

WWDS-SLM3G Disinfection of water supply mains, fittings and standpipes for SLPs

Guidance notes

This procedure covers the disinfection of new mains including the pre-chlorination of polyethylene coils, mains following rehabilitation, temporary overland mains, fittings and standpipes.

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1 Associated documents

Relevant WIS/IGN 4-01-03

Chlorinated water must not be allowed to enter any watercourse, eg, river, pond, surface drain etc, without first being dechlorinated. Refer to procedure NTKSP025 (Dechlorinating mains water before discharge) or contact a supply scientist if further clarification is required.

The site supervisor must be immediately notified if any pollution occurs. The supervisor must inform the environmental team in Assets and Compliance and an operational scientist so that the Environment Agency can be advised and appropriate remedial actions taken.

2 Pre-requisites

The design phase of the main laying scheme shall identify as far as practicable a configuration designed to ensure adequate turnover and to include suitable permanent flushing points for when it is handed over to the client.

An assessment of ground conditions should take place to identify contamination risks to water quality during installation or when installed. The materials selected for the construction should take account of this.

Prior to commencement of all main laying schemes and at the pre-commencement meeting, confirmation is to be sought from Wessex Water Operations that the existing distribution mains have sufficient levels of chlorine residual and that there are suitable velocities for flushing of mains and sufficiency to recharge pipelines. These details are to be notified by the appropriate distribution inspectors and operational scientist.

Consideration shall be given to pre-emptive flushing of existing mains prior to commencement of a scheme.

Construction compounds shall be erected and organised to ensure that there is managed risk of contamination to materials by management of materials. This shall follow guidance from the National Water Hygiene code. It shall include but not be limited to appropriate levels of security, storage of fuels in bunded stores and management of pipes off the ground with appropriate caps and seals.

In addition:

- all staff must be adequately trained, holding a valid National Water Hygiene card
- staff must be appropriately qualified and trained to carry out pressure test and chlorination procedures
- sampling shall be undertaken by UKAS approved staff (records may be requested prior to commencement of work)

- alternative supplies for customers must be available during disinfection
- new mains connections to the network can only take place after representative samples have been taken and results approved by a designated, qualified person
- during disinfection all supplies attached to the new main MUST be isolated to ensure that highly chlorinated water does not enter customers' domestic systems. There must also be a physical break on all connected mains supplies. A sluice valve is NOT considered a reliable means of maintaining mains isolation
- at the end of each working day all exposed pipe ends MUST be effectively and securely sealed in order to prevent contamination
- service connections to high-risk properties ie, properties with rainwater harvesting systems, greywater recycling etc, shall only be made once Wessex Water has confirmed that the installations comply with the Water Supply (Water Fittings) Regulations 1999 and the relevant British Standards.

The following criteria apply for pass/fail on new sections of mains

	Limit	Prescribed Concentration of
Coliforms	0 in 100ml	0 in 100ml
E.coli	0 in 100ml	0 in 100ml
Enterococci	0 in 100ml	0 in 100ml
Clostridium perfringens	0 in 100ml	0 in 100ml
2 day total viable count (22°C)	No limit, assists troubleshooting	
3 day total viable count (37°C)	No limit, assists troubleshooting	
Odour assessment (laboratory)	"Normal" odour	"Normal" odour
Taste assessment (laboratory)	"Normal" taste	"Normal" taste
Turbidity	1 NTU	4 NTU
pH	Incoming water +/-0.5 pH unit and compliant with PCV	6.5 - 9.5
Colour	No limit, assists troubleshooting	No limit, assists troubleshooting
Conductivity (at 20°C)	2500µS/cm at 20°C	2500µS/cm at 20°C
Flushed iron	0.1mg/l	0.2mg/l (200ug/l)
Flushed aluminium	0.1mg/l	0.2mg/l (200ug/l)
Flushed manganese	0.025mg/l	0.05mg/l (50ug/l)
Free chlorine (recorded at site)	+/- 0.1mg/l of background chlorine in the area	+/- 0.1mg/l of background chlorine in the area
Total chlorine (recorded at site)	+/- 0.1mg/l of background chlorine in the area	+/- 0.1mg/l of background chlorine in the area

3 Equipment for water supply mains

The SLP is to ensure that appropriate equipment is available to carry out the work. The preferred process for disinfection of a water main is to ensure that the pipeline is free of debris and dirt using swabs and then use a sodium hypochlorite solution. The approach must demonstrate that the correct level of chlorine has been achieved across the whole pipe length.

The list as a minimum should include:

- 14/15% sodium hypochlorite for disinfection
- trench pump suitably sized
- sodium hypochlorite spray containing 1000mg/l chlorine. 1000mg/l chlorine solution made by adding 7ml of 14/15% sodium hypochlorite solution to 1 litre of clean water or by using approved chlorine tablets which are dissolved in a known volume of clean water
- chlorine test kit for low (0 to 5 mg/l chlorine) and high (0 to 250 mg/L chlorine) ranges with reagents
- flow proportional dosing equipment (eg, Vernon Morris dosing pump)
- sodium thiosulphate crystals or De-chlor tablets sufficient for dechlorination
- dechlorination mixing/dosing equipment
- clean and disinfected approved licenced standpipes
- appropriate PPE must be used. Consult manufacturers' requirements for the correct PPE to use
- turbidity monitor appropriate for range of test, ie, 0-10 (typical range 1-1000 NTU)
- iron test kit appropriate for range of test, ie, 0-0.2mg/l with reagents (typical range 0-3mg/l)
- blow torch, sample bottles and labels
- swabs both hard and soft of appropriate sizes. Soft swabs shall be used with a density of between 20 and 30 kg/m³. For pipe nominal bore up to 300mm, the swab shall have a diameter of 1.25 to 1.5x the nominal bore.

All equipment is to be regularly checked, calibrated, condition recorded or, if required, changed on a 2 year cycle or when deemed no longer serviceable.

4 Disinfection of new mains and pre-chlorination of polyethylene coils

- 1 Insert a cleaning hard swab of suitable size into the main. Charge the main to push the swab through the whole length of the section to be disinfected. Providing the swab appears clean and in good condition repeat cleaning process with a soft swab. If swabs are dirty repeat process until all dirt has been removed from main and water runs clear. Once the soft swab has emerged a pressure test of the section can be undertaken. If pressure test is satisfactory proceed with the disinfection. Record pressure test information and the number of swab passes required to clean section of main.

Note: a pressure test is not required prior to disinfecting coils in a depot for use on site, although a pressure test will be required when multiple coils are joined together.

- 2 Connect a pre disinfected standpipe on the inlet side of the new main, to the existing main hydrant. Measure and record the turbidity, iron and chlorine levels to ensure that the existing water quality meets the required standards. Turbidity must be <1.0NTU, iron <0.1mg/l and chlorine >0.2mg/l. If the existing water does not meet the required standards contact Wessex Water's self-lay team by e-mail (self.lay@wessexwater.co.uk).
- 3 To disinfect the new main follow the operating procedure for the Vernon Morris dosing equipment, or similar, using 14/15% sodium hypochlorite as follows.
 - a Ensure that there is sufficient 14/15% sodium hypochlorite solution available and locked securely in a carrier.
 - b Flush the charging hydrant before connecting all the required hoses.
 - c Open the emptying hydrant fully ie, end of new main section being disinfected.
 - d Connect the sodium hypochlorite carrier to the unit and set the pump to the dosing level required. To achieve a dose of 50mg/l a value of 0.33litres/cubic meter should be set on the vernier dosing controller.
 - e Increase the dose by rotating the body of the pump anticlockwise and decrease by rotating clockwise.

- f. Open the valve to the charging hydrant. This will prime the dosing pump. When the sodium hypochlorite has reached the pump then disinfection will begin. Check that inlet lines are not air locked as this will interfere with correct dosing.
- g. Samples are taken from the flushing hydrant to monitor chlorine levels and confirm when the disinfection is complete.
- h. When the new main outlet chlorine residual measured at the end flushing hydrant reaches at least 30mg/l, stop dosing sodium hypochlorite and turn off the water flow, disconnect the hydrant from the existing main and close the end flushing main.

NB. At no time shall the dosing equipment be left operating unattended.

- 4 Fully operate all line valves in the new main to ensure that they come into contact with the highly chlorinated water.
- 5 Leave the chlorinated main for a minimum of 16 hours (overnight); take a check sample at the terminating hydrant. Chlorine residual after the minimum 16 hour standing time must be maintained above 20mg/l. If the chlorinated main residual is lower than this re-swab and re-chlorinate the pipe section and review the quality of the incoming water. If the residual is greater than 20mg/l the main may be prepared for dechlorination.
- 6 Flush the chlorinated main with water by connecting a pre disinfected standpipe on the inlet side of the new main to the existing main hydrant and open the end flushing hydrant. (Record/make a note of the chlorine residuals in the existing main).
- 7 Dechlorinate the flushing end hydrant water with sodium thiosulphate.
- 8 Chlorine residuals of the dechlorinated water must be monitored to ensure that the process is effective.
- 9 Monitor chlorine residuals at the outlet hydrant prior to dechlorination until they are at normal background concentrations (of the existing main) then turn off and disconnect the inlet hydrant and flushing hydrant.
- 10 Leave the chlorinated main for a minimum of 16 hours (overnight).
- 11 Reconnect the inlet hydrant and sample the outlet end of the new main and the existing main for comparison using a disinfected standpipe and submit for analysis. Disconnect temporary link from hydrant. All samples must have the word 'Existing' or 'New' as applicable included on the location label. A long or large section main will require a number of samples to be taken along the length which will be agreed prior to commencement.
- 12 All samples must pass before the main can be connected to the existing network.
- 13 If the main to be disinfected consists of several different 'legs' repeat the operation above for each leg.
- 14 Pre-chlorinated coils once passed must be marked with an agreed tag and 'use by' date ie, two weeks from date of chlorination. If a coil is not used and in service within the two weeks it must be re-chlorinated using the above procedure. Coils must also be securely capped to avoid contamination during storage and transport from yard to site of installation.
- 15 The maximum length of time that a new main can remain unconnected to the supply network is two weeks from taking the sample.

NB. On completion of the disinfection process care must be taken with any remaining sodium hypochlorite in the dosing lines. This must be flushed out and disposed of correctly.

NB. When chlorinating coils in the depot all pipes must be laid on their side, ie, horizontally. Pipes must not be chlorinated vertically as this is not an acceptable/effective method of disinfection as there may be an air gap.

5 Use of factory sterilised and depot disinfected polyethylene coils

Factory sterilised coils have been exposed to 220°C as part of their manufacture and factory sealed to ensure sterility. They are date stamped with date of manufacture and a 'use by' date of 6 months from date of manufacture.

Depot disinfected polyethylene coils are treated as if they are new mains except that the process took place at the depot. They are date tagged with a 'use by' date two weeks after being disinfected.

However, if the 'use by' date has been exceeded or there is any evidence that the end seals have been damaged they cannot be used unless they are disinfected with sodium hypochlorite as a new main with full chlorination and new mains sampling.

The SLP is responsible for the control of in date polyethylene coils and mains.

- 1 Ensure that coils have been stored correctly in the yard. Factory sterilised coils must not be stored for any longer than 6 months from date of manufacture and capped disinfected polyethylene coils for any longer than 2 weeks from the date of disinfection.
- 2 Check that the outer seal is free of damage. Avoid any dragging of coils as this can damage the outer seal.
- 3 If the outer seal has been damaged check that the inner seal is still in place and repair the outer seal before transporting to site.
- 4 If both seals have been damaged or there is concern over the condition of the coil and caps, then the coil must undergo a new main disinfection or be returned to the supplier for disposal.
- 5 The factory sealed caps must remain in place until immediately before installation and/or connection procedures.
- 6 The pipe details must be recorded at installation in order to follow up any subsequent problems or issues.
- 7 Following installation the main shall be cleaned with a suitably sized swab soaked in a 1000mg/l solution of sodium hypochlorite. The main will then be flushed and sampled. The samples must be identified by recording the location, date and time details for unique identification.
- 8 The main can only be connected if <50 properties are affected and there are no downstream reservoirs. If a downstream reservoir or >50 properties are affected then the main cannot be connected until the check sample has passed (24 hours).
- 9 The maximum length of time that a 'passed' length of main can remain unconnected to the supply network is two weeks from when the sample was taken. If the two weeks has been exceeded then the main will require disinfection and sampling as per the new mains chlorination procedure (4).

6 Disinfection and installation of fittings

Fittings must be stored clear of the ground on plastic sheets or pallets and transported to site in such a way that minimises contamination.

- 1 Prior to joining the fittings together, physically clean the inside of the fitting with a sponge and then spray all inside surfaces with a 1000mg/l chlorine solution.
- 2 Prior to isolating the main excavate down to below the pipe invert and include a sump.
- 3 Ensure the main is drained down as far as possible using washouts and hydrants.
- 4 Insert the pump hose into the sump and once the main is cut ensure that the excavation is pumped out so that the water level is below the main to allow clearance to install the fittings without risking contamination from dirty water, mud, soil etc.
- 5 Once the main has been prepared to take the fitting, spray both ends of the existing pipe with a 1000mg/l chlorine solution.
- 6 Insert the fitting or assembly ensuring there is no ingress of any dirty water or other contaminant.
- 7 Charge up the main.
- 8 Flush to remove excess chlorine and air.

7 Disinfection and use of temporary overland mains

Hydrant standpipes

- 1 Bale out hydrant sump if full of water. Remove bowl cap.
- 2 Open valve slowly taking care not to flood bowl then bale out to at least 25mm below top of bowl.
- 3 Carefully pour 20-30ml of 14/15% sodium hypochlorite solution into the bowl and allow to stand for 2 minutes. Note, if there is a frost plug in the hydrant this needs to be correctly installed to retain liquid in the hydrant bowl and deliver proper disinfection. [Alternatively place an Instachlor tablet in the hydrant bowl and allow 5 minutes to dissolve].
- 4 Make sure the standpipe tap is shut then screw on to the bowl.
- 5 Slowly open the hydrant valve then open the standpipe tap.
- 6 Close the tap when the chlorinated water starts running from the standpipe.
- 7 Leave to stand for 5 minutes to allow for disinfection.
- 8 Ensure flushing water will not enter surface drains or watercourse or have thiosulphate crystals available to dechlorinate as appropriate.
- 9 Fully open standpipe tap and run to waste for at least 5 minutes.
- 10 Measure the residual chlorine to make sure all chlorinated water has been discharged.
- 11 Turn off the tap and sterilise using a blow torch.
- 12 The tap is now ready to be sampled.

MVUs

- 1 Warn the customer of a temporary loss of supply.
- 2 Bale out the meter box if full of water to below the meter valve unit (MVU) connection then turn off the supply to the property.
- 3 If the MVU has a flow meter remove it.
- 4 Close the outlet tap of the standpipe then invert and carefully pour 14/15% sodium hypochlorite solution into the open end until full.
- 5 After 5 minutes empty the sodium hypochlorite solution from the standpipe into a bucket for safe disposal.
- 6 Remove the MVU cover, make sure the standpipe tap is shut and screw standpipe onto fitting.
- 7 Turn on the supply, open the standpipe tap and run to waste for at least 5 minutes.
- 8 Measure the residual chlorine to make sure all chlorinated water has been discharged.
- 9 Turn off the tap and sterilise using a blow torch.
- 10 The tap is now ready to be sampled.

Data protection

For information about how we use your personal data, please see our privacy policy available at www.wessexwater.co.uk/privacy-policy or by writing to Wessex Water, Operations Centre, Claverton Down, Bath BA2 7WW.