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| <p>Water distribution WSP</p> | <p style="text-align: center;">Backsiphonage into the distribution network <i>Management guidance</i></p> |  |
| <p>Information derived from:</p> <ul style="list-style-type: none"> ○ Feedback from water suppliers ○ WHO/World Plumbing Council | <p>Related tools:</p> <ul style="list-style-type: none"> ○ Consumer awareness ○ Stakeholder involvement ○ Asset management ○ Ingress to the network | |
| <p>Important Notes to users: <i>This document provides information to support improved management of piped drinking water quality by water utilities and other stakeholders. It cannot however be definitive and users must ensure that they assess local factors and particularly take account of any national or regional legislative requirements before use. Where necessary this may also need close collaboration with others. The priority to be given to implementing controls to manage identified water quality risks will depend on a proper prioritisation process by each water supplier.</i></p> | | |
| <p>Summary Backsiphonage is a reverse flow condition created by a difference in water pressures that causes water and associated contaminants to flow back into the distribution pipes of a drinking water supply from any source other than the intended one. Backsiphonage can occur from a wide range of industrial, agricultural or domestic premises and can in certain circumstances lead to a significant contamination of the water supply network. This document sets out information which allows water suppliers and others to work together to minimise this risk.</p> | | |
| <p>Detailed information</p> <p>What is backsiphonage? Backsiphonage is a reverse flow condition created by a difference in water pressures that causes water and associated contaminants to flow back into the distribution pipes of a drinking water supply from any source other than the intended one. Backsiphonage can occur from industrial, agricultural or domestic premises and can in certain circumstances lead to a significant contamination of the water supply network.</p> <p>Backsiphonage can also occur <u>within</u> premises where it can lead to localised contamination of the private (non water supplier) plumbing network. This document deals with mitigation of risks affecting the public supply network. Managing risks within premises generally uses the same approach but is dealt with separately under Consumer WSP tools.</p> <p>What causes backsiphonage? Normally mains are pressurised. However the pressure can drop for a number of reasons including planned repairs to the network, bursts in the water main, and excessive local demand on the system, for example during fire fighting or drought. Also, although not considered good practice, some systems in less developed countries only provide supplies on an intermittent basis leading to regular cycles of pressurisation and depressurisation. If contaminated water or other liquids within the premises are in direct hydraulic continuity with the mains network then under these reduced flow conditions, contamination can flow back into the network.</p> <p>Backsiphonage risk assessment and prioritisation Assessing and seeking to mitigate all potential backsiphonage risks within the network can be very difficult, time consuming and resource intensive. Realistically in large networks it is probably impossible to eliminate all risks. However using a risk assessment and prioritisation approach the potential risks can usually be minimised to an acceptable level. This relies on a judgement being made about the frequency and magnitude of depressurisation events, the condition of the distribution network, and the</p> | | |

type of premises within which the highest backsiphonage risks are likely to occur. For example an area of the network in an industrial area and prone to regular mains bursts might have a higher priority for backsiphonage risk management than a network in good condition in an area primarily of domestic properties. However backsiphonage contamination of the network can occur even in lower risk areas so some level of mitigation work will be appropriate everywhere.

Risks can occur from a variety of types of premises. Risks can also be higher in premises where internal water systems are pumped to increase pressure such as in large buildings, factories, hospitals or apartment blocks. Types of risk can include:

- Sewage and wastewater systems from both private and public buildings
- Microbiological wastes from hospitals, clinics and other similar premises
- Toxic or taste/odour causing chemicals from factories and industrial premises
- Animal wastes and chemicals such as pesticides, from farms, abattoirs, stock yards and other agricultural sites

How can backsiphonage risks be minimised

The basic approach to reducing the risk of backsiphonage is proper design and maintenance of potable water plumbing systems to avoid the possibility of any cross linking with systems carrying waste water or other harmful liquids. Thus even if reduced pressure occurs in the network, the likelihood of any contamination backsiphoning into the network is eliminated.

Design and maintenance of plumbing systems is a complex technical area which is often covered by national or regional legislation and/or official guidance. Useful general information can be found in the WHO/World Plumbing Council publication referenced below.

Promoting effective backsiphonage management

The responsibility for effective management of backsiphonage risks normally lies with the consumer or owner of the premises. However water suppliers, in conjunction with government and other stakeholders have a general responsibility to promote awareness of the importance of backsiphonage prevention and management.

The most cost effective approach for this relies on a combination of education and awareness, certification, inspection and legislation. The precise balance between each will be a matter for the appropriate authorities in conjunction with water suppliers and will vary depending on a range of local factors including available resources, institutional arrangements and legal requirements.

- *Education and awareness*
Education and awareness of the risks of backsiphonage are an important part of any risk management strategy. Many consumers and building owners are not aware of the risks either to their own system or the local distribution network. Thus providing practical information on the risks and ways that they can be avoided is important. The best way to communicate with building owners will vary from country to country. However, developing partnerships with other relevant groups such as regional and health authorities, national and local plumbing associations, plumbing retailers, builders, industrial trade associations, farmer groups and many others is likely to be of significant value.
- *Certification*
In some countries either voluntary or mandatory certification systems have been introduced which require that all plumbers have to be trained and certificated as competent to carry out various plumbing activities. This often also requires some form of continuous professional development to make sure that their knowledge is kept up to date.
- *Inspection*
In some countries there are requirements, often backed up by legislation, which require that new plumbing installations or those which are substantially altered, must be notified either to the water supplier or other authority. This allows for inspection to check for any backsiphonage or other plumbing risks. The resources available to check every such installation are usually limited

so in practice most water suppliers will use some form of risk based ranking to focus available inspection resources on those installations which are likely to pose the biggest risk. Additionally some water suppliers have a programme of random inspection of high risk premises to ensure that plumbing systems do not pose an unacceptable backsiphonage risk.

○ **Legislation**

In a number of countries there are various legal requirements which help to minimise the risk of backsiphonage. Development of such legislation is a matter for Government but can include:

- certification of plumbers
- minimum standards of plumbing materials, design and installation
- notification of new or altered plumbing systems.

Typical control points

Since implementation of mitigation measures for water quality risks associated with backsiphonage are outside the responsibility of water suppliers, determining the most suitable control points can be difficult.

In practice potential control points could include:

- Number of plumbers with appropriate training/certification
- Number of high risk premises identified/inspected
- Plumbing suppliers providing consumer/user information on backsiphonage risks

Reference for further detailed information:

- Health aspects of plumbing. A joint publication by WHO and the World Plumbing Council ([Click here](#))
- WHO publication 2004“Managing microbial water quality in piped distribution systems” ([Click here](#))
- Relevant case studies

Typical resources needed:

Resources deployed in development of best practice guidance and awareness raising can be very cost effective, particularly if done in partnership with others. The resources needed for routine inspection of plumbing systems can be substantial and usually has to be carried out using a risk assessment risk prioritisation approach. The necessary resources to implement relevant legislation can vary considerably and is a matter for Government and other authorities.

Document creation:

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