



Guidance Document
 SPS 382.50 Health Care and Related Facilities
 Hot Water Maintenance
ULTRAVIOLET (UV) DISINFECTION

Issue Date: August 25, 2016

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| BACKGROUND | Hot water distribution systems serving a hospital, community-based residential facility, inpatient hospice or nursing home shall be installed and maintained to provide bacterial control. The storing and circulation of hot water shall be either initiated at a minimum of 140°F with a return of a minimum of 124°F, chlorinated at 2 mg/L residual, or disinfected by another system approved by the department. |
| GOALS OF RULES AND POLICIES | The goal of this guidance document is to protect public health of inpatients within a health care facility by disinfection of the hot water supply system. |
| APPLICABLE RULES | Wisconsin Administrative Code: SPS 382.20 , SPS 382.40 , and SPS 382.50 |
| APPLICABLE POLICY ON ALTERNATE | The use of ultraviolet (UV) is “another disinfection system” approved by the department for compliance to SPS 382.50(3)(b)6.c. The installation of a water treatment device requires department plan review under SPS 382.20(1)(a)1. The following operational parameters must be observed. |
| PROCEDURES | <p>Criteria for UV Water Treatment Devices</p> <ol style="list-style-type: none"> 1. UV water treatment devices must conform to Class A criteria under the American National Standard Institute (ANSI)/National Sanitation Foundation (NSF) Standard 55 - Ultraviolet Microbiological Water Treatment Systems. <ol style="list-style-type: none"> a. The capacity of the UV system shall comply with sizing criteria listed in SPS 382.40. b. The water system downstream of the UV disinfection system shall be disinfected prior and immediately before activation. c. Multiple parallel UV treatment systems may be installed to provide disinfection of the water systems. <ol style="list-style-type: none"> i. Single component failure can be expected. If a single UV treatment system is installed, a bypass may be installed provided that continuous disinfection of the hot water distribution system that comply with SPS 382.50(3)(b)6.a or b. d. This device must be installed with a 254 nm wavelength narrow band UV monitor. The monitor must de/energize the solenoid to stop the flow of water at a minimum UV dosage of 40,000 microwatt-seconds per square centimeter (40 millijoules) at a wavelength of 254 nm. e. This device must be installed with automatic fixed flow rate control that prevent flow above the manufacturer's maximum rated flow over the operating pressure range recommended by the manufacturer. f. A solenoid valve must be installed on this device. g. A contingency plan must be posted that provides the following information on system failure: <ol style="list-style-type: none"> i. Name and phone number of UV manufacturer ii. Name and phone number of individual familiar with system (installer, etc.) iii. Precautions and instructions to provide temporary water (provide redundancy or see point E.6.) |

Pretreatment

1. The water supply shall be analyzed for the following water quality parameters and the results shall be included in the UV application. Pretreatment is required for UV installations if the water quality exceeds any of the following maximum limits:

| Parameter | Maximum | Preferred |
|---------------------|----------------|----------------|
| Color | 15 ALPHA units | No ALPHA units |
| Dissolved Iron | 0.3 mg/L | <0.01 mg/L |
| Dissolved Manganese | 0.05 mg/L | <0.0004 mg/L |
| Hardness | 120 mg/L | 17.1 mg/L |
| Hydrogen Sulfide | Non-detectable | Non-detectable |
| Iron Bacteria | None | None |
| pH | 6.5 to 9.5 | 6.5-9.5 |
| Suspended Solids | 10 mg/L | <1 mg/L |
| Turbidity | 5.0 NTU | 1.0 NTU |
| Total Coliform | 0 CFU/100 ML | |
| E. Coli | 0 CFU/100 ML | |

2. Raw water quality shall be evaluated and pretreatment equipment shall be designed to handle water quality changes.

Water Quality Monitoring

1. Total coliform monitoring will be used to evaluate UV treatment effectiveness. The department, on a case specific basis, may require other parameters. The water quality monitoring frequency will be as follows:
 - a. A water quality test shall be taken:
 - i. At startup
 - ii. 2 weeks after start up
 - iii. Once annually thereafter
 - b. Water quality tests shall be taken after disinfection and flushing per SPS 382.40(8)(i).
 - c. A separate sample should be taken upstream and downstream of the device.
 - d. A record shall be kept on the water quality test results.
2. Water system owners are encouraged, but not required, to routinely monitor effectiveness of the water treatment system.

Oversight and Monitoring

1. The solenoid valve must be installed on the inlet of this device.
2. Treatment units and the water system shall automatically shutdown if the UV intensity falls below the required output of 38 mJ/cm².

Maintenance

1. UV water treatment devices should be maintained and serviced by qualified individuals.
2. The cleaning frequency for a UV system shall be based on the manufacturer's recommendations according to water chemistry.
3. The O & M manual on troubleshooting the system shall be kept onsite.
4. The UV water treatment system shall be disinfected prior to placing the water treatment system back into operation after any maintenance of the equipment.
5. The hot water system shall be disinfected after any interruption of the UV system or any maintenance of the piping system that includes exposure within the piping system. Disinfection of the hot water system can be accomplished by using chemical disinfectants such as chlorine or by thermal disinfection by increasing the temperature of the water. An assessment of the system components and specific water quality for special use should be considered prior to the disinfection process. Patient exposure and access to the water during the process should be avoided.

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| | <ol style="list-style-type: none"> 6. When disinfection of the hot water system becomes necessary for startup or maintenance purposes, <ol style="list-style-type: none"> a. Hot water temperature should be raised to 160-170°F and maintained at that level while progressively flushing each outlet around the system. A minimum flush time of five minutes has been established by the Center for Disease Control Hospital Infection Control Practices Advisory Committee. Appropriate safety procedures to prevent scalding are essential, or b. Chlorine should be added to achieve a free chlorine residual of at least 2 mg/L throughout the system. This may require chlorination of the water heater or tank to levels of 20 to 50mg/L. Appropriate safety procedures to prevent the inhalation and/or the ingestion of chlorinated waters are essential. The pH of the water should be maintained between 7.0 and 8.0. Each outlet should be flushed until the odor of chlorine is detected. The chlorine should remain in the system for a minimum of 2 hours (not to exceed 24 hours, free chlorine residuals can cause corrosion of metals), after which the system should be thoroughly flushed with water treated by the activated UV system. 7. Each system should have at least one replacement lamp available on site. |
| DOCUMENTATION | <ol style="list-style-type: none"> 1. A record shall be kept weekly of the UV system. A typical onsite record should include but not limited to: <ol style="list-style-type: none"> a. Location of unit b. Date and time reading taken c. A daily record of a visual equipment inspection (meter reading) d. Identification of person taking reading 2. A record shall be kept on dates of cleaning and replacement of lamps, components or parts. The record should also include: <ol style="list-style-type: none"> a. Identification of individual or contractor making repairs b. Identification of components or parts replaced 3. A record of when the device was shutdown and the reason for shutdown. The record should include: <ol style="list-style-type: none"> a. Date of disruption b. Reason for disruption c. Amount of time system was offline d. Alternate disinfection incorporated when UV system was offline e. Date and type of disinfection of hot water system prior to the UV system put back online 4. A record of any testing of the effectiveness of the UV system and a record of the results. 5. Department and Health representatives shall have access to the UV water treatment system and records on request. |
| NOTIFICATION | <p>The Department of Health Services is to be cc'd as part of this approval. Email to: David R. Soens, Director, david.soens@dhs.wisconsin.gov</p> |
| DEPARTMENT TRACKING | <p>The Division of Industry Services reserves the right to amend/revise this document as conditions arise making them necessary for code compliance and/or to protect public health and the waters of the state.</p> <p>For more information contact a Wisconsin Department of Safety and Professional Services Plumbing Consultant at 608-267-9421 or send an e-mail to DspsSbPlbgTech@wisconsin.gov</p> |

Record Keeping: Ultraviolet (UV)

Weekly Data by Month: __/__/____

Unit# _____

| Date/time | Reading | Alarms | Operator | Comments |
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| | Date/time | Total Time Offline | Reason for Disruption <i>(lamp replacement; sleeve cleaning; loss of power; component replacement; other;)</i> | Alternate Disinfection System <i>(thermal; chlorine)</i> | Operator |
|------------------|-----------|--------------------|---|---|----------|
| Device Shut Down | | | | | |
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| System Effectiveness Test | Date/time | Comments |
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