



*NSF International Standard /
American National Standard*

NSF/ANSI 50 - 2009

**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
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

Adopted February 17, 2009

NSF International

Designated as an ANSI Standard

February 17, 2009

American National Standards Institute

Recommended for Adoption by
The NSF Joint Committee on Swimming Pool and Spa Equipment
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 2008

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 – 2009.”

Copyright 2009 NSF International
Previous editions © 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.

Disclaimers¹

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. 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, 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.

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.

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	3
3	Materials	11
3.1	General	11
3.2	Material formulation	11
3.3	Corrosion resistance	11
3.4	Dissimilar metals	12
3.5	Insulating fittings	12
3.6	Piping materials	12
4	Design and construction	12
4.1	Mechanical parts	12
4.2	Electrical components	13
5	Filters	13
5.1	General	13
5.2	Diatomite and other precoat media-type filters	15
	Table 5.1 – Maximum design filtration rates for precoat media-type filters	16
5.3	Sand-type filters and alternate sand-type media	17
	Table 5.2 – Maximum difference in media surface elevations on a sand type filter	18
	Table 5.3 – Design filtration rates for sand type filters	19
5.4	Cartridge-type and high-permeability-type filters	19
	Table 5.4 – Maximum design filtration rates for cartridge-type filters	21
6	Centrifugal pumps	21
6.1	General	21
6.2	Hydrostatic pressure test	21
6.3	Strainers	21
6.4	Drain plugs	22
6.5	Shaft seals	22
6.6	Pump performance curve	22
6.7	Operation and installation instructions	22
6.8	Self-priming pumps	23
6.9	Data plates(s)	23
6.10	Motors	23
7	Multiport valves	24
7.1	General	24
7.2	Positive indexing	24
7.3	Design pressure	24
7.4	Hydrostatic pressure	24
7.5	Valve leakage	25
7.6	Head loss curve	25
7.7	Waste port seal	25
7.8	Identification	25

8	Recessed automatic surface skimmers.....	25
8.1	Housing	25
8.2	Weir.....	26
8.3	Strainer basket.....	26
8.4	Equalizer line (public pools).....	26
8.6	Trimmer valves.....	27
8.7	Vacuum cleaner connections.....	27
8.8	Operation and installation instructions.....	27
8.9	Data plates(s).....	27
9	Mechanical chemical feeding equipment	28
9.1	General	28
9.2	Erosion resistance.....	28
9.3	Chemical resistance.....	28
9.4	Output rate	29
9.5	Hydrostatic pressure	29
9.6	Life test.....	29
9.7	Shielding	29
9.8	Motors	29
9.9	Suction lift.....	29
9.10	Protection against overdosing	29
9.11	Operation and installation instructions	30
9.12	Data plates(s)	30
10	Flow-through chemical feeding equipment.....	30
10.1	General.....	31
10.2	Chemical resistance	31
10.3	Hydrostatic pressure.....	31
10.4	Motors.....	31
10.5	Output rate.....	31
10.6	Protection against overdosing	31
10.7	Flow-indicating device	31
10.8	Operation and installation instructions	32
10.9	Data plates(s)	32
11	General requirements for process equipment.....	32
11.1	Scope.....	32
11.2	Cleanability	33
11.3	Design pressure (pressure vessels).....	33
11.4	Flow meter	33
11.5	Performance indication.....	33
11.6	Operation and installation instructions	33
11.7	Disinfection efficacy.....	33
11.8	Valve and component identification.....	34
12	Ozone process equipment.....	34
12.1	General.....	34
12.2	Injection methods	34
12.3	Life test.....	34
12.4	Chemical resistant materials	34
12.5	Air preparation	34
12.6	Data plates(s)	34
12.7	Operation and installation instructions	35
12.8	Head loss.....	35

13	Ultraviolet light process equipment.....	35
13.1	General.....	35
13.2	Operating temperatures.....	35
13.3	Operational protection	35
13.5	Cleaning.....	35
13.6	Ultraviolet lamps	36
13.7	Chemical resistant materials	36
13.8	Data plates(s)	36
13.9	Head loss.....	36
14	In-line electrolytic chlorinator or brominator process equipment.....	37
14.1	General.....	37
14.2	Operating temperatures and pressures.....	37
14.3	Operational protection	37
14.4	Chemical-resistant materials	37
14.5	Output rate.....	37
14.6	Pressure requirements	37
14.7	Life test	37
14.8	Salt level	38
14.9	Data plates(s)	38
14.10	Head loss.....	38
15	Brine (batch) type electrolytic chlorine or bromine generators.....	38
15.1	General.....	38
15.2	Operating conditions.....	38
15.3	Injection methods	38
15.4	Operational protection	39
15.5	Chemical-resistant materials	39
15.6	Output rate.....	39
15.7	Life test	39
15.8	Data plates(s)	39
16	Copper/silver and copper ion generators.....	40
16.1	General.....	40
16.2	Operating temperatures and pressures.....	40
16.3	Warning devices	40
16.4	Chemical-resistant materials	40
16.5	Output rate.....	40
16.6	Life test	40
16.7	Uniformity of output	41
16.8	Test kit	41
16.9	Operation and installation instructions	41
16.10	Data plates(s)	41
16.11	Head loss.....	42
17	Automated Controllers.....	42
17.1	Scope.....	42
17.2	Chemical resistant materials	42
17.3	Monitor display	42
17.4	Life test	43
17.5	Performance	43
17.6	Failure sensing and signaling devices.....	43
17.7	Operational Protection.....	44
17.8	Operation and installation instructions	44

17.9	Data plates.....	44
18	Water Quality Testing Devices	45
18.1	General	45
18.2	Testing	45
18.3	Operation and use instructions.....	46
18.4	WQTD Marking/Identification.....	46
Annex A	.....	A1
A.1	Purpose	A1
A.2	Formulation review.....	A1
A.3	Exposure testing	A1
Annex B	.....	B1
B.1	Hydrostatic pressure test (pressure service filters).....	B1
B.2	Vacuum test (vacuum service filters).....	B2
B.3	Head loss test	B3
B.4	Filter media cleanability test.....	B4
B.5	Turbidity reduction test.....	B6
B.6	Precoat media-type filters – turbidity limits, precoat operation	B7
B.7	Cellulose media longevity test	B8
	Table B.1 – Challenge water.....	B9
Annex C	.....	C1
C.1	Performance curve verification	C1
C.2	Hydrostatic pressure test	C3
C.3	Self-priming capability	C3
Annex D	.....	D1
D.1	Hydrostatic pressure test	D1
D.2	Differential pressure/leakage test	D2
D.3	Head loss curve test.....	D3
D.4	Waste port leakage test	D5
Annex E	.....	E1
E.1	Negative pressure test	E1
E.2	Weir opening	E1
E.3	Equalizer leakage test.....	E2
E.4	Flow to pump test – equalizer performance.....	E3
Annex F	.....	F1
F.1	Hydrostatic pressure test	F1
F.2	Erosion resistance (slurry and dry chemical feeders only)	F2
F.3	Chemical resistance.....	F3
F.4	Life test.....	F4
F.5	Uniformity of output test	F5
F.6	Suction lift test.....	F6
Annex G	.....	G1
G.1	Chemical resistance test	G1
G.2	Hydrostatic pressure test	G2
G.3	Uniformity of output test	G3

Annex H	H1
H.1 Disinfection efficacy of supplemental disinfection equipment.....	H1
H.2 Ozone level test	H2
Table H.1 – Disinfection efficacy sampling sequence	H4
Annex I	I1
I.1 Introduction	I1
I.2 Pool water balance.....	I1
I.3 Testing frequencies.....	I1
I.4 In-line electrolytic and brine-type chlorine generators	I1
I.5 Ozone process equipment	I2
I.6 Copper/silver and copper ion generators.....	I3
I.7 Ultraviolet light process equipment.....	I3
Annex J	J1
Annex K	K1
K.1 Recommended installation.....	K1
K.2 Operation and maintenance.....	K2
Annex L	L1
L.1 Recommended installation.....	L1
L.2 Operation and maintenance.....	L2
Annex M	M1
M.1 Chemical resistance.....	M1
M.2 Performance	M2
Annex N	N1
N.1 Test method for WQTDs	N1
N.2 Stock Solution Preparation	N2
N.3 pH Test.....	N2
N.4 Test Procedure-Free Chlorine	N4
N.5 Test Procedure-Combined Chlorine	N4
N.6 Accuracy Testing.....	N5
N.7 Repeatability or Precision Testing	N6
N.8 Shelf Life Testing	N6

This page is intentionally left blank.

Foreword²

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 the following revisions were incorporated:

Issue 16 – Automated Controllers

This ballot incorporated requirements for the evaluation and testing of automated controllers.

Issue 42 – Salt Water

The salt water definition in section 2 was removed, and replaced with a definition for pool water. The scope of the standard was updated and language was added for types of water with varying levels of TDS.

Issue 43 – UV Lifetest

In section 13.4, the 80% pressure requirement was eliminated and the language was updated.

Issue 45 – Copper/silver and copper ion generators

The purpose of this ballot was to specify that the local and/or state regulations should take precedent over the minimum requirements when they are higher for chlorine and bromine residuals in copper/silver and copper ion generators.

Issue 46 – Pool Covers

Language was added to provide for a thorough evaluation of covers used on recreational water structures such as swimming pools, hot tubs, and spas.

Issue 48 – Pool Alarms

This ballot included alarm requirements for pools and added a reference to ASTM F2208.

Issue 50 – Water Quality Testing Devices

This ballot added the evaluation of and requirements for water quality testing devices throughout the standard.

Issue 54 – Annex A and Section 3

Updates were made in Section 3 and Annex A for consistency within NSF/ANSI standards.

Issue 62 – Annex N

The purpose of this ballot was to add the standard testing methods in Annex N relating to water quality testing devices.

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.

This Standard was developed by the NSF Joint Committee on Recreational Water Facilities 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, Joint Committee on Recreational Water Facilities c/o NSF International, Standards Department, P.O. Box 130140, Ann Arbor, MI 48113-0140, USA.

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 Swimming Pool Equipment.

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.

AISI, *AISI type 300 series stainless steel*³

³ American Iron and Steel Institute, 410 Commonwealth Drive, Warrendale, PA 15086 www.steel.org