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A Message from the Chairman

I am delighted to welcome you to this autumn edition of the Societies’ 2012 newsletter. This is our 7th issue of our newly formatted newsletter, which is issued on a quarterly basis to our membership base and our supporters. I believe that this production shows our continued commitment to professionalism within the built environment.

As we enter the autumn of 2012 the economic outlook still remains very weak, although there are some signs of stability and growth in some areas of the market place. I hope that a continued recovery can be sustained during the final few months of the year and that better times are ahead of us, as we approach 2013.

On the membership front, it is also with great encouragement that 3 membership panel meetings have taken place over the last few months. As a result of this I can advise that there has been continued growth in the overall SoPHE Membership base, across all grades. I am also pleased to report that the industrial associate membership base has also continued to grow. I would personally like to welcome all new members who have joined the Society over the last 3 months.

The Societies’ continued programme of CPD technical events and seminars has taken place during the early part of the summer and autumn periods, which is a vital element in what the Society can offer to our members. We are also finalising details of technical events for the winter/spring period of 2013. These CPD technical evenings will be advertised to members over the coming months.

Now that the Olympic Games are over we can look back on the many successes that this event promoted. Those who have had the pleasure of working on the Olympic Park will know how important good public health engineering services design within all of the venues was. It is paramount to the health and well being of all of the occupants that used the facilities within all buildings. We will be providing insight into some of the challenges that the public health engineers were faced with during the design stages, within future editions of the SoPHE Newsletter.

It is with great success that I can inform our members that in August, SoPHE were one of the main sponsors of the ‘38th CIBW062 International Symposium, Water Supply and Drainage for Buildings’, which this year was held in Edinburgh. A full summary for this landmark event will be provided within the next edition of our newsletter.

I am also very pleased to give you the latest update on the progress of this year’s SoPHE Young Engineer Award. This award is now in its 5th year and is approaching the final stage of the competition. In August we received a number of high calibre entries which were eventually shortlisted down to 3 finalists. The final presentations for each of the finalists took place in early October before the judging panel. The overall winner and the other finalists will attend our annual dinner in November and be presented with their awards. We are also delighted again this year that the competition has been in collaboration with Water Aid.

I can inform our members that at the time of writing this article, the final details are now being arranged for our upcoming 9th Annual SoPHE Dinner which is due to be held on 8th November 2012 at the Royal Garden Hotel in London. We are catering for a capacity of over 270 guests which are expected on the night and I believe that this event is going to be once again the highlight of the year for the Society. As well as the guests and VIP’s, I also look forward to presenting some awards to SoPHE members. This will include an Honorary Fellowship award, further details of which will be included in our next edition of the newsletter.

As part of our continued review of maximising the Societies’ outreach, marketing and profile, I can also inform you that we are continuing our SoPHE page under the LinkedIn website, which continues to be very popular. I would encourage all SoPHE members to join and support this group.

After the success of the 2nd SoPHE Northern Dinner which took place in May of this year, I can inform our membership that we are already planning for next years’ event. The 3rd SoPHE Northern Dinner is due to take place in May 2013, which will once again be held in Manchester. Further details will be provided to members nearer the time.

One of my main aims as your Chairman is to continue to promote the Society within the general building services and construction industries as a whole and I will continue to build on the close working relationships already formed within industry. I will of course also look out for new opportunities to raise the profile of the Society where there is a potential to do so.

I can also inform our members that our next newsletter which is our Winter edition, is due to be issued to our members at the end of January 2013.

On a final note I would like to thank again all of those who continue to support the Society, enabling us to keep improving and moving forward, with the overall purpose of further raising the profile of the Public Health Engineer and Public Health Engineering.

C. Northey
Chairman, SoPHE
As the base build installation of the Shard approaches practical completion, I have written this article to reflect back on my involvement on the project over the past 8 years.

Back in 2004, having recently started work for Arup, I began to get involved in the design of London Bridge Tower, as it was called at the time. The building was still architecturally fairly sketchy, Renzo Piano had yet to appoint the executive architect and had not fully bottomed out the way the building use was to be split. The basics of this multi use building had been agreed – offices, public restaurant, hotel, apartments, viewing gallery. However much had yet to be included, for example, the inclusion of a swimming pool at level 51 came as quite a shock after we had completed detailed design. It certainly decimated the level 50 plantroom!

I took the opportunity to make some amendments to the PH at the start of the next design stage. The original strategy for getting domestic water to the top of the building, was for it to be pumped directly from the basement to the top in one go, utilising pressure reducing assemblies throughout. I introduced tanks and pumps at the various plantroom levels within the building to stage the system and break the pressures down. I was concerned about very high pressures lower down the building. Even with the reliable pressure reducing assemblies available, I was nervous of a system required to take roughly 35 bar working pressure. What WRAS approved fittings are PN40 rated? Was it reasonable to expect test pressures well in excess of 50 bar?

Tanks and pumps obviously occupied space which had not previously been allocated and in a tapering building, plant space is at a premium. However, I got in early at this stage of the design and it didn’t create a problem (thanks to mechanical engineers love of plantroom space!).

It was also at this stage that the design for the radiator was dropped. The radiator was a series of banked pipes at the very top of the Shard, designed to extend from levels 75 to 87 and reject heat from the whole building. It would enhance the ‘green’ credentials of the skyscraper and would make an aesthetically pleasing spire. Unfortunately, the amount of heat rejection expected was not enough to justify the energy of pumping the hot water to the top of the building. So, if you have ever taken a look at the Shard and wondered what is going on in the ‘spire’, well, not very much!

Shangri-La had by now been appointed as the hotel operator. The hotel was given a dedicated system of domestic water supply independent from the rest of the building’s landlord’s supply. The domestic water systems were given all the usual surge protection systems which have been the subject of many technical presentations of late. Shock arrestors, air admittance/escape valves, surge valves, soft fill booster set functions, yes, it’s all there. But for a building which has a water supply 285 metres above street level, the system pressures only just climb above 16 bar in the basement levels.
The sanitary design splits the building into three - offices, hotel and apartments. Each system is kept separate as far as practicable. Ventilation pipework was one of the key areas of the sanitary design. By separating the systems, it resulted in long vertical runs of ventilation pipework. Some originating relatively low down in the building and being run right to the very top of the spire, which was the only practical place to terminate. Sizing was an issue, as guidance is very limited. After some fairly fruitless research, I settled on a combination of cross sectional area calculation in tandem with discharge unit capacity. These magnificent vent pipes terminate with bespoke stainless steel cowls at level 86, surely the highest in Europe?

The sprinkler system is based on the British Standards. The entire building is served from the basement by a seven stage pump. The only one of its kind. Pressure control is monitored by digital pressure transducers, these little marvels afford a superior level of control and had the installer (Tyco) singing their praises on a daily basis.

Then there is the wet riser system. It comprises a system of cascading pumps arranged together in a piggy-back operation to keep the pressures in the system down. The Shard is the first real UK skyscraper to be built since the introduction of BS 9990. The additional pressure in the system to meet the new requirement of 8 bar at the landing valves would have resulted in monumental pressures well above 50 bar. So the idea to piggy-back the pumps was spawned. The building has pumps in the basement, level 29 and level 51 and they are effectively all connected to the same pipe. Piggy-backing pumps is not as simple as one would initially imagine. The pumps must operate in sequence to prevent cavitation of the upper level pumps. Priming tanks are provided to allow the jockey pumps to keep the system charged without having all the pumps cascading every time the pressure in the system dropped slightly. Piggy-back pumps can work for wet risers as the pumps serving will always come on at full design flow, hence why I am sceptical of how any system with variable flow would work in this manner.

Fairly late in the design, it became apparent that Southwark and the London Fire Brigade were a little apprehensive about having the tallest building in Europe on their doorstep. Agreement was reached that a wet riser system was to be provided capable of supplying six landing valves simultaneously and at multiple locations within the building. So, the basement pumps are capable of 4500 litres/min, the pumps at level 29 can deliver 3000 litres/min and those at 51 can deliver a more conventional 1500 litres/min. I am reliably informed by both SPP pumps and Tyco that the basement pumps are the largest commercial wet riser pumps in Europe. Having seen these pumps operate in the full cascade sequence, I can report that the Shard wet riser system is very impressive indeed!

What has made the Shard a real challenge is not just the shape of the building - bear in mind that the structural core steps in as the building tapers and changes from conventional concrete to post-tension concrete above level 40. But also the very tight floor to floor heights, typically 3.6m down to 3.2m on the post-tension floors, along with the fact that the building is mixed use. It is effectively five separate buildings stacked one on top of the other. As a result, there is no single riser which passes from the bottom to the top of the building continuously. Services make transitions not only on plant floors but also on floors which incorporate a core change.

Overcoming these design challenges has been extremely difficult at times. Certainly there have been more workshops than I care to remember! Good relationships have also been built along the way though. Renzo Piano and Adamsons Associates (executive architects) have been a pleasure to work with, from the early stages of design all the way to PC. The installation of the plumbing by DG Robson has been to a high standard and we have developed a good relationship with them.

In such a politically charged project, thanks to these relationships, it’s been a much smoother ride than it might easily have been.

My involvement designing and installing the public health and fire suppression systems for the tallest building in Europe has been an extremely rewarding experience. An experience which I will no doubt call upon many times in the future.

Thanks to all involved.
Recent advances in water heater technology have been driven by the need to improve the efficiency of these units both with respect to the operating costs of system and crucially to the sustained reduction in carbon emissions that can result from the correct operation of them.

As a manufacturer of water treatment equipment it is all too easy to launch straight with a scale control solution in hard water areas, solving a problem, which undoubtedly will exist, but is this the only problem the system is likely to experience?

At Hydrotec we strongly believe in taking to the holistic approach to water treatment for a system, looking at all aspect of the design, the water quality and materials and equipment in use, the mode of operation and to proactively, try to predict the likely challenges that the water system will face and provide solutions for these.

Our starting point will usually be the water source. In the UK we are fortunate to have some of the highest quality mains water distribution systems in the world, our water supply companies go to significant lengths to ensure the water produced meets stringent standards, but none the less this has to be distributed to us and sometimes this can be were the problem starts.

Recent field trials for the next generation of water treatment equipment, have shown on almost 90% of sites (distributed throughout the UK) we experienced significant particulate fouling – presumably collected from the distribution pipework along route. fig 1-3 show a selection of collected particles and filter membranes, collected direct from the rising mains.

By Adrian Aylett – Technical Manager, Hydrotec (UK) Ltd

This is a very good example of how parameters interrelate in water treatment,

- The particles themselves can be problematical blocking waters, causing equipment damage and even premature failure
- Collected debris provides habitat and nutrients on which and in which bacteria can thrive and present their own unique problems
- Particulate debris will enhance the corrosivity of the water, by their scouring action

So we now consider that filtration systems should be considered in all projects and that the simple act of filtration not only removes the particulate debris, but also positively contributes to both the
control of corrosion and the minimisation of microbiological proliferation within a system.

To the issues of system scaling itself, we also need to look at the broader picture. It is commonly quoted that just 1mm of scale on a heat transfer surface will decrease the thermal efficiency of the transfer process by 7% (naturally there is a corresponding increase in both operating costs and carbon dioxide production). Without any form of scale protection scale production can be much higher, fig 4 shows a block of scale over 40cm long and weighing nearly 15kg, which was taken from a finned tube calorifier. The unit had to be cut open to extract this chunk of scale, it’s difficult to imagine exactly what the reduction in heat transfer rates will have been for this or exactly how many additional tonnes of carbon dioxide will have been generated as a result of this, but clearly this will have been very substantial.

But will also
- Provide a physical habitat and nutrient for bacteria
- Provide a thermal break (cooler zones) for bacteria
- Impede the correct implementation of a legionella control program
- Enhance the corrosivity of the water both by erosive particles and by differential aeration corrosion

Again this demonstrates the point that it is not wise to consider scale control purely in isolation from all other variables in the system.

Finally with respect to bacteria, bacterial control is a crucial part of almost every water treatment and water management regime. Most bacteria are innocuous and can inhabit water systems without causing any problems. However there are many bacteria that are harmful to health, resulting in a range of symptoms, including skin irritations, migraine, vomiting, diarrhoea and in extreme cases even death. Other groups of bacteria can result in physical damage to plant and equipment, again the damage can take several forms, such as excessive biofilm formation, resulting in blockage (slimes), whilst others can produce strong mineral acids as part of their normal metabolism, naturally these can cause rapid localised corrosion to metallic system components. Control of bacteria is therefore a consideration for all system designs, to both ensure that neither human nor system health is endangered.

Hydrotec (UK) Ltd have been a leading manufacturer in scale and bacteria control products for over 20 years in the UK marketplace and would be pleased to offer advice on alternative methods and technologies to treat both scale formation and bacteria issues. We strongly recommend a clean system approach for all water treatment programs, maximising equipment efficiency, protecting the environment, lowering costs, ensuring legislative compliance, personnel protection and extending system life, whilst being easy to use and minimising operator involvement.

**LATEST INDUSTRY PUBLICATIONS**


The “Blue Roof” concept is novel. Although the concept of managing rainwater utilising blue-roof technology has previously been discussed, (refer to “Blue roof thinking” article written by Carl Harrop, WSP in September 2012 issue of CIBSE Journal), there is no formal definition of the term “Blue-roof”. A suitable definition of “Blue Roof” would be as follows:

“A roof designed to allow the build-up of water above the roof waterproofing membrane (within various elements), not exceeding the designed hydraulic head, for a defined period of time, to enable attenuation of stormwater at roof level, and which also controls the discharge of rainwater run-off at a designed flow rate to meet the design requirements.”

Why the need for Stormwater Attenuation?
The need to demonstrate the impact of new developments on surface water run-off and subsequently the potential implementation of stormwater management systems has been enforced within the European Community member states through the European Water Directive Framework (WDF). This requires all member States of the EU to make the necessary provision for stormwater management through governmental bodies. In the UK the main organisations responsible for the implementation of the WDF include the Environment Agency (EA), Department for Communities of Local Government (DCGL) and Greater London Authority (GLA).

Project Background – Zenith House
Zenith House is a residential development which when completed will provide 309 residential apartments, including private and affordable houses. The scheme comprises the erection of buildings ranging from 2 to 16 storeys with a landscaped courtyard and provision of 218 car parking spaces and 349 cycle spaces. The total site area extends over approximately 1.1 hectare of land.

Ramboll was originally appointed to prepare a Flood Risk Assessment, based on the National Planning Policy Framework to establish the stormwater attenuation requirement for the project to support the planning application for the development.

Problem Statement
The challenge on this project was to investigate an alternative method for stormwater attenuation. This was required as part of the planning conditions to limit the discharge of surface water run-off routed to an external local water authority infrastructure. The primary concern of the local authority in imposing such a restriction was to minimise the risk of surcharging the existing sewage system.

To control the rainwater run-off, prior to discharging to the main sewer, an attenuation tank and a flow control device are required.

Conventionally, a below ground attenuation tank with flow restrictors would have been the method to be adopted. However, due to site constraints and cost issues, a below ground attenuation tank could not be incorporated into the new development. As such, part of the project sought ways to find an innovative and alternative method to attenuate rainwater run-off for the development whilst preserving the local authority’s main objectives.

Design Consideration
The volume of stormwater to be attenuated was calculated using drainage simulation software WinDES, modelling a specific storm duration and return period, and also limiting the maximum permissible discharge to the main sewer, in line with planning requirements. The total calculated volume to be attenuated was found to be 600 m$^3$.

Ramboll proposed to store 450 m$^3$ of the stormwater in a concrete waterproof tank at basement level and the remaining 150 m$^3$ at roof level, using an innovative method to control the discharge at roof level.

The “Blue Roof” concept
The roof was designed to enable the retention of stormwater for a defined period with flow discharge limitations, controlled through a new type of flow restrictor. The structural limitations with regards to loading were considered prior to starting the design of the blue roof system to ensure that the maximum structural load would not be exceeded. A maximum water build-up of 150mm was agreed with the Structural Engineer. Thus, a maximum dead load of 1.5kN/m$^2$ is available for temporary stormwater attenuation.

The rainfall profile used for the sizing of the attenuation volume required was based on a 1 in 100 year storm of 60 minutes.
duration, including 30% for Climate Change, as stated in the Flood Risk Assessment.

The instantaneous rainwater run-off for specific storm duration can be determined from a hydrograph, which shows instantaneous rainfall intensities against time. The outflow from the roof is controlled through an integral flow restrictor, which would significantly reduce the discharge through the rainwater outlet.

The difference in inflow and outflow results in rainwater backing up at a controlled rate at roof level. This allows temporary stormwater storage for a particular storm duration and return period, based on run-off constraints set by the Local Authority and Planning Conditions.

**Key components of the “Blue Roof” System**

Figure 2 shows a typical “Blue Roof” system integrated to a green roof build-up.

The key components of the Blue Roof system are as follows:

1. Integral Flow restrictor
2. Rainwater Outlet
3. Waterproofing membrane
4. Crate system (with a void ratio of approximately 90%)
5. Rainwater pipe
6. Filter Sheet
7. Structural Element
8. Roof Insulation
9. Timber Frame
10. Access & Inspection Chamber.

**Design, manufacture and testing of the Blue Roof flow restrictor**

Ramboll in conjunction with the rainwater specialist manufacturer Harmer developed a new type of flow restrictor to enable the rainwater discharge to be controlled at roof level.

This product is currently available on the UK market and standard orifice sizes with technical data, including stage discharge curves are available to enable the appropriate selection and design of “Blue Roof” system.

![Fig 3 – Rainwater outlet with integral flow restrictor](image)

**Conclusion**

The blue roof concept can be considered as a design solution for urban areas with less space on site for stormwater attenuation or limitations in the maximum excavation depth.

To find out further information regarding blue roof technology please follow the link below:

www.blue-roof-design.co.uk

![Fig 2 – Typical blue roof configuration including a green roof.](image)
Fire sprinkler systems

Growing use of domestic fire sprinklers

Fire sprinkler systems are well known in commercial premises, but aren’t yet common in residential developments. The Welsh Government has announced plans requiring all new and converted residential properties in Wales to be fitted with sprinkler systems from September 2013 saving an estimated 4 lives and 100 injuries annually. Similar requirements are under consideration in Scotland, and in England the Government is encouraging the use of sprinklers by seeking a low-cost design.

In under 3 minutes a room fire in a lounge or bedroom can reach flashover, where the contents simultaneously catch alight (Figure 1). Water from a fire sprinkler system removes heat from the fire, giving extra time for occupants to escape and, if triggered quickly enough, can extinguish the fire before life is threatened.

Figure 1 Fire spread in a bedroom without sprinkler

Sprinkler systems and the Water Fittings Regulations

Sprinkler design is best left to specialists, but designers and installers should be aware of the need to comply with the Water Fittings Regulations or Scottish Byelaws, because the installer is legally liable if the system doesn’t comply. Ignoring the requirements can lead to prosecution, as one man found out last year when fined £600, with £3,200 costs, for failing to notify and failing to install suitable water fittings.

The Water Supplier must be notified in advance and give consent for a fire sprinkler system to be installed as part of any new construction or added to existing non-domestic premises. Elsewhere installers are strongly advised to ask the Water Supplier about the available water pressure and flow at premises. For all new and existing premises, the Water Supplier must be notified of a pump of about the available water pressure and flow for giving extra time for occupants to escape and, if triggered quickly enough, can extinguish the fire before life is threatened.

Water Supply

For domestic premises, BS 9251 requires flow rates of 60 l/min for operating a single sprinkler head, or 42 l/min each for simultaneous discharge through 2 sprinkler heads (single dwellings), or through 4 heads (multiple occupancies). The minimum pressure at the sprinkler head should be 0.5bar.

Non-domestic fire sprinkler systems usually have their own dedicated supply of water. For domestic premises, if the sprinkler is retro-fitted to an existing property with a 25mm diameter supply pipe, the pipe is unlikely to be large enough to supply the sprinklers and restrict the high flow rates required. Either the water supplier’s agreement is needed for a pump on the supply pipe, or a dedicated supply or consideration given to using water from a storage cistern. The standard requires up to 10 minutes sprinkler flow and where the storage cistern also supplies water for domestic use, it recommends providing 110% of the volume needed for fire fighting – more than 900 litres – meaning the existing domestic storage cistern may not be adequate. Deterioration of water quality can result from stagnation in an enlarged domestic cistern, making a separate, dedicated fire-fighting cistern preferable.

Water Metering

Some Water Suppliers fear the theft of water for other purposes if fire-sprinkler system and pipework to sprinkler heads (Figure 2).

Backflow prevention

Backflow protection of at least fluid category 2 is required by regulations for a domestic fire sprinkler system without antifreeze, so a single check valve is adequate (see [5] in Figure 2), located on the sprinkler pipe as close as possible to its branch from the supply pipe. As part of commissioning, the system should be pressure tested to the greater of 1.5 x maximum working pressure or 12 bar.

Sprinklers for commercial or industrial premises may involve high pressure systems or use of fire-suppressant additives or antifreeze. These types of system require a higher level of backflow protection to fluid category four – for example a type AF air gap or a reduced pressure zone valve (type BA device).

Sprinklers undoubtedly can save lives, but they need to be correctly designed, installed and maintained by trained staff.

Figure 2: Elements of BS 9251 domestic fire sprinkler installation and control system
REGIONAL UPDATES

SoPHE Down under update
By Paul Angus and Les Wilson
Not an awful lot to report from Perth WA apart from the fact that the weather is a little temperamental flitting between 29 and 34°C as we move towards summer….life can be tough at times!
In the last newsletter I mentioned that Paul Angus and myself were intending to approach the ‘Association of Hydraulic Service Consultants Australia’ or better known as AHSCA. This has now been initiated and we await their reply which I am confident will only be positive.
This will present a wonderful opportunity between the two hemispheres to engage in dialogue and supplement each other’s knowledge base.
Sustainable water engineering is simply not a buzz word in this part of the world but a rather an instituted response to the real consequences of nature. Australia’s major cities are predominantly coastal and natural water sources are overly stressed. It goes without saying that our two institutions will ultimately gain by the cross-pollination of ideas.

SoPHE North West Update
By Malcolm Atherton
Since the last publication, we have continued with our technical evenings; Wednesday 18th July 2012 on the subject of Coordinated automatic thermal balancing & water hygiene management in DHW & CWS systems introducing legionella control, pseudomonas control, biofilm control and automatic system pasteurisation, which was hosted by Oventrop UK Ltd – as always, this was well attended and I believe that everyone was impressed by some of the solutions put forward.

The last technical evening was on Wednesday 19th September 2012 on the subject of Water Efficiency in Domestic & Commercial Bathrooms and hosted by Twyford Bathrooms. This was a joint evening between ourselves & the members of IHEEM NW Branch; again, it was well attended & well received by all.

At the time of writing, our next evening will be on Wednesday 21st November 2012 entitled “Sanitary Pipework Design & Material options” to be hosted by Paul Hullock of Marley Products.

Finally, an “advanced warning” that the next SoPHE Northern Dinner will take place on Friday 10th May 2013 – further details to be announced in due course.

SoPHE forthcoming Technical Seminars

SoPHE North West region
Forthcoming technical seminars. All Manchester events held at:
The Rain Bar, 80 Great Bridgewater Street, Manchester. M1 5JG - Time TBC

Date: 21 November, 2012 (6 for a 6:30 start)
Topic: Sanitary Pipework Design & Material options
Sponsor: Marley - Paul Hullock / Neil Carter

Date: 16 January 2013 (6 for a 6.30pm start)
Topic: Value Engineered, proven water treatment solutions for lime scale prevention in commercial systems
Sponsor: Sentinel Performance Solutions Ltd – Alan Roberts / Chris Hayes

SoPHE London region
Forthcoming technical seminars. All London Events held at: AECOM, 4th floor, MCP, 71 High Holborn, London, WC1V 8QS (unless otherwise stated)
Time 18:00 - 20:00 (approx)

Date: 27 November, 2012 (6pm for 6.30pm)
Topic: Public Health in partnership with SoPHE
Sponsor: TBC
Venue: Counting House, Fullers 50 Cornhill. London. EC3V 3PD

Date: 04 December, 2012 (18.00 - 19.30)
Topic: Direct Gas-fired Water Heaters - Sizing & Applications
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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 or Paul Angus at  
jonathan.gaunt@arup.com
paul.angus@wspgroup.com.au