

LEGIONELLA RISK ASSESSMENT



CUSTOMER : NATURAL ENVIRONMENTAL RESEARCH COUNCIL

SITE : BRITISH GEOLOGICAL SURVEY, KEYWORTH

DATE : 20 MARCH 2017

Disclaimer: This assessment is based on information provided by site including verbal statements, any relevant plans, explanations regarding operation and usage, etc., and only includes areas within the scope of the assessment and those made known to the Assessor whilst on site.

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WCS Group is trading as WCS Environmental Ltd registered in England & Wales at 20 Grosvenor Place, London, SW1X 7HN. Number 2184649.
The WCS Group is a portfolio company of Marlowe plc.



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LEGIONELLA RISK ASSESSMENT

CONTACT DETAILS

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DATE OF SURVEY : 20 MARCH 2017

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EXECUTIVE SUMMARY

BGS, KEYWORTH – 20 MARCH 2017

This report provides an assessment of the current risks with regards to the control of legionella and its proliferation potential within the water systems on site. Areas considered include:

- the presence of legionella bacteria
- conditions suitable for multiplication of legionella bacteria
- sources of breathable droplets
- the presence, susceptibility and number of people who may be exposed
- review of current control measures and system of control

The most significant concerns found from these key areas are highlighted in the executive summary.

Individual calculations can be found in the Evaluation of the Risk Factors (Section 5).

The presence of legionella bacteria

No legionella samples are routinely taken at the site. However, as legionella bacteria are commonly encountered in environmental sources they may eventually colonise manufactured water systems and be found in cooling tower systems, hot and cold water systems and other plant which use or store water.

Conditions suitable for the multiplication of legionella bacteria and presence of breathable droplets
i.e. Temperature 20-45°C, source of nutrients: sludge, scale, rust, algae and other organic matter and biofilms, deadlegs and parts of the system used intermittently.

There was evidence that some systems could potentially provide a source of nutrients for the multiplication of legionella bacteria: CWST 1 & 2 (EIGL 1) and CWST 1 (WSB).

Records show some elevated cold water temperatures across site from tank and mains supplied outlets, however these systems are pre-treated with chlorine dioxide. Evidence shows on the electronic log book that recorded chlorine dioxide levels are acceptable for these outlets. The risk would increase where there is a fault with the dosing system.

There may be some stagnant conditions present in the deadlegs of pipework found within the system. (see Recommendations, section 6 and photos.

The following systems produce breathable droplets whilst operating under normal conditions showers, hand drenches. However, the act of opening a tap and the water striking a surface (e.g. sink or wash basin) or any act that agitates water in an open environment has the potential to create breathable droplets.

For the specific evidence see survey details for individual water systems and the recommendations.

The presence, susceptibility and number of people who may be exposed

It was not possible to identify specific individuals, however a variable proportion of any group of people will be susceptible to legionella infection: risk increases with age and notably for smokers, heavy drinkers and those who are immuno-compromised or have underlying pre-disposed clinical conditions.

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Review of current control measures and system of control

One of the named responsible persons and deputy on the electronic log book have recently left the company. These positions should be filled as soon as possible and the replacements have suitable legionella training.

New additional CWST's recently installed need to be added to the electronic log book for monitoring.

There were no other concerns with regards to the current control measures / monitoring programme. See section 3; System of Control and section 6; Recommendations, monitoring programme for details.

INTRODUCTION

BGS, KEYWORTH – 20 MARCH 2017

Scope of survey and exclusions

This inspection was carried out as a Legionella Risk Assessment in accordance with the ACoP L8 and HSG274 (Legionnaires' disease – The control of Legionella bacteria in water systems) and WCS Group documented in-house Standard Operating Procedures.

This assessment is only valid for the plant and areas listed as described in the site description and asset register. All other plant, known or otherwise to WCS Group, has not been assessed. The scope of works 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 deadlegs associated with the systems assessed, the complex nature of pipework installations, many 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.

WCS Group cannot be accountable for any omissions to this report resulting from information, data, systems or plant not made readily and reasonably accessible by the client.

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

Background to the disease and organisms

Legionnaires' disease is a potentially fatal form of pneumonia which can affect anybody, but which principally affects those who are susceptible because of age, illness, immunosuppression, smoking, etc. It is caused by the bacterium *legionella pneumophila* and related bacteria. Legionella bacteria can also cause less serious illnesses which are not fatal or permanently debilitating.

On average there are about 200-250 reported cases of Legionnaires' disease each year in the UK of which half are contracted abroad. It is thought that the number of cases is underestimated because the symptoms are similar to other illnesses and cases are not generally reported.

Outbreaks have been associated with cooling tower systems, hot and cold water systems in factories, hotels, hospitals and other establishments. Cases of Legionnaires' disease have occurred among staff in the workplace (factories, offices, shops and hospitals); visitors (delivery drivers) and members of the public (patients, hotel guests or passers-by).

Legionellosis (including Legionnaires' disease) is contracted when inhaling tiny droplets of water contaminated with the bacteria. Sources of droplet formation include cooling towers, showers, spa pools, spray taps, water features, sprinkler systems, wash systems, hoses and any other similar spray forming device. It causes a variety of symptoms and can be fatal in about 12% of reported cases. Some groups are higher risk e.g. men, smokers, people aged over 45, and those with certain existing illnesses.

INTRODUCTION

BGS, KEYWORTH – 20 MARCH 2017

Natural history of the legionella bacterium

Legionella bacteria are common and can be found naturally in environmental water sources. They may eventually colonise man-made water systems and can multiply where there are ideal growth conditions, e.g. warm temperatures between 20°C and 45°C and a supply of nutrients such as other bacteria, sediment, sludge and scale. Biofilms help protect legionella from biocides and temperature control.

The bacteria remain dormant in cool temperatures and do not appear to multiply below 20°C. They will not survive above 60°C. They are more virulent at 37°C (human body temperature) than at 25°C.

Legislation - Health and Safety Law

- The Health and Safety at Work Act 1974
- Management of Health & Safety at Work Regs. 1999
- The Approved Code of Practice (ACoP) and Guidance L8: “Legionnaires’ Disease - The Control of Legionella Bacteria in Water Systems” and technical guidance HSG274.
- COSHH Regulations – 2002
- Notification of Cooling Towers and Evaporative Condensers Regulations 1992

Management Responsibilities - ACoP L8 paras 48 - 57

The ACoP L8 requires the Duty holder to appoint a responsible person having sufficient authority, competence and knowledge. Clarity of duties, contact arrangements and defined lines of communication are important. These are to be understood, documented and audited regularly.

Risk Assessment

The ACoP L8 para 23 states that a reasonably foreseeable risk of exposure to legionella bacteria in:

- a) cooling systems with cooling towers, evaporative condensers or dry / wet cooling systems;
- b) hot and cold water services; and
- c) spa pools
- d) other plant and systems containing water that can create and increase risk from legionella during operation or when being maintained.

INTRODUCTION

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The ACoP L8 para 41 states that a number of factors are required to create a risk of acquiring legionellosis, such as:

- a) the presence of legionella bacteria;
- b) conditions suitable for multiplication of the organisms, e.g. suitable temperatures (20°C - 45°C) and deposits that are a source of nutrients for the organism, such as sludge, scale, rust, algae, other organic matter and biofilms;
- c) a means of creating and spreading breathable droplets, e.g. the aerosol generated by cooling towers, showers or spa pools;
- d) the presence (and numbers) of people who may be exposed, especially in premises where occupants are particularly vulnerable, e.g. healthcare, residential and nursing homes.

The Risk Assessment is focussed on establishing whether there is a risk to health and if so what control measures are needed. ACoP L8 para 42 lists some factors to consider. These relate to the water systems and their operation.

Risk Assessor (Legionella Control Association)

The competence of the assessor is of paramount importance and should be matched to the system being assessed. The assessor should be able to demonstrate that they have specialist knowledge of legionella bacteria and of the water system(s) to be assessed, and are competent to carry out the necessary surveys and sampling. In addition the assessor should have undertaken the necessary practical training and gained experience with a competent assessor to be able to assess the systems described below.

Anthony has extensive experience as a Risk Assessor working at a variety of different sized operations. He holds City & Guilds in Plumbing, Levels 2 and 3.

Review of Risk Assessment

The ACoP L8 para 47 states the assessment is a living document and should be reviewed regularly to ensure it remains up-to-date. Arrange to review the assessment regularly and specifically whenever there is reason to suspect that it is no longer valid. An indication of when to review the assessment and what to consider should be recorded. This may result from, e.g.:-

- a) changes to the water system or its use;
- b) changes to the use of the building in which the water system is installed;
- c) the availability of new information about risks or control measures;
- d) the results of checks indicating that control measures are no longer effective;
- e) changes to key personnel;
- f) a case of legionnaires' disease / legionellosis is associated with the system.

INTRODUCTION

BGS, KEYWORTH – 20 MARCH 2017

Schematic

HSG 274 Pt 2 (Introduction, para 13) states that the Risk Assessment should consider and evaluate a description of the water system, including an up-to-date schematic diagram.

The schematic included in this Assessment is a simplified but accurate illustration of the layout of the water system, including parts temporarily out of use. It is not intended to be a comprehensive technical schematic of the buildings water pipe system. The supplied schematic drawing should be updated, with approval from the site Responsible Person, where required and particularly where changes to the system are undertaken.

SITE DESCRIPTION

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

Description of site, water systems and usage

The Environmental & Isotope Geotechnical Laboratories Block 1 (EIGL 1) forms the largest part of the suites of testing laboratories at the British Geological Survey Keyworth site, and is located north side to the front of the site.

The water systems are for domestic use, i.e. toilet, washing, and kitchen facilities and for laboratory use.

The majority of the cold water outlets in this building are supplied by a new pair of boosted cold water storage tanks (CWST), these tanks are dosed with chlorine dioxide along with the incoming mains supplying the tanks. There are a couple of outlets in the building which are mains fed. Hot water is supplied by two calorifiers (CAL).

It was not possible to identify specific individuals, however a variable proportion of any group of people will be susceptible to legionella infection: risk increases with age and notably for smokers, heavy drinkers and those who are Immunocompromised or have underlying predisposed clinical conditions.

There is a list of all systems in the Asset Register (section 4) and further details can be found in the individual survey sections, together with photographs where appropriate.

The site is open 7am – 7pm weekdays.

Seasonal factors

The site is used all year round and there will be little variation in demand on the water systems. The only changes are expected to be due to the fluctuation in temperature of the incoming mains with weather conditions.

Other Relevant Factors

The adiabatic chiller, located outside the plantroom, which is still in use, has been disconnected from the water supply since the last survey.

SITE DESCRIPTION

BGS, KEYWORTH – 20 MARCH 2017

EIGL 2

Description of site, water systems and usage

The Environmental & Isotope Geotechnical Laboratories Block 2 (EIGL 2) forms part of the suites of testing laboratories at the British Geological Survey Keyworth site and is located between the Kingsley Dunham building and EIGL 1.

The water systems are for domestic use, i.e. toilet, washing, and kitchen facilities and for laboratory use.

Cold water is supplied via the two boosted CWST's located outside EIGL 1, only the link kitchen is mains fed.

Hot water is supplied from the two calorifiers located in the NGR plantroom.

It was not possible to identify specific individuals, however a variable proportion of any group of people will be susceptible to legionella infection: risk increases with age and notably for smokers, heavy drinkers and those who are Immunocompromised or have underlying predisposed clinical conditions.

There is a list of all systems in the Asset Register (section 4) and further details can be found in the individual survey sections, together with photographs where appropriate.

The site is open 7am – 7pm weekdays.

Seasonal factors

The site is used all year around and there will be little variation in demand on the water systems. The only changes are expected to be due to the fluctuation in temperature of the incoming mains with weather conditions.

Other Relevant Factors

The unisex toilets located on the ground and 1st floor hot outlets are regulated by thermostatic mixer valves (TMV).

SITE DESCRIPTION

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

Description of site, water systems and usage

The Environmental & Isotope Geotechnical Laboratories Block 3 (EIGL 3) and the Physical Properties & Fluid Processes Laboratory Block (PPFPL) form part of the suite of testing laboratories at the British Geological Survey, Keyworth site, and are located at the centre of the site.

The water systems are for domestic use, i.e. toilet, washing and kitchen facilities and for laboratory use.

The two buildings are included together in one report, because the water services to both buildings are supplied from the PPFPL boiler room and they form two parts of the same system.

Cold water is supplied via the two boosted CWST's located outside EIGL 1.

Hot water is supplied from the two calorifiers (CAL) located in the PPFPL plantroom. There is also a low volume water heater (LVPOU) in lab K105.

It was not possible to identify specific individuals, however a variable proportion of any group of people will be susceptible to legionella infection: risk increases with age and notably for smokers, heavy drinkers and those who are Immunocompromised or have underlying predisposed clinical conditions.

There is a list of all systems in the Asset Register (section 4) and further details can be found in the individual survey sections, together with photographs where appropriate.

The site is open 7am – 7pm weekdays.

Seasonal factors

The site is used all year around and there will be little variation in demand on the water systems. The only changes are expected to be due to the fluctuation in temperature of the incoming mains with weather conditions.

Other Relevant Factors

Lab K108 has a large cold water tank used for experiments, this tank is dosed every 2 weeks with a Milton type disinfectant. See recommendations.

SITE DESCRIPTION

BGS, KEYWORTH – 20 MARCH 2017

NGR

Description of site, water systems and usage

The National Geological Repository (NGR) is the largest building at the site, consisting of a very large store, labs and welfare facilities. It is located to the north of the site, behind EIGL1 & 2.

The water systems are for domestic use, i.e. toilet, washing, and kitchen facilities and for laboratory use.

Cold water is supplied via the two boosted CWST's located outside EIGL 1 and mains water.

Hot water is supplied by two calorifiers (CAL) located in the NGR plantroom and by low volume point of use heaters (LVPOU).

It was not possible to identify specific individuals, however a variable proportion of any group of people will be susceptible to legionella infection: risk increases with age and notably for smokers, heavy drinkers and those who are Immunocompromised or have underlying predisposed clinical conditions.

There is a list of all systems in the Asset Register (section 4) and further details can be found in the individual survey sections, together with photographs where appropriate.

The site is open 7am – 7pm weekdays.

Seasonal factors

The site is used all year around and there will be little variation in demand on the water systems. The only changes are expected to be due to the fluctuation in temperature of the incoming mains with weather conditions

Other Relevant Factors

There are various large sample cutting machines in the NGR, these use water to cool the cutting action. Although some spray can be created during this process all equipment has a screen guard to protect the user. See recommendations.

SITE DESCRIPTION

BGS, KEYWORTH – 20 MARCH 2017

SRMR

Description of site, water systems and usage

The Staff Restaurant & Meeting Room (SRMR) building is located on the south side of the site.

The water systems are for domestic use, i.e. toilet, washing and kitchen facilities.

The sites cold water main enters the basement plantroom where it is dosed with chlorine dioxide, the mains water pipe then splits to supply the SRMR and the rest of the site.

All cold outlets in the SRMR are mains fed.

Hot water is supplied from the calorifier (CAL) located in the basement plantroom, this CAL also supplies GIH and KDB buildings.

It was not possible to identify specific individuals, however a variable proportion of any group of people will be susceptible to legionella infection: risk increases with age and notably for smokers, heavy drinkers and those who are Immunocompromised or have underlying predisposed clinical conditions.

There is a list of all systems in the Asset Register (section 4) and further details can be found in the individual survey sections, together with photographs where appropriate.

The main site is open 7am – 7pm weekdays.

Seasonal factors

The site is used all year around and there will be little variation in demand on the water systems. The only changes are expected to be due to the fluctuation in temperature of the incoming mains with weather conditions

Other Relevant Factors

The majority of hot outlets are regulated by thermostatic mixing valves (TMV).

SITE DESCRIPTION

BGS, KEYWORTH – 20 MARCH 2017

TECHNICAL ENGINEERING

Description of site, water systems and usage

The Technical Engineering building is located to the rear of the site. It is a large single-storey block with workshops, offices and welfare facilities.

The water systems are for domestic use, i.e. toilet, washing and kitchen facilities.

Cold water is supplied by treated mains from the SRMR which enters the building in the plantroom.

Hot water is supplied from a point of use water heater (POU) and low volume water heaters (LVPOU).

It was not possible to identify specific individuals, however a variable proportion of any group of people will be susceptible to legionella infection: risk increases with age and notably for smokers, heavy drinkers and those who are Immunocompromised or have underlying predisposed clinical conditions.

The main site is open from 7 a.m. to 7 p.m. weekdays.

Seasonal factors

The site is used all year around and there will be little variation in demand on the water systems. The only changes are expected to be due to the fluctuation in temperature of the incoming mains with weather conditions.

Other Relevant Factors

None

SITE DESCRIPTION

BGS, KEYWORTH – 20 MARCH 2017

WSB

Description of site, water systems and usage

The William Smith Building is located toward the rear of the site. It is a large modern three-storey L-shaped building, opened in 2009, containing office areas and welfare facilities.

The water systems are for domestic use, i.e. toilet, washing and kitchen facilities.

Cold water is supplied via treated mains water from the SRMR plantroom which supplies kitchen colds. Sanitary flushes are supplied by a rainwater harvester tank and toilet basin colds from a cold water storage tank (CWST).

Hot water is supplied from low volume water heaters (LVPOU).

There is a list of all systems in the Asset Register (section 4) and further details can be found in the individual survey sections, together with photographs where appropriate.

The main site is open from 7 a.m. to 7 p.m. weekdays.

Seasonal factors

The site is used all year around and there will be little variation in demand on the water systems. The only changes are expected to be due to the fluctuation in temperature of the incoming mains with weather conditions.

Other Relevant Factors

All the toilet hand basin water outlets are fixed temperature single outlet sensor taps. Water temperatures are regulated by thermostatic mixing valves (TMV).

The rain water tank supply in the plantroom is switched weekly between mains water and supply from an underground rain water collection tank.

REVIEW OF SYSTEM OF CONTROL

BGS, KEYWORTH – 20 MARCH 2017

| BGS, Keyworth | | Comments |
|--------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Duty Holder detailed | Yes | All details are held on their electronic Log Book, up2date. Gaynor is still a RP. Jason Barrett listed as a RP has left the company and Steven Roberts the deputy has also left. These positions will be filled shortly. |
| Responsible Persons detailed | Requires updating | |
| Deputy Responsible Persons detailed | Requires updating | |
| Water hygiene service provider detailed | Yes | |
| Training Records | Yes | All details are held on their electronic Log Book, up2date. |
| Roles and Responsibilities identified | Yes | These are defined in the on site Log Book. Up2date. |
| Is there a previous Risk Assessment? | Yes | A Risk Assessment was carried out in 2014 by H2O Chemicals and half the site was assessed in July 2016. Due to major works the buildings in this assessment were not assessed until now. |
| Have recommendations been carried out? | Yes | Recommendations have been carried out and signed off where appropriate. |
| Schematics of Plant Layout | Yes | Included in this report, section 7. |
| Description of Safe Operation of water systems | Yes | Operating manuals / instructions for safe operation of systems i.e. chemical dosing, can be found with the systems. |
| Defects Entered into Log Book | Yes | Entered onto Up2date log book. |
| Appropriate Corrective Actions Taken and recorded | Yes | Details on Up2date log book actions page. |
| Signatures or Electronic IDs Against All Records | Yes | Electronic id on Up2date log book. |
| Is a regular review of the control scheme undertaken by the RP or Deputy | Yes | Regular review meetings are held. |
| If chemicals are used in any aspect of the scheme, is relevant Health and safety information available | Yes | Data sheets are displayed with all chemicals. |

REVIEW OF SYSTEM OF CONTROL

BGS, KEYWORTH – 20 MARCH 2017

| BGS, Keyworth | | Comments |
|-----------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Incident plan in the event of plant failure | Yes | Chemical dosing units have e-mail alarm alerts in case of failure. Daily reports sent to WCS contact (Ruth Wallett), BGS (David Kearney) and BGS help desk. |
| Incident plan in the event of an outbreak or positive legionella test | Yes | Legionella policy is displayed in on site Log Book and electronic Log Book. |
| Shut Down & Start Up Procedures | N/a | |
| Calorifiers | | |
| Annual internal Inspection | No | |
| Annual blow down of drain | Yes | Carried out by CBRE |
| Monthly Calorifier Readings | Yes | Carried out by WCS Group, details held on Up2date. |
| Hot Water Services | | |
| Monthly One Min Tap Temps | Yes | Carried out by WCS Group, details held on Up2date. |
| Circulation Loops Checked | Yes | Carried out by WCS Group, details held on Up2date. |
| Annual One Min Tap Temps | Yes | Carried out by WCS Group, details held on Up2date. |
| POUs (< 15 litres) Water Heaters | | |
| Temperature / usage checks | Yes | Carried out by WCS Group, details held on Up2date. |
| Combination Water Heaters | | |
| Annual Inspections | N/a | |
| Cold Water Storage Tanks | | |
| Annual internal Inspection and summer temperature checks | Yes | Carried out by WCS Group, details held on Up2date. New tanks need to be added to Up2date. |
| Cold Water Services | | |
| Monthly Two Min Sentinel Tap Temperatures | Yes | Carried out by WCS Group, details held on Up2date. |
| Annual Two Min Tap Temperatures | Yes | Carried out by WCS Group, details held on Up2date. |

REVIEW OF SYSTEM OF CONTROL

BGS, KEYWORTH – 20 MARCH 2017

| BGS, Keyworth | | Comments |
|--------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------|
| Annual inspection of the insulation on all system components | No | |
| Showers / Rinse Sprays | | |
| Quarterly dismantle, de-scale and clean | Yes | Carried out by WCS Group, details held on Up2date. |
| Base exchange Softeners | | |
| Weekly checks | No | Weekly checks on brine levels may not be required dependent on salt usage. |
| Annual service and disinfect | Yes | Carried out by WCS Group. |
| Infrequently Used Outlets | | |
| Flushing regime in place | Yes | Completed by CBRE and lab managers. Details recorded by help desk. |
| Rotation Records for multiple pumps | N/a | |
| TMVs | | |
| Maintenance regime in place | Yes | Fail safe checks every 6 months and annual disinfection carried out by WCS Group. |
| Expansion Vessels | | |
| Flush and purge to drain as recommended | No | Vessels are fitted with suitable drains to flush. See recommendations. |
| Other Risk Systems | | |
| Relevant checks in place | Yes | Contracts in place for servicing / maintenance of other plant, for example Air Handling Units. |
| | | |

ASSET REGISTER

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| ASSET | SYSTEMS | LOCATION | NOTES |
|-------------------------|----------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------|
| CWST 1 CWST 2 | DCWS / DHWS DCWS / DHWS | Outside plantroom Outside plantroom | Vertical calorifier linked to CAL 2 |
| CAL 1 CAL 2 | DHWS DHWS | Basement plantroom Basement plantroom | Vertical calorifier linked to CAL 2 |
| CDDS | Chlorine Dioxide Dosing System | Basement plantroom | Supplies CWST 1 & 2 |
| ES 1 – 5 | Emergency Showers | Laboratories U020, U021, U028, U029 and internal corridor near U054 | |
| EW 1 – 3 | Emergency Eye Washes | Laboratories U009 (x2), U028 | Only used as hand drenches |
| RO 1 RO 2 – 6 | Reverse Osmosis Unit Reverse Osmosis Unit | 1 st floor plantroom Labs U013, U029, U040, U051, U052 | 2 tanks and filters Table top units |
| AHU 1 – 2 AHU 3 – 10 | Air Handling Units Air Handling Units | EIGL 2 roof plantroom 1 st floor plantroom | |
| HUM 1 – 3 | Humidifiers | 1 st floor plantroom – AHU 7, 9 & 10 | Steam type humidifiers – not in use |
| ACU | Air Cooling Units | Laboratories U010, U014, U034, U035, U036 | Split pack – cooler / condenser |
| PU 1 PU 2 | LTHWS Chilled water | Basement plantroom Basement plantroom | Pressurisation unit for heating Pressurisation unit for cooling water |

ASSET REGISTER

BGS, KEYWORTH – 20 MARCH 2017

EIGL 2

| ASSET | SYSTEMS | LOCATION | NOTES |
|-----------|-----------------------|-----------------------|--------------------------------------------------------------------|
| AHU 1 – 5 | Air Handling Units | EIGL 2 roof plantroom | |
| ES 1 | Emergency Showers | Lab P128 | |
| EW 1 | Emergency Eye Washes | Room P/U004 | Only used as hand drenches |
| PU 1 | Pressurisation Unit | EIGL 2 roof plantroom | Pressurisation unit for cooling water |
| CWS 1 – 3 | Cooling Water Systems | EIGL 2 roof plantroom | Closed loop cooling water systems for instrument / testing cooling |

ASSET REGISTER

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| ASSET | SYSTEMS | LOCATION | NOTES |
|----------------|-------------------|------------------------------------|--------------------------------------------------------|
| CAL 1 CAL 2 | DHWS DHWS | PPFPL plantroom PPFPL plantroom | Vertical calorifier Vertical calorifier |
| POU 1 | DHWS | PPFPL room K105 | 15 litre unvented point of use water heater |
| S 1 | Shower | EIGL 3 1 st floor W102 | Domestic mixer shower installed as an emergency shower |
| CCM | Saws & polishers | EIGL 3 rooms W104, W105 & W106 | Coolant cutting machines |
| AHU 1 | Air Handling Unit | EIGL 3 roof | |
| HUM 1 | Humidifier | PPFPL room K005 | |
| PU 1 | LTHWS | PPFPL plantroom | Pressurisation unit for heating system |

ASSET REGISTER

BGS, KEYWORTH – 20 MARCH 2017

NGR

| ASSET | BGS REF | SYSTEMS | LOCATION | NOTES |
|----------------|----------------------------|-------------------|------------------------------------------|---------------------------------------------|
| CAL 1 CAL 2 | NGR/CAL/002 NGR/CAL/003 | DHWS DHWS | NGR plantroom NGR plantroom | Vertical calorifiers linked at their outlet |
| POU 1 POU 2 | NGR/WHT/010 NGR/CAL/003 | DHWS DHWS | Ground floor gents First floor ladies | 10 litre unvented water heaters |
| S 1 | NGR/SHW/ 013 | Shower | Ground floor gents | Electric shower |
| CCM | - | Saws and grinders | Rooms N015, N016, N017 | Coolant cutting machines |
| WB | - | Water Boiler | Ground floor mess & first floor kitchen | Boiler unit for beverages |
| PU 1 | - | LTHWS | Plantroom | Pressurisation unit for heating system |

ASSET REGISTER

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| ASSET | BGS REF | SYSTEMS | LOCATION | NOTES |
|-------|----------------|-------------------|------------------------|-----------------------------------------|
| CAL 1 | SRMR/HWC/052 | DHWS | Basement plantroom | Vertical mains fed cylinder (600 litre) |
| RS 1 | SRMR/SW/023 | Rinse Spray | Kitchen dish wash area | Cold only |
| AHU 1 | - | Air Handling Unit | Roof | Ventilation and cooling |
| VM | - | Vending Machines | Restaurant | Beverage vending |
| DW | SRMR/DW/024 | Drinking Water | Restaurant | Water fountain dispenser |
| PU 1 | - | LPHWS | Basement plantroom | Pressurisation unit for heating |
| WS 1 | Water Softener | DCWS | Kitchen | Supplies dishwasher |
| DW | SRMR/DW/045 | Dishwasher | Kitchen | |

ASSET REGISTER

BGS, KEYWORTH – 20 MARCH 2017

TECHNICAL ENGINEERING

| ASSET | BGS REF | SYSTEMS | LOCATION | NOTES |
|---------|--------------|--------------------------|-----------------------|--------------------------------------------|
| POU 1 | TECS/HWH/003 | DHWS | Cleaners room | |
| LVPOU 1 | TECS/HWH/004 | DHWS | Gents washroom | |
| LVPOU 2 | TECS/HWH/005 | DHWS | Under mess room sink | |
| LVPOU 3 | No asset | DHWS | Under store room sink | |
| PU 1 | - | LPHWS | Plantroom | Pressurisation unit for heating |
| WB 1 | TECS/TEA/008 | Water Boiler | Mess room | |
| CCM | - | Coolant Cutting Machines | Workshop | Lathes, etc, not connected to water supply |

ASSET REGISTER

BGS, KEYWORTH – 20 MARCH 2017

WSB

| ASSET | BGS REF | SYSTEMS | LOCATION | NOTES |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| CWST 1 CWST 2 | WSB/CWDS/ | Sanitary DCWS | Roof plantroom Roof plantroom | One piece GRP 'rainwater' tank GRP |
| POU 1 POU 2 POU 3 POU 4 POU 5 POU 6 POU 7 POU 8 POU 9 | WSB/HWH/005 WSB/HWH/017 WSB/HWH/025 WSB/HWH/032 WSB/HWH/044 WSB/HWH/052 WSB/HWH/059 WSB/HWH/071 WSB/HWH/079 | DHWS DHWS DHWS DHWS DHWS DHWS DHWS DHWS DHWS | First floor ladies under basins First floor gents under basins First floor tea point under sink Upper ground floor ladies under basins Upper ground floor gents under basins Upper ground floor tea point under sink Lower ground floor ladies under basins Lower ground floor gents under basins Lower ground floor tea point under sink | 10 litre unvented point of use water heaters |
| PU 1 | - | Chilled | Roof plant room | Pressurisation unit for AHU chilled water system |
| AHU 1 AHU 2 | WSB/AHU/001 WSB/AHU/002 | Air Handling Unit Air Handling Unit | Roof plant room Roof plant room | Office ventilation and cooling Atrium ventilation and cooling |
| WB 1 WB 2 WB 3 | WSB/TB/024 WSB/TB/051 WSB/TB/078 | Water Boiler Water Boiler Water Boiler | First floor tea point Upper ground floor tea point Lower ground floor tea point | |
| CW | - | Drinking Water | First , upper ground & lower ground floor tea points | Chilled water dispensers |
| RWT | - | Rainwater tank | Underground outside building | |

EVALUATION OF THE RISK FACTORS

BGS, KEYWORTH – 20 MARCH 2017

The following assessment parameters and associated risk factors have been developed in order to derive a numerical risk value and overall risk rating as per BS8558:2011 8.2 'Risk Scoring Systems'.

Using the Risk Scoring Matrix below, the risk rating is calculated by the addition of the numerical values for each of the risk parameters of each system.

Risk Scoring Matrix

| Risk Parameter | Risk Rating | Numerical Value |
|------------------------------------------|---------------|-----------------|
| A) Formation of Droplets | | |
| Still water | Low | 10 |
| Droplets | Medium | 20 |
| Aerosol | High | 30 |
| | | |
| B) Water Condition | | |
| Chemical regime | Low | 10 |
| Clean | Low / medium | 15 |
| Contaminated | Medium / high | 25 |
| Heavily contaminated | High | 30 |
| | | |
| C) Water temperature | | |
| Below 20°C | Low | 10 |
| 21°C – 25°C | Medium | 20 |
| 26°C – 45°C | High | 30 |
| 46°C – 50°C | Medium | 20 |
| Above 50°C | Low | 10 |
| | | |
| D) Water turnover | | |
| Stagnant | High | 30 |
| Low turnover | Medium | 20 |
| Moderate turnover | Medium / low | 15 |
| High turnover | Low | 10 |
| | | |
| E) Susceptibility of exposed persons | | |
| Average population | Medium | 20 |
| Susceptible population | High | 30 |
| | | |
| F) Population density of exposed persons | | |
| Low density | Low | 10 |
| Medium density | Medium | 20 |
| High density | High | 30 |

EVALUATION OF THE RISK FACTORS

BGS, KEYWORTH – 20 MARCH 2017

System Risk Rating

Having determined the value using the Risk Scoring Matrix above, the risk rating is determined as below:

| Total Numerical Value | Risk Rating |
|-----------------------|-------------|
| 70 – 105 | Low |
| 110 – 140 | Medium |
| 145 – 180 | High |

The overall risk rating for each system must be evaluated in conjunction with other influences observed during the course of the survey and with consideration for systems breakdowns, abnormal operations, commissioning and other unusual circumstances.

| System Risk Rating | | | | | | | | |
|----------------------------------------------|--------------------------|--------------------|---------------------|------------------|--------------------------------------|-----------------------|------------|-------------|
| Asset/Systems | A. Formation of droplets | B. Water Condition | C Water Temperature | D Water Turnover | E. Susceptibility of Exposed Persons | F. Population Density | Risk Score | Risk Rating |
| Typical mixer shower | 30 | 10 | 10 | 15 | 20 | 10 | 95 | Low |
| Typical electric shower | 30 | 10 | 10 | 10 | 20 | 10 | 90 | Low |
| Typical hot outlet over 50°C | 10 | 10 | 10 | 15 | 20 | 10 | 75 | Low |
| Typical mains supplied cold outlet | 10 | 10 | 10 | 10 | 20 | 10 | 70 | Low |
| Typical tank supplied cold outlet under 20°C | 10 | 10 | 10 | 15 | 20 | 10 | 75 | Low |
| Typical tank supplied cold outlet above 20°C | 10 | 10 | 20 | 15 | 20 | 10 | 85 | Low |

PRIORITY RATINGS FOR RECOMMENDATIONS

BGS, KEYWORTH – 20 MARCH 2017

Where an imminent risk to health and safety is found during a legionella Risk Assessment, this will have been communicated to the Site Responsible Person as soon as practicable by use of the High Risk Response notification.

WCS Group Ltd use a straightforward system designed for ease of use and ease of understanding. These categories depend upon the level of risk and relevance to the control of legionella. The following descriptions define the approach used by WCS Group Ltd.

HIGH PRIORITY

Taking action will substantially improve management or control of the risk from legionella.

This requires prompt action.

MEDIUM PRIORITY

Taking action will assist in managing or controlling the risk from legionella.

This requires action.

LOW PRIORITY

Taking action will assist in managing or controlling the risk from legionella.

This requires action.

RECOMMENDATIONS

BGS, KEYWORTH – 20 MARCH 2017

| | | ACTIONED | |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|
| HIGH PRIORITY | | BY | DATE |
| Management | Records naming the new responsible person and deputy when these positions are filled should be displayed on the electronic log book. | | |
| Training | Appropriate staff should be competent to carry out control measures and have relevant training, e.g. how to control the risk from legionella, and other aspects as deemed appropriate. These include the new responsible person and deputy. | | |
| MEDIUM PRIORITY | | | |
| CWST 1 & 2 (EIGL 1 & CWST 1 (WSB)) | Clean the tanks then disinfect the tanks and their downservices as per AcoP L8 and the Guidance document HSG274 part 2. | | |
| Expansion Vessels | Ideally, expansion vessels fitted to the system should be of the 'flow through' type to minimise stagnation of water within them. Where this is not the case, and wherever practical, expansion vessels should be fitted with isolation and drain valves to allow for the draining and flushing of these units. Internal bladders (where fitted) should be replaced according to manufacturer's guidelines. | | |
| Deadlegs | These were seen in the EIGL 3 plantroom at the rear of the lift, under the sink in EIGL 1 lab U032 and the SRMR plantroom (see photos). These deadlegs should be removed from the system. | | |
| WSB mains bypass | The mains water bypass on associated with CWST 2 should be opened and flushed weekly. | | |
| SRMR small water softener | The plant should be serviced by a qualified softener engineer in accordance with the manufacturer's instructions (usually six-monthly, depending upon the softener usage). | | |
| Humidifiers, Air Conditioning Units | Units should be serviced and maintained as per manufacturer's instructions. | | |
| NGR / EIGL 3 cutting machines | Cutting equipment should be kept clean and free from debris. Any water which is recirculated should be periodically tested for bacteria with a dipslide. | | |
| PPFPL Room K108 | The CWST used for tests in this lab should have regular dipslides to ensure the disinfectant used is effective. | | |
| EIGL 1 plantroom humidifiers | Ensure supply pipework to these unused humidifiers is flushed weekly or all associated pipework removed. | | |

RECOMMENDATIONS

BGS, KEYWORTH – 20 MARCH 2017

| LOW PRIORITY | | | |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| AHUs | The cooling coil and condensate tray should be regularly treated with a suitable biocide to provide ongoing protection from micro-organisms. This, however, should not be a substitute for manual cleaning. | | |
| Water boilers and drinking fountains/ dispensers | All units should be serviced and maintained as per manufacturer's instructions. Any filters should be replaced at recommended intervals. | | |

RECOMMENDATIONS

BGS, KEYWORTH – 20 MARCH 2017

Monitoring Programme

This is based on ACoP L8 checklists in HSG274 and the current site Monitoring Programme.

WEEKLY

- Flush through and purge to drain before use without release of aerosols any infrequently used outlets.

MONTHLY

- Check that temperature is below 20°C after running for up to two minutes in the cold water sentinel taps.
- Check temperatures of stored water / flow and return from calorifiers.
- Check a representative selection of other sentinel outlets on a rotational basis.
- For circulating systems: take temperatures at return legs of principal loops (sentinel points) to confirm they are at a minimum of 50°C (55°C in healthcare premises). Temperature measurements may be taken on the surface of metallic pipework.

QUARTERLY

- Dismantle, clean and descale showerheads, including kitchen rinse spray (RS 1).
- For circulating systems: take temperatures at return legs of subordinate loops, temperature measurements can be taken on the surface of pipes, but where this is not possible, the temperature of water from the last outlet on each loop may be measured and this should be greater than 50°C within one minute of running. If the temperature rise is slow, it should be confirmed that the outlet is on a long leg and not that the flow and return has failed in that local area.

SIX MONTHLY

- Check tank water temperature remote from ball valve and mains temperature at ball valve.
- Check water temperatures to confirm the POU water heater operates at 50–60°C or check the installation has a high turnover.

RECOMMENDATIONS

BGS, KEYWORTH – 20 MARCH 2017

Monitoring Programme (continued)

ANNUALLY

- Visually inspect cold water storage tank and carry out remedial work where necessary.
- Inspect the water in the tank. The surface should be clean and shiny and the water should not contain any debris or contamination. If considered necessary it should be cleaned and disinfected.
- Take temperatures at a representative selection of hot water outlets (intermediate outlets of single pipe systems and tertiary loops in circulating systems) to confirm they are at a minimum of 50°C (55°C in healthcare premises) to create a temperature profile of the whole system over a defined time period.
- Take temperatures at a representative selection of cold water outlets to confirm they are below 20°C to create a temperature profile of the whole system over a defined time period. Peak temperatures or any temperatures that are slow to fall should be an indicator of a localised problem.
- Check the plans for both the hot and cold water circuits to make sure they are correct and up-to-date. This should be done by physical examination of the circuits, if possible. Plans should be updated if necessary.
- Check the existence of all water connections to outside services: kitchens, fire hydrants and chemical wash units. Any insulation should be checked to ensure it remains intact. Any water outlets that are no longer used should be removed.
- Visual check on internal surfaces of the calorifier for scale and sludge where possible, or consider the use of a boroscope. The calorifier should then be cleaned if considered necessary.
- A sample to be taken from the hot water calorifier (where possible) to note condition of the drain water for clarity, quantity of debris and temperature.

RECOMMENDATIONS

BGS, KEYWORTH – 20 MARCH 2017

CHLORINE DIOXIDE MONITORING

WEEKLY

- Check operation of chlorine dioxide dosing equipment – dose rate / chemical reserves.

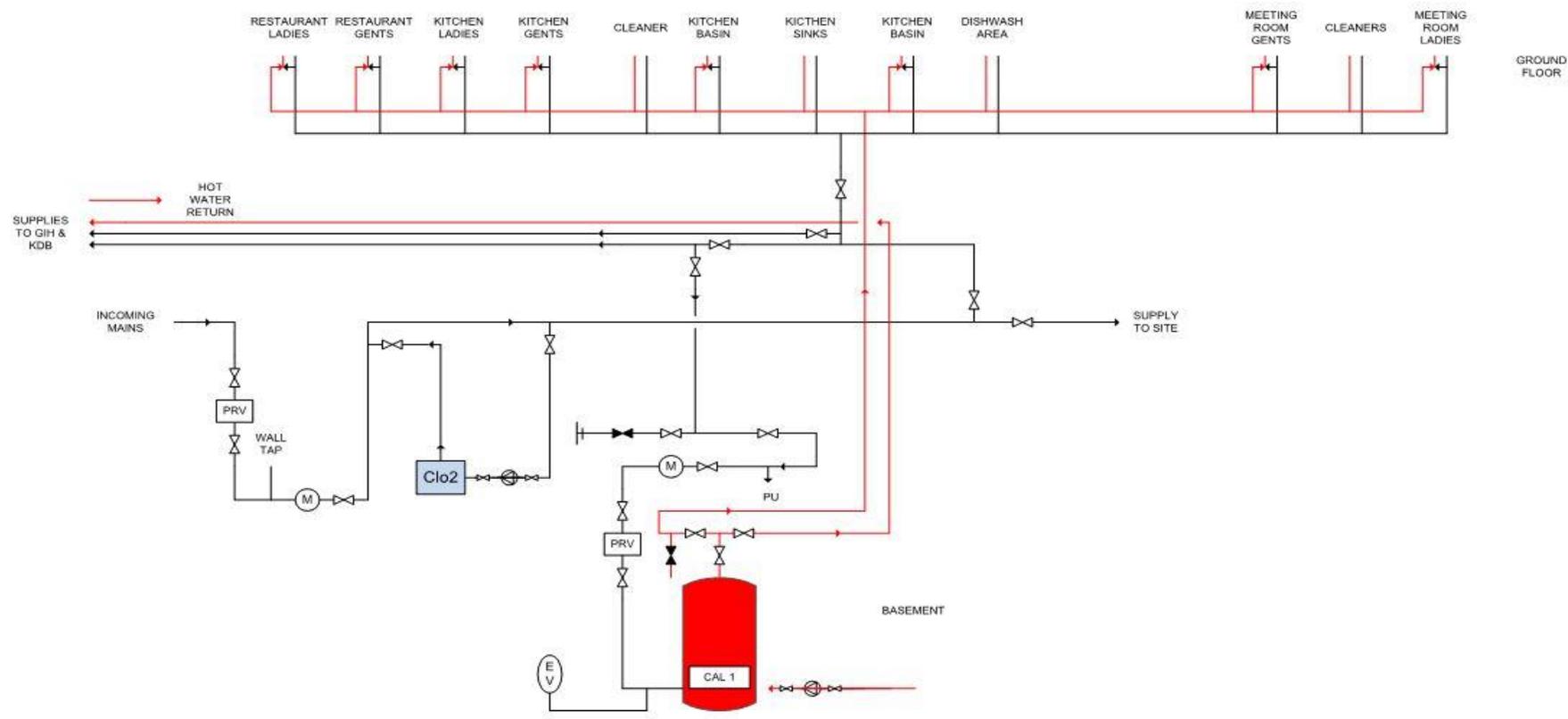
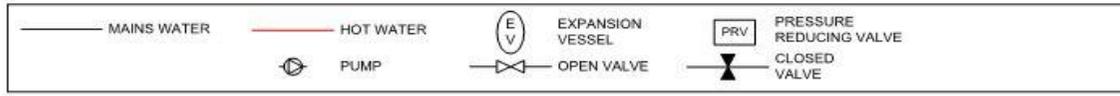
MONTHLY

- Check chlorine dioxide levels at sentinel outlets.

ANNUALLY

- Check chlorine dioxide levels at a representative number of hot and cold water taps on a rotational basis.

SCHEMATIC DRAWINGS



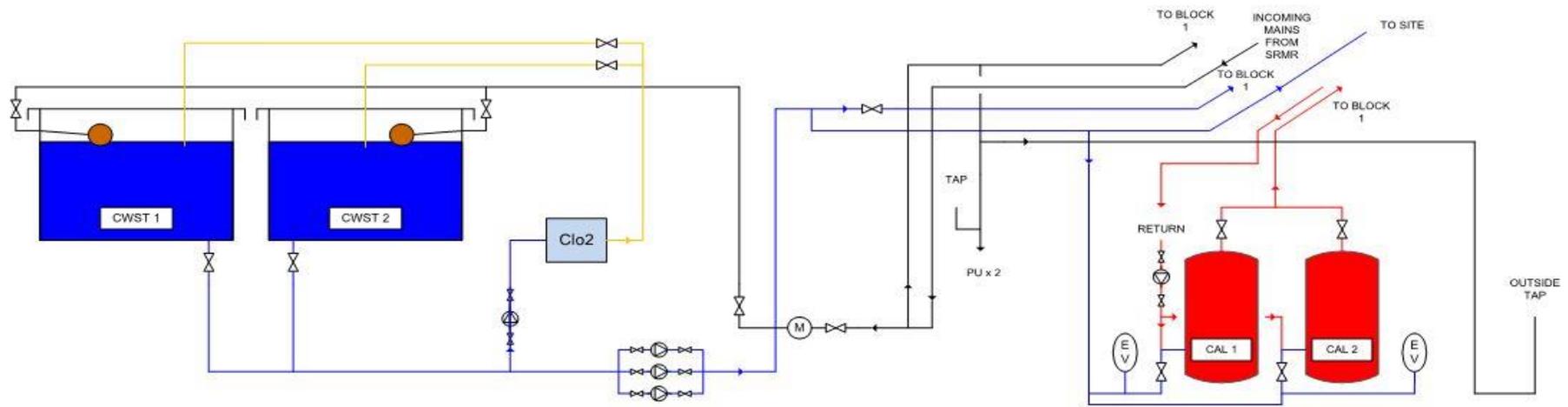
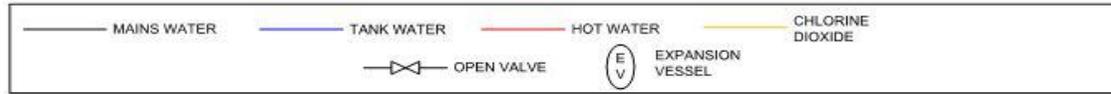
BGS KEYWORTH, SRMR

WATER SCHEMATIC, AS SEEN, NOT TO SCALE

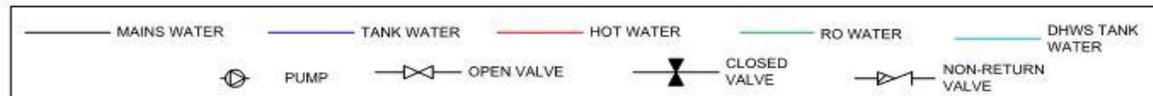
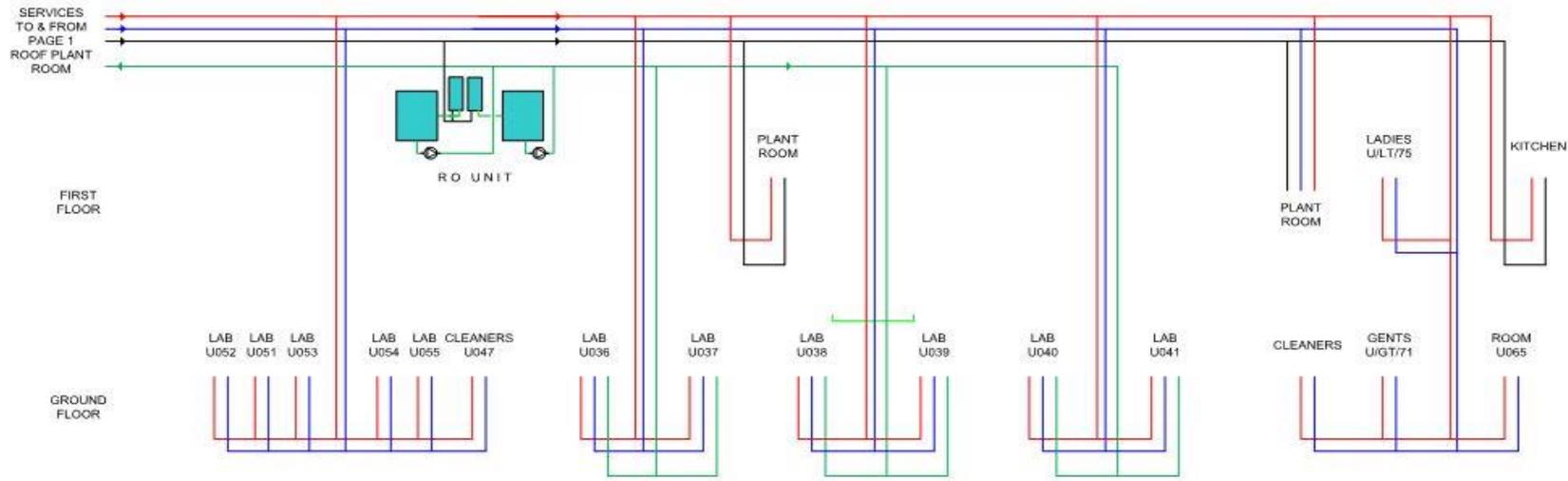
MAR 2017

REVISION 1

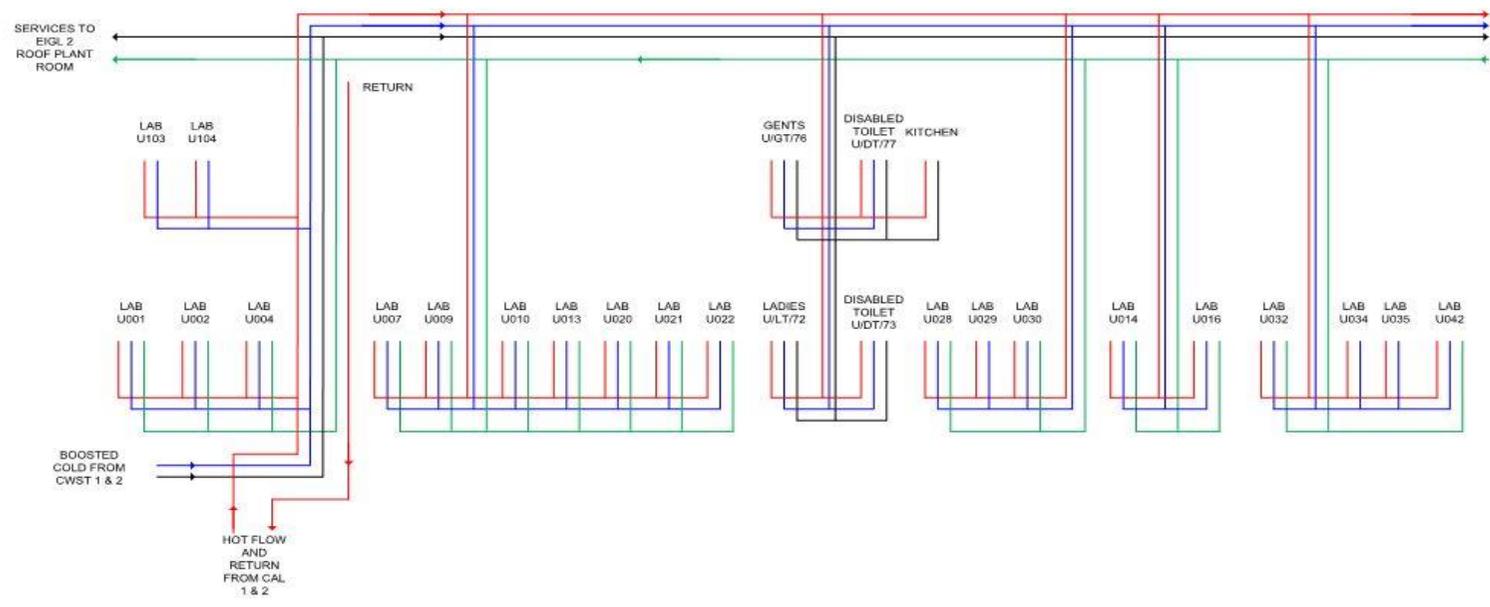
PAGE 1 OF 10



SCHEMATIC DRAWINGS



SCHEMATIC DRAWINGS



BGS KEYWORTH, EIGL BLOCK 1

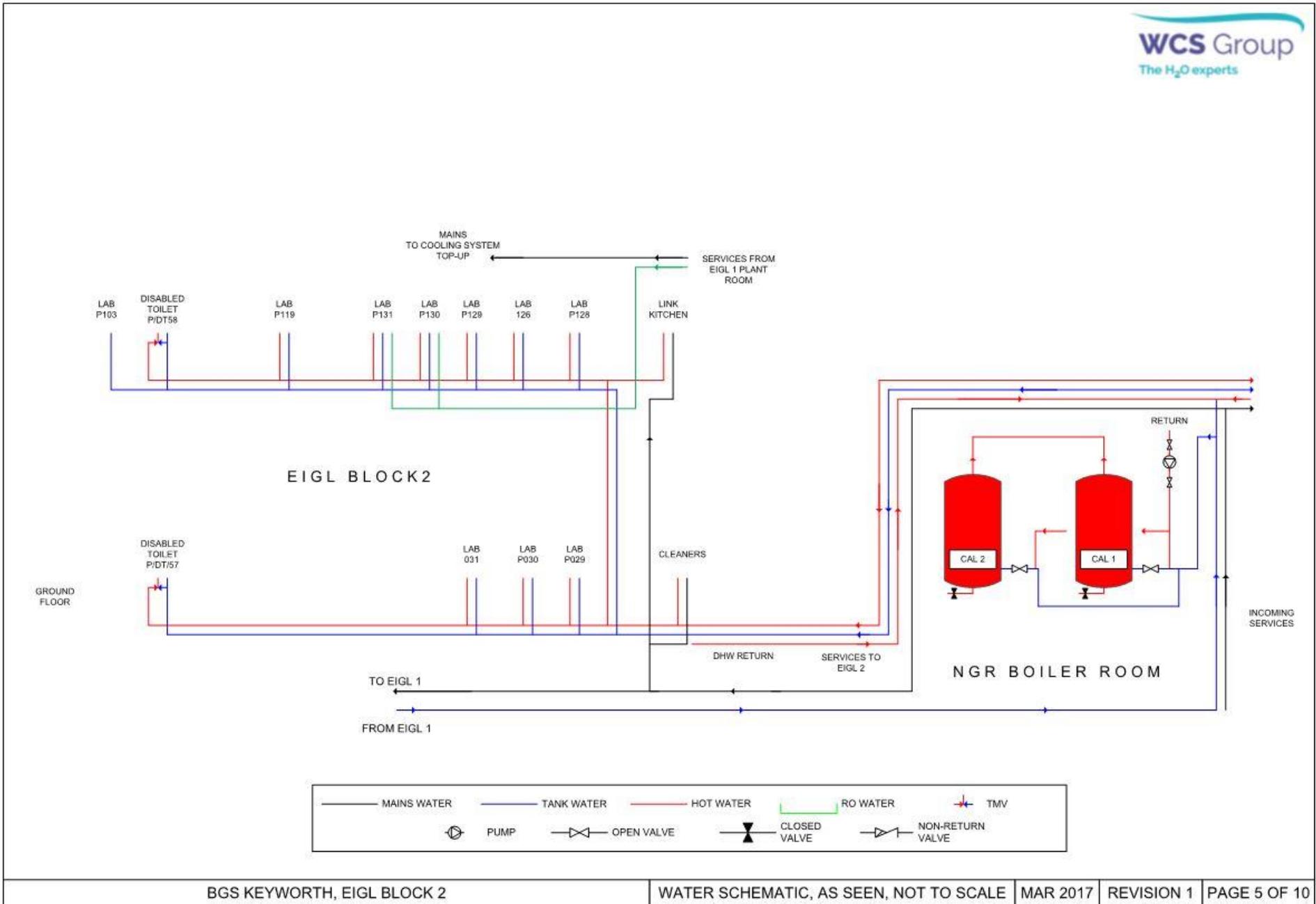
WATER SCHEMATIC, AS SEEN, NOT TO SCALE

MAR 2017

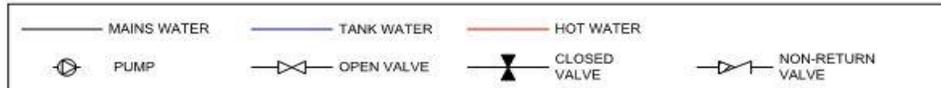
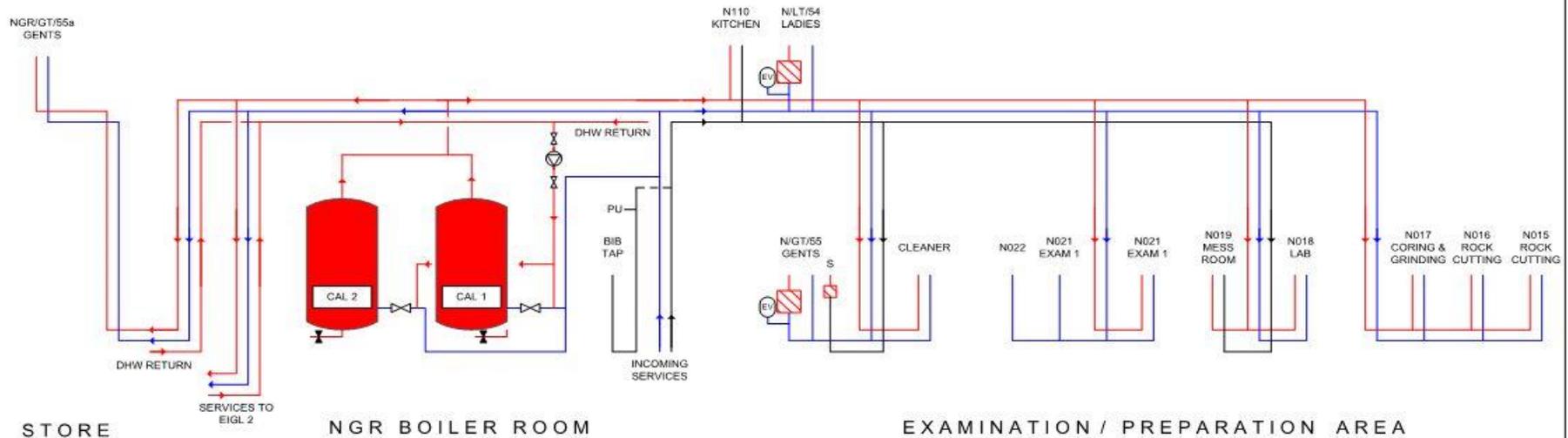
REVISION 1

PAGE 4 OF 10

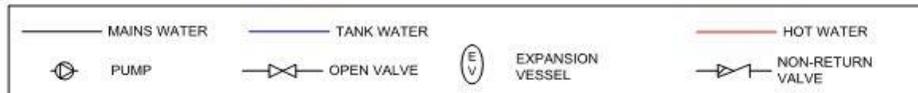
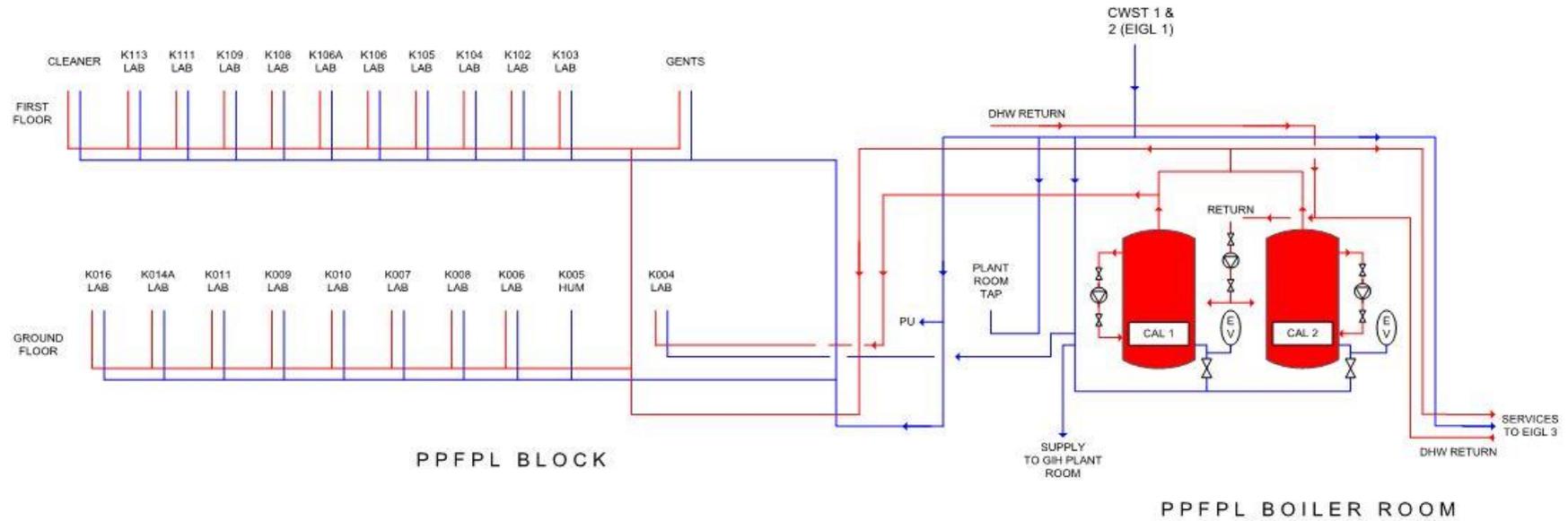
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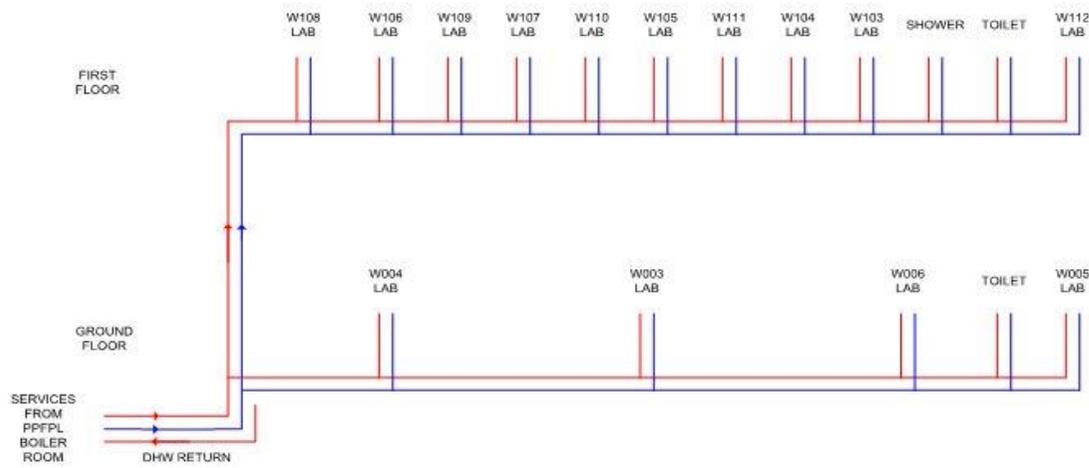
SCHEMATIC DRAWINGS



SCHEMATIC DRAWINGS



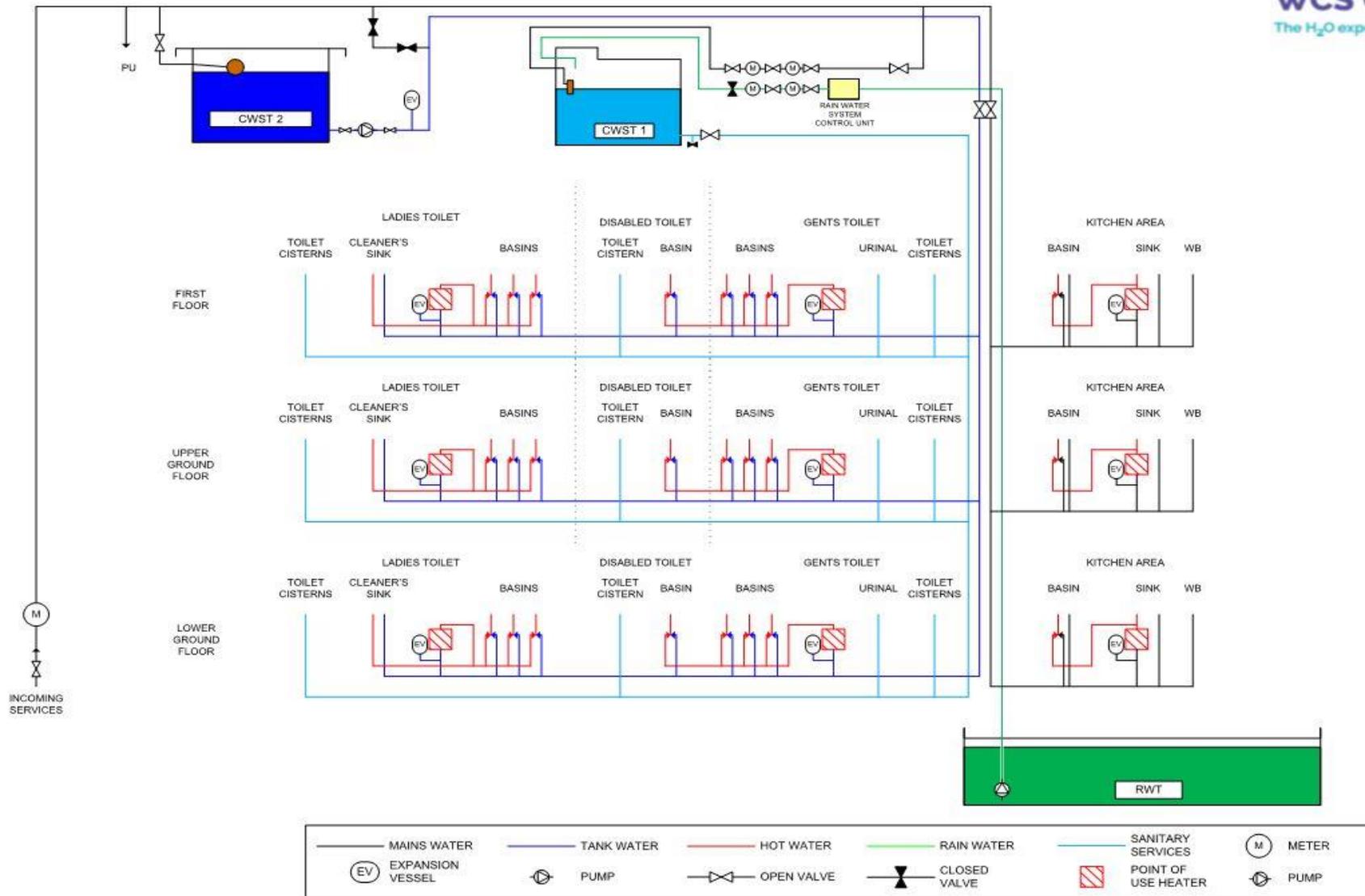
SCHEMATIC DRAWINGS



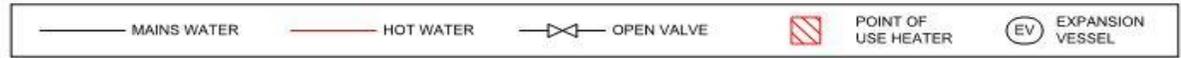
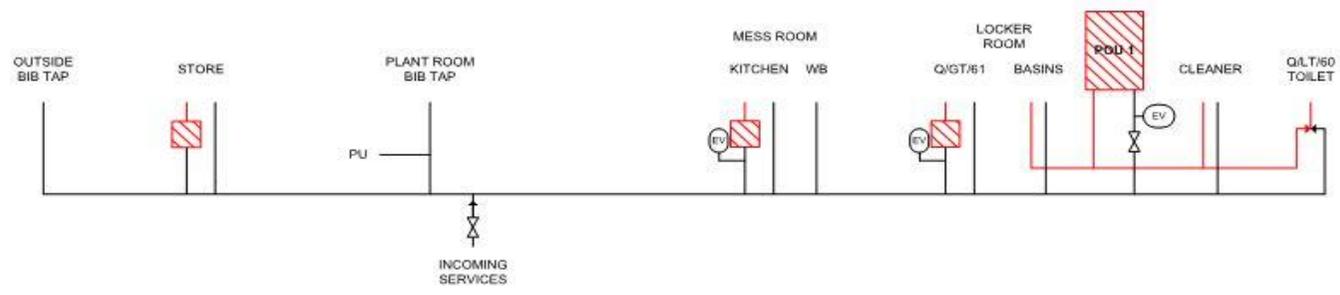
EIGL 3 BLOCK



SCHEMATIC DRAWINGS



SCHEMATIC DRAWINGS



WATER OUTLETS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| Location | Description | Is Area in Use? | Hot Temp °C < 1 min | Cold Temp °C < 2 min | Outlet Tested | Note no(s) |
|---------------------|---------------|-----------------|---------------------|----------------------|---------------|------------|
| Ground Floor | Lab U007 | yes | 57.7 | 18.9 | sink | 1, 2 |
| | Cleaners U047 | yes | 54.3 | 21.1 | sink | |
| | Gents U/GT/71 | yes | 53.1 | 17.5 | wash basin | |
| | Room U065 | yes | 51.6 | 19.3 | wash basin | 3, 4 |
| First Floor | Gents U/GT/76 | yes | 62.2 | 13.0 | wash basin | 5 |
| | Plantroom | yes | 55.8 | 16.1 | sink | 5 |
| | Far kitchen | yes | 50.3 | 19.4 | sink | 5 |

Notes:-

Temperatures shown in bold are out of parameter for Legionella control, or present a scalding risk.

The outlets listed reflect sentinel outlets, some representative outlets, and those deemed to be a potential risk. Other outlets have been assessed in the relevant areas as identified on the schematic drawing.

1. Nearest outlet to CAL 1 & 2
2. Nearest outlet to CWST 1 & 2
3. Furthest outlet from CAL 1 & 2
4. Furthest outlet from CWST 1 & 2
5. Cold mains

WATER OUTLETS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 2

| Location | Description | Is Area in Use? | Hot Temp °C < 1 min | Cold Temp °C < 2 min | Outlet Tested | Note no(s) |
|---------------------|---------------------|-----------------|-------------------------------|----------------------|---------------|------------|
| Ground Floor | Unisex toilet (TMV) | yes | 40.4 51.3 supply | 17.2 | wash basin | 1, 2 |
| First Floor | Unisex toilet (TMV) | yes | 42.0 52.0 supply | 17.4 | wash basin | 1, 2 |
| | Link kitchen | yes | 57.7 | 16.6 | sink | 3, 4 |

Notes:-

Temperatures shown in bold are out of parameter for Legionella control, or present a scalding risk.

The outlets listed reflect sentinel outlets, some representative outlets, and those deemed to be a potential risk. Other outlets have been assessed in the relevant areas as identified on the schematic drawing.

1. Furthest outlet from CAL 1 & 2 (NGR)
2. Furthest outlet from CWST 1 & 2 (EIGL 1)
3. Nearest outlet to CAL 1 & 2 (NGR)
4. Cold mains

WATER OUTLETS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| Location | Description | Is Area in Use? | Hot Temp °C < 1 min | Cold Temp °C < 2 min | Outlet Tested | Note no(s) |
|--------------------------------------|-------------|-----------------|---------------------|----------------------|---------------|------------|
| Ground Floor PPFPL | Lab K004 | yes | 59.7 | 16.1 | sink | 1, 2 |
| First Floor PPFPL | Lab K113 | yes | 56.7 | 19.6 | sink | 3, 4 |
| | Gents | yes | 56.0 | 18.7 | wash basin | |
| Ground Floor EIGL 3 | Toilet | yes | 59.4 | 19.6 | wash basin | 5, 6 |
| | Lab W004 | yes | 59.0 | 19.4 | sink | 7, 8 |
| First Floor EIGL 3 | Toilet | yes | 58.6 | 19.2 | wash basin | 5, 6 |

Notes:-

Temperatures shown in bold are out of parameter for Legionella control, or present a scalding risk.

The outlets listed reflect sentinel outlets, some representative outlets, and those deemed to be a potential risk. Other outlets have been assessed in the relevant areas as identified on the schematic drawing.

1. Nearest outlet to CAL 1 & 2 (PPFPL)
2. Nearest outlet to CWST 1 & 2 (EIGL 1)
3. Furthest outlet from CAL 1 & 2 (PPFPL)
4. Furthest outlet from CWST 1 & 2 (EIGL 1)
5. Furthest accessible outlet from CAL 1 & 2 (PPFPL)
6. Furthest accessible outlet from CWST 1 & 2 (EIGL 1)
7. Nearest outlet to CAL 1 & 2 (PPFPL)
8. Nearest outlet to CWST 1 & 2 (EIGL 1)

WATER OUTLETS

BGS, KEYWORTH – 20 MARCH 2017

NGR

| Location | Description | Is Area in Use? | Hot Temp °C < 1 min | Cold Temp °C < 2 min | Outlet Tested | Note no(s) |
|--------------|------------------------|-----------------|---------------------|----------------------|---------------|------------|
| First Floor | Kitchen N110 | yes | 56.1 | 19.7 | sink | 1, 2 |
| | Store gents NGR/GT/55a | yes | 60.4 | 18.8 | wash basin | 3, 4 |
| | Ladies N/GT/54 | yes | - | 14.9 | wash basin | 5 |
| Ground Floor | Room N015 | yes | 55.5 | 18.8 | sink | 3, 4 |

Notes:-

Temperatures shown in bold are out of parameter for Legionella control, or present a scalding risk.

The outlets listed reflect sentinel outlets, some representative outlets, and those deemed to be a potential risk. Other outlets have been assessed in the relevant areas as identified on the schematic drawing.

1. Nearest outlet to CAL 1 & 2 (NGR)
2. Cold mains
3. Furthest outlet from CAL 1 & 2 (NGR)
4. Furthest outlet from CWST 1 & 2 (EIGL 1)
5. Nearest outlet to CWST 1 & 2 (EIGL 1)

WATER OUTLETS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| Location | Description | Is Area in Use? | Hot Temp °C < 1 min | Cold Temp °C < 2 min | Outlet Tested | Note no(s) |
|---------------------|---------------------------|-----------------|------------------------|----------------------|---------------|------------|
| Ground Floor | Kitchen | yes | 61.8 | 16.5 | sink | 1, 2 |
| | Meeting room ladies (TMV) | yes | 40.7 55.0 supply | 14.1 | wash basin | 2, 3 |

Notes:-

Temperatures shown in bold are out of parameter for Legionella control, or present a scalding risk.

The outlets listed reflect sentinel outlets, some representative outlets, and those deemed to be a potential risk. Other outlets have been assessed in the relevant areas as identified on the schematic drawing.

1. Nearest outlet to CAL 1 (SRMR)
2. Cold mains
3. Furthest outlet from CAL 1 (SRMR)

WATER OUTLETS

BGS, KEYWORTH – 20 MARCH 2017

TECHNICAL ENGINEERING

| Location | Description | Is Area in Use? | Hot Temp °C < 1 min | Cold Temp °C < 2 min | Outlet Tested | Note no(s) |
|---------------------|-------------|-----------------|------------------------|----------------------|---------------|------------|
| Ground floor | Cleaners | yes | 63.3 | 13.1 | sink | 1, 2 |
| | Locker room | yes | 41.3 53.6 supply | 15.9 | wash basin | 2, 3 |

Notes:-

Temperatures shown in bold are out of parameter for Legionella control, or present a scalding risk.

The outlets listed reflect sentinel outlets, some representative outlets, and those deemed to be a potential risk. Other outlets have been assessed in the relevant areas as identified on the schematic drawing.

1. Nearest outlet to POU 1
2. Cold mains
3. Furthest outlet from POU 1

WATER OUTLETS

BGS, KEYWORTH – 20 MARCH 2017

WSB

| Location | Description | Is Area in Use? | Hot Temp °C < 1 min | Cold Temp °C < 2 min | Outlet Tested | Note no(s) |
|--------------------|--------------|-----------------|---------------------|----------------------|---------------|------------|
| Lower Ground floor | Ladies (TMV) | yes | 39.3 60.3 supply | 19.4* | wash basin | 1, 2 |
| | Kitchen | yes | 50.4 | 18.6 | sink | 2, 3 |
| First Floor | Gents (TMV) | yes | LVPOU not on | 17.2* | wash basin | 4 |
| | Kitchen | yes | 55.1 | 15.5 | sink | 2, 3 |

Notes:-

Temperatures shown in bold are out of parameter for Legionella control, or present a scalding risk.

The outlets listed reflect sentinel outlets, some representative outlets, and those deemed to be a potential risk. Other outlets have been assessed in the relevant areas as identified on the schematic drawing.

*temperature taken from pipe.

1. Furthest outlet from CWST 2 (WSB)
2. Hot supplied by LVPOU
3. Cold mains
4. Nearest outlet to CWST 2 (WSB)

COLD WATER STORAGE TANKS

BGS, KEYWORTH – 20 MARCH 2017

CWST 1 & 2 EIGL 1

| Location | Outside EIGL 1 plantroom | System supplies: | DCWS / DHWS |
|------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------|-------------------|
| Identification | | | |
| Structure | Dimensions (m) - (l x w x h) | | 2.0 x 1.0 x 1.5 |
| | Materials of tank | | GRP |
| | Adequate insulation | | yes |
| | Evidence of unapproved WRAS fittings | | no |
| Lid detail | Secure tight fitting lid | | yes |
| | Vent / Screen fitted | | yes |
| Overflow | Rodent screens | | yes |
| Supply | Adequate insulation | | yes |
| | Valved | | yes |
| | Return / Open vent pipes | | no |
| | Fed by | | mains |
| Outlets | Adequate insulation | | yes |
| | Valved | | yes |
| Operation and condition | Temperatures (°C) tank / supply | | 10.1 / 10.7 / 9.9 |
| | Adequate cross flow | | yes |
| | More than one day's usage | | no |
| | Sediment | | light / medium |
| | Biofilm | | no |
| | Corrosion | | none |
| | Internal structure | | good |
|  | | | |
| CWST 1 & 2 | | | |
| Comments | | | |
| Tanks are supplied by mains water treated with chlorine dioxide. Both CWST 1 & 2 are also dosed with chlorine dioxide. | | | |

COLD WATER STORAGE TANKS

BGS, KEYWORTH – 20 MARCH 2017

CWST 1 WSB

| Location | WSB roof plantroom | System supplies: | Sanitary |
|--------------------------------|--------------------------------------|------------------|--------------------|
| Identification | | | |
| Structure | Dimensions (m) - (l x w x h) | | 2.0 x 1.3 x 1.3 |
| | Materials of tank | | GRP |
| | Adequate insulation | | yes |
| | Evidence of unapproved WRAS fittings | | no |
| Lid detail | Secure tight fitting lid | | yes |
| | Vent / Screen fitted | | yes |
| Overflow | Rodent screens | | yes |
| Supply | Adequate insulation | | yes |
| | Valved | | yes |
| | Return / Open vent pipes | | no |
| | Fed by | | mains / rain water |
| Outlets | Adequate insulation | | yes |
| | Valved | | yes |
| Operation and condition | Temperatures (°C) tank / supply | | 17.5 / 11.5 |
| | Adequate cross flow | | yes |
| | More than one day's usage | | unknown |
| | Sediment | | heavy |
| | Biofilm | | no |
| | Corrosion | | none |
| Internal structure | | good | |



CWST 1 (WSB)



CWST 1 INTERNAL (WSB)

Comments

Tank supply is switched weekly between mains supply and rain water.

COLD WATER STORAGE TANKS

BGS, KEYWORTH – 20 MARCH 2017

CWST 2 WSB

| Location | WSB roof plantroom | System supplies: | DCWS |
|--------------------------------|--------------------------------------|------------------|------|
| Identification | | | |
| Structure | Dimensions (m) - (l x w x h) | 1.0 x 1.0 x 0.8 | |
| | Materials of tank | GRP | |
| | Adequate insulation | yes | |
| | Evidence of unapproved WRAS fittings | no | |
| Lid detail | Secure tight fitting lid | yes | |
| | Vent / Screen fitted | yes | |
| Overflow | Rodent screens | yes | |
| Supply | Adequate insulation | yes | |
| | Valved | yes | |
| | Return / Open vent pipes | no | |
| | Fed by | mains | |
| Outlets | Adequate insulation | yes | |
| | Valved | yes | |
| Operation and condition | Temperatures (°C) tank / supply | 12.5 / 11.2 | |
| | Adequate cross flow | yes | |
| | More than one day's usage | unknown | |
| | Sediment | very light | |
| | Biofilm | no | |
| | Corrosion | none | |
| | Internal structure | good | |



CWST 2 (WSB)



CWST 2 INTERNAL (WSB)

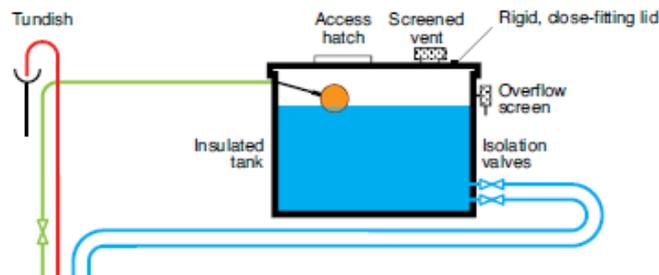
Comments

Design, Construction and Usage

Cold water systems (from HSG274 Part 2)

2.36 The general principles of design should be aimed at avoiding temperatures within the system that encourage the growth of microorganisms including legionella with the following taken into account:

- Cold water storage tanks should be installed in compliance with The Water Supply (Water Fittings) Regulations 1999 and Scottish Water Byelaws 2004. To prevent dirt and other potential nutrients getting in, they should have secure, tightly fitting lids (Figure 2.10). Insect and vermin screens should be fitted to protect any pipework open to the atmosphere, such as the overflow pipe and vent. Where screens are fitted, they should be installed so they do not hold water. To avoid stagnation, where multiple cold water storage tanks are fitted, they should be connected to ensure each tank fills uniformly and water is drawn off through each of the tanks. Access ports should be provided on cold water tanks for inlet valve maintenance, inspection and cleaning.
- All pipe branches to individual outlets should be capable of delivering cold water at a temperature that is as close to the incoming water temperature within two minutes of running.
- The volume of stored cold water should be minimised and should not normally exceed that required for one day's water use although in healthcare premises, a nominal 12 hours total onsite storage capacity is recommended.
- There should be a regular water flow throughout the system and all outlets to avoid stagnation. In cold water storage tanks this can be facilitated by locating inlet and outlet pipes on opposing sides of the tank at different heights (see Figure 2.10).
- Thermal gain should be kept to a minimum by adequate lagging and separation of cold water services pipework and components from hot water services and heating systems; ensuring higher use outlets are installed at the end of each branch to improve flow; and considering, where appropriate, ventilation of void spaces and risers.
- Systems that encourage the movement of cold water in areas of the distribution system that are prone to stagnation and heat gain should be considered.
- All pipework and components carrying fluids other than water supplied by the water supplier and components should be clearly labelled.
- System components and associated equipment which require maintenance are easily accessible.
- Water fittings should only be chosen where they are compliant with The Water Supply (Water Fittings) Regulations 1999 and Scottish Water Byelaws 2004. In the case of non-metallic materials, this will also include conformity with BS 6920. The best method to ensure compliance is to select products from the Water Regulations Advisory Scheme Water Fittings and Materials Directory.



1 **Figure 2.10** Acceptable tank design

CALORIFIERS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| | | |
|--------------------------------|------------------------------------------------------------|----------------------|
| Location | EIGL 1 plantroom | |
| Identification | | CAL 1 & 2 |
| Structure and operation | Configuration | vertical |
| | Calorifier Size (h x w) or water volume (estimated litres) | 500 litres approx |
| | Heat source | LTHW |
| | Fed by | CWST 1 & 2 |
| | Condition of Insulation including pipework | good |
| | System circulated | yes |
| | Shunt pump fitted | yes |
| | Drain present | yes |
| | Temperature gauge present | yes |
| | Storage temperature | 66.0 / 64.0 |
| | Return Temperature | 58.0 |
| Comments | | |

CALORIFIERS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| | | |
|--------------------------------|------------------------------------------------------------|----------------------|
| Location | PPFPL plantroom | |
| Identification | | CAL 1 & 2 |
| Structure and operation | Configuration | vertical |
| | Calorifier Size (h x w) or water volume (estimated litres) | 500 litres approx |
| | Heat source | LTHW |
| | Fed by | CWST 1 & 2 (EIGL 1) |
| | Condition of Insulation including pipework | good |
| | System circulated | yes |
| | Shunt pump fitted | yes |
| | Drain present | yes |
| | Temperature gauge present | yes |
| | Storage temperature | 60.0 / 66.0 |
| | Return Temperature | 54.0 |
| Comments | | |

CALORIFIERS

BGS, KEYWORTH – 20 MARCH 2017

NGR

| | | |
|--------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------|
| Location | NGR plantroom | |
| Identification | | CAL 1 & 2 |
| Structure and operation | Configuration | vertical |
| | Calorifier Size (h x w) or water volume (estimated litres) | 250 litres approx |
| | Heat source | LTHW |
| | Fed by | CWST 1 & 2 (EIGL 1) |
| | Condition of Insulation including pipework | good |
| | System circulated | yes |
| | Shunt pump fitted | no |
| | Drain present | yes |
| | Temperature gauge present | yes |
| | Storage temperature | 64.0 / 65.0 |
| Return Temperature | 54.0 | |
|  | | |
| Comments | | |

CALORIFIERS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| | | |
|-------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------|
| Location | SRMR basement plantroom | |
| Identification | | CAL 1 |
| Structure and operation | Configuration | vertical |
| | Calorifier Size (h x w) or water volume (estimated litres) | 600 litres approx |
| | Heat source | LTHW |
| | Fed by | mains |
| | Condition of Insulation including pipework | good |
| | System circulated | yes |
| | Shunt pump fitted | no |
| | Drain present | yes |
| | Temperature gauge present | yes |
| | Storage temperature | 62.0 / 56.0 |
| | Return Temperature | 55.0 |
|  | | |
| CAL 1 | | |
| Comments | | |

Design, Construction and Usage

Hot water systems (from HSG274 Part 2)

2.37 The general principles of design aim to avoid temperatures within the system that encourage the growth of legionella. Consideration should be given to the following:

Maintaining a supply temperature of at least 60°C from the heat source and / or storage vessel (calorifier):

- the hot water circulating loop should be designed to give a return temperature to the calorifier from each loop of at least 50°C;
- appropriate means for measuring temperature, e.g. thermometer / immersion pockets fitted on the flow and return to the calorifier and in the base of the calorifier;
- all pipe branches to individual outlets should be insulated and sufficiently short to enable the hot water at each outlet to reach 50°C within one minute of turning on the tap;
- the storage capacity and recovery rate of the calorifier should be selected to meet the normal daily fluctuations in hot water use without any significant drop in target supply temperature. The open vent pipe from the calorifier should be sufficiently raised above the water level and suitably sited in the water circuit to prevent hot water from being discharged in normal circumstances. The open vent should ideally discharge to atmosphere via a tundish providing a safe and visible warning of a fault condition;
- where more than one calorifier is used, they should be connected in parallel and deliver water at a temperature of at least 60°C;
- to overcome localised failures in the distribution system, circulating pump design and the correct commissioning of balancing valves are key issues to ensure flow throughout all parts of the hot water system, particularly the hot water return legs. Balancing the hot water system flow and return circuits is critical to avoid long lengths of stagnant pipework that is likely to be at a lower temperature (see Figure 2.11);
- the calorifier drain valve should be located in an accessible position at the lowest point and as close as possible to the vessel, so that accumulated particulate matter can be safely drained;
- all types of water heaters, including storage calorifiers, should be designed and installed so that they are safe to use and maintain, and able to be inspected internally, where possible.

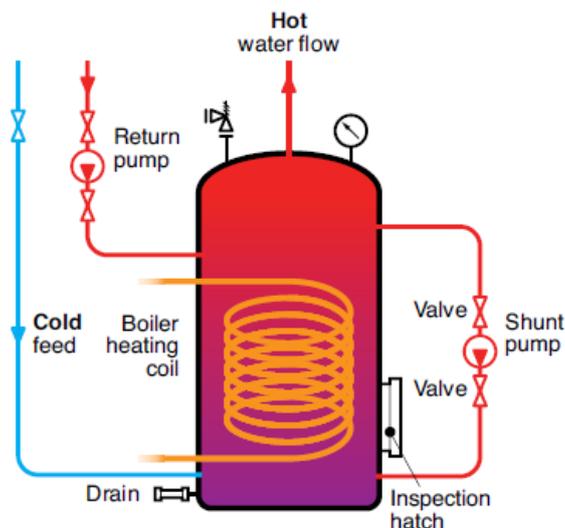


Figure 2.8 Indirect heating calorifier vessel

WATER HEATERS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| Asset Reference | System Usage | Outlet Temps > 50°C ? | Recommendations Required? |
|------------------------|---------------------|---------------------------------|----------------------------------|
| LVPOU 1 | Daily | Yes | No |



LVPOU 1 (PPFPL)

WATER HEATERS

BGS, KEYWORTH – 20 MARCH 2017

NGR

| Asset Reference | System Usage | Outlet Temps > 50°C ? | Recommendations Required? |
|------------------------|---------------------|-------------------------------------|--------------------------------------|
| LVPOU 1 | Daily | Yes | No |
| LVPOU 2 | Daily | Yes | No |

WATER HEATERS

BGS, KEYWORTH – 20 MARCH 2017

TECHNICAL ENGINEERING

| Asset Reference | System Usage | Outlet Temps > 50°C ? | Recommendations Required? |
|-----------------|-----------------|--------------------------|------------------------------|
| POU 1 | Daily | Yes | No |
| LVPOU 1 | Daily | Yes | No |
| LVPOU 2 | Daily | Yes | No |
| LVPOU 3 | At least weekly | Yes | No |

WATER HEATERS

BGS, KEYWORTH – 20 MARCH 2017

WSB

| Asset Reference | System Usage | Outlet Temps > 50°C ? | Recommendations Required? |
|------------------------|---------------------|-------------------------------------|--------------------------------------|
| LVPOU 1 - 9 | Daily | Yes | No |



Typical LVPOU (WSB)

SHOWERS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| Shower | Location | Contamination | Usage | Hot > 50°C | Cold < 20°C | Type |
|------------------|------------------------------------------------|---------------|----------------|---------------|----------------|--------------------------|
| ES 1 - 5 | Lab U020, U021, U028, U029, outside U054 | Clean | Flushed weekly | - | - | Emergency shower |
| EW 1 - 3 | U009 (x2), U028 | Clean | Flushed weekly | - | - | Emergency hand drench |
| Comments: | | | | | | |



TYPICAL EIGL 1 EMERGENCY SHOWER

SHOWERS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3

| Shower | Location | Contamination | Usage | Hot > 50°C | Cold < 20°C | Type |
|------------------------------------------------|----------------------------|---------------|-----------------|---------------|----------------|-----------------------|
| S 1 | 1 st floor W102 | Clean | At least weekly | Yes | Yes | Domestic mixer shower |
| Comments Used as an emergency shower | | | | | | |



S 1 (EIGL 3)



S 1 SHOWERHEAD (EIGL 3)

SHOWERS

BGS, KEYWORTH – 20 MARCH 2017

NGR

| Shower | Location | Contamination | Usage | Hot > 50°C | Cold < 20°C | Type |
|-----------------|--------------------|---------------|-----------------|---------------|----------------|----------|
| S 1 | Ground floor gents | Clean | At least weekly | - | Yes | Electric |
| Comments | | | | | | |



S 1 (NGR)



S 1 SHOWERHEAD (NGR)

SHOWERS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| Shower | Location | Contamination | Usage | Hot > 50°C | Cold < 20°C | Type |
|----------|----------|---------------|-----------------|---------------|----------------|-------------|
| RS 1 | Kitchen | Light scale | At least weekly | - | No | Rinse Spray |
| Comments | | | | | | |



RS 1 (SRMR)



RS 1 SPRAY HEAD (SRMR)

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| | | |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------|
| LOCATION | Location of outlet | EIGL 1 plantroom |
| TYPE | Type of System | Pressurisation unit |
| IDENTIFICATION | Reference | PU 1 |
| | Labelled | Yes |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Low temperature hot water (heating system) |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | None, closed system |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | Not inspected |
| | Assessment of Risk | Very low |
|  | | |
| PU 1 | | |
| Observations: | | |
| The unit supplies a closed system and presents negligible or no risk from legionella. There may be a low risk were the units to be maintained. | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| | | |
|-----------------------------|----------------------------|----------------------|
| LOCATION | Location of outlet | EIGL 1 plantroom |
| TYPE | Type of System | Pressurisation unit |
| IDENTIFICATION | Reference | PU 2 |
| | Labelled | Yes |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Chilled water system |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | None, closed system |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | Not inspected |
| | Assessment of Risk | Very low |



PU 2

Observations:

The unit supplies a closed system and presents negligible or no risk from legionella. There may be a low risk were the units to be maintained.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| | | |
|-----------------------------|----------------------------|-----------------------------------------|
| LOCATION | Location of outlet | EIGL 1 1 st floor plantroom |
| TYPE | Type of System | Reverse osmosis water purification unit |
| IDENTIFICATION | Reference | RO |
| | Labelled | Yes |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Pure water system for lab use |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | >20°C |
| | Direct Spray Formation | None. |
| | Degree of Dirt | None seen |
| | Degree of Biological Slime | None seen |
| | Extent of Corrosion | Not applicable |
| | Assessment of Risk | Low |



Observations:

The reverse osmosis process will filter out any bacteria present within the mains water. RO water system temperatures are usually >20°C, owing to the way the water is recirculated, and it generally reaches the ambient room temperature.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| LOCATION | Location of outlet | Ground floor lab areas |
|-----------------------------|----------------------------|------------------------|
| TYPE | Type of System | Air cooling unit |
| IDENTIFICATION | Designation | ACU |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Local air cooling |
| OPERATION & CONDITION | System Water Temperature | N/A |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | Not inspected |
| | Assessment of Risk | Low |



TYPICAL FAN UNIT



CONDENSER UNITS

Observations:

Water condensing from the cooled air at the ceiling units may create conditions suitable for bacteria to grow. The cooling coils and drainage trays of these units could support bacteria growth and should be regularly inspected and maintained in a clean condition.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| | | |
|----------------------------------|----------------------------|----------------------------------------|
| LOCATION | Location of outlet | EIGL 1 1 st floor plantroom |
| TYPE | Type of System | Humidifier |
| | Designation | HUM |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Air handling unit humidity control |
| OPERATION & CONDITION | System Water Temperature | Ambient mains supply |
| | Outlet Temperature | Steam |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Very low / negligible |



STEAM HUMIDIFIER

Observations:

The units are not used at present and their supplies create deadlegs. Check valves are fitted to the supply where it tees off from the mains.

In use the humidifier works by boiling water to create steam. The boiling sterilises the system.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| | | |
|------------------------------------------|----------------------------|----------------------------------------|
| LOCATION | Location of outlet | EIGL 1 1 st floor plantroom |
| TYPE | Type of System | Air handling unit |
| IDENTIFICATION | Designation | AHU 1 to 10 |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Heating, cooling & ventilation |
| OPERATION & CONDITION | System Water Temperature | N/A |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Low |



AHU U-TRAP

Observations:

Water condensing from the cooled air at the cooling coils within the air handling units may create conditions suitable for bacteria to grow. The cooling coils and drainage trays of these units could support bacteria growth and should be regularly inspected and maintained in a clean condition.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| | | |
|------------------------------------------------------------------------------------|----------------------------|-----------------------------------------|
| LOCATION | Location of outlet | Labs |
| TYPE | Type of System | Reverse osmosis water purification unit |
| IDENTIFICATION | Reference | RO 2 - 6 |
| | Labelled | Yes |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Pure water system for lab use |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | >20°C |
| | Direct Spray Formation | None |
| | Degree of Dirt | None seen |
| | Degree of Biological Slime | None seen |
| | Extent of Corrosion | Not applicable |
| | Assessment of Risk | Low |
| | | |
| Observations: | | |
| The reverse osmosis process will filter out any bacteria present within the water. | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 1

| | | |
|-----------------------------|----------------------------|--------------------------------|
| LOCATION | Location of outlet | EIGL 1 plantroom |
| TYPE | Type of System | Chlorine dioxide dosing system |
| IDENTIFICATION | Reference | CDDS |
| STRUCTURE | Materials of Construction | Mostly plastics |
| | System Serves | Biocide dosing CWST 1 & 2 |
| OPERATION & CONDITION | System Water Temperature | Ambient – as CWST 1 & 2 |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None expected |
| | Extent of Corrosion | N/A |
| | Assessment of risk | Very low |



CHLORINE DIOXIDE DOSING SYSTEM

Observations:

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 2

| | | |
|-----------------------|----------------------------|------------------------------------------------------------|
| LOCATION | Location of outlet | EIGL 2 roof plantroom |
| TYPE | Type of System | Cooling water systems |
| IDENTIFICATION | Reference | CWS 1 – 3 |
| | Labelled | No |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Cooling water for laboratory instrument / testing cooling. |
| OPERATION & CONDITION | System Water Temperature | <20°C to ambient |
| | Outlet Temperature | Closed loop |
| | Direct Spray Formation | None. |
| | Degree of Dirt | Some |
| | Degree of Biological Slime | None seen |
| | Extent of Corrosion | Not applicable |
| | Assessment of Risk | Low |



CHILLED WATER STORAGE VESSEL



CHILLED WATER TANK WITH CHILLER ABOVE

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

| | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------|
| LOCATION | Location of outlet | EIGL 2 roof plantroom |
| TYPE | Type of System | Cooling water systems |
| IDENTIFICATION | Reference | CWS 1 – 3 |
| | Labelled | No |
| <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>CHILLED WATER TANK</p> </div> <div style="text-align: center;">  <p>COOLING COILS IN TANK</p> </div> </div> | | |
| Observations: | | |
| <p>The tanks and vessels are recirculating and supplying water <20°C which is not conducive to bacteria growth. The supplies to these tanks are flushed weekly.</p> | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 2

| | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------|
| LOCATION | Location of outlet | EIGL 2 roof plantroom |
| TYPE | Type of System | Air handling unit |
| IDENTIFICATION | Designation | AHU 1 to 5 |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Heating, cooling & ventilation |
| OPERATION & CONDITION | System Water Temperature | N/A |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Low |
| | | |
| Observations: | | |
| <p>Water condensing from the cooled air at the cooling coils within the air handling units may create conditions suitable for bacteria to grow. The cooling coils and drainage trays of these units could support bacteria growth and should be regularly inspected and maintained in a clean condition.</p> | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------|
| LOCATION | Location of outlet | EIGL 3 Roof |
| TYPE | Type of System | Air handling unit |
| IDENTIFICATION | Designation | AHU |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Heating, cooling & ventilation |
| OPERATION & CONDITION | System Water Temperature | N/A |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Low |
|  <p style="text-align: center;">AHU (EIGL 3)</p> | | |
| Observations: | | |
| <p>Water condensing from the cooled air at the cooling coils within the air handling units may create conditions suitable for bacteria to grow. The cooling coils and drainage trays of these units could support bacteria growth and should be regularly inspected and maintained in a clean condition.</p> | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| | | |
|----------------------------------|----------------------------|--------------------------------|
| LOCATION | Location of outlet | PPFPL lab K005 |
| TYPE | Type of System | Humidifier |
| IDENTIFICATION | Designation | HUM 1 |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Heating, cooling & ventilation |
| OPERATION & CONDITION | System Water Temperature | Ambient mains supply |
| | Outlet Temperature | Steam |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Very low |
| | | |
| Observations: | | |
| | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| | | |
|-----------------------------|----------------------------|------------------------------------------|
| LOCATION | Location of outlet | EIGL 3 Rooms W104 |
| TYPE | Type of System | Coolant cutting machines |
| IDENTIFICATION | Designation | Saws |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Dust suppression / lubrication / cooling |
| OPERATION & CONDITION | System Source | Mains supply |
| | System Water Temperature | >20°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | Possibly in use |
| | Degree of Dirt | None seen |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Low |



SAW



SAW

Observations:

The water is not recirculated. There is likely to be spray / aerosols created during cutting with the saws, but these are guarded and have LEV extraction.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| | | |
|----------------------------------|----------------------------|------------------------------------------|
| LOCATION | Location of outlet | EIGL 3 Rooms W105 – W106 |
| TYPE | Type of System | Coolant cutting machines |
| IDENTIFICATION | Designation | Grinder/polishers |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Dust suppression / lubrication / cooling |
| OPERATION & CONDITION | System Source | Mains supply |
| | System Water Temperature | >20°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | Possibly in use |
| | Degree of Dirt | None seen |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| Assessment of Risk | Low | |



GRINDERS / POLISHERS



GRINDERS

Observations:

The water is not recirculated. There is possibly spray / aerosols created during grinding, however the machines have LEV extraction.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

EIGL 3 / PPFPL

| | | |
|-----------------------------|----------------------------|--------------------------|
| LOCATION | Location of outlet | PPFPL boiler room |
| TYPE | Type of System | Pressurisation unit |
| IDENTIFICATION | Designation | PU 1 |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | LTHWS |
| OPERATION & CONDITION | System Water Temperature | N/A |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Very low |



PU 1

Observations:

The unit supplies a closed system and presents negligible or no risk from legionella. There may be a low risk were the unit to be maintained.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

NGR

| | | |
|-----------------------|----------------------------|--------------------------------------------|
| LOCATION | Location of outlet | Boiler Room |
| TYPE | Type of System | Pressurisation unit |
| IDENTIFICATION | Reference | PU 1 |
| | Labelled | Yes |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Low temperature hot water (heating system) |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | None, closed system |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | Not inspected |
| | Assessment of Risk | Very low |



PU 1

Observations:

The unit supplies a closed system and presents negligible or no risk from legionella. There may be a low risk were the units to be maintained.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

NGR

| LOCATION | Location of outlet | First floor kitchen and ground floor mess room |
|--------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------------------|
| TYPE | Type of System | Water Boiler |
| IDENTIFICATION | Designation | WB |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Beverages |
| OPERATION & CONDITION | System Water Temperature | >50°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of risk | Very low / negligible |
| | | |
| Observations: | | |
| The boiling of the water sterilises the water system and these units do not present a legionella risk. | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

NGR

| | | |
|-----------------------------|----------------------------|------------------------------------------|
| LOCATION | Location of outlet | N015, N016, N017 |
| TYPE | Type of System | Coolant cutting machines |
| IDENTIFICATION | Designation | CCM |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Dust suppression / lubrication / cooling |
| OPERATION & CONDITION | System Source | Mains supply |
| | System Water Temperature | >20°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | Possibly in use |
| | Degree of Dirt | None seen |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Low |



SAW



SAW

Observations:

The water is not recirculated. There is likely to be spray / aerosols created during cutting with the saws, some have LEV extraction.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

NGR

| | | |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| LOCATION | Location of outlet | N015, N016, N017 |
| TYPE | Type of System | Coolant cutting machines |
|  <p>GRINDER</p> |  <p>CUTTER</p> | |
|  <p>CUTTER</p> |  <p>TANK SUPPLYING WATER TO CUTTER</p> | |
| Observations: | | |
| | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| | | |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------|
| LOCATION | Location of outlet | Plant Room |
| TYPE | Type of System | Pressurisation unit |
| IDENTIFICATION | Reference | PU 1 |
| | Labelled | No |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | LPHWS (heating) |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | None, closed system |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | Not inspected |
| | Assessment of Risk | Very low |
|  | | |
| PU 1 | | |
| Observations: | | |
| The unit supplies a closed system and presents negligible or no risk from legionella. There may be a low risk were the units to be maintained. | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| LOCATION | Location of outlet | Roof |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------|
| TYPE | Type of System | Air handling units |
| IDENTIFICATION | Designation | AHU |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Cooling & ventilation |
| OPERATION & CONDITION | System Water Temperature | N/A |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Low |
|  | | |
| AHU 1 | | |
| Observations: | | |
| <p>Water condensing from the cooled air at the cooling coils within the air handling units may create conditions suitable for bacteria to grow. The cooling coils and drainage trays of these units could support bacteria growth and should be regularly inspected and maintained in a clean condition.</p> | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| LOCATION | Location of outlet | Restaurant |
|-----------------------------|----------------------------|-----------------------|
| TYPE | Type of System | Water Dispensing |
| IDENTIFICATION | Designation | DW |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Drinking water |
| OPERATION & CONDITION | System Water Temperature | <20°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None seen |
| | Degree of Biological Slime | None seen |
| | Extent of Corrosion | None seen |
| | Assessment of risk | Very low / negligible |



DW

Observations:

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| LOCATION | Location of outlet | Kitchen |
|-----------------------------|----------------------------|-----------------------|
| TYPE | Type of System | Dish washer |
| IDENTIFICATION | Designation | DW |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Dish washing |
| OPERATION & CONDITION | System Water Temperature | >50°C & <20°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | Contained |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of risk | Very low / negligible |



DW

Observations:

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| | | |
|-----------------------------|----------------------------|----------------|
| LOCATION | Location of outlet | Kitchen |
| TYPE | Type of System | Water softener |
| IDENTIFICATION | Reference | WS 1 |
| | Labelled | Yes |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Dishwasher |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | None. |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | None |
| | Assessment of Risk | Very low |
| | | |
| Observations: | | |
| See recommendations. | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

SRMR

| LOCATION | Location of outlet | Restaurant |
|-----------------------------|----------------------------|-----------------------|
| TYPE | Type of System | Vending Machine |
| IDENTIFICATION | Designation | VM |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Beverages |
| OPERATION & CONDITION | System Water Temperature | >50°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None seen |
| | Degree of Biological Slime | None seen |
| | Extent of Corrosion | None seen |
| | Assessment of risk | Very low / negligible |



VM

Observations:

In-line filters on the supply can harbour bacteria and should be regularly changed during services.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

TECHNICAL ENGINEERING

| | | |
|-----------------------|----------------------------|--------------------------------------------|
| LOCATION | Location of outlet | Plantroom |
| TYPE | Type of System | Pressurisation unit |
| IDENTIFICATION | Reference | PU 1 |
| | Labelled | Yes |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Low temperature hot water (heating system) |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | None, closed system |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | Not inspected |
| | Assessment of Risk | Very low |



PU 1

Observations:

The unit supplies a closed system and presents negligible or no risk from legionella. There may be a low risk were the units to be maintained.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

TECHNICAL ENGINEERING

| | | |
|-----------------------------|----------------------------|---------------------------------------|
| LOCATION | Location of outlet | TEC Workshop |
| TYPE | Type of System | Coolant cutting machine (lathes, etc) |
| IDENTIFICATION | Designation | CCM |
| STRUCTURE | Materials of Construction | Mixed metal |
| | System Serves | Metal cutting & machining |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | Yes |
| | Degree of Dirt | Not seen |
| | Degree of Biological Slime | Not seen |
| | Extent of Corrosion | None |
| | Assessment of risk | Low |



Observations:

The cutting lubricants can support legionella and other bacteria which can cause respiratory disease. Lubricants should contain a biocide and systems should be cleaned regularly every six months.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

TECHNICAL ENGINEERING

| LOCATION | Location of outlet | Mess room |
|-----------------------------|----------------------------|-----------------------|
| TYPE | Type of System | Water Boiler |
| IDENTIFICATION | Designation | WB |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Beverages |
| OPERATION & CONDITION | System Water Temperature | >50°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of risk | Very low / negligible |



WB

Observations:

The boiling of the water sterilises the water system and these units do not present a legionella risk.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

WSB

| | | |
|-----------------------|----------------------------|----------------------------------------|
| LOCATION | Location of outlet | Roof Plant Room |
| TYPE | Type of System | Pressurisation unit |
| IDENTIFICATION | Reference | PU 1 |
| | Labelled | Yes |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | AHU chilled water (air cooling system) |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | None, closed system |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | Not inspected |
| | Assessment of Risk | Very low |



PU1

Observations:

The unit supplies a closed system and presents negligible or no risk from legionella. There may be a low risk were the units to be maintained.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

WSB

| | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------|
| LOCATION | Location of outlet | Roof Plant Room |
| TYPE | Type of System | Air handling units |
| IDENTIFICATION | Designation | AHU |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Heating, cooling & ventilation |
| OPERATION & CONDITION | System Water Temperature | N/A |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of Risk | Low |
| <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>AHU 1</p> </div> <div style="text-align: center;">  <p>AHU 2</p> </div> </div> | | |
| Observations: | | |
| <p>Water condensing from the cooled air at the cooling coils within the air handling units may create conditions suitable for bacteria to grow. The cooling coils and drainage trays of these units could support bacteria growth and should be regularly inspected and maintained in a clean condition.</p> | | |

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

WSB

| LOCATION | Location of outlet | First, upper ground and lower ground tea points |
|-----------------------|----------------------------|-------------------------------------------------|
| TYPE | Type of System | Water Boiler |
| IDENTIFICATION | Designation | WB |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Beverages |
| OPERATION & CONDITION | System Water Temperature | >50°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None |
| | Degree of Biological Slime | None |
| | Extent of Corrosion | None |
| | Assessment of risk | Very low / negligible |



WB

Observations:

The boiling of the water sterilises the water system and these units do not present a legionella risk.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

WSB

| | | |
|-----------------------------|----------------------------|--------------------------------------------------------|
| LOCATION | Location of outlet | First, upper ground and lower ground tea points |
| TYPE | Type of System | Chilled Water Dispensing |
| IDENTIFICATION | Designation | CW |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Chilled drinking water |
| OPERATION & CONDITION | System Water Temperature | <20°C |
| | Outlet Temperature | N/A |
| | Direct Spray Formation | No |
| | Degree of Dirt | None seen |
| | Degree of Biological Slime | None seen |
| | Extent of Corrosion | None seen |
| | Assessment of risk | Very low / negligible |



CW



IN-LINE FILTER

Observations:

Due to their filtering effect in-line filters on the supply can harbour bacteria and should be regularly changed during services.

OTHER SYSTEMS

BGS, KEYWORTH – 20 MARCH 2017

| LOCATION | Location of outlet | Outside underground |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|
| TYPE | Type of System | Rain water harvesting tank |
| IDENTIFICATION | Designation | RWT |
| STRUCTURE | Materials of Construction | Mixed |
| | System Serves | Rain water system |
| OPERATION & CONDITION | System Water Temperature | Ambient |
| | Outlet Temperature | - |
| | Direct Spray Formation | No |
| | Degree of Dirt | Not inspected |
| | Degree of Biological Slime | Not inspected |
| | Extent of Corrosion | Not inspected |
| | Assessment of risk | Very low / negligible |
| | | |
| Observations: | | |
| <p>Commonly rain water systems have an ultra violet unit on the supply to the service tank to kill bacteria in the supply, but there is no such system here.</p> <p>The supply to CWST 1 (WSB) is switched weekly between mains and this supply.</p> | | |



CWST 2 (WSB) OUTLET DEADLEG



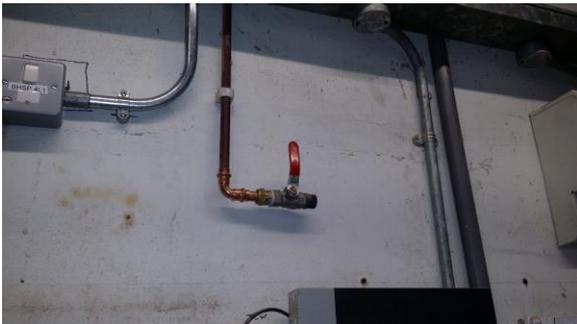
CWST 2 (WSB) EXPANSION VESSEL



TYPICAL TMV



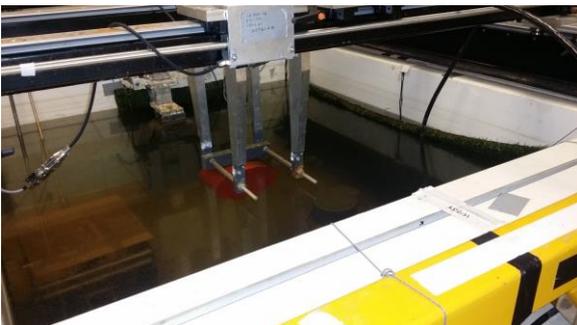
WS 1 (SRMR)



SRMR PLANTROOM DEADLEG



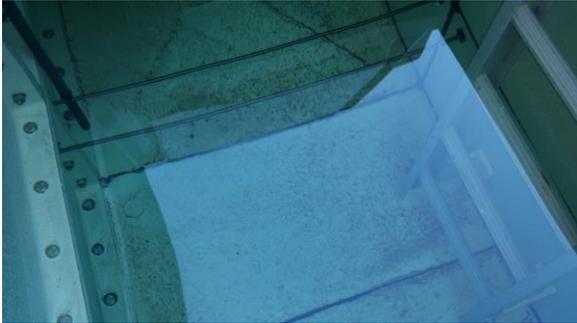
SMALL DEADLEG EIGL 1, LAB U032



PPFPL LAB K108 TEST TANK



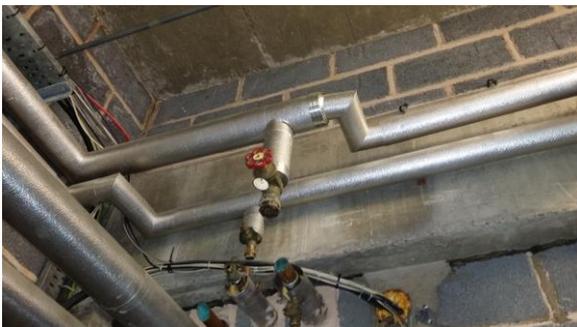
CWST 2 INTERNAL (EIGL 1)



CWST 1 INTERNAL (EIGL 1)



EIGL 3 PLANTROOM DEADLEG (REAR OF LIFT)



PPFPL PLANTROOM DEADLEG



CAL 1 (SRMR) EXPANSION VESSEL