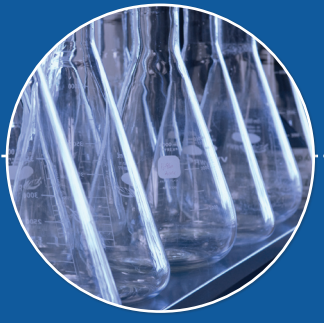
NSF International Standard / American National Standard

NSF/ANSI 62 - 2021

Drinking Water Distillation Systems



Full document details: NSF 62 2021

NSF International, an independent, not-for-profit, nongovernmental 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 Units
c/o NSF International
789 North Dixboro Road, PO Box 130140
Ann Arbor, Michigan 48113-0140 USA
Phone: (734) 769-8010 Fax: (734) 769-0109
Email: info@nsf.org
Web: <www.nsf.org>

Documents
Document Sharing Hub

Full document details: NSF 62 2021

NSF International Standard /
American National Standard
for Drinking Water Treatment Units –

Drinking Water Distillation Systems

Standard Developer
NSF International

Designated as an ANSI Standard
May 20, 2021
American National Standards Institute

Documents
Document Sharing Hub

Full document details: NSF 62 2021

Prepared by
The NSF Joint Committee on Drinking Water Treatment Units

Recommended for adoption by
The NSF Council of Public Health Consultants

Adopted by
NSF International
March 1989

Revised November 1992	Revised September 1997	Revised September 1999
Addendum, June 2002	Revised February 2004	Revised October 2007
Revised August 2009	Revised February 2012	Revised December 2013
Revised January 2015	Revised October 2015	Revised November 2016
Revised November 2017	Revised November 2018	Revised March 2020
Revised August 2020	Revised November 2021	

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 62-2021."

Copyright 2021 NSF International

Previous editions © 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2009, 2007, 2004, 1999, 1997, 1992, 1989

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.

Documents
Document Sharing Hub

Full document details: NSF 62 2021

Disclaimers[1]

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 obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard. It is the responsibility of the user of this standard to judge the suitability of the ANS for the user's purpose.

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

Participation in NSF Standards development activities by regulatory agency representatives (federal, state, or local) shall not constitute their agency's endorsement of NSF or any of its Standards.

Preference is given to the use of performance criteria measurable by examination or testing in NSF Standards development when such performance criteria may reasonably be used in lieu of design, materials, or construction criteria.

The illustrations, if provided, are intended to assist in understanding their adjacent standard requirements. However, the illustrations may not include all requirements for a specific product or unit, nor do they show the only method of fabricating such arrangements. Such partial drawings shall not be used to justify improper or incomplete design and construction.

At the time of this publication, examples of programs and processes were provided for general guidance. This information is given for the convenience of users of this standard and does not constitute an endorsement by NSF International. Equivalent programs and processes may be used.

Unless otherwise referenced, the annexes are not considered an integral part of NSF Standards. The annexes 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. 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.

Documents
Document Sharing Hub

Full document details: NSF 62 2021

This page is intentionally left blank.

Documents
Document Sharing Hub

Full document details: NSF 62 2021

Contents

1 General 1
1.1 Scope 1
1.2 Minimum requirements 1
1.3 Chemical and microbiological reduction performance claims 1
1.4 Treatment train 1
1.5 Reviews and revisions 1

2 Normative references 2

3 Definitions 2

4 Materials 2
4.1 Materials in contact with drinking water 2
4.2 Materials evaluation 4
4.3 Gas chromatography / mass spectroscopy (GC/MS) analysis 5

5 Structural performance 11
5.1 Structural integrity 11

6 Minimum performance requirements 15
6.1 TDS reduction 15
6.2 Performance indication 19
6.3 Flow control 23
6.4 Storage tanks 23
6.5 Evaporator chamber 23
6.6 Openings and rims (product water zone) 23
6.7 Entry ports 23
6.8 Waste connections 23
6.9 Product water dispensing outlets 24
6.10 Active agents and additives 24

7 Elective performance claims – Test methods 25
7.1 Inorganic chemical reduction claims qualified by TDS surrogate testing 25
7.2 Inorganic chemical reduction 25
7.3 In-place sanitization of the product water zone 29
7.4 Microbiological reduction 31
7.5 Production rate verification 33

8 Instruction and information 35
8.1 Installation, operation, and maintenance instructions 35
8.2 Data plate 36
8.3 Replacement components 37
8.4 Performance data sheet 37

Normative Annex 1 Evaluation methods for systems with multiple technologies – Treatment train 41
N-1.1 Requirements for the evaluation of a system containing multiple, sequential treatment technologies 41
N-1.2 Example application of treatment train option B 42
N-1.3 Example application of treatment train option C 43

Documents
Document Sharing Hub

Full document details: NSF 62 2021

Informative Annex 1 Evaluation of total dissolved solids as a surrogate parameter for the reduction of inorganic contaminants by distillation systems 45
I-1.1 Executive summary 45
I-1.2 Introduction 46
I-1.3 Evaluation protocol 46
I-1.4 Results 49
I-1.5 Conclusions 50

Informative Annex 2 Key elements of a certification program for drinking water treatment systems and components 51
I-2.1 Marking the product 51
I-2.2 Listing certified companies 51
I-2.3 Annual audits 51
I-2.4 Testing 51
I-2.5 Toxicological evaluation of materials formulations 52
I-2.6 Corrective action 52
I-2.7 Enforcement 52
I-2.8 Administrative review 52
I-2.9 Appeals 52
I-2.10 Complaints 52
I-2.12 Records 53
I-2.13 Public notice 53
I-2.14 Confidentiality 53

Informative Annex 3 55

Interpretation Annex 57

Documents
Document Sharing Hub

Full document details: NSF 62 2021

Foreword[2]

The purpose of this Standard is to establish minimum requirements for the materials, design and construction, and performance of point-of-use (POU) and point-of-entry (POE) drinking water distillation systems that are designed to reduce specific chemical and microbiological contaminants in public or private water supplies. NSF/ANSI 62 also specifies minimum product literature requirements that manufacturers shall provide to authorized representatives and consumers.

Water contact materials in drinking water treatment units listed under NSF/ANSI 42, NSF/ANSI 44, NSF/ANSI 53, NSF/ANSI 55, NSF/ANSI 58, and NSF/ANSI 62 are tested and evaluated under a separate protocol from NSF/ANSI/CAN 61, with criteria that were developed specifically for the intended end-use. NSF/ANSI/CAN 61 listing shall not be additionally required for acceptance of these listed units for water contact application.

This edition of the Standard contains the following revisions:

Issue 40

This revision clarifies the requirements for drinking fountains under the general performance requirements in Section 6. The ballot also revises the minimum air gap requirement for drinking fountain outlets from 2 inches to 1 inch to be aligned with other industry standards and codes.

Issue 42

This revision updates the minimum 2-L sample requirement to a recommendation in Section 4.2.3.

Issue 43

This revision corrects the improper use of requirements (i.e., “shall”) in notes and corrects minor typos throughout the Standard.

The Interpretations Annex contains responses to interpretation requests. The responses will be published in each version of the Standard until such time that the interpretation response is no longer applicable.

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

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

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

[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. 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.

Documents
Document Sharing Hub

Full document details: NSF 62 2021

This page is intentionally left blank.

Documents
Document Sharing Hub

Full document details: NSF 62 2021

NSF/ANSI Standard
for Drinking Water Treatment Units –

Drinking Water Distillation Systems

1 General

1.1 Scope

This Standard establishes minimum materials, design and construction, and performance requirements for point-of-use (POU) and point-of-entry (POE) drinking water distillation systems and the components used in these systems. Distillation systems covered by this Standard are designed to reduce specific chemical contaminants from potable drinking water supplies. Systems covered under this Standard may also be designed to reduce microbiological contaminants, including bacteria, viruses, and cysts, from potable drinking water supplies. It is recognized that a system may be effective in controlling one or more of these contaminants, but systems are not required to control all.

Systems covered by this Standard are not intended for the treatment of water that is visually contaminated (turbid) or has an obvious contamination source, such as raw sewage, nor are systems covered by this Standard intended to convert wastewater to microbiologically potable water.

1.2 Minimum requirements

A system as defined in this Standard shall meet the applicable requirements of Sections 4, 5, 6, and 8.

A component as defined in this Standard shall meet the requirements of Sections 4 and 8. If the component is pressure bearing, it shall also meet the applicable requirements of Section 5.

1.3 Chemical and microbiological reduction performance claims

1.3.1 All NSF/ANSI 62 performance claims shall be verified and substantiated by test data generated under the requirements of NSF/ANSI 62.

1.3.2 When performance claims are made for substances not specifically addressed in the scope of this Standard or for those substances not specifically addressed but falling under the scope of NSF/ANSI 62, those claims not specifically addressed in the Standard shall be so identified.

1.4 Treatment train

A system that contains multiple, sequential treatment technologies for a performance claim under this Standard shall meet the applicable requirements as described in Annex N-1.

1.5 Reviews and revisions

This Standard shall be reviewed at least every five years. The review shall be conducted by the NSF Joint Committee on Drinking Water Treatment Units.

Documents
Document Sharing Hub
Full document details: NSF 62 2021

2 Normative references

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

21 CFR Parts 170 – 199, *Food and Drugs*[3]

40 CFR Part 141, *US EPA National Primary Drinking Water Regulations*[3]

40 CFR Part 143, *US EPA National Secondary Drinking Water Regulations*[3]

56 CFR Part 357, *US EPA National Secondary Drinking Water Regulations*[3]

APHA/AWWA/WEF, *Standard Methods for the Examination of Water and Wastewater*, twentieth edition, 1998 (hereinafter referred to as *Standard Methods*)[4]

NSF/ANSI/CAN 61, *Drinking Water System Components – Health Effects*

NSF/ANSI/CAN 600, *Health Effects and Evaluation Criteria for Chemicals in Drinking Water*

US EPA 600/4-79-020, *Methods for the Chemical Analysis of Water and Wastes*, March 1983[5]

US EPA 600-4-84-053, *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*, June 1984[5]

US EPA 600/4-88/039, *Methods for the Determination of Organic Compounds in Drinking Water*, December 1988[5]

US EPA 600/4-90/020, *Methods for the Determination of Organic Compounds in Drinking Water – Supplement 1*, July 1990[5]

US EPA 600/4-91/010, *Methods for the Determination of Metals in Environmental Samples*, June 1991[5]

3 Definitions

Terms used in this Standard that have a specific technical meaning are defined in NSF/ANSI 330: *Glossary of Drinking Water Treatment Unit Terminology*.

4 Materials

4.1 Materials in contact with drinking water

4.1.1 POE drinking water treatment units shall conform to the protocol in NSF/ANSI/CAN 61.

[3] National Archives and Records Administration, Office of the Federal Register. 7 G Street NW, Suite A-734, Washington, DC 20401. <www.ecfr.gov>

[4] American Public Health Association, American Water Works Association, and Water Environment Federation. <www.standardmethods.org>

[5] US Environmental Protection Agency. 1200 Pennsylvania Avenue NW, Washington, DC 20004. <www.epa.gov>

Documents
Document Sharing Hub
Full document details: NSF 62 2021

4.1.2 POU drinking water treatment units shall conform to the protocol in this Section.

4.1.3 Acceptance criteria

4.1.3.1 Materials in contact with drinking water shall not impart levels of target compounds or tentatively identified compounds (TICs) that exceed the total allowable concentration (TAC), maximum contaminant levels (MCL), or maximum acceptable concentration (MAC) criteria specified in NSF/ANSI/CAN 600, Table 4.1. Any extractable contaminants not listed in the referenced tables shall be reviewed and shall not exceed criteria developed in accordance with NSF/ANSI/CAN 600, Section 3.

4.1.3.2 TIC identification and quantitation shall be conducted in accordance with Section 4.3.1.2. Additional TIC identification and quantitation shall be verified using a standard of the compound in question or an alternate approved analytical method. Additional TIC identification and quantitation is recommended when the contaminant is a health risk or when the "probability-based matching" process in Section 4.3.1.2 is inconclusive. When possible, the product manufacturer shall assist and support the testing laboratory in the identification of a standard for the compound and an appropriate analytical method, if applicable, so that confirmatory identification and quantification can be performed. If a standard and an adequate alternative analytical method are not available to verify the identification and quantitation of the compound, the TIC shall be evaluated according to Section 4.3.1.2.

NOTE — Manufacturers may not be privy to formulation information, so they may not be able to assist a testing laboratory to identify a standard for the compound that extracted. Refer to Section 4.3.1.2 when the manufacturer does not have material formulation information.

4.1.3.3 Unknown contaminants detected by GC/MS analysis for which identification is unable to be made after performing the steps in Section 4.3.1 shall be reported in accordance to Section 4.1.4.2.

4.1.3.4 The concentration of active agents or additives used in the drinking water treatment process shall be evaluated in the product water as specified in Section 6.10. The concentration of active agents or additives used in the drinking water treatment process shall not be evaluated during extraction testing.

4.1.3.5 Whole-system or component assembly extraction testing may be waived if components, when separately tested, meet the requirements of this Standard and are assembled in a manner that does not introduce any new components or materials, increase the surface area-to-volume ratio of previously evaluated components, or present potential concern based on cumulative factors. The reported extractable concentrations for components shall be arithmetically added to ensure that the whole-system or component assembly meets the allowable levels in accordance with Tables 4.1, 4.2, 4.3, NSF/ANSI/CAN 61, and NSF/ANSI/CAN 600.

4.1.4 Data reporting

4.1.4.1 All contaminants identified and detected at or above the reporting limit (RL) shall be reported with the identification of the contaminant, the concentration, and whether it exceeds the acceptance criteria as required in Section 4.1.3. Contaminants detected below the RL shall be reported to the manufacturer as less than the RL's value.

Example: If the lab's RL is 1.0 mg/L for analyte "X" and the concentration was detected at 0.5 mg/L, the lab shall report less than 1.0 mg/L or < 1.0 mg/L.

4.1.4.2 If the extractable contaminant cannot be identified following the procedures in Section 4.3.1 the laboratory shall supply the manufacturer with the approximate molecular weight along with any additional information about the compound.

Documents
Document Sharing Hub
Full document details: NSF 62 2021

4.2 Materials evaluation

Complete formulation information on any material not certified as specifically compliant with the sections of the US Code of Federal Regulations, Title 21, listed in Table 4.4, shall be reviewed to determine whether the material presents a health effects concern in contact with drinking water and to assess the material's potential for contributing contaminants to the drinking water. As a minimum level of information for those materials requiring submission of formulation information, the complete chemical identity and proportion by weight (in some cases approximate weights or proportions may suffice) and ingredient sources of supply shall be provided.

The following additional information is required when available:

— a list of the known or suspected impurities within the product or material and the maximum percent or parts by weight of each impurity;

— the water solubility, hydrolysis products, and extraction rates of chemicals within the product or material; and

— a list of toxicological studies relevant to the chemicals and impurities present in the product, component, or material.

4.2.1 Analytical methods

All analyses shall be conducted in accordance with the applicable method(s) referenced in Section 2.

4.2.1.1 The laboratory shall validate the analytical method to the RL concentration following the procedures established in the referenced method. The laboratory shall evaluate its method detection limit (MDL) in reference to the RL. In all cases, the RL shall be equal or greater than the MDL. When preparing its calibration standards, the lowest calibration point shall be at or less than the RL.

4.2.1.2 For extracted techniques (e.g., US EPA Method 625), regarding the concentration of the lowest calibration point, the laboratory shall apply the concentration factor due to sample preparation. For example, a sample 1 L extracted, and the extract concentrated to 1.0 mL, for a factor of 1000, if the RL is set to 0.2 ug/L, then the lowest calibration point would be at or less than 0.2 mg/L.

NOTE — See Annex I-3 for additional information on GC/MS and other alternative methods.

4.2.2 Exposure water

Systems and components shall be exposed to locally available tap water that has been adjusted to contain 50 ± 5 mg/L total dissolved solids (TDS), 0.5 ± 0.05 mg/L free available chlorine, and have a pH of 6.75 ± 0.25. Exposure water used to evaluate systems or components shall be 23 ± 2 °C (73 ± 3 °F). Any existing concentrations of extraction testing parameters listed in Tables 4.1, 4.2, and 4.3 found to be present in the exposure water shall be subtracted from the values obtained in the analysis of the extractant water.

4.2.3 Exposure

4.2.3.1 The system or component(s) of a system shall be installed, flushed, and conditioned in accordance with the manufacturer's instructions using the exposure water specified in Section 4.2.2 at an initial inlet static pressure of 340 kPa (50 psig).

4.2.3.2 The system or component(s) shall be refilled with exposure water specified in Section 4.2.2 and operated according to manufacturer’s instructions (if the system does not include a product water reservoir, the unit shall not be operated until immediately prior to sample collection). The system or component(s) shall be maintained for 24 h at an ambient temperature of 23 ± 2 °C (73 ± 3 °F). A water sample shall then be collected in accordance with Section 4.2.3.3. This procedure (Section 4.2.3.2) shall be repeated two

Documents
Document Sharing Hub
Full document details: NSF 62 2021

times for a total of three water sample collections.

4.2.3.3 A daily 2-L collection volume is recommended to ensure there is sufficient volume in the composite sample to conduct the requested analyses. If the water holding volume of the product is greater than 2 L, the entire volume shall be collected in a suitable collection vessel, and a 2-L subsample obtained from this volume. If the water holding volume of the product is less than 2 L, sufficient samples shall be exposed to provide at least $^{1}/_{3}$ of the volume required for analysis of extractant water at each sample point. The maximum number of samples exposed shall not exceed 16 with 125 mL of extractant water drawn from each sample. If the components with a water-holding volume that is less than 250 mL and is able to be identified as one that will only occur once in the flow path of dispensed treated water (such as diverters, faucets, RO shutoff valves, or specialty components) then a volume of 250 mL shall be drawn from each sample using a maximum number of eight samples.

4.2.3.4 All samples collected shall be composited and analyzed in accordance with Section 4.2.1.

4.2.3.5 Systems with adsorptive or absorptive media shall be tested with and without the media. Testing without media shall include removal of any granular adsorptive or absorptive media, and removal of any carbon block replacement elements.

4.3 Gas chromatography / mass spectroscopy (GC/MS) analysis

4.3.1 General requirements for GC/MS analysis

When determined to be required following a product-specific formulation review, US EPA Analytical Methods for semivolatiles and volatiles that include mass spectral libraries shall be performed on products or components and shall include full-range mass spectral libraries to monitor for nontarget compounds.

Testing for semivolatiles (e.g., US EPA Methods 625, 528, or 525.2) and volatiles (e.g., US EPA Methods 524.2 or 524.3) shall be conducted using the required target compounds in Tables 4.2 and 4.3 and the laboratory's RL shall be no greater than the RLs listed in Tables 4.2 and 4.3.

4.3.1.1 Target compounds shall be validated in accordance with the requirements of the referenced method. US EPA Methods 524.2 and 625 have specific validation requirements including precision and accuracy requirements as well as demonstration of sensitivity (method detection limit study or MDL).

For US EPA Method 625, the minimum instrument operation requirements for GC/MS analysis shall be in accordance with those protocols as defined by the method with the following modifications:

— to guard against significant drift from an initial instrument calibration to subsequent instrument batches, the average chromatographic peak area of each internal standard in the calibration curve shall be determined. The chromatographic peak area of each internal standard in the continuing calibration shall be greater than 50% and not more than 200% of that average;

— due to the number of characteristics of the analytes associated with Method 625, while performing a continuing calibration check (CCC), concentrations of 10% of the target compounds for each analysis (e.g., base/neutral, base/neutral/acid, acid) shall be allowed to fall outside of the range of 70% to 130% (outlier) of the true value. None of the concentrations shall be allowed to fall below 50% or above 200% of the true value. If a positive sample analyte result is identified for any outlier, a second CCC shall be performed. If the second CCC determines the sample analyte result to no longer be an outlier, the sample shall be reanalyzed. However, if the second CCC also determines the analyte to be an outlier, a new calibration curve shall be determined, and the sample shall be reanalyzed;

NOTE — At the laboratory's discretion, a calibration may be performed specifically for the compound in question, with the reporting of its data from this second calibration. It shall be understood, that if the laboratory utilizes this approach (calibrating for the specific analyte) all method requirements as specified by Method 625 shall be achieved.

Documents
Document Sharing Hub
Full document details: NSF 62 2021

4.3.1.2 TICs are identified by comparison of the spectrum of the unknown to the mass-spectral reference library utilizing "probability-based matching" (as available from instrument manufacturers) as well as interpretation by the analyst. The laboratory shall report the TIC with the best match factor (the match factor shall not be reported) except in the following circumstances:

— due to the complex nature of GC/MS interpretation and identification, when reviewing the list of possible matches for any particular TIC peak, the laboratory has the authority to assign the identification to a compound "hit" with a lower numeric match factor from the library search algorithm;

— the laboratory may determine that none of the returned compounds by the automated search algorithm is a good match for the unknown peak. In this case the compound is reported as an "Unknown";

— the laboratory may utilize manual spectral interpretation to identify the peak in question; and

— all TICs detected at a concentration greater than or equal to 3.0 ppb shall be reported.

The library used during the analysis shall be National Institute of Standards and Technology (NIST) 2007 or most current version. Additional spectra libraries may be used to assist in the identification of unknown compounds. For TICs, the concentration is estimated by comparison of its total ion area response to the total ion area response of the nearest internal standard. For TICs, a response factor of "1" (one) shall be utilized for the purposes of calculating the TICs estimated concentration.

It shall be understood that when utilizing mass-spectrometer library searches to identify unknown chromatographic peaks (sometimes called "TICs") that the concentration is estimated assuming that the response of the TIC is the same as the internal standard. However, for example, when analyzing for traditional semi volatile compounds by US EPA Method 625, the range of response factors is typically 0.1 to 2. Because the response factor is used as a reciprocal, and assuming that the response for the TIC falls within the range of the compounds for which the system is typically calibrated, the true concentration for this TIC would range up to 10 times greater to one half the reported TIC concentration.

4.3.1.3 Unknown compounds – contaminants detected by GC/MS analysis but are not identified and quantified against a known mass spectrum or standard shall be evaluated as follows:

— the molecular weight shall be reported or, if no molecular ion is identifiable, a minimum value for the molecular weight (for example, if the highest mass ion for the TIC has a m/z of 143, then report MW ≥ 143);

— the chemical class information shall be reported if this determination is possible;

— the laboratory shall report the presence of the common halogens chlorine and bromine utilizing their characteristic "M+2" patterns;

— the product material formulation(s) shall be reviewed for potential identification of the unknown contaminant(s) as an ingredient or byproduct;

— the manufacturer shall be notified and requested to provide supporting information that enables identification of the unknown contaminant(s);

— structure activity relationships (SAR) shall be utilized when sufficient structural identification of the unknown contaminant(s) can be made; and

— alternative methods of analysis that may identify the unknown contaminant(s) shall be considered, such as classifying the unknown into a chemical class.

Contaminants that are identified after performing one or more of the above steps shall be evaluated in

Documents
Document Sharing Hub
Full document details: NSF 62 2021

accordance with Sections 4.1.3.2 and 4.1.3.3. The product manufacturer, laboratory toxicologist and laboratory chemist shall assist the testing laboratory in the identification of a standard for the compound and an appropriate analytical method, if applicable, so that confirmatory identification and quantification can be performed when needed. Standard validation is needed when the identified compound is not reported in the formulation review conducted in Section 4.2.

NOTE — Items b and c above may be automated utilizing software available from NIST with their mass-spectral database.

4.3.1.4 Contaminants detected by GC/MS analysis for which no identification can be made after performing the above steps shall not be considered in the determination of product compliance to this Standard. When unknown contaminants are detected in the extractant water, the testing laboratory shall report the analytical results.

Table 4.1
Extraction testing parameters (metals)

Analyte	CAS number	Maximum reporting limit (RL) (mg/L)	US EPA Method(s)
aluminum	7429-90-5	0.1	200.7, 200.8
antimony	7440-36-0	0.001	200.8, 200.9
arsenic	7440-38-2	0.001	200.8, 200.9
barium	7440-39-3	0.2	200.7, 200.8
beryllium	7440-41-7	0.001	200.7, 200.8, 200.9
cadmium	7440-43-9	0.001	200.8, 200.9
chromium	7440-47-3	0.01	200.7, 200.8, 200.9
copper	7440-50-8	0.1	200.7, 200.8
lead	7439-92-1	0.001	200.8, 200.9
manganese	7439-96-5	0.01	200.7, 200.8
mercury	7439-97-6	0.001	200.8, 245.1
nickel	7440-02-0	0.01	200.7, 200.8
selenium	7782-49-2	0.005	200.8, 200.9
thallium	7440-28-0	0.001	200.8, 200.9

Documents
Document Sharing Hub
Full document details: NSF 62 2021

Table 4.2
Extraction testing parameters (semivolatiles)

Analyte	CAS number	Maximum reporting limit (RL) (mg/L)	Reference Method(s)
2,4,6-trichlorophenol	88-06-2	0.001	525.2, 528, 625
2,4-dichlorophenol	120-83-2	0.001	525.2, 528, 625
2,4-dimethylphenol	105-67-9	0.01	525.2, 528, 625
2,6-di-tert-butyl-4-methoxyphenol	489-01-0	0.003	525.2, 528, 625
2-methylnaphthalene	91-57-6	0.003	525.2, 528, 625
2-nitrophenol	88-75-5	0.001	525.2, 528, 625
2-phenyl-2-propanol	617-94-7	0.005	525.2, 528, 625
3,3-dichlorobenzidine	91-94-1	0.001	525.2, 528, 625
3-and 4-methylphenol, m&p-cresol	106-44-5 108-39-4	0.001	525.2, 528, 625
4-chloro-3-methylphenol	59-50-7	0.07	525.2, 528, 625
4-tert-butylphenol or p-tert-butylphenol	98-54-4	0.05	525.2, 528, 625
acenaphthene	83-32-9	0.004	525.2, 528, 625
acenaphthylene	208-96-8	0.0004	525.2, 528, 625
acetophenone	98-86-2	0.02	525.2, 528, 625
anthracene	120-12-7	0.0003	525.2, 528, 625
benzo(a)pyrene	50-32-8	0.0002	525.2, 528, 625
benzothiazole	95-16-9	0.003	525.2, 528, 625
bis(2-ethylhexyl)adipate	103-23-1	0.04	525.2, 528, 625
bis(2-ethylhexyl)phthalate	117-81-7	0.001	525.2, 528, 625
butyl benzyl phthalate	85-68-7	0.1	525.2, 528, 625
chrysene	218-01-9	0.003	525.2, 528, 625
diethyl phthalate	84-66-2	0.6	525.2, 528, 625
dimethyl phthalate	131-11-3	0.001	525.2, 528, 625
di-n-butyl phthalate	84-74-2	0.07	525.2, 528, 625
fluoranthene	206-44-0	0.0003	525.2, 528, 625
isophorone	78-59-1	0.04	525.2, 528, 625
naphthalene	91-20-3	0.04	525.2, 528, 625
n-nitroso-di-n-butylamine	924-16-3	0.0006	525.2, 528, 625
n-nitroso-di-n-propylamine	621-64-7	0.0005	525.2, 528, 625
n-nitrosodiphenylamine	86-30-6	0.007	525.2, 528, 625
o-cresol or 2-methylphenol	95-48-7	0.001	525.2, 528, 625
pentachlorophenol	87-86-5	0.0005	525.2, 528, 625
phenanthrene	85-01-8	0.0003	525.2, 528, 625
phenol	108-95-2	0.2	525.2, 528, 625
phenyl sulfone	127-63-9	0.002	525.2, 528, 625
pyrene	129-00-0	0.0006	525.2, 528, 625

Documents
Document Sharing Hub
Full document details: NSF 62 2021

Table 4.3
Extraction testing parameters (volatiles)

Analyte	CAS number	Maximum reporting limit (RL) (mg/L)	Reference Method(s)
1,1,1,2-tetrachloroethane	630-20-6	0.001	524.2, 524.3
1,1,1-trichloroethane	71-55-6	0.02	524.2, 524.3
1,1,2,2-tetrachloroethane	79-34-5	0.0005	524.2, 524.3
1,1,2-trichloroethane	79-00-5	0.0005	524.2, 524.3
1,1-dichloroethene	75-35-4	0.0007	524.2, 524.3
1,1-dichloropropene	563-58-6	0.0005	524.2, 524.3
1,2,3-trichlorobenzene	87-61-6	0.0005	524.2, 524.3
1,2,3-trichloropropane	96-18-4	0.004	524.2, 524.3
1,2,4-trichlorobenzene	120-82-1	0.007	524.2, 524.3
1,2-dibromo-3-chloropropane	96-12-8	0.0002	524.2, 524.3
1,2-dibromoethane	106-93-4	0.0002	524.2, 524.3
1,2-dichlorobenzene	95-50-1	0.06	524.2, 524.3
1,2-dichloroethane	107-06-2	0.0005	524.2, 524.3
1,2-dichloropropane	78-87-5	0.0005	524.2, 524.3
1,3,5-trimethylbenzene	108-67-8	0.0005	524.2, 524.3
1,3-dichlorobenzene	541-73-1	0.06	524.2, 524.3
1,4-dichlorobenzene	106-46-7	0.007	524.2, 524.3
2-butanone	78-93-3	0.4	524.2, 524.3
2-chlorotoluene	95-49-8	0.01	524.2, 524.3
2-ethyl-1-hexanol	104-76-7	0.005	524.2, 524.3
4-chlorotoluene	106-43-4	0.0005	524.2, 524.3
4-isopropyltoluene	99-87-6	0.0005	524.2, 524.3
4-methyl-2-pentanone	108-10-1	0.7	524.2, 524.3
acetone	67-64-1	0.6	524.2, 524.3
acetophenone	98-86-2	0.02	524.2, 524.3
acrylonitrile	107-13-1	0.0006	524.2 SIM
benzene	71-43-2	0.0005	524.2, 524.3
bis(2-chloroethyl)ether or di-(2-chloroethyl) ether	111-44-4	0.0003	524.2, 524.3
bromobenzene	108-86-1	0.0005	524.2, 524.3
bromochloromethane	74-97-5	0.009	524.2, 524.3
bromodichloromethane	75-27-4	0.001	524.2, 524.3
bromoform	75-25-2	0.001	524.2, 524.3
bromomethane	74-83-9	0.001	524.2, 524.3
carbon disulfide	75-15-0	0.7	524.2, 524.3
carbon tetrachloride	56-23-5	0.0005	524.2, 524.3
chlorobenzene	108-90-7	0.01	524.2, 524.3
chloroform	67-66-3	0.001	524.2, 524.3

Documents
Document Sharing Hub
Full document details: NSF 62 2021

Table 4.3
Extraction testing parameters (volatiles)

Analyte	CAS number	Maximum reporting limit (RL) (mg/L)	Reference Method(s)
chloromethane	74-87-3	0.003	524.2, 524.3
cis-1,2-dichloroethene	156-59-2	0.007	524.2, 524.3
cyclohexanone	108-94-1	1.0	524.2, 524.3
dibromochloromethane	124-48-1	0.001	524.2, 524.3
dichlorodifluoromethane	75-71-8	0.0005	524.2, 524.3
ethyl acrylate	140-88-5	0.001	524.2, 524.3
ethylbenzene	100-41-4	0.07	524.2, 524.3
methyl acrylate	96-33-3	0.001	524.2, 524.3
methyl methacrylate	80-62-6	0.1	524.2, 524.3
methyl tert-butyl ether	1634-04-4	0.0005	524.2, 524.3
methylene chloride	75-09-2	0.0005	524.2, 524.3
n-butyl acrylate	141-32-2	1	524.2, 524.3
n-butylbenzene	104-51-8	0.0005	524.2, 524.3
sec-butylbenzene	135-98-8	0.0005	524.2, 524.3
styrene	100-42-5	0.01	524.2, 524.3
t-butyl alcohol or t-butanol or tert-butanol	75-65-0	0.1	524.2, 524.3
tetrachloroethene	127-18-4	0.0005	524.2, 524.3
tetrahydrofuran	109-99-9	5	524.2, 524.3
toluene	108-88-3	0.1	524.2, 524.3
xylenes (total) o-xylene [2] or 1,2-xylene, m-xylene, p-xylene	95-47-6 106-42-3 108-38-3	0.1	524.2, 524.3
trans-1,2-dichloroethene	156-60-5	0.01	524.2, 524.3
dichloropropene (total) cis-1,3- trans-1,3	542-75-6 10061-01-5 10061-02-6	0.0005	524.2, 524.3
trichloroethene or trichloroethylene	79-01-6	0.0005	524.2, 524.3
trichlorofluoromethane	75-69-4	0.2	524.2, 524.3
total trihalomethanes (TTHMs) bromodichloromethane bromoform chloroform dichlorobromomethane	—	0.001	524.2, 524.3
vinyl chloride	75-01-4	0.0002	524.2, 524.3

Documents
Document Sharing Hub
Full document details: NSF 62 2021

Table 4.4
Materials listed in US Code of Federal Regulations, Title 21, not requiring formulation review

Sections	Material
172.880 178.3700	petrolatum
172.888 178.3720	synthetic petroleum wax
172.878	white mineral oil
172.884	odorless white petroleum hydrocarbons
172.886 178.3710	petroleum wax
173.25	Ion exchange resins – provided that the subsection stating the composition of the resin is specified.
173.65	divinyl benzene copolymer
178.3620	mineral oil
Part 184	Direct food substances affirmed as generally recognized as safe – when used in accordance with any conditions of use specified for the substance.
solvents	Solvents which may be considered for solvent bonding without review are limited to acetone, methyl ethyl ketone, cyclohexanone, and tetrahydrofuran. Mixtures such as solvent cements shall be evaluated against NSF/ANSI/CAN 61 or shall be subject to formulation review. Solvents that have been reprocessed or recycled shall not be used. NOTE — Solvent bonding is not recommended, as solvents soak into synthetic materials and leach back out into water at relatively high levels for long periods of time. In addition, solvents can contaminate the work area and can be adsorbed by carbon in the work area.

5 Structural performance

5.1 Structural integrity

The purpose for testing structural integrity performance is to evaluate the materials, design, and fabrication quality of the complete water treatment system.

5.1.1 Acceptance

Each test of structural integrity (cyclic pressure and hydrostatic pressure) shall be performed on a separate system. If the complete water treatment system is tested, a separate test of the system pressure vessel is not required.

Complete systems, pressure vessels, and components shall be tested for structural integrity in accordance with Section 5.1.3 at the pressures specified in Table 5.1. When more than one pressure is specified in Table 5.1, testing shall be done at the higher pressure.

Complete systems, pressure vessels, and components shall be water-tight when tested for structural integrity under Section 5.1.3. Weepage shall be considered acceptable at the beginning of a test, but weepage shall not begin in the middle of a test.

Documents
Document Sharing Hub
Full document details: NSF 62 2021

Table 5.1
Structural integrity performance testing

Systems and components	Hydrostatic pressure test	Cyclic pressure test
complete systems and components[1]	2,070 kPa (300 psig) or 3 × maximum working pressure, whichever is greater	100,000 cycles at 0 to 1,040 kPa (0 to 150 psig) or 1.5 × maximum working pressure, whichever is greater
complete disposable systems and components	2,070 kPa (300 psig) or 3 × maximum working pressure, whichever is greater	10,000 cycles at 0 to 1,040 kPa (0 to 150 psig) or 1.5 × maximum working pressure, whichever is greater

[1] Metallic pressure vessels require measurement of circumference and head deflection. The pressure vessel circumference shall not exhibit a permanent increase of more than 0.2% when measured at the midsection and at 305 mm (12 in) intervals. The top and bottom head deflection of the pressure vessel shall not exhibit a permanent deflection exceeding 0.5% of the vessel diameter.

5.1.2 Working pressure

The pressure vessel(s) and all other components of a water treatment system that are subject to line pressure shall be designed and constructed to maintain structural integrity at a pressure of 690 kPa (100 psig) or the maximum working pressure, whichever is greater.

5.1.3 Structural integrity test methods

5.1.3.1 Apparatus

An enclosure shall be provided for each system tested to prevent injury to personnel or property damage if the system fails. An apparatus that may be used for the cyclic and hydrostatic test is shown schematically in Figure 1. Pressure measuring instruments shall have a precision and accuracy of 2% at the point of measurement.

5.1.3.2 Hydrostatic pressure test – Complete systems

Systems designed to operate only at atmospheric pressure shall be exempt from the hydrostatic pressure test but shall be watertight in normal use. Components downstream of the system on/off valve that are not subject to pressure under the off mode, and that either contain no media subject to plugging or are not designed to contain media, shall be exempt from the hydrostatic pressure test but shall be watertight in normal use. Components that are downstream of the system on/off valve but upstream of media subject to clogging shall meet the requirements of this section. The following procedure shall be used for the hydrostatic pressure testing of other complete systems:

a) A water temperature of 13 to 24 °C (55 to 75 °F) shall be used. The test water shall be adjusted to a temperature at which condensation will not form on the surface of the test unit.

b) Connect the inlet of the test system to the apparatus shown in Figure 1. The system shall be in conformance with its normal state of use, with the option of plugging drain lines.

c) Fill the test system with water. Flush to purge air from the system.

Documents
Document Sharing Hub
Full document details: NSF 62 2021