


<b>The University of British Columbia Land and Building Services</b>		<b>Emergency Repairs DISINFECTION METHODS FOR WATERMAIN BREAKS</b>
<b>Work Procedure</b>		
<b>Prepared by:</b> Jenny Liu, Mechanical Utilities Engineer	<b>Approved by:</b> 	<b>Issue Date: May, 2007</b>  <b>Replaces:</b>

1.0 Policy:

This policy summarizes the procedures regarding sanitary practices and disinfection methods during repairs of watermain breaks and is to be followed by all Utilities personnel.

2.0 Definition:

This policy applies to any watermain break or damage to the water distribution system that exposes the system to any potential contamination.

3.0 Objective:

This procedure is required to provide for the protection of the water distribution from contamination during emergency repairs. The procedures explained below are based on AWWA Standard C651-92 (Disinfecting Water Mains), Ontario Ministry of the Environment Bulletin 65-W-4 (Chlorination of Potable Water Supplies), and the 1994 City of Vancouver Standard specifications.

4.0 Procedure:

4.1 Repairs with no groundwater entry into the watermain:

These typically consist of cracked mains (“broken backs”), which are repaired with clamping devices. If the main remains full of pressurized water and some positive outflow from the break is always maintained (the valves are left cracked), it is generally assumed that groundwater or other contamination will not enter the main. Under these circumstances, the only disinfection that is required is to clean and swab (with 6% chlorine solution) the area to be repaired, and swab the repair clamp before applying it. No bacterial test is required.

If, however, a positive water flow out of the pipe is not maintained at least until the trench water is pumped down below the pipe invert, these conditions cannot be considered to have been met, and more complete disinfection and testing is required.

4.2 Repairs subject to groundwater contamination of the watermain:

In these cases a larger break or blowout has occurred, or it has been impossible to maintain continual outflow from the watermain, or pump the trench water level down below the pipe before completely shutting off the water. Groundwater will have entered the broken main. If sewage contamination or other health hazards are not suspected, these cases require disinfection and bacterial testing of the repair, but the results of the bacterial tests are not required before the main is put back into service.

Groundwater contamination must be minimized as much as possible. The trench should be excavated below the main and kept pumped out once repairs begin. Trench walls and floor should be sprayed with 6% chlorine solution to reduce the chance of further contamination from the trench. Valves feeding each side of the break should be left cracked open. Any groundwater and debris in the main must be flushed or cleaned out before installing repair pieces.

All repair pieces must be swabbed or sprayed with 6% chlorine solution (household strength bleach) before installation.

Bacterial tests are required for these repairs. The water sample must be collected from the repaired section of pipe immediately before backfilling the trench. This will generally require that the repaired section be tapped to create a sampling location. A second sample should be collected from a nearby service or hosebib, to act as a “source” sample for comparison. As for watermain construction, these samples must be taken to a lab for total and fecal coliform analysis.

The watermain will be put back into service after repairs are completed and the watermain has been chlorinated. The bacterial tests are intended primarily to function as confirmation that sanitary practices were effective, however if they come back positive (coliforms are present) then further disinfection and testing will be required. If fecal coliforms are detected, that section of watermain must be shut down until disinfection and successful retesting is completed. The strategy for any cases with positive test results must be discussed with the Mechanical Engineer if and when they occur.

Chlorination of the watermain may require the excavation and tapping of the watermain at each end of the block where the break has occurred to facilitate the chlorination of the watermain. Disinfection of the watermain requires a minimum concentration of 200 mg/l for a retention time of two hours. At the end of this time, the chlorine residual (free chlorine concentration) must be a minimum of 100 mg/l.

If this is not met, re-chlorination must take place. After chlorination, the repaired section of watermain must be flushed (into a sanitary sewer) until the chlorine residual is less than 1 mg/l.

Individual services should also be flushed to remove chlorine that may have entered.

#### 4.3 Repairs subject to wastewater and other gross contamination of the watermain:

In any case where a watermain break has been accompanied by a broken sanitary sewer main or sewer service, or when other contaminants that are suspected health concerns may have entered the watermain, the procedures for Case 2 shall be followed, except that **THE WATERMAIN MUST NOT BE PUT BACK INTO SERVICE UNTIL SUCCESSFUL COLIFORM TEST RESULTS (undetectable total and fecal coliforms) HAVE BEEN OBTAINED.** These cases may require the provision of temporary water services to customers, and will cause public relation difficulties, thus the Mechanical Engineer should be consulted when they occur.