



**American Water Works  
Association**

ANSI/AWWA F110-12  
(First Edition)

The Authoritative Resource on Safe Water®

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*AWWA Standard*

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# Ultraviolet Disinfection Systems for Drinking Water



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# Foreword

*This foreword is for information only and is not a part of ANSI\*/AWWA F110.*

## **I. Introduction.**

I.A. *Background.* Ultraviolet (UV) disinfection systems have gained increased acceptance for use in water treatment plants based on information that UV disinfection could cost-effectively inactivate *Cryptosporidium*. In addition, the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) has recognized UV disinfection as a best available technology for meeting the requirements of the rule.

I.B. *History.* The need for a standard addressing UV disinfection systems was recognized by the American Water Works Association (AWWA) in November 2005. The committee was appointed for the task of standardization and at the first inaugural meeting in June 2006, a committee was formed to develop a standard. This first edition was approved by the AWWA Board of Directors on June 10, 2012.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other members of the original consortium included the Water Research Foundation, (formerly AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.<sup>†</sup> Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on April 7, 1990.
2. Specific policies of the state or local agency.

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\* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

† Persons outside the United States should contact the appropriate authority having jurisdiction.

3. Two standards developed under the direction of NSF, NSF\*/ANSI† 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.

4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemical Codex*,‡ and other standards appropriate to the state or local agency.

Various certification organizations may be certifying products in accordance with NSF/ANSI 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, “Toxicology Review and Evaluation Procedures,” to NSF/ANSI 61 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of “unregulated contaminants” are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA F110 does not address additives requirements. Therefore, users of this standard shall consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.
2. Determine the status of certification by all parties offering to certify products for contact with, or treatment of, drinking water.
3. Determine current information on product certification.

**II. Special Issues.** Conditions under which the UV disinfection system is to be operated must be evaluated carefully by the purchasers. The evaluation must include the determination of the hydraulic characteristics of the system in which the lamp will be installed and the electrical circuits required for the operation of the lamp, including the maximum and static differential pressures across the lamp and the range of flow through the UV system under the most adverse operating conditions.

Small changes in transmittance in low-UV-absorbing waters can significantly change UV dose delivery; where ultraviolet transmittance (UVT) monitors are used as part of verifying adequate dose delivery, it is recommended the producer consider

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\* NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

† American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

‡ Both publications available from National Academy of Sciences, 500 Fifth Street NW, Washington, DC 20001.



tightening UVT error limits above the minimum standard where UVT is high (e.g.,  $\geq 94$  percent).

**III. Use of This Standard.** It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives.* The following information shall be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA F110, Ultraviolet Disinfection Systems, of latest revision.
2. Equipment requirements (Sec. 4.1).
3. Request for validation status or an executive summary of the validation report (Sec. 4.3.5).
4. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is not required (Sec. 4.4.1.1).
5. Details of other federal, state or provincial, and local requirements (Sec. 4.4.1).
6. Request for factory test results (Sec. 5.1.1.2).
7. Request for shop inspection by the purchaser (Sec. 5.1.1.3).
8. Request for a required number of training materials (Sec. 5.2.5.2).
9. Specify acceptance testing time requirements (Sec. 5.2.6).
10. Request storage requirements (Sec. 6.2.3).

III.B. *Laying Length.* There is not a standard laying length for UV disinfection systems and because of this, interchangeability between various manufacturers may not be possible without modification to the existing piping system. The purchaser is cautioned to obtain this information from the manufacturers for verification prior to purchase (Sec. 4.4.1).

III.C. *Testing.* This standard requires the manufacturer to have third-party validation testing conducted on a fully assembled system. If the purchaser desires that an additional validation test be conducted on the installed, fully assembled system, this requirement should be specified in the purchase documents (Sec. 4.6).

III.D. *Modifications to Standard.* Any modification to the provisions, definitions, or terminology in this standard must be provided by the purchaser.

**IV. Major Revisions.** This is the first edition of this standard.

**V. Comments.** If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711, FAX at 303.795.7603, write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098, or email at [standards@awwa.org](mailto:standards@awwa.org).

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# **Ultraviolet Disinfection Systems for Drinking Water**

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## **SECTION 1: GENERAL**

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### **Sec. 1.1 Scope**

This standard sets the minimum requirements for closed-vessel UV disinfection systems and equipment elements used for drinking water disinfection of *Cryptosporidium*, *Giardia*, and viruses. It does not include wastewater, reuse, or advanced oxidation treatment. Equipment and elements covered under this standard include UV reactors, related appurtenances, and reactor validation.

### **Sec. 1.2 Purpose**

The purpose of this standard is to provide a minimum set of requirements for UV systems for drinking water treatment systems. This standard is intended to assist with the design, procurement, installation, and commissioning of UV disinfection systems.

### **Sec. 1.3 Application**

This standard can be referenced for design, procurement, installation, and commissioning of UV disinfection equipment used in drinking water treatment.