TO: Joint Committee on Drinking Water Additives – System Components

FROM: France Lemieux, Chair of the Joint Committee

DATE: February 21, 2024

SUBJECT: Proposed revision to NSF/ANSI/CAN 60: Drinking Water Treatment Chemicals – Health Effects (60i98r1)

Revision 1 of NSF/ANSI/CAN 60, issue 98 is being forwarded to the Joint Committee for consideration. Please review the proposal and **submit your ballot by March 13, 2024** via the NSF Online Workspace <https://standards.nsf.org/home>.

Please review all ballot materials. When adding comments, please include the section number applicable to your comment and add all comments under one comment number whenever 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 revision will add aluminum to the metal analytes footnote for tables in Sections 4, 5, 6, & 7.

Background

In May 2019, Health Canada published drinking water guidelines restricting aluminum 2.9 mg/L as a maximum allowable concentration (MAC). NSF/ANSI/CAN 600 incorporated this criterion and thus the SPAC criteria applied to drinking water treatment chemicals was established at 0.29 mg/L. Aluminum is an intentional constituent of metal salt coagulants, such as aluminum hydroxychloride and polyaluminum chloride. However, aluminum is not utilized for evaluation of the product after flocculation per Section 4.3.2 Metal salt coagulants. The metal salt coagulants are precipitated out of the water column and removed from the treatment train. Aluminum is also found as a contaminant in calcium hypochlorite, calcium hydroxide, calcium oxide, and sodium silicate. Based on 2016 & 2017 contaminant testing at NSF laboratories, median at-the-tap concentrations were below 10 ug/L for the product MULs (maximum use levels), and 95th percentile extrapolated concentrations were 21 ug/L, or lower. Aluminum is not expected to be a compliance issue for these treatment chemicals. Bentonite, hectorite (clay), and other mined minerals are expected to contain aluminum at some concentration. NSF does not have contaminant results for these treatment chemicals, which are tested using Method F. However, the solubility is expected to be low since the aluminum constituents are likely aluminum oxides and other insoluble minerals. Aluminum content can be analyzed in test water using ICP-MS instrumentation and EPA 200.8 methodology. Thus, the burden of analysis to testing laboratories and cost to manufacturers is marginal when EPA 200.8 is already being run.

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

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[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 grey highlighting. Rationale Statements are in *italics* and only used to add clarity; these statements will NOT be in the finished publication.]

NSF/ANSI/CAN Standard
for Drinking Water Additives –

Drinking Water Treatment Chemicals – Health Effects

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4 Coagulation and flocculation chemicals

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The following table is a generic listing of the types of products covered in this section. This table is not intended to be a complete list of all products used for coagulation and flocculation applications. Inclusion of a product does not indicate either a use endorsement of the product or an automatic acceptance under the provisions of this standard. Annex I-3, Table I-3.1, includes a cross-reference index of the various chemicals(and the more common synonyms) contained in this table.

Table 4.1
Coagulation and flocculation products – Product identification and evaluation

Chemical type (description)	Synonyms	Formula (CAS number)	Approximate molecular weight	Preparation Method	Typical use level (mg/L)[1]	Minimum test batteries of chemistry-specific analyses[2]
acrylamide / acrylic acid copolymer[3] (polyelectrolytes)	—	(31212-13-2)	4 to 30 million	—	1.0[4]	acrylamide, acrylic acid, acrylonitrile, 3-hydroxypropane nitrile, isobutane nitrile
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[1] The typical use level is an application level which has been used historically in water treatment. The typical use level is not the maximum use level (MUL) for the product unless specifically stated.

[2] Analysis for all chemistry-specific analytes in these minimum test batteries shall be performed each time the product is evaluated. Analysis shall also include formulation-dependent analytes as identified during formulation review. Testing for specific repackages, blends, or dilutions of previously certified products may be waived.

[3] If nitrogen-containing initiators are used in these chemical types, evaluation shall include analysis for the initiator and any initiator by-products.

[4] The typical use level for this product is based on an acrylamide polymer application of 1 mg/L and an acrylamide monomer level of 0.05% in the polymer, or equivalent (40 CFR § 141.111) for a carryover of not more than 0.5 ppb of acrylamide monomer into the finished water.

[5] Metals = aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, selenium, thallium

[6] A GC/MS analysis shall also be performed on this chemical type when recycled materials are used in the manufacturing process.

[7] The first value is the typical use level as indicated by the chemical formula. The second value is the typical use level as aluminum oxide for the aluminum salts (aluminum chloride, aluminum sulfate, polyaluminum chloride, and sodium aluminate).

[8] The first value is the typical use level as indicated by the chemical formula. The second value is the typical use level as Fe for the iron salts (ferric chloride, ferric sulfate, ferrous chloride, and ferrous sulfate).

[9] The typical use level for this product is based on a polyDADMAC polymer application of 25 mg/L and a carryover of not more than 50 ppb of DADMAC into the finished water.

Table 4.1
Coagulation and flocculation products – Product identification and evaluation

Chemical type (description)	Synonyms	Formula (CAS number)	Approximate molecular weight	Preparation Method	Typical use level (mg/L)[1]	Minimum test batteries of chemistry-specific analyses[2]

[10] The typical use level for this product is based on a EPI/DMA polymer application of 10 mg/L and a epichlorohydrin monomer level of 0.01% in the polymer, or equivalent (40 CFR § 141.111) for a carryover of not more than 1 ppb of epichlorohydrin monomer into the finished water.

[11] The typical use level of this product is expressed as mg/L of active polymer in the product as sold.

[12] Sodium silicate may be used in conjunction with an acid-forming substance to produce activated silica. The net concentrations of sodium silicate and acid-forming substance are not to exceed the MULs for these chemicals individually.

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5 Chemicals for corrosion and scale control, softening, precipitation, sequestering, and pH adjustment

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Table 5.1
Chemicals for corrosion and scale control, softening, sequestering, precipitation, and pH adjustment – Product identification and evaluation

Chemical type (primary use)	Synonyms	Formula (CAS number)	Molecular weight (g)	Preparation method	Typical use level[1] (mg/L)	Minimum test batteries of chemistry-specific analyses[2]
calcium carbonate[3] (pH adjustment)	limestone	$CaCO_3$ (471-34-1)	100.9	Method C, Annex N-1, Section N-1.3.4	650	metals,[4] radionuclides, base / neutral / acid scan[5]
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Table 5.1
Chemicals for corrosion and scale control, softening, sequestering, precipitation, and pH adjustment – Product identification and evaluation

Chemical type (primary use)	Synonyms	Formula (CAS number)	Molecular weight (g)	Preparation method	Typical use level[1] (mg/L)	Minimum test batteries of chemistry-specific analyses[2]

[1] The typical use level is an application level that has been used historically in water treatment. The typical use level is not the maximum use level (MUL) for the product, except where specifically stated.

[2] Analysis for all chemistry-specific analytes in these minimum test batteries shall be performed each time the product is evaluated. Analysis shall also include formulation-dependent analytes as identified during formulation review. Testing for specific repackages, blends, or dilutions of previously certified products may be waived.

[3] This product differs from other products covered in this section because it dissolves slowly over time. Calcium carbonate is exposed using the following ratio: 156 g product / 250 mL deionized water, in accordance with Annex N-1, Section 3.4 (Method C).

[4] Metals = aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, selenium, thallium

[5] BNA scan not run if no waste fuels used in the manufacturing process.

[6] Radionuclides and fluoride not run when CaO is sampled from the same location.

[7] Radionuclides and fluoride not run if product is a blend or repackage of certified materials.

[8] The potential impurities for these products may vary considerably depending on source.

[9] Equivalent to 10 mg/L of PO_4, on a dry basis. This typical use level is based on potential ecological effects of phosphates at levels exceeding 10 mg/L of PO_4.

[10] Calculated from the U.S. EPA RfD for zinc, this use level is based on 2 mg/L as zinc.

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6 Disinfection and oxidation chemicals

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Table 6.2
Disinfection and oxidation products – Product identification, and evaluation

Chemical type (primary use)	Synonyms	Formula (CAS number)	Molecular weight (g)	Preparation method	Typical use level (mg/L)[1]	Minimum test batteries of chemistry-specific analyses[2]
ammonia, anhydrous[3] (disinfection & oxidation)	ammonia gas	NH_3 (7664-41-7)	17.0	Method E, Annex N-1, Section N-1.3.6	5	metals,[4] VOCs
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[1] The typical use level is an application level that has been used historically in water treatment. The typical use level is not the maximum use level (MUL) for the product, except where specifically stated.

[2] Analysis for all chemistry-specific analytes in these minimum test batteries shall be performed each time the product is evaluated. Analysis shall also include formulation-dependent analytes as identified during formulation review. Testing for specific repackages, blends, or dilutions of previously certified products may be waived.

[3] Testing on anhydrous ammonia products may be bracketed based on the testing of ammonium hydroxide (aqua ammonia), if the aqua ammonia solution is prepared with the same respective anhydrous ammonia product.

[4] Metals = aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, selenium, and thallium.

[5] Based on mg of dry chemical and a bromochlorodimethylhydantoin SPAC of 9 mg/L.

[6] Hypochlorite products shall include the appropriate statement in product literature, per the requirements of Sections 6.3.2, and 6.3.3

[7] Equivalent to 10 mg/L of Cl_2, on a dry basis. The residual level of chlorine in the treated water is to be compliant with the applicable state or federal requirement.

[8] Chlorine products may be bracketed based on testing of sodium hypochlorite bleach, prepared from the same chlorine source, or annual analysis may alternate between the chlorine and sodium hypochlorite product.

[9] Equivalent to 10 mg/L of Cl_2, on a dry basis. Use levels up to 30 mg/L of Cl_2 may be acceptable for short-term applications such as shock chlorination and disinfection of new installations. The residual level of chlorine in the treated water is to be compliant with the applicable state or federal requirement.

[10] The 23 mg/L value in the typical use level column represents the MUL based on a 35% hydrogen peroxide solution and a hydrogen peroxide SPAC of 8 mg/L. The MUL for other concentrations of hydrogen peroxide can be derived in the same manner.

[11] Iodine disinfection is acceptable for short-term or emergency use, but it is not recommended for long-term or routine community water supply application.

Table 6.2
Disinfection and oxidation products – Product identification, and evaluation

Chemical type (primary use)	Synonyms	Formula (CAS number)	Molecular weight (g)	Preparation method	Typical use level (mg/L)[1]	Minimum test batteries of chemistry-specific analyses[2]
[12] Sodium chlorate and sodium chlorite are used for on-site production of chlorine dioxide in drinking water disinfection. These chemicals are reactants and require mixing with a second chemical to produce chlorine dioxide. These chemicals are generally not approved for unaltered addition to drinking water. Use for other applications will require additional analyses for testing. [13] The 30 mg/L value in the typical use level column represents the MUL based on an anhydrous solid and a SPAC of 20 mg/L for isocyanuric acid. [14] When all certified ingredients are used, testing for this chemical may be alternated every other year.						

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7 Miscellaneous treatment applications

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Table 7.1
Miscellaneous treatment application products – Product identification, and evaluation

Chemical type (primary use)	Synonyms	Formula (CAS number)	Molecular weight (g)	Preparation method	Typical use level (mg/L)[1]	Minimum test batteries of chemistry-specific analyses[2]
acetic acid (biological substrate)	vinegar	$C_2H_4O_2$ (64-19-7)	60.0	Method A, Annex N-1, Section N-1.3.2	200	acetone, metals[3]
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Table 7.1
Miscellaneous treatment application products – Product identification, and evaluation

Chemical type (primary use)	Synonyms	Formula (CAS number)	Molecular weight (g)	Preparation method	Typical use level (mg/L)[1]	Minimum test batteries of chemistry-specific analyses[2]

[1] The typical use level is an application level that has been used historically in water treatment. The typical use level is not the maximum use level (MUL) for the product, except where specifically stated.

[2] Analysis for all chemistry-specific analytes in these minimum test batteries shall be performed each time the product is evaluated. Analysis shall also include formulation-dependent analytes as identified during formulation review. Testing for specific repackages, blends, or dilutions of previously certified products may be waived.

[3] Metals = aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, selenium, and thallium.

[4] Based on mg fluoride ion per L water. Total concentration of fluoride ion in finished water may include fluoride which occurs naturally in the source water. U.S. Centers for Disease Control and Prevention recommends an optimal concentration of 0.7 mg/L fluoride ion in drinking water.

[5] Based on a weight to weight ratio of 1:1 between copper sulfate pentahydrate and citric acid monohydrate.

[6] Based on mg copper per L water.

[7] Based on treating up to 40 grains of hardness.

[8] Based on chlorine level of 12 mg/L prior to treatment.

[9] Bromide analysis required for NaCl for use in electrolytic chlorination only.

[10] Based on fluoride level of 15 mg/L prior to treatment.