



Ohio Department of Health Bureau of Environmental Health

Ultraviolet Light for Continuous Disinfection

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"To improve and protect the health of all Ohioans"

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Ultraviolet light (UV) is an effective means of disinfecting water. Ultraviolet light disinfects water by striking a microorganism with a 254Å (nm) wavelength of electromagnetic radiation at a specified intensity. This action disrupts the DNA preventing the microorganisms from reproducing and thus effectively killing it. Sunlight can disinfect water the same way.

Ohio Administrative Code (OAC) 3701-28-09 currently provides for the use of UV as a primary means of disinfection for private water systems. Only UV systems that meet The National Sanitation Foundation (NSF) Standard 55 **Class "A"** or the equivalent can be considered for approval as a means of primary disinfection of private water systems in Ohio. NSF defines a Class "A" UV system as follows:

"A system capable of delivering a UV dose at a wavelength of 254 nm at least equivalent to 40 mJ/cm² at the alarm set point".

Any UV system that becomes listed on NSF Standard 55 Class "**A**" is acceptable for primary disinfection in Ohio without additional approval from the Ohio Department of Health.

For a regularly updated listing go to the National Sanitation Foundation web site at www.nsf.org/ and look under NSF Standard 55 "A".

If an UV product is not listed on the NSF Class "A" standard the regulating agency may review the technical specifications for compliance with the class "A" standard, or accept an alternative third party certification that determines a system is in compliance with the class "A" standard. The regulating agency **is not required** to review the technical specifications. When a regulating agency decides not to review the technical specifications, the manufacturer would then carry the burden of proof of third party certification that their product meets the requirements of NSF Standard 55 Class "A".

Explanation of (OAC) Requirement for Standard 55 Class "A"

Pathogens are affected differently by varying intensities of UV light. In the OAC UV disinfection dosage is measured as microwatt seconds per centimeter squared. NSF now measures UV dosage at the equivalent milli-joule (mJ/cm²) units.

Many UV devices currently on the market operate at a dosage of 16 mJ/cm² (or the equivalent of 16,000 uW/sec/cm²). These systems are less expensive and will inactivate total coliform, but are **not sufficient** to inactivate many other pathogens to the desired reduction level.

NSF Standard 55 Class “A” UV systems are intended to inactivate disease causing bacteria and viruses and some protozoa. The National Sanitation Foundation describes Standard 55 for “Class A” UV light disinfection systems as follows:

“Class A point-of-entry and point-of-use systems covered by this Standard are designed to inactivate and/or remove microorganisms, including bacteria, viruses, *Cryptosporidium* oocyst and *Giardia* cysts, from contaminated water. Systems covered by this standard are not intended for the treatment of water that has obvious contamination or intentional source such as raw sewage, nor are systems intended to convert wastewater to drinking water. The systems are intended to be installed on visually clear water.”

NFS recently revised the Standard 55 for class A & B UV light disinfection systems. Standard 55 “**Class A**” UV systems are required to operate at a *minimum* UV light dosage of 40 mJ/cm² (the equivalent of 40,000 uW-sec/cm²). “Class A” systems are designed with warning devices and/or automatic shutoffs that activate when UV light dosage reaches a fail-safe set point below 40 mJ/cm². The automatic shutoff is the preferred installation in order to avoid the consumption of untreated water. Recent studies by NFS have determined that Standard 55 “**Class A**” UV disinfection will protect against *Giardia* and *Cryptosporidia* cyst. However, an UV device cannot make a claim for other cyst reduction unless NSF 53 cyst reduction filters have been installed upstream of the UV unit.

NSF Standard 55 “Class B” UV systems are designed to operate at a minimum dosage of 16 mJ/cm² (equivalent 16,000 uW-sec/cm²) and are intended to “reduce normally occurring non-pathogenic or nuisance microorganisms only. The “Class B” or similar non-rated UV systems are **not** intended for the disinfection of “micro biologically unsafe water”. It is illegal (per OAC 3701-28- 09) and should be considered hazardous to install these UV systems for primary disinfection of private water systems.

Improving UV Operation

Transmitted UV light dosage is affected by water clarity. Water treatment devices are dependent on the quality of the raw water. When turbidity is 5 NTU or greater and/or total suspended solids are greater than 10 ppm, pre-filtration of the water is highly recommended. Install these filters prior to the cyst filter. This will also help extend the life of the more expensive cyst filters. Dissolved iron and hardness will also affect the transmittance of UV light as build-ups occur on the quartz sleeve. When dissolved iron levels are 0.3 ppm or above and hardness is 103.0 ppm (6 GPG) or higher, treat the water prior to UV disinfection.

The effective life of an UV bulb for adequate disinfection is about 1 year. Even though, the bulb may still appear to be functioning it will have lost much of its intensity. It should be replaced once per year before the automatic warning or shut-off devices are activated.

If you would like more information about UV light for continuous disinfection, please contact the Bureau of Environmental Health at (614) 466-1390.