**Section 604.900 General Stabilization Requirements**

a) Water distributed by community water supplies must be stable so as to not cause a violation of 35 Ill. Adm. Code 601.101(a).

b) The following water quality parameters of finished water must be evaluated to ensure that water quality parameters minimize corrosion and minimize deposition of excess calcium carbonate (CaCO3) scale throughout the distribution system of the community water supply:

1) alkalinity (as CaCO3);

2) total hardness (as CaCO3);

3) calcium hardness (as CaCO3);

4) temperature;

5) pH;

6) chloride;

7) sulfate;

8) total dissolved solids;

9) oxidation reduction potential;

10) conductivity;

11) iron;

12) manganese;

13) orthophosphate, if applicable; and

14) silica, if applicable.

c) The following may be used to determine the corrosivity of water distributed by a community water supply:

1) Lead and Copper

A) Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems, USEPA (March 2016); Office of Water (4606M); EPA 816-B-16-003, incorporated by reference at 35 Ill. Adm. Code 601.115;

B) Chloride Sulfate Mass Ratio (CSMR), calculated as follows:

$$CMSR=\frac{Cl¯, expressed as mg/L}{SO₄¯, expressed as mg/L };$$

C) Coupon and pipe loop studies.

2) Iron and Steel

Larson-Skold Index (L-SI), calculated as follows:

$$L­SI=\left(Cl+SO₄\right) / alkalinity$$

(All parameters expressed as mg/L of equivalent CaCO3)

BOARD NOTE: The following equation provides a simplified procedure for calculating L-SI:

$$LS­I=\frac{(1.41)(mg/L Cl¯)+(1.04)(mg/L SO₄¯²) }{mg/L alkalinity (as CaC0₃) }$$

Cl- expressed as mg/L chloride

SO4-2 expressed as mg/L sulfate

3) Iron Steel and Concrete

A) Calcium Carbonate Precipitation Potential (CCPP), as referenced in Method 2330 C Standard Methods for Examination of Water and Wastewater, 22nd edition, incorporated by reference in 35 Ill. Adm. Code 611.102.

B) For water containing phosphates:

i) The Alkalinity Difference Technique, as described in Method 2330 B.3.b and 2330 C.2.b Standard Methods for Examination of Water and Wastewater, 22nd edition, incorporated by reference in 35 Ill. Adm. Code 611.102. The CCPP is the difference between the initial and equilibrated water's alkalinity (or calcium) values, when expressed as CaCO3.

ii) The Marble Test, as described in Method 2330 C.2.c Standard Methods for Examination of Water and Wastewater, 22nd edition, incorporated by reference in 35 Ill. Adm. Code 611.102. The Marble Test is similar to the Alkalinity Difference Technique. The CCPP equals the change in alkalinity (or calcium) values during equilibration, when expressed as CaCO3.

d) The following may be used to determine deposition of excess CaCO3 scale:

1) CCPP, as referenced in Method 2330 B Standard Methods for Examination of Water and Wastewater, 22nd edition, incorporated by reference in 35 Ill. Adm. Code 611.102.

2) For water containing phosphates:

A) The Alkalinity Difference Technique, as described in Method 2330 B.3.b and 2330 C.2.b Standard Methods for Examination of Water and Wastewater, 22nd edition, incorporated by reference in Section 611.102. The CCPP is the difference between the initial and equilibrated water's alkalinity (or calcium) values, when expressed as CaCO3.

B) The Marble Test as described in Method 2330 C.2.c Standard Methods for Examination of Water and Wastewater, 22nd edition, incorporated by reference in Section 611.102. The Marble Test is similar to the Alkalinity Difference Technique. The CCPP equals the change in alkalinity (or calcium) values during equilibration, when expressed as CaCO3.

BOARD NOTE: Calcium Carbonate Precipitation Potential (CCPP) can be calculated using Trussell Technologies software: www.trusselltech.com/downloads?category=6.

CCPP does not apply to protection or corrosion of lead and copper plumbing materials or to water containing phosphates. See "Internal Corrosion and Deposition Control", Water Quality & Treatment, A Handbook on Drinking Water, 6th ed. (2011), American Water Works Association.

BOARD NOTE: Estimating Calcium Carbonate Precipitation Potential (CCPP) using the Alkalinity Difference Technique or the Marble Test, both referenced in Standard Methods for Examination of Water and Wastewater, 22nd edition, incorporated by reference at 35 Ill. Adm. Code 611.102, is described as "Calcium Carbonate Saturation". See Simplified Procedures for Water Examination, Manual of Water Supply Practices M12 (5th ed. 2002), American Water Works Association.

Based on the results of the "Calcium Carbonate Saturation" test, CCPP can be calculated as:

CCPP = Final mg/L alkalinity (as CaCO3) - Initial mg/L alkalinity (as CaCO3)

Water is unsaturated with respect to calcium carbonate and may be corrosive if final alkalinity is greater than initial alkalinity, a positive value in the equation above. If there is alkalinity gain in the final alkalinity test, it indicates a tendency to dissolve calcium carbonate scale.

Water is oversaturated with calcium carbonate scale and may deposit calcium carbonate coating in the water mains if final alkalinity is less than initial alkalinity, a negative value in the equation above. If there is alkalinity loss in the final alkalinity test, it indicates a tendency to precipitate calcium carbonate scale. If final and initial alkalinity are the same, the water is stable and in equilibrium with calcium carbonate.

CCPP does not apply to protection or corrosion of lead and copper plumbing materials.

Verifying the alkalinity titration endpoint by using a pH meter to verify the pH of the titrated alkalinity sample is recommended, since titration endpoint visual color change may be individually variable. If the pH of the sample is not certain, consider using a pH of 4.50 to represent the endpoint. See "Alkalinity Test", Standard Methods for Examination of Water and Wastewater, 22nd edition, incorporated by reference in 35 Ill. Adm. Code 611.102.

e) Acceptable stability treatments include:

1) carbon dioxide addition;

2) acid addition;

3) phosphate addition;

4) split treatment;

5) alkali chemical:

A) hydrated lime;

B) sodium carbonate;

C) sodium bicarbonate;

D) sodium hydroxide;

6) carbon dioxide reduced by aeration;

7) calcium hydroxide; and

8) sodium silicate addition.

f) When chemical addition is used for stabilization, the community water supply must comply with the requirements of Subpart K.

(Source: Amended at 47 Ill. Reg. 7503, effective May 16, 2023)