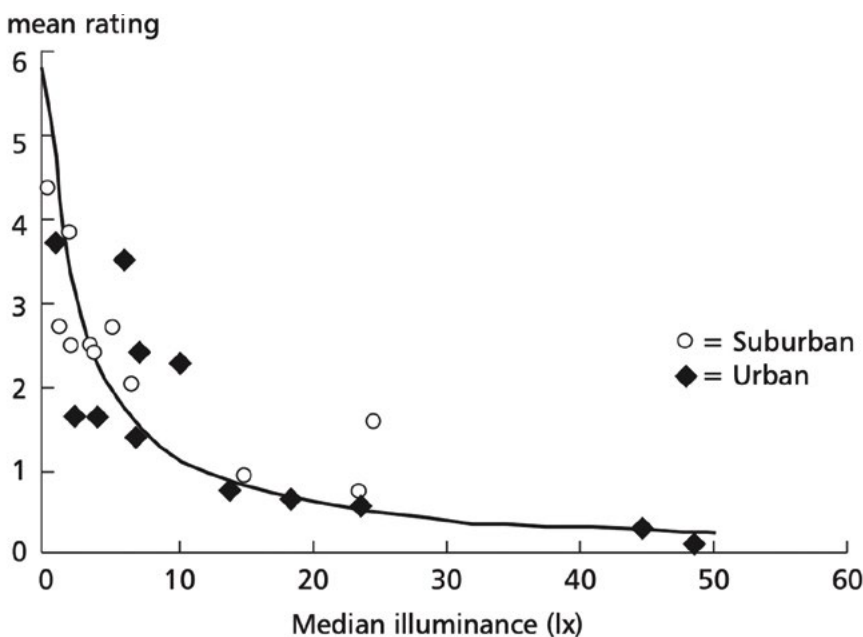
The most straightforward way that lighting impacts actual safety is by improving visibility. Being able to clearly see pathways, obstacles and other people is essential for avoiding accidents and recognising potential threats. While some light is undoubtedly better than none, research suggests that, beyond a certain level, increasing illuminance doesn't necessarily lead to a proportional increase in perceived safety. This is important because simply adding more light fixtures has ecological and financial costs. Uneven illumination creates stark contrasts between light and shadow, potentially obscuring potential threats and contributing to feelings of unease. Conversely, well-distributed light reduces hiding spots and enhances visibility, fostering a sense of safety. Harsh, glaring light can be uncomfortable, impair visibility, and create feelings of vulnerability. This is particularly true for older adults, who are more susceptible to glare-related vision issues.



Employing data published in the seminal paper<sup>6</sup> by Boyce, the perception of safety by visitors experiencing night-time illuminance compared with daylight visits in car parks in two US cities – shown in Figure 1 – indicates a notable relationship between illuminance and the perceptions of safety in the car parks. At a sufficiently high illuminance, the difference in ratings of perceived safety for day compared with night approaches zero. For illuminances in the range 0lx to 10lx, small increases in illuminance produce a large increase in perceived safety. Illuminances in the range 10lx to 50lx show diminishing returns.

Many challenge the assumption that increasing illuminance directly translates to increased feelings of safety. Specifically, studies suggest that beyond a certain threshold (around 5lx to 17lx<sup>7</sup>), the positive impact on safety perceptions plateaus, even as illuminance continues to rise. The level of illuminance considered 'safe' can vary significantly based on the environment and individual expectations. For instance, people accustomed to brightly lit urban areas might perceive lower light levels as less safe compared with those living in rural settings.<sup>7</sup> A recent investigation by Jedon et al<sup>8</sup> considered how spectral composition and intensity influences alertness and arousal levels, impacting pedestrian behaviour and safety. They note that psychological constructs such as alertness, vigilance and/or anxiety are not generally considered in pedestrian lighting research, as it mainly focuses on visual performance. They assert that exploring concepts such as alertness, arousal and anxiety could provide a deeper understanding of pedestrian safety. They consider that, in particular, arousal – the body's way of preparing for action or heightened awareness – seems promising, as it can be influenced by various environmental factors beyond lighting.

Research, including that by Lis et al,<sup>9</sup> indicates a strong link between lighting



**Figure 1: Difference in mean ratings of perceived safety for walking alone in a car park, by day and night (day rating minus night rating) plotted against median night pavement illuminance for car parks in Albany, New York (urban) and Clifton Park, New York (suburban) (after Boyce et al<sup>6</sup>) (Source: SLL Code for Lighting<sup>5</sup>)**



**Figure 2:** The parking area and pedestrian approach to the Remembrance Centre at the National Memorial Arboretum in the UK is designed to provide an environment that maintains the dignity of the location and suitable illumination for awareness of others, reinforcing a perception of safety (Source: Tamlite)

design in urban parks and perceived safety. The study found that park lighting, which enhances 'spatial legibility' (how easily people can understand and navigate through a space), significantly impacts people's sense of safety depending on how different elements of the landscape are illuminated. Path lighting alone did not improve safety perceptions and reduced legibility, while lighting the surrounding horizontal and vertical elements improved spatial legibility and the sense of safety. Background lighting also boosted safety and preference by making the space more legible and mysterious, while excessive foreground lighting decreased safety and privacy. Respondents preferred lighting that balanced legibility and mystery while preserving privacy, which increased their overall preference for the park.

Glare can impact visual comfort and even safety, particularly for pedestrians. Abboushi *et al* recently examined<sup>10</sup> several models proposed over the years that have attempted to predict discomfort from glare. Within the constraints of the datasets that they employed, and considering seven different models, they determined that the

direct illuminance from the source, with the intensity of light falling directly from the lamp onto specific areas, such as paths and roads, was practically the most suitable model, as it tended to offer similar or better predictions than the other models. They also noted that factors such as age can influence glare perception, with older individuals potentially more susceptible to discomfort glare.

Numerous studies have indicated that the presence of other people significantly influences perceptions of safety, often more so than lighting itself. Well-lit spaces that encourage social interaction and create a sense of community can contribute to actual safety by reducing the likelihood of crimes of opportunity. In a recent study, Hamoodh *et al*<sup>11</sup> examined how lighting conditions can impact how pedestrians perceive others based on subtle cues such as facial expressions and hand gestures. The work supported the assumption of previous lighting research that the face is an important visual cue for the interpersonal evaluations necessary for a pedestrian to feel safe. Appropriate lighting can enable accurate interpersonal evaluation by making these visual cues more discernible,

particularly at night when natural visibility is reduced. An example of providing this in an open area is illustrated in Figure 2.

Individual perceptions of safety are shaped by personal experiences, background, and familiarity with different environments.<sup>11,12</sup> Factors such as age, gender and cultural background can influence how people perceive and respond to different lighting conditions and urban environments. This undoubtedly increases the challenge of providing a universally acceptable night-time environment.

There are increasing opportunities offered by manufacturers for what is sometimes termed 'smart' control, but there appears to be limited independent reports on the consequences of advanced control techniques. 'Smart' and more traditional control techniques recently reviewed<sup>13</sup> by Welsh *et al*, illustrate the variability and complexity that, in some cases, may lead to unintended consequences, such as crime displacement, while, in others, deliver a variety of benefits. To create safer, more sustainable urban environments, lighting designs need to reach beyond merely maximising illuminance. Prioritising lighting quality, tailoring strategies to specific contexts – which will probably include the application of carefully considered controls – and fostering collaboration can achieve a holistic approach that balances safety, comfort, energy efficiency and ecological responsibility.

Further research is needed to fully understand the complex interplay of factors that influence perception of safety, behaviour and environmental sustainability. This will enable the development of increasingly effective lighting guidelines for urban areas. ●

© Tim Dwyer 2024.

## Vision in focus

**Photopic vision:** This type of vision occurs under well-lit conditions, typically during the day. It is dominated by cone cells in the retina, which are responsible for colour vision and high visual acuity.

**Scotopic vision:** This vision type occurs under low-light conditions, such as at night. It is dominated by rod cells, which are more sensitive to light but do not detect colour.

**Mesopic vision:** This is a combination of photopic and scotopic vision, and occurs under intermediate lighting conditions, such as dawn or dusk, and is characterised by reduced colour perception and visual acuity.

# Module 240

November 2024

1. Whose studies mentioned in the article suggest understanding alertness, arousal and anxiety can help comprehend pedestrian safety?

- A Abboushi *et al*
- B Boyce *et al*
- C Hamoodh *et al*
- D Jedon *et al*
- E Lis *et al*

2. According to studies, which colour temperature is generally associated with enhancing feelings of safety at night?

- A Bright white light with intermediate Kelvin values
- B Cooler light with higher Kelvin values
- C Daylight-spectrum light
- D Red-tinted light
- E Warmer light with lower Kelvin values

3. According to the article, what is the main drawback of increasing illuminance levels beyond a certain threshold?

- A It causes crime rates to increase
- B It doesn't proportionally increase perceived safety
- C It improves the economy
- D It increases biodiversity in urban areas
- E It makes people feel more tired

4. Which of the following best describes the impact of glare on pedestrians?

- A It has no significant impact
- B It impairs visibility and creates feelings of vulnerability
- C It improves visual comfort and safety
- D It is beneficial for older adults
- E It makes environments more inviting for social interactions

5. What type of vision occurs under intermediate lighting conditions, such as during dawn or dusk?

- A Colour vision
- B Low-contrast vision
- C Mesopic vision
- D Photopic vision
- E Scotopic vision

Name (please print) .....

Job title .....

Organisation .....

Address .....

.....

.....

Postcode .....

Email .....

Are you a member of CIBSE? If so, please state your membership number: .....

### The CIBSE Journal CPD Programme

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

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

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

### References:

<sup>1</sup>Li, Y *et al*, Effects of illuminance and correlated colour temperature of indoor light on emotion perception, *Nature Scientific Reports*, 2021, [bit.ly/CJNov24CPD21](https://bit.ly/CJNov24CPD21).

<sup>2</sup>Bullough, J D *et al*, Impacts of average illuminance, spectral distribution, and uniformity on brightness and safety perceptions under parking lot lighting, *Lighting Res. Technol.* 2020; 52: 626–640, [bit.ly/CJNov24CPD22](https://bit.ly/CJNov24CPD22).

<sup>3</sup>SLL Lighting Guide 21: Protecting the night-time environment, CIBSE SLL.

<sup>4</sup>Vega, P *et al*, A systematic review for establishing relevant environmental parameters for urban lighting: translating research into practice, *Sustainability* 2022, 14, 1107, [bit.ly/CJNov24CPD23](https://bit.ly/CJNov24CPD23).

<sup>5</sup>SLL Code for Lighting, CIBSE SLL, 2022.

<sup>6</sup>Boyce, P R *et al*, Perceptions of safety at night in different lighting conditions, *Lighting Research and Technology* 2000.

<sup>7</sup>Fisher, B S and Nasar, J L, Fear of crime in relation to three exterior site features: prospect, refuge, and escape, *Environment and Behavior*, 1992, 24(1), 35–65, [bit.ly/CJNov24CPD24](https://bit.ly/CJNov24CPD24).

<sup>8</sup>Jedon, R *et al*, Proposing a research framework for urban lighting: the alertness, arousal and anxiety triad, *Lighting Res. Technol.* 2023; 55: 658–668, [bit.ly/CJNov24CPD25](https://bit.ly/CJNov24CPD25).

<sup>9</sup>Lis, A, How to light up the night? The impact of city park lighting on visitors' sense of safety and preferences, *Urban Forestry & Urban Greening* 89 (2023).

<sup>10</sup>Abboushi, B *et al*, Predicting discomfort from glare with pedestrian-scale lighting: A comparison of candidate models using four independent datasets, *Lighting Res. Technol.* 2024; 56: 225–246.

<sup>11</sup>Hamoodh, K *et al*, Visual cues to interpersonal evaluations for pedestrians, *Lighting Res. Technol.* 2023; 55, [bit.ly/CJNov24CPD26](https://bit.ly/CJNov24CPD26).

<sup>12</sup>Himschoot, E A *et al*, Feelings of safety for visitors recreating outdoors at night in different artificial lighting conditions, *Journal of Environmental Psychology* 97, 2024.

<sup>13</sup>Welsh, B *et al*, *The impact and policy relevance of street lighting for crime prevention: a systematic review based on a half-century of evaluation research*, 2024, [bit.ly/CJNov24CPD27](https://bit.ly/CJNov24CPD27).



# CIBSE CPD directory

**A1 Flue Systems**  
www.a1flues.co.uk

**Aalberts IPS – Pegler**  
www.aalberts-ips.co.uk

**ABB Group**  
www.go.abb/electrification

**ACV UK**  
www.acv.com

**ADEY Commercial**  
www.adey.com

**Advanced Air UK**  
www.advancedair.co.uk

**Adveco (AWP)**  
www.adveco.co

**Aermec UK**  
www.aermec.co.uk

**AIC Heating UK**  
www.myaic.co.uk

**Air Movement Supplies**  
www.amsventilation.com

**Airedale International Air Conditioning**  
www.airedale.com

**Airflow Developments**  
www.airflow.com

**Airsys UK**  
www.air-sys.uk

**Albion Valves (UK)**  
www.albionvalvesuk.com

**Alfa Laval**  
www.alfalaval.co.uk

**Aliaxis UK**  
www.aliaxis.co.uk

**Altecnic**  
www.altecnic.co.uk

**Aquabion UK**  
www.aquabion-uk.com

**Aqualeak**  
www.aqualeak.com

**Aquatherm UK**  
www.aquatherm-uk.com

**Ariston Group**  
www.ariston.com/en-uk

**Armaceil UK**  
local.armaceil.com/en/armaceil-uk

**Armstrong Fluid Technology**  
www.armstrongfluidtechnology.com

**Arrow Valves**  
www.arrowvalves.co.uk

**Ascom UK**  
www.ascom.com/uk

**ATC Electrical & Mechanical**  
www.atc.ie

**BACnet Interest Group Europe**  
www.big-eu.org

**Badger Meter UK**  
www.badgermeter.com

**Baxi Heating UK**  
www.baxiheating.co.uk

**BEG (UK)**  
www.beg-luxomat.com/en/

**Belimo Automation UK**  
www.belimo.co.uk

**Biddle Air Systems**  
www.biddle-air.co.uk

**Boldyn Networks**  
www.boldyn.com

**Bosch Thermotechnology**  
www.bosch-thermotechnology.com/gb/en/commercial-industrial/home

**BPC Energy**  
www.bpc-ups.com

**Bray Controls Europe**  
www.bray.com

**Breathing Buildings**  
www.breathingbuildings.com/knowledge

**Brightwater Environmental**  
www.brightwaterenvironmental.co.uk

**Building Controls Industry Association (BCIA)**  
bcia.co.uk/training

**Business Sprinkler Alliance**  
www.business-sprinkler-alliance.org

**Caice Acoustic Air Movement**  
www.caice.co.uk

**Camfil**  
www.camfil.com

**CAREL UK**  
www.carel.com

**Carrier HVAC UK&I**  
www.carrier.com/commercial/en/uk

**Carrier Solutions UK (formerly Toshiba Carrier UK)**  
www.toshiba-aircon.co.uk

**CLa-Val UK**  
www.cla-val.co.uk

**Clade Engineering Systems**  
www.clade-es.com

**Clevertronics UK**  
www.clevertronics.co.uk

**CMD**  
www.cmd-ltd.com

**COLT International**  
www.coltinfo.co.uk

**Commercial Hot Water Solutions**  
www.chws-ltd.co.uk

**Condair**  
www.condair.co.uk

**Cool Designs Ltd**  
www.cdweb.info

**Corporacion Empresarial Altra DBA Airzone**  
www.airzonecontrol.com

**Corsair Engineering**  
www.corsairengineering.co.uk

**CP Films Vertriebs, a subsidiary of Eastman Chemical Company**  
europeafrica.russia.llumar.com

**CPV**  
www.cpv.co.uk

**Crane Building Services & Utilities**  
www.cranefs.com

**Cross Refrigeration (NI)**  
www.cross-group.org/temperature-control

**Daikin Airconditioning UK**  
www.daikin.co.uk

**Daikin Applied (UK)**  
www.daikinapplied.uk

**Deif**  
www.deif.com

**Delmatic Lighting Management**  
www.delmatic.com

**Designplan Lighting**  
www.designplan.co.uk

**Destratair**  
www.destratair.co.uk

**Dextra Group**  
www.dextragroup.co.uk

**Diamond Systems**  
diamondsystems.co.uk

**Diffusion Group**  
www.diffusion-group.com/cpd

**Distech Controls UK**  
www.distech-controls.com

**DMS Metering Solutions**  
www.dms-ltd.com

**Domus Ventilation**  
www.domusventilation.co.uk

**DosaFil**  
www.dosafil.co.uk

**Dutypoint Group**  
www.dutypoint.com

**Ebm-papst UK**  
www.ebmpapst.com/buildingconnect-uk

**ECE UK**  
www.eceuk.com

**Edincare Pumps**  
www.edincare.com

**Elco Heating Solutions/Atag**  
www.elco.co.uk

**eleXion Water Treatment**  
www.elexion.uk

**Elta Group**  
www.eltauk.com

**Energys Limited**  
www.ukenergys.com

**EnviroVent**  
www.envirovent.com

**Enwa Water Technology UK**  
www.enwa.co.uk

**Euroklimat**  
www.euroklimat.it

**European Vacuum Drainage Systems**  
evds.org.uk

**Excel Networking**  
www.excel-networking.com

**Fagerhult Lighting**  
www.fagerhult.co.uk

**Fellowes Brands**  
www.fellowes.com

**Firemac**  
www.firemac.com

**Firesafe Fire Rated Ductwork**  
www.firesafeductwork.co.uk

**Flakt Woods t/a Woods Air Movement**  
www.woodsairmovement.com

**FlexEJ**  
www.flexej.co.uk

**FioControl**  
www.fiocontrol.ltd.uk

**Frenger Systems**  
www.frenger.co.uk

**Fujitsu General Air Conditioning (UK)**  
www.fujitsu-general.com/uk

**Fulton Boiler Works (GB)**  
www.fulton.co.uk

**Future Designs**  
www.futuredesigns.co.uk

**Geberit Sales**  
www.geberit.co.uk

**Georg Fischer Sales**  
www.gfps.com/uk

**GES Water**  
www.ges-water.co.uk

**GF Building Flow Solutions (formerly Uponor)**  
www.uponor.com

**Giacomini UK**  
www.giacomini.co.uk

**Glamox**  
www.glamoxluxonic.co.uk

**Global Energy Systems**  
globalenergysystems.co.uk

**Goodwater**  
www.goodwater.co.uk

**Grant Engineering (UK)**  
www.grantuk.com

**Gripple**  
www.gripple.com

**Güntner (UK)**  
www.guntner.co.uk

**Hamworthy Heating**  
www.hamworthy-heating.com/Training/CPD/CPD-seminars-overview

**Heating Appliances & Spares**  
www.hasl.co.uk

**Helvar**  
www.helvar.com

**Herz Valves UK**  
www.herzvalves.com

**Huawei Digital Power Department (Europe)**  
digitalpower.huawei.com/en

**Humidity Matters**  
www.humiditymatters.co.uk

**Humidity Solutions**  
www.humiditysolutions.co.uk

**Hydrotec (UK)**  
www.hydrotec.co.uk

**Hysopt (Hydronic System Optimisation)**  
www.hysopt.com

**Hytronik International**  
www.hytronik.com

**Ideal Commercial Heating**  
www.idealcommercialboilers.com

**iGuzzini Illuminazione**  
www.iguzzini.com/

**IMI Hydronic Engineering**  
www.imi-hydronic.com/sites/EN/en-gb



**IPU Group**  
[www.ipu.co.uk](http://www.ipu.co.uk)

**Isoplus Piping Systems**  
[www.isoplus.co.uk](http://www.isoplus.co.uk)

**IV Produkt**  
[www.ivprodukt.com](http://www.ivprodukt.com)

**IWTM UK**  
[www.iwtm-uk.com](http://www.iwtm-uk.com)

**Jaeggi Hybridtechnologie**  
[www.jaeggi-hybrid.eu](http://www.jaeggi-hybrid.eu)

**Jaga Heating Products UK**  
[www.jaga.co.uk](http://www.jaga.co.uk)

**Jeremias UK**  
[www.jeremias.uk](http://www.jeremias.uk)

**Joule Hot Water Systems UK**  
[jouleuk.co.uk](http://jouleuk.co.uk)

**Kampmann UK**  
[www.Kampmann.co.uk](http://www.Kampmann.co.uk)

**KE Fibertec UK**  
[www.ke-fibertec.com/uk](http://www.ke-fibertec.com/uk)

**Kingfisher Lighting**  
[www.kingfisherlighting.com](http://www.kingfisherlighting.com)

**Kingspan Technical Insulation**  
[www.kingspantechinsulation.co.uk](http://www.kingspantechinsulation.co.uk)

**KNX UK**  
[www.knxuk.org](http://www.knxuk.org)

**Kohler Uninterruptible Power**  
[www.kohler-ups.co.uk](http://www.kohler-ups.co.uk)

**Komfovent**  
[www.komfovent.com](http://www.komfovent.com)

**Legrand Electrical**  
[www.legrand.co.uk](http://www.legrand.co.uk)

**Lennox Industries**  
[www.lennoxemea.com](http://www.lennoxemea.com)

**Lewden**  
[www.lewden.com/lux](http://www.lewden.com/lux)

**Lifescience Products Ltd**  
[www.lifescience.co.uk](http://www.lifescience.co.uk)

**Lindab**  
[www.lindab.co.uk](http://www.lindab.co.uk)

**Liteplan**  
[www.liteplan.com](http://www.liteplan.com)

**LUG Lighting UK**  
[www.luglightfactory.com/en](http://www.luglightfactory.com/en)

**Mandik UK**  
[www.Mandik.co.uk](http://www.Mandik.co.uk)

**Mansfield Pollard & Co**  
[www.mansfieldpollard.co.uk](http://www.mansfieldpollard.co.uk)

**Mark Eire**  
[www.markeire.com](http://www.markeire.com)

**Medem (UK)**  
[www.medem.co.uk](http://www.medem.co.uk)

**Mennekes**  
[www.mennekes.co.uk](http://www.mennekes.co.uk)

**Mercor Fire Protection UK**  
[mercort-uk.co.uk/](http://mercort-uk.co.uk/)

**MHI Specifications**  
[mhi-hvac.co.uk](http://mhi-hvac.co.uk)

**MK Electric By Honeywell**  
[www.mkelectric.com](http://www.mkelectric.com)

**Mobotix**  
[www.mobotix.com](http://www.mobotix.com)

**Modutherm**  
[www.modutherm.co.uk](http://www.modutherm.co.uk)

**Munters**  
[www.munters.com](http://www.munters.com)

**National Ventilation**  
[www.nationalventilation.co.uk](http://www.nationalventilation.co.uk)

**NIBE Energy Systems**  
[www.nibe.eu/en-gb](http://www.nibe.eu/en-gb)

**Nuair**  
[www.nuair.co.uk](http://www.nuair.co.uk)

**Otter Vacuum**  
[www.ottervacuum.co.uk](http://www.ottervacuum.co.uk)

**Oventrop UK**  
[www.ventrop.com](http://www.ventrop.com)

**Panasonic Heating & Ventilation Air Conditioning UK**  
[www.aircon.panasonic.eu/GB\\_en](http://www.aircon.panasonic.eu/GB_en)

**Parking Ventilation Equipment**  
[www.pveuk.com](http://www.pveuk.com)

**Pettinaroli UK**  
[www.pettinaroli.com](http://www.pettinaroli.com)

**PH Water Technologies**  
[www.phwatertechnologies.co.uk](http://www.phwatertechnologies.co.uk)

**Philip Payne**  
[www.philippayne.co.uk](http://www.philippayne.co.uk)

**Polypipe Building Services**  
[www.polypipe.com/commercial-building-services](http://www.polypipe.com/commercial-building-services)

**Power Control**  
[www.powercontrol.co.uk](http://www.powercontrol.co.uk)

**Powermaster Cooling**  
[www.powermaster-ltd.co.uk](http://www.powermaster-ltd.co.uk)

**Purmo Group UK**  
[www.purmogroup.com](http://www.purmogroup.com)

**Ratio EV Charging**  
[ratioev.uk](http://ratioev.uk)

**Recotherm**  
[www.recotherm.co.uk](http://www.recotherm.co.uk)

**Reflex Winkelmann**  
[www.reflex.de/en](http://www.reflex.de/en)

**Rehau**  
[www.rehau.com](http://www.rehau.com)

**Reliance Worldwide Corporation (UK)**  
[www.rwc.co.uk](http://www.rwc.co.uk)

**Resideo (Ademco 1)**  
[www.resideo.com/gb/en/contact-us](http://www.resideo.com/gb/en/contact-us)

**Riello**  
[www.rielloburners.co.uk](http://www.rielloburners.co.uk)

**Rinnai UK**  
[www.rinnai-uk.co.uk](http://www.rinnai-uk.co.uk)

**Rittal**  
[www.rittal.co.uk](http://www.rittal.co.uk)

**Robus Lighting (LED Group)**  
[www.robust.com](http://www.robust.com)

**Rochester Midland Corporation**  
[www.rmcorppltd.co.uk](http://www.rmcorppltd.co.uk)

**S&P UK Ventilation Systems (Soler & Palau)**  
[www.solerpalau.co.uk](http://www.solerpalau.co.uk)

**S&S Northern**  
[www.snsnorthern.com](http://www.snsnorthern.com)

**Safegard Systems**  
[www.safegard.ie](http://www.safegard.ie)

**Saniflo**  
[saniflo.co.uk](http://saniflo.co.uk)

**SAV Systems**  
[www.sav-systems.com](http://www.sav-systems.com)

**Schiedel Chimney Systems**  
[www.schiedel.com](http://www.schiedel.com)

**Scolmore Group**  
[www.scolmore.com](http://www.scolmore.com)

**Secure Meters**  
[www.securemeters.com](http://www.securemeters.com)

**Sensing Precision**  
[www.sensing-precision.com](http://www.sensing-precision.com)

**Shenton Global**  
[www.shentongroup.co.uk](http://www.shentongroup.co.uk)

**Siemens Building Products**  
[www.siemens.co.uk](http://www.siemens.co.uk)

**Siemens Smart Infrastructure Solutions and Services**  
[www.siemens.co.uk/smart-sustainable-secure](http://www.siemens.co.uk/smart-sustainable-secure)

**Signify Commercial UK**  
[www.signify.com](http://www.signify.com)

**Smardt OPK Chillers**  
[www.smardt.com](http://www.smardt.com)

**Smay Ventilation Systems**  
[www.smay.pl/en](http://www.smay.pl/en)

**Smith Brothers Stores**  
[www.sbs.co.uk](http://www.sbs.co.uk)

**Smith's Environmental Products**  
[www.smithsep.co.uk](http://www.smithsep.co.uk)

**Smoke Control Association**  
[www.smokecontrol.org.uk](http://www.smokecontrol.org.uk)

**SMS Environmental**  
[www.sms-environmental.co.uk](http://www.sms-environmental.co.uk)

**Socomec UK**  
[www.socomec.com](http://www.socomec.com)

**Solaris Energy**  
[www.solaris-energy.co.uk](http://www.solaris-energy.co.uk)

**Sontay**  
[www.sontay.com](http://www.sontay.com)

**SPC (S&P Coil Products)**  
[www.spc-hvac.co.uk](http://www.spc-hvac.co.uk)

**Spirax-Sarco Engineering**  
[www.spiraxsarcoengineering.com](http://www.spiraxsarcoengineering.com)

**Spirotech UK**  
[www.spirotech.co.uk](http://www.spirotech.co.uk)

**SSM Ventilation & Air Conditioning**  
[www.sweeneysheetmetal.ie](http://www.sweeneysheetmetal.ie)

**Stelrad**  
[www.stelrad.com](http://www.stelrad.com)

**Stoane Lighting**  
[www.stoanelighting.com](http://www.stoanelighting.com)

**Stokvis Energy Systems**  
[www.stokvisboilers.com](http://www.stokvisboilers.com)

**Strategic Media Asia**  
[www.stmedia-asia.com](http://www.stmedia-asia.com)

**Strebel**  
[www.strebel.co.uk](http://www.strebel.co.uk)

**Stuart Turner**  
[www.stuart-turner.co.uk](http://www.stuart-turner.co.uk)

**Stulz UK**  
[www.stulz.co.uk](http://www.stulz.co.uk)

**Sunamp**  
[www.sunamp.com](http://www.sunamp.com)

**Swegon**  
[www.swegon.com/uk/cpd](http://www.swegon.com/uk/cpd)

**SWEP International**  
[www.swep.net](http://www.swep.net)

**Systemair**  
[www.systemair.com/en-gb](http://www.systemair.com/en-gb)

**Tamlite Lighting**  
[www.tamlite.co.uk](http://www.tamlite.co.uk)

**Thorlux Lighting**  
[www.thorlux.com](http://www.thorlux.com)

**Titon Ventilation Systems**  
[www.titon.com](http://www.titon.com)

**Trent Control Panels**  
[www.trentproducts.com](http://www.trentproducts.com)

**Tridonic UK**  
[www.tridonic.com/com/en](http://www.tridonic.com/com/en)

**Urbis Schröder**  
[www.urbis-schreder.com](http://www.urbis-schreder.com)

**Vectaire**  
[www.vectaire.co.uk](http://www.vectaire.co.uk)

**Vector Air and Water**  
[www.vector-airandwater.co.uk](http://www.vector-airandwater.co.uk)

**Vector Compliance**  
[www.vector-compliance.co.uk](http://www.vector-compliance.co.uk)

**Vent-Axia Group**  
[www.vent-axia.com](http://www.vent-axia.com)

**Vertiv Infrastructure**  
[www.vertiv.com](http://www.vertiv.com)

**VES**  
[www.ves.co.uk](http://www.ves.co.uk)

**Vexo International (UK)**  
[www.vexoint.com](http://www.vexoint.com)

**Viega**  
[www.viega.co.uk](http://www.viega.co.uk)

**Viking UK&I**  
[www.viking-emea.com](http://www.viking-emea.com)

**Vortice**  
[www.vortice.ltd.uk](http://www.vortice.ltd.uk)

**WB Power Services**  
[www.wbpsltd.co.uk](http://www.wbpsltd.co.uk)

**Whitecroft Lighting**  
[www.whitecroftlighting.com](http://www.whitecroftlighting.com)

**Wilo UK**  
[www.wilo.co.uk](http://www.wilo.co.uk)

**Wint-WI UK**  
[wint.ai](http://wint.ai)

**Wireless Alert Solutions**  
[www.wasol.co.uk](http://www.wasol.co.uk)

**Xtralis (UK)**  
[www.xtralis.com](http://www.xtralis.com)

**Xylem Water Solutions UK**  
[www.xylem.com/en-uk/brands/lowara](http://www.xylem.com/en-uk/brands/lowara)

**YGHP**  
[www.yghp.co.uk](http://www.yghp.co.uk)

**Zemper UK**  
[www.zemper.com/uk](http://www.zemper.com/uk)

**Zeta Compliance Services**  
[www.zetaservices.co.uk](http://www.zetaservices.co.uk)

**Zip Water (UK)**  
[specify.zipwater.co.uk](http://specify.zipwater.co.uk)

Members get 20% off across all training



Master systems design with our expert training courses

## Design of Ductwork Systems

Master ductwork design and sizing essentials, from key components to commissioning. Perfect for engineers, architects, and contractors seeking energy-efficient, low-carbon ventilation systems for superior performance.

**3 December | Remote**

Discover more



## Design of Heating and Chilled Water Pipe

Explore hydronic systems with the BSRIA BG 30 workflow. Gain practical skills in designing, commissioning, and creating a pipe-sizing calculator for real-world applications.

**5 December | Remote**

Discover more





# Don't fight the system, use a better one.

**A**  
POLYPIPE  
ADVANTAGE  
OFF-SITE  
PRE-FABRICATION



Take a stand against convention and join the Advantage Rebellion, where things get a bit radical. Our complete drainage and water supply systems designed and pre-fabricated off-site, reducing costs by 30%, installation times by 60% and waste by 100%. Fully customised systems, quality assured and pre-tested, delivered to site - ready for immediate installation. **Join the Advantage Rebellion and change to a better system.**

**Find out more at [www.polypipe.com/polypipeadvantage](http://www.polypipe.com/polypipeadvantage)**



Part of the  **GENUIT**  
GROUP

 **Polypipe**  
Building Services

# Accelerating modern methods of design and manufacture in buildings

This module explores elements underpinning the concept of design for manufacture and assembly (DfMA) of buildings

**D**esign for manufacture and assembly (DfMA) has been applied across various sectors, including automotive, aerospace, and consumer products. More recently, disciplines associated with the built environment have embraced this approach to add value to their offerings. DfMA can have – and, for some, is already having – a transformative impact on building services engineering by focusing on efficiency, quality and collaboration in the design, fabrication and installation of mechanical, electrical and plumbing (MEP) systems. This CPD article will explore aspects that underpin the concept of DfMA, and consider the benefits and challenges of increased application of modern methods of construction.

DfMA can be considered<sup>1</sup> as involving a four-stage process to optimise product design for efficient manufacture and assembly:

- **Functional analysis:** ensures the design fulfills its purpose by examining components and identifying areas for simplification.
- **Manufacturing analysis:** evaluates design feasibility for manufacturing, considering factors such as materials, processes and complexity.
- **Handling analysis:** assesses ergonomic considerations for handling components during manufacturing and assembly.

- **Assembly analysis:** examines the assembly process, identifying redundant steps, intricate manipulations and potential bottlenecks.

This systematic approach optimises products for both function and manufacturability. This includes an array of applications, such as modular units delivering pre-assembled risers, waste systems, service pods, pumping and heating stations, and plantrooms. Such modules would typically incorporate ductwork, piping, wiring (power and control), and other systems, which are integrated into standardised frameworks. These are designed to be manufactured, often offsite, in a controlled factory environment, and later installed as complete units. Components and systems would normally be designed with simplicity and optimisation in mind, to streamline both the process of offsite manufacturing (OSM) and the assembly on site. This can also encourage the use of standardised, readily available components to reduce complexity and manufacturing costs, such as with the prefabrication of the drainage stack illustrated in Figure 1.

Successful implementation of DfMA requires early involvement of contractors, subcontractors and suppliers in the design process, to ensure that the manufacturing and assembly of the components are feasible and deliverable. It can benefit from digital



**Figure 1:** Offsite prefabrication of drainage systems in factory conditions allows for faster and more confident installation on site. Specialist fabricators and factory-controlled quality assurance systems (including pressure testing) ensure quality and reliability (Source: Polypipe Building Services)

CPD programme  
Modern methods  
of construction



**Continuing professional development (CPD) is the regular maintenance, improvement and broadening of your knowledge and skills to maintain professional competence. It is a requirement of CIBSE and other professional bodies. This Journal CPD programme can be used to meet your CPD requirements. Study the module and answer the questions on the final page. Each successfully completed module is equivalent to 1.5 hours of CPD. Modules are also available at [cibsejournal.com/cpd](http://cibsejournal.com/cpd)**

technologies, including building information modelling/models (BIM), and digital twins to facilitate design coordination and information sharing among project stakeholders. Successful building services design requires close coordination between multiple teams, including mechanical, electrical, plumbing, structural and architectural specialists, who have knowledge and understanding of fabrication, installation and operation. DfMA fosters collaboration early in the design phase by encouraging interdisciplinary consideration of assembly constraints and factory fabrication methods. This encourages smoother communication, more effective coordination and proactive problem-solving from the project's inception.<sup>2</sup> It also supports building systems designers to work more closely with manufacturers, to ensure components fit the overall design and construction plan. As DfMA focuses on simplifying assembly, systems are likely to be easier and quicker to install by reducing the number of individual components needed to be assembled on site. DfMA is a key component of modern methods of construction (MMC), providing the design philosophy and methodology to facilitate the successful implementation of many MMC approaches. While MMC encompasses a range of innovative construction techniques, DfMA provides the framework for the efficient and effective realisation of MMC.

These principles and approach are particularly supportive of the MMC activity related to pre-manufacturing. The use of software systems (such as BIM) for design coordination, clash detection and logistics planning aligns with the principles of process-led site improvements. BIM can be employed to enable more insightful planning of prefabrication and installation, ensuring that systems are optimised for offsite manufacturing and allowing potential issues to be addressed before construction begins. Essentially, DfMA provides the design foundation for a more efficient, streamlined and integrated construction process, which makes it a key aspect of the broader shift towards MMC. This approach is particularly useful in projects with tight schedules, such as hospitals and data centres, where timely completion and compliance with design specifications are critical. The implementation of DfMA often leads to the creation of modular systems that have been proven to simplify fabrication, transportation, installation and maintenance,<sup>2</sup> and reduces the opportunity for errors and defects, producing faster and more predictable project timelines.

MMC promotes standardisation and repeatability, allowing the development of standard systems and sub-systems for use across multiple projects. This is particularly

useful in sectors such as housing or healthcare, where repeated designs are common. One of the most compelling advantages of MMC is the ability to shift a large portion of the work off site, to controlled factory environments. This transition to offsite prefabrication allows for greater control over the quality of components and assemblies, as they are manufactured in a standardised manner, often using automated processes.<sup>3,4</sup> Standardised designs can be prefabricated more efficiently, potentially reducing design time for individual projects. MMC reduces the need for multiple teams of specialists working on site, as much of the work is completed in a factory setting, which helps mitigate common issues such as weather delays, inefficient waste management, and unsafe working conditions. The precision of factory-based manufacturing delivers a significant reduction in defects<sup>4</sup> and reduces material waste, ultimately leading to a higher-quality final product. Through the more extensive planning process there is potential to integrate renewable energy sources, smart controls and other sustainable technologies into the systems. Factory testing and quality control before systems are installed on site can further improve system performance and reduce the risk of defects. Processes can link the construction programme to BIM, enabling detailed cost measurement and analysis, and the creation of a library of construction materials relevant to MMC.<sup>5</sup>

By moving more of the work to a factory environment, engineers can design systems that can be assembled by fewer, highly trained workers. This reduces the demand for onsite labour teams and minimises the need for potentially dangerous activities associated with working in difficult site conditions, such as high-level installations or work in confined spaces. It also reduces congestion and the number of trades working simultaneously on site, so improving overall site efficiency and safety. The opportunity to closely control material waste and reduce onsite emissions aligns with environmentally-conscious construction practices. By enabling parallel construction activities, MMC reduces the overall construction time. While modules are being fabricated off site, other onsite tasks can proceed simultaneously, resulting in a faster project completion.<sup>2</sup> Supply chain management becomes crucial in MMC, as prefabricated components need to be delivered on time and integrated smoothly into the overall construction schedule.

Digital technologies, particularly BIM, play a crucial role in amplifying the benefits of MMC in MEP. BIM facilitates the creation of comprehensive 3D models that aid in clash detection, optimise MEP routing, and generate highly accurate fabrication drawings. The seamless transfer of this digital

information to the manufacturing facility further enhances the overall accuracy and efficiency of the construction process.

An MMC framework<sup>6</sup> developed by the UK government's former Department for Levelling Up, Housing and Communities (DLUHC; now the Ministry of Housing, Communities and Local Government) outlines seven distinct categories of MMC:

- 1. 3D primary structural system:** This category focuses on volumetric construction, where three-dimensional units, often entire rooms or modules, are manufactured off site and then assembled on site. This approach is particularly well suited to projects with repetitive layouts, such as hotels, student housing, and some residential buildings.
- 2. 2D primary structural systems:** This category involves the offsite manufacture of two-dimensional elements, such as walls, floors and roof panels, which are then assembled on site to form the building's structure. This category encompasses various materials and systems, including timber frame, light-gauge steel and precast concrete panels.
- 3. Non-systemised structural components:** This category focuses on individual load-bearing elements that are pre-manufactured off site and then incorporated into the building's structure on site.
- 4. Additive manufacturing:** Although not yet widely used in construction, this category includes innovative techniques such as 3D printing, where building components or even entire structures are created layer by layer on site.
- 5. Non-structural assemblies and sub-assemblies:** This category encompasses pre-manufactured elements that are not part of the building's primary structure, but contribute to its overall functionality. Examples include prefabricated bathroom pods, kitchen units, utility cupboards and pre-assembled MEP modules.
- 6. Product-led site improvements:** This category focuses on using traditional building materials in innovative ways to improve onsite productivity. This can include using pre-sized or pre-cut materials or employing components designed for faster and easier installation.
- 7. Process-led site improvements:** This category encompasses innovations in onsite processes and technologies that enhance construction efficiency, productivity and safety. Examples include the use of BIM for site logistics and coordination, digital site verification tools, robotics, drones, and worker augmentation technologies.

While the seven categories provide a valuable framework for understanding MMC, a recent collaborative research report<sup>7</sup>



introduces an additional category, referred to as category '0': Precondition: design, standardisation, and digitisation. This category emphasises the crucial role of design thinking, standardisation of components, and digital tools in enabling the successful implementation of MMC. It highlights that MMC is not merely about offsite manufacturing, but also about a holistic approach that integrates design, manufacturing and onsite assembly processes. However, this proposed category could blur the division between the scopes of DfMA and MMC.

The DLUHC framework is primarily geared towards residential construction. However, the principles and benefits of MMC are applicable across various sectors, including healthcare, education, commercial, and even infrastructure.<sup>7</sup> There has been a 'significant increase' in completed modular housing projects around London that may reflect the framework's success.<sup>4</sup> Developers and contractors are recognising the benefits of these techniques and are increasingly incorporating them into their projects. There has been greater collaboration between industry stakeholders, which is essential for the successful implementation of MMC, which has led to the formation of new partnerships and alliances.<sup>7</sup> Increased investment in MMC-related technologies and businesses indicates a growing confidence in the potential of MMC to transform the construction sector.<sup>4</sup>

It is important to note, however, that the adoption of OSM is still in its early stages and there are challenges to overcome. The perceived barriers largely stem from concerns around cost, logistics and industry readiness. High initial investments in technology, manufacturing facilities and specialised equipment can deter companies, despite the long-term cost savings. Design flexibility is often seen as limited with OSM, especially for complex projects, which can make it less appealing. Additionally, logistical challenges – such as transporting large, prefabricated components to urban or remote sites – can add to the complexity.

A skills gap within the workforce is another hurdle, as OSM requires proficiency in digital tools, manufacturing processes and system integration – areas in which many construction professionals lack experience. Regulatory and planning processes are often not well suited to offsite methods, causing delays and uncertainty in compliance. The construction industry's fragmented supply chain can further impact the efficiency of OSM projects, with issues around coordination and reliability.

Culturally, the industry has been slow to embrace OSM because of its conservative nature, and there are concerns over the

quality and long-term performance of prefabricated solutions. This resistance is compounded by a perception of risk, as OSM depends heavily on precise coordination, and any disruption can lead to costly delays. Finally, securing finance can be challenging, as lenders are often cautious about its viability compared with traditional methods.

Nonetheless, DfMA, MMC and OSM can deliver significant benefits to building services engineering. A recent report by the UK parliament's Science and Technology Committee calls for greater adoption of OSM in the construction sector. It highlights the benefits that are encompassed by DfMA, including improved quality, faster construction times and reduced waste – as, for example, delivered by the drainage stacks in Figure 2. However, the report also confirms the barriers to wider adoption, such as skills gaps, lack of collaboration, and financing challenges.

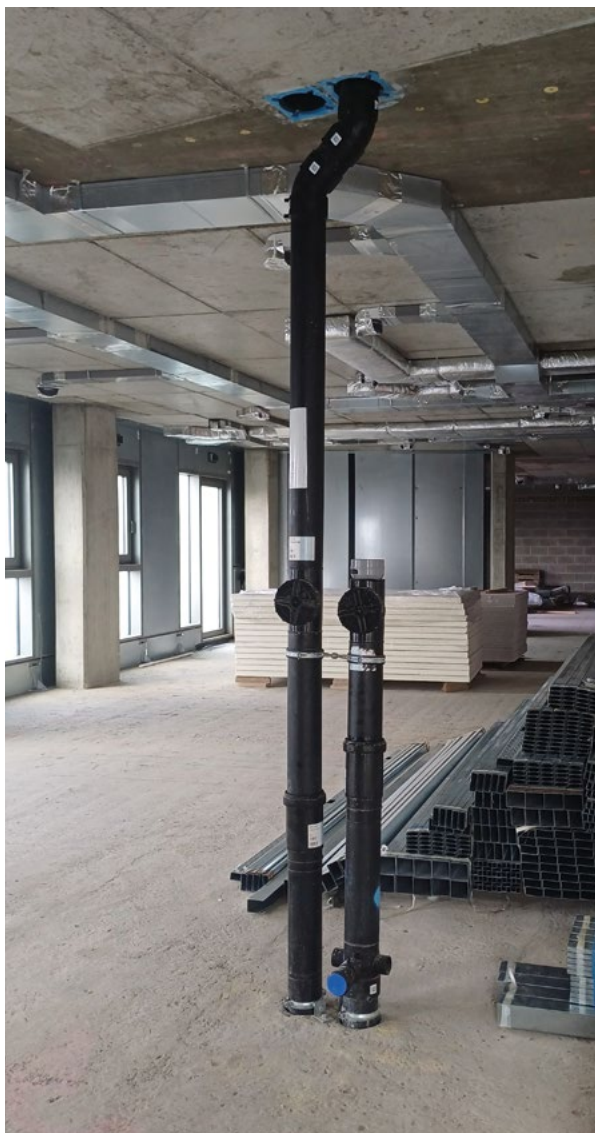
To address these challenges, the report recommends that the government support skills development, promote best practices,

and create a favourable funding environment for OSM. It also highlights that collaboration among industry stakeholders is crucial, as is the use of digital tools such as BIM.

By implementing these recommendations, the government can create an increasingly supportive environment for MMC, leading to a more efficient, sustainable and resilient construction industry. This could result in improved quality, faster construction times, reduced waste, and greater value for developers and consumers. Government support can readily reach beyond financial initiatives such as grants, tax incentives or subsidies, to mitigate the upfront costs associated with MMC.

By mandating the appropriate use of MMC for public projects – including schools, hospitals and social housing – the government could help ensure consistent demand for MMC, lessening concerns about the long-term stability of the sector, which is often hindered by irregular workloads and funding streams. ●

© Tim Dwyer 2024.



**Figure 2: Scheduled deliveries of standardised prefabricated components reduces the need for onsite storage, while also reducing the time and cost of installation for these drainage stacks. Waste on site is virtually eliminated. Such systems are designed for easy adaptation to most domestic drainage applications in high-rise developments (Source: Polypipe Building Services)**

# Module 241

November 2024

**1. What is one of the primary benefits of DfMA in building services engineering?**

- A Improves the speed and quality of site installation
- B Increases recycling of site waste
- C Negates the need for collaboration between teams
- D No need for scheduled site deliveries
- E Requires low-skilled factory workers

**2. Which of these was not identified as a benefit in the illustration of the offsite factory prefabrication of the drainage system?**

- A Factory-controlled quality assurance systems
- B No skilled site workers are required
- C Pressure testing can be undertaken in the factory
- D Provides faster more confident installation on site
- E Specialist fabricators employed in factory

**3. Which stage in the DfMA process focuses on ensuring ergonomic considerations during the manufacturing process?**

- A Assembly analysis
- B Design analysis
- C Functional analysis
- D Handling analysis
- E Manufacturing analysis

**4. As noted in the article, what is one of the key challenges to the wider adoption of offsite manufacturing?**

- A Lack of regulatory support for traditional methods
- B High initial investments in technology and manufacturing facilities
- C An overabundance of skilled digital workers
- D Immediate cost savings on all projects
- E Excessive design flexibility

**5. What is the primary purpose of the suggested stage 0 category in the DLUHC framework?**

- A To add emphasis to the importance of offsite manufacturing
- B To emphasise design thinking, component standardisation, and use of digital tools
- C To ensure that all MMC projects are led by sustainable considerations
- D To limit the need to use digital tools
- E To reduce concerns about the use of fewer site operatives

Name (please print) .....

Job title .....

Organisation .....

Address .....

Postcode .....

Email .....

Are you a member of CIBSE? If so, please state your membership number: .....

**The CIBSE Journal CPD Programme**

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

I understand that I will receive marketing communications from Polypipe Building Services after completing this module (please tick here)

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

**References:**

<sup>1</sup> Design for manufacture and assembly (DfMA) Guideline: Version 1, Construction Innovation Hub, UKRI, 2022.

<sup>2</sup> Reference Materials – Adopting DfMA for MEP works, Aecom Asia Company Limited for HK CIC, 2021.

<sup>3</sup> Bao, Z et al, 'Design for manufacture and assembly (DfMA) enablers for offsite interior design and

construction', *Building Research and Information*, 2021, [bit.ly/CJNov24CPD31](https://doi.org/10.1080/09590283.2021.2000000).

<sup>4</sup> Bayliss, S and Bergin, R, *Modular housing handbook*, RIBA Publishing, 2020.

<sup>5</sup> Jansen van Vuuren, T and Middleton, C, *Methodology for quantifying the benefits of offsite construction*, CIRIA 2020.

<sup>6</sup> Introducing the MMC definition framework, MHCLG Joint Industry Working Group on MMC, 2019, [bit.ly/CJNov24CPD32](https://www.cibsejournal.com/cpd) – accessed 30 September 2024.

<sup>7</sup> Ahmad Alrifai, A et al, *Offsite construction – concept design and delivery*, Buildoffsite/CIRIA 2023.



# MEMBERSHIP RENEWAL 2025



**Renew your CIBSE membership today and stay ahead in the industry.**



Your renewal is due by 1 January 2025.



Scan the QR code to log in to MyCIBSE and pay online.

**RENEW NOW**



[www.cibse.org/my-account](http://www.cibse.org/my-account)



# EnwaMatic<sup>®</sup>

ADVANCED WATER TECHNOLOGY



Side stream filtration and water treatment for heating and cooling systems

## Efficient by Design

