CHAPTER 62-04-08
WATER SOFTENER UNITS

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62-04-08-01. General.

1. The objective of this chapter is to provide a standard of quality, capacity, and performance for water softener units. Water softener performance is to be based upon referee tests procedures described in section 62-04-08-09.

2. A manual bypass for raw water shall be provided as part of installation connections, and a drain for regenerational effluents shall be provided as described in chapter 62-04-06.

3. The regeneration process must include no less than the following operations, although not necessarily in this sequence except for subdivision d:

   a. Exchanger bed must be capable of being cleaned of filtered turbidity.

   b. Regenerate with salt and rinse from exchanger bed.

   c. Terminate rinse.

   d. Return to service.

4. The operation under subdivision a of subsection 3 may be eliminated in softeners of upflow design. Softeners of upflow design shall not be used for water having an iron content in excess of three tenths parts per million, or a turbidity in excess of ten parts per million.

General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04

62-04-08-02. Classification of water softeners.

1. **Manual direct salting regeneration.** All operations are performed manually and dry salt is added directly into the water softener. Sufficient water is removed to make room for salt. Termination of the rinsing process (subsection 3 of section 62-04-08-01) may be automatic.

2. **Manual brine regeneration.** All operations are performed manually. Brine instead of dry salt is used for regeneration.

3. **Semiautomatic direct salting regeneration.** All operations are performed manually except the operations under subdivision a of subsection 3 of section 62-04-08-01.

4. **Automatic regeneration.** All operations, including bypass of raw water supply, are performed automatically after setting timer or closing electric switch. Brine is used for regeneration. Salt is added to salt dissolving chamber or brine container as required.

5. **Fully automatic regeneration.** Regeneration, including bypass of raw water supply, is initiated and performed automatically. Salt storage is sufficient for multiple regenerations.

General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04

62-04-08-03. Softener construction.

1. Materials shall be selected for their strength and resistance to corrosion by water and brine; shall be free of objectionable color throw, taste and odor; and shall not impart toxic substances to the water.

2. Softener tanks shall be constructed for a minimum working pressure of one hundred twenty-five pounds per square inch [56.70 kilograms per 6.45 square centimeters] and a hydrostatic test pressure of two hundred pounds per square inch [90.72 kilograms per 6.45 square centimeters].

   a. Tanks shall be suitably corrosion resistant as to types of material or protective mechanism. Types of materials would include corrosion resistant, or noncorrosive materials such as high nickel alloys, 18-8 stainless steel and plastics. Plastic tanks shall meet the requirements of the national sanitation foundation.

   b. Mild steels are not to be used unless the interior of the tank is protected by a lining or coating such as hot dip galvanizing; organic coating; glass, ceramic or rubber lining. Galvanized tanks shall contain not less than one and five tenths ounces [42.53 grams] of zinc per square foot [929.03 square centimeters]. If the internal coating or protective mechanism is not suitable for protecting the exterior of the tank, a suitable external protective means, such as hot dip galvanizing, porcelain enamel, or organic finish shall be used.

3. Valves, piping, and screens.

   a. Valves, piping, and screens shall be constructed of suitable corrosion resistant materials. Dissimilar metals shall be insulated or shielded when deemed necessary by the manufacturer.

   b. Automatic water softeners employing electrical or hydraulic operating controls shall be of sturdy construction with durable combination valves and time clocks. They shall be constructed to minimize the possibility of admitting salt water into the house water system when the manufacturer's instructions are followed. All electrical components shall be "approved" as defined in the current National Electric Code (published by national board of fire underwriters).

   c. The ion exchanger shall be of a suitable type, insoluble in water, of good durability, free from objectionable color-throw, taste, odor, and should not impart toxic substances to the water.

General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04

62-04-08-04. Softener rating.

1. Softener rating shall be based on grains of hardness removed (as calcium carbonate) between successive regenerations and must be related to the pounds of salt required for each regeneration.

2. The number of cubic feet, the type of ion exchanger (such as greensand, carbonaceous, siliceous gel, resin), the amount of salt required for each regeneration shall be given for each softener, and manufacturer's specified backwash, rinse, and softening flow rates in gallons per minute shall be given for each softener of downflow design. The same information with the exception of manufacturer's specified backwash rate shall be given for water softeners of upflow design.

3. Grain capacity shall be validated by actual test runs as specified on at least one size of each model. Manufacturer's test results must be correlated and extended to other sizes of the same model. Manufacturer's certified test data to be supplied when required.

General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04

62-04-08-05. Field performance.

1. The softener shall deliver not less than four gallons per minute [15.14 liters per minute] of soft water.

2. Pressure drop from inlet to outlet of the softener, including valving and exchanger (at manufacturer's specified softening flow rate) shall not exceed fifteen pounds per square inch [6.80 kilograms per 6.45 square centimeters].

General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04

62-04-08-06. Application of equipment.

1. Water analysis. A chemical analysis of the water supply, made according to accepted water analysis standards, shall be furnished with the recommendation for water conditioning equipment. For those waters containing a hardness of four hundred milligrams per liter [23 grains per gallon] and or sodium in excess of one hundred milligrams per liter (6 grains per gallon) of calcium carbonate. The compensate hardness to determine the increased amount of resin needed.

2. Capacity and sizing. To assure adequate softening capacity, the following formula may be used (based upon daily water needs per person of fifty gallons [189.27 liters]) to determine the required size of manual and semiautomatic softeners:

   G x P x H x F = Softening capacity requirements in grains of hardness.

   Where "G" is fifty gallons (daily needs per person).

   Where "P" is the number of persons to occupy dwelling.

   Where "H" is the hardness of the water supply expressed in grains per gallon, and "F" is the desired frequency of regeneration in days.

   Note: G = twenty-eight gallons if water closets are not supplied with softened water.

   G = twenty gallons if only hot water is to be softened.

3. The following table supplies the ratio of occupancy to the number of bedrooms within the dwelling to be used with the formula supplied in subsection 2 in determining adequate size of equipment.

Number of bedrooms		2	2	4	5	6
Estimated number of occupants		4	5	6	7	8
Total Gallons Used Per Day	G = 50	200	250	300	350	400
	G = 28	112	140	168	196	224
	G = 20	80	100	120	140	160
Minimum number of days between regeneration (subsection 4 of section 62-04-08-02) and automatic equipment (subsection 5 of section 62-04-08-02		1	1	1	1	1
Minimum number of days between regeneration (subsection 1 of section 62-04-08-02) and manual and semiautomatic equipment (subsection 2 of section 62-04-08-02)		7	7	7	7	7

a. Manual or semiautomatic water softeners having a softening capacity of less than eight hundred gallons [3028.33 liters] between each regeneration shall not be acceptable.

b. Automatic regeneration (subsection 4 of section 62-04-08-02) and fully automatic regeneration equipment (subsection 5 of section 62-04-08-02) shall in no case be sized to require regeneration more than once in any twenty-four-hour period unless acceptable provision is made to deliver soft water during the regeneration process.

4. When the water softener is to be installed on a private water supply system, attention should be directed to the capacity of the pump and well and to the operating pressure of the water system to assure proper operations and regeneration of the softener.

General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04

62-04-08-07. Installation.

1. **Drainage.** Drainage from the softener in regenerating shall discharge to the building drain through an air break or air gap, to a laundry tray, floor drain, or similar properly trapped and vented fixture or stand pipe. If a fixture is not accessible it shall be the duty of the water conditioning contractor to obtain the services of a licensed plumber to install a trapped and vented outlet.

2. **Brine rinse.** Installations requiring rinsing of brine through building water distribution piping shall not be acceptable.

3. **Piping.** Pipe used in installations shall not create a corrosive condition because of dissimilarity of metals, and shall not create more than a ten percent pressure drop in system when system operates at forty pounds per square inch [18.14 kilograms per 6.45 square centimeters] or less, and shall not create a pressure drop of more than twenty percent when system operates at a pressure of forty-one pounds per square inch [18.60 kilograms per 6.45 square centimeters] or more (when softener is operating at manufacturer's specified softening flow rate).

4. **Disinfection.** Disinfection of all installations shall comply with the manufacturer's instructions or the water conditioning equipment manufacturer's association's instruction.

5. **Operating instructions.** The manufacturer or installer shall provide and attach to, or near, the softening equipment a set of instructions for use of the owner, detailing the method of operation, regeneration, and maintenance required.

History: Amended effective January 1, 1992.
General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04

62-04-08-08. Warranties.

1. **On equipment.** The manufacturer shall provide the user of the equipment with an unconditional warranty of not less than three years on the water softener tank and brine container, and the first year on all other materials and parts which may become defective.

2. **On installation.** Warranty replacement parts shall be furnished and installed by contractor without additional charge during the first year after date of installation. Equipment carrying a manufacturer's warranty in excess of one year shall be plainly denoted in the submission.

General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04

62-04-08-09. Referee test procedures for water softening equipment.

1. **Water quality.** Water used for test runs shall have a hardness of between fifteen and twenty grains per gallon [256.5 and 342 milligrams per liter] (as calcium carbonate), ph in range of six and nine tenths to eleven, and water temperature shall be between fifty-five degrees and sixty-five degrees Fahrenheit [12.77 and 18.33 degrees Celsius]. If unavailable in natural form, it shall be prepared to this specification in the ratio of two-thirds calcium and one-third magnesium. To determine hardness of the influent water, a constant percentage of influent water shall be collected during the test run and the composite tested for hardness by accepted water hardness test methods. (As described in the water conditioning foundation engineering manual and "Standard Methods for the Examination of Water and Waste Water", published by American public health association, 1790 Broadway, New York, New York).

2. **Water softener test.**

   a. The softener shall be connected to water supply in accordance with manufacturer's standard installation instructions.

   b. A meter shall be placed in outlet line from the softener to measure rate of flow and volume of water.

   c. The softener shall operate within water pressure range and shall be regenerated in accordance with manufacturer's instructions. With softener valves in softening position, water delivered at outlet shall be tested by accepted water hardness test methods with one grain per gallon [17.1 milligrams per liter] hardness leakage as the determining end point.

3. **Softening flow rate.**

   a. Softening capacity runs shall be at constant rate of flow at fifty percent of manufacturer's specified softening rate. This shall be considered equivalent performance to the intermittent flow obtained in the home.

b. A pressure drop test shall be made. The pressure loss from inlet to outlet of softener, including valving and exchanger at manufacturer's specified softening flow rate, shall not exceed fifteen pounds per square inch [6.80 kilograms per 6.45 square centimeters].

4. **Test records.**

a. Hardness of effluent shall be tested at intervals of not less than ten percent of the total softening run and shall meet test specified below.

b. Five complete softening capacity runs shall be made on each model. Data for the first two runs shall be discarded. Capacity shall be based on the average of three succeeding runs which do not show a variance of ten percent from the average.

c. Hardness test shall be one grain per gallon [17.1 milligrams per liter] of hardness leakage as the determining end point as described in accepted water hardness test procedures.

5. **Softening capacity.**

a. Capacity of the water softener is to be determined only between points at which hardness of effluent meets the accepted water hardness test.

b. Softening capacity rating in grains of hardness removed shall be the gallon capacity multiplied by the average hardness of the raw water as determined by a composite percentage sample required under subsection 1.

General Authority: NDCC 43-18.1-03
Law Implemented: NDCC 43-18.1-04