

(4) **CHEMICAL TREATMENT.** All waterworks shall be equipped with chemical feed equipment and the necessary appurtenances which can continuously disinfect the water.

(a) All municipal water systems and new subdivision water systems intended to serve 15 or more living units shall be equipped with chemical feed equipment and the necessary appurtenances which can continuously disinfect the water.

(b) All surface water treatment plants and other waterworks where treatment is required shall be equipped with backup chemical feed equipment in the event of failure of the primary equipment.

(c) Approval from the department is required for the addition of any chemical to a community water system. A 30-day supply of chemicals shall be kept on hand as required by NR 108.06(3). Chemicals shall meet current A.W.W.A. standards and be approved by the department. Colored chemicals will be approved if coloring agents are not used in toxic concentrations or in amounts which impart taste, odor or color to the water supply. The department may require the analysis of chemicals if necessary to insure use of safe chemicals. Copies of the above standards are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.

**Note:** The chemical standards referred to in (4) (c) are those issues in effect at the effective date of NR 111.

(d) Chemical containers shall be labelled to include the chemical name, purity, concentration and name and address of the supplier.

(e) Requests for the substitution of disinfection agents in lieu of chlorine for bacteriological control may be approved by the department. However, such agents may not be used without specific approval by the department.

**Note:** Refer to Part 5 of this chapter. NR 111.50 and following, for requirements for design and construction of facilities for storage handling, and chemical application.

**History:** Cr. Register, November, 1974, No. 227, eff. 12-1-74; am. (intro.), (1) (b), (4) (a) and (c), Register, April, 1978, No. 268, eff. 5-1-78.

**NR 111.24 Distribution systems.** (1) Ownership of municipal water systems. The distribution system, as defined in NR 111.03, shall be owned and maintained by the waterworks owner. All water mains on private property which are, or in the future may be, connected to the distribution system at more than one point, thereby allowing flow through the piping system, shall be owned and maintained by the waterworks owner.

**Note:** To insure the use of approved materials and the proper installation and maintenance, the department recommends that proposed fire hydrants and water mains serving fire hydrants on private property be installed in easements and owned and maintained by the waterworks owner.

(2) **NORMAL PRESSURE.** The distribution system and related storage facilities shall be operated to maintain a minimum of 35 pounds per square inch at all locations under normal operating conditions. In areas where this pressure cannot be maintained, it shall be necessary to proceed as required in NR 111.64(1). [11.65(1)].

(3) **FIRE FLOW PRESSURE.** The system shall be operated so that under fire flow conditions the residual pressure is not less than 20 pounds per square inch (gauge). If 20 psi cannot be maintained, fire pumpers shall not be allowed to connect to fire hydrants.

(4) **MAINTENANCE.** Each supplier of water shall establish a schedule for flushing dead-end mains or mains in other areas to remove sediment or objectionable water. Water storage facilities shall be inspected on a routine basis and maintenance provided as necessary. Record keeping shall be established to insure routine scheduling and performance of valve and hydrant maintenance.

**Note:** Requirements for the design and construction of distribution systems are contained in part 7 of this chapter, NR 111.70 and following.

**History:** Cr. Register, November, 1974, No. 227, eff. 12-1-74; am. (1) and (4), Register, April, 1978, No. 288, eff. 5-1-78.

**NR 111.25 Cross-connections and interconnections.** Cross-connections are prohibited except as provided in subsections (2) and (3) below and in Wis. Adm. Code section H 62.14.

(1) **CROSS-CONNECTION CONTROL PROGRAM.** The supplier of water for every municipal water system shall develop and implement a comprehensive control program for the elimination of all existing cross-connections and prevention of all future cross-connections. A record of the cross-connection control program shall be kept current and available for annual review by the department. The program plan shall include but not be limited to:

(a) A complete description of the program and the administration procedures, including designation of the inspection or enforcement agency or agencies;

(b) Local authority for implementation of the program, such as, ordinance or rule;

(c) A time schedule for inspection and reinspection of consumer premises for cross-connections including appropriate record keeping.

(d) A description of the methods and devices which will be used to protect the water supply by reference to or inclusion of chapter H62;

(e) Provisions for denial or discontinuance of water service, after reasonable notice, to any premises where an unprotected cross-connection exists.

(2) **FIRE PROTECTION SYSTEMS.** (a) An existing cross-connection for fire protection purposes only, which was originally approved and installed before January, 1924, may be continued if:

1. The need for the cross-connection can be demonstrated to the department, and

2. The double check valve installations are replaced with an approved reduced pressure backflow device and an approved installation no later than 5 years from the date of adoption of these rules. Double check valves in need of replacement prior to that date shall be replaced with an approved backflow preventor installation at that earlier date. All devices shall meet the requirements of chapter H62.

2. Determinations shall be made for the carbon dioxide content of the raw water.

*Note:* When concentrations exceed 10 milligrams per liter, the economics of removal by aeration as opposed to removal with lime should be considered. (See NR 111.36 (1) for aeration requirements.)

3. Equipment for stabilization of water softened by the lime-soda process is required. (See NR 111.56 for stabilization requirements.)

4. Provisions shall be included for proper disposal of softening sludges. (See NR 111.86 for design requirements.)

5. The use of excess lime shall not be considered an acceptable substitute for chlorination or any other approved method of disinfection. (See NR 111.53.)

(b) *Ion exchange process.* Iron, manganese, or a combination of both in the oxidized state or unoxidized state, may cause resin fouling in the ion exchange process. Pretreatment shall be required whenever the content of iron, manganese, or a combination of both is one milligram per liter or more. In specific instances, the department may also require pretreatment where lesser amounts exist. In addition:

1. The units shall be of pressure or gravity type, of either an upflow or downflow design, using automatic or manual regeneration.

*Note:* Automatic regeneration is suggested for small plants.

2. The design capacity for hardness removal shall not exceed 20,000 grains per cubic foot when resin is regenerated with 0.3 pounds of salt per kilograin of hardness removed.

3. The depth of the exchange material shall not be less than 3 feet.

4. The rate of softening shall not exceed 7 gallons per square foot per minute, and the backwash rate shall be 6 to 8 gallons per square foot per minute.

5. The freeboard will depend upon the specific gravity of the media and the direction of water flow.

6. The bottoms, strainer systems and support for the exchange materials shall conform to criteria provided for rapid rate gravity filters in NR 111.45.

7. Facilities shall be included for even distribution of the brine over the entire surface of both upflow or downflow units. Backwash, rinse and air relief discharge pipes shall be installed in such a manner as to prevent back-siphonage

8. A bypass shall be provided around softening units to produce a blended water of desirable hardness. Meters shall be installed on the bypass line and on each softener unit. An automatic proportioning or regulating device and shut-off valve shall be provided on the bypass line. The department may require treatment of the bypassed water to obtain acceptable levels of iron or manganese in the finished water.

9. Waters having 5 units or more turbidity shall not be applied directly to the cation exchange softener. Silica gel materials shall not be used for waters having a pH above 8.4 or when iron is present. When the applied

water contains a chlorine residual the cation exchange material shall be a type that is not damaged by residual chlorine. Phenolic resin should not be used.

10. Brine storage tanks must conform to the following requirements:

a. The wet storage tank shall be designed to hold at least  $1\frac{1}{2}$  times the volume of salt delivered to permit refill before the tank is completely empty. The volume of both salt and brine storage to be provided will depend upon the size of the plant; the proximity and assuredness of the salt source, and the method of delivery.

b. The storage tank shall be isolated from possible sources of contamination, specifically:

1) It shall be properly covered and equipped with manholes having watertight covers to prevent entry of surface runoff;

2) Overflows and vents shall be designed in accordance with NR 111.62 (4) and NR 111.62 (6), respectively;

3) The water for filling the tank shall be distributed over the entire surface of the tank by pipes at least 2 pipe diameters above the maximum liquid level in the tank or be protected from back-siphonage;

4) The underdrain collection system shall be covered with a screen or perforated plate to allow brine but not salt to pass through.

c. A sampling tap shall be provided on the brine discharge line in order that the concentration of brine can be determined. A suitable means for measuring the volume of brine used for regeneration shall be provided.

**Note:** It is recommended that the interior concrete surfaces of brine storage tanks be painted with a salt-resistant sealing compound or paint to prevent deterioration.

11. Brine wastes. (See NR 111.84 for requirements.)

12. Sampling and testing. Smooth-end sampling taps shall be provided for control purposes. Taps shall be located on each raw water source, each treatment unit influent and each treatment unit effluent. Testing equipment shall be provided to adequately control the treatment process at all plants.

13. Stabilization. Water from ion exchange treatment plants shall be stabilized as required in NR 111.55 (4).

**History:** Cr. Register, November, 1974, No. 227, eff. 12-1-74; renum. from 111.86, am. (3) (b) 2, Register, April, 1978, No. 268, eff. 5-1-78.

#### **PART 4. SURFACE WATER—REQUIREMENTS FOR DESIGN AND CONSTRUCTION OF FACILITIES**

**NR 111.40 General requirements.** The source of water selected shall provide the highest quality water reasonably available which, with appropriate treatment and adequate safeguards, will meet the drinking water standards in NR 111.22 [109]. Minimum treatment shall include disinfection, coagulation, sedimentation and filtration. The design of the treatment processes, equipment and structures shall depend on an evaluation of the nature and quality of the particular water to be treated. Variations from the design criteria may be approved by the department

(a) Feed equipment shall conform to requirements in NR 111.50 through NR 111.53;

(b) Phosphate chemicals shall be certified by the U. S. department of agriculture as food grade;

(c) Stock phosphate solution shall be kept covered and disinfected by carrying approximately 10 mg/1 chlorine residual;

(d) Facilities shall be included to maintain satisfactory chlorine residuals as indicated in NR 111.23;

(e) Phosphate concentration shall not exceed 10 mg/1 as PO<sub>4</sub>.

(3) "SPLIT TREATMENT". If approved by the department, a lime-soda water treatment plant can be designed using "split treatment" in which raw water is blended with lime-treated water to partially stabilize the water. However, treatment plants designed to utilize "split treatment" shall contain facilities for further stabilization by other methods.

(4) ALKALI FEED. An alkali feeder shall be provided for all ion exchange water softening plants to provide stable water. Other waters may also be corrosive and require pH adjustment. The chemical shall be adequately mixed and the point of application located such that any deposition in the piping is minimized. The piping shall be accessible for cleaning or replacement. Equipment for monitoring pH shall be provided.

(5) OTHER. Other chemical compounds may be approved by the department on a case-by-case basis if their effectiveness is demonstrated by testing or other studies.

History: Cr. Register, November, 1974, No. 227, eff. 12-1-74.

#### PART 6. STORAGE FACILITIES: REQUIREMENTS FOR DESIGN AND CONSTRUCTION

**NR 111.60 Applicability.** This part covers reservoirs for community water systems which are intended to serve 15 or more living units of having source capacity greater than 70 gallons per minute. Reservoirs for community water systems which are intended to serve less than 15 living units or having source capacity less than 70 gallons per minute shall be constructed in accordance with the requirements of Wis. Adm. Code chapter NR 112.

History: Cr. Register, April, 1978, No. 268, eff. 5-1-78.

**NR 111.61 General.** (1) **SIZING.** A sufficient quantity of water, as determined from engineering studies, shall be maintained in elevated storage when only one pumping unit to the distribution system is available to serve the water system. This shall be at least a one-day supply under normal operating conditions. When more than one distribution pump is available, the storage shall be in accordance with standard engineering practice. The requirement for elevated storage may be waived by the department in cases where the system is designed to serve less than 50 homes; where it is not economically feasible to provide elevated storage; where elevated storage facilities are proposed for a later development phase; or where service is proposed for domestic use only.

(2) **Pressure requirements.** The storage facilities shall be designed to meet the minimum and maximum pressure requirements specified in

Register, July, 1978, No. 271  
Environmental Protection

NR 111.65 and, in conjunction with distribution system design, provide flows as specified in NR 111.72 A hydro-pneumatic tank or other reliable means shall be provided to maintain system pressure when a gravity storage reservoir is not available. (Note: See NR 111.36 for hydro-pneumatic tank requirements.)

(3) Bypass piping. If the system design is such that all water must pass through one ground reservoir there shall be bypass piping from the well pump(s) to the high lift pump(s) to allow the reservoir to be taken out of service for cleaning and maintenance. This requirement can be waived where the well pump(s) can provide sufficient volume and pressure directly to the distribution system or where the well pump(s) and high lift pump(s) are greatly different in capacity.

**History:** Cr. Register, November, 1974, No. 227, eff. 12-1-74; renum. from 111.60, r. (2), renum. (3) to be (2) and am., and cr. (3), Register, April, 1978, No. 268, eff. 5-1-78.

**NR 111.62 Location.** (1) Storage facilities shall not be located within a floodway. If it is necessary to locate a reservoir in a floodplain outside of the floodway the bottom shall be a minimum of 2 feet above the regional flood elevation. (Note: See Wis. Adm. Code chapter NR 116 for floodway and floodplain criteria.)

(2) The area surrounding structures shall be graded in a manner that will prevent surface water from standing within 50 feet of the structure.

**Note:** It is recommended that the bottom of ground level reservoirs and standpipes be placed at the normal ground surface.

(3) Where the bottom must be below normal ground surface, it shall be placed above the groundwater table. Sewers, drains, standing water, and similar sources of contamination shall be kept at least 50 feet from the reservoir. Water pipe, pressure tested in place to 50 psi without leakage, may be used for gravity sewers at lesser separations if approved by the department.

(4) The top of a ground level reservoir shall not be less than 2 feet above normal ground surface. Clearwells constructed under filters may be excepted from this requirement when the total design gives the same protection.

**History:** Cr. Register, November, 1974, No. 227, eff. 12-1-74; renum. from 111.61, am. (1), Register, April, 1978, No. 268, eff. 5-1-78.

**NR 111.63 Construction details.** (1) **MATERIALS.** The materials and designs used for finished water storage structures shall provide stability and durability as well as protect the quality of the stored water. Unless the design engineer can justify the use of other materials, only steel or concrete will be approved for use in a water storage facility. Steel structures shall follow the current American Water Works Association standards concerning steel tanks, standpipes, reservoirs and elevated tanks wherever they are applicable.

(2) **PROTECTION.** All new finished water storage structures shall have watertight roofs or covers which exclude birds, animals, insects and dust. Locks on access manholes and any other necessary measures shall be provided to prevent trespassing, vandalism and sabotage.

(3) **DRAINS.** Piping used to drain water from a water storage structure shall not have a direct connection to a sanitary sewer. Connection to a