FEEDBACK

We would welcome any comments on this newsletter or contributions to future editions, in particular with regards to:

Future events for consideration
What should SoPHE be providing to our members
Items or comments you think may be worth raising or informing your fellow members
Technical articles from members, giving situations encountered and how they were overcome.

Please email comments to Jonathan Gaunt at jonathan.gaunt@arup.com
Welcome to the Spring 2009 edition of the SoPHE newsletter.

I hope you will agree that this second edition in the new format continues to be a step forward. As you may be aware, we have a new editor Tim McDermott from Little Dragon working with our Communications team who has helped update layout whilst maintaining the informative content.

Inside you will find the results of the SoPHE Young Engineers Award which was announced at last November’s Anniversary Dinner. The Water Sirens were worthy winners of the inaugural Award which has achieved considerable coverage. I hope we are able to continue to use the Award to recognise excellence and to promote our discipline to a wider audience.

On a more sombre note much has been happening in the construction industry driven by external factors, such as the economic downturn. This has an effect on some of the jobs that we work on. As well as the current effect this has on our industry it has the potential to have a knock on effect on the ‘shape’ of our discipline. With the overall workload dropping, recruitment into our industry will be adversely affected. Great strides over the past few years have been taken to develop a graduate entry into our industry through the introduction of the Public Health Engineering Technology at the University of Greenwich. Many of you will be aware that the first cadre of students are working towards their BEng. We need to nurture this initiative, during the difficult times so that we have high calibre graduates to draw on when the economy and the industry recovers.

There are still opportunities in the market, such as upgrading the performance of the existing building stock. I suggest that our design and engineering skills can usefully be deployed refurbishing poorly performing buildings to higher levels of sustainability and adapting them to meet the challenge of a changing climate.

As you will be aware The Environment Agency is predicting an increase in water stress, especially in the South East of England; indeed the agency recently announced the need to meter all residential buildings in order to better manage demand. Water meters can play an important role, however the sensible upgrading of water systems is the next obvious step.

In addition, the Department of Communities and Local Government have revised Part G (Sanitation, hot water safety and water efficiency) of the Building Regulations which aims to reduce demand and improve hot water safety.

The legislation will be laid before Parliament shortly and is planned to come into force late 2009. WRC have organised a series of workshops reviewing changes (details in this edition).

Your feedback and comments on the newsletter would be most welcome.

Martin Shouler
Chairman, SoPHE
A pumber’s life down under - Les Wilson

Every so often a choice work opportunity presents itself and I get to travel down to our Tauranga office in the beautiful ‘Bay of Plenty’.

Towards the end of last year I received a tentative call asking if I would be available to assist on a hospital project further down the coast in Whakatane (pronounced fukka taun!). I was told it would mean spending three or four nights in a cozy little hotel down by the water front and eating at restaurants. It was a tough one… but I let my better judgement guide me and I duly accepted! I spent the next fifteen minutes trying to locate Whakatane on the map.

‘Beca - Tauranga’ had been commissioned by the ‘Bay of Plenty District Health Board’ to investigate the existing services and plant, prior to the preparation of a technical proposal to upgrade the hospital campus. My role involved the following:

a) An overview of the present water services.
b) Identification of potential health risks
c) To evaluate what would have to be undertaken a month or so later

I met up with Janan Bashir who was to lead the on-site investigation. The journey down took us along the Pacific Coast Highway and through some of the most spectacular coastal scenery New Zealand has to offer. Upon arriving at Whakatane hospital I was given a quick run down on its history from Janan. Parts of the campus dated back to the Second World War and originally served as a field hospital to returning service men, whilst other buildings were built through the 60’s, 70’s and 80’s as the hospital expanded. The result was a series of buildings with their respective services in relative stages of repair.

Internal Hot water Reticulation

Once inside the boiler room below the main hospital emergency wing, we noted the hot water flow was being circulated at 160º F (71 ºC) with a return temp of 140 ºF (60 ºC). As wards and consulting rooms above had not been fitted out with TMV’s, we assumed that the water delivery at outlet points must be around 62 - 63 ºC after deducting for inadequate lagging. Healthy adult skin only needs a 5 second exposure at 60 ºC to incur second degree burns and less than 1 second at 70 ºC. Children and the elderly are even more susceptible.

We were informed that the hospital management did not want to install a myriad of TMV’s throughout the hospital during the first phase of the upgrade due to budget constraints and that this issue would be revisited at a later date.

Internal Cold water Reticulation

Internal stainless steel water storage tanks located in a dedicated tank room on the top level of the main emergency block held a combined total of 22,800 ltrs. Two stainless steel tanks with a combined total 7600 ltrs supplied the calorifiers in the basement. We estimated that the tanks provided 20 - 24 hr storage coverage. The kitchen, out patients department, steam and boiler plant and laundry were fed directly off the incoming site main. An internal boosted pump system supplied water directly to the sterilizers, fire hose reels and above storage tanks.

Ongoing alterations, renovations and additions over the years have produced a series of abandoned branches. These had the potential to support the incubation of legionella. Presence of iron and scale sediment act as nutrients in the water and sustain microbes such as algae, amoebae, protozoa and other bacteria. As wards and consulting rooms above had not been fitted out with TMV’s, we assumed that the water delivery at outlet points must be around 62 - 63 ºC after deducting for inadequate lagging.

Healthy adult skin only needs a 5 second exposure at 60 ºC to incur second degree burns and less than 1 second at 70 ºC. Children and the elderly are even more susceptible.

We were informed that the hospital management did not want to install a myriad of TMV’s throughout the hospital during the first phase of the upgrade due to budget constraints and that this issue would be revisited at a later date.

Internal Cold water Reticulation

Internal stainless steel water storage tanks located in a dedicated tank room on the top level of the main emergency block held a combined total of 22,800 ltrs. Two stainless steel tanks with a combined total 7600 ltrs supplied the calorifiers in the basement. We estimated that the tanks provided 20 - 24 hr storage coverage. The kitchen, out patients department, steam and boiler plant and laundry were fed directly off the incoming site main. An internal boosted pump system supplied water directly to the sterilizers, fire hose reels and above storage tanks.

Ongoing alterations, renovations and additions over the years have produced a series of abandoned branches. These had the potential to support the incubation of legionella. Presence of iron and scale sediment act as nutrients in the water and sustain microbes such as algae, amoebae, protozoa and other bacteria.

Internal Cold water Reticulation

Internal stainless steel water storage tanks located in a dedicated tank room on the top level of the main emergency block held a combined total of 22,800 ltrs. Two stainless steel tanks with a combined total 7600 ltrs supplied the calorifiers in the basement. We estimated that the tanks provided 20 - 24 hr storage coverage. The kitchen, out patients department, steam and boiler plant and laundry were fed directly off the incoming site main. An internal boosted pump system supplied water directly to the sterilizers, fire hose reels and above storage tanks.

Ongoing alterations, renovations and additions over the years have produced a series of abandoned branches. These had the potential to support the incubation of legionella. Presence of iron and scale sediment act as nutrients in the water and sustain microbes such as algae, amoebae, protozoa and other bacteria.

Identified Health and Safety Risks

- Ongoing alterations, renovations and additions over the years have produced a series of abandoned branches. These had the potential to support the incubation of legionella. Presence of iron and scale sediment act as nutrients in the water and sustain microbes such as algae, amoebae, protozoa and other bacteria.

- It was soon apparent that to keep the hospital up and running over the years, the existing services had been continuously extended. What we now inspected appeared to be a mish mash of add-ons and patch ups.

- Another example of a valved off branch.

General Water Pipe work

- Cont....
General Water Pipe work

We noted the use of dissimilar metals such as galvanized steel directly joined to copper and vice versa without di-electric couplings in the water system. This may be the product of ongoing maintenance and alterations but unfortunately had led to heavy localized corrosion of pipes, fittings and valves. Again this provided a source of nutrient to support bacteria as corroded sediment is slowly absorbed into the water and dissipated throughout the system.

Domestic Reticulation and Fire Water Storage:

Fire fighting capacity consisted of hydrants off a 0150 metered domestic water reticulation serving the hospital site with two back-up external concrete water tanks with a combined capacity of 900,000 ltrs. These were retained for fire fighting with the idea that a fire tender could draw water from the tanks to fight a fire via a single hydrant coupled to a 0100 suction line. This line was not connected into the site domestic water pipe work infrastructure.

We further learnt that the two 450,000 ltr fire water storage tanks were emptied on an adhoc basis. Perhaps these pumps had deteriorated and perhaps seized up completely.

Disruption of Water Services following a Natural Disaster

The hospital effectively has 24 hrs of internal storage to supply the WC’s, showers and whb’s within the emergency wing. How the rest of the hospital would function following a severe quake was any one’s guess? Effectively, if it lost its incoming main then the following would be severely compromised:

- The main kitchen
- Sterilizers
- Cold water storage tanks (after 24 hrs)
- Main Laundry
- Boilers
- Steam Plant
- All other buildings on the site

We advised that it would realistically take between 2 to 3 days for a council to launch a full emergency water distribution operation utilizing water held in local reservoirs and that available from local sources. Further, key medical facilities such as hospitals and local medical centers should make specific provision for levels of on-site water storage appropriate to their post earthquake function.

Post-disaster estimated water consumption per day

We assumed that essential water services would be restricted by application of an emergency management plan, then possibly, the essential services would be as follows:-

- Potable drinking water
- Kitchen
- Laundry
- Sterilisation processes
- Restricted showers and toilet usage
- Running of essential plant only

The average daily metered water consumption at the hospital is presently 102 m³, in a post-disaster situation, taking into consideration the influx of people to the Hospital, this figure may swell to the order of half the normal average daily consumption again, i.e. 153 m³ per day.

Bulk Water Tanks and Delivery Network

Recommended the following:

- UV treatment plant sized to control the risk. I eventually decided on silver / copper ionization plant on the hot water return.
- The main kitchen
- Sterilizers
- Cold water storage tanks (after 24 hrs)
- Main Laundry
- Boilers
- Steam Plant
- All other buildings on the site

We noted the use of dissimilar metals and replace with a common material

Health and Safety Risks, we recommended the following;

- Identify and remove dead legs and redundant branch pipes as shown in photographed examples on the previous page including the branch tees. If these can not be removed, then the branch left in place should be no longer than its diameter prior to capping off.
- Remove sections of pipe work (300mm either side of joint) inclusive of fittings containing dissimilar metals and replace with a common material

To implement the above scheme, we anticipated that the upgrade of works would involve;

- Structural investigation of existing tanks
- Lining of tanks
- Replacing the pumps adjacent to the tanks with a VSD pump set
- UV treatment plant sized to meet the peak water flow for the whole hospital
- Alterations to the existing reticulation to allow for a new pump boosted line to link up the existing two 0150 water mains.

As I write this, we are awaiting on the Bay of Plenty District Health Board’s decision.

The lighter side of public health

We recommended that the two existing 450,000 ltrs concrete storage tanks be utilised as a bulk reservoir of water, thus forming an integral part of the main water supply. With the tanks feeding the entire combined domestic and fire water site reticulation on a rotation basis of 2 days on / 2 days off, each tank would be ensured of an adequate turnover of water. The draw-off configuration from the tanks would also provide an adequate redundancy for fire fighting.

We estimated that the hospital at any time (barring further expansion) would have a secure supply for 3 days plus. This would not only provide a secure source of potable water for culinary purposes, but also provide a secure source to the sterilizers, steam plant, laundry and boiler room.
BALANCING RECIRCULATING HOT WATER SYSTEMS

David Corner, Technical Manager, Oventrop UK Ltd.

To ensure that a recirculating hot water system works efficiently and economically, it is essential to balance the hot water circuit so that all circulation points achieve optimum flows to maintain ideal temperatures.

If adequate balancing is not carried out, remote areas will take longer to achieve desired outlet temperatures. Additionally, areas that do not have adequate circulation temperatures will be at greater risk of allowing the growth of Legionella bacteria.

Traditionally, the balancing of the hot water return has been very crudely achieved by the use of lockshield ball valves or double regulating valves. However, due to the very low flow rates required to provide only enough water to satisfy the circulation needs, this process has relied on balancing by measurement of the return temperature with a touch thermometer and setting the valves in a virtually closed position.

One approach to try to overcome this scenario has been to increase the flow demand to levels that can be measured by traditional low flow commissioning stations. Whilst this allows the installer and the designer to achieve measurable flows, it consequently results in increasing greatly the volume of circulating water. This substantially increases the pump size, absorbed energy and heat required for the additional water.

As draw-off occurs, the dynamics of circulating water change as the water takes the least line of resistance through the open outlets. At this point, the static balancing carried out using traditional valves has very little effect and will not return to being effective until there is no draw off from any part of the system.

Setting up a HWS circulation using traditional valves is very difficult, even in ideal situations, due to the low flow rates and the use of touch thermometers. However, the exercise is made more difficult by the need to maintain temperature control. These valves measure the water temperature as it passes across their sensing element and adjusts the flow of water accordingly. The valves are either factory preset or adjusted on site to give a desired control temperature. If the sensed water temperature is too low with reference to the set temperature, the valve will open to allow more water to heat the return. If the water temperature is at or above the control temperature, the valve will throttle to reduce the flow of water and allow it to lose more heat. It is important that when the valve throttles, it always allows a minimum of residual volume of water to pass through the valve. This is necessary as the valve must always have water passing across the sensor to sense and control the temperature.

Essentially, the desire is to balance the water within the circuit in order to achieve good circulation temperatures within the entire system. The best way to do this is to monitor the temperatures within the pipework and to continually increase or decrease the flows to achieve the desired temperatures in reaction to draw-off from the system. This is not possible with traditional valves.

Temperature balancing valves are designed to provide this level of control. These valves measure the water temperature as it passes across their sensing element and adjusts the flow of water accordingly. The valves are either factory preset or adjusted on site to give a desired control temperature. If the sensed water temperature is too low with reference to the set temperature, the valve will open to allow more water to heat the return. If the water temperature is at or above the control temperature, the valve will throttle to reduce the flow of water and allow it to lose more heat. It is important that when the valve throttles, it always allows a minimum of residual volume of water to pass through the valve. This is necessary as the valve must always have water passing across the sensor to sense and control the temperature.

By using these valves, the circulation is constantly measured and the return water taken from all parts of the system dependant on the demand. The system is now in dynamic control and any measuring stations in the sub mains will not achieve repeatable readings as the thermostatic balancing valves will be varying the circulated volume to maintain temperature control. Having therefore balanced the circulation, other static balancing valves or measuring devices on the sub mains are not required.

No specific balancing is required when using thermostatic balancing valves. Each valve needs only to be set to work by changing the desired set point temperature if different from the factory preset. It is then recommended to energise the hot water and allow this to circulate for 48 hours to allow the valves and the system to settle. After this period, the temperatures should be checked using the built-in temperature gauges. In certain reference positions, it may be provident to install BMS sensors to electronically monitor the temperatures.

Control of Legionella and disinfection of HWS circulation should be considered when designing systems to reduce the risk of any Legionella outbreaks. A risk assessment should be made by the user to determine the frequency and timing of disinfection process. It is essential that all parts with the HWS system are subjected to the disinfection process by raising the storage and distribution temperature above 70°C to kill the Legionella spores. To minimise the period of high temperature within the system whilst carrying out a thorough disinfection, it is recommended to increase the flow rates through the pipework. Thermostatic balancing valves will respond to the higher temperatures passing across their sensor and open to a disinfection position allowing a greater flow rate of water. To ensure that not only the preferred circuits see the higher temperature at the higher volume, the thermostatic balancing valve must be able to control the volume flow rate during disinfection by returning back to the residual flow once the valve has sensed 70°C. To optimise the disinfection period, BMS sensors at the system extremities to monitor when the higher temperatures are reached may be beneficial.

The use of thermostatic balancing valves for temperature control during normal operation and disinfection periods will ensure the HWS circulation is as economical and efficient as possible.

Little Dragon - Behind the scenes of the SoPHE Newsletter

Looking to make the most of your marketing budget?

Little Dragon is a small marketing and graphic design agency based in North Yorkshire.

We could tell you about our clients around the country, including SoPHE, and the years of experience we have, but what’s more important to us is what Little Dragon can do for you right now.

So call us on 07787 563 244 and together we can breathe some fire into your next project.

Brochures catalogues logos adverts graphic design
Editorials stands banners promotional products branding
The new edition of the Building Regulations: Part G

The Building Regulations set standards for the design and construction of buildings, primarily to ensure the safety and health for people in or around those buildings. A new edition of Part G (Sanitation, hot water safety and water efficiency) will be laid before Parliament in March 2009 and will come into force in October 2009.

The new edition will bring about significant changes to the design of hot and cold water supplies in buildings. It will support sustainability by:

- specifying applications where “non wholesome” water might be used in buildings, such as the use of captured rainwater for toilet flushing; and
- introducing a water efficiency standard for new homes of no more than 125 litres per person per day when assessed using the specified water calculator.

This one-day briefing provides a detailed understanding of the changes to Part G of the Building Regulations in England and Wales. The workshops are being held in June/July to allow you to prepare for the changes and the opportunities that this new edition offers in terms of allowing new technology and benefits to householders.

Programme

09.30 Registration & refreshments & exhibition
10.00 Overview by CLG
10.30 What’s new in Part G
11.00 Cold water supply, WCs, bathrooms and kitchens
11.30 Water efficiency
11.30 Water efficiency
12.30 Lunch & exhibition
13.30 Water efficiency. Hot water systems and safety
11.00 Refreshments & exhibition
11.30 Responsibilities for compliance with Part G
15.00 Close

Visit website: partgworkshops.wrcplc.co.uk

FORUM

The CIBSE website has a discussion forum facility which enables SoPHE members to keep in touch with what is going on in our industry. Whether you want to pose a technical question to and seek answers from other SoPHE members, let others know of technical problems or new products that you have found that might be of use etc. All that we ask is that it is not used as a social forum or as a soapbox.

Unfortunately, since its inception it has not been too widely used, although some people have been using the CIBSE general discussion forum. Please remember, that the more we use it, the more value we will get out of it. In case you have forgotten, to the left is a simple guide on how to use it.

There are a couple of threads that have not been responded to:

1. What is the view to using TMV’s in schools? BB87 is looking for 45 in primary and nursery schools but should we use this every where in toilet areas? Any thoughts would be appreciated.

2. I have been asked by some senior engineers to look for a piece of PH software that will be able to design all aspects of rain water drainage (gutters, siphonic, attenuation etc). We already have MicroDrainage, but (from what I understand) that doesn’t do gutters or siphonic. If anyone uses or knows of a program that may be of help I would appreciate if you would give me a company or software name.

As you can see, the questions are very different in there nature; a technical query and a software/product query. We are sure that there are a lot of members out there who either have an answer to the queries and a great deal more who would benefit from seeing the responses. So please make an effort to look at the SoPHE discussion forum now and again. You may find that someone is having a similar problem to yourself or you may be able to help, so if you feel you can input to the any of the threads, please do so.”
The Society of Public Health Engineers celebrated its 5th Anniversary in November with its annual dinner held for the second consecutive year at the Royal Garden Hotel in London.

The dinner proved to be the best attended to date with over 250 guests. At a time when the construction industry like so many is having difficult times, it was pleasing to see that the Society moving forward and growing. Success has been fuelled by the growing number of Industry Associates joining SoPHE and supporting the event and also by continued growth in membership helped by the Society expanding into new regions throughout the UK.

The evening started early with a drinks reception in the Palace Bar. This year the reception was also an opportunity to view the work on display for the 3 finalists of the “Young Engineers Award”.

The evening events started in the main hall for what was a splendid evening with first class food and wine, keynote speeches, awards ceremony and after dinner drinks. The scene was set with an open ceremony and after dinner drinks. A wine, keynote speeches, awards and also by continued growth in membership helped by the Society expanding into new regions throughout the UK.

The meeting began with Mr Paul Angus welcoming everyone and introducing Professor John Swaffield, President of CIBSE, giving a lecture on: "Consideration of water the new carbon of the future". The evening started early with a drinks reception in the Palace Bar. This year the reception was also an opportunity to view the work on display for the 3 finalists of the “Young Engineers Award”.

The evening concluded with Mr Mike Darvill Chair of the SoPHE Industry Group thanking the sponsors for their support in making the evening possible, and for their £1,000 donation to the WaterAid charity.

As is “tradition” members then retired to the bar to socialise with colleagues and friends in celebrating another year of success.

The following points outline the items that were discussed...

-Where intense conurbations are being built in the area of the least rainfall and the effects of this, including suggestions to modify the plan
-Changes in the gulf stream
-Recycling of water for use in buildings
-Rainfall is changing in its intensity which affects rainwater design
-Potential increase in occurrence of aggressive storms due to climate change
-Types of outlets

Some 40+ delegates took their places on 19th November 2008 at 17:30 pm at the Rain Bar, Manchester.

The meeting concluded with Mr Angus welcoming everyone and introducing Professor John Swaffield, President of CIBSE, giving a lecture on: "Consideration of water the new carbon of the future". The evening started early with a drinks reception in the Palace Bar. This year the reception was also an opportunity to view the work on display for the 3 finalists of the “Young Engineers Award”.

The evening concluded with Mr Mike Darvill Chair of the SoPHE Industry Group thanking the sponsors for their support in making the evening possible, and for their £1,000 donation to the WaterAid charity.

As is “tradition” members then retired to the bar to socialise with colleagues and friends in celebrating another year of success.

The following points outline the items that were discussed...

-Where intense conurbations are being built in the area of the least rainfall and the effects of this, including suggestions to modify the plan
-Changes in the gulf stream
-Recycling of water for use in buildings
-Rainfall is changing in its intensity which affects rainwater design
-Potential increase in occurrence of aggressive storms due to climate change
-Types of outlets

Some 40+ delegates took their places on 19th November 2008 at 17:30 pm at the Rain Bar, Manchester.

The meeting began with Mr Paul Angus welcoming everyone and introducing Professor John Swaffield, President of CIBSE, giving a lecture on: "Consideration of water the new carbon of the future". The evening started early with a drinks reception in the Palace Bar. This year the reception was also an opportunity to view the work on display for the 3 finalists of the “Young Engineers Award”.

The evening concluded with Mr Mike Darvill Chair of the SoPHE Industry Group thanking the sponsors for their support in making the evening possible, and for their £1,000 donation to the WaterAid charity.

As is “tradition” members then retired to the bar to socialise with colleagues and friends in celebrating another year of success.

The following points outline the items that were discussed...

-Where intense conurbations are being built in the area of the least rainfall and the effects of this, including suggestions to modify the plan
-Changes in the gulf stream
-Recycling of water for use in buildings
-Rainfall is changing in its intensity which affects rainwater design
-Potential increase in occurrence of aggressive storms due to climate change
-Types of outlets

Some 40+ delegates took their places on 19th November 2008 at 17:30 pm at the Rain Bar, Manchester.

The meeting began with Mr Paul Angus welcoming everyone and introducing Professor John Swaffield, President of CIBSE, giving a lecture on: "Consideration of water the new carbon of the future". The evening started early with a drinks reception in the Palace Bar. This year the reception was also an opportunity to view the work on display for the 3 finalists of the “Young Engineers Award”.

The evening concluded with Mr Mike Darvill Chair of the SoPHE Industry Group thanking the sponsors for their support in making the evening possible, and for their £1,000 donation to the WaterAid charity.

As is “tradition” members then retired to the bar to socialise with colleagues and friends in celebrating another year of success.

The following points outline the items that were discussed...

-Where intense conurbations are being built in the area of the least rainfall and the effects of this, including suggestions to modify the plan
-Changes in the gulf stream
-Recycling of water for use in buildings
-Rainfall is changing in its intensity which affects rainwater design
-Potential increase in occurrence of aggressive storms due to climate change
-Types of outlets
SELECTION OF ULTRA VIOLET DISINFECTION UNITS
FOR USE IN BUILDING SERVICES GOODWATER LTD

Having recently celebrated 20 years of supplying water treatment products and services to the Building Services sector, Goodwater have forged over this time a reputation for honest and detailed advice to consultants and contractors alike.

Goodwater has been providing UV disinfection plant in the UK since the early 90’s and has considerable technical knowledge and experience in this field.

Our WRAS approved range of UV plant complements the varied products in our portfolio, such as Physical Water Conditioning, Water Softening, Filtration and Chlorine Dioxide dosing, allowing for unbiased and complete advice on a wide range of water treatment issues.

This article aims to provide detailed information covering what UV is and does, how and where it works most effectively, sizing considerations and maintenance issues. Further advice can be sought from our representatives and technical personnel.

What is UV light?

Ultra Violet (UV) light is electromagnetic radiation with a wavelength shorter than that of visible light in the range of 400 nanometers to 100 nanometers. The UV light that reaches earth is generated by the sun and comes in the form of short, medium and long wave lengths known as UV-A, UV-B and UV-C. UV A and B are most commonly associated with sunburn because the earth’s ozone layer filters out most of the UV-C. Both UV-B and UV-C cause damage to DNA; however, it is the stronger UV-C light that is utilised in the process of UV disinfection.

The specific section of the UV spectrum between 185 and 400nm has strong germicidal effects with peak effectiveness around 254nm.

When UV energy comes into contact with a microorganism, it passes through the cell wall and penetrates the DNA, breaking the DNA bonds and preventing the organism from reproducing leading to the death of the organism. UV is effective against all micro-organisms such as bacteria, viruses, mould spores and yeasts. The degree of inactivation by ultraviolet radiation is directly related to the strength of UV dose applied to the water and this is explained in more detail later. Why is UV disinfection needed?

Although mains water is, generally, of good quality and bacteriologically sound, there are numerous risks of microbiological activity occurring within a domestic water system. There are potential risks that bacteria, such as e.coli and Legionella, may grow within water tanks, HWS “cool zones” and underused sections of pipework such as dead legs.

Such contamination can have legal, financial and health implications and can be identified as a risk; once a risk is identified suitable precautions should be taken to reduce that risk. This is especially relevant when taking into consideration the health and safety at work act 1974, concerning the control and prevention of legionella, and HSE ACoP L8. In most cases pasteurisation is used to prevent this risk, however, this is usually not an option on cold water services so alternative processes should be considered.

The primary benefit of UV disinfection is its effectiveness against bacteria in water without the need for additional chemical compounds. UV disinfection is a physical process and therefore does not require the use of any items that have specialist health and safety requirements involving transportation, storage, handling. UV does not introduce toxins or residues into the water and does not alter the chemical composition, taste, odour or pH. UV disinfection has no known carcinogenic or toxic by-products when used in conjunction with an inert housing such as stainless steel.

UV disinfection units do not have any dispersive or residual effects downstream of the unit but do ensure that the water that leaves the unit has been disinfected. However, careful consideration must be given to its positioning within the system to be treated. Treatment is most effective when installed as close as possible to the point of water usage. This is supported by the Health and Safety Executive as detailed in the following extract from L8.

Extract from HSE ACoP L8, Treatment and control programmes. Ozone and UV treatment

“The strategies previously described are dispersive, i.e. they are directly effective throughout the water system downstream from the point of application. A number of other strategies are available, for example UV irradiation or ozone. These systems are not intended to be dispersive and are usually designed to have their effect at or very close to the point of application. This usually results in the active ingredient not being directly measurable in the circulating system. In large systems it may be necessary to use a number of point applications of these treatments and the system suppliers will be able to advise appropriately.”

Therefore, UV based disinfection equipment is best installed at or very close to the point of application. As there can be 10’s or 100’s of outlets in a building, installation of UV disinfection on all of these would be costly and impractical in terms of on going maintenance. As a result, UV is typically installed after a water tank as incoming water from a water undertaker is usually of potable quality and there is a real risk of bacteriological growth within the tank. This risk is due to potentially high ambient temperatures, low water usage and the presence of sediment and biofilms within the tank.

Another popular location for the installation for UV disinfection units is on a purpose built re-circulation loop from the bottom of the storage vessel to the top. Re-circulation loops incorporating UV disinfection and filtration are normally used when there are very large volumes of stored water and the retention time is greater than 8 hours. Turning the tank over 3 times in a 24 hour will help to prevent stagnation and will allow the water to be continuously disinfected. This system has been used at many sites including the redevelopment of Ascot Racecourse.

How are UV units sized?

The sizing of UV disinfection plant is based on four factors, namely:

1. The transmission of UV through the water (otherwise known as the T10 factor).
2. The UV dose rate required to achieve disinfection, normally measured in mJ/cm2.
3. The peak flow rate to be treated.
4. The pressure of the water being treated.

UV light passes most efficiently through cleaner, more transparent water. UK mains water usually has a T10 factor of 90% - 95%. All Goodwater UV units are sized to treat the peak flow rate required based on a 90% T10 factor.

Water within rainwater recycling systems will tend to have a much lower T10 factor, possibly as low as 50% due to the higher level of particulate matter present. This factor will be affected by the level of filtration upstream of the UV plant and can be tested upon completion of a recovery system than on a domestic
The chart below highlights the UV dose rates required to achieve a 99.9% kill for various bacteria. It is commonplace throughout Europe for commercial UV plant to be sized to provide a UV dose rate of at least 30mJ/cm² when operated at the peak flow rate required, at the end of the lamp life. This provides a reasonable safety margin, in particular in cases where the UV lamp is used as the primary disinfection method at the end of the treatment train.

The flow rate at which water passes through a UV disinfection unit, as well as the T10 factor, will determine the dose rate (in mJ/cm²) applied into the water. For example, a unit that is sized to treat a peak flow rate of 5 l/s, based on a T10 of 90% and a UV dose rate of 30mJ/cm², will offer a greater dose rate when the water passes through the unit at lower flows. Similarly, the same UV unit can treat great differences in flows based on different UV dose rates and T10 factors.

The chart above is extracted from a data sheet for a Goodwater unit and demonstrates these different flows and dose rates for a single unit.

The water delivery pressure is also a factor as Goodwater’s standard range of UV units are tested to 15 bar and have a maximum working pressure of 10 bar. However, these units can be adapted to withstand maximum working pressures of 15 bar if necessary. This is an aspect of UV unit sizing that can be overlooked, but is vital to ensure that the unit does not fail.

In summary the size of a UV unit is generally based on treating the peak flow rate required assuming a T10 factor of 90% and a UV dose rate of 30mJ/cm². On rainwater recovery systems, the water to be treated should be tested to establish the T10 factor and the unit can then be sized accordingly.

### Typical Capacity (m³/hr) (at end of lamp life) for Tucana 76-120 C UV Unit

<table>
<thead>
<tr>
<th>UV-C Dosage (mJ/cm²)</th>
<th>20mJ/cm²</th>
<th>30mJ/cm²</th>
<th>40mJ/cm²</th>
<th>50mJ/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose (%) Transmission fluid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99%</td>
<td>9.6m³/hr</td>
<td>6.4m³/hr</td>
<td>4.8m³/hr</td>
<td>3.8m³/hr</td>
</tr>
<tr>
<td>90%</td>
<td>8.6m³/hr</td>
<td>5.7m³/hr</td>
<td>4.3m³/hr</td>
<td>3.4m³/hr</td>
</tr>
<tr>
<td>80%</td>
<td>7.6m³/hr</td>
<td>5.1m³/hr</td>
<td>3.8m³/hr</td>
<td>3.0m³/hr</td>
</tr>
</tbody>
</table>

### Bacteria

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>UV Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clostridium tetani</td>
<td>23.1</td>
</tr>
<tr>
<td>Clostridium botulinum</td>
<td>11.2</td>
</tr>
<tr>
<td>Corynebacterium diphtheriae</td>
<td>6.5</td>
</tr>
<tr>
<td>Dysentery bacilli</td>
<td>4.2</td>
</tr>
<tr>
<td>Eberthella typhosa</td>
<td>4.1</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>6.6</td>
</tr>
<tr>
<td>Legionella bozemanii</td>
<td>3.5</td>
</tr>
<tr>
<td>Legionella gormanii</td>
<td>4.9</td>
</tr>
<tr>
<td>Legionella micdades</td>
<td>3.1</td>
</tr>
<tr>
<td>Legionella longbeachae</td>
<td>2.9</td>
</tr>
<tr>
<td>Legionella pneumophila (Legionnaires Disease)</td>
<td>12.3</td>
</tr>
<tr>
<td>Leptospira canicola</td>
<td>6.0</td>
</tr>
<tr>
<td>Infectious Jaundice</td>
<td>10.5</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa (Envirion Strain)</td>
<td>3.9</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa (Lab. Strain)</td>
<td>3.9</td>
</tr>
<tr>
<td>Pseudomonas fluorescens</td>
<td>6.6</td>
</tr>
<tr>
<td>Salmonella enteritidis</td>
<td>7.6</td>
</tr>
<tr>
<td>Salmonella paratyphi</td>
<td>6.1</td>
</tr>
<tr>
<td>(Enteric Fever)</td>
<td></td>
</tr>
<tr>
<td>Salmonella Species</td>
<td>15.2</td>
</tr>
<tr>
<td>Salmonella typhimurium</td>
<td>15.2</td>
</tr>
<tr>
<td>Salmonella typhi</td>
<td>7.0</td>
</tr>
<tr>
<td>(Typhoid Fever)</td>
<td></td>
</tr>
<tr>
<td>Salmonella</td>
<td>10.5</td>
</tr>
<tr>
<td>Shigella dysenteriae - Dysentery</td>
<td>4.2</td>
</tr>
<tr>
<td>Shigella flexneri – Dysentery</td>
<td>3.4</td>
</tr>
<tr>
<td>Shigella paradysenteriae</td>
<td>3.4</td>
</tr>
<tr>
<td>Spirillum rubrum</td>
<td>6.16</td>
</tr>
<tr>
<td>Streptococcus faecalis</td>
<td>10.0</td>
</tr>
</tbody>
</table>

### Cont...

1. Temperature increases within the unit can cause scale to form on the internal quartz sleeve if the water is not pre-treated against scale build up. Any such scale will hinder the transmission of UV light into the fluid, thereby greatly reducing the unit's efficiency.

2. Excessive increases in temperature can cause the UV lamps to overheat and cause premature failure. This will result in increased maintenance costs.

3. There is a significant risk of the temperatures escalating to levels preferential to bacteriological growth (35 – 45 degrees Celsius) and beyond. This is counter productive when the intention of UV plant is to kill bacteria.

4. Should the temperatures increase beyond these temperatures there is a real risk of scaling, particularly at points close to the UV installation.

5. Repeatedly switching the unit on and off to prevent these temperature rises is not recommended as this may also result in premature lamp failure. Goodwater strongly recommends that all UV units be supplied with a temperature sensor to monitor the chamber temperature. This is linked to a small solenoid valve which is installed downstream of the unit and

Goodwater have considerable experience in this field and are always available to meet to discuss the use of UV units as well as any other water treatment issues.
SOPHE London Region
Technical Presentation – Surface Water Attenuation

On 17th February 2009, Polypipe Water Management Solutions Ltd gave London Region a Technical CPD presentation on the subject of surface water attenuation.

All public health engineers are well aware of the provision of SUDS and retention storage facilities are an important factor in today’s drainage design. The planning authorities guided by the sewerage authorities and Environment Agency now appear to require more and more drainage schemes to have surface water flows limited to an equivalent green field run-off.

Once upon a time this requirement did not apply to brown field sites, but the necessity to control surface water run-off now is becoming standard procedure and establishing the limit for surface water discharge is essential.

The presentation helpfully covered all of the various systems available on the market and gave an insight into their design, testing, Factors of Safety and suitability of use in conjunction with the newly published CIRIA C680 document ‘Structural Design of Modular Geocellular Drainage Tanks’ which highlights the pitfalls of some systems in certain conditions.

The Polypipe ‘Polystorm’ modular units are linked together to form an underground storage facility when wrapped with an appropriate impervious membrane. The modular pattern units are an efficient and cost effective way of providing underground storage. These units are very popular with contractors, who do not need heavy lifting equipment in order to install.

Storage units can be supplied in various grades duties to meet the appropriate vehicle loadings and ground conditions. It is most important that the manufacturer’s and CIRIA’s guidelines are adhered to in this respect. It is strongly recommended that consultation with the manufacturer is undertaken at an early stage to select the appropriate units.

The importance of adequate silt interception before surface water enters the retention chamber was stressed to ensure the long term efficiency of the system. It is important that the building management documentation incorporates guidelines for the silt pit to be regularly cleaned.

In conjunction with their modular units, Polypipe are also able to provide Vortex flow control chambers to limit flow rates from the site to that required by the relevant authority.

Members were reminded that in addition to their use as retention facilities to limit flow, the storage units can also be used as soakaways, when wrapped with an appropriate permeable geotextile.

Further details are on the SOPHE Website, or via www.polypipewms.com.

SoPHE NORTH-WEST UPDATE - Paul Angus

Up in Manchester, SoPHE North West has been going from strength to strength.

The technical meetings, which are held every 2 months, have been attracting record attendances since the region was formed in 2004. Most recently, it was standing room only on the 19th November 2008, where the current CIBSE President Professor John Swaffield provided an interesting and entertaining presentation on the Consideration of water – the new carbon of the future.

Following on from the successful attendance of the meeting in November, the first meeting of 2009 was held on the 21st January in Manchester with over 45 delegates attending.

Also presenting on the evening was Peter Snoad, Geberit Technical Manager who provided an in depth overview of Siphonic Rainwater Design. With over 40 delegates in attendance on the evening the evening was a resounding success with a fine balance between the two presenters being provided.

As a token of appreciation, Professor Swaffield, who had made the trip from Edinburgh with Dr Lynne Jack (Heriot Watt University), was presented with a crystal bowl by Dr. Steve Ingle, on behalf of all those involved with SoPHE North West.

Geberit also kindly sponsored the evening with a terrific buffet, which also provided an opportunity for everyone to network afterwards.

If you are interested in attending future meetings or require further details, these can be obtained by contacting Paul Angus, SoPHE NW Secretary, paul.angus@wsp-group.com

SoPHE SOUTHERN GROUP

Interest has been shown for a Southern group for SoPHE based in the East and West Sussex region. Technical evenings are intended to be run in the Brighton and Worthing area.

Those wishing to join the group should contact Simon Dent on 0754 6583150, 01273 464402 or email design@ilstfd.freeserve.co.uk.

STOP PRESS SoPHE ANOTHER YEAR OLDER

The 6th Anniversary SoPHE annual dinner takes place on the 5th November 2009 at the same venue as last year, The Royal Garden Hotel, Kensington, London, with pre dinner drinks at 5.30pm. Room rates have been negotiated with the hotel for anyone wishing to stay overnight. SoPHE will once again make a donation to our adopted charity Water Aid. Please contact Clare Ollerhead (ollerhead@cibse.org) or Mike Darvill (mike.darvill@roth-uk.com) for further details or visit the SoPHE website.
PREVIOUS TECHNICAL EVENTS (2003-2009)

1. TYCO/WORMALD FIRE SYSTEMS. Life and building fire protection.
   Contact: www.wormald.co.uk

2. MARLEY PLUMBING. Sanitation sizing to BS12056, Part 2.
   Contact: www.marleyplumbinganddrainage.com

3. HYDROTEC UK LTD. Technical overview of physical water conditioners and ultra violet disinfection.
   Contact: www.hydrotec.co.uk

4. A O SMITH (WATER PRODUCTS Co). Assessing, sizing of direct and storage type hot water heaters for commercial/industrial applications, giving consideration to latest building regulations.
   Contact: www.hotwater.com

5. VERNAGENE. Chlorine dioxide, Disinfection. Understanding the principles of dosing with consideration to health and safety aspects.
   Contact: www.vernagene.com

6. NEW HADEN PUMPS. The design and sizing of both foul and surface water pump sump chambers and stations.
   Contact: SouthEastNHPPumps.com

7. ALLAN AQUA LTD. Design principles for boosted cold water and fire services relating specifically to high rise buildings.
   Contact: www.allanaqua.co.uk

8. THAMES WATER PLC. Discussions on items within the Regulations which required clarification.
   Contact: www.thames-water.com


10. KSB LTD. Grey Water Re-cycling for various types of buildings. General overview on the design principles with advantages and disadvantages on the possible options for re-using water

11. BRE. Control of Legionella Bacteria in water systems.

12. SPEL Products. An introduction to surface water/Foul water Puraceptors, Stormceptors, both full retention and by-pass types. Sizing, Alarms, Regulations and update on the latest Rivers Authority Requirement etc

13. EVAC. Design principles for vacuum drainage systems.

14. GRINEIL. Designing Sprinkler Mist systems

15. GEBERIT. Design principles of symphonic rainwater systems

16. HONEYWELL. Applications of Thermostatic rainwater Valves. TM2 and TM3 valves

17. NEW HADEN PUMPS. Over pumping into surcharged sewers

18. GRUNDFOS. The principles of borehole pumping and pump sizing. www.grundfos.co.uk

19. MICRO DRAINAGE. Suds attenuation modelling through the use of Micro Drainage computer software.

20. CONDER. Sizing principles of small sewage treatment works. www.condersystems.com

21. POLYPIPE. Engineering solutions in relation to SUDS. www.polypipe.com

22. ENVIRONMENTAL SUSTAINABLE SOLUTIONS. Storm water control.

23. HOME ENGINEERING. Design principles associated with the selection of TMV valves.

24. CLEARWATER TECHNOLOGY. Chlorine Dioxide built in line with ACOP L8 & HTM 04

25. HUGHES. Review of standards associated with safety showers and wash basins in Hospital and lab buildings.

26. MIRA. Control of legionella bacteria in water systems

27. BRIAN WHARLOW. Design risk assessment and evaluation of the principles associated with rainwater designs.

28. Keynote speech by Prof John Swafield

29. GRUNDFOS. Commercial building services pumping solutions

30. Design concepts associated with rainwater attenuation sizing, including oil separation

31. ACO. Drainage systems for hygienic and corrosion resistant applications.

32. Review of the design principles associated with mist & fog fire suppression systems, including the requirements of FM 200.

FORThCOMING TECHNICAL EVENTS

Full details of events will be advised to members of the Region / Branch prior to each meeting.

Members may contact the Secretary for details.

Society of Public Health Engineers (SoPHE) - London and South West Region Forthcoming Events

Society of Public Health Engineers (SoPHE) - North West Region Forthcoming Events

All technical sessions are held every other month on the 3rd Wednesday of the month at: The Rain Bar, Board Room (2nd Floor) 80 Great Bridgewater Street, Manchester. M1 5JG 6pm (for 6.30pm start) to 8pm approx.

Full details of each event will be advised to members of the North West region and SoPHE members prior to each meeting.

Tuesday 19 May
Review of the technical properties associated with stainless steel pipelines and drainage products as used within Public Health Engineering services.
Presented by: - BLUCHER UK LTD
Location: -O’Neils Bar, Conway Street, London

Tuesday 23 June
A review of the design principles and standards associated with valves incorporated into Hospital piped systems.
Presented by: - HORNE VALVES
Location: - Building Centre, Store Street, London

Thursday 5 November
SoPHE annual dinner at the Royal Garden Hotel, Kensington, London

FORTHCOMING EVENTS

Society of Public Health Engineers (SoPHE) - North West Region Forthcoming Events

All technical sessions are held every other month on the 3rd Wednesday of the month at: The Rain Bar, Board Room (2nd Floor) 80 Great Bridgewater Street, Manchester. M1 5JG 6pm (for 6.30pm start) to 8pm approx.

Full details of each event will be advised to members of the North West region and SoPHE members prior to each meeting.

2009

Wednesday 20th May
Solar Hot Water Solutions, presented by AO Smith

Wednesday 15th July
Modern day design in vitality swimming pools and water features, presented by Barr & Wray

NW Secretary: Paul Angus
WSP Buildings
The Victoria
150 – 182 The Quays
Salford
Greater Manchester
M50 3SP

Tel: +44 (0)161 886 2438
Mob: +44 (0) 7920 250646
Email: paul.angus@wspgroup.com
NEW MEMBERS

Associates:
Colin Kiely
Philip Meir
Benjamin Marcus Rose
Gary Warman
Tiffany Gee

Members:
Ashveen Jeetun
Joseph Hendry
Andrew Russell
Simon Andrew Dent
Steven Sawers
Ayan Das

Associate Members:
Maria Delia Marginean
Mohammad Daureeawo
Paul Maysey

Industrial Associates:
Jung Pumpen/Pump Technical Services
Horne Engineering
Aliaxis
Heatrae Sadia

USEFUL WEBSITES AND EMAILS

The Chartered Institution of Building Services Engineers
www.cibse.org

Society of Public Health Engineers
www.cibse.org/sophe

Technical Group:
Alan Neall – aneall@geneverandpartners.co.uk

Membership Group:
Martin Shouler – martin.shouler@arup.com

Communication Group:
Jonathan Gaunt - jonathan.gaunt@arup.com
Chris Northey- chris.northey@bdsp.com

Education Group:
Ian Fellingham – ian.fellingham@googlemail.com

SoPHE Industrial Group:
Mike Darville (Chairman) – mike.darvill@roth-uk.com

Goodwater Ltd
23-24 Ivanhoe Road, Hogwood Lane Industrial Estate, Finchampstead, Wokingham, Berkshire, RG40 4QQ
tel +44 (0)118 973 5003  fax +44 (0)118 973 5004  e-mail info@goodwater.co.uk  web www.goodwater.co.uk

Goodwater is dedicated to providing a professional, flexible and reliable approach to water treatment, adopting the most practical and cost-effective solutions available.

In today’s progressive technological world, Goodwater utilises the most appropriate techniques and products to ensure that the best solutions are engineered into every programme of work from the outset. Our involvement at the earliest stage is therefore always desirable and encouraged.

Goodwater commit to provide comprehensive solutions to clients that exceed our requirements and their expectations. With full ISO 9001:2000 and Legionella Control Association accreditation clients are assured that Goodwater will deliver a quality product and service resulting in total water solutions every time.

Products
• Water softeners
  Pegasus range
• Physical water conditioners
  Phoenix range
• UV disinfection systems
  Tucana range
• Chlorine dioxide units
  Dorado range
• Chemical dosing systems
  Aquarius range
• Filtration & purification systems
  Cygnus range

Services
• Pre-commission chemical cleaning
  (BSRIA Standards)
• Commissioning
• Disinfection
  (BS6700:2006 & ACoP L8)
• Legionella risk assessment
  (ACoP L8)
• Term contract programmes
• Maintenance
• Boiler & cooling tower treatment
• Water hygiene
• Water sampling & testing
• Consultancy
• Chemical supply

For more information please call:
+44 (0)118 973 5003