Treatment – Distribution Pipework

Matt Bower

DWQR Risk Assessment Training

2018

Drinking Water Quality Regulator for Scotland

Overview

- Large area of risk

- Wide range of materials and conditions

- About management and filling in knowledge gaps

- Often neglected part of the system

- Much is down to owners and users…..

Pipework – What can you risk assess?

 Pipe bridges

 Surface mains

 Air valves

 Hydrants / valves / wash outs

 Water quality

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Pipework – Key Points to Watch For
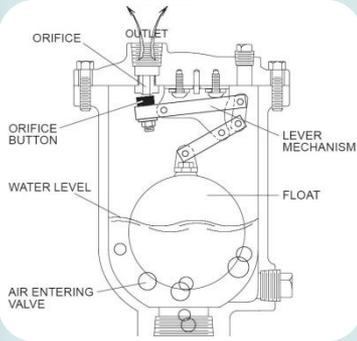
Main contamination risks

- Pipe integrity
- Air valves
- Backsiphonage (suck back…)
- Hydrocarbons
  - This *will* permeate plastic pipes
- Inappropriate pipe materials
  - Lead, plastics, Coal tar linings

Other issues

- Long residence times
- Dead legs
- Third party access
- Freezing
- Disinfection by-products
  - Mainly where chlorine or chlorine dioxide used

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Questions

DPW1	Is there a lack of understanding of the location and direction of flow of water in distribution?	There should be a clear site plan or schematic with the location (and direction of flow) of the drinking water, greywater or sewage pipes. There should be clear labelling and pipe specification for the different systems - full details in BS 8515 and WRAS guidance Note 9-02-05. Main water connections to any private water supply must be protected from cross-connection and backflow protection is required on the mains supply.	5
DPW2	Is there a risk of a deterioration in water quality after treatment, so that it is not fully compliant with quality standards?	This can be determined by the examination of sample results, either taken during the risk assessment, during previous risk assessments or through other monitoring arrangements, e.g. WFD ground water monitoring surveys, on-site tests. If results indicate that the water is not compliant with quality standards, the control measure(s) must be appropriate to the cause, as indicated by the results, and may require revision of the treatment.	5
DPW3	Is there a risk of microbiological contamination (latrines, septic tanks, waste pipes, animal enclosures or cess pits) present in the vicinity of the distribution system?	If unsewered human or animal sanitation is present within 50m of the distribution system then there is potential for raw human sewage to contaminate the distribution network if there are any defects. Consider any available information on the positioning of septic tanks as well as their condition (maintenance), as well as any available information on the soakaway location in relation to the distribution network.	5
DPW4	Is there evidence of disinfection by-products in the network (e.g. taste problems due to THMs)?	There are many different disinfection by-products but those most commonly analysed for are Trihalomethanes (THMs) which are usually identified through sample results. In certain circumstances they may cause taste/odour complaints. This will only be applicable in a Private Distribution system if there is additional treatment after the point of supply and where chloramination or chlorination is present, and such an arrangement should be checked.	4
DPW5	If chlorine/chlorine dioxide disinfection is practised is there a risk of low disinfectant residual in the distribution network?	Chlorine dioxide residuals should be set according to the specific circumstances of the supply system. A target resdual should be set and monitored for at the end of the distribution system; This should be monitored regularly. Too high a residual could lead to byproduct (chlorate) formation.	3
DPW6	Is there a risk due to no process for mains repair and maintenance?	This relates to the existence of a procedure and how well it ensures protection against contamination, i.e. hygienic Installation and Operations (repairs being carried in a clean environment, fittings disinfected before use, etc.). If no, the likelihood score relates to the frequency of mains repair or other maintenance.	5
DPW7	Is there history of any fractures or faults in the distribution system which could allow ingress of contamination?	A history of fractures or faults (burst pipes, loss of supplies) could indicate that the pipework is in an unsatisfactory condition or is vulnerable to damage. In a pumped supply this may indicate a lack of pressure control resulting in leaking pipes.	4
DPW8	Is there any other route by which contamination can enter the distribution network via back-flow? (air valves, cross connections, dead legs of pipe)	Contamination can also enter the distribution network via back-flow. This comprises back pressure (pushed) or back-siphonage (sucked). Where pressure differentials occur without suitable back-flow or air gap protection then contamination may enter the network through cross connections; leaking joints, broken pipes etc.	4

Questions

DPW 9	Is there evidence any pipes are coal tar lined (could cause PAH failures)?	Coal tar was used pre-1970 to line iron mains. Coal-tar linings can be discounted in plastic, cement mains or asbestos mains. This material contains compounds, amongst others, called polycyclic aromatic hydrocarbons, some of which are known to be carcinogenic above certain concentrations (consult WHO guidelines). Furthermore, coal tar lining can cause various unpleasant aesthetic issues, including petrochemical like taste and odours.	4
DPW 10	Do any third parties have access to hydrants or other points in the distribution system?	Third parties (contractors, builders, tenant farmers etc.) should only have access to hydrants via a procedure of authorised permission to operate them. This should only be granted where risk of disturbing deposits has been assessed as low. Where no such system is in place, an appropriate procedure must be implemented which should include control of their use.	5
DPW 11	Is there a risk of chemical contamination of pipes (e.g. from contaminated land, oil from generators/ household fuel tanks/ fuel stores or solvent spillage)?	Oil and other hydrocarbons can pass rapidly through plastic pipes and contaminate the water; This can be a particular problem with petrol / diesel spills on driveways or sills of heating oil. Historic contamination in soils can also affect plastic pipes. In these circumstances metal or "barrier" pipe can be used.	4
DPW 12	Are there any pipes exposed and at risk of damage by any means, e.g. vermin, vehicle, UV/sunlight damage, overheating or freezing?	Pipes that are laid overground or in shallow trenches may be at risk of damage by gnawing rodents, or accidental damage by other wildlife or livestock or any other means, including those caused by motorised vehicles or machinery. Consider this risk in terms of the pipe material, their position, location, exposure to vermin and other animals, use of surroundings. Freezing or overheating may also occur.	4
DPW 13	Is there a risk to quality from a lack of control over valves in the network which are normally closed?	Closed valves require periodic Installation and Operation to prevent them seizing up? However, deposits do collect behind them over time and can cause discolouration and turbidity. Therefore such Installation and Operations must be controlled by an approval procedure, to ensure valve Installation and Operations are first risk accessed and only carried out by competent persons following an appropriate procedure.	3
DPW 14	Are there, or could there be, sections of pipework containing stagnant water?	These are characterised either by (a) sections of mains of a relatively large diameter in relation to the demand off these, e.g. a 3" main with a trough at the end which is only occasionally used is likely to contain stagnant water; or (b) legs of main with no connections off these and therefore no turnover of water; (c) or where a low discharge point is present? (i.e. a single standpipe). 'Dead legs' of main may be present	3
DPW 15	Where there is copper pipework present, is it corroding?	Where copper pipes are used in the distribution system, these problems can be determined through on-site tests, or may manifest in taste complaints (metallic) or discolouration (blue/green) or laboratory tests.	3
DPW 16	Are lead pipes / fittings present in the supply?	Lead pipes are usually only found in distribution systems laid before the 1970s. Unpainted lead pipes appear dull grey. They are also soft and if they are gently scraped you will see the shiny, silver-coloured metal beneath. Dissolution of lead into the water supply occurs at a higher rate where the pH of the water is lower (more acidic).	4
DPW 17	Have there been complaints or reports of water quality problems (e.g. taste, odours or reports of any aquatic animals (freshwater shrimp, louse or worms)?	Ask the operator if there have been any complaints about the water being supplied or if there have been any known taste, odour or aquatic animal issues. When surface water is treated the majority of these plants and animals are removed. However, some animals and algae can pass through water filters and enter the distribution system.	3
DPW 18	Is the backflow protection within the distribution network inadequate?	If the premises are within the private supply, check whether backflow protection is in place. If the supply is a private distribution system (PDS), the appropriate Water Company can confirm whether any existing backflow deficiencies have been identifed upstream of the supply to the PDS. All private supplies should follow this best practice with backflow-prevention devices being installed.	5

Management and Control

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Overview

- Arguably most important part of RA

- Single risk score required, with subsidiary questions to help you decide

- It's all about confidence….

Management and Control

MC1	RISK TO WATER QUALITY FROM INADEQUATE MANAGEMENT? Determine confidence in management by considering the following questions, and give an overall risk score:	5	
MC1.1	Are written procedures / schedules kept for maintenance of treatment processes?	Yes or No?	
MC1.2	Are there written records kept to show when maintenance tasks have been completed?	Yes or No?	
MC1.3	Are manufacturers' instructions and/or manuals available (and followed) for all treatment processes?	Yes or No?	
MC1.4	Do operators have adequate (even if informal) general hygiene awareness?	Yes or No?	
MC1.5	Is the person(s) nominated to manage the supply trained to run and maintain the supply?	Yes or No?	
MC1.6	Is there a nominated person to run the supply when the above person is unavailable?	Yes or No?	
MC1.7	Is there a documented system to report emergencies to management/owner of supply?	Yes or No?	
MC1.8	Is there a stock control process for any key chemicals / spare parts / equipment?	Yes or No?	
MC1.9	Is there a documented contingency plan in the event of power failure, equipment failure, water quality issue?	Yes or No?	
MC1.10	Are there procedures / records for responding to alarms, monitors, on-site tests?	Yes or No?	
MC1.11	Are there appropriate procedures for rectifying customer complaints?	Yes or No?	
MC11.12	Is there a regular and documented inspection of the whole supply to look for new risks?	Yes or No?	
MC1.13	Are there procedures and records in place to inform the LA of any changes to the risk assessment?	Yes or No?	
MC1.14	Is there a documented contingency for the supply running out?	Yes or No?	
MC1.15	Are there adequate sample points to allow testing of all aspects of the water supply?	Yes or No?	

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Overview

- Fairly common – treats whole house or only single tap in property (POE / POU)

- "Under sink solution"

- Often cartridge filter, UV, but could be ion exchange or RO membrane

- Property Specific Treatment section plus select as many individual treatment modules as you need

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Property Specific Treatment

127, Station Road, Edinburgh, EH1 1AA

UPRN
906342142

Type of property
Residential

Max. people
5

Centralised treatment?
Yes

Point of use treatment?
Yes

Comments
These are some comments

‹ **Back to property list**

Choose relevant sections

- Property Internal
- **Property Specific Treatment**
- Treatment Cartridge Filters
- Treatment UV Disinfection
- Treatment Sediment Filters
- Treatment Chemical Filters
- Treatment Ion Exchange Filters
- Treatment Desalination and RO
- Treatment Membrane

Property Specific Treatment

This subsection assesses how the supply is managed and risks are controlled. It looks at the supply as a whole. Only a single score is needed, having considered all the questions within the sub-section.

📄 **Word export**

Q1   Is there a risk of the treatment system not being maintained to the manufacturer's instructions?   **[Yes]** No

Q2   Is the design of the individual treatment system inappropriate for the nature of and risks from the incoming water quality?   **[Yes]** No

Q3   Could the treatment device(s) be installed incorrectly?   **[Yes]** No

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Property Specific Treatment

Property Specific Treatment

This subsection assesses how the supply is managed and risks are controlled. It looks at the supply as a whole. Only a single score is needed, having considered all the questions within the sub-section.

📄 **Word export**

Q1 Is there a risk of the treatment system not being maintained to the manufacturer's instructions? **Yes** No

Q2 Is the design of the individual treatment system inappropriate for the nature of and risks from the incoming water quality? **Yes** No

Q3 Could the treatment device(s) be installed incorrectly? **Yes** No

Q4 Is the treatment device installed at an inappropriate location? **Yes** No

Q5 Is there a risk of water being consumed at water outlets where there is no treatment? **Yes** No

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Property Specific Treatment – Things to Watch For

- Inappropriate locations & installation
- Bad DIY solutions
- No maintenance
- Drinking softened / RO water directly (not healthy!)
- Other taps used for consumption in property not treated

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Property – Internal Overview

- We know it's difficult
- Important element in managing WQ
- Some risks are enhanced on PWS
- Various ways of approaching task
- Gradually build up a picture - prioritise

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Property – Internal Main Risks

- Tanks
- Lead piping & solder
- Some (legal) brass fittings contain lead
- Pipework design
  - Long runs
  - Dead legs
- Tap hygiene
- Cross connections

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Property – Internal References
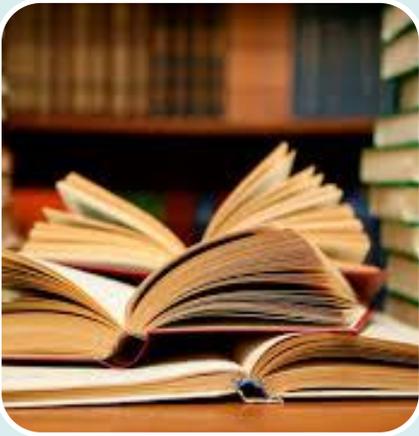
- World Health Organisation – authoritative but aimed at larger premises

- Anglian Water – practical guide in form of short videos around house

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Property – Internal Risk Questions

Choose relevant sections

- Property Internal
- Property Specific Treatment
- Treatment Cartridge Filters
- Treatment UV Disinfection
- Treatment Sediment Filters
- Treatment Chemical Filters
- Treatment Ion Exchange Filters
- Treatment Desalination and RO
- Treatment Membrane Filtration
- Treatment Cl Disinfection
- Treatment ClO2 Disinfection
- Treatment Conditioning pH Corr
- Treatment Ozonation
- Treatment Slow Sand Filters

Property Internal

Small-scale treatment within the property at the place where the water is consumed (e.g. under the sink). Complete this section anywhere there is PST treatment, plus the subsection relevant to the actual treatment process used (e.g. UV).

📄 **Word export**

Q1   Is there a risk to water quality due to poor design of the plumbing system?   **Yes** | No

Q2   Could vermin access any water storage tanks within properties?   **Yes** | No

Q3   Could a lack of cleaning of loft tanks cause quality issues ?   **Yes** | No

Q4   Are there any lead pipes / fittings within the properties?   **Yes** | No

Q5   Are there aesthetic issues with the water at the consumers' tap?   **Yes** | No

Q6   Is there inadequate backflow protection for any non-potable supply (e.g. rainwater harvesting / grey water systems) in place at any of the properties?   **Yes** | No

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