



Master Plumbers'
Association of Queensland

Kelvin Slade

2016 Churchill Fellow



Legionella
Management
Advisory Group

Project:- To research & establish and accredited training program to educate the plumbing industry on the management and treatment of the Legionella bacteria.

Rewarding Australians Striving for Excellence

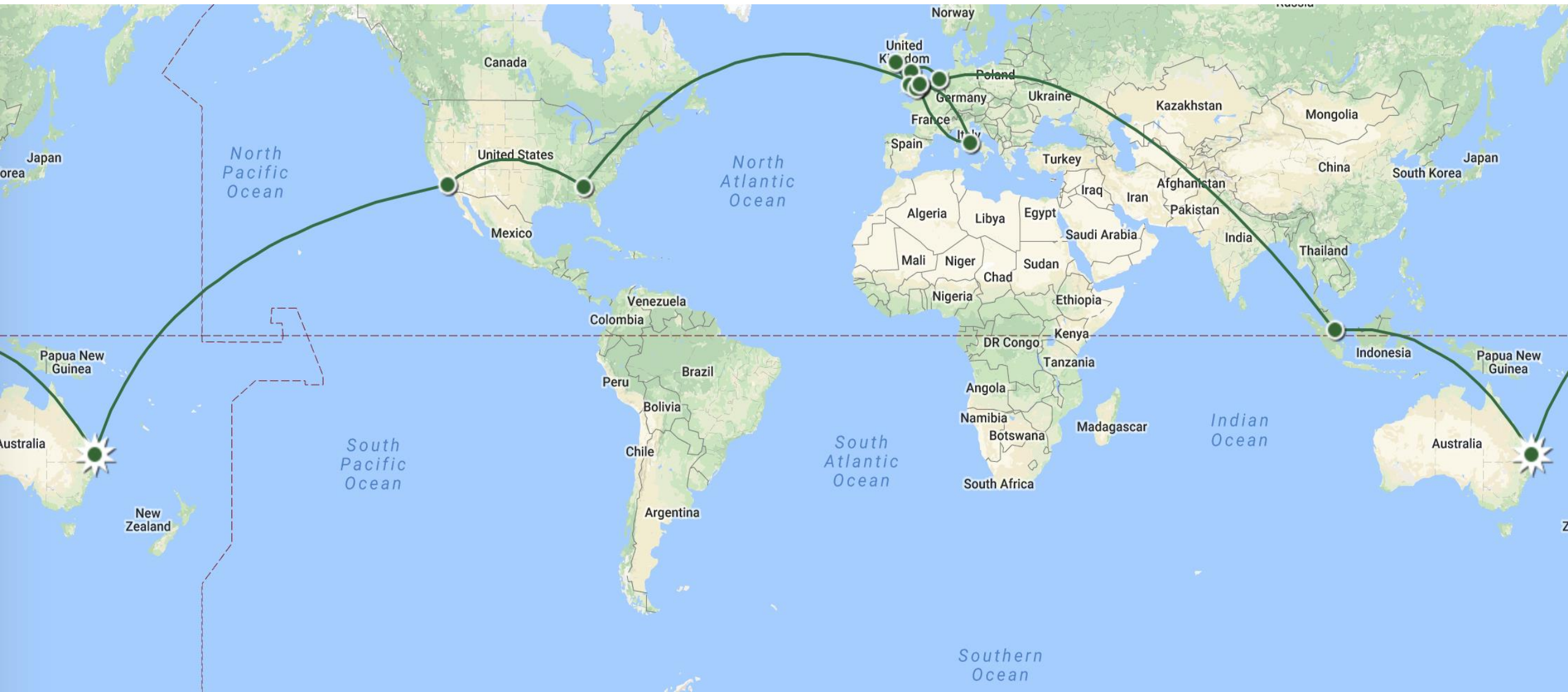


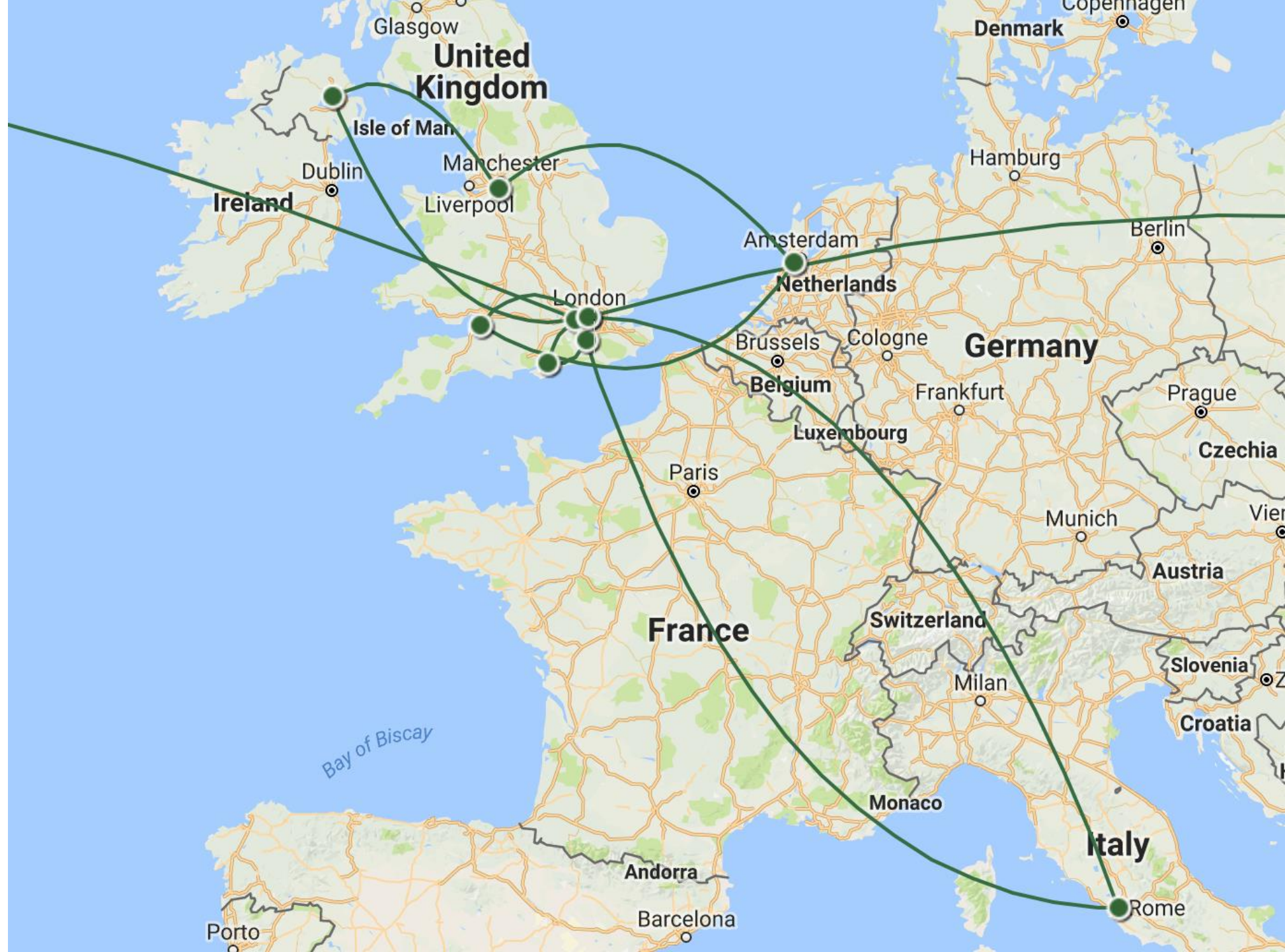
Winston Churchill Memorial Trust

- The Trust was formed with the principal objective of perpetuating and honouring Sir Winston's memory by the awarding of Memorial Fellowships to be known as 'Churchill Fellowships'.
- The aim of the Trust is to provide an opportunity for Australians to travel overseas to conduct research in their chosen field that is not readily available in Australia.
- In 1962 the Duke of Edinburgh asked Sir Winston what type of memorial he would like so that the world could remember him. Sir Winston suggested something like the Rhodes Scholarships. This led to the concept of travelling Fellowships.
- The Returned Services League brilliantly planned and executed a nationwide doorknock on 'Churchill Memorial Sunday' Sunday the 28th of February, 1965 – only four weeks after Churchill's funeral. The one-day doorknock raised 2,206,000 Pounds (\$4,412,000).

Rewarding Australians Striving for Excellence

The World Tour





ASHRAE - Atlanta Georgia

American Society of Heating, Refrigeration and Air-Conditioning Engineers



The Centers for Disease Control and Prevention (CDC) Atlanta Georgia



CDC Staff

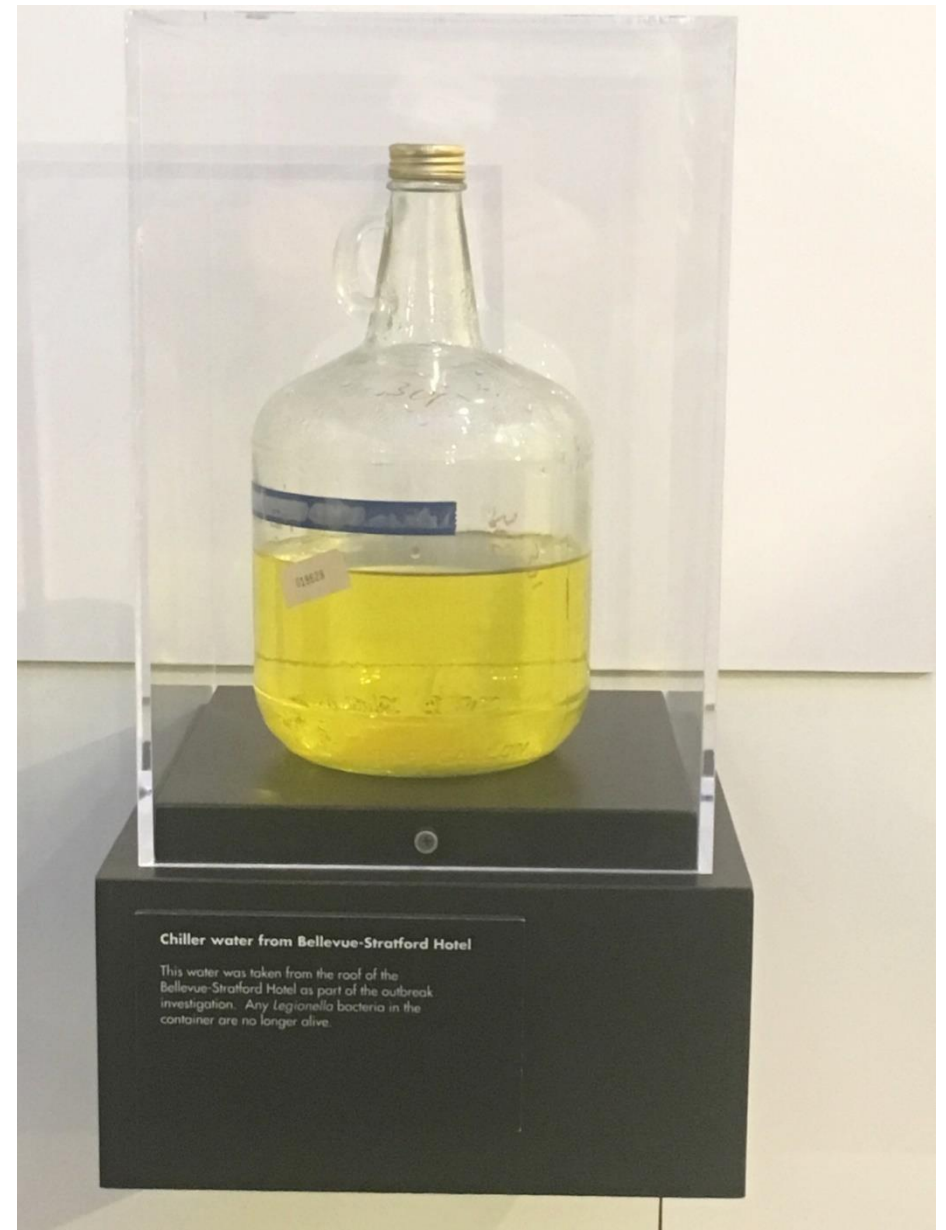


Matthew Arduino MS, DrPH,
FSHEA
CDC

Take home points from the CDC

- Communicating information to the public is much easier when a code or a standard is in place to advise against
- Standards and codes must be written in a language that can be understood
- The CDC published a tool kit, which is a definition of AHRAE Std 188
- The public want to know answers & specifics about Legionella & Legionnaires disease
- Political & media pressures are brought to bare on LD investigations
- Need to educate society better
- Better training is required for non scientific community
- Government agencies need to improve their ability to engage the public and disseminate information
- Government should work closely with Standards organisation's
- CDC view is that prevention through good engineering is best practice

Where it all began



ANSI/ASHRAE Standard 188-2015



- 10 years in the making
- 5 Public reviews - too many people on the committee
- Considered to be the primary reference document in the USA
- Based on the HACCP approach
- Does not specify testing for Legionella
- Cl 6.2.8 – Testing at the discretion of the Program Team
- Does describe preventative measures in Sect 7

Additional Guidelines



ASHRAE Guideline 12-2000R

Public Review Draft

Proposed Revision of Guideline 12-2000, Managing the Risk of Legionellosis Associated with Building Water Systems

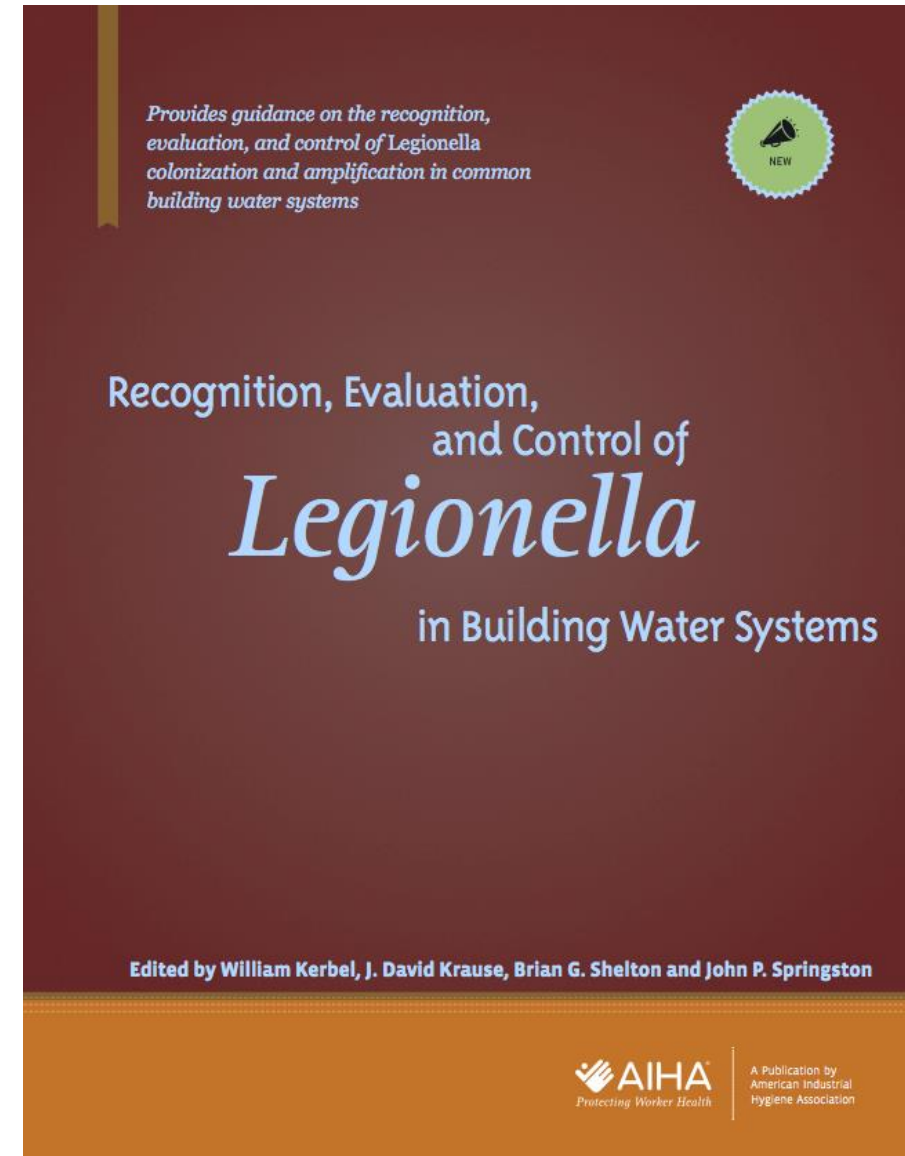
**First Public Review (July 2017)
(Complete Draft for Full Review)**

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed guideline, go to the ASHRAE website at www.ashrae.org/standards-research-technology/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the guideline (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

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ASHRAE, 1791 Tullie Circle, NE, Atlanta GA 30329-2305



PathCon Laboratories – Norcross Georgia

Dr Brian Shelton – CEO

Dr James Feeley & Dr George Goorman



American statistics

As of 2016:

- Officially 5,000 cases of Legionnaires Disease are reported each year
- It is universally agreed the correct figures is as high as 25,000
- 400% increase over the last 15 years, due to aging population, aging infrastructure and miss-diagnosis
- LD has a 10% fatality rate
- Most outbreaks were in buildings with complex water systems
- 9 out of 10 outbreaks were preventable with more effective management



Belfast Health and
Social Care Trust







Royal Children's Hospital



Routine sampling & testing

H A C C P





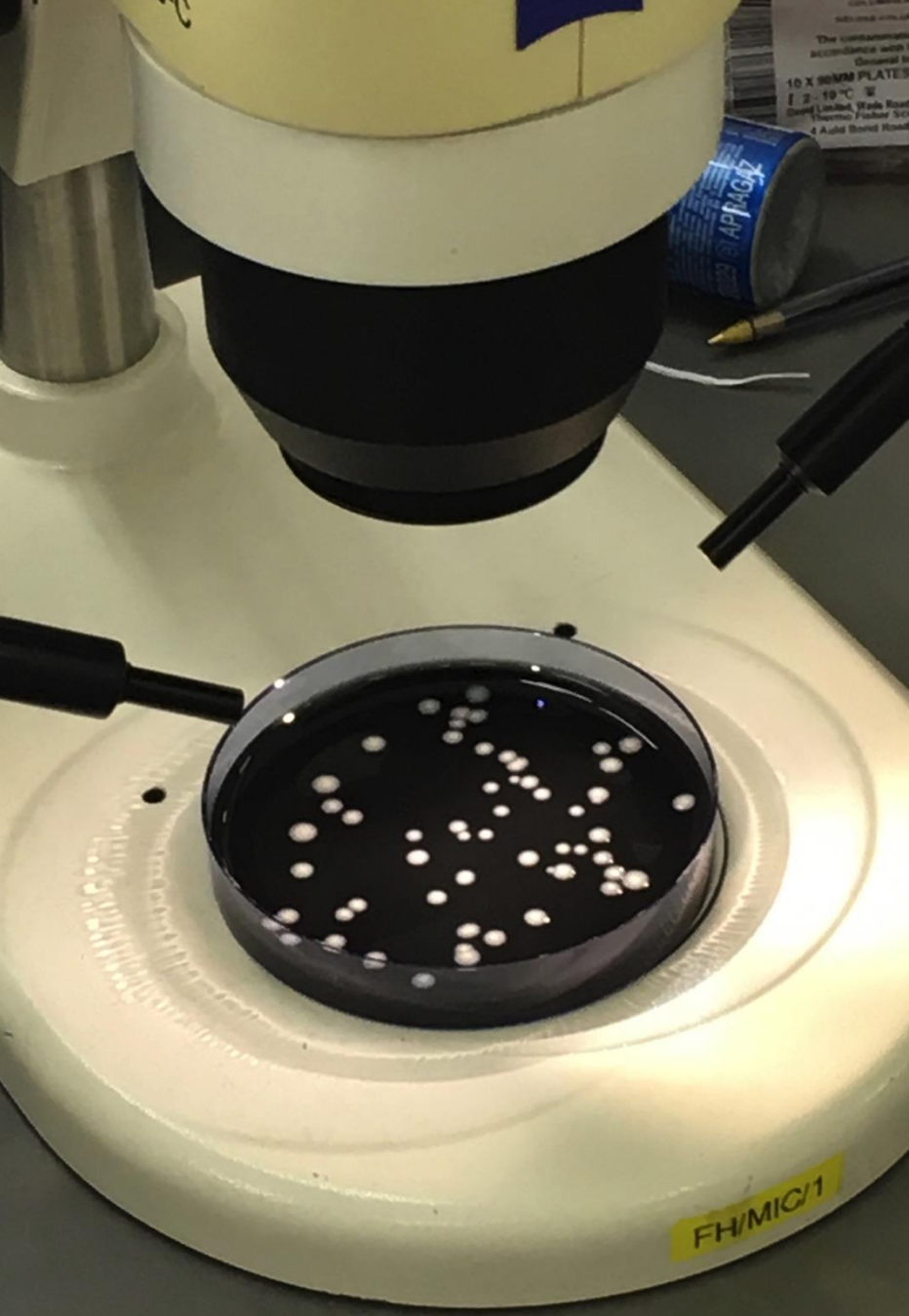






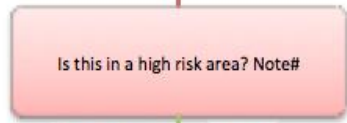
Chlorine Dioxide Dosing System Belfast City Hospital





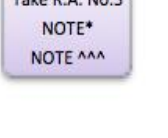
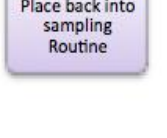
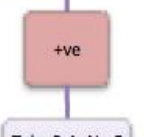
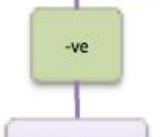
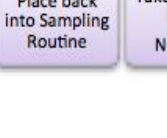
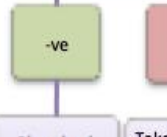
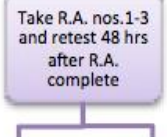
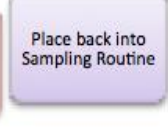
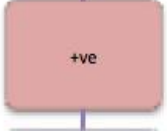
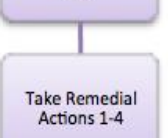
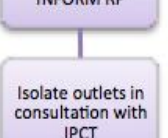
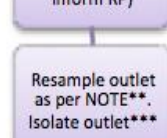
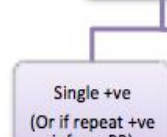
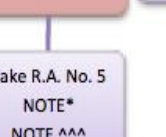
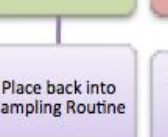
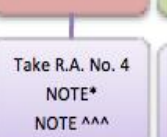
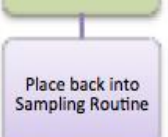
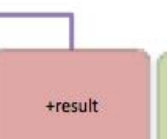
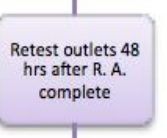
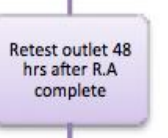
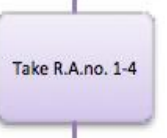
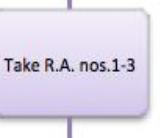
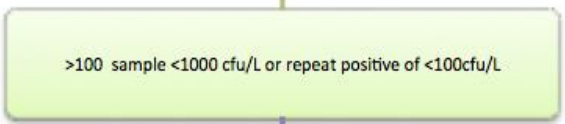
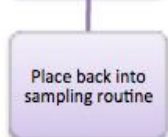
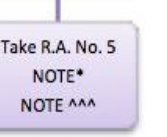
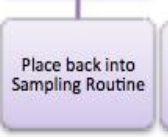
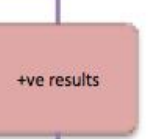
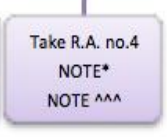
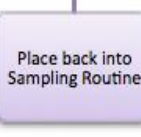
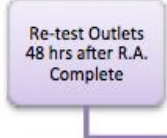
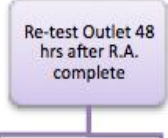
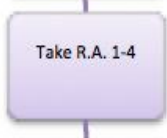
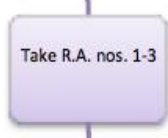
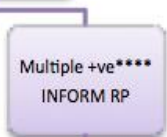
Dr Adrienne Shaw

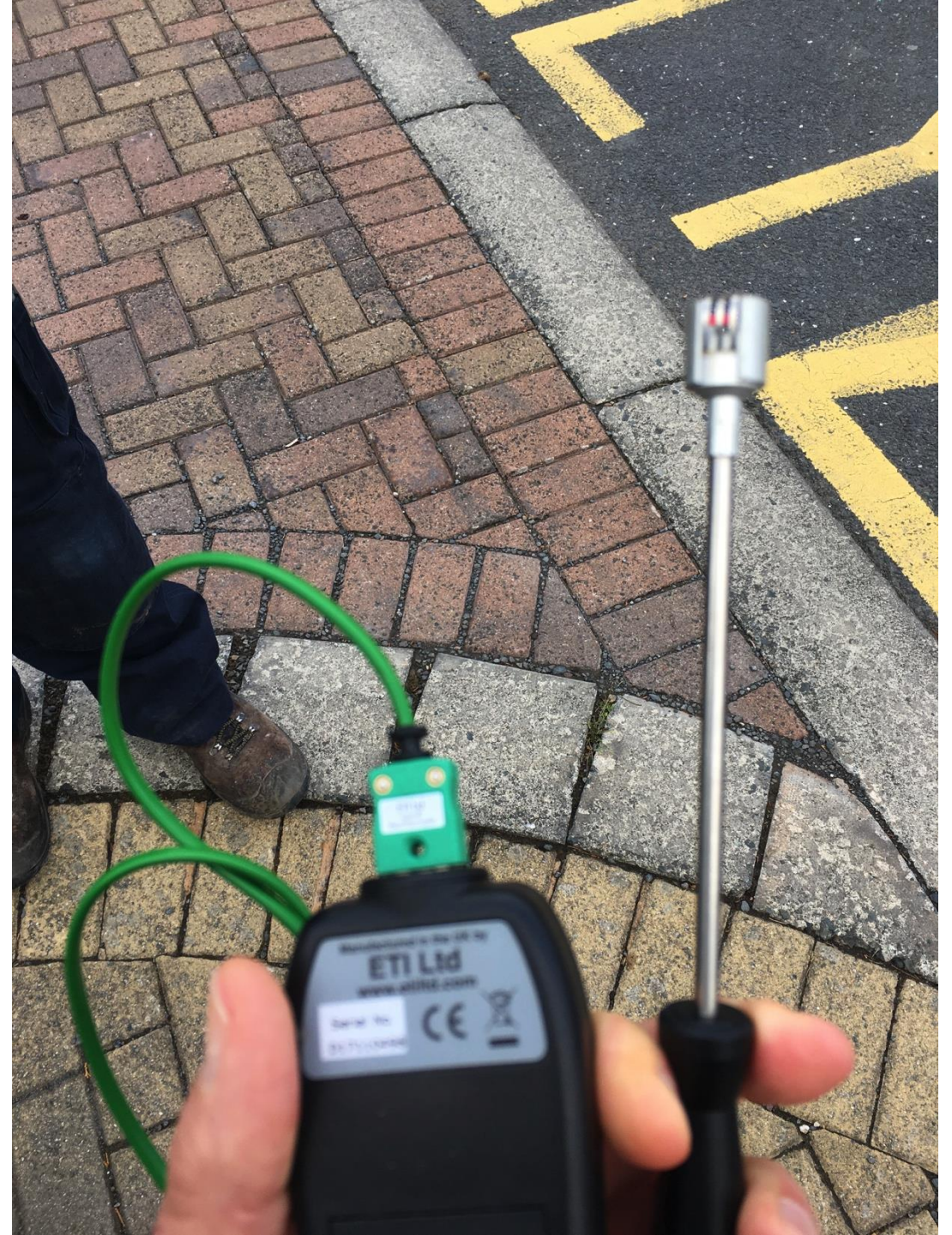
BHSCT Labs
Belfast



YES

NO







Calderdale Hospital
Halifax

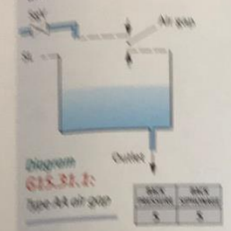




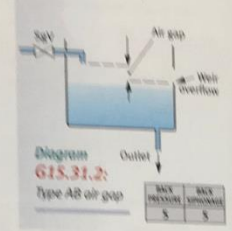
Diagrams of backflow prevention arrangements

All air gaps except AUK2 to be 20mm or twice the inlet bore diameter whichever is the greater. See table S15.2 on page 6.11 for AUK2 dimensions.

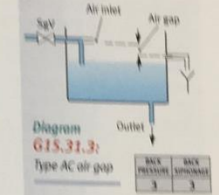
Type AA
Air gap with unrestricted discharge



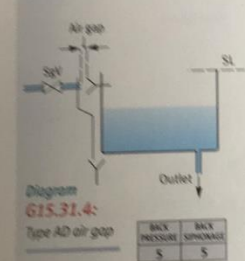
Type AB
Air gap with weir overflow



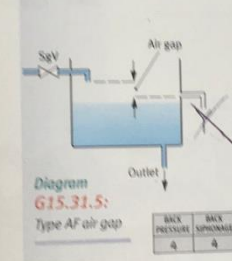
Type AC
Air gap with submerged inlet and circular overflow



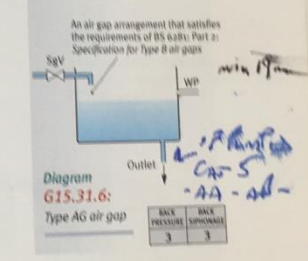
Type AD
Air gap with injector. Often known as a 'jump jet'.



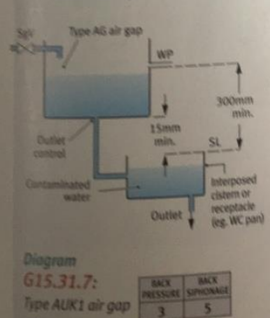
Type AF Cat 4.
Air gap with circular overflow



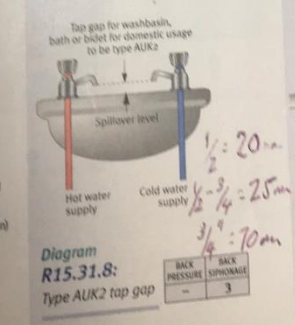
Type AG
Air gap device with minimum size circular overflow



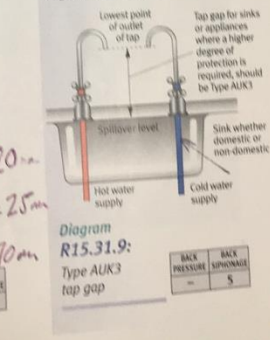
Type AUKs Break Tank.
Air gap with interposed cistern. The air gap in the cistern is to conform with Type AG air gap



Type AUK2
Tap gap for domestic premises eg. basin, bath or bidet



Type AUK3
Tap gap for higher risk premises or appliances eg. medical type premises





Engie Facilities & Estates Management

CALDERDALE ROYAL HOSPITAL

Checklist 33

Quarterly Shower Head Inspections



Apply current colour dot here

Task Instructions

1. All showers should be fitted with wipe clean showerheads and NOT adjustable jets
2. All showerheads and hoses will be completely removed and replaced with clean showerheads and hoses 6 monthly
3. All fixed showerheads will be dismantled and cleaned 6 monthly
4. All showerheads will receive a visual check 6 monthly
5. If a clean and descale is required follow procedures 6 - 10.
6. Dismantle.
7. Clean in chlorinated water.
8. Ensure showerhead and hose are completely dry before installation
9. Re-assemble to shower
10. Flush shower through for 5 minutes to ensure hose is clear of cleaning agents
11. Check the water temperature is correct. If too hot or cold make a note and inform the Maintenance Supervisor

Please sign below when the sections allocated to you are completed.

Block	Print Name	Signed	Date Completed
A			/ /
B			/ /
C			/ /
D			/ /
MHV			/ /
G			/ /
H			/ /
J			/ /
L			/ /
N			/ /
S			/ /
K			



125-130	TMV – Temperature and Fail Safe	6 Monthly
141	Sentinel Points	Monthly
207	Flushing Little Used Outlets	Weekly
342	Flushing Little Used Outlets – Temperature Testing	Weekly
349	SCBU – Flushing Outlets in Augmented Areas – Engie	Twice Weekly
350	Flushing Outlets in Augmented Areas - Trust	Daily
Contract	Pseudomonas Aeruginosa Sampling	6 Monthly
230	DHWS Expansion Vessel Flush	3 Monthly
235	Shower Head & Hose Inspection / Clean	3 Monthly
236	Cold Water Tank Inspection	Annual
237-248	DHWS Calorifier Internal Inspection	Annual
252	Backflow Prevention Units RPZ (Reduced Pressure Zone)	Annual
284	Fire Hydrant Flushing	3 Monthly
286	Mains Water Supply to site Temperature	Monthly
Contract	TVC & Legionella Sampling	6 Monthly
BMS	Cold and Hot Water Water Supply's constantly monitored. Monthly reports produced.	Constant / Monthly
BMS	Pasturisation	Every Night
AE	Authorised Engineers Site External Audits	Annual
Advance	Site Risk Assessment	Bi-Annual
Cool Water Direct	Water Coolers – Drinks Units	6 Monthly
Cool Lec	Ice Machines	Annual

✗



✓



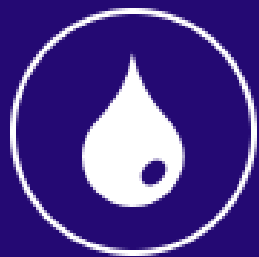
Manchester / Midlands visit – Items of interest

- Legionella and Pseudomonas are equally recognised and treated
- Risk Assessments are key
- Water hygiene training increasingly becoming a pre-requisite for any contractor working on building water systems
- Bottled water dispensers are outlawed in the UK for patient use in hospitals
- Facility Management Contractor tested bottled water with surprising results
- Scoop ice machines outlawed in hospitals generally – Pseudomonas risk. Instant ice machines only but not for patient use.

Eastwood Park...

training





Water Hygiene

Practical water safety for healthcare premises (ACoP L8 | HTM 04-01)



UK Legislation – Water Hygiene

Health & Safety at Work Act 1974

Regulations

COSHH

ACoP

L8

Guidance

HSG 274 - Non health care

HTM 04-01 – Health Care

Regulations

COSHH

4 The essential elements of COSHH are:

- risk assessment;
- prevention of exposure or substitution with a less hazardous substance if this is possible, or substitute a process or method with a less hazardous one;
- control of exposure where prevention or substitution is not reasonably practicable;
- maintenance, examination and testing of control measures, eg automatic dosing equipment for delivery of biocides and other treatment chemicals;
- provision of information, instruction and training for employees;
- health surveillance of employees (where appropriate, and if there are valid techniques for detecting indications of disease) where exposure may result in an identifiable disease or adverse health effect.

Legionnaires' disease

The control of legionella bacteria in water systems

Approved Code of Practice and guidance on regulations



L8 (Fourth edition)
Published 2013

This book is aimed at dutyholders, including employers, those in control of premises and those with health and safety responsibilities for others, to help them comply with their legal duties in relation to legionella. 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 to be responsible for others.

This fourth edition of the ACOP and guidance on regulations contains revisions to simplify and clarify the text. The main changes are removing Part 2, the technical guidance, which is published separately as HSG274 at www.hse.gov.uk/pubns/books/hsg274.htm, and giving the following issues ACOP status:

- risk assessment;
- the specific role of an appointed competent person, known as the 'responsible person';
- the control scheme;
- review of control measures;
- duties and responsibilities of those involved in the supply of water systems.

Approved Code of Practice

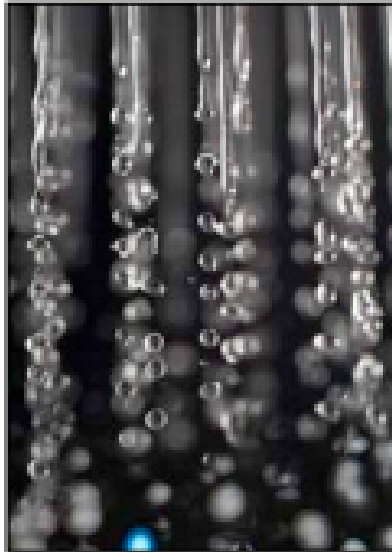
This Code has been approved by the Health and Safety Executive, with the consent of the Secretary of State. It gives practical advice on how to comply with the law. If you follow the advice you will be doing enough to comply with the law in respect of those specific matters on which the Code gives advice. You may use alternative methods to those set out in the Code in order to comply with the law.

However, the Code has a special legal status. If you are prosecuted for breach of health and safety law, and it is proved that you did not follow the relevant provisions of the Code, you will need to show that you have complied with the law in some other way or a Court will find you at fault.

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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

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HSG 274 part 2

Monitoring for legionella

2.120 Legionella monitoring should be carried out where there is doubt about the efficacy of the control regime or it is known that recommended temperatures, disinfectant concentrations or other precautions are not being consistently achieved throughout the system. The risk assessment should also consider where it might also be appropriate to monitor in some high risk situations, such as certain healthcare premises. The circumstances when monitoring for legionella would be appropriate include:

- water systems treated with biocides where water is stored or distribution temperatures are reduced. Initial testing should be carried out monthly to provide early warning of loss of control. The frequency of testing should be reviewed and continued until such a time as there is confidence in the effectiveness of the regime;
- water systems where the control levels of the treatment regime, eg temperature or disinfectant concentrations, are not being consistently achieved. In addition to a thorough review of the system and treatment regimes, frequent testing, eg weekly, should be carried out to provide early warning of loss of control. Once the system is brought back under control as demonstrated by monitoring, the frequency of testing should be reviewed;
- high-risk areas or where there is a population with increased susceptibility, eg in healthcare premises including care homes;
- water systems suspected or identified in a case or outbreak of legionellosis where it is probable the Incident Control Team will require samples to be taken for analysis (see Appendix 2.3).

HSG 274

CI 2.125

Table 2.2 Action levels following legionella sampling in hot and cold water systems

Legionella bacteria (cfu/l)	Recommended actions
>100 cfu/l and up to 1000	<p>Either:</p> <ul style="list-style-type: none">■ if the minority of samples are positive, the system should be resampled. If similar results are found again, a review of the control measures and risk assessment should be carried out to identify any remedial actions necessary or■ if the majority of samples are positive, the system may be colonised, albeit at a low level. An immediate review of the control measures and risk assessment should be carried out to identify any other remedial action required. Disinfection of the system should be considered
>1000 cfu/l	<p>The system should be resampled and an immediate review of the control measures and risk assessment carried out to identify any remedial actions, including possible disinfection of the system. Retesting should take place a few days after disinfection and at frequent intervals afterwards until a satisfactory level of control is achieved.</p>

Legionnaires' disease: Technical guidance

Part 3: The control of legionella bacteria in other risk systems



This guidance for dutyholders, including employers, those in control of premises and those with health and safety responsibilities for others, will 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 bacteria and guidance on compliance with the relevant parts of the Management of Health and Safety at Work Regulations 1999.

What are other risk systems?

3.2 In addition to evaporative cooling systems and hot and cold water systems there are other risk systems that may produce aerosols, thus posing a foreseeable risk of exposure to legionella. This list is not exhaustive but examples of these types of systems include, but are not limited to:



- ultrasonic humidifiers/foggers;
- misting devices used for humidifying vegetables, meat and other food products;
- spray humidifiers;
- air washers, wet scrubbers, particle and trivial gas scrubbers;
- water softeners;
- emergency showers, eyebaths and face wash fountains;
- sprinkler and hose reel systems;
- spa pools;
- whirlpool baths;
- horticultural misting systems;
- vehicle washers including automatic washers for cars, buses, lorries and railway rolling stock;
- powered dental equipment;
- fountains and decorative water features including those on display for sale;
- non-disposable nebulisers used for respiratory therapy;
- industrial effluent treatment plants;
- irrigation systems;
- fire, dust and odour suppression systems;
- paint spray preparation equipment;
- tunnel pasteurisers and similar equipment.

HSG 274 Part 3 – App 3.1

Emergency showers, eyebaths and face-wash fountains	Flush through and purge to drain ensuring three to five times the volume of water in the stagnant zone is drawn off	As indicated by risk assessment, but at least every six months
	Inspect water storage tanks (where fitted)	Monthly
	Clean and disinfect shower heads, nozzles, roses, 'Y' strainers, and water storage tanks (where fitted)	Quarterly, or more frequently, as indicated by the risk assessment

HSG 274 Part 2

Thermal disinfection

2.133 Thermal disinfection of hot water services is carried out by raising the temperature of the whole contents of the calorifier and circulating water for at least an hour. Every hot water outlet throughout the system must then be flushed and, to be effective, the temperature at the calorifier should be maintained high enough to ensure that the temperature at the outlets does not fall below 60 °C. Each tap and appliance should be run sequentially for at least five minutes at the full temperature (but not necessarily at full flow), and it should be measured and recorded.

2.134 Thermal disinfection may prove to be ineffective where parts of the calorifier or water system fail to reach the required temperature for a long enough period.

Chemical disinfection

2.135 The disinfection of a water system is normally based on chlorine being dosed at 50 ppm for a minimum contact period of one hour, at the end of which the concentration should not be less than 30 ppm free residual chlorine. However, lower concentrations and longer contact times are considered acceptable, as set out in BS 8558.

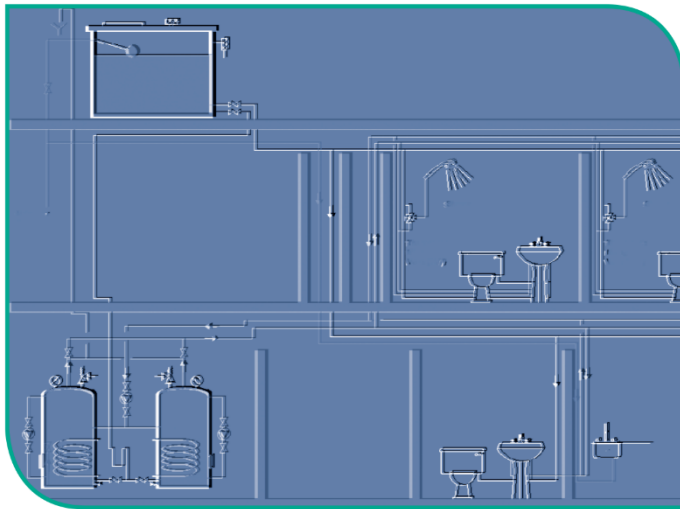
2.136 Other disinfectants may be used where they are shown to be effective. Their intended application should take into account the type of system and user profile at the specified concentration levels and contact period. If the disinfectant is for use in water systems supplying wholesome water then these must comply with the requirements of The Water Supply (Water Quality) Regulations 2000, for Scotland, The Water Supply (Water Quality) (Scotland) Regulations 2001 and 2010, and for Wales, the Water Supply (Water Quality) (Wales) Regulations 2010.



Department
of Health

Health Technical Memorandum 04-01: Safe water in healthcare premises

Part A: Design, installation and
commissioning



Department
of Health

Health Technical Memorandum 04-01: Safe water in healthcare premises

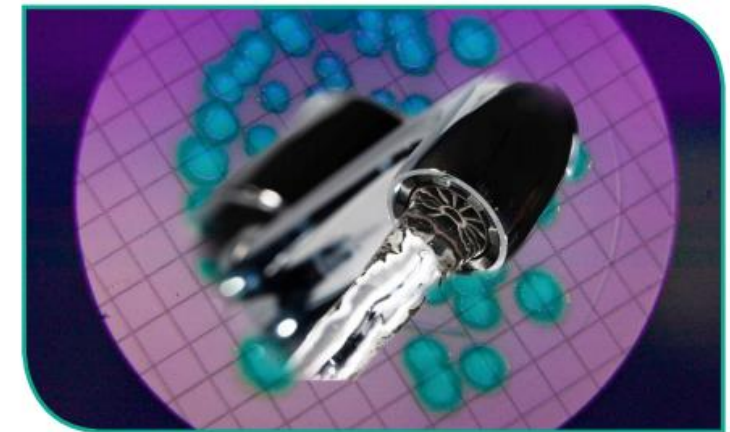
Part B: Operational
management



Department
of Health

Health Technical Memorandum 04-01: Safe water in healthcare premises

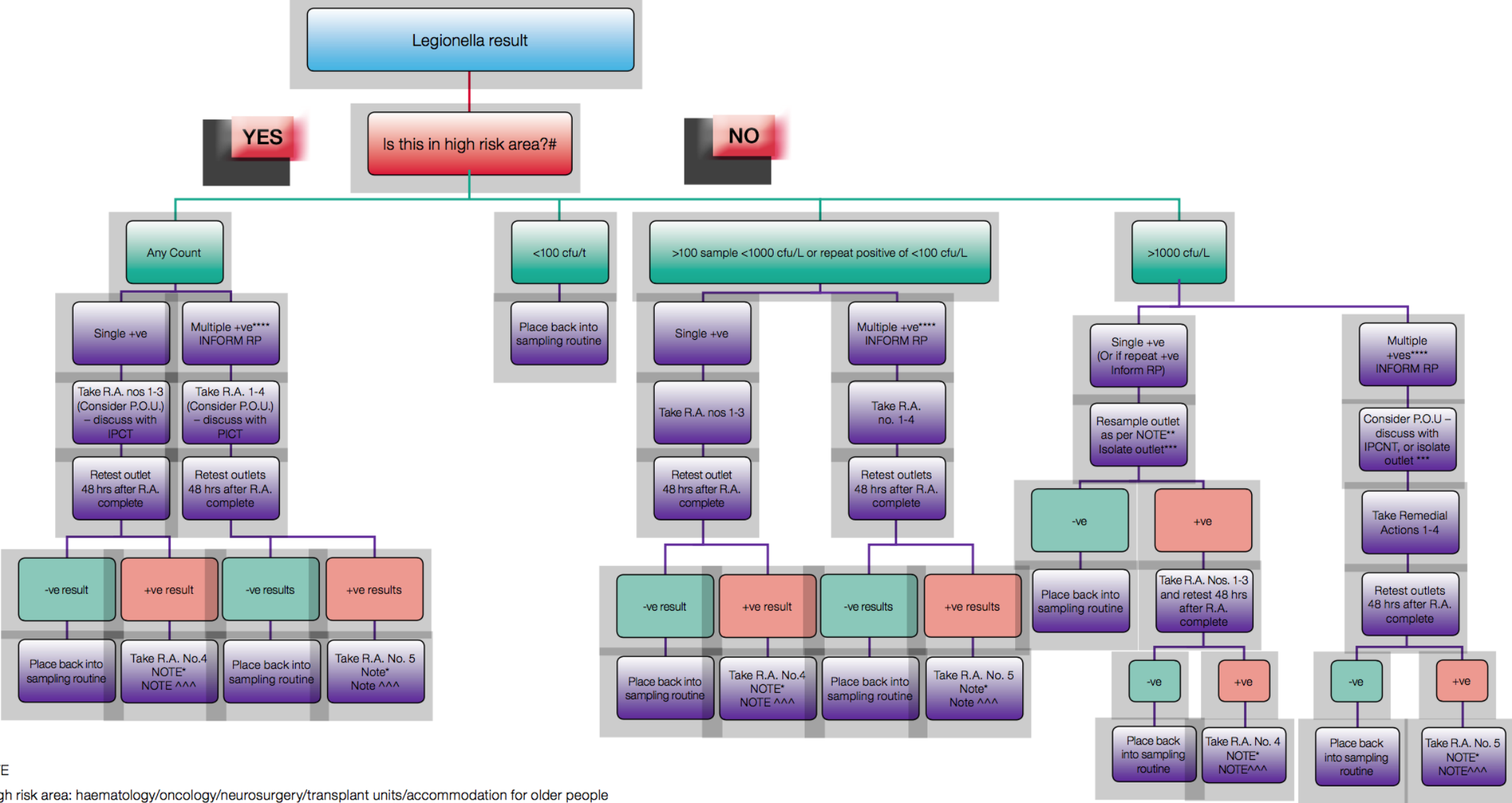
Part C: *Pseudomonas
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Appendix 2.1 Legionella risk assessment

- 1 It is a legal duty to carry out an assessment to identify and assess whether there is a risk posed by exposure to legionella from the hot and cold water system or any work associated with it.
- 2 The risk assessment should consider all aspects of operation of the hot and cold water systems and while there will be common factors, the individual characteristics of each system should be taken into account. Site personnel who manage the systems to determine current operational practice should be consulted. The commissioning, decommissioning, periods of operation, maintenance, treatment and subsequent management of each individual aspect of operation will require review and validation to ensure site procedures are effective.
- 3 The checklist below gives the most common key requirements when assessing risk associated with a hot and cold water system based on mechanical, operational, chemical and management aspects:
 - details of management personnel who play an active role in the risk management process, to include names, job titles and contact information for:
 - the dutyholder;
 - the appointed responsible person (s), including deputies;
 - service providers, eg water treatment suppliers, cleaning and disinfection service providers;



NOTE

High risk area: haematology/oncology/neurosurgery/transplant units/accommodation for older people

* If all remedial actions are exhausted and there is no improvement in results, then take remedial action No. 6.

** Take additional samples pre and post from adjacent areas on same loop based on worst case scenario (Low usage outlets).

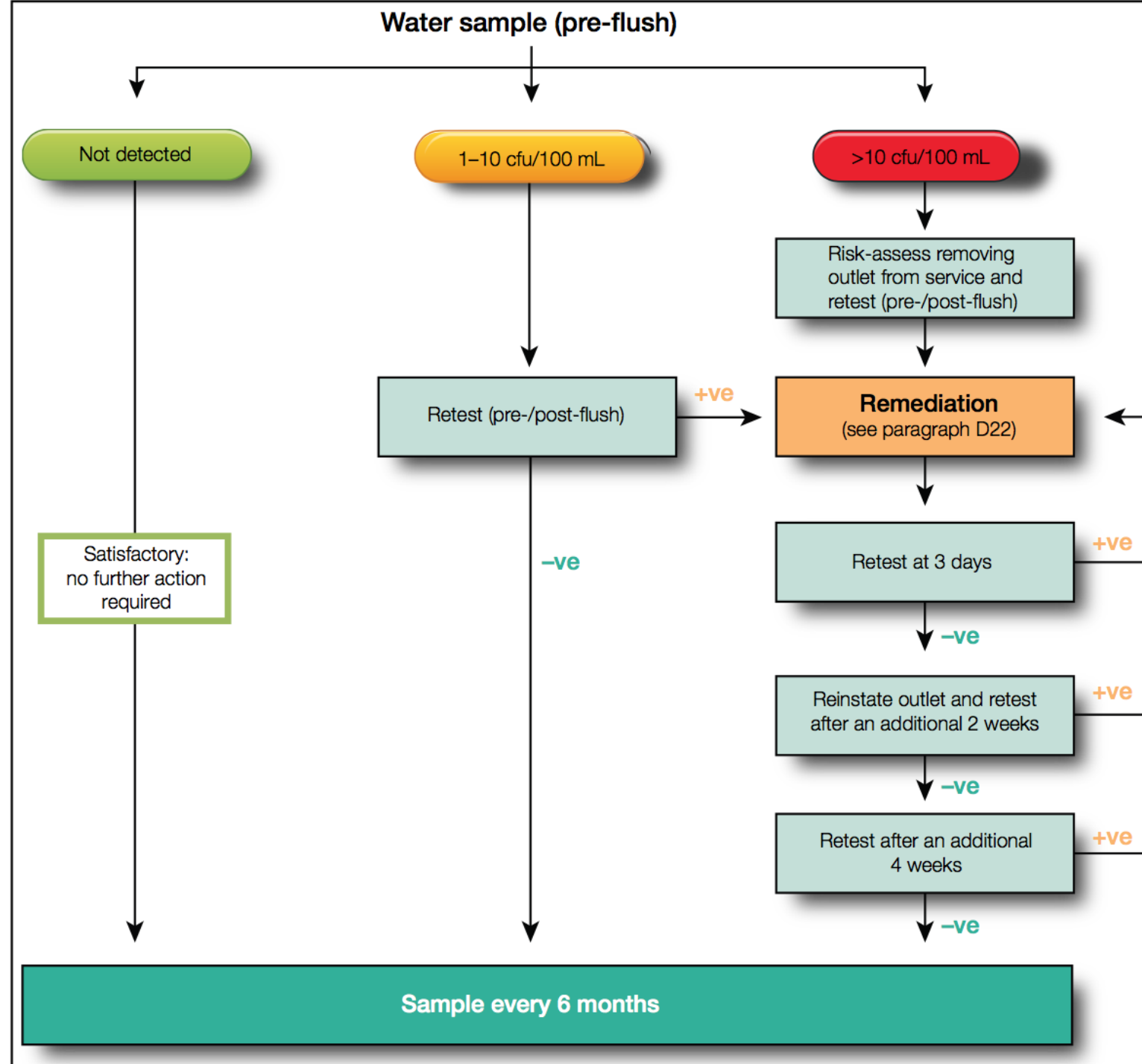
HTM 04-01

Part B

Pseudomonas aeruginosa

Ecology

5.1 *P. aeruginosa* is a Gram-negative bacterium, commonly found in wet or moist environments. It is commonly associated with disease in humans with the potential to cause infections in almost any organ or tissue, especially in patients compromised by underlying disease, age or immune deficiency. As a pathogen the significance of *P. aeruginosa* is exacerbated by its resistance to antibiotics, virulence factors and its ability to adapt to a wide range of environments and nutrients.





The 9th International Conference on
Legionella

Roma, 26th - 30th September 2017



The European Perspective

ECDC Data

2005 = 5000 cases LD - 2016 = 7000 cases LD

UK cases reported to be below 400 per year and falling

UK cases peaked in 2006

Fatality rates: peaked in 2009 @ 12% - now 9%

Detection methods: Urine antigen now 80% - culture method about 10% with PCR increasing use annually

Healthcare infections remain unchanged in terms of how LD is acquired.

Infections peak in the summer months

German
Drinking Water
Code of Practice

Code of Practice W 551 (2004): summarized (5)

Table 1b Assessment of findings after a more detailed examination *)

<i>Legionellae</i> (CFU/100 ml) ¹⁾	Assessment	Measure	More detailed examination	Follow-up examination
> 10000	Extremely high contamination	Directly necessary to ward off danger (disinfection and restriction of use, e.g. ban on showering) Rehabilitation necessary	Immediately	1 week after disinfection or rehabilitation
> 1000	High contamination	Short-term rehabilitation required	Within max. 3 months	1 week after disinfection or rehabilitation ²⁾
≥ 100	Average contamination	Medium-term rehabilitation required	Within max. 1 year	1 week after disinfection or rehabilitation ²⁾
< 100	No detectable / slight contamination	None	-	After 1 year (after 3 years) ³⁾

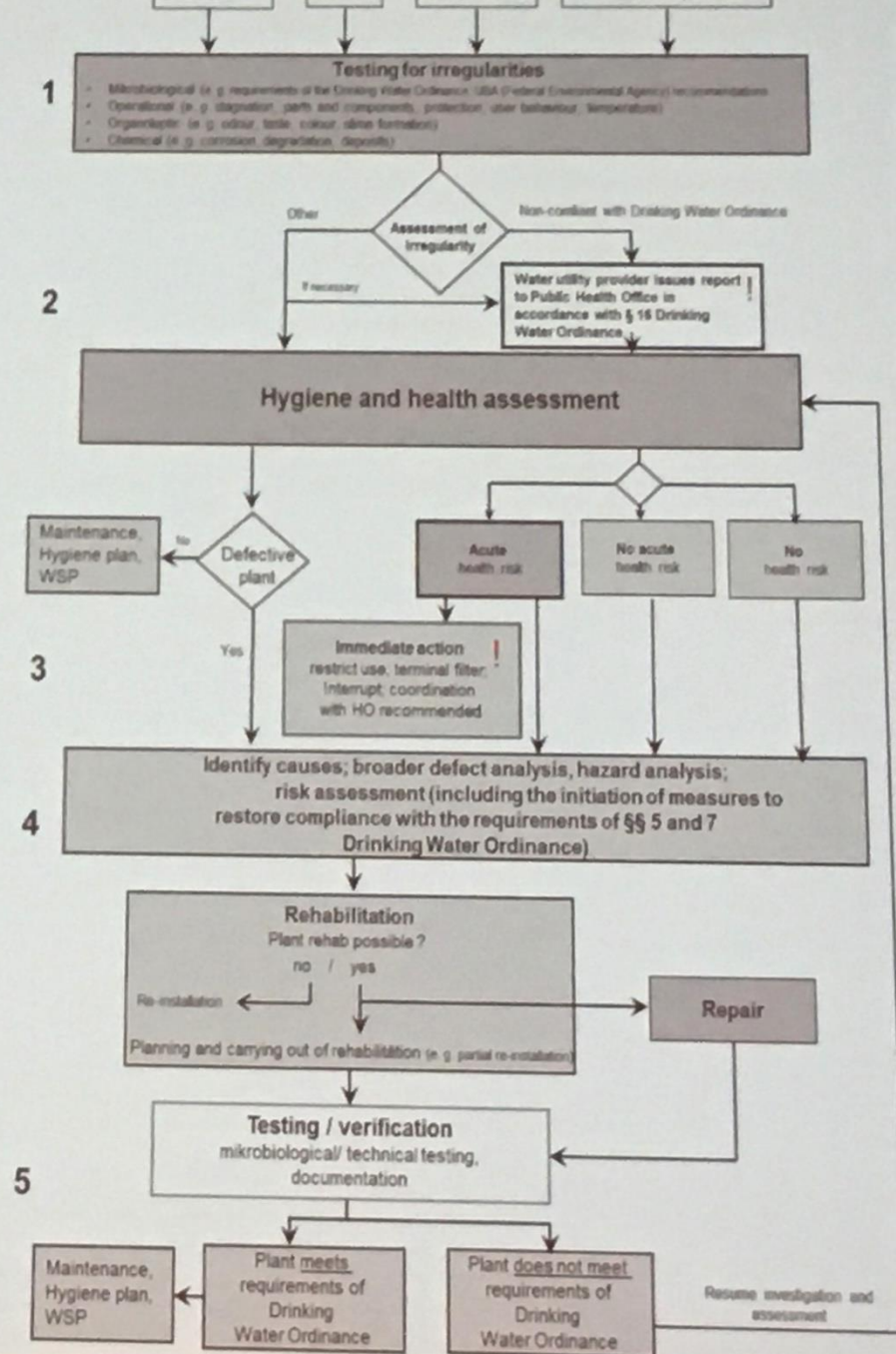
*) Examinations and assessments have to be performed in accordance with the Federal Environmental Agency's respectively valid recommendation.

Code of Practice W 556 (2015)

If problems occur...

This flow chart shows the sequence of
a fault situation elimination with all
necessary individual measures and
valuations

...consider it once calmly



Rome: Speakers of interest

Richard Benthall – Route of Exposure to Aerosol - Australia

Paul Edelstein – Clinical Characteristics of Legionella - USA

Rolan Suchenwirth & Stefan Pleischl – Germany Drinking Water Regulations

Dr Yusen Eason Lin – Evaluating Legionella Surveillance in Health Care in Taiwan

Dr Janet Stout – Controlling Legionella in Building Systems using Monochloramine - USA

Round Table sessions

19:00-19:30

ROUND TABLE DISCUSSION

Best Practices and Evidence-Based Strategies Useful to Prevent and Control *Legionella*
Presence and Diffusion in the Environmental Reservoirs

Participants: Paola Borella, Sebastian Crespi, Eason Lin, Martin Exner, Janet Stout, Susanne Lee – John Lee

SATURDAY SEPTEMBER 30TH

CLOSURE OF THE CONFERENCE ANTICIPATED AT 13.00



[illegible]

How much bacteria does it take to cause Legionnaires Disease?

Ecology of Legionella

Research conducted by Professor Victor Lu and a number of other teams, indications are that , in immunocompromised patients, the effective dose could be as low as 100cfu/L

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DR David Murdoch, University of Otago, Christchurch

- Biofilm holds Amoeba which host the Legionella cells
- 1 Amoeba cell 3 – 10 micrometers in diameter contains 20 – 900 Legionella cells
- Measured in No of Amoeba cells / cm² of biofilm = 100 – 500 Amoeba

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- 1 Amoeba cell 3 – 10 microns in diameter contains 20 – 900 Legionella cells
- Measured in No of Amoeba cells / cm² of biofilm = 100 – 500 Amoeba
- Comparing the two pieces of data, indications are that less than 1mm² of biofilm hosts enough Legionella cells to cause an LD infection in an immunocompromised patient.

The City of London Corporation





Public Health
England

Allan Johnson
Food, water & Environmental Scientist

- Legionella testing – Colindale filter 1 Ltr of water and cultivate 6 – 7 dishes per test. They detect more Legionella than nearly any other lab in the UK.
- Chlorine is very ph dependent. Converts to hydrochloric acid between ph7.2-7.6. At 7.8 it starts to disassociate elements
- Chlorine dioxide is not ph dependent
- Giardia and Cryptosporidium are chlorine resistant
- Hard water tends to experience biocide buildup within water systems
- Copper silver ionization is well documented and widely used in the UK and elsewhere with great success. Like other forms of disinfection it must be monitored

Singapore

ALS Labs – Singapore



Public Utilities Board



‘We should keep in mind that sanitation and hygiene are the greatest human achievements in terms of extending life expectancy, and we must seize every opportunity to raise awareness and make these benefits available to all’

Prof Martin Exner

Director of the Institute for Hygiene and Public Health – University Bonn



Thank you !

