POLLUTION CONTROL BOARD

NOTICE OF ADOPTED AMENDMENTS

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SUBTITLE F: PUBLIC WATER SUPPLIES
CHAPTER I: POLLUTION CONTROL BOARD

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AUTHORITY: Implementing Section 14-19 and authorized by Section 27 of the Illinois Environmental Protection Act [415 ILCS 5/17 and 27].

SOURCE: Adopted in R18-17 at 43 Ill. Reg. 8064, effective July 26, 2019; emergency amendment in R20-20 at 44 Ill. Reg. 7777, effective April 17, 2020, for a maximum of 150 days; amended in R20-21 at 44 Ill. Reg. 14736, effective August 27, 2020; amended in R18-25 at 47 Ill. Reg. _____, effective _____.

SUBPART B: SOURCE DEVELOPMENT

Section 604.255 Well Pumps, Discharge Piping, and Appurtenances

a) Where line shaft pumps are used:

1) the casing must be firmly connected to the pump structure or have the casing inserted into a recess extending at least one-half inch into the pump base;

2) the pump foundation and base must be at least six inches above the finished floor elevation; and

3) lubricants must comply with Section 604.105(f).

b) Where a submersible pump is used:

1) the top of the casing must be effectively sealed to prohibit the entrance of water under all conditions of vibration or movement of conductors or cables;

2) the electrical cable must be firmly attached to the riser pipe at 20-foot intervals or less; and

3) mercury seals must not be used when an existing submersible pump is replaced or a new submersible pump is installed.

c) Discharge Piping

1) The discharge piping for each well must:

A) be designed to minimize friction loss;

B) be equipped with a check valve in or at the well, a shutoff valve, a pressure gauge, and a means of measuring flow;

C) be protected from the entrance of contamination;

D) have control valves and appurtenances located above the pumphouse floor when an above-ground discharge is provided;

E) be equipped with a smooth-nosedsmooth nosed sampling tap at least 18 inches18 inches above the floor to facilitate sample

collection, located at a point where positive pressure is maintained~~,~~ but before any treatment chemicals are applied;

F) when necessary to remove entrapped air from the well, be equipped with an air release-vacuum relief valve located upstream from the check valve, with exhaust/relief piping terminating in a down-turned position at least 18 inches above the floor and covered with a 24 mesh, corrosion-resistant~~corrosion resistant~~ screen;

G) be valved to permit test pumping and control of each well;

H) have all exposed piping, valves, and appurtenances protected against physical damage and freezing;

I) be anchored to prevent movement and be supported to prevent excessive bending forces;

J) be protected against surge or water hammer; and

K) be constructed so that it can be disconnected from the well or well pump to allow the well pump to be pulled.

2) The well must have a means of pumping to waste that is not directly connected to a sewer.

3) The discharge, drop, or column piping inside the well for submersible, submersible jet, and submersible line shaft pumps must:

A) be capable of supporting the weight of the submersible pump, piping, water, and appurtenances, and of withstanding the thrust, torque, torque fatigue, and other reaction loads created during pumping; and

B) use lubricants, fittings, brackets, tape, or other appurtenances that comply with Section 604.105(f).

d) Pitless Well Units

1) Pitless units must:

A) be shop-fabricated from the point of connection with the well casing to the unit cap or cover;

B) be threaded or welded to the well casing;

C) be of watertight construction throughout;

D) be of materials and weight at least equivalent and compatible to the casing;

E) have field connection to the lateral discharge from the pitless unit of threaded, flanged, or mechanical joint connection; and

F) terminate at least 18 inches above final ground elevation or three feet above the 100-year flood level or the highest known flood elevation, whichever is higher.

2) The design of the pitless unit must make provision for:

A) access to disinfect the well;

B) a properly constructed casing vent meeting the requirements of subsection (e);

C) facilities to measure water levels in the well, under subsection (f);

D) a cover at the upper terminal of the well that will prevent the entrance of contamination;

E) a contamination-proof entrance connection for electrical cable;

F) an inside diameter as great as that of the well casing to facilitate work and repair on the well, pump, or well screen; and

G) at least one check valve within the well casing.

3) If the connection to the casing is by field weld, the shop-assembled unit must be designed specifically for field welding to the casing. The only

field welding permitted will be that needed to connect a pitless unit to the casing.

e) Casing Vent

1) Well casing must be vented to the atmosphere.

2) The vent must terminate in a downturned position, at or above the top of the casing or pitless unit, no less than 12 inches above grade or floor, in a minimum 1½-inch~~1½ inch~~ diameter opening covered with a 24 mesh, corrosion-resistant~~corrosion resistant~~ screen.

3) The pipe connecting the casing to the vent must be of adequate size to provide rapid venting of the casing.

4) Where vertical turbine pumps are used, vents may be placed into the side of the casing.

f) Water Level Measurement

1) Each well must be equipped with a means for taking water level measurements.

2) Where pneumatic water level measuring equipment is used, it must be made using corrosion-resistant materials and attached firmly to the drop pipe or pump column to prevent the entrance of foreign materials.

g) Observation wells must meet the requirements in 77 Ill. Adm. Code 920.170.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART C: SOURCE WATER PROTECTION PLAN

Section 604.315 Source Water Assessment

a) The source water assessment must contain the following information:

1) a statement of the importance of the source water;

2) a list of water supplies that obtain water from this community water supply;

3) a delineation of all sources of water used by the community water supply, including:

A) for surface water, description of the watershed, map of the watershed, and intake locations;

B) for groundwater, the well identification number, well description, well status, and well depth; a description of setback zones;~~,~~ and a description of the aquifer for each well;

4) a report on the quality of the source water for all sources of water delineated in subsection (a)(3), including:

A) when and where samples used to determine the quality of the source water were taken. These samples must be tested by a certified laboratory; and

B) the certified laboratory's results;

5) a report on the quality of the finished water;

6) an identification of potential sources of contamination to the source water;

7) the analysis of the source water's susceptibility to contamination; and

8) an explanation of the community water supply's efforts to protect its source water.

b) Upon request, the Agency will provide technical assistance to a community water supply in conducting the source water assessment.

c) A community water supply may use a Source Water Assessment Program Fact Sheet prepared by the Agency to fulfill the requirements of this Section.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART E: CLARIFICATION

Section 604.525 Tube or Plate Settlers

a) Settler units consisting of variously shaped tubes or plates installed in multiple layers and at an angle to the flow may be used for sedimentation, following flocculation.

b) Tube or plate settlers must meet the following requirements:

1) Inlet and outlet design must maintain velocities suitable for settling in the basin and to minimize short-circuiting;

2) Plate units must be designed to minimize maldistribution across the units;

3) Drain piping from settler units must be sized to facilitate a quick flush of the settler~~settlers~~ units and to prevent flooding of other portions of the plant;

4) Outdoor installations must be protected against freezing, including sufficient freeboard above the top of the settlers;

5) Tubes must have a maximum application rate of 2 gpm per square foot of cross-sectional area, unless higher rates are shown through pilot plant or in-plant demonstration studies;

6) Plates must have a maximum application rate of 0.5 gpm per square foot, based on 80 percent of the projected horizontal plate area;

7) Flushing lines must be provided to facilitate maintenance and must be properly protected against backflow or back-siphonage~~back siphonage~~;

8) Inlets and outlets must conform with Section 604.515(b) and (d);

9) The units' support system must be able to carry the weight of the settler units when the basin is drained plus any additional weight to support maintenance; and

10) Settler units must accommodate:

A) A water or air jet system for cleaning their tubes or plates; and

B) Dropping their water level to allow cleaning with the system identified in subsection (b)(10)(A).

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART F: FILTRATION

Section 604.605 Rapid Rate Gravity Filters

a) The use of rapid rate gravity filters requires pretreatment.

b) For community water supplies treating surface water, groundwater under the direct influence of surface water, or using lime soda softening treatment, unless otherwise approved by the Agency under Section 604.145(b), the nominal filtration rates must not exceed 3 gal/min/ft^2 of filter area for single media filters and 5 gal/min/ft^2 for multi-media filters. Filtration rates must be reduced when treated water turbidity exceeds the standards in 35 Ill. Adm. Code 611.

c) For community water supplies treating groundwater and not using lime soda softening treatment, unless otherwise approved by the Agency under Section 604.145(b), the rate of filtration must not exceed 4 gal/min/ft^2 of filter area.

d) Number of Filter Units.

1) A minimum of two units must be provided. Each unit must be capable of meeting the plant design capacity or the projected maximum daily demand at the approved filtration rate.

2) Where more than two filter units are provided, the filters must be capable of meeting the plant design capacity at the approved filtration rate with one filter removed from service.

3) Where declining rate filtration is provided, the variable aspect of filtration rates and the number of filters must be considered when determining the design capacity for the filters.

e) Structural Details and Hydraulics. The filter structure must be designed to provide for the following:

1) vertical walls within the filter;

2) no protrusion of the filter walls into the filter media;

3) cover by superstructure;

4) head and walking room to permit normal inspection and operation;

5) minimum depth of filter box of 8.5 feet;

6) minimum water depth over the surface of the filter media of 3 feet;

7) trapped effluent to prevent backflow of air to the bottom of the filters;

8) prevention of floor drainage to the filter with a minimum 4-inch curb around the filters;

9) prevention of flooding by providing overflow;

10) maximum velocity of treated water in pipe and conduits to filters of 2 ft/sec;

11) cleanouts and straight alignment for influent pipes or conduits where solids loading is heavy, or following lime soda softening;

12) construction to prevent cross-connections~~cross connections~~, short-circuiting, or common walls between potable and non-potable water; and

13) wash water drain capacity to carry maximum flow.

f) Wash water troughs must be constructed such that:

1) the bottom elevation is above the maximum level of expanded media during washing;

2) a 2-inch freeboard is provided at the maximum rate of wash;

3) the top edge is level and is all at the same elevation;

4) troughs are spaced so that each trough serves the same number of square feet of filter area; and

5) the maximum horizontal travel of suspended particles to reach the trough does not exceed 3 feet.

g) The filter media must be composed of clean silica sand or other natural or synthetic media free from detrimental chemical or bacterial contaminants and must meet the following requirements:

1) a total depth of not less than 24 inches;

2) a uniformity coefficient of the smallest material not greater than 1.65;

3) a minimum of 12 inches of media with an effective size range of 0.45 mm to 0.55 mm;

4) filter media specifications:

A) Filter anthracite must consist of hard, durable anthracite coal particles of various sizes. Blending of non-anthracite material is not acceptable. Anthracite must have:

i) an effective size of 0.45 mm to 0.55 mm with a uniformity coefficient not greater than 1.65 when used alone;

ii) an effective size of 0.8 mm to 1.2 mm with a uniformity coefficient not greater than 1.7 when used as a cap;

iii) an effective size less than 0.8 mm for anthracite used as a single media on potable groundwater for iron and manganese removal only (effective sizes greater than 0.8 mm may be approved based upon on-siteon site pilot plant studies);

iv) a specific gravity greater than 1.4;

v) an acid solubility less than 5 percent; and

vi) a Moh's scale of hardness greater than 2.7.

B) Sand must have:

i) an effective size of 0.45 mm to 0.55 mm;

ii) a uniformity coefficient of not greater than 1.65;

iii) a specific gravity greater than 2.5; and

iv) an acid solubility less than 5 percent.

C) High-density~~High density~~ sand must consist of hard, durable, and dense grain garnet, ilmenite, hematite or magnetite, or associated minerals of those ores that will resist degradation during handling and use, and must:

i) contain at least 95 percent of the associated material with a specific gravity of 3.8 or higher;

ii) have an effective size of 0.2 to 0.3 mm;

iii) have a uniformity coefficient of not greater than 1.65; and

iv) have an acid solubility less than 5 percent.

D) Granular activated carbon as a single media may be considered for filtration only after pilot or full-scale testing and with prior approval of the Agency. The design must include the following:

i) The media must meet the basic specifications for filter media in subsections (g)(1) through (g)(3).

ii) There must be provisions for a free chlorine residual and adequate contact time in the water following the filters and prior to distribution.

iii) Provisions must be made for frequent replacement or regeneration.

E) Other media types or characteristics must be approved by the Agency;

5) supporting media designed as follows based on the type of filter material:

A) A three-inch layer of torpedo sand must be used as a supporting media for filter sand when~~where~~ supporting gravel is used, and must have:

i) an effective size of 0.8 mm to 2.0 mm; and

ii) a uniformity coefficient not greater than 1.7.

B) Gravel

i) When gravel is used as the supporting media, it must consist of cleaned and washed, hard, durable, rounded silica particles and must not include flat or elongated particles.

ii) The coarsest gravel must be 2.5 inches in size when the gravel rests directly on a lateral system, and must extend above the top of the perforated laterals.

iii) Not less than four layers of gravel must be provided in accordance with the following size and depth distribution:

Size	**Depth**
2½ to 1½ inches	5 to 8 inches
1½ to ¾ inches	3 to 5 inches
¾ to ½ inches	3 to 5 inches
½ to 3/16 inches	2 to 3 inches
3/16 to 3/32 inches	2 to 3 inches

iv) Reduction of gravel depths and other size gradations may be approved by the Agency upon justification for slow sand filtration or when proprietary filter bottoms are specified.

h) Filter Bottoms and Strainer Systems

1) Water quality must be reviewed beforeprior to the use of porous plate bottoms to prevent clogging and failure of the underdrain system.

2) The design of manifold type collection systems must:

A) minimize loss of head in the manifold and laterals;

B) ensure even distribution of washwater and even rate of filtration over the entire area of the filter;

C) provide the ratio of the area of the strainer systems' final openings to the area of the filter at about 0.003;

D) provide the total cross-sectional area of the laterals at about twice the total area of the final openings;

E) provide the cross-sectional area of the manifold at 1.5 to 2 times the total area of the laterals; and

F) direct lateral perforations without strainers downward.

3) The Agency may approve departures from these standards for high-ratehigh rate filters and for propriety bottoms.

i) The following appurtenances must be provided for every filter:

1) influent and effluent sampling taps;

2) a gauge indicating loss of head;

3) a meter indicating the instantaneous rate of flow;

4) a pipe for filtering to waste that has a six-inchsix inch or larger air gap, or other Agency-approved cross-connectionAgency approved cross connection control measure;

5) a continuously recording Nephelometer capable of measuring and recording filter effluent turbidity at maximum 15-minute intervals, and with alarm capability to notify the operator if filtered water turbidity exceeds 0.3 NTU (Nephelometric Units);

6) an adjustable-rate~~adjustable rate~~ valve to allow the operator to gradually control the flow rate increase when placing the filters back into operation; and

7) a hose and storage rack for washing filter walls.

j) Backwash. Provisions must be made for washing filters as prescribed in this subsection.

1) The community water supply must use filtered water provided at the required rate by washwater tanks or a dedicated washwater pump to wash the filters.

2) Backwash rate must meet the following requirements:

A) a minimum rate of 15 gal/min/ft^2, consistent with water temperatures and specific gravity of the filter media;

B) a rate sufficient to provide for a 50 percent expansion of the filter bed; and

C) a reduced rate of 10 gal/min/ft^2 for full depth anthracite or granular activated carbon filters, upon approval by the Agency.

3) Washwater pumps in duplicate must be provided unless an alternate means of obtaining washwater is available.

4) The main washwater line must have a regulator or valve to obtain the desired rate of filter wash with the washwater valves on the individual filters open wide.

5) The main washwater line or backwash waste line must have a rate of flow indicator, preferably with a totalizer, located so that it can be easily read by the operator during the washing process.

6) Rapid changes in backwash water flow must be prevented.

7) Backwash must be completed with an operator in attendance to initiate the backwash cycle and to control the return-to-service procedure to assure

that the effluent turbidity is less than 0.3 NTU when the filter is placed back into operation for discharge to the clearwell.

8) Appropriate measures for cross-connection~~cross connection~~ control must be provided.

k) Surface or subsurface wash facilities are required except for filters used exclusively for iron, radionuclides, arsenic, or manganese removal. Wash facilities may include a system of fixed nozzles or a revolving-type apparatus. All devices must be designed:

1) to provide water pressures of at least 45 psi;

2) ~~if connected to the treated water system,~~ to prevent back-siphonage~~back siphonage~~ by properly installing a vacuum breaker or other approved device, if connected to the treated water system; and

3) to provide a rate of flow of 2.0 gpm/ft^2 of filter area with fixed nozzles or 0.5 gpm/ft^2 with revolving arms.

l) Air scouring may~~can~~ be used in place of surface wash if the air scouring meets the following requirements:

1) Air flow for air scouring the filter must be 3 to 5 ft^3~~f~~/min/ft^2 of filter area when the air is introduced into~~in~~ the underdrain; a lower air rate must be used when the air scour distribution system is placed above the underdrains;

2) A method to avoid filter media loss during backwashing must be provided;

3) Air scouring must be followed by a fluidization wash sufficient to restratify the media;

4) Air must be free from contamination;

5) If air scour distribution systems are placed at the media and supporting bed interface, the air scour nozzles must be designed to prevent media from clogging the nozzles or the air entering the air distribution system;

6) Piping for the air distribution system must not be flexible hose or other soft material;

7) Air delivery piping must not:

A) pass down through the filter media; and

B) have any arrangement in the filter design that would allow short-circuiting between the applied unfiltered water and the filtered water;

8) When air scouring is being used~~utilized~~, the backwash rate must be variable and must not exceed 8 gal/min, unless a higher rate is necessary to remove scoured particles from filter media surfaces; and

9) Air scouring piping must not be installed in the underdrain unless the underdrain was designed to accommodate the piping.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART G: DISINFECTION

Section 604.735 Chlorinator Piping

a) Cross-Connection~~Cross Connection~~ Protection~~.~~

1) The chlorinator piping must be designed to prevent contamination of the treated water.

2) For all systems required to disinfect under Section 604.700, piping must be arranged to prevent backflow or back-siphonage~~back flow or back siphonage~~ between multiple points of chlorine application.

3) The water supply to each eductor must have a separate shutoff valve.

b) Pipe Material

1) The pipes carrying elemental liquid or dry gaseous chlorine under pressure must be Schedule 80 seamless steel tubing or other materials recommended by The Chlorine Institute in Pamphlet 6, Piping Systems for

Dry Chlorine, incorporated by reference in 35 Ill. Adm. Code 601.115. These pipes must not be PVC.

2) Rubber, PVC, polyethylene (PE), or other materials recommended by The Chlorine Institute must be used for chlorine solution piping and fittings.

3) Nylon products are not acceptable for any part of the chlorine solution piping system.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART H: SOFTENING

Section 604.805 Cation Exchange Process

a) Pre-treatment under Section 604.1010(b) or (c) is required when the content of iron, manganese, or a combination of the two is 1 mg/L or more.

b) Design requirements must provide:

1) automatic regeneration based on the volume of water softened; and

2) a manual override on all automatic controls.

c) The design capacity for hardness removal must not exceed 20,000 grains per cubic foot when resin is regenerated with 0.3 pounds of salt per 1000 grains of hardness removed.

d) The depth of the exchange resin must not be less than 3 feet.

e) Flow Rates

1) The rate of softening must not exceed 7 gal/min/ft^2 of bed area.

2) The backwash rate must be 6 to 8 gal/min/ft^2 of bed area.

3) Rate of flow controllers or the equivalent must be installed.

f) The freeboard must be calculated based on the size and specific gravity of the resin and the direction of water flow. Unless otherwise approved by the Agency

under Section 604.145(b), the washwater collector must be 24 inches above the top of the resin on downflow~~down flow~~ units.

g) The bottoms, strainer systems, and support for the exchange resin must conform to the criteria provided for rapid rate gravity filters in Section 604.605(f) and (g).

h) Brine must be evenly distributed over the entire surface of both upflow and downflow units.

i) Backwash, rinse, and air relief discharge pipes must be installed to prevent any possibility of back-siphonage~~back siphonage~~.

j) Bypass Piping and Equipment

1) Bypass must be provided around softening units to produce a blended water of desirable hardness.

2) Totalizing meters must be installed on the bypass line and on each softener unit.

3) The bypass line must have a shutoff valve. An automatic proportioning or regulating device is recommended.

k) When the applied water contains a chlorine residual, the cation exchange resin must be a type that is not damaged by residual chlorine.

l) Sampling Taps

1) Smooth-nosed sampling taps must be provided for the collection of representative samples.

2) The taps must be located to provide for sampling of the softener influent, effluent, and blended water.

3) The sampling taps for the blended water must be at least 20 feet downstream from the point of blending.

4) Petcocks are not acceptable as sampling taps.

m) Brine and Salt Storage Tanks~~:~~

1) Salt dissolving or brine tanks and wet salt storage tanks must be covered and must be corrosion-resistant~~corrosion resistant~~.

2) The make-up water inlet must be protected from back-siphonage~~back siphonage~~. Water for filling the tank must be distributed over the entire surface by pipes above the maximum brine level in the tank. An automatic declining level control system on the make-up water line is recommended.

3) Wet salt storage basins must be equipped with manholes or hatchways for access and for direct dumping of salt from truck or railcar. Openings must be provided with raised curbs and watertight covers having overlapping edges similar to those required for finished water reservoirs.

4) Overflows, where provided, must be protected with corrosion-resistant~~corrosion resistant~~ screens and must terminate with either a turned downed bend having a proper free fall discharge or a self-closing flap valve.

5) The salt must be supported on graduated layers of gravel placed over a brine collection system.

6) Alternative designs that are conducive to frequent cleaning of the wet salt storage tank may be approved by the Agency.

7) Total salt storage must provide for at least 30 days of operation.

n) Corrosion control must be provided under Subpart I.

o) Suitable disposal must be provided for brine waste.

p) Pipes and contact materials must be resistant to the aggressiveness of salt. Plastic and red brass are acceptable piping materials. Steel and concrete must be coated with a non-leaching protective coating that is compatible with salt and brine.

q) Dry bulk salt storage must be enclosed and separated from other operating areas to prevent damage to equipment.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART I: STABILIZATION

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 ($CaCO_3$) scale throughout the distribution system of the community water supply:

1) alkalinity (as $CaCO_3$);

2) total hardness (as $CaCO_3$);

3) calcium hardness (as $CaCO_3$);

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:

$$\text{CMSR} = \frac{\text{Cl}^-\text{, expressed as mg/L}}{\text{SO}_4^-\text{, expressed as mg/L}};$$

C) Coupon and pipe loop studies.

2) Iron and Steel
Larson-Skold Index (L-SI), calculated as follows:

$$\text{L-SI} = (\text{Cl} + \text{SO}_4) \text{ / alkalinity}$$

(All parameters expressed as mg/L of equivalent $CaCO_3$)

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

$$\text{LS-I} = \frac{(1.41)(\text{mg/L Cl}^-) + (1.04)(\text{mg/L SO}_4^{-2})}{\text{mg/L alkalinity (as CaC0}_3)}$$

Cl^- expressed as mg/L chloride
SO_4^{-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 $CaCO_3$.

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 $CaCO_3$.

d) The following may be used to determine deposition of excess $CaCO_3$ 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 $CaCO_3$.

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 $CaCO_3$.

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 $CaCO_3$) - Initial mg/L alkalinity (as $CaCO_3$)

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~~is not applicable~~ 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. _____, effective _____)

SUBPART J: OTHER TREATMENT

Section 604.1005 Anion Exchange

a) Pre-treatment Requirements. Pre-treatment under Section 604.1010 is required when a combination of iron and manganese exceeds 0.5 mg/L.

b) Anion Exchange Treatment Design

1) Automatic regeneration based on volume of water treated must be used unless manual regeneration is justified and is approved by the Agency.

2) If a portion of the water is bypassed around the units and blended with treated water, the following requirements must be met:

A) the maximum blend ratio allowable must be determined based on the highest anticipated raw water nitrate level; and

B) a totalizing meter and a proportioning or regulating device or flow regulating valves must be provided on the bypass line.

3) A manual override must be provided on all automatic controls.

4) Adequate freeboard must be provided to accommodate the backwash flow rate of the unit, ensuring the resin will not overflow. The freeboard must be calculated based on the size and specific gravity of the resin.

5) The system must be designed to include an adequate under drain and supporting gravel system and brine distribution equipment.

6) Sampling Taps

A) Smooth-nosed sampling taps must be provided for the collection of representative samples.

B) The taps must be located to provide for sampling of the softener influent, effluent, and blended water.

C) The sampling taps for the blended water must be at least 20 feet downstream from the point of blending.

D) Petcocks are not acceptable as sampling taps.

7) Brine and Salt Storage Tanks~~:~~

A) Salt dissolving or brine tanks and wet salt storage tanks must be covered and must be corrosion-resistant~~corrosion resistant~~.

B) The make-up water inlet must be protected from back-siphonage~~back siphonage~~. Water for filling the tank must be distributed over the entire surface by pipes above the maximum brine level in the tank. An automatic declining level control system on the make-up water line is recommended.

C) Wet salt storage basins must be equipped with manholes or hatchways for access and for direct dumping of salt from truck or railcar. Openings must be provided with raised curbs and watertight covers having overlapping edges similar to those required for finished water reservoirs.

D) Overflows, where provided, must be protected with corrosion-resistant~~corrosion resistant~~ screens and must terminate with either a turned downward bend having a proper free fall discharge or a self-closing flap valve.

E) The salt must be supported on graduated layers of gravel placed over a brine collection system.

F) Alternative designs that are conducive to frequent cleaning of the wet salt storage tank may be approved by the Agency.

G) Total salt storage must provide for at least 30 days of operation.

c) Exchange Capacity. The design capacity for nitrate removal must not exceed 10,000 grains per cubic foot when the resin is regenerated at 15 pounds of salt per cubic foot of resin.

d) Number of Units. At least two units must be provided. The treatment capacity must be capable of producing the maximum average daily demand at a level below the nitrate/nitrite MCL, with one exchange unit out of service.

e) Type of Media. The anion exchange media must be of the nitrate selective type.

f) Flow Rates. Unless otherwise approved by the Agency under Section 604.145(b), the following flow rates apply:

1) The treatment flow rate must not exceed 5 gal/min/ft^2 of bed area.

2) The backwash flow rate must be between 4.0 and 6.0 gal/min/ft^2 of bed area.

3) The regeneration rate must be approximately 1.0 gal/min/ft^2 of bed area with a fast rinse approximately equal to the service flow rate.

g) Cross-Connection~~Cross Connection~~ Control. Backwash, rinse, and air relief discharge pipes must be installed to prevent any possibility of back-siphonage.

h) Construction Materials. Pipes and contact materials must be resistant to the aggressiveness of salt. Plastic and red brass are acceptable materials. Steel and concrete must be coated with a non-leaching protective coating that is compatible with salt and brine.

i) Housing. Dry bulk salt storage must be enclosed and separated from other operating areas to prevent damage to equipment.

j) Preconditioning of the Media. Prior to startup of the equipment, the media must be regenerated with no less than two bed volumes of water containing sodium chloride followed by an adequate rinse.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.1010 Iron and Manganese Control

a) Except as provided in 35 Ill. Adm. Code 611.300(e), treatment is required to meet the iron and manganese MCL as stated in Section 611.300(b).

b) Removal of Iron and Manganese by Oxidation, Detention, and Filtration

1) Oxidation must be by aeration, as indicated in Subpart D, unless the community water supply demonstrates chemical oxidation provides equivalent results to aeration. Chemicals that may be used for oxidation include chlorine, sodium permanganate, potassium permanganate, ozone, or chlorine dioxide.

2) Detention

A) A minimum detention time of 30 minutes must be provided following aeration to ensure that the oxidation reactions are complete prior to filtration. This minimum detention time may be modified only when a pilot plant study indicates completion of oxidation reactions in less time.

B) The reaction tank/detention basin must be provided with an overflow, vents, and access hatches~~vent and access hatch~~ in accordance with Subpart M.

3) Filtration. Filters must conform to Subpart F.

c) Removal by Manganese Greensand or Manganese Coated Media Filtration~~.~~

1) Permanganate or chlorine must be added to the water upstream of the filter, per the manufacturer's recommendation.

2) An anthracite media cap of at least six inches must be provided over manganese greensand.

3) Normal backwash rate is 8 gal/min/ft^2 with filters containing manganese greensand and 15 gal/min with manganese coated media.

4) Sample taps must be provided:

A) prior to application of permanganate;

B) immediately ahead of filtration;

C) at points between the anthracite media and the manganese greensand;

D) halfway down the manganese greensand; and

E) at the filter effluent.

d) Sequestration of Iron or~~and/or~~ Manganese by Polyphosphates

1) Sequestration by polyphosphates must not be used when the combination of iron and manganese exceeds 1 mg/L.

2) Phosphate solution must be kept covered and disinfected by carrying approximately 10 mg/L free chlorine residual unless the phosphate is not able to support bacterial growth and the phosphate is being fed from the covered shipping container. Phosphate solutions having a pH of 2.0 or less may also be exempted from this requirement by the Agency.

3) Polyphosphates must not be applied ahead of iron and manganese removal treatment. The point of application must be prior to aeration, oxidation, or disinfection.

4) The phosphate feed point must be located as far ahead of the oxidant feed point as possible.

e) Sequestration of Iron or~~and/or~~ Manganese by Sodium Silicates:

1) Sequestration by sodium silicate must not be used when iron, manganese, or a combination of iron and manganese exceeds 2 mg/L.

2) A full-scale demonstration will be required to determine the suitability of sodium silicate for the particular water and the minimum feed needed.

3) Chlorine or chlorine dioxide addition must accompany the sodium silicate addition.

4) Sodium silicate must not be applied ahead of iron or manganese removal treatment.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART K: CHEMICAL APPLICATION

Section 604.1105 Feed Equipment and Chemical Storage

a) Solution Feed Equipment~~.~~

1) Corrosion-resistant~~Corrosion resistant~~ containers must be provided for solution feeders.

2) Containers must have non-corrodible covers with overhanging edges. Openings must be constructed to prevent contamination.

3) Scales or a volumetric measuring device must be provided for determining the amount of solution fed.

b) Feeder Redundancy

1) When chemical feed is necessary for the protection of the supply, such as chlorination, coagulation, or other essential processes:

A) a minimum of two feeders must be provided with each having adequate capacity to provide the maximum dosage necessary; and

B) the standby unit or a combination of units of sufficient size to meet capacity must be provided to replace the largest unit when out of service.

2) A separate feeder must be used for each chemical applied.

3) Each chemical feeder and day tank must be identified with its content.

4) Spare parts must be available on site for all feeders and chemical booster pumps to replace parts that are subject to wear and damage.

c) Control

1) At automatically operated facilities:

A) The automatic controls must be designed to allow override by manual controls.

B) Chemical feeders must be electrically interconnected with the well or service pump so that they will not operate if the well or service pump is not operating.

2) Chemical feed rates must be proportional to the flow stream to achieve the appropriate dose of chemical application.

3) A means to measure the water flow stream being dosed must be provided to determine chemical feed rates.

4) Provisions must be made for measuring the quantities of chemicals used.

5) Weighing Scales

A) Weighing scales must be capable of providing reasonable precision for the~~in relation to~~ average daily dose.

B) Unless otherwise approved by the Agency under Section 604.145(b), treatment chemicals in a gaseous state must be weighed;

C) Fluoride solution fed from supply drums or carboys must be weighed; and

D) Volumetric dry chemical feeders must be weighed unless otherwise approved by the Agency under Section 604.145(b).

d) Dry chemical feeders must:

1) measure chemicals volumetrically or gravimetrically;

2) provide adequate water and agitation of the chemical within the slurry tank; and

3) completely enclose chemicals to prevent the emission of dust to the operating room.

e) Positive Displacement Solution Pumps

1) Positive displacement type solution feed pumps may be used to feed liquid chemicals, but must not be used to feed chemical slurries.

2) Pumps must be capable of operating at the required maximum rate against the maximum head conditions found at the point of injection.

3) Calibration tubes or mass flow monitors that allow for direct physical measurement of actual feed rates must be provided.

f) To ensure that chemical solutions cannot be siphoned or overfed into the water supply, liquid chemical feeders must:

1) assure discharge at a point of positive pressure;

2) provide vacuum relief; or

3) provide a suitable air gap or anti-siphon device.

g) Cross-connection~~Cross connection~~ control must be provided to assure that:

1) the make-up water lines discharging to liquid storage tanks must be properly protected from backflow;

2) no direct connection exists between any sewer and a drain or overflow from a chemical feed system; and

3) all overflows and drains from a chemical field system must have an air gap~~airgap~~ above the sewer or overflow rim of a receiving sump.

h) Chemical feed equipment location must be readily accessible for servicing, repair, and observation of operation.

i) Make-up-water lines must be:

1) obtained from the finished water supply, or from a location sufficiently downstream of any chemical feed point to assure adequate mixing; and

2) ample in quantity and adequate in pressure.

j) Storage of Chemicals

1) Space must be provided for:

A) at least 30 days of chemical supply;

B) convenient and efficient handling of chemicals;

C) dry storage conditions; and

D) a minimum storage volume of 1.5 times the gross shipping volume.

2) Offloading areas must be clearly labeled to prevent accidental cross-contamination.

3) Chemicals must not be stored in confined spaces.

4) Chemicals must be stored in covered or unopened shipping containers, unless the chemical is transferred into an approved storage unit.

5) Feed equipment and storage chemicals must be stored inside a building unless otherwise approved by the Agency under Section 604.145(b).

6) Liquid chemical storage tanks must have a liquid level indicator.

7) Secondary Containment

A) Liquid chemical storage tanks must have secondary containment consisting of an overflow and a receiving basin capable of receiving accidental spills or overflows without uncontrolled discharge.

B) A common receiving basin may be provided for each group of compatible chemicals that provides sufficient containment volume to prevent accidental discharge in the event of failure of the largest tank. Groups of compatible chemicals are as follows: acids, bases, salts and polymers, absorption powders, oxidizing powders, and compressed gases.

8) Vents from storage tanks must have a corrosion resistant~~corrosion resistant~~ 24 mesh screen.

k) Bulk Liquid Storage Tanks

1) A uniform strength of chemical solution must be maintained. Continuous agitation must be provided to maintain slurries in suspension.

2) A means to assure continuity of chemical supply must be provided.

3) Means must be provided to measure the liquid level in the tank.

4) Liquid storage tanks including any access openings must be kept securely covered.

5) Overflow pipes, when provided, must:

A) be turned downward, with the end screened;

B) have a free fall discharge; and

C) be located where noticeable.

6) Liquid storage tanks must be vented, but not through vents in common with other chemicals or day tanks.

7) Each liquid storage tank must be provided with a valved drain in accordance with subsection (g).

8) Solution tanks must be located, and protective curbings provided, so that chemicals from equipment failure, spillage, or accidental drainage do not enter the water in conduits or ~~,~~ treatment or storage basins. Chemicals must be stored as required by subsection (j)(5).

l) Day Tanks

1) Day tanks must be provided where bulk storage of liquid chemical is provided.

2) Day tanks must meet all the requirements of subsection (k), except that shipping containers do not require overflow pipes and subsection drains.

3) Day tanks must be scale-mounted~~,~~ or, if the liquid level can be observed in a gauge tube or through translucent sidewalls of the tank, have a calibrated gauge painted or mounted on the side ~~if liquid level can be observed in a gauge tube or through translucent sidewalls of the tank~~. In opaque tanks, a gauge rod may be used. The ratio of the area of the tank to its height must

be such that unit readings are meaningful in relation to the total amount of chemical fed during a day.

4) Except for fluosilicic acid, hand pumps may be provided for transfer from a shipping container. When motor-driven transfer pumps are provided, a liquid level limit switch must be provided.

5) Tanks and tank refilling line entry points must be clearly labeled with the name of the chemical contained.

6) Filling of day tanks must not be automated.

m) Feed lines must be:

1) of durable, corrosion-resistant material;

2) protected against freezing;

3) designed to prevent clogging; and

4) color-coded~~color coded~~ and labeled in accordance with Section 604.120.

n) Handling. Provision must be made for the proper transfer of dry chemicals from shipping containers to storage bins or hoppers, in such a way as to minimize the quantity of dust that may enter the room.

o) Housing

1) Floor surfaces must be smooth and impervious, slip-proof, and well-drained~~well drained~~.

2) Vents from feeders, storage facilities, and equipment exhaust must discharge to the outside atmosphere above grade and remote from air intakes.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART M: STORAGE

Section 604.1350 Combination Pressure Tanks and Ground Storage

A combination of ground storage, hydropneumatic storage, and pumps may be considered in water systems for maintaining pressure on the distribution system. Design of such a system must include:

a) a minimum ground storage volume equivalent to 1.5 times the average daily usage;

b) a minimum of two pumps, each capable of meeting the peak hourly flow provided in Section 604.115(d). If more than two pumps are proposed, the peak hourly flow must be met when any pump is out of service;

c) an electric generator with an automatic start capable of providing power to pumps that can produce the peak hourly flow ~~as~~ provided in Section 604.115(d), plus sufficient power to operate all chemical feeders, appurtenances, and equipment essential to plant operation. Consideration must be given to sizing the generator to provide power for at least one well; and

d) a hydropneumatic tank sized to provide service for a minimum of 10 minutes under the peak hourly flow provided in Section 604.115(d).

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART O: CROSS CONNECTIONS

Section 604.1510 Cross-Connection~~Cross Connection~~ Control Device Inspectors

a) Except as provided in subsection (c), cross-connection~~cross connection~~ control devices must be inspected at least annually by a person approved by the Agency or its designee as a cross-connection~~cross connection~~ control device inspector (CCCDI). The inspection of mechanical devices must include physical testing in accordance with the manufacturer's instructions.

1) Records of the annual inspection must be submitted to the community water supply.

2) Each device inspected must have a tag attached listing the date of the most recent test, name of CCCDI, and type and date of repairs.

3) A maintenance log must be maintained at the site of installation and must include:

A) make, model, and serial number of the backflow preventer, and its location at the site;

B) date of each test;

C) name and approval number of the person performing the test;

D) type of test kit used and date of its most recent calibration;

E) test results and a brief statement indicating whether the results pass or fail the test;

F) repairs or servicing required;

G) repairs and date completed; and

H) servicing performed and date completed.

b) Requirements for Cross-Connection~~Cross Connection~~ Control Device Inspector Approval

1) Each applicant for CCCDI Approval must:

A) be a person authorized to perform plumbing as described in the Illinois Plumbing License Law [225 ILCS 320/3(1)].

B) complete a training course offered by the Environmental Resources Training Center (see 110 ILCS 530 and https://www.siue.edu/ertc) or the Agency's delegate on cross-connection~~cross connection~~ control devices~~device~~ that includes hands-on~~hands on~~ practice testing of different types of backflow devices and proper maintenance and repair.

C) apply~~complete and submit an application~~ for CCCDI Approval.

D) successfully complete both written and performance examinations demonstrating competency in the following: the principles of

backflow and back-siphonage; the hazard presented to a potable water system; locations that require installation of cross-connection~~cross-connection~~ control devices; identifying, locating, inspecting, testing, maintaining and repairing cross-connection control methods and devices in-line, as located throughout each system that connects to a community public water supply. The applicant must successfully complete:

i) the written examination with a minimum score of 75%; and

ii) a performance-based examination by demonstrating competency in testing device procedures on all types of devices at the examination center.

2) CCCDIs must renew the CCCDI Approval each year between May 1 and June 30. An application for CCCDI renewal will be sent by the Agency or its designee, and must be completed and returned by June 30 of the renewal year. CCCDIs must complete an eight-hour recertification course every three years from the date of the original issuance of the CCCDI license. The course must be offered by the Environmental Resources Training Center or the Agency's delegate and include a written and practical exam demonstrating competency in backflow prevention testing.

3) A CCCDI Approval or admission to an examination for CCCDI Approval must be suspended, revoked, or not issued by the Agency for any one or more of the following causes:

A) Practice of any fraud or deceit in obtaining or attempting to obtain a CCCDI Approval, including misrepresentation of approval;

B) Any repeated, flagrant, or willful negligence or misconduct in the inspection, testing, or maintenance of cross-connection~~cross connection~~ control devices;

C) Falsification of reports required by this Part;

D) Willful violation of the Environmental Protection Act or any rules adopted under it.

4) Suspension and Revocation Procedures

A) Any person may file with the Agency a written complaint regarding the conduct of a CCCDI approved under this Part. The complaint must state the name and address of the complainant, the name of the CCCDI, and all information that supports the complaint.

B) The Agency may initiate the suspension or revocation procedure based on~~on the basis~~ of any written complaint or on its own motion. The Agency's decision to institute suspension or revocation proceedings will be based on the seriousness of the violation and its potential deleterious impact on~~upon~~ public health and safety.

C) When the suspension or revocation procedure is initiated, the Agency must notify the CCCDI by certified mail that suspension or revocation is being sought. The notice must specify the cause upon which suspension or revocation is sought and include the procedures for requesting a hearing before the Agency. A request~~Request~~ for hearing must be made in writing within 14 days after receipt of the Agency's certified notification. If no hearing is requested, the Agency will suspend or revoke the CCCDI Approval.

D) If a hearing is~~Should a hearing be~~ requested, the Director must appoint one or more Agency employees to chair the proceedings. The hearing must be conducted according to the hearing requirements of 35 Ill. Adm. Code 168.

E) The Director must make a decision within 30 days after receiving the hearing transcript. The Director must give written notice of that decision and reasons for the decision to the CCCDI by certified mail.

F) Within 30 days after receiving a notice of suspension or revocation from the Agency, the CCCDI may appeal the suspension or revocation to the Pollution Control Board. The suspension or revocation of the CCCDI's Approval must be stayed pending a final decision on the appeal by the Board.

c) Backflow preventers located in the treatment plant, wellhouse, or booster station of a community public water supply facility must be inspected at least annually by either an approved CCCDI or by a certified water supply operator who has completed the qualifications listed in subsections (b)(1)(B) and (D).

1) When the inspection is conducted by a certified water supply operator who has completed the necessary qualifications, records must be kept as required by subsection (a)(3).

2) Each device inspected must have a tag attached listing the date of the most recent test, name of the CCCDI, and type and date of repairs.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.1520 COVID-19 Emergency Provisions (Repealed)

~~Due to the public health emergency related to the COVID-19 outbreak, the CCCDI approval renewal application deadlines for 2020 pursuant to Section 604.1510(b)(2) are extended. For renewal year 2020, CCCDIs must renew their CCCDI Approval between August 31 and October 30. An application for CCCDI renewal will be sent by the Agency or its designee and must be completed and returned by October 30, 2020.~~

(Source: Repealed at 47 Ill. Reg. _____, effective _____)

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE F: PUBLIC WATER SUPPLIES
CHAPTER I: POLLUTION CONTROL BOARD

PART 604
DESIGN, OPERATION, AND MAINTENANCE CRITERIA

SUBPART A: GENERAL PROVISIONS

SUBPART B: SOURCE DEVELOPMENT

SUBPART C: SOURCE WATER PROTECTION PLAN

SUBTITLE F

SUBPART D: AERATION

SUBPART E: CLARIFICATION

SUBPART F: FILTRATION

SUBPART G: DISINFECTION

SUBTITLE F

SUBPART H: SOFTENING

SUBPART I: STABILIZATION

SUBPART J: OTHER TREATMENT

SUBPART K: CHEMICAL APPLICATION

SUBPART L: PUMPING FACILITIES

SUBPART M: STORAGE

SUBPART N: DISTRIBUTION

SUBPART O: CROSS CONNECTIONS

AUTHORITY: Implementing Section 14-19 and authorized by Section 27 of the Illinois Environmental Protection Act [415 ILCS 5/17 and 27].

SOURCE: Adopted in R18-17 at 43 Ill. Reg. 8064, effective July 26, 2019; emergency amendment in R20-20 at 44 Ill. Reg. 7777, effective April 17, 2020, for a maximum of 150 days; amended in R20-21 at 44 Ill. Reg. 14736, effective August 27, 2020; amended in R18-25 at 47 Ill. Reg. _____, effective _____.

Section 604.255 Well Pumps, Discharge Piping, and Appurtenances

a) Where line shaft pumps are used:

1) the casing must be firmly connected to the pump structure or have the casing inserted into a recess extending at least one-half inch into the pump base;

2) the pump foundation and base must be at least six inches above the finished floor elevation; and

3) lubricants must comply with Section 604.105(f).

b) Where a submersible pump is used:

1) the top of the casing must be effectively sealed to prohibit the entrance of water under all conditions of vibration or movement of conductors or cables;

2) the electrical cable must be firmly attached to the riser pipe at 20-foot intervals or less; and

3) mercury seals must not be used when an existing submersible pump is replaced or a new submersible pump is installed.

c) Discharge Piping

1) The discharge piping for each well must:

A) be designed to minimize friction loss;

B) be equipped with a check valve in or at the well, a shutoff valve, a pressure gauge, and a means of measuring flow;

C) be protected from the entrance of contamination;

D) have control valves and appurtenances located above the pumphouse floor when an above-ground discharge is provided;

E) be equipped with a smooth-nosed sampling tap at least 18 inches above the floor to facilitate sample collection, located at a point

where positive pressure is maintained but before any treatment chemicals are applied;

F) when necessary to remove entrapped air from the well, be equipped with an air release-vacuum relief valve located upstream from the check valve, with exhaust/relief piping terminating in a down-turned position at least 18 inches above the floor and covered with a 24 mesh, corrosion-resistant screen;

G) be valved to permit test pumping and control of each well;

H) have all exposed piping, valves, and appurtenances protected against physical damage and freezing;

I) be anchored to prevent movement and be supported to prevent excessive bending forces;

J) be protected against surge or water hammer; and

K) be constructed so that it can be disconnected from the well or well pump to allow the well pump to be pulled.

2) The well must have a means of pumping to waste that is not directly connected to a sewer.

3) The discharge, drop, or column piping inside the well for submersible, submersible jet, and submersible line shaft pumps must:

A) be capable of supporting the weight of the submersible pump, piping, water, and appurtenances, and of withstanding the thrust, torque, torque fatigue, and other reaction loads created during pumping; and

B) use lubricants, fittings, brackets, tape, or other appurtenances that comply with Section 604.105(f).

d) Pitless Well Units

1) Pitless units must:

A) be shop-fabricated from the point of connection with the well casing to the unit cap or cover;

B) be threaded or welded to the well casing;

C) be of watertight construction throughout;

D) be of materials and weight at least equivalent and compatible to the casing;

E) have field connection to the lateral discharge from the pitless unit of threaded, flanged, or mechanical joint connection; and

F) terminate at least 18 inches above final ground elevation or three feet above the 100-year flood level or the highest known flood elevation, whichever is higher.

2) The design of the pitless unit must make provision for:

A) access to disinfect the well;

B) a properly constructed casing vent meeting the requirements of subsection (e);

C) facilities to measure water levels in the well, under subsection (f);

D) a cover at the upper terminal of the well that will prevent the entrance of contamination;

E) a contamination-proof entrance connection for electrical cable;

F) an inside diameter as great as that of the well casing to facilitate work and repair on the well, pump, or well screen; and

G) at least one check valve within the well casing.

3) If the connection to the casing is by field weld, the shop-assembled unit must be designed specifically for field welding to the casing. The only field welding permitted will be that needed to connect a pitless unit to the casing.

e) Casing Vent

1) Well casing must be vented to the atmosphere.

2) The vent must terminate in a downturned position, at or above the top of the casing or pitless unit, no less than 12 inches above grade or floor, in a minimum 1½-inch diameter opening covered with a 24 mesh, corrosion-resistant screen.

3) The pipe connecting the casing to the vent must be of adequate size to provide rapid venting of the casing.

4) Where vertical turbine pumps are used, vents may be placed into the side of the casing.

f) Water Level Measurement

1) Each well must be equipped with a means for taking water level measurements.

2) Where pneumatic water level measuring equipment is used, it must be made using corrosion-resistant materials and attached firmly to the drop pipe or pump column to prevent the entrance of foreign materials.

g) Observation wells must meet the requirements in 77 Ill. Adm. Code 920.170.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.315 Source Water Assessment

a) The source water assessment must contain the following information:

1) a statement of the importance of the source water;

2) a list of water supplies that obtain water from this community water supply;

3) a delineation of all sources of water used by the community water supply, including:

A) for surface water, description of the watershed, map of the watershed, and intake locations;

B) for groundwater, the well identification number, well description, well status, and well depth; a description of setback zones; and a description of the aquifer for each well;

4) a report on the quality of the source water for all sources of water delineated in subsection (a)(3), including:

A) when and where samples used to determine the quality of the source water were taken. These samples must be tested by a certified laboratory; and

B) the certified laboratory's results;

5) a report on the quality of the finished water;

6) an identification of potential sources of contamination to the source water;

7) the analysis of the source water's susceptibility to contamination; and

8) an explanation of the community water supply's efforts to protect its source water.

b) Upon request, the Agency will provide technical assistance to a community water supply in conducting the source water assessment.

c) A community water supply may use a Source Water Assessment Program Fact Sheet prepared by the Agency to fulfill the requirements of this Section.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.525 Tube or Plate Settlers

a) Settler units consisting of variously shaped tubes or plates installed in multiple layers and at an angle to the flow may be used for sedimentation, following flocculation.

b) Tube or plate settlers must meet the following requirements:

1) Inlet and outlet design must maintain velocities suitable for settling in the basin and to minimize short-circuiting;

2) Plate units must be designed to minimize maldistribution across the units;

3) Drain piping from settler units must be sized to facilitate a quick flush of the settler units and to prevent flooding of other portions of the plant;

4) Outdoor installations must be protected against freezing, including sufficient freeboard above the top of the settlers;

5) Tubes must have a maximum application rate of 2 gpm per square foot of cross-sectional area, unless higher rates are shown through pilot plant or in-plant demonstration studies;

6) Plates must have a maximum application rate of 0.5 gpm per square foot, based on 80 percent of the projected horizontal plate area;

7) Flushing lines must be provided to facilitate maintenance and must be properly protected against backflow or back-siphonage;

8) Inlets and outlets must conform with Section 604.515(b) and (d);

9) The units' support system must be able to carry the weight of the settler units when the basin is drained plus any additional weight to support maintenance; and

10) Settler units must accommodate:

A) A water or air jet system for cleaning their tubes or plates; and

B) Dropping their water level to allow cleaning with the system identified in subsection (b)(10)(A).

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.605 Rapid Rate Gravity Filters

a) The use of rapid rate gravity filters requires pretreatment.

b) For community water supplies treating surface water, groundwater under the direct influence of surface water, or using lime soda softening treatment, unless otherwise approved by the Agency under Section 604.145(b), the nominal filtration rates must not exceed 3 gal/min/ft^2 of filter area for single media filters and 5 gal/min/ft^2 for multi-media filters. Filtration rates must be reduced when treated water turbidity exceeds the standards in 35 Ill. Adm. Code 611.

c) For community water supplies treating groundwater and not using lime soda softening treatment, unless otherwise approved by the Agency under Section 604.145(b), the rate of filtration must not exceed 4 gal/min/ft^2 of filter area.

d) Number of Filter Units

1) A minimum of two units must be provided. Each unit must be capable of meeting the plant design capacity or the projected maximum daily demand at the approved filtration rate.

2) Where more than two filter units are provided, the filters must be capable of meeting the plant design capacity at the approved filtration rate with one filter removed from service.

3) Where declining rate filtration is provided, the variable aspect of filtration rates and the number of filters must be considered when determining the design capacity for the filters.

e) Structural Details and Hydraulics. The filter structure must be designed to provide for the following:

1) vertical walls within the filter;

2) no protrusion of the filter walls into the filter media;

3) cover by superstructure;

4) head and walking room to permit normal inspection and operation;

5) minimum depth of filter box of 8.5 feet;

6) minimum water depth over the surface of the filter media of 3 feet;

7) trapped effluent to prevent backflow of air to the bottom of the filters;

8) prevention of floor drainage to the filter with a minimum 4-inch curb around the filters;

9) prevention of flooding by providing overflow;

10) maximum velocity of treated water in pipe and conduits to filters of 2 ft/sec;

11) cleanouts and straight alignment for influent pipes or conduits where solids loading is heavy, or following lime soda softening;

12) construction to prevent cross-connections, short-circuiting, or common walls between potable and non-potable water; and

13) wash water drain capacity to carry maximum flow.

f) Wash water troughs must be constructed such that:

1) the bottom elevation is above the maximum level of expanded media during washing;

2) a 2-inch freeboard is provided at the maximum rate of wash;

3) the top edge is level and is all at the same elevation;

4) troughs are spaced so that each trough serves the same number of square feet of filter area; and

5) the maximum horizontal travel of suspended particles to reach the trough does not exceed 3 feet.

g) The filter media must be composed of clean silica sand or other natural or synthetic media free from detrimental chemical or bacterial contaminants and must meet the following requirements:

1) a total depth of not less than 24 inches;

2) a uniformity coefficient of the smallest material not greater than 1.65;

3) a minimum of 12 inches of media with an effective size range of 0.45 mm to 0.55 mm;

4) filter media specifications:

A) Filter anthracite must consist of hard, durable anthracite coal particles of various sizes. Blending of non-anthracite material is not acceptable. Anthracite must have:

i) an effective size of 0.45 mm to 0.55 mm with a uniformity coefficient not greater than 1.65 when used alone;

ii) an effective size of 0.8 mm to 1.2 mm with a uniformity coefficient not greater than 1.7 when used as a cap;

iii) an effective size less than 0.8 mm for anthracite used as a single media on potable groundwater for iron and manganese removal only (effective sizes greater than 0.8 mm may be approved based upon on-site pilot plant studies);

iv) a specific gravity greater than 1.4;

v) an acid solubility less than 5 percent; and

vi) a Moh's scale of hardness greater than 2.7.

B) Sand must have:

i) an effective size of 0.45 mm to 0.55 mm;

ii) a uniformity coefficient of not greater than 1.65;

iii) a specific gravity greater than 2.5; and

iv) an acid solubility less than 5 percent.

C) High-density sand must consist of hard, durable, and dense grain garnet, ilmenite, hematite or magnetite, or associated minerals of those ores that will resist degradation during handling and use, and must:

i) contain at least 95 percent of the associated material with a specific gravity of 3.8 or higher;

ii) have an effective size of 0.2 to 0.3 mm;

iii) have a uniformity coefficient of not greater than 1.65; and

iv) have an acid solubility less than 5 percent.

D) Granular activated carbon as a single media may be considered for filtration only after pilot or full-scale testing and with prior approval of the Agency. The design must include the following:

i) The media must meet the basic specifications for filter media in subsections (g)(1) through (g)(3).

ii) There must be provisions for a free chlorine residual and adequate contact time in the water following the filters and prior to distribution.

iii) Provisions must be made for frequent replacement or regeneration.

E) Other media types or characteristics must be approved by the Agency;

5) supporting media designed as follows based on the type of filter material:

A) A three-inch layer of torpedo sand must be used as a supporting media for filter sand when supporting gravel is used, and must have:

i) an effective size of 0.8 mm to 2.0 mm; and

ii) a uniformity coefficient not greater than 1.7.

B) Gravel

i) When gravel is used as the supporting media, it must consist of cleaned and washed, hard, durable, rounded silica particles and must not include flat or elongated particles.

ii) The coarsest gravel must be 2.5 inches in size when the gravel rests directly on a lateral system, and must extend above the top of the perforated laterals.

iii) Not less than four layers of gravel must be provided in accordance with the following size and depth distribution:

Size	**Depth**
2½ to 1½ inches	5 to 8 inches
1½ to ¾ inches	3 to 5 inches
¾ to ½ inches	3 to 5 inches
½ to 3/16 inches	2 to 3 inches
3/16 to 3/32 inches	2 to 3 inches

iv) Reduction of gravel depths and other size gradations may be approved by the Agency upon justification for slow sand filtration or when proprietary filter bottoms are specified.

h) Filter Bottoms and Strainer Systems

1) Water quality must be reviewed before the use of porous plate bottoms to prevent clogging and failure of the underdrain system.

2) The design of manifold type collection systems must:

A) minimize loss of head in the manifold and laterals;

B) ensure even distribution of washwater and even rate of filtration over the entire area of the filter;

C) provide the ratio of the area of the strainer systems' final openings to the area of the filter at about 0.003;

D) provide the total cross-sectional area of the laterals at about twice the total area of the final openings;

E) provide the cross-sectional area of the manifold at 1.5 to 2 times the total area of the laterals; and

F) direct lateral perforations without strainers downward.

3) The Agency may approve departures from these standards for high-rate filters and propriety bottoms.

i) The following appurtenances must be provided for every filter:

1) influent and effluent sampling taps;

2) a gauge indicating loss of head;

3) a meter indicating the instantaneous rate of flow;

4) a pipe for filtering to waste that has a six-inch or larger air gap, or other Agency-approved cross-connection control measure;

5) a continuously recording Nephelometer capable of measuring and recording filter effluent turbidity at maximum 15-minute intervals, and with alarm capability to notify the operator if filtered water turbidity exceeds 0.3 NTU (Nephelometric Units);

6) an adjustable-rate valve to allow the operator to gradually control the flow rate increase when placing the filters back into operation; and

7) a hose and storage rack for washing filter walls.

j) Backwash. Provisions must be made for washing filters as prescribed in this subsection.

1) The community water supply must use filtered water provided at the required rate by washwater tanks or a dedicated washwater pump to wash the filters.

2) Backwash rate must meet the following requirements:

A) a minimum rate of 15 gal/min/ft^2, consistent with water temperatures and specific gravity of the filter media;

B) a rate sufficient to provide for a 50 percent expansion of the filter bed; and

C) a reduced rate of 10 gal/min/ft^2 for full depth anthracite or granular activated carbon filters, upon approval by the Agency.

3) Washwater pumps in duplicate must be provided unless an alternate means of obtaining washwater is available.

4) The main washwater line must have a regulator or valve to obtain the desired rate of filter wash with the washwater valves on the individual filters open wide.

5) The main washwater line or backwash waste line must have a rate of flow indicator, preferably with a totalizer, located so that it can be easily read by the operator during the washing process.

6) Rapid changes in backwash water flow must be prevented.

7) Backwash must be completed with an operator in attendance to initiate the backwash cycle and to control the return-to-service procedure to assure that the effluent turbidity is less than 0.3 NTU when the filter is placed back into operation for discharge to the clearwell.

8) Appropriate measures for cross-connection control must be provided.

k) Surface or subsurface wash facilities are required except for filters used exclusively for iron, radionuclides, arsenic, or manganese removal. Wash facilities may include a system of fixed nozzles or a revolving-type apparatus. All devices must be designed:

1) to provide water pressures of at least 45 psi;

2) to prevent back-siphonage by properly installing a vacuum breaker or other approved device, if connected to the treated water system; and

3) to provide a rate of flow of 2.0 gpm/ft^2 of filter area with fixed nozzles or 0.5 gpm/ft^2 with revolving arms.

l) Air scouring may be used in place of surface wash if the air scouring meets the following requirements:

1) Air flow for air scouring the filter must be 3 to 5 $ft^3/min/ft^2$ of filter area when the air is introduced into the underdrain; a lower air rate must be used when the air scour distribution system is placed above the underdrains;

2) A method to avoid filter media loss during backwashing must be provided;

3) Air scouring must be followed by a fluidization wash sufficient to restratify the media;

4) Air must be free from contamination;

5) If air scour distribution systems are placed at the media and supporting bed interface, the air scour nozzles must be designed to prevent media from clogging the nozzles or the air entering the air distribution system;

6) Piping for the air distribution system must not be flexible hose or other soft material;

7) Air delivery piping must not:

A) pass down through the filter media; and

B) have any arrangement in the filter design that would allow short-circuiting between the applied unfiltered water and the filtered water;

8) When air scouring is being used, the backwash rate must be variable and must not exceed 8 gal/min, unless a higher rate is necessary to remove scoured particles from filter media surfaces; and

9) Air scouring piping must not be installed in the underdrain unless the underdrain was designed to accommodate the piping.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.735 Chlorinator Piping

a) Cross-Connection Protection

1) The chlorinator piping must be designed to prevent contamination of the treated water.

2) For all systems required to disinfect under Section 604.700, piping must be arranged to prevent backflow or back-siphonage between multiple points of chlorine application.

3) The water supply to each eductor must have a separate shutoff valve.

b) Pipe Material

1) The pipes carrying elemental liquid or dry gaseous chlorine under pressure must be Schedule 80 seamless steel tubing or other materials recommended by The Chlorine Institute in Pamphlet 6, Piping Systems for Dry Chlorine, incorporated by reference in 35 Ill. Adm. Code 601.115. These pipes must not be PVC.

2) Rubber, PVC, polyethylene (PE), or other materials recommended by The Chlorine Institute must be used for chlorine solution piping and fittings.

3) Nylon products are not acceptable for any part of the chlorine solution piping system.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.805 Cation Exchange Process

a) Pre-treatment under Section 604.1010(b) or (c) is required when the content of iron, manganese, or a combination of the two is 1 mg/L or more.

b) Design requirements must provide:

1) automatic regeneration based on the volume of water softened; and

2) a manual override on all automatic controls.

c) The design capacity for hardness removal must not exceed 20,000 grains per cubic foot when resin is regenerated with 0.3 pounds of salt per 1000 grains of hardness removed.

d) The depth of the exchange resin must not be less than 3 feet.

e) Flow Rates

1) The rate of softening must not exceed 7 gal/min/ft^2 of bed area.

2) The backwash rate must be 6 to 8 gal/min/ft^2 of bed area.

3) Rate of flow controllers or the equivalent must be installed.

f) The freeboard must be calculated based on the size and specific gravity of the resin and the direction of water flow. Unless otherwise approved by the Agency under Section 604.145(b), the washwater collector must be 24 inches above the top of the resin on downflow units.

g) The bottoms, strainer systems, and support for the exchange resin must conform to the criteria provided for rapid rate gravity filters in Section 604.605(f) and (g).

h) Brine must be evenly distributed over the entire surface of both upflow and downflow units.

i) Backwash, rinse, and air relief discharge pipes must be installed to prevent any possibility of back-siphonage.

j) Bypass Piping and Equipment

1) Bypass must be provided around softening units to produce a blended water of desirable hardness.

2) Totalizing meters must be installed on the bypass line and on each softener unit.

3) The bypass line must have a shutoff valve. An automatic proportioning or regulating device is recommended.

k) When the applied water contains a chlorine residual, the cation exchange resin must be a type that is not damaged by residual chlorine.

l) Sampling Taps

1) Smooth-nosed sampling taps must be provided for the collection of representative samples.

2) The taps must be located to provide for sampling of the softener influent, effluent, and blended water.

3) The sampling taps for the blended water must be at least 20 feet downstream from the point of blending.

4) Petcocks are not acceptable as sampling taps.

m) Brine and Salt Storage Tanks

1) Salt dissolving or brine tanks and wet salt storage tanks must be covered and must be corrosion-resistant.

2) The make-up water inlet must be protected from back-siphonage. Water for filling the tank must be distributed over the entire surface by pipes above the maximum brine level in the tank. An automatic declining level control system on the make-up water line is recommended.

3) Wet salt storage basins must be equipped with manholes or hatchways for access and for direct dumping of salt from truck or railcar. Openings must be provided with raised curbs and watertight covers having overlapping edges similar to those required for finished water reservoirs.

4) Overflows, where provided, must be protected with corrosion-resistant screens and must terminate with either a turned downed bend having a proper free fall discharge or a self-closing flap valve.

5) The salt must be supported on graduated layers of gravel placed over a brine collection system.

6) Alternative designs that are conducive to frequent cleaning of the wet salt storage tank may be approved by the Agency.

7) Total salt storage must provide for at least 30 days of operation.

n) Corrosion control must be provided under Subpart I.

o) Suitable disposal must be provided for brine waste.

p) Pipes and contact materials must be resistant to the aggressiveness of salt. Plastic and red brass are acceptable piping materials. Steel and concrete must be coated with a non-leaching protective coating that is compatible with salt and brine.

q) Dry bulk salt storage must be enclosed and separated from other operating areas to prevent damage to equipment.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

SUBPART I: STABILIZATION

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 ($CaCO_3$) scale throughout the distribution system of the community water supply:

1) alkalinity (as $CaCO_3$);

2) total hardness (as $CaCO_3$);

3) calcium hardness (as $CaCO_3$);

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:

$$\text{CMSR} = \frac{\text{Cl}^-\text{, expressed as mg/L}}{\text{SO}_4^-\text{, expressed as mg/L}};$$

C) Coupon and pipe loop studies.

2) Iron and Steel
Larson-Skold Index (L-SI), calculated as follows:

$$\text{L-SI} = (\text{Cl} + \text{SO}_4) \,/\, \text{alkalinity}$$

(All parameters expressed as mg/L of equivalent $CaCO_3$)

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

$$\text{LS-I} = \frac{(1.41)(\text{mg/L Cl}^-) + (1.04)(\text{mg/L SO}_4^{-2})}{\text{mg/L alkalinity (as CaC0}_3)}$$

Cl^- expressed as mg/L chloride
SO_4^{-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 $CaCO_3$.

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 $CaCO_3$.

d) The following may be used to determine deposition of excess $CaCO_3$ 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 $CaCO_3$.

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 $CaCO_3$.

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 $CaCO_3$) - Initial mg/L alkalinity (as $CaCO_3$)

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. _____, effective _____)

Section 604.1005 Anion Exchange

a) Pre-treatment Requirements. Pre-treatment under Section 604.1010 is required when a combination of iron and manganese exceeds 0.5 mg/L.

b) Anion Exchange Treatment Design

1) Automatic regeneration based on volume of water treated must be used unless manual regeneration is justified and is approved by the Agency.

2) If a portion of the water is bypassed around the units and blended with treated water, the following requirements must be met:

A) the maximum blend ratio allowable must be determined based on the highest anticipated raw water nitrate level; and

B) a totalizing meter and a proportioning or regulating device or flow regulating valves must be provided on the bypass line.

3) A manual override must be provided on all automatic controls.

4) Adequate freeboard must be provided to accommodate the backwash flow rate of the unit, ensuring the resin will not overflow. The freeboard must be calculated based on the size and specific gravity of the resin.

5) The system must be designed to include an adequate under drain and supporting gravel system and brine distribution equipment.

6) Sampling Taps

A) Smooth-nosed sampling taps must be provided for the collection of representative samples.

B) The taps must be located to provide for sampling of the softener influent, effluent, and blended water.

C) The sampling taps for the blended water must be at least 20 feet downstream from the point of blending.

D) Petcocks are not acceptable as sampling taps.

7) Brine and Salt Storage Tanks

A) Salt dissolving or brine tanks and wet salt storage tanks must be covered and must be corrosion-resistant.

B) The make-up water inlet must be protected from back-siphonage. Water for filling the tank must be distributed over the entire surface by pipes above the maximum brine level in the tank. An automatic declining level control system on the make-up water line is recommended.

C) Wet salt storage basins must be equipped with manholes or hatchways for access and for direct dumping of salt from truck or railcar. Openings must be provided with raised curbs and watertight covers having overlapping edges similar to those required for finished water reservoirs.

D) Overflows, where provided, must be protected with corrosion-resistant screens and must terminate with either a turned downward bend having a proper free fall discharge or a self-closing flap valve.

E) The salt must be supported on graduated layers of gravel placed over a brine collection system.

F) Alternative designs that are conducive to frequent cleaning of the wet salt storage tank may be approved by the Agency.

G) Total salt storage must provide for at least 30 days of operation.

c) Exchange Capacity. The design capacity for nitrate removal must not exceed 10,000 grains per cubic foot when the resin is regenerated at 15 pounds of salt per cubic foot of resin.

d) Number of Units. At least two units must be provided. The treatment capacity must be capable of producing the maximum average daily demand at a level below the nitrate/nitrite MCL, with one exchange unit out of service.

e) Type of Media. The anion exchange media must be of the nitrate selective type.

f) Flow Rates. Unless otherwise approved by the Agency under Section 604.145(b), the following flow rates apply:

1) The treatment flow rate must not exceed 5 gal/min/ft^2 of bed area.

2) The backwash flow rate must be between 4.0 and 6.0 gal/min/ft^2 of bed area.

3) The regeneration rate must be approximately 1.0 gal/min/ft^2 of bed area with a fast rinse approximately equal to the service flow rate.

g) Cross-Connection Control. Backwash, rinse, and air relief discharge pipes must be installed to prevent any possibility of back-siphonage.

h) Construction Materials. Pipes and contact materials must be resistant to the aggressiveness of salt. Plastic and red brass are acceptable materials. Steel and concrete must be coated with a non-leaching protective coating that is compatible with salt and brine.

i) Housing. Dry bulk salt storage must be enclosed and separated from other operating areas to prevent damage to equipment.

j) Preconditioning of the Media. Prior to startup of the equipment, the media must be regenerated with no less than two bed volumes of water containing sodium chloride followed by an adequate rinse.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.1010 Iron and Manganese Control

a) Except as provided in 35 Ill. Adm. Code 611.300(e), treatment is required to meet the iron and manganese MCL as stated in Section 611.300(b).

b) Removal of Iron and Manganese by Oxidation, Detention, and Filtration

1) Oxidation must be by aeration, as indicated in Subpart D, unless the community water supply demonstrates chemical oxidation provides equivalent results to aeration. Chemicals that may be used for oxidation include chlorine, sodium permanganate, potassium permanganate, ozone, or chlorine dioxide.

2) Detention

A) A minimum detention time of 30 minutes must be provided following aeration to ensure that the oxidation reactions are complete prior to filtration. This minimum detention time may be modified only when a pilot plant study indicates completion of oxidation reactions in less time.

B) The reaction tank/detention basin must be provided with an overflow, vents, and access hatches in accordance with Subpart M.

3) Filtration. Filters must conform to Subpart F.

c) Removal by Manganese Greensand or Manganese Coated Media Filtration

1) Permanganate or chlorine must be added to the water upstream of the filter, per the manufacturer's recommendation.

2) An anthracite media cap of at least six inches must be provided over manganese greensand.

3) Normal backwash rate is 8 gal/min/ft^2 with filters containing manganese greensand and 15 gal/min with manganese coated media.

4) Sample taps must be provided:

A) prior to application of permanganate;

B) immediately ahead of filtration;

C) at points between the anthracite media and the manganese greensand;

D) halfway down the manganese greensand; and

E) at the filter effluent.

d) Sequestration of Iron or Manganese by Polyphosphates

1) Sequestration by polyphosphates must not be used when the combination of iron and manganese exceeds 1 mg/L.

2) Phosphate solution must be kept covered and disinfected by carrying approximately 10 mg/L free chlorine residual unless the phosphate is not able to support bacterial growth and the phosphate is being fed from the covered shipping container. Phosphate solutions having a pH of 2.0 or less may also be exempted from this requirement by the Agency.

3) Polyphosphates must not be applied ahead of iron and manganese removal treatment. The point of application must be prior to aeration, oxidation, or disinfection.

4) The phosphate feed point must be located as far ahead of the oxidant feed point as possible.

e) Sequestration of Iron or Manganese by Sodium Silicates:

1) Sequestration by sodium silicate must not be used when iron, manganese, or a combination of iron and manganese exceeds 2 mg/L.

2) A full-scale demonstration will be required to determine the suitability of sodium silicate for the particular water and the minimum feed needed.

3) Chlorine or chlorine dioxide addition must accompany the sodium silicate addition.

4) Sodium silicate must not be applied ahead of iron or manganese removal treatment.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.1105 Feed Equipment and Chemical Storage

a) Solution Feed Equipment

1) Corrosion-resistant containers must be provided for solution feeders.

2) Containers must have non-corrodible covers with overhanging edges. Openings must be constructed to prevent contamination.

3) Scales or a volumetric measuring device must be provided for determining the amount of solution fed.

b) Feeder Redundancy

1) When chemical feed is necessary for the protection of the supply, such as chlorination, coagulation, or other essential processes:

A) a minimum of two feeders must be provided with each having adequate capacity to provide the maximum dosage necessary; and

B) the standby unit or a combination of units of sufficient size to meet capacity must be provided to replace the largest unit when out of service.

2) A separate feeder must be used for each chemical applied.

3) Each chemical feeder and day tank must be identified with its content.

4) Spare parts must be available on site for all feeders and chemical booster pumps to replace parts that are subject to wear and damage.

c) Control

1) At automatically operated facilities:

A) The automatic controls must be designed to allow override by manual controls.

B) Chemical feeders must be electrically interconnected with the well or service pump so that they will not operate if the well or service pump is not operating.

2) Chemical feed rates must be proportional to the flow stream to achieve the appropriate dose of chemical application.

3) A means to measure the water flow stream being dosed must be provided to determine chemical feed rates.

4) Provisions must be made for measuring the quantities of chemicals used.

5) Weighing Scales

A) Weighing scales must be capable of providing reasonable precision for the average daily dose.

B) Unless otherwise approved by the Agency under Section 604.145(b), treatment chemicals in a gaseous state must be weighed;

C) Fluoride solution fed from supply drums or carboys must be weighed; and

D) Volumetric dry chemical feeders must be weighed unless otherwise approved by the Agency under Section 604.145(b).

d) Dry chemical feeders must:

1) measure chemicals volumetrically or gravimetrically;

2) provide adequate water and agitation of the chemical within the slurry tank; and

3) completely enclose chemicals to prevent the emission of dust to the operating room.

e) Positive Displacement Solution Pumps

1) Positive displacement type solution feed pumps may be used to feed liquid chemicals, but must not be used to feed chemical slurries.

2) Pumps must be capable of operating at the required maximum rate against the maximum head conditions found at the point of injection.

3) Calibration tubes or mass flow monitors that allow for direct physical measurement of actual feed rates must be provided.

f) To ensure that chemical solutions cannot be siphoned or overfed into the water supply, liquid chemical feeders must:

1) assure discharge at a point of positive pressure;

2) provide vacuum relief; or

3) provide a suitable air gap or anti-siphon device.

g) Cross-connection control must be provided to assure that:

1) the make-up water lines discharging to liquid storage tanks must be properly protected from backflow;

2) no direct connection exists between any sewer and a drain or overflow from a chemical feed system; and

3) all overflows and drains from a chemical field system must have an air gap above the sewer or overflow rim of a receiving sump.

h) Chemical feed equipment location must be readily accessible for servicing, repair, and observation of operation.

i) Make-up-water lines must be:

1) obtained from the finished water supply, or from a location sufficiently downstream of any chemical feed point to assure adequate mixing; and

2) ample in quantity and adequate in pressure.

j) Storage of Chemicals

1) Space must be provided for:

A) at least 30 days of chemical supply;

B) convenient and efficient handling of chemicals;

C) dry storage conditions; and

D) a minimum storage volume of 1.5 times the gross shipping volume.

2) Offloading areas must be clearly labeled to prevent accidental cross-contamination.

3) Chemicals must not be stored in confined spaces.

4) Chemicals must be stored in covered or unopened shipping containers, unless the chemical is transferred into an approved storage unit.

5) Feed equipment and storage chemicals must be stored inside a building unless otherwise approved by the Agency under Section 604.145(b).

6) Liquid chemical storage tanks must have a liquid level indicator.

7) Secondary Containment

A) Liquid chemical storage tanks must have secondary containment consisting of an overflow and a receiving basin capable of receiving accidental spills or overflows without uncontrolled discharge.

B) A common receiving basin may be provided for each group of compatible chemicals that provides sufficient containment volume to prevent accidental discharge in the event of failure of the largest tank. Groups of compatible chemicals are as follows: acids, bases, salts and polymers, absorption powders, oxidizing powders, and compressed gases.

8) Vents from storage tanks must have a corrosion resistant 24 mesh screen.

k) Bulk Liquid Storage Tanks

1) A uniform strength of chemical solution must be maintained. Continuous agitation must be provided to maintain slurries in suspension.

2) A means to assure continuity of chemical supply must be provided.

3) Means must be provided to measure the liquid level in the tank.

4) Liquid storage tanks including any access openings must be kept securely covered.

5) Overflow pipes, when provided, must:

A) be turned downward, with the end screened;

B) have a free fall discharge; and

C) be located where noticeable.

6) Liquid storage tanks must be vented, but not through vents in common with other chemicals or day tanks.

7) Each liquid storage tank must be provided with a valved drain in accordance with subsection (g).

8) Solution tanks must be located, and protective curbings provided, so that chemicals from equipment failure, spillage, or accidental drainage do not enter the water in conduits or treatment or storage basins. Chemicals must be stored as required by subsection (j)(5).

l) Day Tanks

1) Day tanks must be provided where bulk storage of liquid chemical is provided.

2) Day tanks must meet all the requirements of subsection (k), except that shipping containers do not require overflow pipes and subsection drains.

3) Day tanks must be scale-mounted or, if the liquid level can be observed in a gauge tube or through translucent sidewalls of the tank, have a calibrated gauge painted or mounted on the side. In opaque tanks, a gauge rod may be used. The ratio of the area of the tank to its height must be such that unit readings are meaningful in relation to the total amount of chemical fed during a day.

4) Except for fluosilicic acid, hand pumps may be provided for transfer from a shipping container. When motor-driven transfer pumps are provided, a liquid level limit switch must be provided.

5) Tanks and tank refilling line entry points must be clearly labeled with the name of the chemical contained.

6) Filling of day tanks must not be automated.

m) Feed lines must be:

1) of durable, corrosion-resistant material;

2) protected against freezing;

3) designed to prevent clogging; and

4) color-coded and labeled in accordance with Section 604.120.

n) Handling. Provision must be made for the proper transfer of dry chemicals from shipping containers to storage bins or hoppers, in such a way as to minimize the quantity of dust that may enter the room.

o) Housing

1) Floor surfaces must be smooth and impervious, slip-proof, and well-drained.

2) Vents from feeders, storage facilities, and equipment exhaust must discharge to the outside atmosphere above grade and remote from air intakes.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.1350 Combination Pressure Tanks and Ground Storage

A combination of ground storage, hydropneumatic storage, and pumps may be considered in water systems for maintaining pressure on the distribution system. Design of such a system must include:

a) a minimum ground storage volume equivalent to 1.5 times the average daily usage;

b) a minimum of two pumps, each capable of meeting the peak hourly flow provided in Section 604.115(d). If more than two pumps are proposed, the peak hourly flow must be met when any pump is out of service;

c) an electric generator with an automatic start capable of providing power to pumps that can produce the peak hourly flow provided in Section 604.115(d), plus sufficient power to operate all chemical feeders, appurtenances, and equipment essential to plant operation. Consideration must be given to sizing the generator to provide power for at least one well; and

d) a hydropneumatic tank sized to provide service for a minimum of 10 minutes under the peak hourly flow provided in Section 604.115(d).

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.1510 Cross-Connection Control Device Inspectors

a) Except as provided in subsection (c), cross-connection control devices must be inspected at least annually by a person approved by the Agency or its designee as a cross-connection control device inspector (CCCDI). The inspection of mechanical devices must include physical testing in accordance with the manufacturer's instructions.

1) Records of the annual inspection must be submitted to the community water supply.

2) Each device inspected must have a tag attached listing the date of the most recent test, name of CCCDI, and type and date of repairs.

3) A maintenance log must be maintained at the site of installation and must include:

A) make, model, and serial number of the backflow preventer, and its location at the site;

B) date of each test;

C) name and approval number of the person performing the test;

D) type of test kit used and date of its most recent calibration;

E) test results and a brief statement indicating whether the results pass or fail the test;

F) repairs or servicing required;

G) repairs and date completed; and

H) servicing performed and date completed.

b) Requirements for Cross-Connection Control Device Inspector Approval

1) Each applicant for CCCDI Approval must:

A) be a person authorized to perform plumbing as described in the Illinois Plumbing License Law [225 ILCS 320/3(1)].

B) complete a training course offered by the Environmental Resources Training Center (see 110 ILCS 530 and https://www.siue.edu/ertc) or the Agency's delegate on cross-connection control devices that includes hands-on practice testing of different types of backflow devices and proper maintenance and repair.

C) apply for CCCDI Approval.

D) successfully complete both written and performance examinations demonstrating competency in the following: the principles of backflow and back-siphonage; the hazard presented to a potable water system; locations that require installation of cross-connection control devices; identifying, locating, inspecting, testing, maintaining and repairing cross-connection control methods and devices in-line, as located throughout each system that connects to a community public water supply. The applicant must successfully complete:

i) the written examination with a minimum score of 75%; and

ii) a performance-based examination by demonstrating competency in testing device procedures on all types of devices at the examination center.

2) CCCDIs must renew the CCCDI Approval each year between May 1 and June 30. An application for CCCDI renewal will be sent by the Agency or its designee, and must be completed and returned by June 30 of the renewal year. CCCDIs must complete an eight-hour recertification course every three years from the date of the original issuance of the CCCDI license. The course must be offered by the Environmental Resources Training Center or the Agency's delegate and include a written and practical exam demonstrating competency in backflow prevention testing.

3) A CCCDI Approval or admission to an examination for CCCDI Approval must be suspended, revoked, or not issued by the Agency for any one or more of the following causes:

A) Practice of any fraud or deceit in obtaining or attempting to obtain a CCCDI Approval, including misrepresentation of approval;

B) Any repeated, flagrant, or willful negligence or misconduct in the inspection, testing, or maintenance of cross-connection control devices;

C) Falsification of reports required by this Part;

D) Willful violation of the Environmental Protection Act or any rules adopted under it.

4) Suspension and Revocation Procedures

A) Any person may file with the Agency a written complaint regarding the conduct of a CCCDI approved under this Part. The complaint must state the name and address of the complainant, the name of the CCCDI, and all information that supports the complaint.

B) The Agency may initiate the suspension or revocation procedure based on of any written complaint or on its own motion. The Agency's decision to institute suspension or revocation proceedings will be based on the seriousness of the violation and its potential deleterious impact on public health and safety.

C) When the suspension or revocation procedure is initiated, the Agency must notify the CCCDI by certified mail that suspension or revocation is being sought. The notice must specify the cause upon which suspension or revocation is sought and include the procedures for requesting a hearing before the Agency. A request for hearing must be made in writing within 14 days after receipt of the Agency's certified notification. If no hearing is requested, the Agency will suspend or revoke the CCCDI Approval.

D) If a hearing is requested, the Director must appoint one or more Agency employees to chair the proceedings. The hearing must be conducted according to the hearing requirements of 35 Ill. Adm. Code 168.

E) The Director must make a decision within 30 days after receiving the hearing transcript. The Director must give written notice of that decision and reasons for the decision to the CCCDI by certified mail.

F) Within 30 days after receiving a notice of suspension or revocation from the Agency, the CCCDI may appeal the suspension or revocation to the Pollution Control Board. The suspension or

revocation of the CCCDI's Approval must be stayed pending a final decision on the appeal by the Board.

c) Backflow preventers located in the treatment plant, wellhouse, or booster station of a community public water supply facility must be inspected at least annually by either an approved CCCDI or by a certified water supply operator who has completed the qualifications listed in subsections (b)(1)(B) and (D).

1) When the inspection is conducted by a certified water supply operator who has completed the necessary qualifications, records must be kept as required by subsection (a)(3).

2) Each device inspected must have a tag attached listing the date of the most recent test, name of the CCCDI, and type and date of repairs.

(Source: Amended at 47 Ill. Reg. _____, effective _____)

Section 604.1520 COVID-19 Emergency Provisions (Repealed)

(Source: Repealed at 47 Ill. Reg. _____, effective _____)