

Why is Water System Design so crucial in the avoidance of subsequent issues during Operation?

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Water Systems and Legionnaires' disease

- Legionnaires' disease is a lung infection caused by Legionella bacteria, transmitted by breathing in water droplets containing Legionella bacteria.
- HSG274 Part 2 - ***“ANY water system that has the right environmental conditions could potentially be a source for legionella bacteria growth”*** - Don't think your facility is exempt – loss of control can lead to colonisation which once allowed takes time, money and effort to eradicate.
- Dutyholders must ensure there are necessary precautions in place to prevent or control the exposure risk from Legionella within their facility.
- Seeking professional advice from water system design through to operation is crucial for gaining the necessary assurance about water quality. A competent professional who can identify risk areas, input on management of such risks and advise on legal duties of the Dutyholder can massively impact the susceptibility of a building to Legionella bacteria.
- Climate change and the change in water conditions creates opportunities for proliferation.
- Cutbacks, financial challenges, lack of resources, failing PPM programmes all provide opportunity for growth. Remediation is often significantly more costly than when water systems are considered within design stages.



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Water Systems Management

Do we learn from past designs - Often not fast enough

Do we share experiences and improvements that have been made – Sometimes

Do specifications consider water system designs and improvements in technology – budget often the issue despite it leading to significant improvements

Do the same mistakes get made from design -> construction -> operation – the initial pre-start and design expertise is not included from the outset

Are Legionella and other waterborne pathogens (Mycobacterium, Pseudomonas aeruginosa etc.) using every opportunity to populate water systems – Yes

Do drains have any significant impact on the growth of micro-organisms – Yes.
Are they always considered within design stages - No



Common mistakes when Water Systems are not prioritised within Design stages

Specification – out of date / not incorporating newer technological advancements

Building design – not incorporating “evidence-based practice”

Tender process – over reliance on cost rather than expertise

Energy efficiency vs water usage – Air Source Heat Pumps / Solar

Water temperature – not factoring in environmental changes

Water storage – over/under capacity

Water source – not evidencing quality

Water supply (hot and cold) – consider whether integrated or stand-alone

Water movement – stagnation occurring

Water components –unapproved components / flexible hoses

Water chemistry – not considering water hardness / softness

Competency of personnel – unverified personnel / lack of training

HSG274 Part 2 - “Water systems should be designed and constructed to be safe and without risks to health when used at work.”



Learning from design mistakes:

T. Inkster, C. Peters, T. Wafer, D. Holloway, T. Makin. (2021)

*“Investigation and control of an outbreak due to a contaminated hospital water system, identified following a rare case of *Cupriavidus pauculus* bacteraemia.” *Journal of Hospital Infection*, 111, pp. 53-64.*

“Careful design, adequate control measures and maintenance are essential for hospital water systems in order to prevent infections due to waterborne organisms” (Inkster et al. 2021)

Key learning points from research undertaken pertaining to water system design:

- Water Safety Groups should include Infection Control personnel from the start; should be actively involved in planning and commissioning.
- Water control within new-build projects require EARLY consideration.
- Consider regular flushing of outlets within new-build projects.
- Pipework capping is essential tool to avoid contamination.
- Prior to installation, outlets need to be cleaned and disinfected.
- Once installed, should be flushed regularly mirroring operational use.



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Design implementation benefitting water safety:



**A newly constructed
healthcare facility in
Scotland - over 300-bed
capacity**



**Each area has
continuous flow
dropping to each outlet**

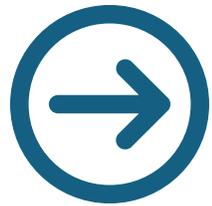
**The return only happens
back at the main feed
source in the corridor**

**Rather than traditional
flow and return**



**Proven both here and
other locations to be
successful**

**Eliminates many issues
with a normal
flow/return and
balancing of traditional
systems**



Commissioning of Water Systems

HSG274 Part 2 - “From a microbiological perspective, the period between filling the system and bringing it into normal use is potentially the most hazardous.”

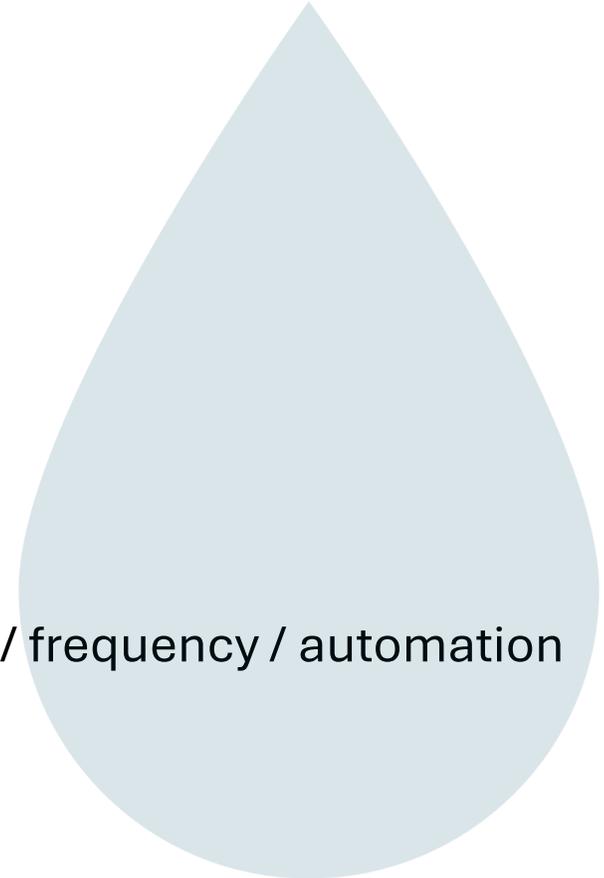




Common mistakes when Water Systems are not prioritised within Commissioning stages



- **Timeline** – “wetting” of the system
- **Management once “wetted”** – by whom / records / frequency / automation
- **Flushing** – water cannot sit stagnant
- **Disinfection** – concentration / duration / chemical used





Water safety and commissioning :

- 600+ bed acute hospital - 2 new 30 bed wards added into an existing water system infrastructure.
- Very limited pathogen issues in the existing water system - frequently demonstrated through routine microbiological testing.
- M&E contractors did not take note of the warnings given regarding not wetting the water systems too early.
- Potential use of BOSS White Jointing Compound.
- Soldered joints with high flux levels.



Impacts on commissioning :



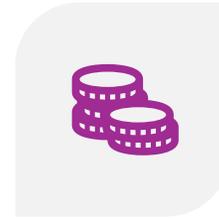
HEAVILY
CONTAMINATED
NEW PIPEWORK
REQUIRING
MULTIPLE
DISINFECTIONS /
WASH THROUGH



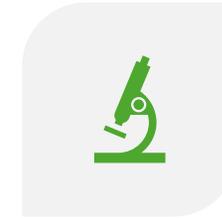
TRADITIONAL
DISINFECTION
STRATEGIES DID NOT
OVERCOME
MICROBIOLOGICAL
CONTAMINATION



SHOCK
DISINFECTION
FAILED TO
OVERCOME AND
REDUCE LEVELS OF
CONTAMINATION



COST OF INSTALLING
CONTINUOUS
BIOCIDE DOSING
AND PROTECTION
MECHANISM TO
ENSURE SAFETY OF
EXISTING WATER
SYSTEM



SIGNIFICANT COST
INCREASES DUE TO
INCREASED
MICROBIOLOGICAL
TESTING



DELAY IN MOVING
PATIENTS INTO NEW
WARDS



What CAN you start implementing to reduce the risk of subsequent issues during operation?



Ensure designers use up-to-date templates



Incorporate “evidence-based practices” into designs in addition to guidance



Engage with AE (Water) from concept / specification stages through to completion



Ensure personnel fully briefed on management of water from the start



Ensure there is comprehensive Water Safety Policy / Plan pertaining to Capital Projects – ensure this is followed and adhered to



Validate expertise of main contractors / mechanical and engineering personnel and ensure their training is correct



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Supported by over 40 years of experience, Water Solutions Group delivers water hygiene consultancy, auditing and sampling services across many disciplines, providing that added peace of mind in respect of compliance and governance.

From water safety groups, policy and plans to hands-on testing through our associate UKAS accredited laboratory, we provide an in-depth service unsurpassed within the water industry.

Water Solutions Group's professional knowledge is extensive, providing independent, expert advice that delivers added reassurance to minimise risk in water management. Working in partnership with our customers, our affordable, bespoke solutions have earned us an enviable reputation, making us the supplier of choice by many.

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