



*NSF International Standard /
American National Standard*

NSF/ANSI 60 - 2014a

Drinking Water Treatment Chemicals - Health Effects



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 Treatment Chemicals
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
Web: <http://www.nsf.org>

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

Drinking water treatment chemicals — Health effects

Standard Developer

NSF International

NSF International Board of Directors

Designated an ANSI Standard

November 17, 2014

American National Standards Institute

Prepared by
The NSF Joint Committee on Drinking Treatment Chemicals

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
Revised May 2009
Revised December 2009
Revised May 2011
Addendum March 2012
Revised August 2012
Revised January 2014
Revised September 2014
Revised February 2015

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 – 2014a."

Copyright 2015 NSF International
Previous editions © 2014, 2013, 2012, 2011, 2010, 2009, 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.

Disclaimers¹

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.

¹ 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. As such, 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

1	Purpose, scope, and normative references.....	1
1.1	Purpose	1
1.2	Scope	1
1.3	Normative references.....	1
1.4	Alternate chemicals.....	2
1.5	Significant figures and rounding	2
2	Definitions	2
3	General requirements.....	4
3.1	General.....	4
3.2	Formulation submission and review.....	5
3.3	Sampling, preparation, and analysis of samples	6
3.4	Contaminant concentrations.....	6
3.5	Product labeling	6
3.6	Formulation control	7
3.7	Product traceability.....	7
3.8	Conformity assessment requirements.....	7
3.9	Product security.....	7
4	Coagulation and flocculation chemicals	9
4.1	Coverage	9
4.2	Definitions.....	9
4.3	General requirements	10
4.4	Sample requirements.....	10
4.5	Sample preparation.....	10
4.6	Analysis	11
4.7	Normalization.....	11
4.8	Evaluation of contaminant concentrations.....	11
5	Chemicals for corrosion and scale control, softening, precipitation, sequestering, and pH adjustment.....	16
5.1	Coverage	16
5.2	Definitions.....	16
5.3	General requirements	16
5.4	Sample requirements.....	16
5.5	Sample preparation.....	16
5.6	Analysis	17
5.7	Normalization.....	17
5.8	Evaluation of contaminant concentrations.....	17
6	Disinfection and oxidation chemicals	23
6.1	Coverage	23
6.2	Definitions.....	23
6.3	General requirements	23
6.4	Sample requirements.....	23
6.5	Sample preparation.....	24
6.6	Analysis	24
6.7	Normalization.....	24
6.8	Evaluation of contaminant concentrations.....	25
7	Miscellaneous treatment applications	28
7.1	Coverage	28
7.2	Definitions.....	28
7.3	General requirements	28

7.4 Sample requirements	28
7.5 Sample preparation.....	28
7.6 Analysis	29
7.7 Normalization.....	29
7.8 Evaluation of contaminant concentrations.....	29
8 Miscellaneous water supply products.....	33
8.1 Coverage	33
8.2 Definitions.....	33
8.3 General requirements	33
8.4 Sample requirements.....	34
8.5 Sample preparation.....	34
8.6 Analysis.....	34
8.7 Normalization of contaminant concentrations.....	34
8.8 Evaluation of contaminant concentrations.....	38
Annex A	A1
Annex B	B1
Annex C	C1
Annex D	D1
Annex E	E1
Annex F	F1

Foreword²

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 include the Water Research Foundation (formerly 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 at 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 of providing assurances that adequate health protection exists for covered products.

All references to gallons (gal) are in U.S. gallons.

This version of NSF/ANSI 60 – 2014a includes the following revisions:

Issue 64: This issue addresses the use of natural polymers in water well construction and remediation under section 8.

Issue 65: This issue combines the current tables from Annexes D and E under NSF/ANSI 60 and 61 and includes updates on several substances.

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

Suggestions for improvement of this Standard are welcome. This Standard is maintained on a Continuous Maintenance schedule and can be opened for comment at any time. Comments should be sent to Chair,

² 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. As such, 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.

Joint Committee on Drinking Water Additives – Treatment Chemicals at standards@nsf.org, or c/o NSF International, Standards Department, PO Box 130140, Ann Arbor, Michigan 48113-0140, USA.

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).

Water Research Foundation

The mission of the Water Research Foundation (WRF) is to sponsor practical, applied research in 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. WRF 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.

WRF'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 50 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. 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 for which the American Water Works Association (AWWA) is formed 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 of providing a safe and adequate water supply and proposing solutions thereto in an effort to improve the quality and quantity of the water supply provided to the public.

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.

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, the chemical contaminants, and the impurities that are directly added to drinking water from drinking water treatment chemicals. This Standard does not establish performance or taste and odor requirements for 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 produced as by-products through reaction of the treatment chemical with a constituent of the treated water are not covered by this Standard.

Acknowledging the fact that indigenous microorganisms may be present in drinking water, products resulting in the intentional introduction of microorganisms for the treatment of drinking water are excluded from the scope of the Standard.

1.3 Normative references

The following documents contain requirements, which by reference in this text, constitute requirements of this Standard. At the time this Standard was balloted, the editions listed below were valid. All documents are subject to revision, and parties are encouraged to investigate the possibility of applying the recent editions of the documents indicated below. The most recent published edition of the document shall be used for undated references.

21 CFR 587, *Good Laboratory Practice for Non-Clinical Laboratory Studies*³

40 CFR Part 160, *Good Laboratory Practice Standards*⁴

40 CFR Part 798, *Health Effects Testing Guidelines*⁴

³ US Food and Drug Administration, 5600 Fishers Lane, Rockville, MD 20857 <www.fda.gov>.

⁴ Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 <www.gpo.gov>.