



**American Water Works  
Association**

**ANSI/AWWA C654-13**  
(Revision of ANSI/AWWA C654-03)

**AWWA Standard**

# Disinfection of Wells

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## AWWA Standard

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\* Liaison, nonvoting

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## Foreword

*This foreword is for information only and is not a part of ANSI\*/AWWA C654.*

### **I. Introduction.**

I.A. *Background.* During construction of a well, the bore hole may become contaminated by surface-water inflow and undesirable fluids through which the bore hole may penetrate. In addition, contamination may be introduced in a well by the drilling fluid, on equipment, or through the bore hole itself. A part of this contamination may be carried into the water-producing formations. During repairs or maintenance of an existing well, contamination may be introduced by the work practices performed or replacement components.

Well disinfection in accordance with this standard includes chlorination of the well casing, the pump and associated piping, and the gravel pack and immediate area of the aquifer around the casing, as well as verification of satisfactory bacteriological quality of the water. This standard is not intended to provide procedures for disinfection of the aquifer beyond the immediate location of a well; aquifer disinfection can best be handled by an engineering evaluation of all the conditions present at a specific location. The procedures for disinfection described in this standard are expanded beyond, and are intended to complement, information contained in AWWA A100, Standard for Water Wells, Section 11, Well Disinfection.

I.B. *History.* This is the fourth edition of AWWA C654, Standard for Disinfection of Wells. The first edition was approved by the AWWA Board of Directors on Jan. 25, 1987. The second edition was approved on June 15, 1997. The third edition was approved Jan. 19, 2003. This fourth edition was approved January 20, 2013.

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 American Water Works Association Research Foundation (AwwaRF, now Water Research Foundation) 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.

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

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. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state or local agency.
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 Chemicals Codex*,‡ and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in 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 C654 does not address additives requirements. Users of this standard should consult the appropriate state or local agency having jurisdiction in order to

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

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

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

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

**II. Special Issues.** Disinfection of wells requires high levels of disinfectant to be applied to ensure bacteria and other potential pathogens are inactivated. It should be noted that pH and temperature are two important factors affecting the disinfection process. Above pH 9, chlorine is in the form of hypochlorite, which is not as effective a disinfectant as hypochlorous acid, which is more prevalent at pH lower than 9. Temperature also affects the disinfection process; low temperatures are not as effective as high temperatures.

Disinfectants other than chlorine may be appropriate to use. While this standard describes only the use of liquid chlorine, sodium hypochlorite solutions, and calcium hypochlorite, the applicability of other disinfectants should be evaluated. Ozone and chemical cleaners have been used, and these warrant further investigation. Whichever disinfectant or method is selected, approval from the local regulatory agency may be required.

**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 should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C654, Standard for Disinfection of Wells, of latest revision.
2. Whether compliance with NSF/ANSI 60, Drinking Water Chemicals—Health Effects, is required.
3. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
4. Method of disinfection to be used.
5. Any required disposal and precautions to be taken in disposing of chlorinated water.
6. Method of dechlorination to be used—ANSI/AWWA C655, Field Dechlorination, of latest revision.
7. Bacteriological testing and method to be used.
8. Redisinfection procedure to be used if required.
9. Details of other federal, state or provincial, and local requirements (Sec. 4).

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

**IV. Major Revisions.** Major changes made to the standard in this revision include the following:

1. The Special Issues section of the foreword has been updated to include a note to the user on the effect of pH and temperature on the disinfection process, as well as a note on consideration of alternative disinfectants (foreword, Section II).

2. Definitions for *available chlorine*, *free chlorine*, *chlorine residual*, *contractor*, *gravel-packed well*, *manufacturer*, *purchaser*, and *supplier* have been added (Section 3).

3. A requirement for compliance with the Safe Drinking Water Act has been added (Section 4).

4. A cautionary note on potential corrosion of pumps and appurtenances from highly chlorinated water has been added (Sec. 4.1).

5. An advisory note on using appropriate personal protective equipment when handling chlorine products has been added (Sec. 4.2).

6. An informational note on using calcium hypochlorite in water with high calcium hardness has been added (Sec. 4.2.3).

7. Chlorination of gravel installed in new wells has been clarified to include requirements for chlorination of drilling fluid and volume of chlorinated water to add to well (Sec. 4.3.1.2).

8. Circulating the chlorinated water (Sec. 4.5.2) has been made an optional procedure.

9. Reference to ANSI/AWWA C655 for field dechlorination practices has been added (Sec. 4.6).

10. The sampling requirement (timing and number of samples) has been clarified (Sec. 5.1).

11. A section on optional sampling and testing has been added (Sec. 5.4).

12. Appendix B on Disposal of Heavily Chlorinated Water has been removed. This information is now covered in more detail in ANSI/AWWA C655, Field Dechlorination.

**V. Comments.** If you have any comments or questions about this standard, please call AWWA Engineering & 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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# Disinfection of Wells

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## SECTION 1: GENERAL

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### **Sec. 1.1 Scope**

This standard describes the procedures for disinfection and bacteriological testing of wells for potable water service following construction, servicing, maintenance, or any other activity or event that might lead to contamination of the water. The chlorination procedures provided in this standard are for the gravel pack, well casing, pump, and appurtenant piping and are presented in the sequence in which they generally would be implemented.

### **Sec. 1.2 Purpose**

The purpose of this standard is to establish the minimum requirements for the disinfection of wells for potable water service, including procedures for disinfection and bacteriological testing.

### **Sec. 1.3 Application**

This standard can be referenced in specifications for the disinfection of wells and can be used as a guide for procedures for chlorination and bacteriological testing. The stipulations of this standard apply when this document has been referenced and then only to the disinfection of wells.