Summary of Substantive Changes
between the 2020 and the 2021 editions of
NSF/ANSI 42 "Drinking Water Treatment Units – Aesthetic Effects"

Presented to the IAPMO Standards Review Committee on March 7, 2022

General: The changes to this standard may have an impact on currently listed products. The substantive changes are:

- Changing the drinking fountain dimensional requirements for the distance between the water outlet and the flood rim of the waste receptacle (see Section 6.3.1.4)
- Added provisions for total organic Carbon (TOC) adjustment in multiple Sections (see Sections 7.2.3.3, 7.3.1.5.4, 7.3.2.6.1, 7.3.2.6.4, 7.3.3.6.4, 7.3.4.6.4, and Annex 6)

Section 6, Minimum performance requirements: Reduced the drinking fountain dimensional requirements for the distance between the water outlet and the flood rim of the waste receptacle from 2 in to 1in as follows:

6.3 Product water dispensing outlets

Product water dispensing outlets other than drinking fountain outlets, if provided, shall be designed, constructed, and located so that the discharge orifice is directed downward. The lower edge of the outlet shall be at an elevation not less than 51 mm (2 in) above the flood rim of the waste receptacle.

6.3.1 Drinking fountain outlets

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6.3.1.4 *The lower edge of the drinking water outlet shall be at least ~~51~~25 mm (~~2~~1 in) above the flood rim of the waste receptacle.*

Section 7, Elective performance claims – Test methods: Added provisions for total organic Carbon (TOC) adjustment as follows:

7.2 Bacteriological performance

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7.2.3 Influent challenge

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7.2.3.3 TOC adjustment

Specification indicated in Section 7.2.3 shall be maintained if naturally occurring TOC is available in the source water at levels greater than 2.0 mg/L. If concentration of TOC needs to be increased to meet the minimum specification, chlorinated tannic acid as prepared in accordance with Annex N-6 shall be added to the test water to achieve a specification of TOC concentration of 2.0 to 3.0 mg/L in the test water.

7.3 Chemical reduction testing

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7.3.1 Chemical reduction claims

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7.3.1.5.4 TOC adjustment

Specification indicated in Section 7.3.1.5.1 shall be maintained if naturally occurring TOC is available in the source water at levels greater than 1.0 mg/L. If concentration of TOC needs to be increased to meet the minimum specification, chlorinated tannic acid as prepared in accordance with Annex N-6 shall be added to the test water to achieve a specification of TOC at 1.5 ± 0.5 mg/L.

7.3.2 Chloramine reduction testing

7.3.2.1 Chloramine reduction claims

Claims for the reduction of chloramine may be made for drinking water treatment systems when tested in accordance with Section 7.3.2. To qualify for a chloramine reduction claim, ~~T~~the system shall reduce ~~an average influent challenge of 3.0 ± 0.3 mg/L monochloramine (measured as Cl2/L) so that, prior to the 100% sampling point,~~ the concentration of chloramine from the influent challenge so that, prior to the final sample point establishing capacity, 90% of the product water sample concentrations ~~are less~~ demonstrate a greater than or equal to ~~0.5 mg/L monochloramine (measured as Cl2/L)~~ 80.0% reduction of the influent water concentration at each sampling point. Samples collected at the ~~100%~~ final sample point establishing capacity shall ~~be less than or equal to 0.5 mg/L monochloramine (measured as Cl2/L)~~ demonstrate a greater than or equal to 80.0% reduction of the influent water concentration at each sampling point.

7.3.2.6 Influent challenge

7.3.2.6.1 Chloramine reduction test water

A water supply with the following specific characteristics shall be used:

pH	*9.0 ± 0.25*
temperature	*20 ± 3 °C (68 ± 5 °F)*
TDS	*200 to 500 mg/L*
Hardness	*< 170 mg/L as $CaCO^3$*
Turbidity	*< 1 NTU*
TOC (total organic carbon)	*> 1.0 mg/L [1]*
organic nitrogen[2]	*< 0.2 mg/L [3]*
chloramine (analyzed as specified in Section 7.3.2.3)	*2.7 to 3.3 mg/L monochloramine (measured as Cl_2/L)[4]*

[1] If naturally present in source water at adequate concentration. Adjustment of TOC is given in Section 7.3.2.6.4.

[2] Measured as the difference between Kjeldahl nitrogen and ammonia nitrogen.

[3] This requirement may be waived if the test water used during analytical validation (Section 7.3.2.3.2) contains organic nitrogen > 0.2 mg/L

[4] Monochloramine NH_2Cl (CAS #10599-90-3)

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7.3.2.6.4 TOC adjustment

Specification indicated in Section 7.3.2.6.1 shall be maintained if naturally occurring TOC is available in the source water at levels greater than 1.0 mg/L. If concentration of TOC needs to be increased to meet the minimum specification, chlorinated tannic acid as prepared in accordance with Annex N-6 shall be added to the test water to achieve a specification of TOC at 1.5 ± 0.5 mg/L.

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7.3.2.8 Sampling

Collection of the influent challenge and product water samples shall begin during the on portion of the cycle after one unit volume has passed through the test unit. Sampling shall occur 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. 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 in the same manner during the next on cycle.

When the below calculation is performed (using the product's estimated system capacity, manufacturer's rated service flow rate, and the on cycle) and is equal to or greater than 1,200 minutes, the sample points at 20 ± 5%, 40 ± 5%, 60 ± 5%, 80 ± 5%, and 100 +2/-0% of estimated system capacity shall be taken after a minimum of 4 h of test operation. The sample point that establishes the system capacity shall be taken after a minimum of 4 h of test operation.

Calculation:
*1,200 minutes ≤ capacity / (on cycle * RSF)*
where:
capacity = estimated system capacity in liters (gallons)
on cycle = the percent ON of the on/off cycle expressed in decimal (e.g. 50% on = 0.50)
RSF = the manufacturer's stated rated service flow of the system in the same units as capacity, liters per minute (gallons per minute)

Influent challenge water shall be sampled and analyzed for conformance with the pH requirements under Section 7.3.2.6.1 and chloramine reduction requirements under Table 7.2, a minimum of once for each batch of challenge water or every 3,785 L (1,000 gal).

7.3.3 Chlorine reduction testing

7.3.3.1 Claims

Claims for chlorine reduction may be made when tested in accordance with Section 7.3.3. To qualify for a chlorine reduction claim, the system shall reduce the concentration of chlorine from the influent challenge so that, prior to the ~~100%~~ final sample point establishing capacity, 90% of the product water sample concentrations ~~are less~~ demonstrate a greater than or equal to the ~~maximum product~~ 50% reduction of the influent water concentration~~s in Table 7.3~~. Samples collected at the ~~100%~~ final sample point establishing capacity shall ~~be~~ demonstrate a greater than or equal to ~~the~~ 50% reduction ~~requirement in Table 7.3~~ of the influent water concentration.

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7.3.3.6.4 TOC adjustment

Specification indicated in Section 7.3.3.6.1 shall be maintained if naturally occurring TOC is available in the source water at levels greater than 1.0 mg/L. If concentration of TOC needs to be increased to meet the minimum specification, chlorinated tannic acid as prepared in accordance with Annex N-6 shall be added to the test water to achieve a specification of TOC at 1.5 ± 0.5 mg/L.

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7.3.4.6.4 TOC adjustment

Specification indicated in Section 7.3.4.6.1 shall be maintained if naturally occurring TOC is available in the source water at levels greater than 1.0 mg/L. If concentration of TOC needs to be increased to meet the minimum specification, chlorinated tannic acid as prepared in accordance with Annex N-6 shall be added to the test water to achieve a specification of TOC at 1.5 ± 0.5 mg/L.

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% ~~and 120%~~ of the estimated capacity.

Section 8, Instruction and information:

8.2.2 Commercial modular systems

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8.2.2.3.1 Allowance for chlorine and/or monochloramine claims:

−in the specific case where chlorine and monochloramine are the only claims made with a rated capacity in liters (gallons) for a unique model number designation, the rated capacity / rated service life in liters (gallons) shall be separately and uniquely identified for chlorine and monochloramine claims, if requested by the manufacturer; and

−wherever a rated capacity is stated which is greater than the minimum claimed capacity, all rated capacities, rated service flow(s), and their associated claim shall be presented in the same type size and font in immediate proximity. The only additional claims allowed for a unique model number designation under Section 8.2.2.3.1 are those claims that do not have a volumetric rated capacity associated with them (i.e., particulate, cyst).

Normative Annex 6

Preparation of TOC solution using tannic acid

N-6.1 Scope and purpose

This protocol outlines the method for preparing a chlorinated tannic acid concentrate to be used as the TOC requirement for testing DWTU systems.

N-6.2 Method summary

Tannic acid is slowly dissolved in 12% bleach to partially chlorinate the tannic acid to improve the stability of the TOC and simulate chlorinated NOM in natural waters.

N-6.3 Safety

N-6.3.1 *Good laboratory practices (GLP) shall be adhered to at all times (the wearing of lab coat, gloves, and safety glasses) to prevent accidental personal contamination and/or exposure to hazardous waste.*

N-6.3.2 *THIS IS A VERY EXOTHERMIC REACTION! Caution must be taken to control the heat generated.*

N-6.3.2.1 *Take care when weighing out the dry tannic acid to avoid creating tannic dust in the air.*

N-6.3.2.2 *Use an ice bath to keep the temperature below 30 °C (54 °F). Place a thermometer in the solution to monitor the temperature throughout the procedure.*

N-6.3.2.3 *Add the tannic acid slowly over time to ensure the ice bath can dissipate the heat properly.*

N-6.4 *Apparatus and equipment*

— large 6-L plastic bucket;

— water bath, something large enough to contain the reaction vessel with room enough for a ring of ice water;

— stir plate and stir bar;

— thermometer able to read between 20 and 100 °C (36 and 180 °F);

— stir rod; and

— filtering apparatus with Whatman #3 filters or equivalent.

N-6.5 Reagents

— tannic acid, reagent grade; and

— 12% bleach solution.

N-6.6 Solution preparation

a) Pour 3.5 L of 12% bleach into a 6 L or larger container and place the bucket in an ice bath.

b) Fill the ice bath with ice water to 3/4 of the way up the reaction container.

c) Place a large stir bar into the container and place the set-up on stir plate. Start the stir plate.

d) Set up a thermometer in the bleach so you can constantly monitor the temperature of the reaction. Keep the temperature below 30 °C (54 °F).

e) Weigh out 93 g of tannic acid and slowly start adding it to the bleach in about 10 g increments every 5 to 10 min. You can add it faster as long as the temperature does not go over 30 °C (54 °F). You can scale up the reaction if necessary, as long as you keep the ratio of tannic acid / bleach the same (100 g tannic acid / gal bleach).

f) Stir the solution occasionally to dissolve the tannic acid that floats on the top.

g) After all the tannic acid is added, allow the solution to stir for about 20 min. If the solution is yellow, add small amounts of tannic acid and stir until the solution color changes to brown. The brown color indicates a slight excess of unreacted tannic acid. Yellow indicates the complete chlorination of tannic acid.

h) After the reaction is complete turn off the stir plate and allow the undissolved organic matter to settle to the bottom.

i) Set up the large filter funnel with Whatman #3 filter paper or equivalent in the hood.

j) Use vacuum filtration to filter the chlorinated tannic acid solution.