**TO:** Joint Committee on Drinking Water Treatment Units

**FROM:** Dr. Robert Powitz, Chair of the Joint Committee

**DATE:** November 16, 2022

**SUBJECT:** Proposed revisions to:
NSF/ANSI 42: *Drinking Water Treatment Units – Aesthetic Effects* (42i109r5)
NSF/ANSI 53: *Drinking Water Treatment Units – Health Effects* (53i130r5)
NSF/ANSI 401: *Drinking Water Treatment Units – Emerging Compounds/Incidental Contaminants* (401i22r5)

Revision 5 of NSF/ANSI 42 issue 109, NSF/ANSI 53 issue 130, and NSF/ANSI 401 issue 22 is being forwarded to the Joint Committee for consideration. Please review the proposal and **submit your ballot by December 7, 2022** via the NSF Online Workspace <www.standards.nsf.org>.

When adding comments, please identify the section number/name for your comment and add all comments under one comment number where possible. If you need additional space, please use the attached blank comment template in the reference documents and upload online via the browse function.

## Purpose

The proposed revisions will harmonize the current operational cycles and sampling specified in NSF/ANSI 42, 53, and 401. **Revision 2** addressed comments received during the r1 ballot (11/30/20) to specify a minimum run time per day and clarify the language for the rest time. **Revision 3** addressed additional comments received from a straw ballot of r2 (6/16/21) and added an exemption for holidays and weekends, specified the collection time after 1 hour instead of the 3rd cycle for rests longer than 2 hours, and allowed an operational cycle of up to 10%-on / 90%-off for POU devices. **Revision 4** addressed comments received in the r3 ballot (10/6/21) and removed the minimum 7-hr run time and associated minimum test time exceptions. R4 did not include changes to the "Chloramine reduction testing" section, which many commentors noted were erroneously included in the r3 ballot. **Revision 5** addresses comments received in the r4 ballot (10/28/22) and changes the rest time from 8 hours to a minimum of 8 hours and clarifies that effluent samples shall be collected at or beyond the percent of the capacity indicated.

## Background

At the 2020 DWTU JC meeting, it was reported that for many years the DWTU standards had specified on/off operation cycles of 16 hours on and 8 hours off. It was suggested that the 16-hour accelerated test was implemented in the standards with the intention to reduce the cost of testing and minimize the length of the test. However, from a logistical standpoint many times it is difficult for labs to run a 16-hour cycle. For example, a system may not have the capacity to run for 16 hours and would require the labs to prepare or change challenge water during the 24-hour test.

During the JC discussion, it was also noted that several of the newer protocols (e.g., perchlorate, PFOA/PFOS) specify an operational cycle of up to 16 hours per 24-hour period. The committee agreed that this requirement should be consistent across the DWTU standards and that an initial straw ballot be sent to the JC for consideration.

A straw ballot was sent to the JC for consideration and received 100% affirmative votes on the proposed language (27 of 30 votes submitted). Two comments were received, however, on the concern that allowing "up to 16 hours" could result in very short run times each day to "game" the protocol. This could also be accomplished by only collecting samples (organics/chlorine/chlo-ramines) in the first cycle after an 8-hour rest. It was suggested that both of these issues could be resolved by requiring a minimum of 1 hour of cycling operation prior to any sample is collected after a 2 hour or longer rest period (excepting a sample required for active agents).

In November 2020, a formal ballot was sent to the JC with proposed language for performance claims under Standards 42, 53, 58 (VOC only via reference to NSF 53), and 401 with the following exceptions due to specific existing requirements which must be maintained:

Excluded Tests:

- Mechanical filtration including nominal particulate, turbidity or any cyst reduction test
- Perchlorate
- Lead
- Arsenic
- Radon
- Bacteriostatic
- pH
- Scale control
- Non-plumbed batch treatment systems

Revised sampling language was also proposed for flow-through systems which are subject to the cycle time requirement. Batch systems and the other excluded tests did not include this proposed language.

The 42i109r1 et al ballot received 19 affirmative votes (68%) and nine negative votes (32%). Ten comments included requests to specify a minimum run time per day and clarify the language for the rest time.

**Results of the Revision 2 Straw Ballot**

The straw ballot for draft 2 (42i109r2 et al) received 25 affirmative votes (89%) and 3 negative votes (11%). Suggestions were made to add an exemption to the minimum operation time for holidays and weekends and to specify the collection time after 1 hour instead of the 3rd cycle for rests longer than 2 hours. It was also recommended to allow an operational cycle of up to 10%-on / 90%-off for POU devices if requested by the manufacturer. One comment (from Mandy Huntoon) indicated support for requiring a minimum of 1 hour of cycling operation prior to any sample is collected after a 2 hour or longer rest period instead of a 7-hr minimum run time. However, as multiple comments were received on the original ballot (r1) in favor of including a minimum run time, this language was left in the r3 ballot to determine if there was a consensus to eliminate the 7-hr minimum operation time.

**Results of the Revision 3 Ballot**

The r3 ballot received 9 affirmative votes (60%), 6 negative votes (40%), and 8 abstentions. Comments showed there was not consensus on the minimum 7-hr run time, so that requirement and the associated minimum test time exceptions were removed from the r4 ballot. The r4 ballot kept the minimum 1-hour cycling operation to address any potential filter recovery after stagnation. Many r3 commentors noted the chloramine section changes should not have been included in the r3 ballot as changes to the operating cycle were addressed differently in an earlier ballot (42i115r2, 9/13/21). The r4 revision therefore did not include chloramine language changes.

**Results of the Revision 4 Ballot**

The r4 ballot received 28 affirmative votes (90%) and 3 negative votes (10%). Comments showed there was not consensus on rest time, so the r5 ballot changes the rest time from 8 hours to a minimum of 8 hours. There was also concern about the clarity of sample collection, so r5 specifies that samples shall be collected at or beyond the percent of the capacity indicated. Two comments (Hemang Patel and Andrew Lombardo) expressed concern that the changes introduce a high level of variability between labs and tests. The r5 ballot addresses this by clarifying sample collection times after the system has been shut down for an extended time, which has a greater effect than the total time the system is run each day. Requiring a minimum run time prior to sampling after a rest period minimizes the variability due to filter recovery (as demonstrated in the earlier chloramine ballot, 42i115r2 (9/13/21)). Run times have not demonstrated significant lab variability when compared to testing cycle times used such as 10/90 vs. 50/50.

Please refer to the 2020, 2021, and 2022 DWTU JC meeting summary excerpts, the original issue paper (DWTU-2020-8), and all ballot comments and responses (r1, r2, r3, and r4) under referenced items for additional background information.

If you have any questions about the technical content of the ballot, you may contact me in care of:

Dr. Robert Powitz
Chair, Joint Committee on Drinking Water Treatment Units
c/o Monica Milla
Joint Committee Secretariat, NSF
Tel: (734) 214-6223 / Email: mmilla@nsf.org

**[Note – The recommended changes to the standard which include the current text of the relevant section(s) indicate deletions by use of ~~strikeout~~ and additions by gray highlighting. Revision 2 additions are shown by yellow highlighting and revision 3 additions by blue highlighting. Revision 4 deleted these additions by use of strikeout over the original color (r4 did not have any new additions). The current revision 5 changes are shown in green highlighting. Rationale statements are in *italics* and only used to add clarity; these statements will NOT be in the finished publication.]**

NSF/ANSI Standards
for Drinking Water Treatment Units

# NSF/ANSI 42: Drinking Water Treatment Units – Aesthetic Effects

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## 7 Elective performance claims – Test methods

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### 7.3 Chemical reduction testing

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#### 7.3.1.6 Methods

Systems shall be conditioned using the test contaminant specified in Table 7.1 and test water in Section 7.3.1.5.1. The conditioning volume shall be excluded from the volume measured as the influent challenge volume for capacity and sample point determination.

##### 7.3.1.6.1 Plumbed-in systems and faucet mounted systems

Two systems shall be conditioned in accordance with the manufacturer's instructions and Section 7.3.1.6. The systems shall be tested using the appropriate influent challenge at the manufacturer's rated service flow rate and an initial dynamic pressure of 410 ± 20 kPa (60 ± 3 psig). The pressure shall not be readjusted, although the system may experience some change in dynamic pressure. ~~The systems shall be operated on a 50% on / 50% off basis, 16 h per 24-h period, followed by an 8-h rest under pressure. A 10% on / 90% off cycle of operation may be used in testing if requested by the manufacturer.~~ The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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#### 7.3.1.7 Sampling

Collection of influent challenge and product water samples shall begin during the on portion of the cycle after the passage of 10 unit volumes of the influent challenge and at 20%, 40%, 60%, 80%, and 100% of the estimated system capacity. Samples shall be collected at or beyond the percent of the capacity indicated. The volume of water collected for each sample shall not exceed 1 L (0.26 gal) or four times the amount required for analysis, whichever is larger. If the on cycle ends before the necessary sample volume has been collected, the remaining sample volume shall be collected at the beginning of the next on cycle. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period, except for required active agent sampling.

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***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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#### 7.3.3 Chlorine reduction testing

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#### 7.3.3.7 Methods

Systems shall be conditioned using the test contaminant specified in Table 7.3 and test water in Section 7.3.3.6. The conditioning volume shall be excluded from the volume measured as the influent challenge volume for capacity and sample point determination.

##### 7.3.3.7.1 Plumbed-in systems and faucet mounted systems

Two systems shall be conditioned in accordance with the manufacturer's instructions and Section 7.3.3.7. The systems shall be tested using the appropriate influent challenge at the manufacturer's rated service flow rate and an initial dynamic pressure of 410 ± 20 kPa (60 ± 3 psig). The pressure shall not be readjusted, although the system may experience some change in dynamic pressure. ~~The systems shall be operated on a 50% on / 50% off basis, 16 h per 24-h period, followed by an 8-h rest under pressure. A 10% on / 90% off cycle of operation may be used in testing if requested by the manufacturer. .~~ The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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#### 7.3.3.8 Sampling

Collection of influent challenge and product water samples shall begin during the on portion of the cycle after the passage of 10 unit volumes of the influent challenge and at 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100% of the estimated system capacity. Samples shall be collected at or beyond the percent of the capacity indicated. The volume of water collected for each sample shall not exceed 1 L (0.26 gal) or four times the amount required for analysis, whichever is larger. If the on cycle ends before the necessary sample volume has been collected, the remaining sample volume shall be collected at the beginning of the next on cycle. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

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***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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### 7.3.4 Hydrogen sulfide and phenol reduction testing

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#### 7.3.4.7 Methods

Systems shall be conditioned using the test contaminant specified in Table 7.4 and test water in Section 7.3.4.6. The conditioning volume shall be excluded from the volume measured as the influent challenge volume for capacity and sample point determination.

##### 7.3.4.7.1 Plumbed-in systems and faucet mounted systems

Two systems shall be conditioned in accordance with the manufacturer's instructions and Section 7.3.4.7. The systems shall be tested using the appropriate influent challenge at the manufacturer's rated service flow rate and an initial dynamic pressure of 410 ± 20 kPa (60 ± 3 psig). The pressure shall not be readjusted, although the system may experience some change in dynamic pressure. ~~The systems shall be operated on a 50% on / 50% off basis, 16 h per 24 h period, followed by an 8 h rest under pressure. A 10% on / 90% off cycle of operation may be used in testing if requested by the manufacturer.~~ The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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#### 7.3.4.8 Sampling

Collection of influent challenge and product water samples shall begin during the on portion of the cycle after the passage of 10 unit volumes of the influent challenge and at 20%, 40%, 60%, 80%, and 100% of the estimated system capacity. Samples shall be collected at or beyond the percent of the capacity indicated. The volume of water collected for each sample shall not exceed 1 L (0.26 gal) or four times the amount required for analysis, whichever is larger. If the on cycle ends before the necessary sample volume has been collected, the remaining sample volume shall be collected at the beginning of the next on cycle. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

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***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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### 7.3.5 Iron and manganese reduction testing

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#### 7.3.5.7 Methods

One system shall be tested at a water source site providing an influent challenge meeting the requirements of Section 7.3.5.6. The system shall be conditioned in accordance with the manufacturer's instructions using the test contaminant specified in Table 7.5 and test water specified in Section 7.3.5.6. The conditioning volume shall be excluded from the volume measured as the influent challenge volume for capacity and sample point determination. If provisions are available for running product water to waste, the operating cycle shall be in accordance with Section 7.3.5.7.1 or 7.3.5.7.2. If an individual residential site is selected for system testing, actual usage cycle times may be used.

##### 7.3.5.7.1 Plumbed-in systems and faucet mounted systems

One system shall be conditioned in accordance with the manufacturer's instructions and Section 7.3.5.7. The system shall be tested using the appropriate influent challenge at the manufacturer's rated service flow rate and an initial dynamic pressure of 410 ± 20 kPa (60 ± 3 psig). The pressure shall not be readjusted, although the system may experience some change in dynamic pressure. ~~The systems shall be operated on a 50% on / 50% off basis, 16 h per 24-h period, followed by an 8-h rest under pressure. A 10% on / 90% off cycle of operation may be used in testing if requested by the manufacturer.~~ The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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### 7.3.5.8 Sampling

Collection of influent challenge and product water samples shall begin during the on portion of the cycle after the passage of 10 unit volumes of the influent challenge and at 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100% of the estimated capacity. Samples shall be collected at or beyond the percent of the capacity indicated. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

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***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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### 7.3.7 Zinc reduction testing

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### 7.3.7.7 Methods

Systems shall be conditioned using the test contaminant specified in Table 7.7 and test water in Section 7.3.7.6. The conditioning volume shall be excluded from the volume measured as the influent challenge volume for capacity and sample point determination.

#### 7.3.7.7.1 Plumbed-in systems and faucet mounted systems

Two systems shall be conditioned in accordance with the manufacturer's instructions and Section 7.3.7.7. The systems shall be tested using the appropriate influent challenge at the manufacturer's rated service flow rate and an initial dynamic pressure of 410 ± 20 kPa (60 ± 3 psig). The pressure shall not be readjusted, although the system may experience some change in dynamic pressure. ~~The systems shall be operated on a 50% on / 50% off basis, 16 h per 24-h period, followed by an 8-h rest under pressure. A 10% on / 90% off cycle of operation may be used in testing if requested by the manufacturer. .~~ The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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### 7.3.7.8 Sampling

Collection of influent challenge and product water samples shall begin during the on portion of the cycle after the passage of 10 unit volumes of the influent challenge and at 20%, 40%, 60%, 80%, and 100% of the estimated system capacity. Samples shall be collected at or beyond the percent of the capacity

indicated. The volume of water collected for each sample shall not exceed 1 L (0.26 gal) or four times the amount required for analysis, whichever is larger. If the on cycle ends before the necessary sample volume has been collected, the remaining sample volume shall be collected at the beginning of the next on cycle. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

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***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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# NSF/ANSI Standard for Drinking Water Treatment Units —

# NSF/ANSI 53: Drinking Water Treatment Units — Health Effects

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## 7 Elective performance claims – Test methods

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### 7.2 Chemical reduction claims

#### 7.2.1 Organic chemical reduction testing

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#### 7.2.1.6 Cycle time

The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle may be used~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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#### 7.2.1.8 Sampling

For systems with performance-indication devices, during the "on" portion of the cycle, influent and effluent samples shall be collected at the start of the test (after the passage of 10 unit volumes of influent challenge) and at 25%, 50%, 75%, 100%, and 120% of the estimated capacity. For systems without performance indication devices, the system shall be tested to 200% of the estimated capacity. Samples shall be collected at startup (after the passage of 10 unit volumes) and at 50%, 100%, 150%, 180%, and 200% of the

estimated capacity. Samples shall be collected at or beyond the percent of the capacity indicated. Samples for each system shall be at least one unit volume. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

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***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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### 7.2.2 Inorganic reduction testing

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#### 7.2.2.6 Cycle time

The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle may be used~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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#### 7.2.2.8 Sampling

For systems with performance-indication devices, during the "on" portion of the cycle, influent and effluent samples shall be collected at the start of the test (after the passage of 10 unit volumes of influent challenge) and at 25%, 50%, 75%, 100%, and 120% of the estimated capacity. For systems without performance indication devices, the system shall be tested to 200% of the estimated capacity. Samples shall be collected at startup (after the passage of 10 unit volumes) and at 50%, 100%, 150%, 180%, and 200% of the estimated capacity. Samples shall be collected at or beyond the percent of the capacity indicated. Samples for each system shall be at least one unit volume. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

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***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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### 7.2.5 Volatile organic chemical (VOC) reduction – Surrogate organic chemical testing

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#### 7.2.5.6 Cycle time

The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by an 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle may be used~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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#### 7.2.5.8 Sampling

For systems with performance indication devices, during the "on" portion of the cycle, influent and effluent samples shall be collected at the start of the test (after the passage of 10 unit volumes of influent challenge) and at 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%, 110%, and 120% of the estimated capacity. For systems without performance indication devices, the system shall be tested to 200% of the estimated capacity. Samples shall be collected at startup (after the passage of 10 unit volumes) and at 20%, 40%, 60%, 80%, 100%, 120%, 140%, 160%, 180%, and 200% of the estimated capacity. Samples shall be collected at or beyond the percent of the capacity indicated. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

NOTE — All influent samples ~~shall~~ should be analyzed. Effluent samples collected at 20%, 40%, 60%, 80%, and 110% (40%, 80%, 120%, and 160% for systems without performance indication devices) ~~shall~~ should be stored and analyzed only if necessary to establish the capacity if different from originally estimated.

***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours, clarifies that samples shall be collected at or beyond the percent of the capacity indicated, and changes "shall" to "should" as notes cannot contain normative language.***

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### 7.2.6 Nonregenerating PFAS reduction testing

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#### 7.2.6.6 Cycle time

The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by an 8-h rest under pressure ~~(a 10% on / 90% off cycle may be used if requested by the manufacturer for POU systems but for POE systems only 50% on / 50% off cycle shall be used~~) (a cycle of up to 10% on / 90% off ~~cycle~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

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#### 7.2.6.9 Sampling

The effluent of the test system shall be sampled after a minimum of one bed volume has passed through the column or half of the cycle "on" time has passed, whichever is greater.

##### 7.2.6.9.1 PFAS

For systems with performance-indication devices, during the "on" portion of the cycle, influent and effluent samples shall be collected for PFAS analysis at the start of the test (after the passage of 10 unit volumes) and at 25%, 50%, 75%, 100%, and 120% of the estimated capacity. For systems without performance indication devices, during the "on" portion of the cycle, influent and effluent samples shall be collected for PFAS analysis at the start of the test (after the passage of 10 unit volumes) and at 50%, 100%, 150%, 180% and 200% of the estimated capacity. Samples shall be collected at or beyond the percent of the capacity indicated. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

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***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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### 7.4 Metals reduction testing

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#### 7.4.2 General metals reduction

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#### 7.4.2.6 Cycle time

The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle may be used~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~

~~– An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
~~– Testing that occurs over holidays and weekends.~~

⋮

#### 7.4.2.8 Sampling

For systems with performance-indication devices, during the "on" portion of the cycle, influent and effluent samples shall be collected at the start of the test (after the passage of 10 unit volumes of influent challenge) and at 25%, 50%, 75%, 100%, and 120% of the estimated capacity. For systems without performance indication devices, the system shall be tested to 200% of the estimated capacity. Samples shall be collected at startup (after the passage of 10 unit volumes) and at 50%, 100%, 150%, 180%, and 200% of the estimated capacity. Samples shall be collected at or beyond the percent of the capacity indicated. Samples for each system shall be at least one unit volume. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

⋮

***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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### 7.4.4 Mercury reduction testing

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#### 7.4.4.6 Cycle time

The systems shall be operated on a 50% on / 50% off cycle basis with a 15- to 40-min cycle, up to 16 h per 24-h period, ~~but no less than 7 h~~, followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10% on / 90% off ~~cycle may be used~~ is permissible if requested by the manufacturer for POU systems only).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

~~– Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
~~– An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
~~– An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
~~– Testing that occurs over holidays and weekends.~~

⋮

#### 7.4.4.8 Sampling

For systems with performance-indication devices, during the "on" portion of the cycle, influent and effluent samples shall be collected at the start of the test (after the passage of 10 unit volumes of influent challenge) and at 25%, 50%, 75%, 100%, and 120% of the estimated capacity. For systems without performance indication devices, the system shall be tested to 200% of the estimated capacity. Samples shall be collected at startup (after the passage of 10 unit volumes) and at 50%, 100%, 150%, 180%, and 200% of the estimated capacity. Samples shall be collected at or beyond the percent of the capacity indicated. Samples for each system shall be at least one unit volume. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent

samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

⋮

***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

NSF/ANSI Standard
for Drinking Water Treatment Units –

# NSF/ANSI 401: Drinking Water Treatment Units – Emerging Compounds / Incidental Contaminants

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## 7 Elective performance claims – Test methods

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### 7.2 Chemical reduction claims

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#### 7.2.1 Chemical reduction testing – Active media

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#### 7.2.1.5 Cycle time

The systems shall be operated on a 50% on- / 50% off-cycle basis with a 15 to 40 min cycle, up to 16 h per 24 h period, ~~but no less than 7 h,~~ followed by ~~an~~ a minimum 8-h rest under pressure (a cycle of up to 10%-on / 90%-off ~~cycle may be used~~ is permissible if requested by the manufacturer).

~~Every effort shall be made to run the test for the minimum test time however the following exemptions are allowed:~~

- ~~Testing flow and remaining capacity allow the test to be completed in less than 7 hours.~~
- ~~An issue with the test rig occurs which prevents the lab from running the system for the minimum time.~~
- ~~An issue with challenge water preparation or stability occurs not allowing the lab to run the system for the minimum time.~~
- ~~Testing that occurs over holidays and weekends.~~

⋮

#### 7.2.1.7 Sampling

For systems with performance indication devices, during the 'on' portion of the cycle, influent and effluent samples shall be collected at the start of the test (after the passage of 10 unit volumes of influent challenge) and at 25%, 50%, 75%, 100%, and 120% of the estimated capacity. For systems without performance indication devices, the system shall be tested to 200% of the estimated capacity. Samples shall be collected at startup (after the passage of 10 unit volumes) and at 50%, 100%, 150%, 180%, and 200% of the estimated capacity. Samples shall be collected at or beyond the percent of the capacity indicated. Samples for each system shall be at least one unit volume. Effluent samples shall be collected in the last ½ of the "on" portion of the cycle. Following an overnight rest or any other rest period longer than 2 h, no effluent

samples shall be collected until ~~the 3rd "on" cycle~~ a minimum of 1 hour cycling operation has been completed following the rest period except for required active agent sampling.

⋮

***Rationale: Changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***

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***Full Revision History:***

- ***Revision 1 harmonized the current operational cycles and sampling specified in NSF/ANSI 42, 53, and 401 per 2020 DWTU JC meeting (May 13, 2020) and results of initial straw ballot (closed September 15, 2020).***
- ***Revision 2 specified a minimum test time per comments received during the previous ballot (r1) with a few exemptions.***
- ***Revision 3 added an exemption for holidays and weekends, revised the collection time to 1 hour instead of the 3rd cycle for rests longer than 2 hours, and allowed an operational cycle of up to 10%-on / 90%-off for POU devices per comments received from the r2 straw ballot.***
- ***Revision 4 removed the 7-hour minimum run time introduced in Revision 2 and the associated minimum test time exceptions introduced in Revisions 2 and 3. It did not include changes to the "Chloramine reduction testing" section of NSF/ANSI 42 which were erroneously included in the r3 ballot.***
- ***Revision 5 changes the rest time from 8 hours to a minimum of 8 hours and clarifies that samples shall be collected at or beyond the percent of the capacity indicated.***