

CONTINUOUS CHLORINATION DISINFECTION SYSTEM INSTALLATION GUIDANCE



A Peristaltic Chemical Feed Pump

The purpose of this guide is to help small water systems establish continuous chlorination disinfection treatment. Please contact the DWP Field Inspection Team at 287-2070 with any questions.

BEFORE YOU BEGIN

All treatment changes at public water systems must be reviewed and approved by the Drinking Water Program prior to construction. The DWP will also conduct a post construction inspection of the system to ensure the system meets all DWP requirements. Please notify the DWP as soon as the disinfection system has been installed so a Field Engineer can inspect it.

The Drinking Water Program recommends that a water treatment professional be contacted for an evaluation of the water and water system prior to the installation of a chlorination system. Elevated levels of iron, manganese and other inorganics could interfere with the intended operation of the chlorination system. Moreover, other treatment processes currently in place may be affected by the addition of chlorine.

All materials, products, and coatings that contact drinking water must be certified to meet NSF/ANSI Standard 61. All chemicals added to drinking water must be certified to meet NSF/ANSI Standard 60. Exemptions to these requirements are found in the State of Maine Rules Relating to Drinking Water.

All chlorination systems must be installed with the capacity to achieve 4-log inactivation for viruses if needed in the future. Please contact the Field Inspection Team to determine the requirements related to 4-log inactivation of viruses.

REQUIRED FEATURES

The continuous chlorination system must include the following features:

- A chemical feed pump.
- A chlorine solution tank.
- A free chlorine residual monitoring kit.
- A raw water tap and check valve installed prior to the pressure tank and treatment. See Figures 1 and 2.
- The ability to meet 4-log inactivation of viruses.
- The ability to maintain a free chlorine residual at the entry point within the range of 0.2 mg/l to 0.7 mg/l.

The following chemical feed pumps are listed in order of preference:

1. Peristaltic Pump
2. Flooded Suction Diaphragm Pump with 4-Way Valve¹
3. Diaphragm Pump with 4-Way Valve

Note: Make sure to become familiar with the parts of the pump and keep records of the pump supplier's contact information readily available in the event spare parts, manuals or emergency repairs are needed.

REQUIREMENTS FOR INSTALLATION OF CONTINUOUS CHLORINATION SYSTEMS

- The chemical feed pump:
 - If the system operates off of *one well*, the chemical feed pump must be electrically wired or controlled so that the chemical feed pump activates when the well pump turns on.
 - If *multiple wells* OR a *variable speed pump* is in use, the chemical feed pump must be paced to the flow of the water using a special chemical feed pump and water meter. When using this type of system, the water meter sends an electrical signal to the chemical feed pump. As the meter turns faster, the speed of the pump increases, injecting the proper amount of chlorine.
 - If a *variable speed pump* is *not* in use, the system must show the DWP how the residual will be maintained to meet safe drinking water requirements.
- The chlorine injection line should be as short as possible to avoid looping and bending, but should be long enough to allow for minor changes in placement of the chlorine tank.
- The chlorine solution tank should be located in a covered, cool, dry area. Make sure that dust, debris and insects cannot enter the top of the tank.
 - If a hose is used to fill the chlorine solution tank with water, *do not leave the hose in the tank* after filling it. This is a hazardous cross connection with potential serious health risks.
 - If a water line for filling a chlorine solution tank is hard piped, make sure there is an air gap or a backflow device that will prevent back siphonage on the supply line. The air gap must be must be at least two times the diameter of the supply line and not less than one inch.

¹ A 4-Way (also known as Multi-Function) Valve offers auto-degassing for pumping chemicals prone to off-gassing.

- Use an initial chlorine solution ratio of about 1 part Clorox bleach² to 15 parts water. Write down the date and the amount of bleach and water added to the tank. Use this information to help determine whether to increase or decrease the solution strength in order to get the correct chlorine residual. Record the final mixture recipe in a short written procedure describing how to fill the solution tank and keep the procedure visible at the tank.
- A “DPD Method”, Free Chlorine, low range (0 mg/l to 3.5 mg/l) chlorine test kit is required to test the chlorine residual levels at the entry point to the distribution system. **A pool test kit is NOT acceptable**
- The target chlorine residual range is 0.2 mg/l to 0.7 mg/l in the system. If the chlorine residual is too high or too low adjust the solution strength accordingly to compensate for the chlorine residual levels, or make small adjustments (in 5% increments) in the stroke and/or feed rate of the feed pump
- Chlorine residual readings should be taken at the entry point to the distribution system, right after the contact tank.
 - **These chlorine residual readings must be recorded at a minimum of twice a week and reported to the Drinking Water Program on the Monthly Operating Report (MOR) form each month. The DWP provides these booklets. The form is also available online for electronic submission.**
 - **MORs must be submitted to the DWP by the 10th day of the month following the compliance month.**
 - Conduct a test for chlorine residual at the same time and location whenever a bacteria sample is collected for compliance. Record the residual reading in the sections indicated on the chain of custody paperwork that comes with the water sample kit. Also record these results on the MORs.
- Conduct occasional chlorine residual tests at other faucets at the far reaches of the water system to make sure that chlorine is reaching all sections of the piping. Chlorine should be detectable at all locations in the distribution system.

CONTINUOUS CHLORINATION DISINFECTION SYSTEM CONFIGURATION

When installing a continuous chlorination disinfection system, the following parts are added to the existing well and pressure tank:

- Chemical feed pump
- Chlorine solution tank
- Chlorine contact tank

The configuration of the set up varies dependent on whether there is a single well and the chlorination pump is tied directly to the well pump circuit, or there are multiple wells and the chlorination pump is activated by a flow-meter with an electrical signal output. Figures 1 and 2 represent typical set ups based upon the number of active wells receiving treatment.

² Clorox is currently the only supermarket sodium hypochlorite (bleach) that meets NSF 60 certification.

When the chlorination pump is connected electrically to the well pump circuit directly, the chlorine injection point should be before the pressure tank. This prevents a pressure tank full of un-chlorinated water from flowing into the system before the chlorination pump turns on. See **Figure 1**.

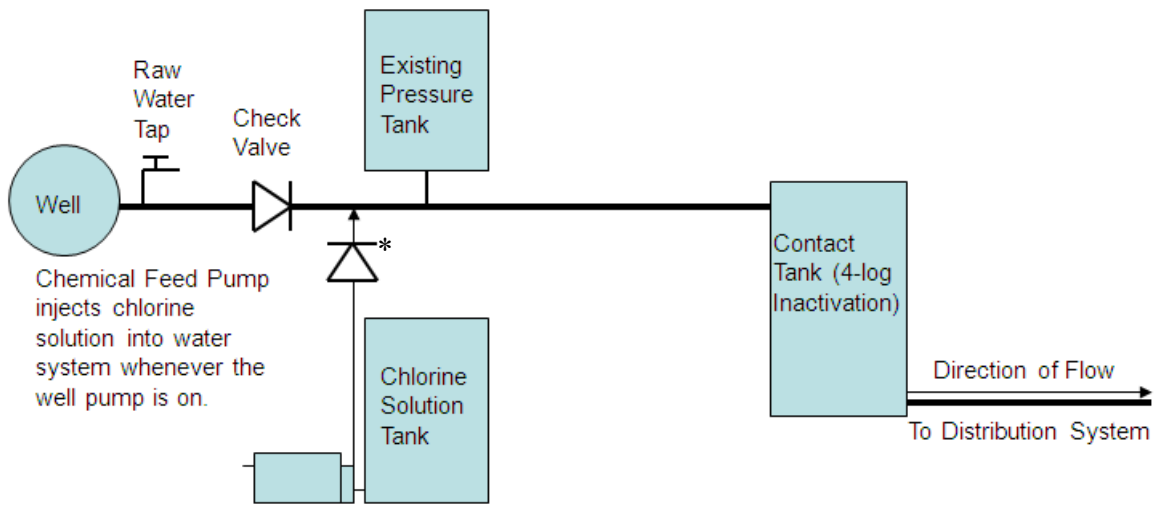


Figure 1: Configuration for Continuous Chlorination Disinfection System for Single Well

If the chlorination pump is activated by a flow-meter with an electrical signal output, then the injection point of the chlorination can be before or after the pressure tank. See **Figure 2**.

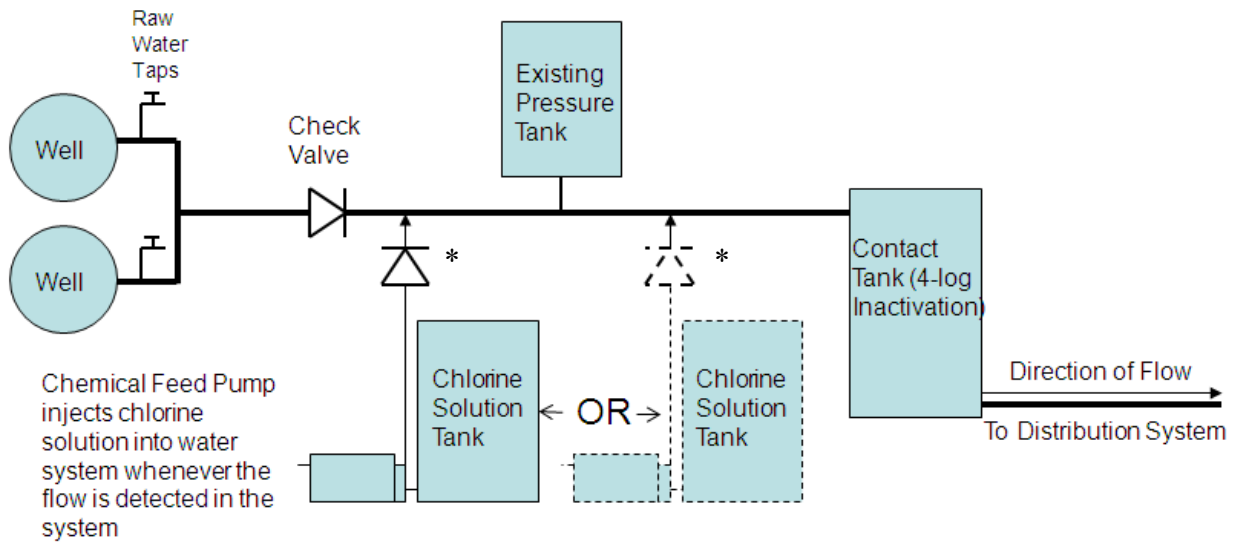


Figure 2: Configuration for Continuous Chlorination Disinfection System for Multiple Wells or a Variable Speed Pump

* This check valve may be built into a “four-way valve” on the pump or in the case of a peristaltic pump, this check valve is not necessary.

In the first case, the chemical feed pump injects chlorine solution into the water system whenever the well pump is on. In the latter, the chemical feed pump injects chlorine solution into the water system whenever water flow is detected in the system. In either case, this ensures that the only time chemicals are injected into the water supply is when water is flowing.

A water treatment installer can recommend the size of the chemical feed pump based on flow rate from the well and operating pressure. Refer to the list of preferred chemical feed pumps in the Required Features portion of this document.

The contact tank is where the bacteria are inactivated. The longer the chlorine solution is in contact with the bacteria the greater chance there is that the bacteria will be inactivated. **Chlorination systems must be designed to meet 4-log inactivation of viruses.** Contact the DWP to determine design details related to this requirement. The pH, temperature, and peak flow of the water system will be needed to calculate the volume of the required contact tank.

AFTER THE CONTINUOUS CHLORINATION SYSTEM IS OPERATIONAL

Chlorine residual samples must be collected by the Public Water System daily for a period of four weeks immediately following installation of the disinfection system. After the DWP has determined that the chlorine residual has been maintained at consistent levels, sampling for chlorine residuals may be reduced depending on system size and complexity. Reduced chlorine residual monitoring shall be no less than twice per week and the PWS must submit monthly operational reports indicating residual levels to the DWP by the tenth day of the month following the compliance month. The DWP reserves the right to require increased monitoring.

For further information please contact a member of the Maine Drinking Water Program Field Inspection Team at (207) 287-2070.