

Hamilton City Development Manual	
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## SECTION H : DISINFECTION AND FLUSHING

### 1.0 GENERAL PROCEDURE

Generally, pipeline pressure testing and disinfection shall be witnessed by Council. The Contractor shall provide at least 1 day's advance notice for each of, pressure testing and disinfecting a pipeline.

It is a requirement for the Contractor's site-supervisor for pressure testing and disinfection water mains to hold the NZQA qualification "National Certificate in Water Reticulation".

The process of commissioning a pipeline shall follow one of the general procedures outlined below.

- The pipeline is thoroughly flushed, pressure tested, disinfected using dissolved HTH powder, and then left in the 'in-service' and pressurised state.
- The pipeline is disinfected using chlorine tablets glued to the inside of each pipe during construction, pressure tested, flushed and then left in the 'in-service' and pressurised state.

In the second of these options, if further work on the pipeline is required as a result of a failed pressure test then the disinfection step shall be repeated (using dissolved HTH powder).

### 2.0 DISINFECTION

Disinfection chemicals should be applied to achieve a free chlorine concentration of between 10 mg/litre and 100 mg/litre (the pH should not be higher than pH 9 — concrete lined pipes can cause the pH to be raised to the point where chlorine becomes ineffective).

The disinfectant requires time to be effective. The required contact time is a function of concentration. The product of free chlorine concentration (mg/litre) and contact duration (minutes) shall be not less than 7,200. e.g. a satisfactory treatment regime would involve a free chlorine concentration of 10 mg/litre with a contact duration of 720 minutes.

At the end of the disinfection period the free chlorine concentration shall be not less than 10 mg/litre. If at the end of the disinfection period the free chlorine concentration is less than 10 mg/litre then the pipeline shall be thoroughly flushed and the disinfection process repeated.

If the disinfection process is being applied to a pipeline with customer connections each service pipeline shall be closed at the toby prior to the disinfectant being administered.

The quantity of available chlorine varies for each chemical so it is not appropriate to apply 'rules of thumb' as to how much is needed to achieve a particular concentration.

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Generally the calculation takes the form:

$$\text{target chlorine concentration (grams/cubic metre)} = \frac{\text{weight of available chlorine (grams)}}{\text{volume of pipeline (cubic metres)}}$$

where:

$$\begin{aligned} \text{weight of available chlorine} &= \text{weight of chlorine chemical (grams)} \times \% \text{ of available chlorine} \\ \text{volume of the pipeline} &= \text{length (m)} \times [\text{diameter (m)}]^2 \times 0.785 \text{ (cubic metres)} \end{aligned}$$

$$\text{and diameter (m)} = \frac{\text{pipe diameter (mm)}}{1,000}$$

If chlorine tablets are used for disinfection these shall be glued to the inside of the pipe using a small amount of food grade glue or sealant such as 'Silaflex RTV clear'. The tablets take some time to dissolve so timing of the chlorine contact period shall not begin until such time as the available chlorine level reaches the intended concentration.

### 3.0 DISINFECTANT

Common forms of disinfectant are:

- Sodium Hypochlorite (NaOCl) liquid sold in bulk is typically 13 to 15% available chlorine.
- Chlorinated iso-cyanurate (swimming pool tablets) is available as Di-chlor and Tri-chlor forms. The cyanuric acid content slows the rate of chlorine dissipation to the atmosphere. The amount of available chlorine varies between 58% and 90% depending on product.
- Calcium Hypochlorite ( Ca(OCl)<sub>2</sub> ) also know as HTH (High Test Hypochlorite) is a powder with typically 65 to 70% available chlorine by weight.

*Warning:* These chemicals are strong oxidants and can cause serious burns; they are explosive if allowed to come into contact with organic liquids such as petrol, diesel and oil. Using the chemicals should only be undertaken by personnel trained in this application of disinfecting water.

### 4.0 REMOVING THE DISINFECTANT

Sometime after the minimum contact period for disinfection, the super chlorinated water is to be flushed from the pipeline. Flushing should continue for at least 10 minutes beyond the initial removal of the super chlorinated water. Projects involving pipelines of 250 NB and larger should be flushed until such time as the residual chlorine level matches that of the normal water supply in the area (i.e. upstream of the new pipe).

Individual customer connections shall be flushed by opening each toby valve installed on the pipeline. In the case of a pipeline repair where it is not practical to flush water at the toby, an outside hose tap should be used as the flushing point for each service connection. If the super chlorinated water can not be discharged to a sewer, it shall be neutralised before discharge to the environment.

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## **5.0 BACTERIOLOGICAL TEST**

In commissioning new pipelines, HCC shall be given 24 hours notice as to when sampling for bacteriological tests is to be carried out.

Water in the pipeline shall be sampled between 12 hours and 2 days after post-chlorination flushing and the samples tested for the presence of E.Coli by Ministry of Health Approved laboratory with IANZ accreditation for this type of test. The number of samples shall be at least one for projects involving less than 100 metres of pipe, two for projects up to 200 metres length, etc.

A satisfactory result is zero E.Coli per 100 ml.

Note: There are high risks of test failure due to sample contamination so it is recommended that the testing laboratory is also involved in collecting the sample.

If E.Coli is detected the pipeline shall be swabbed, flushed, disinfected, flushed again and then the bacteriological tests repeated. The process shall be repeated until such time as a clear test is recorded.