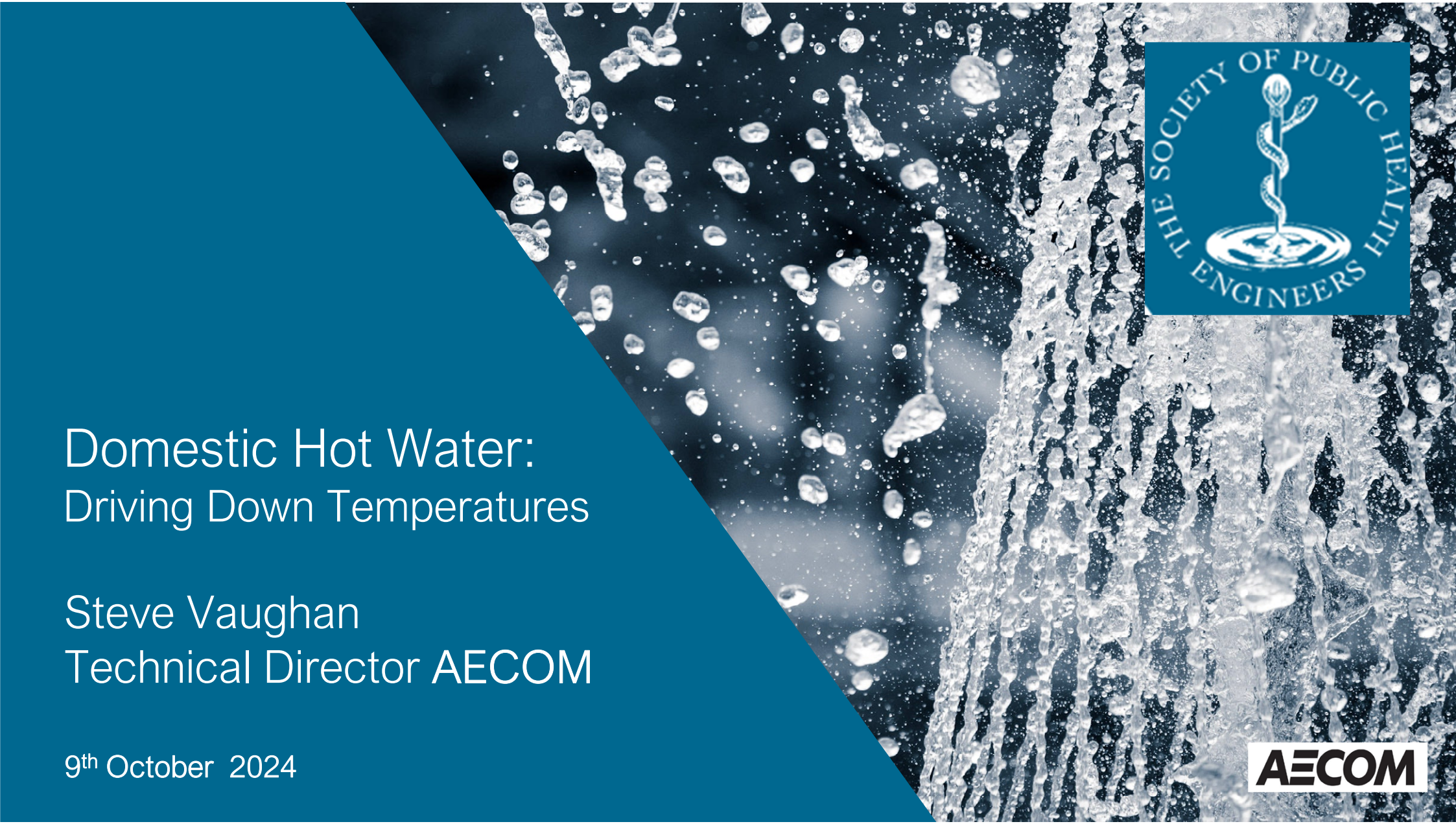


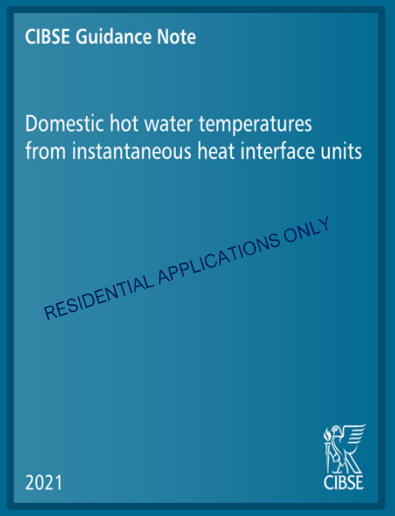
Domestic Hot Water:
Driving Down Temperatures

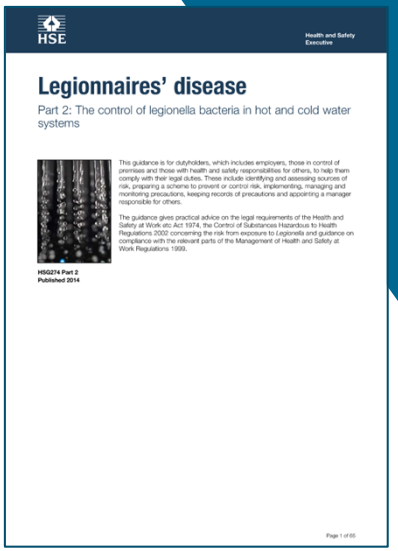
Steve Vaughan
Technical Director AECOM

9th October 2024

Key Documents

- **HSG 274 Part 2** : The control of legionella bacteria in hot and cold water systems – Covered within part 1
- **CIBSE CP1** Heat Networks: 2020
- **CIBSE Guidance Note 2021**: DHW Temperatures from Instantaneous HIU's
- **HTM 04-01**: Safe water in Healthcare premises Part A
- **TMV Certification** – TMV2 and TMV3 criteria and constraints





Presentation details

Part 1 : Legionella Bacteria

Provides an introduction to legionella bacteria, legionaries disease and the relevance/connection to good domestic water design.

Part 2 : Domestic Hot Water – Lowering Delivery Temperatures

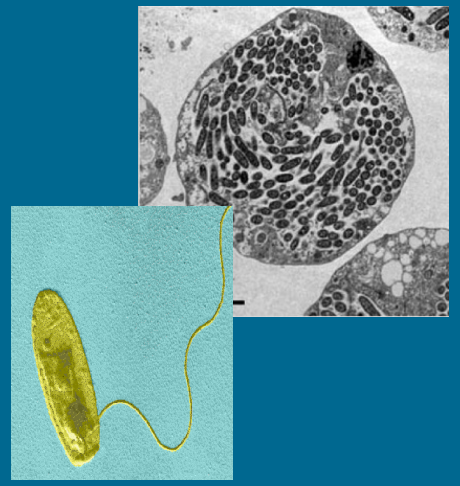
Provides an overview of current drivers in the building engineering industry and impact to Public Health Engineering Design.

It questions the current legislative reliance on temperature regime for water hygiene within domestic water systems.

- Identify key statements within each document - relating to temperature and water hygiene
- TMV selection, operation and certification
- Domestic hot water and district heating system performance
- Why does hot water temperature matter? Particularly with Heat Pumps
- Legionnaires disease and control measures for other waterborne bacteria

Part 1 : Legionnaires Disease

Within the domestic water systems we have to consider safe and efficient control of legionella bacteria.



- Legionella bacteria is found everywhere in the environment.
- It is a natural inhabitant of water and can survive in sterile tap water.
- Can survive and multiply in non-sterile sources.
- Warm water between 20 – 45^{o}C is the perfect water temperature for the bacteria to multiply.
- It is killed at temperatures above 60^{o}C
- You cannot usually get legionnaires disease from drinking water containing the bacteria

Further useful information can be found: www.nhs.uk/conditions/legionnaires-disease/
Safe Drinking Water Foundation www.safewater.org

Legionnaires Disease

It is not harmful to drink water which contains Legionella bacteria

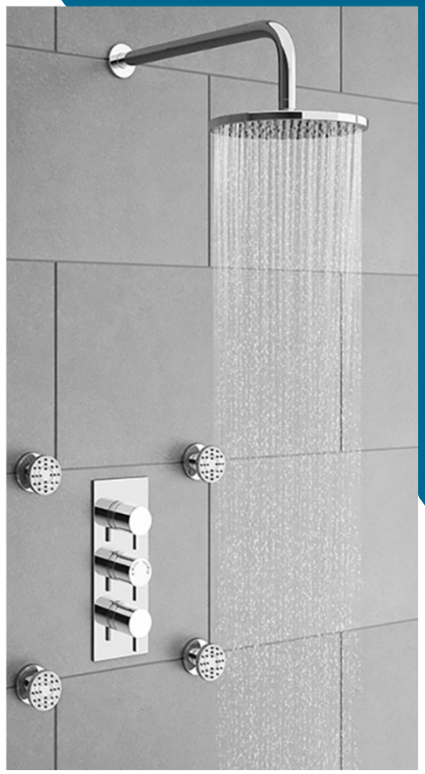
guardians of drinking water quality
DRINKING WATER INSPECTORATE

The bacteria needs to enter your lungs to create a risk of contracting Legionnaires disease.

It presents with pneumonia like symptoms – severely effecting the lungs

Legionnaires Disease

Therefore plumbing outlets such as showers, spray taps are potential risks



Legionnaires Disease

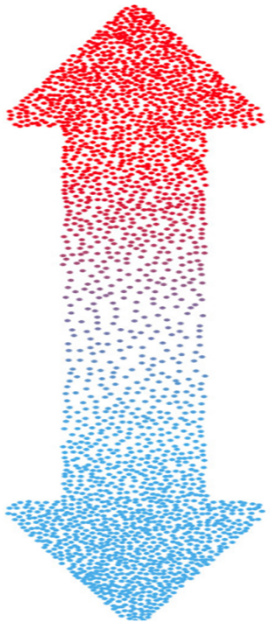
The Ideal Legionella Growth Temperatures:

Legionnaires Disease

Principles of good design for domestic water systems:

Keep the hot water HOT

Keep the cold water COLD



Legionnaires Disease

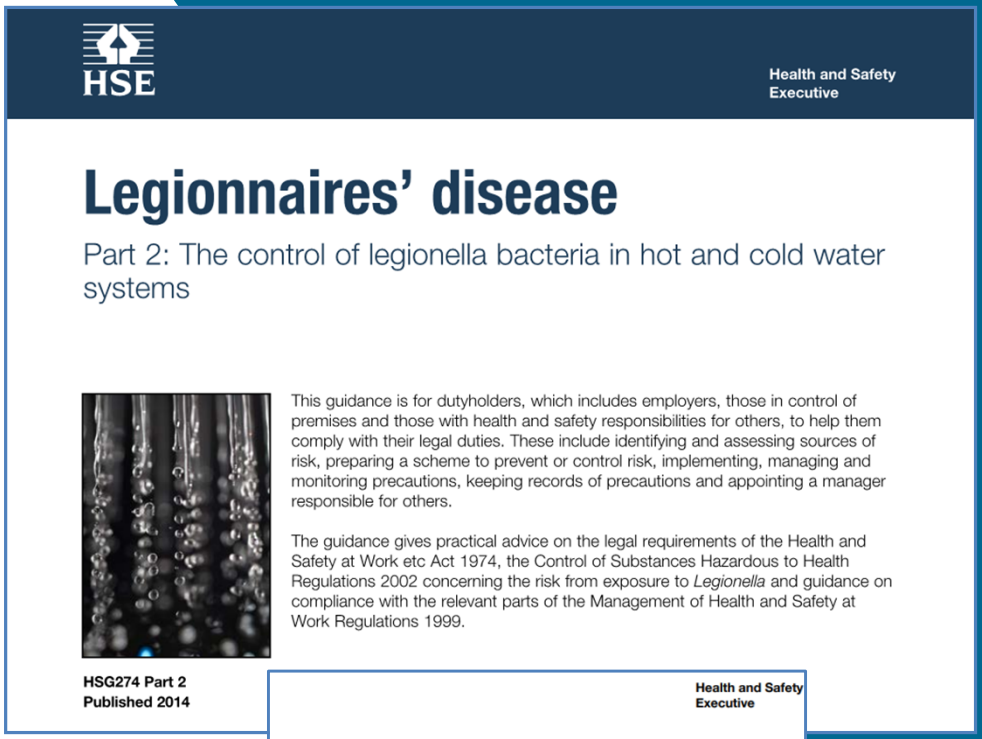
Heath and Safety Executive document
HSG 274 Part 2

States options for water treatment and control programmes for hot and cold water systems:

- Temperature regime
- Biocide treatments
- Supplementary measures
  - For point of use applications

In summary:

HSE identifies 2 options for legionella control


HSE

Health and Safety Executive

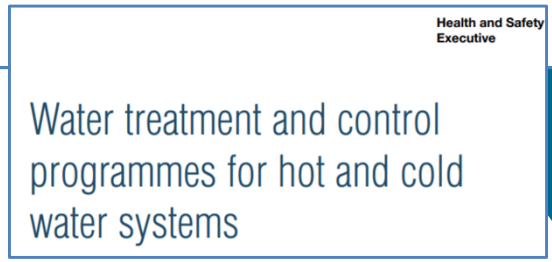
Legionnaires' disease

Part 2: The control of legionella bacteria in hot and cold water systems

This guidance is for dutyholders, which includes employers, those in control of premises and those with health and safety responsibilities for others, to help them comply with their legal duties. These include identifying and assessing sources of risk, preparing a scheme to prevent or control risk, implementing, managing and monitoring precautions, keeping records of precautions and appointing a manager responsible for others.

The guidance gives practical advice on the legal requirements of the Health and Safety at Work etc Act 1974, the Control of Substances Hazardous to Health Regulations 2002 concerning the risk from exposure to *Legionella* and guidance on compliance with the relevant parts of the Management of Health and Safety at Work Regulations 1999.

HSG274 Part 2
Published 2014


Health and Safety Executive

Water treatment and control programmes for hot and cold water systems

Legionnaires Disease

Heath and Safety Executive document
HSG 274 Part 2

Health and Safety Executive

Water treatment and control programmes for hot and cold water systems

2.80 Dutyholders are required to prevent or control the risk from exposure to legionella. Precautions include physical methods such as regular movement of hot and cold water in distribution pipework, regular flushing of outlets to ensure water cannot stagnate in the hot and cold water systems and POU filters. For control measures to be effective, it is essential to keep the whole system clean, as biofilms or inorganic matter such as scale can reduce the efficacy of any type of control measure significantly.

HSE

Health and Safety Executive

Legionnaires' disease

Part 2: The control of legionella bacteria in hot and cold water

2.81 Although temperature is the traditional and most common approach to control sometimes there can be technical difficulties in maintaining the required temperature particularly in older buildings with complex water systems. Control methods includin water treatment techniques, when used correctly and if properly managed, can be effective in the control of legionella in hot and cold water systems. However, the selection of a suitable system for the control of legionella is complex and depends o a number of parameters, including system design, age, size, and water chemistry, a of which can contribute to the complexity and difficulty of achieving adequate contro There is no single water treatment control regime that is effective in every case, and each control method has both benefits and limitations.

Published 2014

Legionnaires Disease

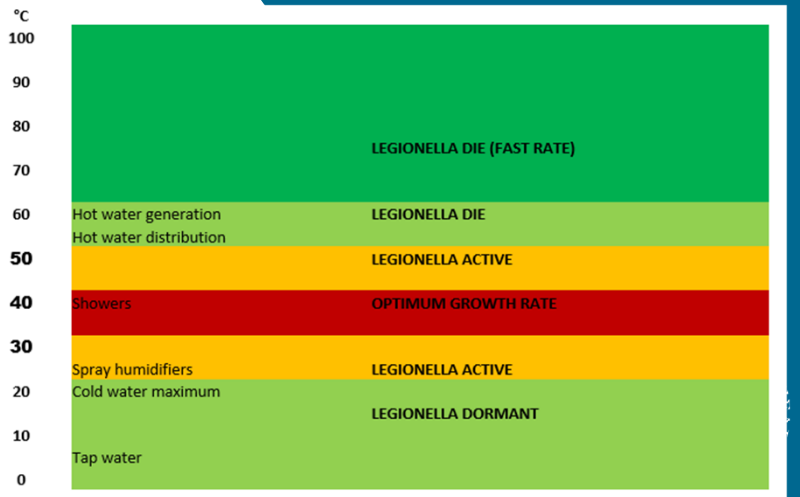
Heath and Safety Executive document
HSG 274 Part 2

- **OPTION 1:** TEMPERATURE REGIME: Keep the hot water HOT and the cold water COLD

- **Cold** water outlets – **below 20^{0}C**

- **Hot** water outlets - **at least 50^{0}C**
- Hot water outlets - Where TMV's are fitted: supply at least 50^{0}C
- Hot water **storage** at a minimum of **60^{0}C**

- Hot water circulation – Secondary **flow** at least **60^{0}C**
- Hot water circulation – Secondary **return** at least **50^{0}C**



Legionnaires Disease

Heath and Safety Executive document
HSG 274 Part 2

- **OPTION 2:** BIOCIDE TREATEMENT

4 Biocide Treatment options are listed in HSG 274 Part 2:

- Chlorine Dioxide
- Copper Silver Ionisation
- Chlorine
- Silver stabilised hydrogen peroxide

. . . . . But there are others available such as Monochloramine . . . .

As well as supplementary measures:

- Point of Use filters
- Ozone and UV treatment
- And others such as ultra-filtration, Titanium AOP . . .

As clause 2.81 states:
"There is no single water treatment control regime that is effective in every case, and each control method has both benefits and limitations"

This is applicable to temperature regime as well as the various biocide treatments

Consider all constraints carefully – Such as H&S issues, System compatibility (i.e. plastic pipework), residual effect

Legionnaires Disease

Heath and Safety Executive document
HSG 274 Part 2

Returning to discuss TEMPERATURE REGIME:

- It has no residual effect . . . Unlike many biocide treatment methods
- Not all waterborne pathogens are controlled by temperature regime
- The proliferation/production of scale within the water system disproportionally increases as temperature increases.
  - Scale is a food source for bacteria and can harbour water borne pathogens

Part 2 : Domestic Hot Water

: Lowering Domestic Hot Water temperatures

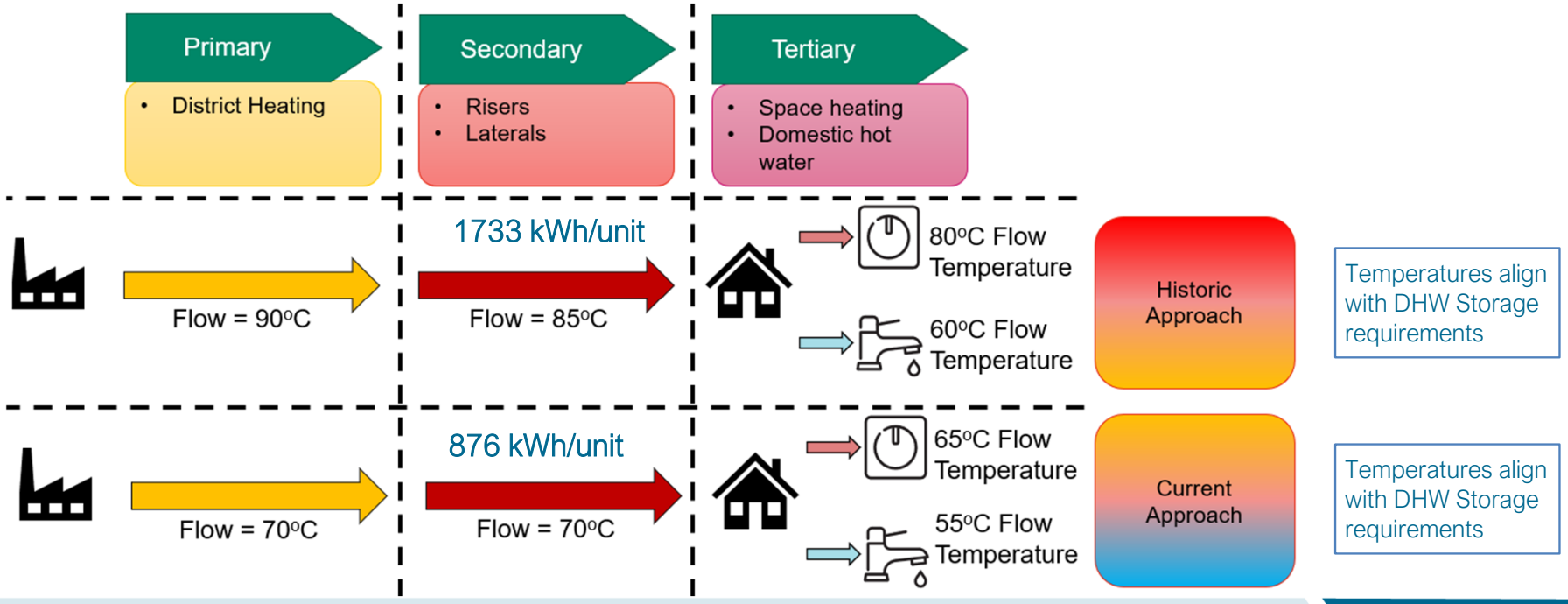
- Current Drivers for change – The guidance

CIBSE CP1

Heat networks:
Code of practice for the UK

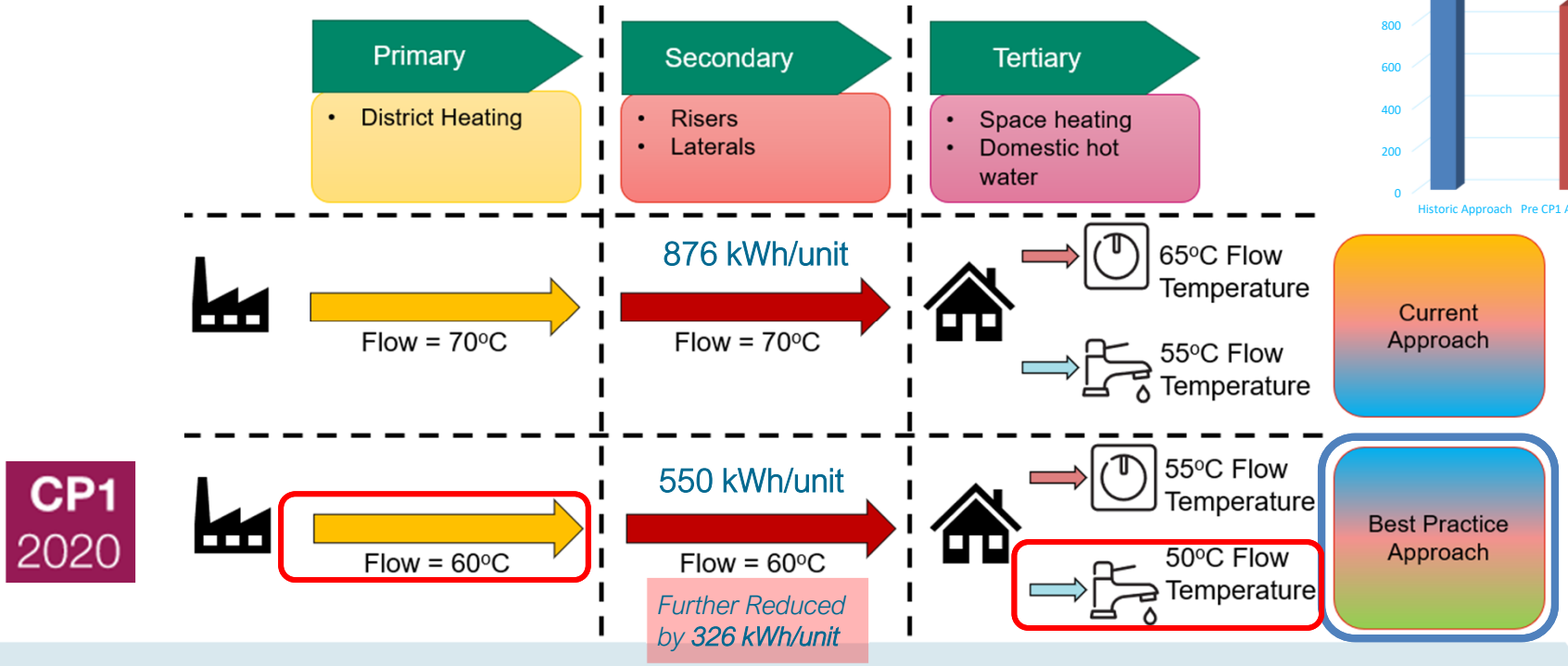
Domestic Hot Water and System Performance

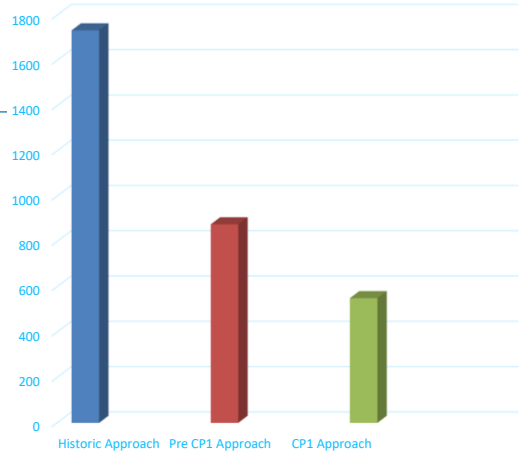
Ongoing Change in Thermal Limitation – THE HISTORY



Domestic Hot Water and System Performance

Ongoing Change in Thermal Limitation





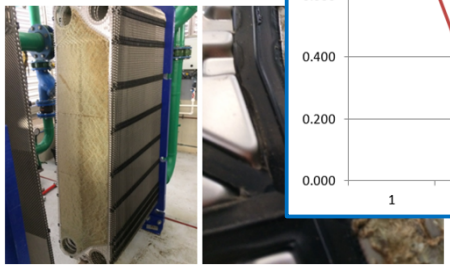
Code of Practice 1 Heat Networks: 2020

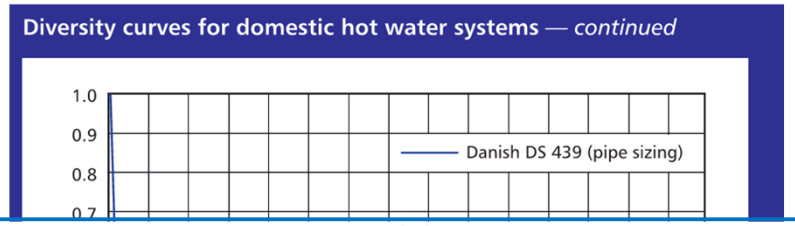
Key statements (delivery temperatures):

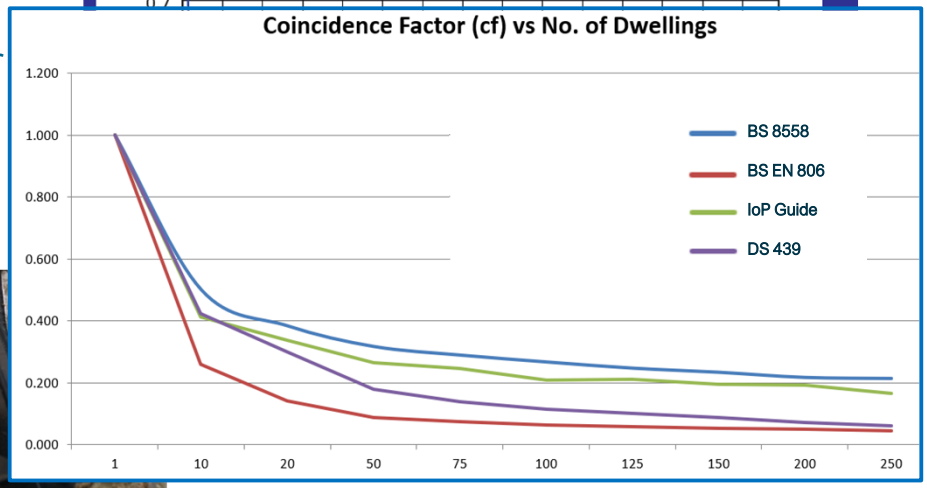
- Peak DHW demand to be diversified based on Danish Standard DS 439 (p.74-75)
  - This relates to diversification of connected DHW load for dwellings

- Identifies that Scaling of plate heat exchangers is much reduced below 55°C (p.84)

In hard water areas there is a risk that DHW heating coils and plate heat exchangers may scale up, reducing heat transfer and increasing return temperatures. Scaling risk is much reduced if DHW temperatures are below 55 °C and if there is turbulent flow at the heating surface. For HIUs with a DHW plate heat exchanger, the BESA HIU Test results can be used to specify HIUs with lower scaling risk, and the maximum recommended DHW temperature is 55 °C. For heating coils in DHW cylinders, where *Legionella* risk requires higher temperatures (e.g. 60 °C) and the flow is not turbulent, the risks of scaling are higher.







Code of Practice 1 Heat Networks: 2020

Key statements (delivery temperatures):

- DHW design stated to deliver minimum 45°C within 45 seconds (p.87)
- Care should be taken to avoid over estimation of peak DHW flow rates, leads to oversizing of pipework and higher heat losses (p.108)
- Requires the HIU to achieve 50°C at the heat exchanger outlet, unless there is a particular requirement (p.176)

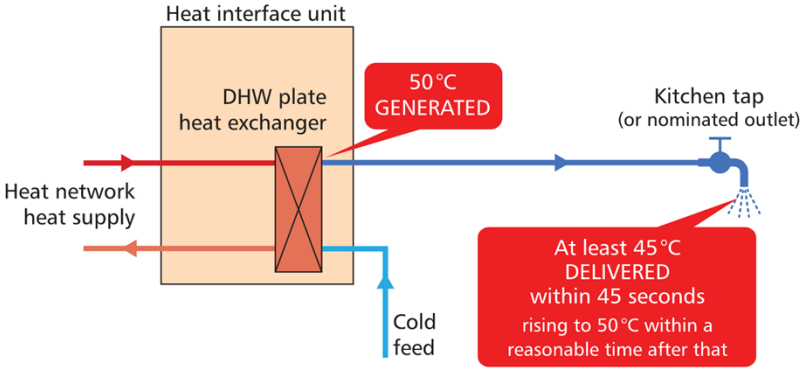
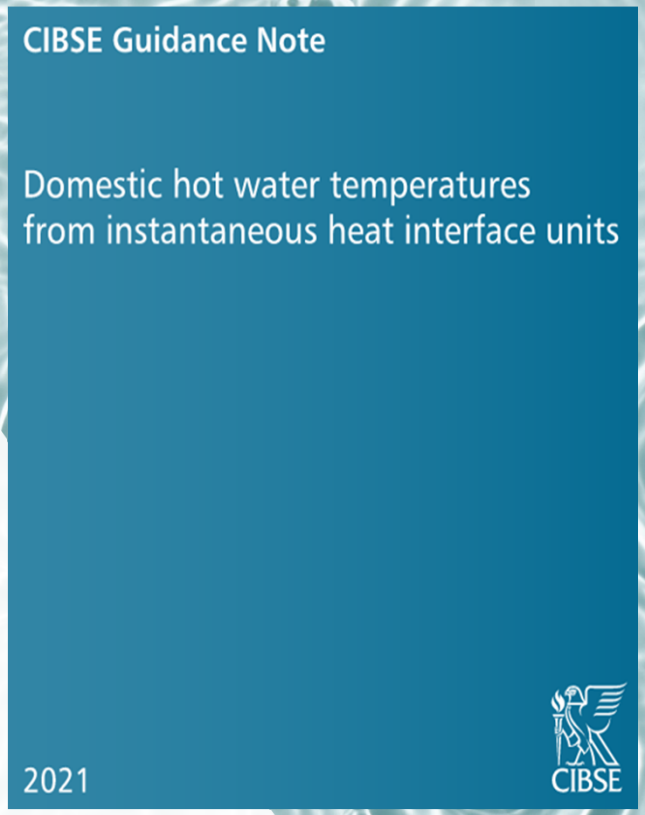


Figure 29 DHW temperature *generated* by an instantaneous HIU versus the service actually *delivered* to the consumer

CIBSE Guidance Note

Domestic hot water temperatures from instantaneous heat interface units: 2021

RESIDENTIAL INSTALLATIONS ONLY



CIBSE Guidance Note 2021:

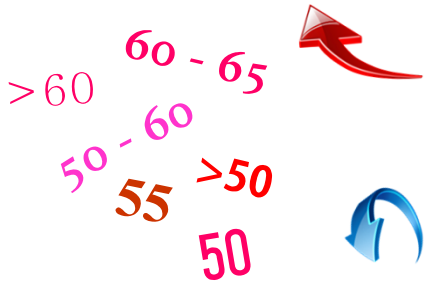
Key statements (design standards):

- Table 1 (p.4) lists a selection of standards (17No.) that indicate a clear lack of agreement in guidance provided.

Standard	Distributed hot water	Hot water to taps/TMVs
Key standards		
HSE HSG274 *Legionnaires' Disease. Part 2: The control of legionella bacteria in hot and cold water systems*	Low storage volume systems should be able to achieve peak temperature of 50–60°C	Supplied at 50°C
HSE ACoP L8 *Legionnaires' Disease: The control of legionella bacteria in water systems*		Supplied at 50°C
British Standard BS EN 806-2: 2005: *Specifications for installations inside buildings conveying water for human consumption. Design*		For central hot water systems, 30 seconds after fully opening a draw-off fitting the water temperature should not be less than 60°C, unless otherwise specified by local or national regulations
British Standard BS 8558: 2015: *Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*		Delivered at or above 50°C within 1 minute of running the water
Building Regulations, Approved Document G* *Sanitation, hot water safety and water efficiency*	Does not exceed 60°C	Maximum temperature at bath tap of 48°C
British Standard BS 6700: 2006 + A1: 2009: *Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Specification* (no longer current but cited in Approved Document G)	Stored and distributed at a temperature of not less than 60°C	Temperature at the discharge point of 50°C after 1 minute
WRAS *Water Regulations Guide*	Not less than 55°C (this may not be achievable where provided by instantaneous or combination boilers)	Not less than 50°C within 30 seconds after fully opening the tap (this may not be achievable where provided by instantaneous or combination boilers)
CIBSE TM13 *Minimising the risk of Legionnaires' disease*	Stored at >60°C with distribution temperature of 55–60°C	Minimum 50°C, max flush time to achieve this of 1 minute

Additional standards		
British Standard BS 8580-1: 2019: *Water quality. Risk assessments for Legionella control. Code of practice*	Maintained at 50°C or above (circulating hot water system)	Target to reach minimum of 50°C within 1 minute of turning on (non-circulating hot water systems)
British Standard BS 6465-3: 2020: *Sanitary installations. Code of practice for selection, installation and maintenance of sanitary and associated appliances*		Delivering at around 50°C
CIBSE Guide G *Public health and plumbing engineering*	Maintained above 50°C, preferably at 55°C	
Institute of Plumbing (CIPHE) *Plumbing Engineering Services Design Guide*	Minimum 50–55°C	50°C attainable at all taps within 30–60 seconds
CIBSE/ADE CP1 *Heat networks: Code of Practice for the UK*		The hot water delivery temperature at the instantaneous HIU shall be set to 50–55°C; temperatures in this range are acceptable provided the volume of water is small and the *Legionella* risk can be controlled
BSRIA BG/62 *Heat Interface Units*	Generation temperature of at least 55°C for once-through, non-storage domestic hot water systems based on HIU with plate heat exchanger	At least 50°C
NHBC Standards		At least 50°C within 1 minute of running the water, 55°C at kitchen sink
TMVA Guide *The Control of Hot Water Temperatures in Domestic Properties*	Hot water should be maintained at 60–65°C to reduce microbiological contamination	
BRE IP 14/03 *Preventing Hot Water Scalding in Bathrooms: using TMVs*		Temperature should never exceed 46°C at taps

* For use in England only. Similar guidance is available for Scotland, Wales and Northern Ireland.
TMV = thermostatic mixing valve



CIBSE Guidance Note 2021:

Key statements (user requirements for DHW temperatures – kitchen sink):

- BEAMA States that 'water should be available between 46 and 48°C to ensure thorough removal of grease, but this is not governed by any published recommendations (p.9)
- It can therefore be assumed that all the commercially available hand dishwashing detergents in Europe will be effective using hot water tap temperatures of 45°C and above (p.9)
- Proctor and Gamble state 39-41°C is the normal temperature range that consumers would use for the Fairy Liquid produce (p.9)
- Table 3 shows recommended minimum temperatures (p.9)

Table 3 Supply temperature requirements (°C)

Outlet	NHBC Standards	CIBSE Guide G
Bath tap	40	44
Shower	40	41
Wash basin tap	40	43
Kitchen tap	55 (50*)	50 to 60

*50 °C will be adopted by NHBC from January 2022.

CIBSE Guidance Note 2021:

Key statements (minimising the risk of burns):

- Requirement G3(4) of Building Regulations 2020 states: *'The hot water supply to any fixed bath must be so designed and installed as to incorporate measures to ensure that the temperature of the water that can be delivered to the bath does not exceed 48°C'.* (p.6)

The Building Regulations 2010

Sanitation, hot water safety and water efficiency

G

APPROVED DOCUMENT

(4) The hot water supply to any fixed bath must be so designed and installed as to incorporate measures to ensure that the temperature of the water that can be delivered to that bath does not exceed 48°C.

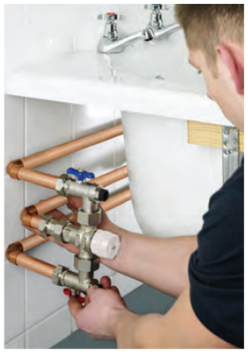
Prevention of scalding

3.65 The hot water supply temperature to a bath should be limited to a maximum of 48°C by use of an in-line blending valve or other appropriate temperature control device, with a maximum temperature stop and a suitable arrangement of pipework.

3.67 In-line blending valves and composite thermostatic mixing valves should be compatible with the sources of hot and cold water that serve them.

CIBSE Guidance Note 2021:

Key statements (minimising the risk of burns):



- Compliance with AD G3 is commonly achieved by use of thermostatic mixing valve (TMV) at outlet that presents scalding risk (p.6)

- TMV's provide a dual function (p.6):
  - Blending hot and cold water to a safe temperature
  - Automatically shutting off the supply of blended water when the cold water supply fails

- However, no mention of TMV certification or potential warranty issues – which is a challenge for specification compliance

TMV2 and TMV3 Certification requires specific approach temperatures and differential temperatures (between the DHW supply and blended temperatures) to be adhered to. At 50°C the hot failsafe (shut-off) cannot be approved in accordance with certification parameters – although some TMVs do operate satisfactorily they will not be warrantied.

CIBSE Guidance Note 2021:

Key statements (minimising the risk of burns):

- For instantaneous systems, the secondary shut-off function can be provided inherently within the design of the hot water system. Figure 2 shows recommended pipework configuration – no separate IV for cold to TMV(p.7).

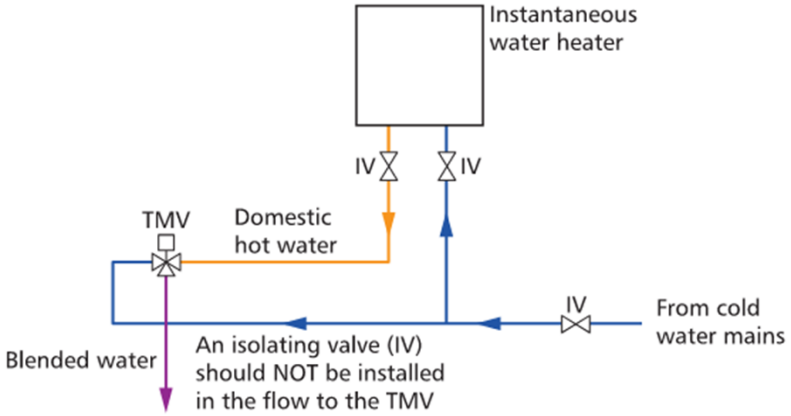


Figure 2 Pipework arrangement to prevent hot water bypass in event of cold water failure

CIBSE Guidance Note 2021:

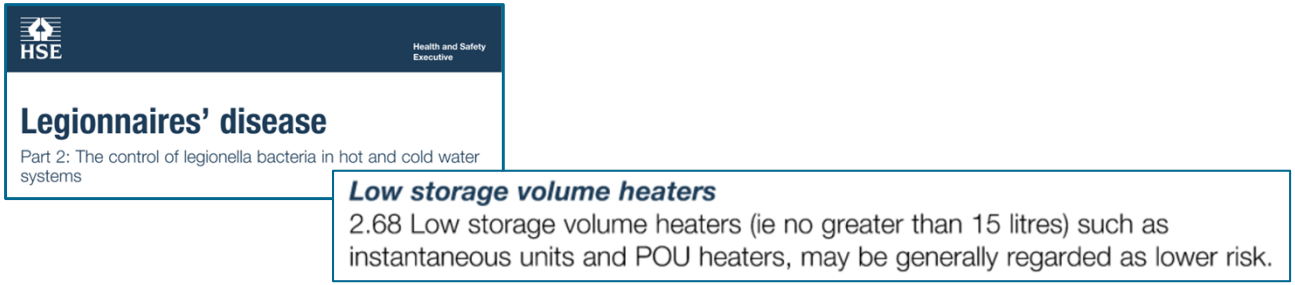
Key statements (Legionnaires' disease and low volume instantaneous DHW heaters):

- Traditionally, hot water systems in the UK have included water storage, with temperature used to reduce the risk of legionella growth (p.7)
- However, this is not required for instantaneous systems with high rates of turnover (p.7)
- HSG274 requires that risk assessments should be performed for all DHW systems (p.7)
  - Including Low volume (no greater than 15 litres) instantaneous systems

CIBSE Guidance Note 2021:

Key statements (Legionnaires' disease and low volume instantaneous DHW heaters):

- HSE was consulted and considers HIU providing instantaneous DHW to dwelling should be included under definition of low storage volume (no greater than 15 litres) and therefore a lower risk system (p.7)



HSE

Health and Safety Executive

Legionnaires' disease

Part 2: The control of legionella bacteria in hot and cold water systems

Low storage volume heaters

2.68 Low storage volume heaters (ie no greater than 15 litres) such as instantaneous units and POU heaters, may be generally regarded as lower risk.

- HSG274 Part 2 states for low water volume systems (p.7):
  - Should be able to achieve peak temperature of 50 to 60°C
  - Temperatures less than 50°C should only be permitted where there is high turnover (or alternative control)
  - There is no requirement for either minimum temperature or delivery time at the tap.

CIBSE Guidance Note 2021:

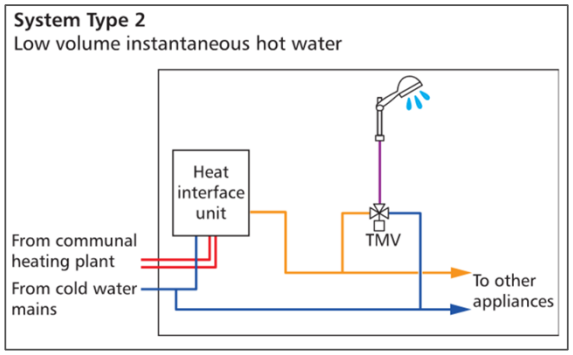
Key statements (Legionnaires' disease and low volume instantaneous DHW heaters):

- Lower risk scenario: Health and Safety Executive consulted and considers HIU providing instantaneous DHW to dwelling should be included under definition of low storage volume (no greater than 15 litres) and therefore a lower risk system (p.7)

Lower risk scenario

This scenario has been agreed with the HSE as a lower risk system.

- Block of flats served by communal heating system and communal boosted cold water system.
- Each dwelling/flat has its own low volume HIU to generate instantaneous hot water (System Type 2 – see Figure 1).
- There is no stored hot water, and each HIU contains less than 15 litres of water (as per HSG274 Part 2, paragraph 2.68).



CIBSE Guidance Note 2021:

Key statements (Legionnaires' disease and low volume instantaneous DHW heaters):

- HSG274 Part 2 states for low water volume systems (p.7):
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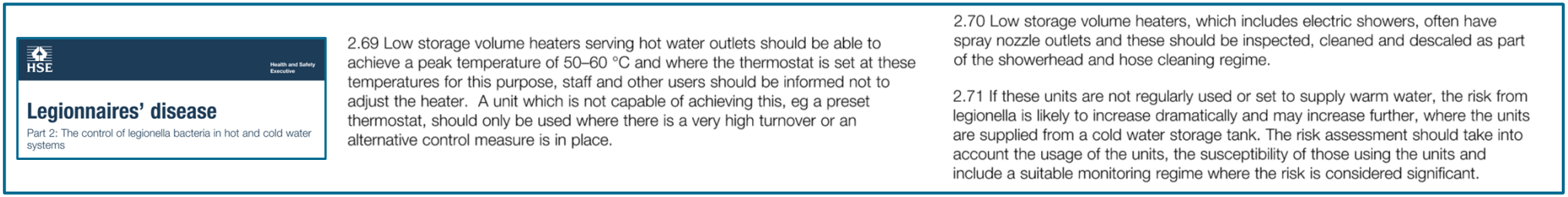
  - > Temperatures less than 50°C should only be permitted where there is high turnover (or alternative control)
  - > There is no requirement for either minimum temperature or delivery time at the tap.



HSE Health and Safety Executive

Legionnaires' disease

Part 2: The control of legionella bacteria in hot and cold water systems

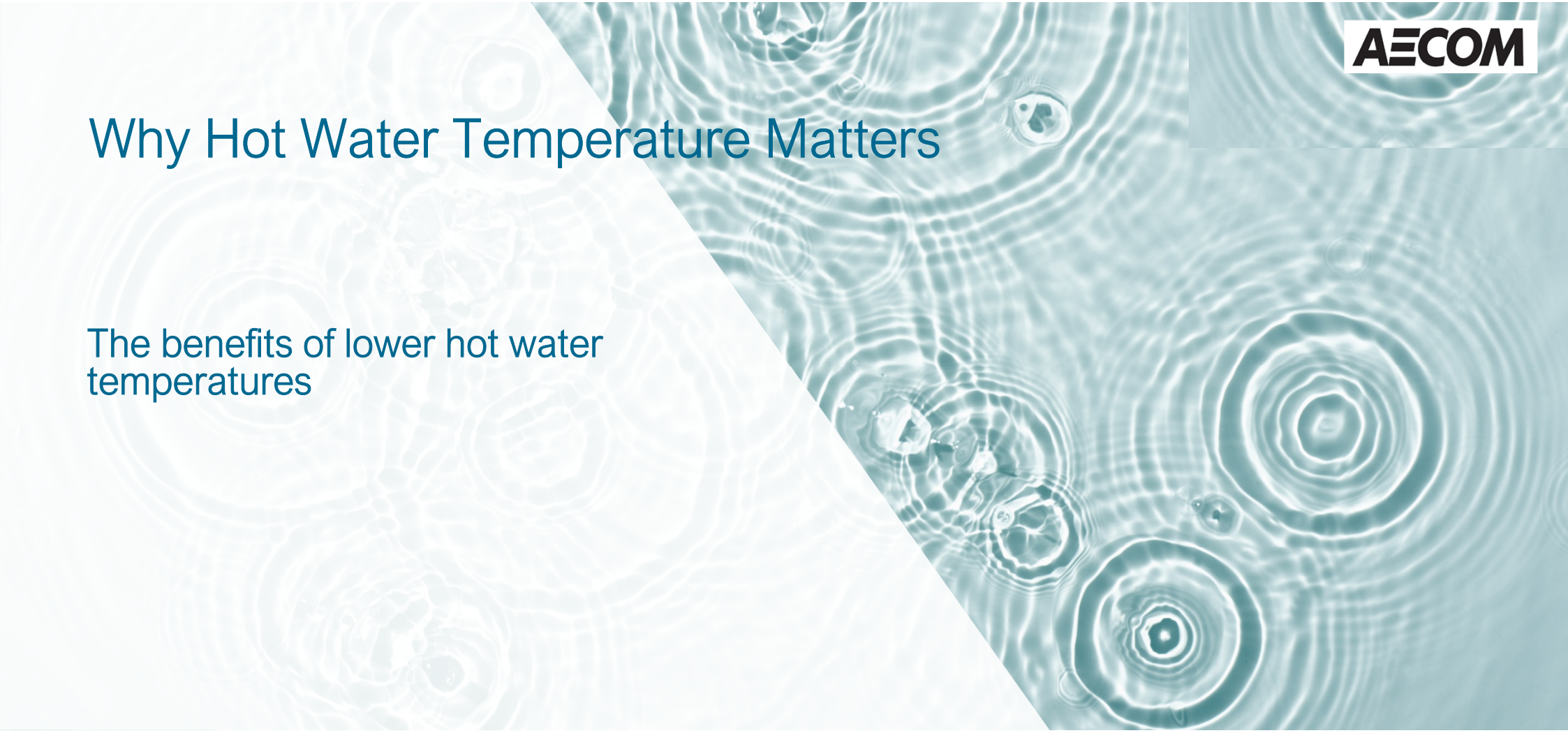
2.69 Low storage volume heaters serving hot water outlets should be able to achieve a peak temperature of 50–60 °C and where the thermostat is set at these temperatures for this purpose, staff and other users should be informed not to adjust the heater. A unit which is not capable of achieving this, eg a preset thermostat, should only be used where there is a very high turnover or an alternative control measure is in place.

2.70 Low storage volume heaters, which includes electric showers, often have spray nozzle outlets and these should be inspected, cleaned and descaled as part of the showerhead and hose cleaning regime.

2.71 If these units are not regularly used or set to supply warm water, the risk from legionella is likely to increase dramatically and may increase further, where the units are supplied from a cold water storage tank. The risk assessment should take into account the usage of the units, the susceptibility of those using the units and include a suitable monitoring regime where the risk is considered significant.

Why Hot Water Temperature Matters

The benefits of lower hot water temperatures



Benefits of lower DHW temperatures

- Facilitates transition to heat pumps on heat networks – improved SCOP = reduced £/kWh cost of heat
- Reduced network losses = reduced £/kWh cost of heat
- Reduced risk of scalding

DHW the limiting factor on operating temps

- **UFH** becoming ubiquitous on new build developments = typically max 45°C
- As a result, **DHW temperatures are now typically the limiting factor** on Heat Network flow temperatures
- **5°C has a major impact** in the context of heat pumps and heat network efficiency

A few degrees matter for heat pumps

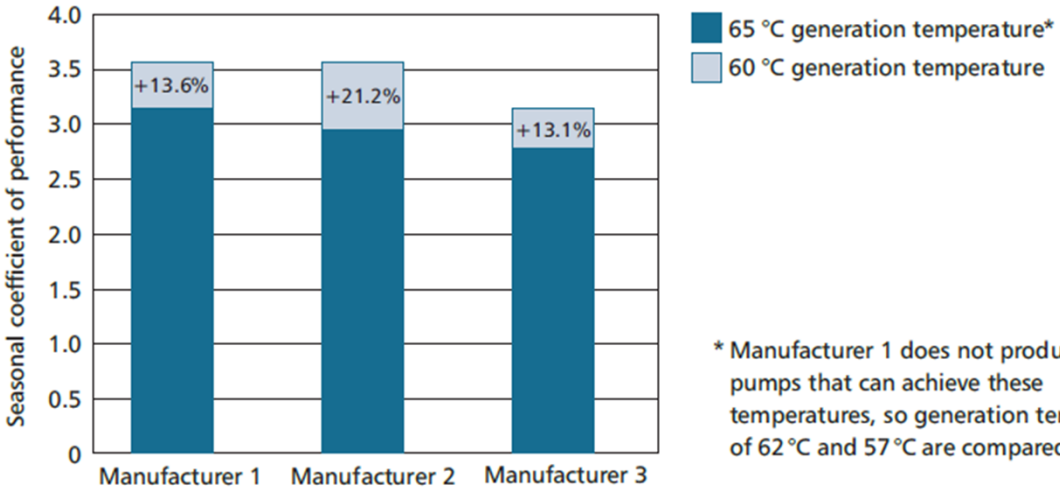
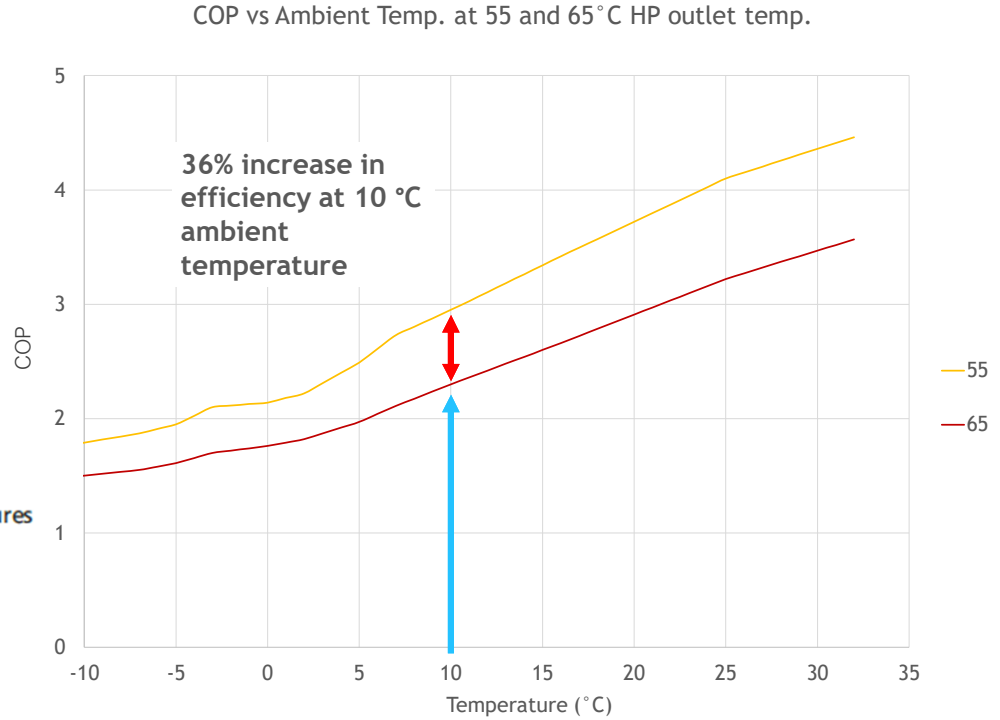


Figure 5 Increase in SCOP with decrease in generation temperature



…and for heat network losses

Table 6 Comparative performance of design approaches

	Typical practice	Recommended practice
HIU generation temperature	55 °C	50 °C
Heat network flow temperature	65 °C	60 °C
Annual heat loss per dwelling	876 kW·h	774 kW·h [–11%]

Basis of table data: annual average internal temperature: 22 °C.

5°C also critical when it comes to scalding

Table 2 Type of scalding burn injury based on time of exposure (Dansk Standard, 2009)

	Time of exposure in minutes and seconds							
Temperature	45 °C	50 °C	55 °C	60 °C	65 °C	70 °C	75 °C	80 °C
Type of burn								
Adult								
3rd degree	>60 min (e)	300 s	28 s	5.4 s	2.0 s	1.0 s	0.7 s	0.6 s (e)
2nd degree	>60 min (e)	165 s	15 s	2.8 s	1.0 s	0.5 s	0.36 s	0.3 s (e)
Child								
3rd degree	50 min (e)	105 s	8 s	1.5 s	0.52 s	0.27 s	0.18 s	0.1 s (e)
2nd degree	30 min (e)	45 s	3.2 s	0.7 s	0.27 s	0.14 s	<0.1 s	< 0.1 s (e)

(e) = estimate

Health Technical Memorandum 04-01: Safe water in healthcare premises Part A: Design, installation and commissioning

Never events

0.18 NHS England's never events policy framework defines "never events" as serious, largely preventable patient safety incidents that should not occur if the available preventative measures have been implemented by healthcare providers. On the list of never events is scalding of patients. The risk of scalding for vulnerable patients (children and young people, older people, and disabled people) is a particular problem in healthcare premises. HTM 04-01 provides guidance on reducing the risk of scalding.

- Effectively a 10 fold increase in risk moving from 50°C to 55°C
- 755 people treated in hospital for scalding from hot water taps during the year 2017-18

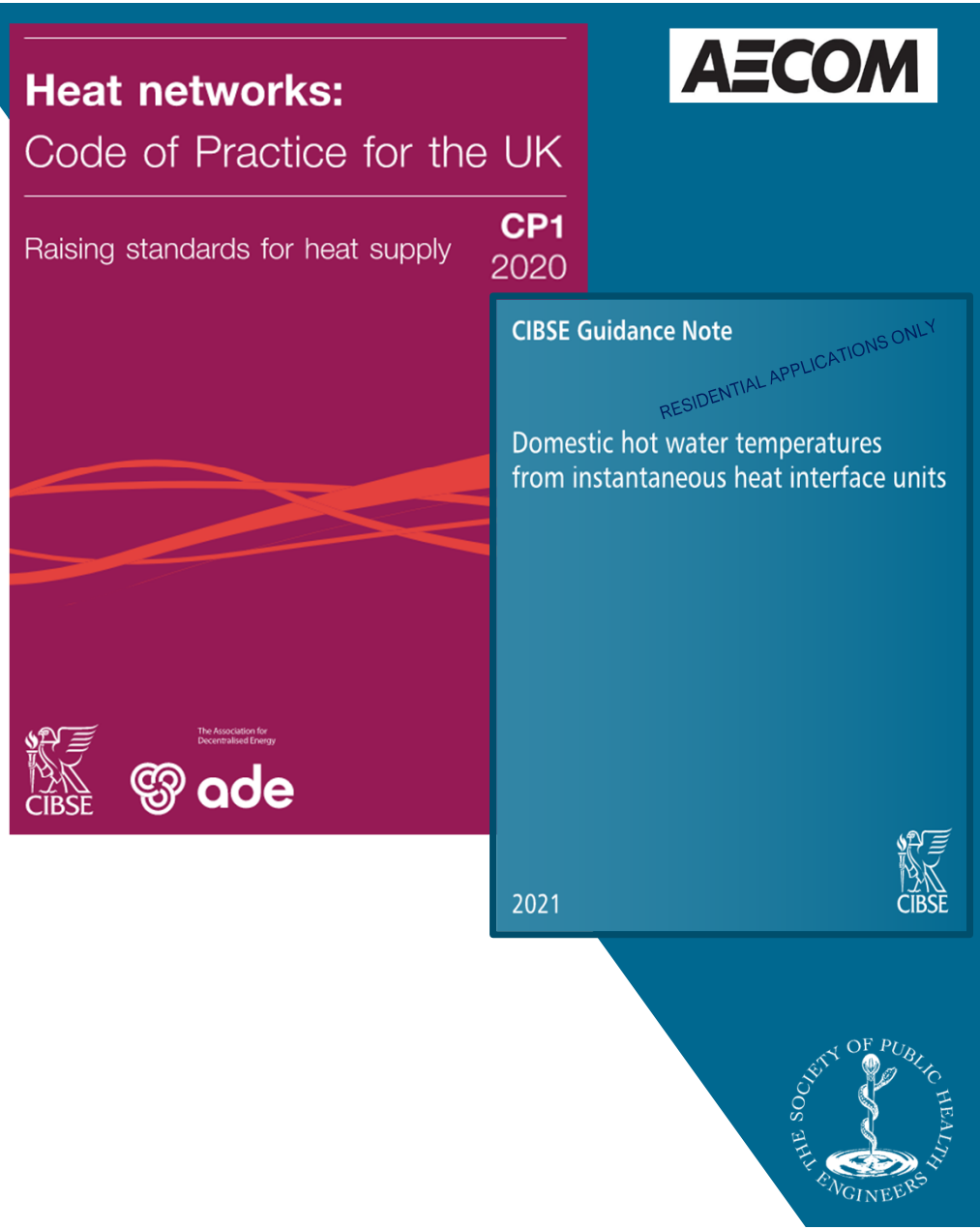
Summary (part 2)

Relating to:

- CIBSE CP1 Heat Networks: 2020
- CIBSE Guidance Note 2021: DHW Temperatures from Instantaneous HIU's

Summary (part 2)

- CP1 and the drive towards net zero has reduces District Heat Network temperatures to levels that will not allow generation and storage of Domestic Hot Water at 60°C without supplementary boosting of the temperature.
- For low-risk low water content instantaneous systems: CIBSE guidance and HSE acknowledge that instantaneous DHW delivery temperatures of 45°C rising to 50°C is acceptable – but risk assessment needed
- Heat Pumps are now frequent used as COPs of +4 can often be achieved. But their efficiency dramatically reduces when delivering temps of +45°C are needed. A 5°C reduction in delivery temperature increases efficiency by 36%



Summary (part 2)

BUT:

- The technical issue with regard to TMV hot water shut-off for TMV2 applications has been overcome – However . . . .
  - There are still issues to be addressed with regard to test criteria and warranty. Performance standards currently require DHW @55°C with min 10°C delta t between DHW supply and blended temperature

Specifications	
Factory temperature setting	38°C
Temperature setting range	38-46°C
Temperature, hot supply	52-65°C (Max 85°C
Temperature, cold supply	5-25°C
Minimum hot to mix differential temperature	10°C
Temperature stability	+/- 2°C
Working pressure, static	16.0 bar max
Working pressure, dynamic	0.2 to 5.0 bar
Maximum pressure loss ratio	10:1
Flow rate, minimum	4 L/min

AECOM

CP1
2020

CIBSE Guidance Note

RESIDENTIAL APPLICATIONS ONLY

Domestic hot water temperatures from instantaneous heat interface units

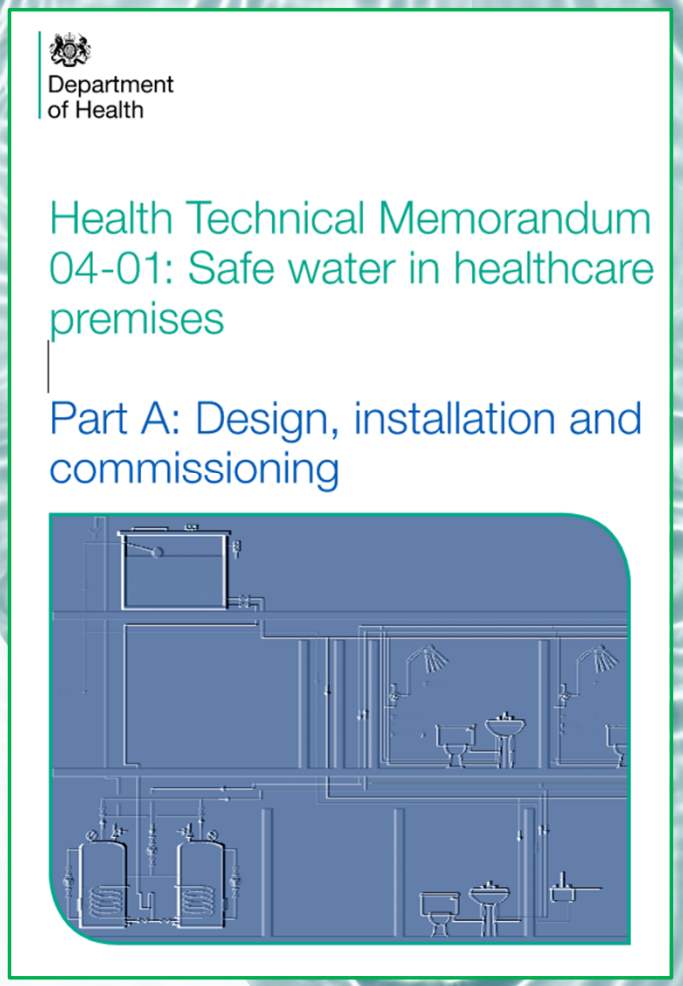
TECHNICAL SPECIFICATION		
	BS EN 1287 : 1999	BS EN 1111 : 1999
Maximum static pressure (bar)	10.0	10.0
Supply pressure hot and cold (bar)	0.1 - 1.0	1.0 - 5.0
Hot supply (C)	55 - 65	55 - 65
Cold supply (C)	Maximum 25	Maximum 25
Mixed water temperature	Maximum 46	Maximum 46

THE SOCIETY OF PUBLIC HEALTH ENGINEERS

Specific Guidance relating to design of domestic water systems in Healthcare premises

HTM 04-01: Safe water in Healthcare premises

Part A: Design, installation and commissioning



HTM 04-01 Part A

Key statements

- Controlling waterborne pathogens (page .v)

The guidance gives comprehensive guidance on measures to control waterborne pathogens. While Legionella control is, in the main, associated with poor engineering configuration and maintenance . . .

. . . . . a temperature control regime is the traditional strategy for reducing the risk from Legionella and for reducing the growth and colonisation of other waterborne organisms within water systems.

. . . . . Because of the complexity of hot and cold water distribution systems and the difficulty of maintaining a temperature control regime in some healthcare facilities, this guidance suggests that additional chemical, physical and other water control methods that have been shown to be capable of controlling microbial colonisation and growth may also be considered.

HTM 04-01 Part A

Key statements – Temperature regime criteria

- 9.4 and 9.5 Relates to cold water supply temperatures (page 40, 41 and 42)

  9.4 Currently there is no upper limit standard for drinking water temperature in European or domestic legislation. In normal circumstances temperatures should be delivered below 20°C but there is growing evidence that supply temperatures may rise above 25°C in summer months.
  Coupled with improvements in building thermal performance and climate change, rising cold water supply temperature is likely to become more problematical. The design aim should be to ensure that cold water temperature draw-off is as close to the supply temperature as possible (see also paragraphs 2.55–2.56 from HSG274 Part 2).

Note (page 41)

For the control of *Legionella* and other waterborne organisms, 20°C is the quoted upper value above which multiplication of *Legionella* in particular begins to take place (see Part B, Chapter 4). It should be noted that during extremes of weather, environmental factors can influence the incoming water temperatures, particularly where water is provided from surface water sources.

We are increasingly seeing incoming cold water supply temperatures from water utility providers approaching and in some instances exceeding 20°C.
Is cooling an option or sustainable?
How is the water hygiene risk controlled?

Note (page 42)

Cooling water that may have been previously at a temperature conducive to *Legionella* growth will not reduce the risk of infection.

This is the temperature regime requirements for domestic COLD water system:

- Maximum system temperature of 20°C

HTM 04-01 Part A

Key statements – Temperature regime criteria

- 10.5 Hot water temperatures (page 46)

10.5 Hot water is required in healthcare premises at various delivery temperatures for particular needs.

The highest temperature, 55°C, is required typically in main kitchens, laundries, dirty utilities and food preparation areas.

Elsewhere the delivery temperature for personal hygiene will depend on individual preference for comfort and safety of patients who require assistance.

In circulating hot water systems, the highest temperature will be required at all draw-offs on a loop. To achieve this, see Note 2 below, the flow from the calorifer/water heater is required to be at least 60°C at its outlet with a minimum return temperature to it at 50°C.

This is the temperature regime requirements for domestic HOT water system:

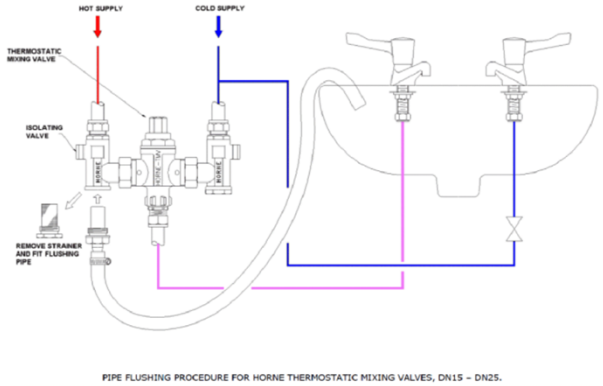
- DHW storage at min 60°C
- Fitting/Outlet DHW temperature 55°C
- DHW return at calorifier min 50°C

HTM 04-01 Part A

Key statements – Maintenance

- 8.40 Strainers (page 37)

. . . . .Strainers can be a source of Legionella bacteria and should be included in routine cleaning, maintenance and disinfection procedures.



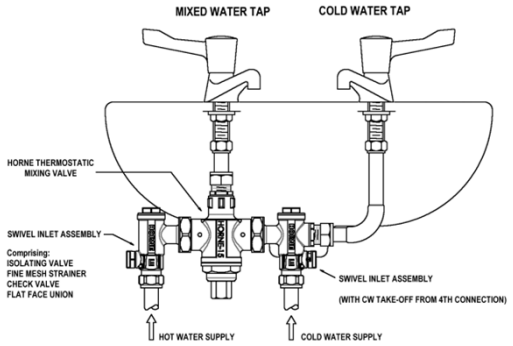
PIPE FLUSHING PROCEDURE FOR HORNE THERMOSTATIC MIXING VALVES, DN15 – DN25.

HTM 04-01 Part A

Key statements – Dead-legs

- 10.48 Downstream supplies from TMVs (page 52)

10.48 Particular attention should be given to ensuring that pipework containing blended water should be kept to a minimum. Generally, the downstream supply from the mixing device should not exceed 2 m.



2m of blended DHW at 37-40°C is permitted. Deadleg, maintenance challenges to pasteurise these dead-legs are all concerns

HTM 04-01 Part A

Key statements – Biocide water treatment

- 4.8 Where biocides are used to control microbial growth in water systems ….(page 24)

> 4.8 Where biocides are used to control microbial growth in water systems, as with the temperature regimen, meticulous control and monitoring programmes should be in place if they are to be effective.
>
> However, careful consideration should be given to any equipment that is connected to the water system that may be affected by the application of a biocide (for example, renal departments, haemodialysis units and neonatal units).

Temperature Regime

Points to note with regard to Temperature Regime

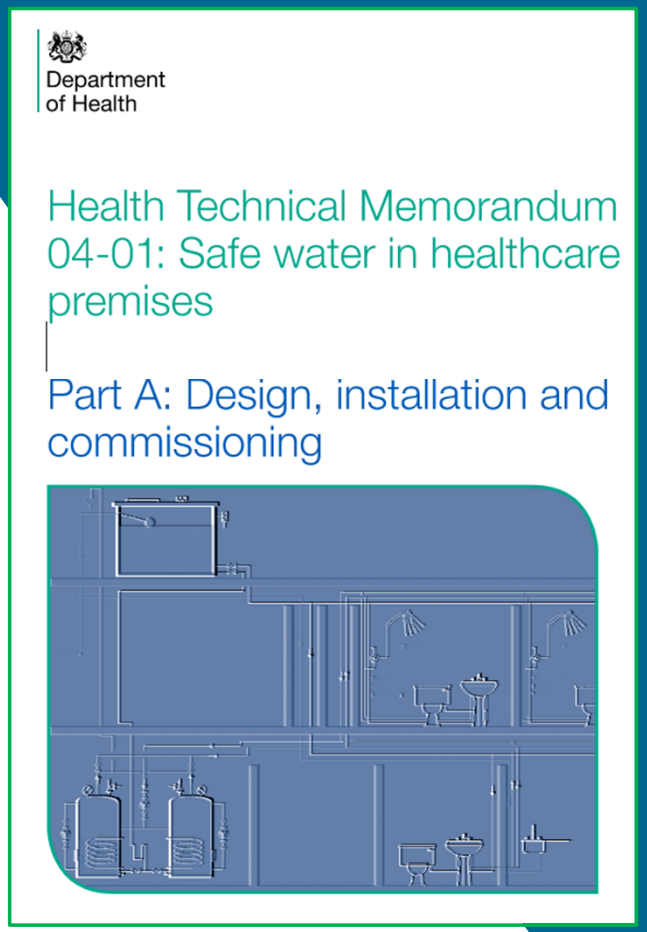
- It has no residual effect . . . Unlike many biocide treatment methods
- Not all waterborne pathogens are controlled by temperature regime
- The proliferation/production of scale within the water system disproportionally increases as temperature increases.
  - Scale is a food source for bacteria and can harbour water borne pathogens

Summary

Relating to:

- HTM 04-01 Part A . . . acknowledges:

- That complex domestic H&C water systems can be difficult to maintain water hygiene.
- Incoming cold water can exceed 20°C which is the maximum temperature for temperature regime.
  - Cooling water after it has exceeded 20°C is a potential risk
- Strainers can be problematic as harbour food source for bacteria – found in TMVs, PRVs etc.
- Dead-legs of blended hot from TMVs are a risk.
- Biocide water treatment is considered in addition to temperature regime and requires meticulous control and monitoring programmes, as does temperature regime.



Summary

So if we were to consider a lower temperature DHW distribution system:

- That complex domestic H&C water systems can be difficult to maintain water hygiene.
- Incoming cold water can exceed 20°C which is the maximum temperature for temperature regime.
  - Cooling water after it has exceeded 20°C is a potential risk
- Strainers can be problematic as harbour food source for bacteria – found in TMVs, PRVs etc.
- Dead-legs of blended hot from TMVs are a risk.
- Biocide water treatment is considered in addition to temperature regime and requires meticulous control and monitoring programmes, as does temperature regime.
- Heat gains from DHW system to cold water system and internal environment.

Consider designing multiple local systems with lower water content, potentially less complex etc.

How is water quality be maintained – Biocide dosing? This could also dose the DHW system?

TMVs could be omitted:
- Less maintenance. Reduction in strainers

Reduced/no deadlegs as DHW returns can be taken to fittings

Does this make the system less complex? Easier to balance pressures, reducing numbers of PRVs?

Scale risk is reduced

Reduced heat gain to space/other services

Summary

And returning to points relating to temperature regime:

- It has no residual effect.
- Not all waterborne pathogens are controlled by temperature regime
- The proliferation/production of scale within the water system disproportionally increases as temperature increases.

Biocide dosing has residual effect (varies)

Biocide dosing can target multiple pathogens. **But some may become resistant.**

Scale production is reduced. Less food source for bacteria.

Thank you!
Any questions?

Steve Vaughan
Technical Director AECOM