Banyuls - Barton Stacey Parish Council
LEGIONELLA RISK ASSESSMENT REPORT

The Pavilion
Barton Stacey

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Risk Assessment Date: 31 January 2019

Job Number: R19-00701

Recommended Review Date: January 2020

0224

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1 Summary

1.1 Enquiries

All enquiries relating to this document should be directed to Healthy Buildings International, info@hbi.co.uk or telephone: 0118 988 9999.

1.2 Executive Summary

	Actions		
	Low Priority	Medium Priority	High Priority
Number of remedial actions and their priorities:	2	3	5
Percentage	20%	30%	50%

A total of 10 remedial actions were identified.

Based on the findings of this Risk Assessment (as explained in Section 7.7) we advise the next Legionella Risk Assessment Audit and Review be conducted in January 2020. The Risk Assessment should also be reviewed following any significant changes to the water systems.

1.3 Action Plan

The remedial and improvement actions arising from this risk assessment has been detailed in the Action Plan below. These actions should be attended to in order to comply with the ACoP L8 (2013) and should be managed in conjunction with the Company Control of Legionella Policy. The actions can also be managed using www.RecordsForBuildings.com. The Action Summary is divided into three priority categories **HIGH**, **MEDIUM** and **LOW**:

Guide timescales are included below for these risk categories, but it should be noted that these are for indicative purposes only and we recommend that you should review these actions and apply specific timescale targets to each action. Furthermore, it should be noted that many of these actions may be completed more quickly than the timescale indicated and we generally recommend that all actions be completed at the earliest possible opportunity.

- **1** **-** A **HIGH** priority action rating represents a wholly unsatisfactory arrangement and requires immediate attention in order to reduce the risk to a satisfactory level. We advise a timescale of 1 month for completion of these actions.

- **2** - A **MEDIUM** priority action rating indicates that some remedial measures are required in order to reduce the risk to a satisfactory level. We advise a timescale of 3 months for completion of these actions.

- **3** - A **LOW** priority action rating indicates generally satisfactory arrangements, but the recommended actions, which may be of a prophylactic nature, would be of benefit in reducing the overall risk. We advise a timescale of 6 months for completion of these actions. Nevertheless a number of these low priority actions are simple and inexpensive and should be completed as soon as possible.

SUMMARY

HBI ID No.	ITEM	HAZARD DESCRIPTION	PRIORITY	RECOMMENDED ACTION
Site	Site	There is no suitable System of Control for Legionellosis	**1**	Implement System of Control to include all requirements of the ACoP L8 and HSG 274
Site	Site	There are no water systems schematic drawings available	**1**	Produce Water Systems Schematic.
Site	Site	There is no evidence in the logbook that site personnel have received suitable legionella awareness training	**1**	Provide legionella awareness training to site personnel and add certification to logbooks
443771	Electric Shower, GF RHS Changing Room, ES	Rarely used shower that acts as a high risk deadleg	**1**	Remove shower and cut back pipework or flush weekly and record
443772	Electric Shower, GF LHS Changing Room, ES	Rarely used shower that acts as a high risk deadleg	**1**	Remove shower and cut back pipework or flush weekly and record
Site	Little Used Outlets – Seasonal	The outlets in areas not in constant use are considered little used	**2**	Flush weekly in times of low use. Record all actions.
443773	Deadleg (or never used outlet), GF Main Hall Kitchen, DL	This outlet is not used regularly, so it is considered to form a deadleg in the system.	**2**	Remove and fully cut pipework back to the live pipe. Until such time as it is removed, or if it cannot be removed, it should be flushed weekly and the action recorded.
443769	Domestic Water Outlet, GF Main Hall Kitchen, SK	Scale noted to outlet(s)	**2**	Clean outlet(s) of scale
443768	Electric Water Heater, GF Main Hall Kitchen, EWH	Outlet temperature >65°C	**3**	Turn down the stored water temperature to reduce scald risk.
443769	Domestic Water Outlet, GF Main Hall Kitchen, SK	There were no signs warning of the dangers of scalding	**3**	Post pictorial warning sign

1.4 Asset Register

It is from inspection of the systems below and the outlets that they supply that comments in this report are made:

HBI ID No.	Location	Description	Other Ref	Representative of
Hot Water Systems				
443768	GF Main Hall Kitchen	Electric Water Heater	EWH	
Showers				
443771	GF RHS Changing Room	Electric Shower	ES	
443772	GF LHS Changing Room	Electric Shower	ES	
Other Water Systems				
443770	GF Gents Toilets	Incoming Water Main	ICM	
443773	GF Main Hall Kitchen	Deadleg (or never used outlet)	DL	

2 Introduction

2.1 General Introduction

Site Name:	The Pavilion
Client:	Jo Gadney of Banyuls - Barton Stacey Parish Council
Lead Surveyor:	Robert McGhee
Survey Date:	31 January 2019
Report Quality Approval:	Tuula McClatchie
Report Approval Date:	12 February 2019

HBI undertook a Legionella Risk Assessment of the installed building systems and those control measures employed to minimise the risk of legionellosis at the above building.

Healthy Buildings International are UKAS accredited for Legionella Risk Assessment. This report should not be reproduced in full without the permission of Healthy Buildings International Limited. We recommend that, where risk systems have been identified, this report be used as part of an HBI system of control for legionellosis.

Robert McGhee of HBI is an authorised Lead Legionella Risk Assessor under HBI's UKAS approved quality authorisation procedure. Full details of qualifications and experience can be obtained on request. All instrumentation and testing equipment is calibrated in accordance with HBI's UKAS approved quality procedures and laboratory testing is undertaken by UKAS approved sub contract laboratories where appropriate. Copies of certification are available on request.

2.2 Scope of Survey and Exclusions

The survey has been undertaken in accordance with the recommendations of the ACoP L8 (2013), HSG 274 Part 1 (2013), Part 2 (2014) & Part 3 (2013) and BS 8580 (2010) and is only valid for the plant listed. All other plant, known or otherwise to Healthy Buildings International, has not been assessed. The scope of works excludes the following items, unless they have been specifically requested and included in the agreed specification; preparation of: schematic drawings, a comprehensive asset register or a formal written scheme for preventing risk. It also excludes undertaking an evaluation (practical or financial) of the feasibility of the removal or replacement of any plant or equipment identified as presenting a reasonably foreseeable risk of causing Legionellosis. Some or all of these actions may be necessary upon completion of this risk assessment.

The survey has been undertaken on a non-destructive and non-intrusive basis, so is limited to those items in plain sight that may be safely accessed. Whilst all efforts have been made to identify any potential dead legs associated with the systems assessed therefore, the complex nature of pipework installations, much of which are hidden within buildings, prevents this from being a fully complete and accurate list.

For the same reasons, it is neither practical nor possible to assess all materials used in the construction of complex multi-component systems such as those covered by this document. It should therefore be noted that not all materials present can or have been assessed for their suitability of use.

Healthy Buildings International cannot be accountable for any omissions to this report resulting from information, data, systems or plant not made readily and reasonably accessible by Banyuls - Barton Stacey Parish Council.

Please note that this Risk Assessment only addresses one of many requirements of the ACoP L8 (2013) and is therefore not alone sufficient to ensure complete compliance with the law.

3 Description of the Building and Water Systems

3.1 General Building Information

Building Name:	The Pavilion
Building Address:	Recreation Ground, Barton Stacey
Building Use:	Commercial
Number of Floors of Building:	1
Number of Basements:	0
Floors / Area Surveyed:	All areas
Estimated Floor Area Surveyed:	50m²
Estimated No of Occupants:	0
Approximate Building Age:	1970s
Building Occupancy:	Vacant majority of the time

Susceptible Individuals -

The public have access to this property. It cannot be discounted that a member of the public may have an increased susceptibility to legionellosis. Any legionella risk systems associated with the property are therefore assumed to have an elevated risk.

3.2 Responsible Persons

Responsible Persons Detailed?	No

3.3 Building Water Services Information

Water Source:	Town Main
Drinking Water:	Mains
Domestic Cold Water:	Mains
Domestic Hot Water:	Point of Use Electric Water Heaters
Spray Systems Present:	Showers
Evaporative Systems Present:	None
Adequate Information Available and Access Permitted?	Yes, full risk assessment possible
Further Info	
This site is vacant majority of the time. It is used as a football changing rooms. The mains water supplies the site. There is one EWH supplying the kitchen. There is one shower in each changing room	

The list of plant detailed in the Executive Summary (Section 1.2) should be used for indicative purposes only and it should be noted that it includes only key water assets i.e. it is not intended to detail a comprehensive list of outlets, although some might be included for illustrative purposes. It is also impossible to guarantee that every system on site has been identified. For comprehensive details of the relevant plant and outlets please refer to the schematic drawing for the site. If no such schematic drawing is available or if the schematic is not considered valid, we would suggest that you contact HBI, as this is a requirement of the ACoP L8 (2013).

It is from inspection of the systems detailed in the Executive Summary (Section 1.2) and the outlets that they supply that comments in the following section 'Observations on the Water Services' are made. Unique identification (ID) reference numbers have been allocated by HBI to the various systems/outlets in the building and these are detailed in the table below. Unless otherwise instructed, HBI have attached bar code labels to the systems or outlets to indicate this reference.

3.4 Observations on the Water Systems

The water systems and points relating to their condition are made in the following sections.

3.4.1 Water Heaters

The following water heaters were identified, the details and conditions of which are identified in the tables below:

3.4.1.1.	**Electric Water Heater**
Location	GF Main Hall Kitchen
HBI ID Reference	443768
Other reference	EWH
Storage Capacity (L)	10
Outlet Temperature	**91.8°C**
Direct Spray Formation	No
Used Regularly	No

Recommendations	443768: GF Main Hall Kitchen

HBI switched on the heater to obtain a temperature.

HBI would strongly suggest that the heater is turned down from its current setting to reduce scald risk which is significant.

3.4.3 Showers

The following showers were identified, the details and conditions of which are identified in the tables below:

3.4.3.1.	**Electric Shower**
Location	GF RHS Changing Room
HBI ID Reference	443771
Other Reference	ES
Degree of Dirt / Scale	Clean
Used Regularly	**No**

Deposits within System

Recommendations	443771: GF RHS Changing Room

We consider that this system constitutes a risk system as defined in the ACoP L8.

Site staff were not sure how often these outlets are used. HBI believe these are likely to be little used.

As the showers are not used they effectively form dead-legs in the water systems, so they should be flushed weekly or if possible removed. If they are removed, ensure that all associated pipe-work is cut back to source.

3.4.3.2.	**Electric Shower**
Location	GF LHS Changing Room
HBI ID Reference	443772
Other Reference	ES
Degree of Dirt / Scale	Clean
Used Regularly	**No**

Deposits within System

Recommendations	443772: GF LHS Changing Room

We consider that this system constitutes a risk system as defined in the ACoP L8.

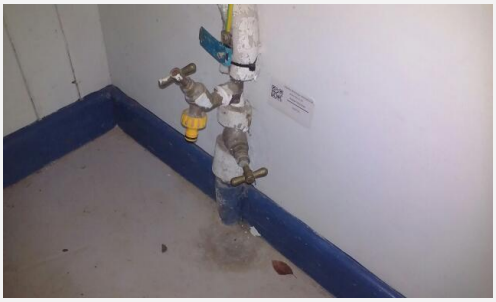
Site staff were not sure how often these outlets are used. HBI believe these are likely to be little used.

As the showers are not used they effectively form dead-legs in the water systems, so they should be flushed weekly or if possible removed. If they are removed, ensure that all associated pipe-work is cut back to source.

3.4.4 Other Systems/General Points of Note

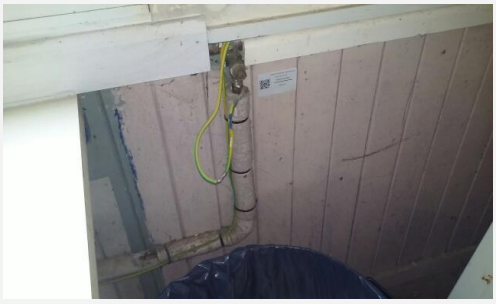
The following other systems were identified, the details and conditions of which are identified in the tables below:

3.4.4.1.	**Incoming Water Main**
Location	GF Gents Toilets
HBI ID Reference	443770
Other reference	ICM



Recommendations	443770: GF Gents Toilets
HBI noted a bib tap on the ICM however, there is little pipework between the tap and pipework therefore low risk of stagnation of water.	
No specific recommendations, for information only.	

3.4.4.2.	**Deadleg (or never used outlet)**
Location	GF Main Hall Kitchen
HBI ID Reference	443773
Other reference	DL



Recommendations	443773: GF Main Hall Kitchen
On the MCWS. Approx 1.75m length to live spur. Remove and cut pipework back to the live source to prevent stagnation.	

3.4.4.3.	**Little Used Outlets – Seasonal**
Location	Throughout

Recommendations	
We suspect that there may be periods when areas are unoccupied or not in use. This can lead to stagnation and an increase in the likelihood that legionella and other bacteria will proliferate. We would recommend that these situations be assessed and a programme of regular flushing of any little used or out of use outlets be instigated. All actions should be recorded in the site System of Control.	

4 Testing of Water Systems

4.1 Water Temperature Measurements

Water temperatures in the range 20 to 45°C favour the growth of legionella bacteria. It is uncommon to find proliferation below 20°C and it does not survive above 60°C. Organisms may however remain dormant in cool water, multiplying only when the temperature reaches a suitable level. The ACoP L8 (2013) recommends that cold water storage and distribution be at 20°C or below and that for hot water distribution, at least 50°C is attainable at taps within one minute of running (55°C in Healthcare Premises). Whenever water is present at greater than 43°C there is a risk of scalding and so any points noted at temperatures above this should have signs warning of the presence of hot water. Where water is present at greater than 60°C, there is a risk of serious injury and it is essential that warning signs be posted. In order to meet revised regulations, such signs should now contain a pictorial illustration indicating that a risk is presented e.g. a warning triangle.

4.1.1 Cold Water Temperature Measurements

OBJECTIVE To confirm that cold water services are being maintained at temperatures that minimise the risk of proliferation of legionella bacteria.

METHOD Measurement of water temperature by the use of an electronic wet probe thermometer of non-blended cold outlets and visual inspection of those outlets.

RESULTS

HBI ID No.	Location	Temp °C	Scale Level
Cold Water		**@ 2 Minutes**	
443769	GF Main Hall Kitchen SK Domestic Water Outlet	4.6	**Medium**

Recommendations

Any domestic cold water temperatures that exceeded 20°C after a two-minute tap run are highlighted in the table above. It should be ensured that cold water temperatures equilibrate to 20°C and this might involve insulating pipework and assessing the turnover of the DCW system.

Any scale levels rated as moderate / heavy indicate that a program for regular de-scaling of outlets is not implemented or insufficient and this should be addressed.

4.1.2 Hot Water Temperature Measurements

OBJECTIVE To confirm that hot water services are being maintained at temperatures that minimise the risk of proliferation of legionella bacteria.

METHOD Measurement of water temperature by the use of an electronic wet probe thermometer and contact thermometer and visual inspection of those outlets. Where present and accessible, hot water flow and return temperatures have been assessed using a contact probe which enables assessment of the performance of any Therm Valve present. Where either hot temperature column is left blank, then either there is no pipework associated with the outlet or there are access restrictions that prevent measurement.

RESULTS

HBI ID No.	Location	Temp °C	Scale Level	Caution Hot Sign Required?
Hot Water		**@ 1 Minute**		
443769	GF Main Hall Kitchen SK Domestic Water Outlet	**91.8**	**Medium**	**Yes**

Recommendations

Any domestic hot water temperatures that failed to equilibrate to 50°C after a one-minute tap run are highlighted in the table above (55°C in Healthcare Premises). The temperature of the water serving these outlets should be increased in order that 50°C (55°C in Healthcare Premises) is achieved at all DHW outlets. Any outlets with temperatures exceeding 65°C should be reduced as these pose a significant scald hazard.

Any hot return temperatures that do not reach 50°C should be investigated (but it should be noted that these temperatures were taken using contact probes, which by nature have a higher inaccuracy than immersion probes).

Any scale levels rated as moderate / heavy indicate that a program for regular de-scaling of outlets is not implemented or insufficient and this should be addressed. Any outlet, whether classified as a spray outlet or not, will have the potential to produce a spray if not maintained in a clean condition. It is therefore imperative that outlets are maintained free of scale and dirt.

Any outlets that provide water in excess of 43°C should either have a TMV fitted or should have a pictorial ‘caution hot water’ sign posted. Those with no signs posted are indicated above with a **Yes**. These require signs posting.

4.2 Risk Factor Calculations

The following algorithms are used to calculate the risk factor of representative significant risk systems where HBI were able to safely obtain a temperature. Temperature may be presumed for systems where obtaining a temperature may pose an unreasonable hazard. Other risk systems identified are detailed in Section 3.3 of this report.

4.2.1 Legionella Risk Factor Calculation HBI ID No. 443771

GF RHS Changing Room ES Electric Shower

A	**Source condition**			**E**	**Water change rate**		
	Chemically treated	1			High rate of change	1	
	Clean	3	3		Frequent to moderate	3	8
	Moderate contamination	8			Infrequent to low rate	8	
	Heavy contamination	10			Static	10	
B	**Source accessibility**			**F**	**Nature of exposed population**		
	Enclosed system	1					
	Limited exposure (open indoors)	8	8		Average risk	3	3
	Multiple exposure (open outdoors)	10			High Risk (elderly/infirm)	10	
	Adjacent to or in airstream	100			Special risk (cooling tower / healthcare)	30	
C	**Acidity/Alkalinity**			**G**	**Degree of exposure**		
	pH > 9.1 or < 6.2	1			Slight (<3 hours/week)	4	
	pH 6.2 to 6.6 or 7.2 to 9.1	2	2		Moderate (3 to 30 hrs/wk)	6	4
	pH 6.7 to 7.1 neutral	3			High (>30 hours/week)	8	
D	**Incubation – Water Temperature**			**H**	**Droplet formation**		
	Chilled or heated >49°C or <13°C	3			Still water	1	
	Ambient: 13° - 19°C	10	30		Flowing water	3	10
	Heated: 20° - 50°C	30			Coarse Droplets	8	
					Aerosol, fine mist	10	

Contamination (& Accessibility)	= A x B	**W =**	24
Amplification	= C x D x E	**X =**	480
Exposure & Host Susceptibility	= F x G x H	**Y =**	120
Risk Factor Total	= W+X+Y	**Z =**	624

Risk Factor Table

Factor	Code		Low		Moderate		High	
Total	Z	16		178		500	**624**	4300

TESTING OF WATER SYSTEMS

4.2.2 Legionella Risk Factor Calculation HBI ID No. 443772

GF LHS Changing Room ES Electric Shower

A	**Source condition**			**E**	**Water change rate**		
	Chemically treated	1			High rate of change	1	
	Clean	3	3		Frequent to moderate	3	8
	Moderate contamination	8			Infrequent to low rate	8	
	Heavy contamination	10			Static	10	
B	**Source accessibility**			**F**	**Nature of exposed population**		
	Enclosed system	1					
	Limited exposure (open indoors)	8	8		Average risk	3	3
	Multiple exposure (open outdoors)	10			High Risk (elderly/infirm)	10	
	Adjacent to or in airstream	100			Special risk (cooling tower / healthcare)	30	
C	**Acidity/Alkalinity**			**G**	**Degree of exposure**		
	pH > 9.1 or < 6.2	1			Slight (<3 hours/week)	4	
	pH 6.2 to 6.6 or 7.2 to 9.1	2	2		Moderate (3 to 30 hrs/wk)	6	4
	pH 6.7 to 7.1 neutral	3			High (>30 hours/week)	8	
D	**Incubation – Water Temperature**			**H**	**Droplet formation**		
	Chilled or heated >49°C or <13°C	3			Still water	1	
	Ambient: 13° - 19°C	10	30		Flowing water	3	10
	Heated: 20° - 50°C	30			Coarse Droplets	8	
					Aerosol, fine mist	10	

Contamination (& Accessibility)	= A x B	**W =**	24
Amplification	= C x D x E	**X =**	480
Exposure & Host Susceptibility	= F x G x H	**Y =**	120
Risk Factor Total	= W+X+Y	**Z =**	624

Risk Factor Table

Factor	Code		Low		Moderate		High	
Total	Z	16		178		500	**624**	4300

Legionella Risk Factor Calculation Summary

HBI ID No.	Risk System	Risk Factor
443771	GF RHS Changing Room ES Electric Shower	**624**
443772	GF LHS Changing Room ES Electric Shower	**624**

Recommendations

The locations identified as having a high risk factor are those with a score of greater than 500 in the above table. These highlight systems which require remedial action or those where adequate maintenance and monitoring is of greatest importance.

We recommend that you continue to maintain all systems in a manner likely to minimise the risk of legionellosis. The above risk factors do not include for the presence of legionella organisms. The identification of legionella bacteria at any outlet should be considered as a significant risk, (irrespective of the Risk Factor determined above) and should be treated as reason for immediate action.

5 Inspection of the Scheme of Control

Once the risk systems have been identified and assessed, a scheme should be prepared for preventing or controlling the risk of exposure to legionellosis. In addition, to ensure that precautions continue to be carried out and that adequate information is available for checking what is done in practice, a record should be kept. This detailed information required should be in the form of a dedicated site System of Control and Log Records. These should be available for inspection at all times.

At the time of our visit, an inspection of the System of Control and Site Records was undertaken. The following table illustrates the findings of this inspection:

The Pavilion		**Comments**
Is there a previous Risk Assessment?	No	
Risk Systems on Site	Yes	ES
Particularly Susceptible Occupants Present?	Yes	Public can access the site
Is there Regime of Tests (e.g.Temps)	No	**Required**
Is there System of Control?	No	**Required**
Schematics of Plant Layout present and valid	No	**Required**
Training Records present?	No	**Required**
Recommendations		
At the time of our visit no System of Control or Log Records were found to be available on site. We therefore strongly recommend that a suitable system of control be produced, listing all of the requirements of the ACoP, including risk systems, the precautions to be taken, all testing records etc. No schematic drawings were found to be available for the water systems on this site. It is a specific requirement of the ACoP that plans or schematic drawings of the systems are included in the record systems and so we recommend that suitable drawings be prepared and added to the control records. No training records were present for site staff. All staff involved with the Scheme of Control should undertake legionella awareness training and records should be kept in the site logbook.		

6 Appendix 1 - Standards and Abbreviations

Standards and methods used in this report are taken from the most appropriate references available. Sources quoted are often given as acronyms and their full names are given here for easy reference.

HSE:	Health and Safety Executive
ACoP L8:	Approved Code of Practice L8, published by the Health & Safety Executive; Legionnaires' disease. The control of legionella bacteria in water systems 2013
HSG 274 Part 1	Legionnaires' disease: Technical Guidance. Part 1 the control of legionella bacteria in evaporative cooling systems 2013
HSG 274 Part 2	Legionnaires' disease: Technical Guidance. Part 2 the control of legionella bacteria in hot and cold water systems 2014
HSG 274 Part 3	Legionnaires' disease: Technical Guidance. Part 3 the control of legionella bacteria in other risk systems 2013
COSHH:	Approved Code of Practice published by the Health & Safety Commission; The Control of Substances Hazardous to Health Regulations 2002 (amended)
HSWA:	Health and Safety at Work etc. Act 1974.
BS 8580:	British Standard 8580 Water quality – Risk assessments for Legionella control – Code of Practice 2010
CIBSE TM13:	The Chartered Institution of Building Services Engineers: Technical Memorandum 13: Minimising the risk of Legionnaire's disease 2002
HTM 04-01:	Department of Health: Health Technical Memorandum 04-01: The control of *Legionella,* hygiene, "safe" hot water, cold water and drinking water systems; Part B: Operational management 2006

APPENDIX 1

Other common and scientific abbreviations are used in this report and their full forms are given below:

DCW:	Domestic Cold Water
DHW:	Domestic Hot Water
TVC:	Total Viable Colonies
LHS:	Left Hand Side
RHS:	Right Hand Side
GF, 1F…	Ground Floor, First Floor…
TMV:	Thermostatic Mixing Valve
CWST:	Cold Water Storage Tank
PHE:	Plate Heat Exchanger
F&E:	Feed & Expansion
MS	Mixer Shower (hot and cold feed)
ES	Electric Shower (cold feed)
WHB	Wash Hand Basin (typically porcelain basin)
SK	Sink (typically stainless steel)
BSK	Butlers Sink (long drop sink in cleaner’s cupboard)
LSK	Lab Sink (long drop sink in laboratory environment)
WC	Water Closet (toilet cistern)
EWH	Electric Water Heater
IWH	Instant Water Heater
HWH (H)	Hot Water Heater with Header
DDR	Domestic Dishwasher
TP	Tea Point Hot Water Boiler
CWD	Chilled Water Dispensers
cfu/ml:	colony forming units per millilitre

APPENDIX 1

cfu/l:	colony forming units per litre
10^3	1,000
10^4	10,000
10^5	100,000
>	Greater than
<	Less than

7 Appendix 2 – General Information

7.1 Background

In July 1976 in Philadelphia an outbreak of pneumonia affected 221 people, killing 34. Many were members of the American Legion attending a convention in the Bellevue-Stratford Hotel. The causative organism, *Legionella pneumophila*, is widely distributed in nature and although positively identified and named only several months after the outbreak of the illness that gave the disease its name, Legionnaires disease, it has probably been causing infections in humans for hundreds of years.

There are now identified more than 45 species of legionella and at least 14 serogroups of *Legionella pneumophila*, however the Pontiac sub-type (MAb2) of *Legionella pneumophila Serogroup One* is responsible for more than 90% of known infections. In recent years up to 300 cases of Legionnaires disease are reported each year in England and Wales alone.

7.2 Habitat

Legionella species occur naturally in soil, rivers and lakes and have the ability to successfully colonise man-made water handling and storage systems, which often provide ideal conditions of nutrition and temperature for their proliferation. Legionella infection is not transmissible from person to person; it is caused by the inhalation of water aerosols containing the bacteria, by susceptible individuals. The numbers of organisms required to induce infection is not known but will vary according to age, general health and other predisposing factors.

The potential for legionella to become a hazard to the health of large numbers of people is greatly enhanced by conventional water and air conditioning engineering methods, as used in re-circulating cooling towers, air conditioning chill coils and humidifiers, water storage and distribution systems and other aquatic systems, such as whirlpool spa baths.

7.3 Building Water Systems

The single isolation of these bacteria from a water system does not mean that the disease will necessarily manifest itself, but if the contaminated water becomes an aerosol the risk of human infection is greatly increased. Thus if man-made water systems produce jets, sprays or mists, as with cooling towers, showers and some types of humidifiers, it is important to minimise the chances of legionella colonising the water reservoirs, storage tanks and other aquatic systems serving them. Certainly cooling towers are of particular importance for their operating temperatures are at an optimum level, they are designed to aerosolise the water and they are easily and frequently contaminated by wind-blown dusts and soil particles, which can carry with them disease producing micro-organisms, including legionella.

The presence of these bacteria in water systems is therefore of prime importance to engineers, building managers and hygienists. The organisms can be controlled in such systems by the careful control of temperature, the application of biocides etc. Detection and identification of legionella species however, plays a vital role both in initial assessment of the water system and subsequent treatment effectiveness and ongoing water quality monitoring.

7.4 Legislation

The Health & Safety at Work Act 1974 (HSWA) and Control of Substances Hazardous to Health Regulations 2002 (amended) (COSHH) include for the risks from hazardous micro-organisms, including legionella. Under the Regulations risk assessments and the adoption of appropriate precautions are required to be made. Furthermore, the Approved Code of Practice and Guidance L8 *(Legionnaires' disease. The control of legionella bacteria in water systems)*, (the ACoP L8 (2013)), sets out statutory requirements for dealing with such risk. The ACoP L8 (2013) applies to the risk from legionella bacteria in any circumstances where the HSWA applies. In order to comply with their legal duties, as detailed in the ACoP L8 (2013), employers and those with responsibility for the control of premises should:

- Identify and assess sources of risk;
- Prepare a scheme for preventing or controlling the risk;
- Implement, manage and monitor precautions;
- Keep records of the precautions; and
- Appoint a person to be managerially responsible.

7.5 Hazard Assessment

At the time of water sampling HBI Consultants evaluate all the relevant factors affecting the condition of the water source, such as, system design, accessibility to airborne contamination, circulation rate, pH, temperature, droplet formation, water treatment programme, etc.

Assessment of the hazards then permits high-risk sources to be identified and ensures that responsible means of implementing precautions are undertaken.

As the likelihood of future contamination can be predicted this also allows maintenance regimes and water treatment protocols to be established on the basis of need rather than on guesswork.

7.6 Regular Monitoring

Water from systems that disseminate a spray or fine mist of water, such as cooling towers and showers present the greatest degree of risk and so a routine monitoring of their water storage systems, in accordance with the guidance detailed in the ACoP L8 (2013), is recommended by HBI. This will also allow management to have up-to-date reports on the status of the building water systems and gives confidence that maintenance standards are being met. Tenants, staff and building users can then be assured that all reasonable precautions are being taken to avoid the spread of Legionnaires' disease. Hot and cold-water services and other water systems should similarly be appraised for risk and a suitable system of maintenance, cleaning and testing implemented.

Because of its widespread presence in nature and its ability to thrive in man-made water systems, it is unlikely that legionella can be completely or permanently eradicated from potentially hazardous systems. However, by suitable design, maintenance, treatment and testing of building water systems it is possible to control the conditions which allow this and other bacteria, fungi and protozoans to multiply, thus keeping the incidence of disease outbreaks associated with such systems at a minimum.

7.7 Frequency of Risk Assessment

The recommended date of the next Legionella Risk Assessment Audit and Review is detailed in Section 1.2. The Lead Risk Assessor has made this decision based on the overall risk presented on the site. A frequency of less than 2 years may be advised for sites containing high risk systems such as Cooling Towers. A frequency in excess of 2 years may be advised for sites with very low risk, where all the following criteria apply:

- in a small building without individuals especially 'at risk' from legionella bacteria;
- where daily water usage is inevitable and sufficient to turnover the entire system;
- where cold water is directly from a wholesome mains supply (no stored water tanks);
- where hot water is fed from instantaneous heaters or local volume water heaters (supplying outlets at 50 °C);
- where the only outlets are toilets and wash hand basins (no showers).

Where any of the following situations occur, we advise a Legionella Risk Assessment Audit and Review also be undertaken, irrespective of the advised frequency of review:

- a change to the water system or its use;
- a change to the use of the building where the system is installed;
- new information available about risks or control measures;
- the results of checks indicating that control measures are no longer effective;
- changes to key personnel;
- a case of legionnaires' disease/legionellosis associated with the system.

Where a client requires the next Legionella Risk Assessment Audit and Review to be undertaken on a greater frequency than that determined by the Lead Risk Assessor, this will be taken into account in the stated recommended review date (as per contractual requirements or company internal procedures).

7.8 Assessment of Risk Factor

As legionella are common in natural water sources, random sampling of water systems and services for the bacterium will often yield positive results. Even where sampling results are negative there is no guarantee that it is not present elsewhere in the system. It is therefore difficult to determine risk solely on the basis of water sampling results and so the following sheets have been prepared as an aid to understanding the relative risk of the systems assessed.

For a representative number of those systems that have been identified and are recognised to be potential causes of legionellosis, as defined in the ACoP L8 (2013), a numerical assessment of the risk has been calculated. The rationale behind the risk factor score is that the following key factors determine the likelihood that Legionnaires' disease will occur.

7.8.1 Contamination (& Accessibility) (W)

This is an evaluation of the probability that contamination will occur at source. It includes an assessment of the water quality and integrity and also considers the accessibility of occupants to the water. It includes a multiplication of the following two factors **(A x B)**:

A – Source condition

- Chemically treated (for example biocidal treatment in condenser water, copper/silver ion treated water, chlorine dioxide treated water)
- Clean (untreated water that there is no visual evidence of contamination)
- Moderate contamination (elevated levels of scale on a shower for example)
- Heavy contamination (for example an outlet supplied by a heavily corroded tank full of sediment)

Worse case approach: It should be noted that a heavily or moderately contaminated outlet or system that is also chemically treated would be considered 'moderate' or 'heavy contamination' in preference to 'chemically treated'. Evidence of high risk temperature in the distributed and/or stored water system to the outlet will also be used to determine the contamination probability.

B – Source accessibility

- Enclosed system (e.g. a closed water system that is only occasionally drained for maintenance)
- Limited exposure (open indoors). E.g. an indoor outlet or shower
- Multiple exposure (open outdoors). E.g. an external spray hose, cooling tower, shower used by the public in a swimming pool
- Adjacent to or in airstream (e.g. a cooling tower next to the air inlet for an air handling unit)

7.8.2 Amplification (X)

Amplification is a determination of the cultivation conditions. Factors which affect the rate of amplification of legionella bacteria are considered and evaluated, including assessment of such conditions as temperature, pH and water change rate. It includes a multiplication of the following four factors **(C x D x E)**:

C – Acidity/Alkalinity

- pH > 9.1 or < 6.2
- pH 6.2 to 6.6 or 7.2 to 9.1
- pH 6.7 to 7.1 neutral

D – Incubation – Water Temperature

- >50°C or <13°C
- 13° - 20°C
- 20° - 50°C

Worse case approach: If, for example, a highest temperature of greater than 50°C is recorded for a shower at the time of our visit, a risk factor rating will still be used based upon a temperature in the range 20 - 50°C, as this is clearly the range in which the shower will normally operate. The water supplied from a TMV will be the temperature selected for the algorithm irrespective of the hot temperature to the TMV (low hot temperatures to the TMV will be considered when assessing the source condition)

E – Water change rate

- High rate of change (e.g. evaporative condenser system with high rate of evaporation)
- Frequent to moderate (outlet used more than twice weekly)
- Infrequent to low rate (outlet used less often than twice weekly)
- Static (outlet very rarely used or not at all)

7.8.3 Exposure & Host Susceptibility (Y)

This considers; transmission, an assessment of the formation of droplets or aerosols; individual exposure, to determine increased risk that droplets will be inhaled and the host susceptibility and evaluating the nature of the exposed population. It includes a multiplication of the following three factors **(F x G x H)**:

F - Nature of exposed population

- Average Risk
- High Risk (elderly/infirm)
- Special risk (cooling tower / healthcare)

G - Degree of exposure

- Slight (<3 hours/week).
- Moderate (3 to 30 hrs/wk)
- High (>30 hours/week)

H - Droplet formation

- Still water (e.g. quench tank)
- Flowing water (e.g. tap)
- Coarse Droplets (e.g. shower)
- Aerosol, fine mist (e.g. cooling tower)

7.8.4 Subtotal (Z)

The risk factor subtotal is then calculated (W + X + Y). This can be considered to represent the risk of occupants of Legionellosis without as assessment of their specific susceptibility depending on what type of hospital patient they may be.

The assessment gives an appraisal of risk as a value between 14 and 4,300 according to the following formula:

Risk Factor Table								
Factor	**Code**		**Low**		**Medium**		**High**	
Risk at source	W	1		64		100		1000
Cultivation conditions	X	3		60		160		900
Exposure rate	Y	12		54		240		2400
Total	**Z**	**16**		**178**		**500**		**4300**

These numbers are intended only as a guide to aid the understanding of relative risk and do not directly account for the presence of legionella bacteria. Clearly the presence of legionella bacteria would greatly increase the risk and these algorithms should always be interpreted accordingly. It must be realised that the mere presence of legionella bacteria at any concentration does not necessarily imply that exposed people will become ill; however, if the conditions are such that high-risk levels are indicated, then it would be prudent to deal with that situation as a matter of urgency. Furthermore, the presence of such a potentially harmful organism in any situation should be considered undesirable.

8 Appendix 3 – Recommended Procedures for Maintenance

This section outlines the operational maintenance procedures recommended by HBI for those systems identified in Section 2 as having a reasonably foreseeable risk. This may not be a comprehensive list, but is provided here as a useful cross check against current procedures. All water systems identified as presenting a risk should be maintained in accordance with the recommendations of the ACoP L8 (2013).

Actions required by the ACoP L8 (2013) include the following:

- Conduct a suitable and sufficient assessment of risk in order to appraise the risk to health and the measures for prevention.
- Prepare a written scheme for minimising the exposure risk including; an up-to-date schematic drawing of the plant, a description of the correct, safe operation and precautions to be taken.
- Detail those persons responsible for the implementation of precautions. This should include; the person on whom the statutory duty falls, persons to take managerial or supervisory responsibility, the name of people appointed to undertake the assessment, persons responsible for implementing the written scheme and details of lines of communication.
- Keep records of; precautionary methods carried out, inspections, tests or checks, remedial work etc. All such records should detail the date of completion and the signature of the person who carried out the task.

8.1 Domestic Water Systems

8.1.1 Cold Water Storage Tanks

Temperatures in storage tanks should be maintained below 20°C by use of insulation and good water distribution and turnover. The temperature of each tank should be measured six-monthly and recorded. The temperature of the incoming water inlet should also be recorded at least six monthly, once in the winter and once in the summer.

Approved lids should be fitted and all tanks should comply with the water byelaws.

Inlet and outlet on tanks should be arranged to provide a cross flow and the tank sized to produce a rapid turnover of water, ideally holding no greater than one day's supply for the building.

Particular attention must be paid to maintenance and operation of any water softeners and filters. These should be backwashed and maintained as per manufacturer's instructions and filters should be checked and cleaned regularly, as per manufacturer's instructions, to prevent the build-up of sediment and organic matter that can encourage the proliferation of legionella.

Cold Water Services Maintenance

Annually (in summer)

1. Check and record temperature of the water surface at the approximate centre of the tank.

2. Check mains water temperature at the ball valve.

3. Inspect tanks internally for rust, damage or contamination.

4. Clean and disinfect tanks if determined by the inspection.

8.1.2 Stored Domestic Hot Water

The operational temperatures of the calorifiers should be maintained at 60°C during operation and if any calorifier is out of use due to maintenance etc for a week or more it should be "PASTEURISED" by raising the temperature of the whole calorifier to 70°C for at least 1 hour before being put back on line.

A recirculation or shunt pump may be fitted to eliminate temperature differences within the calorifier. Where this is done the underside of the calorifier should be thermally insulated to minimise heat loss. The pump should only be switched on during the first charge-up period in the early hours of the morning. It should not be left running during discharge. Temperature stratification is valuable during discharge to ensure that the hot water supply remains at the design temperature for the longest possible time

To reduce the risk of contamination the calorifiers should not be put on line until their temperatures have reached 60°C. This may be achieved by holding off the secondary domestic hot water pumps and running the anti-stratification pumps until the temperature in the calorifier reaches 60°C, when the system can be put into normal control.

The flow temperature from the calorifier should be maintained at 60°C or greater and the return at not less than 50°C. This may be achieved by means of control and temperatures gauges. An approved drain cock and inspection hatch should be fitted to enable routine maintenance and cleaning.

Stored Domestic Hot Water Maintenance

Monthly

1. Check and record calorifier flow temperature and adjust as necessary.

2. Where appropriate, check and record return water temperature.

Annually

1. Inspect internally by removing the access hatch or using a borescope and clean by draining the vessel. If no access hatch, purge any debris to drain. Collect the initial flush to inspect clarity, debris and record temperature. Record this action.

8.1.3 Hot Water Heater With Integral Header Tank

Header tank heaters are of a design whereby there is an integral cold-water tank located on top of the hot water cylinder. In HBI's experience this results in an elevated storage temperature in the header tank and ideal conditions for legionella and other microbial proliferation. In operation, due to the typically low hot water capacity, it may be possible during peak use, to draw water straight from the header tank to outlet, thereby significantly increasing the risk of infection. **We therefore recommend that wherever possible all such units should be removed.** If not practicable to remove the units, the header tank must be inspected annually then cleaned and disinfected as necessary. If hot water is found to regularly overflow into the header tank then we strongly advise the unit be removed (or the overflow re-directed to drain). The temperature at outlet should be monitored monthly to ensure stored water is between 55 & 60°C.

Hot Water Heater With Integral Header Tank Maintenance

Cold Water Header Tank

Annually (in summer)

1. Check and record temperature of the water in the tank.
2. Inspect tanks internally for rust, damage or contamination.
3. Clean and disinfect tanks if determined by the inspection.

Hot Water Heater

Monthly

1. Check and record outlet temperature and adjust unit as necessary.

8.1.4 Water Heaters (greater than 15L)

Water heaters with a capacity greater than 15L should be treated as per calorifiers.

Monthly

1. Check and record water heater flow temperature and adjust as necessary.
2. Where appropriate, check and record return water temperature.

8.1.5 Domestic Hot and Cold Water Distribution

Cold water should wherever possible be stored and distributed within the building at a temperature of less than 20°C. Distributed water outlets should be insulated and kept away from hot piping etc. to prevent excessive rises in the supply temperature. The increase in water temperature on distribution should not typically be more than 2°C. Cold water outlets should be below 20°C after running the water for up to two minutes.

The hot water distribution system should operate such that at least 50°C is attainable at the taps within one minute of running the tap to normal operating position i.e. half open. Any tap that does not meet this specification should be reported and the need for this supply reviewed.

At temperatures above 50°C there is an increasing danger of scalding, therefore, if excessive temperatures are reached, warning notices should be placed at point of use.

Consideration should be given to the removal of all deadlegs, including static or infrequently used outlets. Where infrequently used outlets do remain they must be flushed each week, for a period of several minutes.

Sentinel taps are those taps nominated for regular routine inspection and are normally the nearest and furthest from the water storage tank or calorifier. Other taps, which are considered to represent a special risk, may also be nominated as sentinel taps.

Thermostatic mixing valves (TMVs) should be sited as close as possible to the point of use and should ideally only serve one outlet. Where they serve multiple outlets, the mixed water legs should be kept as short as possible. Supplies to TMVs may be regarded as sentinel taps and should achieve the required temperatures for distributed waters.

Taps should be maintained clean and free from scale.

Drinking taps should be clearly labelled.

APPENDIX 3

Domestic Hot and Cold Water Distribution Maintenance

Cold Water Outlets

Monthly

1. Check and record in the inspection log, the temperature of sentinel taps after 2 mins (nearest and furthest from the supply and any other long branches).

Annually

1. Check and record temperatures from a representative selection of other points on a rotational basis to ensure whole system is reaching satisfactory temperatures for legionella control. (The frequency of this can be adjusted depending on the building / water system characteristics)

2. Check thermal insulation

Hot Water Outlets

Monthly

1. Check and record in the inspection log, the temperature of sentinel taps after 1 min (nearest and furthest from each hot water source supply and any other long branches).

2. For circulating systems, check and record the return legs of principle loops.

Quarterly

1. For circulating systems, check and record the return legs of sub-ordinate loops

Annually

1. Check and record temperatures from a representative selection of other points on a rotational basis to ensure whole system is reaching satisfactory temperatures for legionella control. (The frequency of this can be adjusted depending on the building / water system characteristics)

Thermostatic Mixing Valves

Six-Monthly

1. Fail safe check all TMVs and reset temperatures

Annually

1. Inspect, clean, de-scale and disinfect any strainers or filters.

Point of Use Water Heaters (no greater than 15L)

Instant Water Heaters and Electric Water Heaters should provide water to outlet at a temperature of between 50°C and 60°C.

Monthly – Six Monthly

1. Check and record water temperature at outlet (or check installation has a high turnover)

8.1.6 Showers and Spray Hoses / Taps

Showers and spray outlets present a high risk of contamination and infection and consideration should be given to the removal from service of any rarely used shower installations. If showers are not used very regularly, they should be routinely flushed weekly.

It is preferable that showers should have rigid pipework and be fitted with an automatic dump valve to ensure drainage of the spray head and adjoining pipework.

Maintenance

Quarterly (or more frequently if necessary)

1. Dismantle, clean and de-scale removable parts, heads, inserts and hoses where fitted.

8.1.7 Infrequently Used Outlets

These systems present a risk of contamination when stagnant, which can result in high levels of microbes being released when the outlet is returned to service. Consideration should be given to the removal from service of any rarely used installations. If outlets are not used very regularly (less than daily), they should be routinely flushed weekly for five minutes. Butler's sinks are often considered little used outlets and as such should also be flushed weekly.

Weekly (Twice-Weekly for Healthcare Environments)

1. Flush through and purge to drain.

8.1.8 Butlers Sinks & Sluice Sinks

Outlets such as these usually have a high drop which can create a splash/spray and are often used infrequently. This can lead to stagnation of water within the pipework and an increase in the likelihood that legionella and other bacteria will proliferate in the system. The frequency of use should therefore be determined and if little-used the outlet should be added to the weekly flushing regime.

8.1.9 Expansion Vessels

Expansion vessels fitted to pressurised domestic water systems are often off long pipe legs, which can be considered deadlegs. We advise that outlets / drain valves are installed as close to the end of the line as possible to enable routine flushing of the line, which is required on a monthly – six monthly basis.

8.1.10 Flexible Hoses

Flexible hoses made from ethylene propylene diene monomer (EPDM) have been found heavily infected with biofilm, which include Legionella Bacteria. The inner surfaces of flexible hoses become roughened and pitted making disinfection difficult. This is considered a specific issue in environments with high risk individuals (care home and healthcare), where installations do not have to move. Flexible hoses in these environments should be replaced with WRAS approved non-flexible pipework.

8.2 Other Systems

8.2.1 Boilers / Closed Hot Water System

In normal operation, closed water systems are not considered as presenting a risk of legionellosis as the water is enclosed and is not in the risk temperature range. Suitable precautions should however be taken when undertaking maintenance work on systems which have been off-line for an extended period of time. Closed systems should be treated with a suitable inhibitor to prevent corrosion.

8.2.2 Pressurisation Units for Closed Systems

Pressurisation units that serve closed hot or chilled water systems are often supplied off a long leg from either the mains or a tank. If water is not regularly drawn through these lengths of supply pipework then they can be considered deadlegs. We advise that non-return valves be fitted at the spur from the live pipe or alternatively they be flushed weekly.

8.2.3 Feed and Expansion Tanks

F&E tanks that supply closed water systems are not considered to constitute a Legionella risk. They are often supplied off a long leg from the mains. If water is not regularly drawn through these lengths of supply pipework then they can be considered deadlegs. We advise that non-return valves be fitted at the spur from the live pipe or alternatively they be flushed weekly.

8.2.4 Drinking Water

Chilled Water Dispensers, Drinks Vending Machines and Bottled Drinking Water Stations should be subject to regular, routine testing for the quality of the water with regard to its fitness for human consumption.

Tea Points or Hot Drinking Water Boilers provide water a temperature close to boiling. Due to the high temperature, they are not considered to be at risk of Legionella proliferation within. They should be maintained as per manufacturer's guidelines and the outlets regularly cleaned of scale.

9 Appendix 4 – LCA Code of Conduct

HBI are registered as a Service Provider with the Legionella Control Association. One requirement of the Code of Conduct for Service Providers is that they should ensure that all clients a receive copy of the LCA Code of Conduct and Certificate of registration, HBI have therefore made these documents available on their website and they may be accessed via the following link; http://www.hbi.co.uk/resource-centre.aspx

10 Appendix 5 – Schematic Drawings

Where schematics have been commissioned as part of this Risk Assessment, they will be present here. Where they have been requested as a separate document or are located in the System of Control this will be detailed in Section 5.