



**Summary of Substantive Changes  
between the 2018 and the 2019 editions of  
NSF/ANSI 53 “Drinking Water Treatment Units – Health Effects”**

**Presented to the IAPMO Standards Review Committee on March 8, 2021**

**General:** The changes to this standard should not have an impact on currently listed products. The substantive changes are:

- Added a performance reduction claim for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) for non-regenerable drinking water treatment devices that use anion exchange media (see Section 7.2.6)
- Revised requirements for lead reduction from 10 µg/L to 5 µg/L (see Table 7.10)

Section 7, Elective performance claims – Test Methods: Added a performance reduction claim for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) for non-regenerable drinking water treatment devices that use anion exchange media as follows:

**7.2 Chemical reduction claims**

.....

**7.2.6 Nonregenerating PFOA/PFOS reduction testing**

*This protocol is designed for nonregenerable POU and POE devices using anion exchange media.*

**7.2.6.1 PFOA/PFOS reduction claim**

*Claims for PFOA/PFOS reduction are permitted when tested in accordance with Section 7.2.6 as long as maximum effluent concentrations in Table 7.7 are not exceeded.*

**7.2.6.2 Apparatus**

*Refer to Section 7.1.2, Figure 2 for an example of the test apparatus.*

**7.2.6.3 Analytical methods**

*All analyses shall be conducted in accordance with the applicable methods referenced in Section 2 and Annex I-5.*

**7.2.6.4 Premature filter plugging**

*If a product prematurely plugs prior to the completion of the required test volume, the volume of the final sample point collected prior to plugging becomes the final test volume to determine capacity. Applicable actions to remediate premature filter plugging for this tests method are contained in Annex N-5, Sections N-5.1, N-5.2, N-5.3, and N-5.6.*

**7.2.6.5 PFOA/PFOS reduction test water**

- a) A water supply shall be treated by reverse osmosis, then shall be treated by deionization (RO/DI) water and shall have a conductivity of less than 2 µS / cm.*
- b) All chemical additions shall take place either after the test tank is filled with the RO/DI water, or while the test tank is being filled. Reagent grade chemicals shall be used for all additions to adjust the RO/DI water to meet the following specific characteristics:*
- c) Dissolve enough sodium bicarbonate (NaHCO<sub>3</sub>) in RO/DI water to achieve a test tank concentration of 200 mg/L of alkalinity expressed as CaCO<sub>3</sub>.*



- d) Adjust the pH of the test tank solution using hydrochloric acid (HCl) or sodium hydroxide (NaOH) to  $7.5 \pm 0.5$ . Record the amount HCl used.
- e) Dissolve enough magnesium sulfate ( $MgSO_4 \cdot 7H_2O$ ) in RO/DI water to achieve a test tank concentration of 200 mg/L as sulfate. Sodium Sulfate ( $NaSO_4 \cdot 7H_2O$ ) may be substituted for 75% of the magnesium sulfate if the presence of hardness interferes with the proper operation of the device under test.
- f) Dissolve enough perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) in RO/DI water to achieve test tank concentration of 0.0005 mg/L of PFOA and 0.0010 mg/L of PFOS.
- g) Mix and measure the final pH, and adjust as needed. Mixing shall be minimized thereafter throughout the duration of the test.
- h) Dissolve enough sodium chloride (NaCl) in RO/DI water to achieve a test tank concentration of 100 mg/L of chloride. Balance this number with the amount of chlorides added from the HCl for pH control to maintain a target of 100 mg/L. Stir and transfer to the test tank.
- i) Each tank of water prepared shall have all of the parameters specified in Table 7.8 verified by analytical methods.

#### **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, 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).

#### **7.2.6.7 Method – POU**

Two systems shall be conditioned using the PFOA / PFOS reduction water specified in Section 7.2.6.5 with the test contaminant present. The conditioning volume shall be excluded from the volume measured as the influent challenge volume for capacity and sample point determination.

##### **7.2.6.7.1 Plumbed-in systems without reservoirs and all faucet-mounted systems**

Two systems shall be conditioned in accordance with the manufacturer's instructions and Section 7.2.6.7. The systems shall be tested using the influent challenge water at the maximum flow rate attainable by setting an initial dynamic pressure of  $410 \pm 20$  kPa ( $60 \pm 3$  psi). The pressure shall not be readjusted although the system may experience some change in dynamic pressure. The operating cycle specified in Section 7.2.6.6 shall be used.

##### **7.2.6.7.1.1 Refrigerator filters without integral flow control**

Chemical reduction testing for refrigerator filters without an integral automatic fixed flow rate control shall be performed at a controlled flow rate that is equal to or greater than the rated service flow of the refrigerator filter system and refrigerator plumbing.

##### **7.2.6.7.1.2 Refrigerator filters without integral flow control, with water dispenser and ice maker**

If the refrigerator filter does not include an integral automatic fixed flow rate control, and supplies water to both a water dispenser and an ice maker, then any chemical reduction testing shall be performed at a controlled flow rate equal to or greater than the tested flow rate of the icemaker or the tested flow rate of the water dispenser, whichever is greater.

##### **7.2.6.7.2 Plumbed-in systems with reservoirs**

Two systems shall be conditioned in accordance with the manufacturer's instructions and Section 7.2.6.7. The system shall be tested using the influent challenge water at the maximum flow rate attainable by setting an initial dynamic pressure of  $410 \pm 20$  kPa ( $60 \pm 3$  psi). The pressure shall not be readjusted although the system may experience some change in dynamic pressure. Where the design of the system does not lend itself to the operating cycle specified in Section 7.2.6.6, the operating cycle shall be a repetitive complete filling and emptying of the reservoir. It is acceptable to run this cycle continuously for 24 h per day.



**7.2.6.7.3 Nonplumbed pour-through-type batch treatment systems**

Two systems shall be conditioned in accordance with the manufacturer’s instructions and Section 7.2.6.7. If the effluent reservoir capacity is equal or greater than two times the volume of the influent reservoir, multiple successive influent reservoir fills shall be performed until the remaining volume in the effluent reservoir is less than the influent reservoir volume. The resulting volume for each filling of the effluent reservoir shall be the batch volume. If the volume of the effluent reservoir is less than two times the volume of the influent reservoir, the batch volume shall be the influent reservoir volume.

Example:

<u>Influent volume (L)</u>	<u>Effluent volume (L)</u>	<u>Batch (L)</u>
<u>1.0</u>	<u>1.8</u>	<u>1.0</u>
<u>1.2</u>	<u>2.5</u>	<u>2.4</u>
<u>1.4</u>	<u>4.0</u>	<u>2.8</u>

**7.2.6.7.3.1 Systems with a manufacturer’s recommended use pattern**

Two systems shall be tested using the appropriate influent challenge water using the manufacturer’s use pattern. The use pattern shall include information about the rest period between the fillings. The rest period after the influent reservoir has drained given by the manufacturer shall not exceed 75 min and include a tolerance of at least ± 15 min. The systems shall be operated up to 16 h per 24 h period, followed by an 8 h rest period. Exceptions to the rest period are permissible for laboratory operational needs (e.g., water preparation, equipment malfunctions).

**7.2.6.7.3.2 Systems without a manufacturer’s recommended use pattern**

Two systems shall be tested using the appropriate influent challenge water. The systems shall be operated up to 16 h per 24 h period, followed by an 8 h rest period. The test cycle shall include a rest period of 30 to 90 min after the influent reservoir has drained. The total volume per day shall be limited to 10 batches. Exceptions to the rest period are permissible for laboratory operational needs (e.g., water preparation, equipment malfunctions).

**7.2.6.7.3.3 Mouth drawn drinking water treatment units**

Products meeting the definition for mouth drawn drinking water treatment unit shall be evaluated using the method specified in Annex N-3.

Two systems shall be conditioned in accordance with the manufacturer's instructions and Section 7.2.6.7.

**7.2.6.7.3.4 Squeeze bottle drinking water treatment units**

Products meeting the definition for squeeze drawn drinking water treatment unit shall be evaluated using the method specified in Annex N-4.

Two systems shall be conditioned in accordance with the manufacturer's instructions and Section 7.2.6.7.

**7.2.6.8 Method – POE – Full scale units**

Two systems shall be conditioned in accordance with the manufacturer’s instructions using the PFOA / PFOS reduction water specified in Section 7.2.6.5 with the test contaminant present. The conditioning volume shall be excluded from the volume measured as the influent challenge volume for capacity and sample point determination. The systems shall be tested using the influent challenge water (Section 7.2.6.5) at the rated service flow at an initial dynamic pressure of 410 ± 20 kPa (60 ± 3 psi). The pressure shall not be readjusted although the system may experience some change in dynamic pressure. The flow rate shall be controlled to the rated service flow or the maximum flow rate achievable through the entire



test, but if the flow rate cannot be maintained at greater than 25% of the rated service flow, the test shall be terminated. The operating cycle specified in Section 7.2.6.6 shall be used.

**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 PFOA and PFOS**

For systems with performance-indication devices, during the "on" portion of the cycle, influent and effluent samples shall be collected for PFOA and PFOS 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 device, during the "on" portion of the cycle, influent and effluent samples shall be collected for PFOA and PFOS 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.

Table 5.1, Structural integrity testing requirements: The table was revised to correct an error by adding a heading for "Complete Systems" and "Components"

Table 7.10, Lead reduction requirements and Table 8.1, Performance data sheet reduction claims: These tables were revised to change the current pass/fail criteria for lead reduction from 10 µg/L to 5 µg/L to reflect current proposals at the state, federal, and international levels.

Table 7.7, PFOA/PFOS reduction requirements: New table was added.

Table 7.8, PFOA/PFOS influent water characteristics: New table was added.