

Department of Public Health  
Drinking Water Program Device Certification Program

## **Guidelines for Microbiological Reduction Protocols**

October 2009

These guidelines are intended to identify the basic elements of an acceptable microbiological reduction testing protocol for California's Residential Water Treatment Device Certification Program. Devices certified for microbiological reduction must be demonstrated to achieve 99.9999% bacteria reduction, 99.99% virus reduction, and 99.95% cyst reduction.

**Supplemental treatment of municipally treated drinking water:** A manufacturer may desire to market a system as a supplemental microbiological treatment device that is intended to provide assurance to consumers in the case of a treatment plant upset or incursion in the distribution system to protect them in advance of a "boil water order". The Department requires this type of claim to meet full microbiological reduction requirements. Considering that the source of contamination may be unknown and could even be raw sewage (worst case), a less capable device may not provide adequate protection. During upset and/or incursion conditions, the source water could also have elevated levels of turbidity and/or TOC.

**Water system use to meet Surface Water Treatment Rule:** Certification of the device may qualify it for use as a point-of-entry (POE) device to meet the Surface Water Treatment Rule (SWTR) on a constructed conveyance water system, but the manufacturer cannot apply for a domestic water supply permit. The water system that is proposing to use POE in lieu of centralized treatment must come to the Department with an application to amend or revise or obtain a domestic water supply permit. The certified POE device must be able to be used to meet the SWTR or LT2 pathogen removal requirements.

### **Elements of Test Protocol**

There are several basic elements that must be addressed in a microbiological reduction test protocol intended to certify a residential water treatment device under the Department's certification program.

1. Minimum reductions:  
Bacteria: 99.9999%  
Virus: 99.99%  
Cyst: 99.95%
2. Surrogate organisms may be proposed. The Department may accept surrogate test organisms or compounds when they represent the most difficult organism/compound for

the technology to remove/inactivate. Provide appropriate references to support any surrogates proposed.

3. Challenge water with 30 NTU turbidity and 10 mg/L TOC water (to mimic worst-case surface water or distribution system incursion scenarios). On a case-by-case basis, we will consider variations to these challenge water conditions if the proposed challenge water parameters represent the most rigorous performance conditions for the technology used in the device.
4. Certified microbiological reduction devices must have a fail-safe method of operation. UV disinfection systems have UV sensors that go into alarm when the necessary UV dose is not being delivered to the water. Distillation systems cease producing product water when they fail. Please describe how the candidate system will fail in a safe mode (will not pass through microbiologically unsafe water) and include a means to verify fail-safe operation in the test protocol.
5. Systems whose performance depends on flow rate must be tested at maximum flow rate. Maximum flow rate is to be determined by measuring flow rate at maximum operating pressure. If the system includes a dynamic flow controller, maximum flow rate is to be determined by measuring flow at every 10 psi from 60 psi up through the manufacturer's maximum specified operating pressure or 120 psi, whichever is greater.
6. All effluent samples should be taken as "first draw". Also, all samples are to be analyzed individually and not composited.
7. If MS-2 will be used, the coliphage preparation procedure should provide evidence that the final solution is homogeneous and monodispersed.
8. Three (3) units should be tested simultaneously.

**Technology specific testing parameters previously approved by the Department:**

Ultraviolet Light

**Surrogate:** MS-2 phage

**Challenge water:** Low turbidity water accepted when certification conditioned to require ANSI/NSF Standard 53 certified cyst filter upstream of UV system.

Mechanical Reduction

**Surrogate:** MS-2 phage may be used when log reduction is equivalent to pathogen class requirement it is representing (i.e., 99.9999% MS-2 reduction required for bacteria surrogate, 99.99% MS-2 reduction required for virus surrogate).

### **Process to apply for protocol review and certification**

The Department in advance of testing must approve all test protocols for microbiological reduction. If testing is not done according to a Department-approved protocol, the applicant runs the risk of having the Department deny the application on the basis of inadequate testing.

To have the Department review a proposed test protocol, submit an application for certification, the appropriate fee, the protocol (two copies), description and drawings of the system.