**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/ft2 of bed area.

2) The backwash rate must be 6 to 8 gal/min/ft2 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. 7503, effective May 16, 2023)