

UV Water Treatment

WHAT IS UV TREATMENT?

Ultra-violet (UV) treatment is the disinfection process of passing water by a special light source. Immersed in the water in a protective transparent sleeve, the special light source emits UV waves that can inactivate harmful microorganisms. This method of treatment is growing in popularity because it does not necessarily require the addition of chemicals.

UV systems alone are neither intended to treat water that is visually contaminated nor intended to convert wastewater to safe, microbiologically potable water.

HOW DOES UV TREATMENT WORK?

The ultra-violet rays, similar to the sun's UV but stronger, alter the nucleic acid (DNA) of viruses, bacteria, molds or parasites, so that they cannot reproduce and are considered inactivated. UV treatment does not alter the water chemically as nothing is added except energy. It should be noted that inactivated microorganisms are not removed from the water. UV treatment does not remove dirt and particles, metals such as lead or iron,

or hard minerals such as calcium. Other devices are required to remove particles, metals and minerals, and information can be found in other *About Your House* documents in the water treatment series.

DO I NEED A UV SYSTEM?

If your drinking water is municipally supplied or your regularly tested water source is safe, it is likely that you do not need a UV system for health purposes. If further peace of mind for safe drinking water is your goal, UV may provide additional treatment to your water.

IS UV-TREATED WATER SAFE TO DRINK?

UV-treated water is safe to drink. UV treatment does not add chemicals or change the chemical composition of the water. When properly sized and installed on a visually clear water source, UV can effectively protect from microorganisms in the water. Prolonged storage of water after UV treatment is not recommended.

ARE THERE DIFFERENT TYPES OF UV SYSTEMS?

There are different types of UV systems. UV systems exist to treat all possible flow ranges, from small point-of-use applications to entire municipalities. For household applications, a point-of-use or point-of-entry UV system can be used. A point-of-use system is a small, portable device that attaches to a faucet and rests on the counter. It can also be mounted under a counter. Larger point-of-entry systems are also available which are installed where the water supply enters the home, disinfecting the entire water supply.

Should you decide to purchase a UV system, there are two types: Class A and Class B.

Class A systems can be both point-of-entry and point-of-use (large or small), and are designed to inactivate and/or remove microorganisms including bacteria, viruses, *Cryptosporidium* oocyst and *Giardia* cysts from contaminated water. However, they are intended to be installed on visually clear water (not coloured, cloudy or turbid water) and not for converting wastewater or raw sewage to drinking water.

Class B systems can also be point-of-entry and point-of-use systems (large or small); however, they are intended for supplemental bactericidal treatment of disinfected public drinking water (i.e. municipally supplied water) or other drinking water that has been tested and deemed acceptable for human consumption by the provincial or local health agency having jurisdiction. They are intended to reduce nuisance microorganisms and are not intended for disinfection.

Residential systems can treat from 4L (0.08 US gal) of water per minute to upwards of 152L (40 US gal) per minute. All types of systems require a 110-V outlet for operation.

WHAT ARE THE PARTS OF A UV SYSTEM?

A UV system is comprised of the following:

- UV light source called a “lamp” or “bulb”. Class B UV systems typically deliver a dose of $16\text{mJ}/\text{cm}^2$, and are normally chosen by people on municipally treated water or private water supplies unlikely to be unsafe. Class A systems deliver a dose of 30 to $40\text{mJ}/\text{cm}^2$, enough to be used on water supplies which are not considered safe. A dose of $40\text{mJ}/\text{cm}^2$ is recognized by Health Canada as sufficient for this type of application. As there

are a variety of wattages for the lamp, ensure your replacement bulb is the one the manufacturer recommends for that unit.

- Protective transparent housing for bulb—usually quartz
- Power supply
- A water chamber for the water to travel through for treatment
- Filters for pre- and / or post-treatment
- For larger Class A systems, there may be a bulb replacement indicator light and / or alarm

HOW MUCH DO UV UNITS COST?

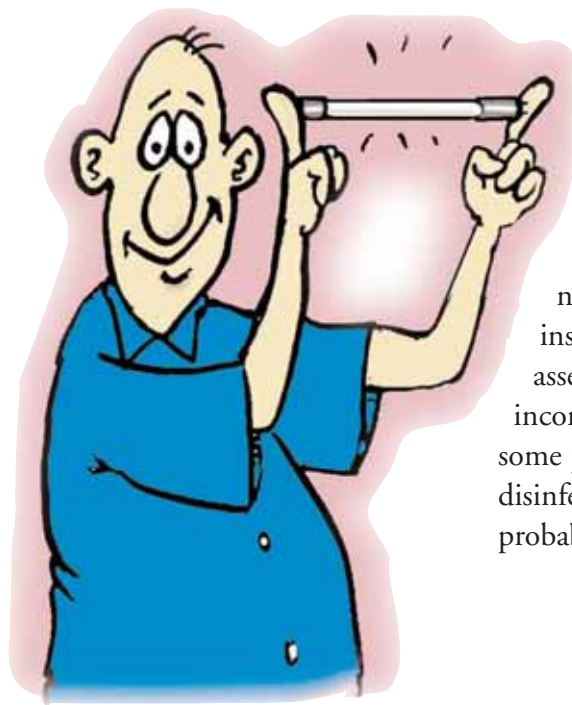
Costs vary from \$300 for a basic self-installed unit to \$700-\$900 for a plumber-installed system—which includes a basic UV unit and labour. Costs can go up to \$1,200 for a unit with more features. These include a

flow-restrictor to make sure that the treatment capacity of the unit is not exceeded, a solenoid—a device that shuts off the water when the power is off—and an intensity meter to close down the system if the bulb is not producing strong enough UV rays. If the system is combined with filters, there are additional costs for regular filter replacement. An annual filter/lamp replacement can be approximately \$150. A lamp/bulb alone may cost from \$40 to \$100.00 depending on the wattage of the bulb.

Electricity costs are another consideration; however, the system is similar to running a 60W bulb. There is no additional water cost for running a UV system, as all of the treated water is available for consumption.

WHO INSTALLS THE UV UNIT?

Point-of-use systems can be installed by you; however, it's important to know the condition of your water before use in case you need pre-filters. With point-of-entry systems, there are a number of aspects that need to be considered when installing a unit. These include assessing the condition of the incoming water, the need to install some pipes and the need to properly disinfect the system. This work is probably best done by a plumber,



water professional or mechanical contractor. If you are in a rural area and wish to install a system by yourself, contact a local plumbing supply store. In all cases, carefully read the manufacturer's instructions and follow them to the letter. You may want to consult a professional if a more complex system (one that uses filters) is required.

WHAT ARE THE INSTALLATION CONSIDERATIONS?

Water should be free of soil or sand particles (it should look clear and not cloudy). Such particles can block the UV rays and allow harmful particles to survive. Accordingly, a UV system normally has a five-micron filter installed upstream from the UV unit. For surface water usage (as opposed to well water), a one-micron absolute filter should then be installed after the five-micron filter to remove cysts (small capsule-like sacs that enclose certain organisms). The UV unit is installed after these filters. There are characteristics that can affect UV effectiveness such as water hardness, alkalinity, pH, and iron concentrations etc. Water should therefore be tested before installation to see if it will need additional treatment. This will assure proper UV disinfection. Contact a UV unit manufacturer or a water-testing laboratory to arrange a test.

HOW DO I OPERATE UV SAFELY?

Simply follow the manufacturer's instructions for operation and maintenance.

The basics for a point-of-use (tap) model, for example, is to attach it to the faucet and plug the device into an electrical outlet.

HOW DO I MAINTAIN A UV SYSTEM?

UV units operate at a low cost. The bulb gradually loses its disinfecting capabilities over time. It should be changed by you at least once a year—even if it is still operating. The quartz sleeve surrounding the bulb must be kept clean in order for the unit to function safely. It should be examined once a month; and if it becomes cloudy, it should be cleaned. Note: no one system can treat water 100 per cent, and without proper maintenance it should not be considered 100 per cent reliable.

In cases where you suspect the water is unsafe due to a malfunction of the unit, you should boil water for one minute before using the water for drinking and brushing teeth. Should your plumbing become contaminated, it is recommended that you contact your local public health unit for the proper clean-up procedures.

CONSIDERATIONS

Other treatment devices may be required in addition to UV. Prolonged storage of water treated using UV, as the sole method of treatment, is not recommended.

If your drinking water comes from a private source, (such as a well), be sure to have your water tested periodically to ensure it is safe to drink.

CERTIFICATION

Health Canada strongly recommends that all products that come into contact with drinking water be certified to the appropriate health-based performance standard developed by NSF International. In the case of Ultra-Violet Light units, it is recommended that they be certified as meeting standard NSF/ANSI 55 for Class A or Class B devices. Components employed in conjunction with the UV system should also be certified to meet other applicable NSF/ANSI Standards. In Canada, CSA International, NSF International, and Underwriters Laboratories have been accredited by the Standards Council of Canada to certify drinking water materials as meeting the above-mentioned standards. These standards are widely accepted in North America, as they ensure the removal of specific contaminants, as well as the performance and mechanical

integrity of the materials that come into contact with drinking water. Check the UV treatment unit's packaging or ask your dealer for a listing of the substances that the unit is certified to remove.

WHERE CAN I GET MORE INFORMATION?

You can consult Health Canada's Web site at: www.hc-sc.gc.ca/ewh-semt/water-eau/index_e.html, which describes activities related to Canadian drinking water quality.

You can check the Web site of NSF International at www.nsf.org for information about health-based performance standard related to drinking water treatment units. NSF also lists certified systems.

The Canadian Water Quality Association is an industry source of information for drinking water treatment units, and can be found at www.cwqa.com. You can talk to various retailers and dealers to discuss different approaches to

water treatment. A municipal water department or local utility may also be of assistance to you.

Canada Mortgage and Housing Corporation acknowledges the contribution of Health Canada to the development of this document. For further questions regarding water treatment and water quality,

Contact: Health Canada at water_eau@hc-sc.gc.ca or call (613) 957-2991 or 1-866-225-0709

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