

Something in the pipeline...

In the third feature of his series on building pathology, Chris Mahony aims to raise awareness among BSs of the problems caused by *Pseudomonas* and leaking pipes

Pseudomonas has been identified as a problem-causing bacteria in the London area and has been found in systems in other areas of the UK. Its existence and impact on HVAC systems has been widely reported, but what is it and what should we do about it?

Pseudomonas is one of many bacteria that are commonly found in nature. It occurs naturally in topsoil and lakes or other natural water courses and as a result sometimes finds its way into our water systems. There are five groups of *Pseudomonas* and the main one with which we are concerned is *Pseudomonas Aeruginosa*, which is the most commonly isolated. It is a motile rod type bacteria that can exist in free solution or in biofilm on the inside of pipes and vessels. It can grow in temperatures of up to 42°C, is resistant to most forms of antibiotic, will survive in distilled water and flourishes in the absence of O₂ if NO₃ is available as a respiratory electron acceptor. It will inhabit a domestic water system very quickly if it is allowed to establish in the first place and can be identified by a bluish/greenish pigment and a characteristic fruity odour.

Although *Pseudomonas Aeruginosa* is not normally a problem in the natural environment, it can be instrumental in various types of infection in immunocompromised individuals and burn victims and can result in ear, eye, throat, lung and dermatitis infections as well as being found in association with other illnesses such as Cystic Fibrosis.

Where plumbing installations are concerned, biofilm is one of the main problem forms of bacterial growth: many of the pathogenic bacteria that water supply companies deal with will grow as a biofilm. Biofilm adheres to the inside of pipes or vessels and is

instrumental in promoting corrosion of some materials, particularly metals, by electrochemical means. The mechanism of biofilm corrosion is clearly and concisely explained in an article produced by Edstrom Industries Inc. In summary, the biofilm creates anodes and cathodes on the metal, which then results in corrosion. This, in turn, makes cleaning and treatment of the biofilm more difficult, allowing it to re-establish quickly after treatment.

Biofilm is notoriously difficult to treat and, aside from pipe corrosion, it can seriously reduce the rate of flow of water in the pipes and the rate of heat transfer from pipes. Biofilm is also instrumental in depletion of chlorine in the water.

Plumbing installations are becoming ever more complex and in modern housing in particular the number of bathrooms and sanitary appliances is increasing. In many homes there are sections of plumbing that are very infrequently used: they are effectively 'dead legs' in which bacterial growth can establish quickly if initial system flushing is not carried out properly prior to commissioning the system, despite the statutory requirements for pre-connection flushing.

Symptoms of a chronic biofilm growth in a system include reduction in water quality, drop in delivery pressure at the outlet, colour or smell of the water and obviously corrosion, which can in extreme cases result in perforation of the metal pipes.

Once established, removal of biofilm from inside pipes and vessels can be problematic. In terms of water supply and distribution pipes, super chlorination is the most common method and there is clear guidance on cleansing potable water storage facilities in relation to commercial premises.

In addition to super chlorination, high pressure flushing and

mechanical scouring (pigging) of larger bore pipes is also used. Depending on the condition of the material on which the biofilm has established, it is likely that the biofilm will re-establish within a month of treatment. Ultimately, prevention is much more economic and practical than remediation.

If you are aware of an emerging problem the Building Pathology Working Group would be pleased to hear from you via email. You may also wish to find out more about *isurv Building Surveying*, the new RICS online information service (see page 19 for details).

To contact the working group, email chairman Chris Mahony on chrism@churchlukas.com. My thanks to Ian McHardy and David Randall.

Bibliography

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