

Minimum Requirements of UV Class A Systems in NSF/ANSI 55

Rationale for options

The current Class A ultraviolet light system requirements in the NSF/ANSI 55 standard are conservative beyond those accepted for other disinfection and acute contaminant water treatment systems. The present provisions would create numerous false alarm service calls that restrict the product and reduce its practical applications in private residences. Equally conservative options can and should be offered as an alternative in NSF/ANSI 55 to further the use of ultraviolet light devices for the better protection of public health.

The UV sensor is a relatively unique requirement for certified products. It is possible, for example, that membrane systems and other filters could also develop a failure such as a minute leak around a seal or through an imperfection, yet we allow such other microbiological purification systems to not have a continuous fail safe monitor for effectiveness. Chlorination systems are always accepted to not have a continuous monitor of chlorine residual. It is proposed that the standard should have an equally conservative alternative to the sensor monitor, such as perhaps including presence-absence coliform sample bottles with the Class A certified units. These units will be supplied with instructions for the homeowner to periodically analyze and check the water quality and safety coming out of the unit. That is similar to the precedent requirement for RO systems certified to NSF/ANSI Standard 58 for nitrate reduction.

Manufacturers of UV devices find the bulk of their products to users in the USA, Canada, and elsewhere do not contain sensors and are not Class A systems as required by the standard for such devices to be used for treating potentially unsafe waters. This is due to choice of consumers opting for lower cost and less troublesome product. The use of such devices has been satisfactory to meet the consumers' needs and to provide drinking water protection.

Further, it is common knowledge that current UV sensors require calibration and/or maintenance to provide reliable functioning. The sensors, when used,

lead toward incessant false malfunction alarms thus leading to needless shut down of the systems. These alarms would lead to calls for dealer service to bring the system on line again and to restore the household water supply. False sensor malfunctions can be due, for example, to temperature build up in the device during non-flow periods, causing an erroneous low dose signal and thereby a needless and annoying shut down of the device. Such occurrences often lead to the users disconnecting the sensors and thereby defeating their intended purpose in protecting public health.

The present situation is not fully protective of the consumers as intended by the spirit of the standard. Rather it may drive consumers away from the Class A required appurtenances. We need to provide other equally protective options or alternatives to better serve the users.

This is the intent of the suggested changes for consideration by the UV Task Force and the DWTU Joint Committee.

Features of suggested Option 2:

- Requirement of 40 mJ/cm² for Class A was selected conservatively based on the dose required to inactivate bacterial pathogens (~10), Crypto & Giardia (~10) and viruses of concern (~30). In Option 2 we are recommending a raise of the requirement to 60 mJ/sq.cm. This increase could account for most needs in the real life situations of variations in background water qualities. This is an increase in factor of safety of at least another 50% over the already present safety factors. This may be a tough requirement, but it can be met by the manufacturers within their technical capabilities.
- In this option a requirement for lamp change at $\frac{3}{4}$ of the lamp's measured life cycle has been included. This can be done by a programmable calendar timer with an indication of ineffective operation at the end of the time period. (For example, a nine-month lamp change out is required if the life of the lamp is validated for 9000 hours or 1 year.) The manufacture will be responsible to provide the lamp degradation curve as part of the documentation submitted at

the time of testing. This provides at least an additional 33% factor of safety to cover variations in background water qualities.

- Requirement of audible and/or visual alarms as well as termination of water is being maintained in this option as well.
- Water quality restrictions will also be spelled out. While these quality parameters are important for any UV applications, it is considered more appropriate to be indicated for this Option 2 for Class A.
- Bacteriological test kits are required. (These user-friendly test kits reliably monitor for the same indicator organisms used to determine the microbiological safety and compliance of municipal water systems. They will show whether the system is properly operating when used by the users.)
- Clear Instructions for inspecting, cleaning and maintaining the system is also required to be included with specific instructions for inspection at one, two and three weeks intervals initially. This is done with the understanding that UV treatment may need regular maintenance, and specific pre-treatment of the feed water for the device to be fully effective.

All of these together will lead toward better protection of public health than what we have offered till now.

6.2.1 Class A systems

6.2.1.1: Option 1- Class A systems shall be equipped with a UV sensor to indicate when the UV irradiance at the sensor is below the minimum required by this Standard. One or more of the following means shall be used to indicate ineffective operation:

- a visual alarm;
- an audible alarm; or
- a system that terminates discharge of water.

The alarm or shut-off system shall be evaluated in accordance with 6.2.3.

6.2.1.2: Option 2 – Systems without the use of sensors shall be equipped with all the other required components for effective operation. At the minimum, they shall contain a controller that provides the following functions:

1. operation and failure of the electrical function of the lamp
2. In the case of ineffective performance a visual and audible alarm or termination of water
3. Displays of the device in function, failure signal of each lamp, and service time of lamps

These devices shall be required to demonstrably use the same type of UV lamps that provide at 254 nm. They also must include a calendar timer set to trigger the change of bulbs at 75% of the demonstrated life of the bulb. The manufacturer shall provide the lamp degradation curve as part of the documentation submitted at the time of testing.

The instructions included with the device as well as presale literature shall indicate the need for using these devices only on waters that meet the following requirements or pretreated to do so:

- iron less than 0.3 ppm
- manganese less than 0.05 ppm
- hardness less than 7 grains per gallon
- tannins less than 0.1 mg/L
- turbidity less than 1 NTU
- UV transmittance greater than 75%

These manufacturers shall be required to include instructions on the use of household food safe cleaners to clean/descale the UV systems. They shall require inspection and cleaning if necessary of these systems more often in the beginning of the installation of the device or in known dirty or scaling waters. They shall be required to be inspected and cleaned at least once every three months.

The manufacturers shall also be required to include a microbiological test kit for use by the users at least once between the changing of lamp(s). The efficacy of the test kit shall be demonstrated.

7.2.2.1 Class A systems

A Class A system **with sensors** shall deliver a UV dose at least equivalent to 40 mJ/cm^2 [$4.0 \times 10^4 \text{ } \mu\text{W-sec/cm}^2$] at the alarm set point when the system is tested in accordance with 7.2.2.7 or 7.2.2.8 as applicable. The equivalence of the UV dose shall be determined by comparing the system's inactivation of MS-2 Coliphage to the inactivation obtained in accordance with 7.2.1.3.

A Class A system **without sensors** shall deliver 60 mJ/sq.cm when tested in accordance with 7.2.2.8. (The testing of these units shall be done at 70% UVT achieved by the addition of PHBA to the test waters). The equivalence of the UV dose shall be determined by comparing the system's inactivation of MS-2 Coliphage to the inactivation obtained in accordance with 7.2.1.3.

7.2.2.8.2 Acceptance

7.2.2.8.2.1 Class A systems

For Class A systems with sensors, the geometric mean of all MS-2 Coliphage plaques on influent samples minus the geometric mean of counts on all effluent samples shall demonstrate a log reduction equal to or greater than the reduction caused by a dose of 40 mJ/cm^2 [$4.0 \times 10^4 \text{ } \mu\text{W-sec/cm}^2$] as calibrated in 7.2.2.

For Class A systems without sensors, the geometric mean of all MS-2 Coliphage plaques on influent samples minus the geometric mean of counts on all effluent samples shall demonstrate a log reduction equal to or greater than the reduction caused by a dose of 60 mJ/cm^2 [$6.0 \times 10^4 \text{ } \mu\text{W-sec/cm}^2$] as calibrated in 7.2.2.