

NSF/ANSI 60-2005  
Addendum 1

# Drinking water treatment chemicals — Health effects

---

**NSF International Standard/  
American National Standard**

Developed by a consortium of:

- NSF International
- The American Water Works Association Research Foundation
- The Association of State Drinking Water Administrators
- The American Water Works Association

With support from:

- The U. S. Environmental Protection Agency  
under cooperative agreement CR-812144

NSF/ANSI 60-2005  
Addendum 1



*NSF International, an independent, not-for-profit, non-governmental organization, is dedicated to being the leading global provider of public health and safety-based risk management solutions while serving the interests of all stakeholders.*

*This Standard is subject to revision.  
Contact NSF to confirm this revision is current.*

Users of this Standard may request clarifications and interpretations, or propose revisions by contacting:

Chair, Joint Committee on Drinking Water Additives  
c/o NSF International  
789 North Dixboro Road, P.O. Box 130140  
Ann Arbor, Michigan 48113-0140 USA  
Phone: (734) 769-8010 Telex: 753215 NSF INTL  
FAX: (734) 769-0109  
E-mail: [info@nsf.org](mailto:info@nsf.org)  
Web: <http://www.nsf.org>

**NSF/ANSI 60-2005  
Addendum 1**

NSF International Standard/  
American National Standard  
for Drinking Water Additives —

**Drinking water treatment chemicals —  
Health effects**

Standard Developer  
**NSF International**

Adopted October 24, 2006  
**NSF International Board of Directors**

**Designated an ANSI Standard**  
October 24, 2006  
**American National Standards Institute**

Prepared by  
**The NSF Joint Committee on Drinking Water Additives**

Recommended for Adoption by  
**The NSF Council of Public Health Consultants**

Adopted by  
**NSF International**  
**December 1987**

Revised June 1988  
Revised October 1988  
Revised May 1996  
Revised November 1996  
Revised September 1997  
Revised October 1999  
Revised May 2000  
Revised November 2000  
Revised February 2001  
    Addendum September 2001  
Revised June 2002  
    Addendum August 2002  
Revised September 2003  
    Editorial Revision October 2003  
    Addendum December 2003  
Revised November 2004  
    Addendum May 2005  
Revised November 2005  
    Addendum October 2006

Published by

**NSF International**  
**PO Box 130140, Ann Arbor, Michigan 48113-0140, USA**

For ordering copies or for making inquiries with regard to this Standard, please reference the designation "NSF/ANSI 60-2005, Addendum 1."

Copyright 2006 NSF International  
Previous editions © 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1997, 1996, 1988, 1987

Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from NSF International.

Printed in the United States of America.

## Disclaimers<sup>1</sup>

NSF International (NSF), in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of NSF represent its professional judgment. NSF shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. NSF shall not incur any obligations or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

Participation in NSF's Standards development activities by a representative of a regulatory agency (federal, state, or local) shall not be construed as the agency's endorsement of NSF, its policies, or any of its Standards.

This document has been reviewed by the Office of Drinking Water, U. S. Environmental Protection Agency, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of USEPA nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Partial funding by USEPA for the development and implementation of NSF Standard 60 (USEPA Cooperative Agreement #CR-812144) and participation of USEPA representatives in the standards development or implementation activities do not constitute USEPA's endorsement of NSF, NSF's policies, or the Standard.

NSF Standards provide basic criteria to promote and protect public health. Provisions for safety have not been included in this Standard because governmental agencies or other national standards-setting organizations provide safety requirements.

Unless otherwise referenced as *normative*, the annexes are not considered an integral part of NSF Standards. They are provided as general guidelines to the manufacturer, regulatory agency, user, or certifying organization.

---

<sup>1</sup> The information contained in this Disclaimer is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. Therefore, this Disclaimer may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

This page is intentionally left blank.

**Contents**

<b>1</b>	<b>Purpose, scope, and normative references</b> .....	<b>1</b>
1.1	Purpose .....	1
1.2	Scope.....	1
1.3	Normative references .....	1
1.4	Alternate chemicals .....	2
<b>Annex B</b>	.....	<b>B1</b>
B.1	General .....	B1
B.2	Sampling.....	B1
B.3	Preparation of samples.....	B3
B.4	Analysis methods .....	B10
B.5	Estimated contaminant exposure concentration .....	B17
	Table B1 – Preservation of prepared sample solutions .....	B19
<b>Annex D</b>	.....	<b>D1</b>
D.1	General .....	D1
D.2	USEPA and Health Canada drinking water criteria .....	D1
D.3	NSF International peer-reviewed drinking water criteria .....	D1
D.4	Drinking water criteria based on USEPA guidance concentrations .....	D2
D.5	Threshold of evaluation (TOE) chemical list.....	D2
	Table D1 – U. S. Environmental Protection Agency and Health Canada.....	D3
	Table D2 – NSF International peer-reviewed drinking water criteria .....	D9
	Table D3 – Drinking water criteria based on USEPA guidance concentrations .....	D13
	Table D4 – Threshold of evaluation chemicals .....	D22
<b>Annex E</b>	.....	<b>E1</b>
E.1	General .....	E1
E.2	Informational threshold of evaluation chemicals .....	E1
	Table E1 – Threshold of evaluation chemicals having datasets from which specific TAC/SPAC values, or CBEL values, could be set using Annex A.....	E3

This page is intentionally left blank.



Revisions to NSF/ANSI 60-2005 are shown in this addendum as ~~crossouts~~ for deletions and **highlights** for additions.

© 2006 NSF

**NSF/ANSI 60-2005**

**Addendum 1**

## **Foreword<sup>2</sup>**

In response to a competitive request for proposals from the U. S. Environmental Protection Agency (USEPA), a Consortium led by NSF International (NSF) agreed to develop voluntary third-party consensus standards and a certification program for all direct and indirect drinking water additives. Other members of the Consortium included the American Water Works Association Research Foundation, the Association of State Drinking Water Administrators, the Conference of State Health and Environmental Managers, and the American Water Works Association. (COSHEM has since become inactive as an organization.) Each organization was represented on a steering committee with oversight responsibility for the administration of the cooperative agreement. The steering committee provided guidance on overall administration and management, and the member organizations will remain active after the expiration of the cooperative agreement.

The standards were developed using a voluntary consensus process. All parties with interest were represented, including regulatory agencies, industry, and water suppliers; consultants; and other users of products covered by the standards.

Two standards for additives products have been adopted. NSF/ANSI 61: *Drinking water system components – Health effects* currently covers indirect additives. NSF/ANSI 60, and subsequent product certification against it, will replace the USEPA Additives Advisory Program for drinking water treatment chemicals. For more information with regard to USEPA's actions, refer to the July 7, 1988 *Federal Register* (53FR25586).

NSF/ANSI 60 has been developed to establish minimum requirements for the control of potential adverse human health effects from products added to water for its treatment. It does not attempt to include product performance requirements, which are currently addressed in standards established by such organizations as the American Water Works Association, the American Society for Testing and Materials, and the American National Standards Institute. Because this Standard complements the standards of these organizations, it is recommended that products also meet the appropriate requirements specified in the standards of such organizations.

The Standard and the accompanying text are intended for voluntary use by certifying organizations, utilities, regulatory agencies, and/or manufacturers as a basis for providing assurances that adequate health protection exists for covered products.

This version (NSF/ANSI 60-2005, Addendum 1) includes the following revisions:

- Incorporation of the Absolute Method as defined by ASTM E29 *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications* when determining conformance with the specifications in this Standard, and addition of this reference in the Normative References, Section 1.3.
- Streamlining of the sampling procedures described in Annex B, sections B.2.1 and B.2.2, and addition of procedures for sampling from retains.
- Incorporation of recent additions of unregulated contaminants to Tables D2 and D4.

Please note that the footnote in Table D1 that states that the Single Product Acceptable Concentration (SPAC) for bromate will be lowered to 0.003 mg/L in 2005 is still under evaluation by the NSF Joint Committee on Drinking Water Additives. At this time, it has not been demonstrated that the drinking water

---

<sup>2</sup> The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. Therefore, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

Revisions to NSF/ANSI 60-2005 are shown in this addendum as ~~crossouts~~ for deletions and **highlights** for additions.

© 2006 NSF

**NSF/ANSI 60-2005**

**Addendum 1**

industry demand for hypochlorite chemicals cannot be adequately met at the lower SPAC. The next revision of this standard will be made up to date with the decision of the Joint Committee.

This Standard was developed by the NSF Joint Committee on Drinking Water Additives using the consensus process described by the American National Standards Institute.

Suggestions for improvement of this Standard are welcome. Comments should be sent to Chair, Drinking Water Additives, c/o NSF International, Standards Department, P. O. Box 130140, Ann Arbor, Michigan 48113-0140, USA.

Revisions to NSF/ANSI 60-2005 are shown in this addendum as ~~crossouts~~ for deletions and **highlights** for additions.

© 2006 NSF

**NSF/ANSI 60-2005**

**Addendum 1**

## **Consortium Organizations**

### NSF International

Popularly referred to as NSF, NSF International is a non-commercial agency. It is incorporated under the laws of Michigan as a not-for-profit organization devoted to research, education, and service. It seeks to solve problems involving man and his environment. It wishes to promote health and enrich the quality of life through conserving and improving that environment. Its fundamental principle of operation is to serve as a neutral medium in which business and industry, official regulatory agencies, and the public come together to deal with problems involving products, equipment, procedures, and services related to health and the environment. It is conceived and administered as a public service organization.

NSF is perhaps best known for its role in developing Standards and Criteria for equipment, products, and services that bear upon health. NSF was the lead organization in the Consortium responsible for developing this Standard. NSF conducts research; tests and evaluates equipment, products, and services for compliance with standards and criteria; and grants and controls the use of NSF registered Marks.

NSF offers product certification (Listing Services) for all products covered by its Standards. Each program has established policies governing the associated product evaluation, Listing Services, follow-up, and enforcement activities. The NSF Listing Mark is widely recognized as a sign that the product or service to which it relates complies with the applicable NSF Standard(s).

### AWWA Research Foundation

The mission of the American Water Works Association Research Foundation (AWWARF) is to sponsor practical, applied research on behalf of the drinking water industry of North America. The scope of the research program embraces all aspects of water supply operation, from development and maintenance of water resources to treatment technologies and water quality issues, from storage and distribution system operations to health effects studies and utility planning and management activities. AWWARF serves as the centralized industry institution for planning, managing, and funding cooperative research and development in drinking water, including the subsequent transfer of technology and results for practical application by the water utility community.

AWWARF's purpose in this cooperative program is to provide a communication link with the water utilities throughout North America and serve as the focal point for identification of research needs of the water supply industry with respect to the additives program.

### The Association of State Drinking Water Administrators

The Association of State Drinking Water Administrators (ASDWA) is a non-profit organization whose eligible membership is comprised of drinking water program administrators in each of the fifty states and seven U. S. territories. Through the organization, representatives speak with a collective voice to Congressional committees, the United States Environmental Protection Agency, professional and trade associations, water utilities, and the general public on issues related to state drinking water programs. With its mission of protecting the public health through assurance of high quality drinking water, and promoting responsible, reasonable, and feasible drinking water programs at the state and federal levels, the Association is a valued contributor to the consortium and to the program. It provides the link between the additives program and the state drinking water programs.

### The Conference of State Health and Environmental Managers

The Conference of State Health and Environmental Managers (COSHEM), known formerly as the Conference of State Sanitary Engineers (CSSE), is currently inactive as an organization. It brought to the consortium expertise and involvement of state health and environmental program managers. The Conference was the focal point for health concerns of all state environmental programs, including drinking water, wastewater, air, solid and hazardous wastes, radiological, occupational, health, and food programs. A standing committee on water supply focused on drinking water issues and kept the membership informed. The Conference played an important role early in the program through two-way communication with state health and environmental program decision makers.

### American Water Works Association

The purpose of the American Water Works Association (AWWA) is to promote public health, safety, and welfare through the improvement of the quality and quantity of water delivered to the public and the development and furtherance of understanding of the problems relating thereto by:

- advancing the knowledge of the design, construction, operation, water treatment and management of water utilities, and developing standards for procedures, equipment, and materials used by public water supply systems;
- advancing the knowledge of problems involved in the development of resources, production, and distribution of safe and adequate water supplies;
- educating the public on the problems of water supply and promoting a spirit of cooperation between consumers and suppliers in solving these problems; and
- conducting research to determine the causes of problems with providing a safe and adequate water supply and proposing solutions thereto.

AWWA brings to the Consortium its established position as the largest public drinking water association in North America, with a broad range of membership including utilities, consultants, manufacturers/distributors/agents, contractors, and other organizations with a direct interest in drinking water.

Revisions to NSF/ANSI 60-2005 are shown in this addendum as ~~crossouts~~ for deletions and **highlights** for additions.

© 2006 NSF

**NSF/ANSI 60-2005**

**Addendum 1**

© 2006 NSF

**NSF/ANSI 60-2005**

**Addendum 1**

## NSF/ANSI Standard for Drinking Water Additives —

# Drinking water treatment chemicals — Health effects

## 1 Purpose, scope, and normative references

### 1.1 Purpose

This Standard establishes minimum health effects requirements for the chemicals, chemical contaminants, and impurities that are directly added to drinking water from drinking water treatment chemicals.

### 1.2 Scope

This Standard contains health effects requirements for drinking water treatment chemicals that are directly added to water and are intended to be present in the finished water. This Standard also contains health effects requirements for other chemical products that are directly added to water but are not intended to be present in the finished water. Chemicals covered by this Standard include, but are not limited to, coagulation and flocculation chemicals, softening, precipitation, sequestering, pH adjustment, and corrosion/scale control chemicals, disinfection and oxidation chemicals, miscellaneous treatment chemicals, and miscellaneous water supply chemicals.

Contaminants created as byproducts through reaction of the treatment chemical with a constituent of the treated water are not covered by this Standard. This Standard also does not establish performance or taste and odor requirements for drinking water treatment chemicals.

### 1.3 Normative references

The following documents contain requirements that, by reference in this text, constitute requirements of this Standard.

APHA, *Standard Methods for the Examination of Water and Wastewater*, twentieth edition<sup>3</sup>

ASTM E29-02. *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*<sup>4</sup>

ASTM E506-98. *Standard Test Method for Mercury in Liquid Chlorine*<sup>4</sup>

ASTM G22-76 (1996). *Standard Practice for Determining Resistance of Plastics to Bacteria*<sup>4</sup>

<sup>3</sup> American Public Health Association, 800 I Street NW, Washington, DC 20001

<sup>4</sup> ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2859