

THE ATHLETES VILLAGE LONDON 2012 OLYMPIC GAMES EXECUTIVE SUMMARY

The building and commissioning of the Athletes Village in London 2012 gave an unprecedented opportunity to gather data on the management of water distribution systems and how to effectively control any water-borne pathogens present.

The approach taken was to form a Water Safety Group (WSG) and a Water Safety Plan (WSP), as recommended by the WHO, the UK Department of Health and the UK Health and Safety Executive. This was overseen by the Authorising Engineer (Paul Nolan).

The quality of the water provided during the course of the Games was of an exceptional standard and was backed up with full documentation.

This document explains some of the intricacies required to ensure a successful outcome and requires that a similar approach is taken in Rio 2016. The provision of a demonstrable, high quality water supply has already been demonstrated in London 2012 and this cannot be compromised for future Olympic Games.

Paralympian's Olympic Games

4302 athletes

503 events

164 countries

Olympic Games

16000 athletes

300 events

204 countries



- 13 Buildings
- 10 floors (approx.) each building
- 2818 properties
- More than 30000 tap and shower outlets

INTRODUCTION:

The organisation of each Olympic Games is a learning curve for future Games and London 2012 uniquely identified the challenges and potential solutions for controlling water-borne organisms such as *Legionella* spp., *Pseudomonas* spp. and protozoa.

The Athletes Village (AV) is typically a new construction project where the buildings will be erected over 3 years, and whereby the water systems are filled on completion and may be left to stagnate for more than a year.

Commissioning of these buildings must take place 18 months before the games and this is when water-borne organisms should be identified and managed, to provide safe water for the athletes and families staying in the AV.

BACKGROUND:

At the London 2012 AV, the water quality concerns were not just *Legionella* spp., but also *Pseudomonas* spp. There are more deaths from water-borne *Pseudomonas* spp. infections than *Legionella* spp. in the UK, however, if there is an outbreak of Legionnaires' disease in the UK, the legal system will be invoked and it is usual for individuals to be fined thousands of pounds or face imprisonment for many years. There are many examples of prosecution and substantial monetary fines in recent legal history.

It was also necessary to test for faecal pollution such as *E.coli* and *Cryptosporidium* spp., according to the UK Drinking Water (DWI) Regulations. Research studies have shown that significant gastro-intestinal disease could be attributed to consumption of water contaminated with coliforms, *E.coli*, and *Cryptosporidium* spp. The recognition of the importance of viral and protozoan pathogens in causing waterborne disease has led to a reappraisal of approaches to microbial water quality control, as the bacterial indicator organisms typically used are less reliable in indicating the potential presence of viral and protozoan pathogens.

THE WATER SAFETY PLAN (WSP) APPROACH:

The approach taken was to undertake simple water sampling and to develop a Water Safety Plan for the AV and the Olympic Park.

The Olympic Delivery Authority (ODA) and the London Organising Committee of the Olympic and Paralympic Games (LOCOG) were the overarching (government) bodies that organised the games and the Health and Safety concerns, over many disciplines. They insisted that a Water Safety Plan and Water Safety Group were formed to manage and provide recorded evidence that the water supplies throughout the AV was safe to use.

There are many peer-reviewed published papers which recognise exercise-induced immunosuppression in athletes and such vulnerable groups may be particularly susceptible to water-related hazards. Therefore the AV was of very special concern in regards to water hygiene and water monitoring management.

The world media were very interested in how the water quality in the AV was managed and they even stayed in the AV, sleeping and living there for a week before the games in order to experience the conditions and then feedback to their readers around the world in their daily papers. The media interest was allegedly caused by the poor water quality issues at the Commonwealth Games in India 2010.

The AE was responsible for ensuring the water systems in the AV were safe to use for the 16000 athletes who stayed for 6 weeks in the 3000 apartments.

The AE responsibilities were typically:

- Water Safety Plans
- Risk assessments
- Water sampling techniques
- Filtration solutions
- Disinfection strategies
- Identifying and appointing the experts for the Water Safety Group

The Purpose of the WSP:

To prevent contamination of water from the source to the point of consumption; and give consumers greater involvement and control over maintaining water quality.

- WSP's can be used for new or existing water systems.
- WSPs provide a Hazard Analysis and Critical Control Point (HACCP) approach for water systems.

The public health risk posed by legionellosis can be addressed by preventive measures — although the source of infection cannot be completely eradicated, risks can be substantially reduced. The preferred approach to health risk assessment in evaluating specific risks is to develop a WSP, which provides a detailed and systematic assessment and prioritisation of hazards, and operational monitoring of barriers and control measures.

Developing the AV WSP:

It is important to identify, and reach agreement with all parties, the known risks to the athletes and other visitors. This is particularly important for the Paralympian's, where people needed special environments for bathing or showering. The key to this is:

- Preparation;
- Risk Assessment;
- Operational monitoring;
- Management and communication;

Preparation (18 months before the Games)

The preparation stage involves determining what skills are needed and how large the team should be, identifying suitable experienced personnel, including members of the community, who could be members of the Olympic team, securing adequate support in terms of finances and other resources, and identifying relevant stakeholders.

Assembling a team is a core preparatory requirement for the development and implementation of a WSP in a building. The team will be in charge of developing and implementing the WSP. The role includes identifying hazards, assessing risks, identifying and monitoring control measures, and developing incident protocols. WSPs are the most effective means of consistently ensuring the safety of drinking water supplies through a comprehensive risk-management approach that encompasses all steps, from source through treatment and distribution to consumers. The WSP approach is based on identifying all significant risks to public health, ensuring that effective controls and barriers are applied to minimize these risks to acceptable levels, and monitoring the operation of the controls and barriers to ensure that safety is maintained

CONCLUSION:

The application of WSP's and good management by those responsible for drinking-water production and distribution can assure drinking-water safety. However, management of building water systems can be complicated by a number of factors, including ownership of assets and rights of access that change on building property boundaries. Drinking water systems in buildings are generally designed, installed and controlled independently from public water supplies.

It is therefore of vital importance to choose the members of the WSP carefully and to ensure that they are all fully trained and conversant with their individual responsibilities. Strong leadership is required to develop a positive outcome and independent audit will ensure that the WSP is being followed correctly.

LONDON OLYMPIC GAMES 2012

The decision to implement the WSP at the London Olympic Games 2012 was without doubt a major success (improvement) for the health and wellbeing of the athletes residing in the Athletes Village

- There were no reported water-borne pathogenic infections throughout their stay.
- The water quality exceeded that of wholesome drinking water throughout the entire Olympic Games

The WSP and the WSG teams provided safe water systems for the athletes, world media, visiting world dignitaries, who all stayed in the AV, before and during the Games.

RIO DE JANEIRO SUMMER OLYMPICS AND PARALYMPICS 2016

Looking ahead at the challenges for the Olympic Games in Brazil it is apparent that there must be a WSP, a risk management strategy approach and a team of experts brought together to form the WSG team for the AV, in Rio 2016.

Significant health outcome improvements were made at the AV in London 2012 and these must not be compromised in Rio 2016, to ensure the wellbeing of all the athletes, world media, and visiting dignitaries.



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Glossary

Legionnaires' disease

Was named after an outbreak of a severe pneumonia-like disease that occurred at the Bellevue Stratford Hotel, Philadelphia, USA in 1976, where there was a convention of the American Legionnaire veterans.

Is a form of pneumonia caused by bacteria of the genus *Legionella*.

It is still not known how many *Legionella* bacteria (CFU or GU) are required to contract the disease.

Legionnaires' disease is a potentially fatal form of pneumonia and everyone is susceptible to infection.

Risk increases with age, but some people are more susceptible i.e. people over 40, smokers and heavy drinkers, people suffering from chronic respiratory or kidney disease, diabetes, lung and heart disease or anyone with an immunocompromised situation.

The epidemiologist who isolated the bacteria was Mr Robert Sharrar, who has gained little recognition from growing the organism.

People catch Legionnaires' disease usually by inhaling aerosols (not droplets of water) suspended in the air, which contain the bacteria. The other infection route is by aspiration i.e. via ingesting a fluid which enters the windpipe by mistake.

Legionellosis

Legionellosis is any illness caused by exposure to *Legionella* spp.

Other manifestations of Legionnaires' disease, with less associated mortality are Pontiac fever and Lochgoilhead fever.

Legionella pneumophila and other related bacteria are common in natural water sources such as rivers, lakes and reservoirs.

Usually found in low numbers, they may also be found in purpose-built water systems, such as cooling towers, evaporative condensers, hot and cold water systems and spa pools.

If conditions are favourable, the bacteria may multiply, increasing the risks of Legionnaires' disease.

It is therefore important to control the risks by introducing appropriate measures.

Aerosols

It is an erroneous belief that water droplets are an aerosol and that *Legionella*, or other bacteria, virus, etc. have to be contained within a wet droplet.

Water droplets may/can create the structure of an aerosol if the droplets are small enough.

Water evaporates from small droplets very speedily, and can occur in milliseconds.

For particles of less than no greater than 5 micrometres, the rate of evaporation may reply on the temperature of the location, relative humidity and airflow.

An aerosol is defined as a suspension in a gaseous medium of solid particles, liquid particles having a negligible falling velocity. It is a suspension of particles which may contain legionella with a typical droplet size of < 5 micrometres that can be inhaled into the lungs.

Pseudomonas aeruginosa

Gram-negative rod measuring 0.5 to 0.8 μm by 1.5 to 3.0 μm . Almost all strains are motile by means of a single polar flagellum.

The bacterium is ubiquitous in soil and water, and on surfaces in contact with soil or water.

Its metabolism is respiratory and never fermentative, but it will grow in the absence of O_2 if NO_3 is available as a respiratory electron acceptor. The typical *Pseudomonas* bacterium in nature might be found in a biofilm, attached to some surface or substrate, or in a planktonic form, as a unicellular organism, actively swimming by means of its flagellum.

Pseudomonas is one of the most vigorous, fast-swimming bacteria seen in hay infusions and pond water samples. In its natural habitat *Pseudomonas aeruginosa* is not particularly

distinctive as a pseudomonad, but it does have a combination of physiological traits that are noteworthy and may relate to its pathogenesis.

Its optimum temperature for growth is 37 degrees, and it is able to grow at temperatures as high as 42 degrees. Although there is evidence to suggest it can grow at temperatures from 10 degrees centigrade

Pseudomonas aeruginosa is an opportunistic pathogen, meaning that it exploits some break in the host to initiate an infection.

In fact, *Pseudomonas aeruginosa* is the epitome of an opportunistic pathogen of humans.

The bacterium almost never infects uncompromised tissues, yet there is hardly any tissue that it cannot infect if the body tissue are compromised in some manner.

It causes urinary tract infections, respiratory system infections, dermatitis, soft tissue infections, bacteremia, bone and joint infections, gastrointestinal infections and a variety of systemic infections, particularly in patients with severe burns and in cancer and AIDS patients who are immunosuppressed.

Pseudomonas aeruginosa infection is a serious problem in patients hospitalised with cancer, cystic fibrosis, and burns. The case fatality rate in these patients is possible.

Like other members of the genus, *Pseudomonas aeruginosa* is a free-living bacterium, commonly found in soil and water