ANSI/AWWA F110-16
(Revision of ANSI/AWWA F110-12)

American Water Works Association

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AWWA Standard

Ultraviolet Disinfection Systems for Drinking Water

Effective date: Jan. 1, 2017.
This first edition approved by AWWA Board of Directors June 10, 2012.
Approved by American National Standards Institute July 26, 2012.

AWWA Standard

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Contents

All AWWA standards follow the general format indicated subsequently. Some variations from this format may be found in a particular standard.

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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. The first edition was approved by the AWWA Board of Directors on June 10, 2012. This edition was approved on June 19, 2016.

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 (AWWA) 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.† 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. Specific policies of the state or local agency.

2. 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.

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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.

‡ NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

3. 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 jurisdictions. 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 lamps will be installed and the electrical circuit required for the operation of the lamps, 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.

Sensors (UV intensity and UV transmittance) are critical components for making UV disinfection a credible technology for municipal drinking water. For all sensors, both the frequency and specificity of calibration may vary by location and UV manufacturer. In designing UV facilities and specifying UV equipment, accessible, easy-to-use sensor calibration routines should be highlighted as part of any basic instrumentation package. 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

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

producer consider tightening UVT error limits above the minimum standard where UVT is high (e.g., ≥ 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 for Drinking Water, of latest revision.
2. Equipment requirements (Sec. 4.1).
3. Request for validation status or an executive summary of the validation report (Sec. 4.3.5.2).
4. Details of other federal, state or provincial, and local requirements (Sec. 4.4.1).
5. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is not required (Sec. 4.4.1.1).
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 on-site field representative (Sec. 5.2.2).
9. Request for a supplier check of equipment for correct installation and function (Sec. 5.2.3).
10. Request for a required number of training materials (Sec. 5.2.5.2).
11. Specify acceptance testing time requirements (Sec. 5.2.6).
12. 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. 4.3.2.4).

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. Major revisions made to the standard in this edition include the following:

1. Manufacturer reporting requirements prior to fabrication and startup were removed.
2. Flow to waste provisions were removed (Sec. 5.2.1).
3. Double block and bleed valve requirements were removed (Sec. 5.2.1.2).
4. Personal protection and mercury spill protocol requirements were removed from Sec. 5.3.

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.

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Ultraviolet Disinfection Systems for Drinking Water

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard sets the minimum requirements for closed-vessel ultraviolet (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.