



*NSF International Standard /  
American National Standard*

## NSF/ANSI 50 - 2016

Equipment for Swimming Pools, Spas,  
Hot Tubs and Other Recreational  
Water Facilities



*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 Recreational Water Facilities  
c/o NSF International  
789 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 International Standard/  
American National Standard

Equipment for Swimming Pools,  
Spas, Hot Tubs and other  
Recreational Water Facilities—

Evaluation criteria for materials, components,  
products, equipment and systems for use at  
recreational water facilities

Standard Developer

**NSF International**

**Designated as an ANSI Standard**

February 19, 2016

**American National Standards Institute**

Recommended for Adoption by  
**The NSF Joint Committee on Recreational Water Facilities**  
**The NSF Council of Public Health Consultants**

Adopted by  
**The NSF International**  
May 1977

Revised May 1979  
Revised June 1984  
Revised November 1985  
Revised May 1992  
Revised July 1996  
Revised January 2000  
Revised May 2001  
Revised March 2004  
Revised October 2005  
Revised April 2007  
Revised October 2007  
Revised February 2009

Revised May 2009  
Revised August 2010  
Revised August 2011  
Addendum November 2011  
Revised September 2012  
Revised December 2013  
Revised June 2014  
Revised July 2015  
Revised August 2016

Published by  
**NSF International**  
**P. O. 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 50 – 2016."

Copyright 2012 NSF International  
Previous editions © 2015, 2014, 2013, 2011, 2010, 2009, 2008, 2007, 2005, 2004, 2001, 2000, 1996, 1992, 1985, 1984, 1979

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, 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.

NSF Standards provide basic criteria to promote sanitation and protection of the public health.

Participation in NSF Standards development activities by regulatory agency representatives (federal, local, state) 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.

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

1	General .....	1
1.1	Scope .....	1
1.2	Variations in design and operation .....	1
1.3	Alternate materials .....	1
1.4	Standard review .....	1
1.5	Normative references .....	1
2	Definitions .....	4
3	Swimming pool water contact materials and swimming pool treatment chemicals .....	13
3.1	Swimming pool water contact materials .....	13
3.2	Swimming pool treatment chemicals .....	14
3.3	Corrosion resistance .....	15
3.4	Dissimilar metals .....	15
3.5	Insulating fittings .....	15
3.6	Piping materials .....	15
4	Design and construction .....	16
4.1	Installation of piping, valves, and fittings .....	16
4.2	Assembly .....	16
4.3	Closing and sealing devices .....	16
4.4	Suction fittings .....	16
4.5	PVC Hose .....	16
4.6	Safety Vacuum Release Systems (SVRS) .....	16
4.7	Pool and Spa Covers .....	16
4.8	Pool Alarms .....	16
4.9	Barriers and fencing .....	17
4.10	Vacuum port fitting cover .....	17
5	Filters .....	17
5.1	General .....	17
5.2	Pre-coat media-type filters .....	18
5.3	Sand-type filters .....	21
5.4	Cartridge-type and high-permeability-type filters .....	23
6	Centrifugal pumps .....	25
6.1	General .....	25
6.2	Hydrostatic pressure test .....	25
6.3	Strainers .....	25
6.4	Drain plugs .....	26
6.5	Shaft seals .....	26
6.6	Pump performance curve .....	26
6.7	Operation and installation instructions .....	26
6.8	Self-priming pumps .....	26
6.9	Data plate .....	27
6.10	Motors .....	27
7	Non-integral strainers .....	28
7.1	Non-integral strainer basket .....	28
7.2	Non-integral strainer cover .....	28
7.3	Drain plug .....	28
7.4	Head loss .....	28
7.5	Hydrostatic pressure test .....	29
7.6	Operation and installation instructions .....	29

7.7	Data plate.....	29
8	Valves .....	29
8.1	General.....	29
8.2	Positive indexing .....	29
8.3	Design pressure .....	30
8.4	Pressure service .....	30
8.5	Valve leakage.....	30
8.6	Head loss curve .....	30
8.7	Waste port seal .....	30
8.8	Vacuum service.....	30
8.9	Installation and operating instructions.....	30
8.10	Identification.....	31
9	Recessed automatic surface skimmers.....	31
9.1	Housing .....	31
9.2	Weir.....	31
9.3	Strainer basket.....	32
9.4	Equalizer line.....	32
9.5	Cover and mounting ring .....	33
9.6	Trimmer valves.....	33
9.7	Vacuum cleaner connections .....	33
9.8	Operation and installation instructions.....	34
9.9	Data plate.....	34
10	Mechanical chemical feeding equipment .....	34
10.1	General .....	34
10.2	Erosion resistance .....	35
10.3	Chemical resistance .....	35
10.4	Output rate.....	35
10.5	Hydrostatic pressure.....	35
10.6	Life test .....	35
10.7	Shielding .....	36
10.8	Motors .....	36
10.9	Suction lift .....	36
10.10	Protection against overdosing .....	36
10.11	Operation and installation instructions .....	36
10.12	Data plate .....	37
11	Flow-through chemical feeding equipment.....	37
11.1	General .....	37
11.2	Chemical resistance .....	37
11.3	Hydrostatic pressure.....	37
11.4	Motors .....	37
11.5	Output rate.....	38
11.6	Protection against overdosing .....	38
11.7	Flow-indicating device .....	38
11.8	Operation and installation instructions .....	38
11.9	Data plate .....	39
12	Filtration media .....	39
12.1	Pre-coat filter media .....	39
12.2	Sand and alternate sand-type filter media.....	40
13	Ozone process equipment.....	41
13.1	General.....	41

13.2	Ozone components .....	41
13.3	Ozone generator .....	41
13.4	Injection methods .....	41
13.5	Gas flow meter.....	41
13.6	Valve and component identification.....	41
13.7	Cleanability .....	42
13.8	Ozone resistant materials.....	42
13.9	Compatible materials for operation .....	42
13.10	Design pressure (pressure vessels) .....	43
13.11	Head loss.....	43
13.12	Water flow meter .....	43
13.13	Oxidation-reduction potential (ORP) monitoring.....	43
13.14	Warning devices .....	43
13.15	Operational protection .....	43
13.16	Ozone destruct .....	44
13.17	Ozone output .....	44
13.18	Life test .....	44
13.19	Disinfection efficacy.....	44
13.20	<i>Cryptosporidium</i> reduction.....	44
13.21	Operation and installation instructions .....	45
13.22	Information on ozone off-gassing and removal devices .....	45
13.23	Data plate .....	45
14	Ultraviolet (UV) light process equipment .....	46
14.1	General .....	46
14.2	Cleanability .....	46
14.3	Design pressure (pressure vessels) .....	46
14.4	Flow meter .....	46
14.5	Performance indication .....	46
14.6	Operation and installation instructions .....	47
14.7	Data plate .....	47
14.8	Disinfection efficacy.....	48
14.9	Valve and component identification.....	48
14.10	Operating temperatures.....	48
14.11	Operational protection .....	48
14.12	Life Test.....	48
14.13	Cleaning.....	49
14.14	Ultraviolet (UV) lamps.....	49
14.15	Chemical resistant materials .....	49
14.16	Head loss.....	49
14.17	Hydrostatic Pressure Requirements.....	49
14.18	UV <i>Cryptosporidium</i> Inactivation and dose determination .....	49
15	In-line electrolytic chlorinator or brominator process equipment.....	50
15.1	General .....	50
15.2	Cleanability .....	50
15.3	Design pressure (pressure vessels) .....	50
15.4	Flow metering device.....	50
15.5	Performance indication.....	51
15.6	Operation and installation instructions .....	51
15.7	Data plate .....	51
15.8	Valve and component identification.....	51
15.9	Operating temperatures and pressures.....	52
15.10	Operational protection .....	52
15.12	Chemical-resistant materials .....	52
15.13	Output rate.....	52

15.14	Pressure requirements .....	52
15.15	Life test .....	52
15.16	Salt level .....	52
15.17	Head loss.....	52
16	Brine (batch) type electrolytic chlorine or bromine generators .....	53
16.1	General .....	53
16.2	Cleanability .....	53
16.3	Design pressure (pressure vessels) .....	53
16.4	Flow metering device.....	53
16.5	Performance indication.....	53
16.6	Operation and installation instructions .....	53
16.7	Data plate .....	54
16.8	Valve and component identification.....	54
16.9	Operating conditions.....	54
16.10	Injection methods .....	54
16.11	Operational protection .....	54
16.12	Chemical-resistant materials .....	54
16.13	Output rate.....	54
16.14	Life test .....	55
17	Copper/silver and copper ion generators .....	55
17.1	General .....	55
17.2	Cleanability .....	55
17.3	Design pressure (pressure vessels) .....	55
17.4	Flow metering device.....	56
17.5	Performance indication.....	56
17.6	Operation and installation instructions .....	56
17.7	Data plate .....	57
17.8	Disinfection efficacy .....	57
17.9	Valve and component identification.....	57
17.10	Operating temperatures and pressures.....	57
17.11	Warning devices .....	57
17.12	Chemical-resistant materials .....	58
17.13	Output rate.....	58
17.14	Life test .....	58
17.15	Uniformity of output .....	58
17.16	Head Loss.....	58
18	Automated Controllers.....	58
18.1	Scope.....	58
18.2	Chemical resistant materials .....	58
18.3	Monitor display.....	58
18.4	Life test .....	59
18.5	Performance .....	59
18.6	Failure sensing and signaling devices.....	60
18.7	Operational protection .....	60
18.8	Operation and installation instructions .....	60
18.9	Data plate .....	60
19	Water Quality Testing Devices (WQTD).....	61
19.1	General .....	61
19.2	Testing.....	61
19.3	Operation and use instructions.....	62
19.4	WQTD Marking/Identification.....	62

20	Spas and hot tubs.....	63
20.1	General.....	63
20.2	Materials.....	63
20.3	Electrical components.....	63
20.4	Design and construction.....	63
20.5	Circulation system.....	66
20.6	Air blower and air induction systems.....	69
20.7	Temperature control systems, heaters, and controls.....	70
20.8	Sanitation and treatment systems.....	70
20.9	Data plate.....	72
20.10	Owner’s manual.....	72
21	Fittings for water-park, spray-pad, pool, or spa.....	74
21.1	Water inlet or water return fittings.....	74
21.2	Surface or deck drain fittings.....	75
21.3	Overflow fittings and perimeter grating.....	76
21.4	Fittings for water circulation and treatment.....	77
22	Heat exchangers, heaters, coolers, and solar water heating systems.....	78
22.1	General.....	78
22.2	Performance.....	79
22.3	Operation and installation instructions.....	79
22.4	Marking and product identification.....	80
23	Flow metering device.....	80
23.1	Scope.....	80
23.2	Performance testing.....	80
23.3	Evaluation and testing criteria.....	80
23.4	Design, construction and performance requirements.....	81
23.5	Fastener evaluation.....	81
23.6	Working pressure and pressure testing.....	81
23.7	Head loss.....	82
23.8	Flow rate measurement accuracy.....	82
23.9	Flow metering device testing and accuracy levels.....	82
23.10	Display flow rate scale range.....	83
23.11	Display resolution.....	83
23.12	Life testing.....	83
23.13	Product marking or data plate.....	83
23.14	Installation and operation manual.....	84
Annex A	.....	A1
Annex B	.....	B1
Annex C	.....	C1
Annex D	.....	D1
Annex E	.....	E1
Annex F	.....	F1
Annex G	.....	G1
Annex H	.....	H1

Annex I	.....	I1
Annex J	.....	J2
Annex K	.....	K1
Annex L	.....	L1
Annex M	.....	M1
Annex N	.....	N1
Annex O	.....	O1
Annex P	.....	P1
Annex Q	.....	Q1
Annex R	.....	R1
Annex S	.....	S1
Annex T	.....	T1
Interpretation Annex	.....	1

## Foreword<sup>2</sup>

The purpose of this Standard is to establish minimum materials, design and construction, and performance requirements for components, products, equipment and systems, related to public and residential recreational water facility operation.

If a value for measurement is followed by a value in other units in parenthesis, the second value may be only approximate. The first stated value is the requirement.

In this edition of NSF/ANSI 50 editorial revisions and the following issues were incorporated:

**Issue 89 – UV Systems and Alerting** – to incorporate updated language and requirements into section 14.5.

**Issue 92 – Disinfection Efficacy** – to incorporate updated language and requirements for section 14.8 and Annex H.

**Issue 99 – Flow metering device** – to add language for testing, performance, labeling, and materials for flow meters to NSF/ANSI 50.

**Issue 102 – Ozone definitions** – to add definitions to support the ozone requirements in the Standard.

**Issue 112 – Ozone Annex H** – to update Annex H in regards to ozone production testing requirements, by removing the requirement of recording dew point and O<sub>2</sub> concentration of output of the air prep equipment.

**Issue 113 – Annex F** to update F.4.5 Acceptance criteria.

**Issue 114 – Section 14 error** – to replace output with operational protection as a required post-life test as protection was included in previous version of the standard.

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 Recreational Water Facilities at [standards@nsf.org](mailto:standards@nsf.org). or c/o NSF International, Standards Department, PO Box 130140, Ann Arbor, MI 48113-0140, USA.

---

<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.

This page is intentionally left blank.

## NSF/ANSI Standard

### Equipment for Swimming Pools, Spas, Hot Tubs and other Recreational Water Facilities

Evaluation criteria for materials, components, products, equipment and systems for use at recreational water facilities

## 1 General

### 1.1 Scope

This Standard covers materials, components, products, equipment and systems, related to public and residential recreational water facility operation.

### 1.2 Variations in design and operation

A component varying in design and/or operation may qualify under this Standard. Appropriate tests and investigations shall indicate that the component performs as well as components conforming to this Standard. Such components shall meet the requirements for materials, finishes, and construction in this Standard.

### 1.3 Alternate materials

If specific materials are mentioned, other materials equally satisfactory from the standpoint of public health may be permitted.

### 1.4 Standard review

A complete review of this Standard shall be conducted at least every five years. These reviews shall be conducted by representatives from the industry, public health, and user groups, or agencies of the NSF Joint Committee on Recreational Water Facilities.

### 1.5 Normative references

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

21 CFR Chapter 1. *Code of Federal Regulations*<sup>3</sup>

21 CFR Part 58, Subchapter A. *Code of Federal Regulations*<sup>3</sup>

---

<sup>3</sup> USFDA, 5600 Fishers Lane, Rockville, MD 20857 <[www.fda.gov](http://www.fda.gov)>