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**Rules and Regulations  
for the Preparation and Submission  
of Plans for Public Water Supply Systems  
and Water Treatment Plants ,**

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The State Department of Health of the State of New Jersey, pursuant to the authority vested in it by Chapter 177, Laws of 1947, as amended by Chapter 444, Laws of 1948, hereby establishes the following rules and regulations for employment in the administration of R.S. 58:12-1 et seq., 58:11-2, 58:11-3 and 58:11-10. All prior rules and regulations in these matters adopted on various dates by the Department of Health of the State of New Jersey are hereby rescinded.

STATE DEPARTMENT OF HEALTH OF THE  
STATE OF NEW JERSEY

By: Roscoe P. Kandle, M.D., M.P.H.  
*State Commissioner of Health*

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## SECTION 1 — INTRODUCTION

### 1.1 Applicability of these Rules and Regulations

- a. The purpose of these Rules and Regulations is to ensure the delivery to the consumer of adequately protected water for potable and domestic purposes which is of adequate pressure and volume for such purposes.
- b. Any proposed waterworks facilities which have a bearing on water quality are subject to examination, including those concerning the sources, treatment, and distribution of surface and ground water supplies. Wells, water treatment plants, transmission and distribution mains (except for routine extensions of existing distribution mains), and water storage facilities are subject to examination. Except for the location and design of intakes which affect water quality, dam structures are not included.
- c. These Rules and Regulations comprise the general and specific requirements which must be met in order to provide adequate protection of the public health in cases of unevaluated or severe conditions. Plans and specifications and other data submitted to the Department will be examined on the basis of the requirements expressed herein. Deviations may be allowed if adequately justified by the applicant, or if believed necessary by the Department.

### 1.2 Deviations from Rules and Regulations Requirements

- a. When it can be established by the applicant that the proposed installation provides adequate protection, plans and specifications which deviate from the requirements of these Rules and Regulations will be examined on the basis of the conservative evaluation of data submitted by the applicant.
- b. In order for such consideration to be given, the data submitted by the applicant must include analytical and survey determinations which demonstrate either
  - (1) the source of supply is adequately protected by natural means, or
  - (2) that extended operation of a comparable treatment installation or pilot plant has provided adequate protection and acceptable operating characteristics for a period sufficiently long to cover all the variations in conditions that may be reasonably expected.

### 1.3 "Adequate Protection" Defined

The term "adequate protection," as used in these Rules and Regulations, shall mean and imply that the water reaching the consumers complies continuously with the physical, chemical and bacteriological requirements of the New Jersey Potable Water Standards; and the term "adequately protected" shall be construed accordingly.

### 1.4 Preliminary Plans, Etc.

In the case of extensive or involved projects, or those for which deviations from these Rules and Regulations are anticipated, the preparation of a preliminary report and plan is advisable before detail design proceeds; and it is recommended that the preliminary data be discussed with the

Department engineers before final decisions are made. Formal comments will be made by the Department on preliminary reports, if requested.

### **1.5 Classification of Natural Waters**

For the purposes of these Rules and Regulations and to form a basis in determining the degree of treatment required, the following classifications shall apply to natural waters intended as sources of supply for potable and domestic purposes:

**Class 1.** Waters which may be adequately protected by disinfection only, and which meet the requirements of the New Jersey Potable Water Standards in all respects except as to bacterial content which shall not exceed an average coliform M.P.N. concentration of fifty (50) per 100 ml. in any month.

**Class 2.** Waters which may be adequately protected by disinfection and, in addition, by one or more of the following: filtration, straining, aeration, iron removal, manganese removal, phosphate compound treatment, pH adjustment, or softening; and in which the average coliform M.P.N. concentration does not exceed fifty (50) per 100 ml. in any month.

**Class 3.** Waters which require pretreatment, filtration, disinfection, and any other processes defined in Class 2 to effect adequate protection; and in which the average coliform M.P.N. concentration is more than fifty (50) per 100 ml., but less than five thousand (5,000) per 100 ml. in any month.

**Class 4.** Waters which require prechlorination, pretreatment, filtration, postchlorination facilities, and any other processes defined in Class 2 to effect adequate protection; and in which the average coliform M.P.N. concentration exceeds five thousand (5,000) per 100 ml. in any month.

## **SECTION 2—MATERIAL TO BE SUBMITTED**

### **2.1 Applications for Approval**

- a. Applications for the approval of plans and specifications shall be submitted by a qualified professional engineer licensed to practice in New Jersey, on forms provided by the Department. Plans submitted by such an engineer shall bear his seal (R.S. 45:8-45) and must be preceded or accompanied by a letter of appointment from the proper official of the city, county, district, company or other unit, certifying that the engineer has been duly authorized to prepare such plans and specifications.
- b. Applications are to be signed by the proper official (with title) of the public body, company, or corporation; (or if signed by an authorized agent, shall be accompanied by a certified copy of the authorization).
- c. Applications by newly constituted privately owned water utilities shall be approved by the local governing body of the municipality or municipalities concerned.
- d. The review of plans by the Department is limited to sanitary engineering features of public health significance; it does not include the examination of structural, hydraulic, mechanical or electrical design, nor economic factors.
- e. The approvals of the Division of Water Policy and Supply of the Department of Conservation and Economic Development, and of the

Department of Public Utilities, are required in many instances of water supply projects. Such approvals are frequently coincidental with the requirements of approval by the New Jersey State Department of Health. It is therefore recommended that applicants consult with representatives of these Departments on matters concerning water diversion rights, well drilling permits, approval of municipal franchises, rates, charges, etc. Such approvals by other controlling agencies are, however, not required to be submitted to this Department.

## **2.2 Engineering Data to be Submitted to the Department**

The following materials shall accompany the application for approval:

- a. An Engineer's Report as outlined in subsection 2.3 (one copy).
- b. Maps, plans and specifications (one complete set, unless the applicant needs or desires an approved set, in which case two complete sets shall be submitted).
- c. Total estimated cost of the proposed project, including the cost of land and legal and engineering fees, and the cost of all applicable structures even though they may not be subject to review.

## **2.3 Engineer's Report**

The Engineer's Report shall, when pertinent, contain the following information:

- a. Description of existing waterworks as related to the proposed project.
- b. Data on present and future population served by the facility together with present and anticipated water requirements and the relationship of the proposed works to these factors. Estimates should, in general, be for a period of twenty-five (25) years unless a shorter design period can be justified.
- c. Information on the source of supply, to include the following data:
  - (1) If from a surface source; the dependable yield, characteristics of the quality of the water in relation to its treatability; information obtained as a result of a sanitary survey on the sources of pollution; and the existing or proposed measures to insure protection of the supply.
  - (2) If from an underground source; data on the geological strata expected to be penetrated and the effect that such strata may have on the quality of the water; available information on yield and water quality; test well findings (if any); sources of potential pollution within a minimum distance of five hundred (500) feet or, in the case of adverse geological conditions such as creviced or fissured rock formations, from a larger area; and a general description of the construction features proposed to protect the source from pollution.
- d. A description of significant pumping equipment, giving capacity of units and general information on the arrangement of facilities, including the provision of standby power (if provided), control of operation, and alarm systems.
- e. A summary of proposed treatment processes with data to establish that the proposed processes will produce adequate protection of the water so treated, together with sufficient information on the nature and dosage of any chemicals applied so as to provide the reviewer with a clear understanding of their operation. Normal capacity of each unit shall

be given to show that the requirements of these Rules and Regulations are being met.

- f. The methods proposed for the treatment and disposal of sludge and filter backwash.
- g. Sanitary features of proposed storage, transmission and distribution works.
- h. That portion of the system to be built at the present time.

#### 2.4 Maps

A map or maps in sufficient detail to aid in the examination and comprehension of the specific project covered by the application shall be embodied with, or accompany, the plans and specifications. All maps shall be drawn to a suitable scale, shall be properly titled, and the north point and datum shall be indicated. Topography shall be shown by elevations, contours or other suitable methods. Where pertinent, roads, streams, municipal boundaries and other features shall be shown, including applicable data such as watersheds, reservoir locations, wells and well fields, water treatment plants, existing transmission and distribution mains, storage tanks, fire hydrants, and potential sources of pollution such as sewers and sewage disposal units.

#### 2.5 Plans

##### a. Details

(1) Plans shall be drawn to standard scales on uniformly-sized sheets. Each sheet shall contain necessary titles, scales, dates, owner's name and the general description of the project. The name of the engineer and his seal shall be shown on each sheet.

(2) The preferred size is a drawing having a height of twenty-two (22) inches and a length of about thirty-four (34) inches including suitable margins. Lettering should be sufficiently large to permit reduction, and all plans should have graphic scales.

(3) If there is more than one sheet, all shall be bound together and, in the case of transmission and distribution mains, an index map shall be supplied showing by number the area and districts covered by the various sheets.

##### b. Symbols

All topographical symbols and conventions used shall be clearly defined. Water transmission and distribution mains to be built at present or constructed later shall be shown by suitable conventions. Where applicable, existing sanitary sewers and combined sewers shall be shown by special designations.

##### c. Elevations and Dimensions

Surface elevations shall be shown of all important parts of the work, with sufficient dimensions to permit verification of the operation of the facility. Datum shall be stated.

##### d. Plans for Water Treatment Plants, etc.

(1) The plants for intake structures, pumping equipment, water treatment plants, and similar structures shall include a general plan showing the various units and structures included in the project and, subject to the provisions of paragraph d.3. of this subsection, detail plans of such units and structures.

(2) The detail plans shall show longitudinal and transverse sections sufficient to explain the construction of each unit, including the hydraulic profile through the plant, when applicable.

(3) Only the detailed plans relevant to the examination by the Department need be submitted. Detailed drawings which have no sanitary significance but which are given by the engineer for the guidance of builders or contractors need not be submitted, e.g. structural details; reinforcement details; details of heating, ventilation, electrical work; architectural details; and the electrical-mechanical details of pumps, engines and machinery.

## **2.6 Specifications**

Complete specifications shall be submitted covering the sanitary facilities of the project. To conserve file space in this Department and to facilitate review of the data, sections dealing with general conditions of Contract, Notices to Bidders, Detailed Specifications for such items as doors, windows, fittings and fixtures, steel work, concrete, and wood work, should be omitted.

## **2.7 Operation During Construction**

- a. When a modification or an addition to an existing water treatment plant is proposed, the engineer shall submit a program for keeping existing units in operation during construction.
- b. If a shutdown of any existing treatment units will be necessary during construction, the engineer shall submit for approval a schedule which will ensure that the delivered water will be adequately protected during the shutdown period.

# **SECTION 3 — GENERAL REQUIREMENTS**

## **3.1 Instrumentation**

- a. Each water source installation shall include a totalizing flow meter. Except for small installations, indicating, totalizing, and recording equipment is required.
- b. Installations shall be provided with adequate instrumentation to ensure the proper operation of the process.
- c. There shall be means available to determine water level elevations in each distribution storage unit.
- d. Each pump shall be equipped with a discharge pressure gauge.

## **3.2 Laboratory Facilities**

- a. Every water treatment plant shall be equipped for the determination of chlorine residual concentrations.
- b. Plants for the treatment of Class 2 waters shall be equipped with sufficient laboratory facilities to conduct the analyses required for control of the treatment process or processes involved.
- c. Plants for the treatment of Class 3 waters shall be equipped with sufficient laboratory facilities to conduct the analyses required for control of the treatment processes involved and shall, in addition, have facilities or arrangements for bacteriological examination.

- d. Plants for the treatment of Class 4 waters shall be equipped with sufficient laboratory facilities to conduct all the determinations required to establish conformance with the New Jersey Potable Water Standards.

### **3.3 Disinfection of Waterworks Facilities**

- a. After completion of any public water supply or water treatment facility (including transmission and distribution mains and distribution system reservoirs and tanks), all surfaces with which adequately protected water may come into contact shall be effectively disinfected before being placed into service.
- b. Acceptable methods of disinfection will include, but shall not necessarily be confined to, the following:
  - (1) Contact with a chlorine solution of concentration not less than fifty parts per million (50 ppm), for a minimum contact period of twelve (12) hours.
  - (2) Contact with a chlorine solution of concentration not less than twenty parts per million (20 ppm), for a minimum contact period of twenty-four (24) hours.
  - (3) Thorough wetting of the surfaces to be disinfected, by means of brush or spray application, of a chlorine solution of concentration not less than five hundred parts per million (500 ppm), with a minimum contact period of one (1) hour.
- c. Proposed method or methods for the disinfection of waterworks facilities shall be included in the specifications.

### **3.4 Avoidance of Cross Connections, etc.**

- a. No cross connection shall be permitted to exist in any water treatment plant between any pipe or conduit carrying adequately protected water and another pipe or conduit carrying waste water, raw water, or water in any prior stage of treatment.
- b. No conduit or chamber containing adequately protected water shall be permitted to have a common partition with another conduit or chamber containing waste filter wash water or water in any prior stage of treatment, unless the common partition is made completely impermeable by use of an acceptable protective membrane.
- c. Sludge draw-off lines, filter backwash discharge lines, well blow-off lines, and overflows from any water treatment or treated water storage reservoir or tank shall not be connected directly into any storm drain, sanitary sewer, or water source; but shall be protected by a suitable one way air-gap-delivery connection to ensure that no backflow can occur under any condition.
- d. Priming systems for pumps shall be such as to prevent the contamination of adequately protected water.

### **3.5 Wastewater Treatment and Disposal**

- a. Wastewater, such as sludge from coagulation and sedimentation tanks and filter backwash water, shall ordinarily be treated before being discharged into any of the waters of this State. The degree of treatment will be contingent upon the character of the wastewater and its effect upon the receiving waters. Disposal of sanitary sewage shall be in accordance with existing statutes and regulations promulgated thereunder.

- b. Unless otherwise approved, minimum treatment shall be by plain sedimentation in lagoons. A minimum of two (2) lagoons shall be provided with a minimum total combined capacity equivalent to twenty-four (24) hours wastewater flow. They shall be designed with suitable baffles to minimize short-circuiting, and shall be provided with slow-release outlet devices.
- c. Wastewaters containing high concentrations of dissolved solids shall be controlled as to discharge rate and the point of discharge, so as to meet the requirements of the Department for the specific situation.

### **3.6. Operating Buildings**

A suitable operating building shall be provided for each water treatment plant. The building shall be provided with heat, lighting, and ventilation. Office space, workshop, laboratory, and storage should be provided.

### **3.7 Sanitary Facilities**

Drinking water, toilet, and lavatory facilities are recommended for each water treatment plant, and each pumping station; and are required at each treatment plant for waters of Classes 3 and 4. A shower is recommended.

### **3.8 Maintenance and Operating Equipment**

Depending on the size of the plant and the character of the equipment, a complete outfit of necessary tools and accessories shall be provided.

### **3.9 Safety Features**

All waterworks facilities shall be equipped with necessary safety features, including access ladders, railings at the tanks and walkways, guards around belts and other moving parts, handrails at stairs or steps, adequate ventilation of enclosures, and such special provisions as are required by these rules and regulations for the handling of chemicals. Nonslip treads on stairs shall be provided, and slope of stair shall meet New Jersey Labor Department requirements. Warning signs shall be posted in hazardous locations. A First Aid kit shall be provided. Where required for safety or security, a suitable enclosure shall be provided.

### **3.10 Electrical Work**

All electrical work shall conform to the National Electric Code, with particular attention to hazardous location requirements.

## **SECTION 4—GROUND WATER SUPPLIES**

### **4.1 Duplicate Installations Required**

- a. In supplies derived entirely from ground water sources, duplicate wells and pumping equipment, or equivalent, shall be provided when average water demand exceeds twenty thousand (20,000) gallons per day or the number of services exceeds one hundred (100).
- b. An interconnection with another approved public water supply may be accepted in lieu of a duplicate installation.

### **4.2 Protection of Ground Water Sources**

- a. Sufficient land shall be acquired around wells, infiltration galleries, springs, and similar sources of ground water developed for public water supply, as to satisfy the Department.

- b. All land within a minimum of fifty feet (50 ft.) from a well shall be acquired by the owners of a public water supply system.
- c. Any sewer or line carrying sanitary or industrial wastes which is within one hundred feet (100 ft.) of a well shall be of steel, reinforced concrete, cast-iron or other suitable material; shall be properly protected, of completely watertight construction, and shall be tested for watertightness after installation.
- d. No manholes or connections on a sanitary sewer system shall be permitted within one hundred feet (100 ft.) of a well.

#### **4.3 General Information Required**

The Engineer's Report required in accordance with the provisions of subsection 2.3 shall include the following information:

- a. General description of the construction of the ground water source.
- b. Test pumping report including maximum tested yield and drawdown.
- c. Capacity of pumping equipment installed and the control of its operation.

#### **4.4 Information to be Shown on Map**

The map or maps required in accordance with the provisions of subsection 2.4 shall show the following information:

- a. Topography and the locations of existing, presently planned, and future planned ground water sources in the area under consideration. Each source shall be given an identifying number in chronological order of construction.
- b. Elevations of well-heads above a common datum plane and highest known flood elevations.
- c. Pollutational hazards (such as septic tank systems, sewers, barnyards, and watercourses), as are required in subsection 2.3 c (2).

#### **4.5 Formation Log**

The detailed plans and specifications shall be accompanied by a formation log showing the types and thicknesses of formations penetrated by the well or, in the event this information is not available at the time of the application, it shall be submitted to the Department when the well has been constructed and prior to the approval of the well as a source of water for public potable and domestic purposes.

#### **4.6 Detailed Drawings**

- a. A schematic drawing or drawings of the construction shall be included with as much detail as is practicable with the information available, and shall include:
  - (1) Length, size and locations of casings and screens.
  - (2) Method of sealing off shallow ground water from entering the well, including the sealing of the annular space between the drill hole and the outer casing and surface strata.
  - (3) Pumping unit, including prime and stand-by power sources.
  - (4) Plan and section of pump house or similar structure.
  - (5) Method of connecting the well or other ground water source with the distribution system..
- b. A detailed drawing or drawings shall be submitted for the following construction:

- (1) Details of well head, including elevations of protective curbing, top of casing, pump house floor and surrounding grade.
- (2) Method of sealing well head against surface pollutants.
- (3) Provision and locations of well vents and the methods for their protection against the entry of contaminating matter.
- (4) Well head piping details, showing provision and locations of check valves, surge or air relief valves, gate valves, sampling tap, water level indicator, discharge pressure gauge, and blow-off connection to permit pumping to waste.

#### **4.7 Applicability of AWWA Standards for Wells**

Subject to the provisions of this Section minimum well construction standards shall equal applicable portions of the American Water Works Association Standard for Deep Wells (AWWA A100-58) or superseding standard.

#### **4.8 General Requirements of Wells**

- a. All wells shall be constructed so as to prevent surface and shallow ground waters from gaining access into the well or the aquifer. Any annular space outside the casing shall be filled with a nonshrink neat cement grout, sand-cement grout, or other approved sealing material, at least two inches (2") thick for a vertical distance extending a minimum of fifty feet (50 ft.), unless otherwise approved. Annular spaces to be grouted shall be filled from the bottom of the space to the top of the well in one continuous operation.
- b. Where the danger of salt water intrusion exists the well shall be constructed with an outer casing in accordance with the requirements of the Water Policy and Supply Council of the State of New Jersey.
- c. The casings of wells drilled or driven into rock shall extend through the overburden, and shall be effectively sealed into the rock formation. If the rock is fractured, creviced, or fissured, or is limestone or shale, the casing shall be extended a sufficient depth into the rock to satisfy the Department that the aquifer is adequately protected.
- d. The string of pipe used as the protective casing in a well shall be continuous, with tight joints from its bottom terminal to the top of the well, to assure adequate surface protection.
- e. Gravel-pack wells shall be constructed with clean insoluble stone properly graded for the formation size and the screen opening. The specifications shall include a provision for the disinfection of the gravel before its placement.

#### **4.9 Well Casings**

- a. (1) Metal casings which are to be a permanent part of the well shall be of wrought iron or steel having minimum weights and thicknesses as specified in the American Water Works Association Standard Specification A100-58, or superseding standard.  
(2) The joints of permanent metal casings shall be welded or made up with threaded couplings.
- b. Other casing materials, if proposed, shall be of such weight and thickness as is required to withstand the stress of installation and any corrosive effect of the water and soil, and shall have acceptable, watertight, joints.

- c. Screens, when provided, shall be of adequate strength and of material which will adequately resist corrosion, and of such design and size as to assure long life. Screens shall be set at an elevation to assure that the lowest pumping level in the well will be above the top of the screen.

#### **4.10 Protection of Well Head**

- a. The well head shall be so constructed as to assure the maximum protection of the well, and to exclude entry into the well of any contaminating matter.
- b. The casing pipe and protective curbing of all wells shall extend at least twelve inches (12") above the pump house floor or the grade near the well.
- c. Pump house floor shall be sloped away from the well head and, unless otherwise permitted, the floor shall be above the maximum known flood elevation.
- d. Well pits will be accepted only if adequate provision is made for their drainage by a sump pump or other arrangement. Direct connection to a sewer or storm drain will not be acceptable.
- e. The space between the pump column and the inner casing of each well shall be provided with a vent which shall be protected with a down-facing elbow or mushroom type head located above the flood level. All vents shall be screened against the entry of insects.
- f. Wells in which pumping equipment is not installed shall be properly capped to exclude the entry of contaminating matter pending such installation.

#### **4.11 Special Requirements for Other Ground Water Sources**

- a. Where approval is requested for other works for the derivation of water from ground sources, such as dug or bored wells, radial collectors, infiltration galleries or springs, the provisions of subsections 4.1 through 4.10 shall apply insofar as they are applicable.
- b. Such applications shall include sufficient detail as to the method of construction to permit the Department to fully evaluate the sanitary significance of the proposed works.

#### **4.12 Tests, Samples and Records**

- a. Provisions shall be made to test the ability of each water collection device to yield water. Test pumping should be effected over a sufficient period of time at a rate in excess of twenty percent (20%) above the installed capacity. Records of drawdown and flow rate shall be made at frequent intervals during the test, and water levels during the recovery period shall be recorded.
- b. Water samples shall be taken during the test period, and examined for bacteriological and chemical quality.
- c. Records of the test pumping data shall be submitted to the Department.

#### **4.13 Abandoned Wells, Test Wells, and Observation Wells**

Abandoned wells, test wells, and observation wells shall be properly sealed in accordance with the provisions of the Division of Water Policy and Supply, New Jersey Department of Conservation and Economic Development.

#### **4.14 Pumping Equipment**

- a. Details of the pumping equipment to be installed, including rated capacity, type of drive, and a general description of the pumping unit, shall be submitted.
- b. Total pumping capacity installed should be sufficient to provide at least the maximum anticipated water demand with the largest single unit out of service.
- c. The pump and equipment for each well shall be designed and installed to ensure a pollution proof and, where necessary, a frost proof installation. The pump base shall be constructed so as to permit installation of a watertight mounting.
- d. When possible the pump shall be so located and designed as to make the use of a pump pit unnecessary. The location shall be such as to permit convenient access for the removal and repair of the pump.
- e. Maximum pump capacity shall be such that the pumping level will not fall below the top of the screen.
- f. The pump setting and suction inlet should be so located that the pumping level cannot be drawn below the top of the screen.
- g. The setting of the pump should be such that the pumping level will not be drawn below the level of the lowest pump bowl.

#### **4.15 Auxiliary Equipment for Well Supplies**

- a. The discharge pipe from each well shall be provided with a check valve and a shut-off valve. The check valve shall be located between the pump and any blow-off, bypass, or other connection to the discharge pipe.
- b. Well blow-off shall terminate above ground level, and shall be suitably protected against the entry of pollution.
- c. Each well shall be equipped with a water level indicator, a discharge pressure gauge and a flow meter. For large installations the Department may require the installation of an indicating, totalizing and recording meter.

#### **4.16 Disinfection of Equipment, Etc.**

After completion of the ground water source of supply and the installation of the permanent pumping equipment, the well or other ground water source, suction piping, pumping equipment and discharge piping shall be disinfected in accordance with the provisions of subsection 3.3, before being placed into service.

#### **4.17 Approval of Water Quality**

- a. Following disinfection of the ground water source as required by subsection 4.16, the water shall be pumped to waste until the water is free of residual chlorine.
- b. The water shall then be tested by the Department for quality, and the water source will not be approved for distribution for public potable and domestic purposes until satisfactory bacteriological and chemical tests are obtained or suitable treatment is proposed.
- c. Wells shall stand idle for at least twenty-four (24) hours immediately preceding the test, and they shall contain no disinfectant.

- d. Notwithstanding the provisions of this subsection, the chemical testing may be waived if it can be demonstrated that the water is of similar chemical quality to that from other ground water sources in the immediately adjacent area and that it will be subjected to adequate treatment prior to its distribution for public potable and domestic purposes.

## **SECTION 5 — SURFACE WATER SUPPLIES**

### **5.1 General**

The following requirements regarding construction of facilities concerned with surface water supply sources are set forth to ensure adequate protection of the water supply. Basic information on the source must be contained in the Engineer's Report as outlined in subsection 2.3.

### **5.2 Location and Protection of Intakes**

- a. Intakes shall be so located and designed as to secure adequate quantities of water of good quality.
- b. Intakes shall be so located and arranged that surface drainage from the immediate vicinity of the intake has a minimum adverse effect on water quality.

### **5.3 Depth of Intake Openings**

Intake structures shall ordinarily permit selective withdrawal of water from multiple levels.

### **5.4 Coarse Screens or Racks**

Each intake shall be protected by removable or cleanable coarse screens or racks to prevent debris from entering the system.

### **5.5 Screening and Straining**

- a. Fine screens may be used for the purpose of excluding smaller fish and debris from the system.
- b. For surface waters that do not require filtration, screening or straining devices capable of the removal of visible organisms and debris shall be provided. Data shall be submitted to substantiate their effectiveness and practicability. Devices shall be of such design that they may be automatically cleaned.

## **SECTION 6 — PUMPING STATIONS**

### **6.1 General**

The following minimum requirements are stated in order to ensure that each pumping station constructed can deliver water to its point of discharge in such a manner as to maintain adequate protection.

### **6.2 Location and Protection**

- a. The station site shall be such as to afford maximum protection against flooding or other damage.
- b. The station shall be protected against unauthorized entry and vandalism. It shall preferably be enclosed within an industrial-type woven mesh fence with lockable gate.

### **6.3 Construction of Building**

- a. Buildings shall be constructed of durable and fire-resistant materials and, so far as is practicable, shall be of a design which blends with the other buildings in the immediate area.
- b. Buildings shall be so constructed that surface water will not enter or lie against the building. Normally, the ground floor shall be at least six inches (6") above the surrounding ground.
- c. All floors, dry wells, meter pits, piping galleries, and similar locations not intended to contain water, shall be self-draining without possibility of backflow. If necessary, sufficient sump pumping capacity shall be provided for the removal of water.
- d. Adequate heating, lighting and ventilation shall be provided.

### **6.4 Wet Wells**

Wet wells shall be watertight and be protected against entry of seepage or other foreign material. They shall be covered, and be provided with a vent or vents which shall be screened and protected.

### **6.5 Pumping Equipment**

- a. Pumping equipment shall be designed to meet the necessary delivery conditions.
- b. The number and capacity of the pumping units shall be sufficient to provide the maximum output of the station when the largest single unit is out of service.
- c. Booster pumps shall be controlled to prevent negative pressures on the suction lines. The design shall be such as to prevent reduction of distribution pressures below twenty pounds per square inch (20 psi).
- d. Priming systems shall be such as to prevent contamination of potable water supplies.

### **6.6 Accessories**

Pumping stations shall be adequately equipped with such valves, gauges, meters, and other accessories as are needed for the proper operation of the station.

### **6.7 Power**

- a. A dependable source of power shall be provided for the operation of the pumping equipment.
- b. When commercial electrical power is used, two independent sources of power should be available, comprising either:
  - (1) Two independent electrical sources, or
  - (2) One electrical source, and one standby source either for emergency power generation or direct drive to the pumping equipment.
- c. When nonelectrical power source is used, dependability of the source must be demonstrated.

### **6.8 Signalling Devices**

All automatic and remotely-controlled pumping stations shall be provided with telemetering equipment or other adequate automatic signalling devices which will indicate when the station is out of service.

## 6.9 Cross Connections

There shall be no cross connection anywhere in the station between a potable water supply and any supply which is not of potable quality.

# SECTION 7—DISTRIBUTION SYSTEMS

## 7.1 Material to be Submitted

- a. For new water supply systems, a plan showing the distribution system shall be submitted with the other engineering data. This shall show locations, diameters and material of the pipes, and location of hydrants, blowoffs, and main valves.
- b. Major extensions, additions, and improvements of transmission and distribution lines in excess of an estimated construction cost of \$50,000 shall be submitted for review and approval. Routine extensions, additions, and alterations need not be submitted.

## 7.2 Capacity and Size of Mains

- a. Design capacity of water mains shall be such as to provide a minimum pressure of twenty pounds per square inch (20 psi), at peak day demand plus fire flow.
- b. Unless a smaller diameter can be justified by the engineer, the minimum diameter of all distribution mains shall be six inches (6"). In any case, any pipe intended to supply fire hydrants shall have a minimum diameter of six inches (6").

## 7.3 General Design Requirements

- a. So far as is practicable, distribution mains shall be laid in the loop system to eliminate deadends. Deadends, if unavoidable, shall have a fire hydrant, flushing hydrant, or blowoff for flushing purposes.
- b. All distribution mains shall be provided with sufficient earth or other suitable cover to prevent freezing.
- c. Water services and plumbing shall conform to the relevant local and/or State plumbing codes.
- d. The specifications shall include provision for the adequate disinfection of all new distribution mains prior to being placed into service.
- e. Water mains and sewers generally shall be separated by a horizontal distance of ten feet (10 ft.). If such lateral separation is not possible, the water and sewer pipes shall be in separate trenches, with the sewer at least eighteen inches (18") below the bottom of the water main; or with such other separation as is approved by the Department. At crossings of sewers and water mains, the sewer shall, in general, be at least eighteen inches (18") below the bottom of the water main. Where this is not possible, the sewer shall be constructed of cast iron pipe with mechanical or slip-on joints, or hot-poured lead joints, for a distance of at least ten feet (10 ft.) on either side of the crossing; or other suitable protection, as approved by the Department, shall be provided.

## 7.4 Water Crossings

- a. Surface water crossings, both over and under water, present special problems which should be discussed before final plans are prepared.

- b. Sampling taps and valves should be provided at each end of a water crossing to facilitate sanitary control.

#### **7.5 Maintenance of Adequate Protection**

- a. Chambers or pits containing gate valves, air-relief valves, blowoffs, meters, or similar appurtenances to a distribution system shall be suitably drained and shall not be connected directly to any storm sewer or sanitary sewer.
- b. No blowoff, air-relief valve, flushing device, or hydrant drain shall be directly connected to a storm sewer or sanitary sewer.
- c. The open end of an air-relief pipe shall be extended from the manhole or enclosing chamber to a point at least one foot (1') above the ground, and shall be provided with a downfacing elbow and insect screen.
- d. Except as permitted under the provisions of Chapter 308, P. L. 1942, there shall be no physical connection between the distribution system and any unapproved source of water. No steam condensate, or cooling water from engine jackets or other heat-exchange devices, shall be returned to the potable water supply.

### **SECTION 8 — DISTRIBUTION STORAGE**

#### **8.1 General**

- a. Storage for finished water shall be provided as an integral part of each water supply system.
- b. The location, size, type and elevation of the equalization reservoir, standpipe or elevated tank shall be such as to meet the distribution system pressure requirements contained in Section 7.
- c. Unless a smaller capacity can be justified by the provision of standby power, alternate sources of supply, adequate booster pumps or interconnections, storage facilities serving the system by gravity shall be equivalent to approximately one day's water requirements.
- d. In any system serving more than fifty (50) customers, hydropneumatic tanks will not be considered as providing adequate storage.
- e. Clear wells, whether designed as separate structures or as part of the filter structure, shall meet the requirements for below-grade reservoirs. (See subsection 8.5.)
- f. Finished water shall not be stored adjacent to an untreated water compartment when only a single wall separates the two.
- g. Each reservoir and tank shall be equipped with overflow and low level warnings or alarms.
- h. There shall be means available to determine water level elevations in each distribution storage unit. (See subsection 3.1.)
- i. Facilities shall be so designed as to permit dewatering for cleaning and maintenance without interrupting service. Direct connection to a storm sewer or sanitary sewer will not be permitted.

#### **8.2 Protection and Safety**

- a. All equalization reservoirs, standpipes and elevated tanks shall be protected against unauthorized access and vandalism. Fencing, locks, and other necessary safeguards shall be provided.

- b. Due regard, in the design of an elevated facility, must be given to the personal safety of employees. (See subsection 3.9.)

### **8.3 Roofs and Covers**

- a. Each reservoir, standpipe, or elevated tank shall be provided with a suitable roof or cover.
- b. The roof of the structure shall be well-drained, but drainspout pipes shall not enter the reservoir. Parapets or similar construction which would tend to hold water or snow on the roof, will not be permitted.
- c. Access manholes or scuttles above the water lines of an elevated tank shall be framed at least six inches (6") above the surface of the roof; ground-level reservoir manholes shall be elevated at least thirty-six inches (36") above the roof, depending upon the amount of snow expected. Each access manhole or scuttle shall be provided with a solid tight cover which is securely fastened against unauthorized entry.
- d. All vents shall be protected with downfacing elbows or mushroom covers, and insect screens. Vents on ground level reservoirs shall terminate not less than twenty-four inches (24") above the roof.

### **8.4 Inside Paint, etc.**

- a. All protective coatings in contact with the water shall be inert, non-toxic, and shall not impart any taste, odor or color to the water.
- b. Painting specifications for the inside paint shall be submitted with the appropriate engineering data; except that, if identical with the appropriate AWWA Standard Specification, an indication to this effect will be sufficient without necessity of submitting details.

### **8.5 Below-Grade Reservoirs**

- a. Reservoirs constructed partly or entirely below grade shall be so designed, located, and graded as to be secure against uplift and the entry of underground or surface pollution.
- b. Any sanitary sewer within one hundred feet (100 ft.) of a below-grade reservoir shall be of steel, reinforced concrete, cast iron or other suitable material; shall be properly protected, of completely watertight construction, and shall be tested for watertightness after installation.
- c. No manholes or lateral connections to a sanitary sewer shall be permitted within one hundred feet (100 ft.) of a below-grade reservoir.

### **8.6 Above-Grade Reservoirs, Standpipes and Elevated Tanks**

- a. Above-grade reservoirs, standpipes and elevated tanks shall be provided with such inside or outside ladders as may be necessary to permit ready inspection.
- b. Riser pipes shall be protected to prevent freezing.
- c. Each overflow pipe of an elevated tank or standpipe shall have free-fall discharge which is in plain view, and terminate at least six inches (6") above the ground. A stub overflow will not be considered suitable.

### **8.7 Sterilization**

All reservoirs, tanks, and appurtenances shall be disinfected in accordance with the provisions of subsection 3.3 before being placed into service and after having been entered for cleaning, repair, or painting.

## SECTION 9—CHEMICAL HANDLING AND FEEDING

### 9.1 Number and Capacity of Feeders

- a. For essential (noninterruptible), chemicals, a minimum of two (2) chemical feeders will be required, each of sufficient capacity to supply all of the chemical needed.
- b. If more than two (2) chemical feeders are to be used, sufficient combined feed capacity shall be available with the largest feeder out of operation.

### 9.2 General Requirements

- a. Variation in the accuracy of the feed rate shall not exceed five percent (5%), of the intended dosage.
- b. Suitable means shall be provided to ensure proper chemical dosage of the water being treated.
- c. Methods for accurately measuring the amount of chemical fed shall be provided.
- d. Feeders shall be located so as to prevent dust and fumes from entering other operating areas.

### 9.3 Solution Feeders

Solution feeders shall comply with the following requirements:

- a. Suitable means shall be provided to measure make-up water.
- b. Make-up water shall be introduced through an air break or other approved method for preventing back-siphonage.
- c. The solution shall not be introduced directly into any pipe or conduit under negative pressure, or directly into a well and, in the case of feed into the pump discharge line from wells, shall not be introduced between the check valve and the pump.
- d. The discharge of the solution feeder shall be equipped with a suitable valve to prevent siphonage of the solution.

### 9.4 Chemical Solution Tanks

Chemical solution tanks shall comply with the following requirements:

- a. When applicable, the tank shall be provided with adequate agitation to keep the strength of the solution uniform throughout.
- b. The pipes supplying water for the dissolving of chemicals, or for make-up water, shall be protected against back-siphonage.
- c. The capacity of each day-tank shall be sufficient to provide at least three (3) hours chemical solution storage at normal feed rates, and shall preferably provide for eight (8) hours of such operation.

### 9.5 Dry Feeders

Dry feeders may be of the volumetric or gravimetric type, and shall comply with the following requirements:

- a. They shall be completely enclosed, and adequate means for the control of dust shall be provided.
- b. The solution pot shall be of adequate design to ensure effective solution or suspension of the chemical.

- c. Make-up water shall be introduced through an air break or other approved method for preventing back-siphonage.
- d. There shall be no direct connection between a solution pot drain and a sanitary sewer.
- e. Waste liquids or sludge from solution pots shall be disposed of by such means as may be approved by the Department.

#### 9.6 Chemical Feed Lines

Chemical feed lines shall be equipped with clean out connections; shall be easily accessible for repair or cleaning; protected against damage and freezing; corrosion resistant; as short as possible; and be provided with adequate slope to permit draining.

#### 9.7 Storage and Handling of Chemicals

- a. Chemical storage space shall be provided so that normally at least one (1) month's supply of all essential chemicals may be conveniently stored under satisfactory storage conditions.
- b. Approved dust control methods shall be used in handling dry chemicals. Exhaust air from vacuum conveying equipment shall be filtered and discharged outdoors. Where chemical containers are being dumped, an exhaust fan with filter and suitable duct work shall be used which provides an air velocity of at least two hundred (200) feet per minute at the opening through which the chemical is being dumped. Containers may be dumped in enclosures or through dust-tight connections without use of fan exhausts. Crystalline or granular forms of the chemical may be used to reduce dust control problems.
- c. Specifications for equipment for the storage, handling and feeding of chemicals which are hazardous to the health of employees shall include the provision of sufficient rubber or neoprene gloves and, where dry powdered chemicals are handled, Bureau of Mines approved respirators. Facilities shall be provided for washing hands and gloves.

### SECTION 10 — MISCELLANEOUS TREATMENT PROCESSES

#### 10.1 Aeration

- a. Facilities for aeration of water, either before or after the addition of chemicals, will be examined for effectiveness in treatment and adequate protection of the water.
- b. Because of the large variation in aeration requirements, no standards are herein prescribed for the air volumes to be provided.
- c. Where water is subjected to an aeration process, and is not subsequently subjected to filtration, the following minimum requirements shall be fulfilled to provide adequate protection against dust, insects, and bacteriological contamination.
  - (1) All air entering the aeration unit shall be passed through a corrosion resistant screen of not less than 24 mesh.
  - (2) If of spray or trickle type, the aeration device shall be placed in a louvered enclosure equipped with watertight and dust-tight roof, and the aerated water shall be subsequently disinfected.

- d. Notwithstanding the requirements of this subsection, no special protection against aerial contamination is required where the aerated water is subsequently subjected to coagulation and filtration.

## 10.2 Softening

- a. A public water supply, prior to distribution, shall be subjected to a softening process of the raw water contains a total hardness in excess of the recommended maximum specified in the New Jersey Potable Water Standards.
- b. Design of facilities for the softening of water shall conform to pertinent requirements of other sections of these rules and regulations.
- c. Lime softening
  - (1) Except where carbon dioxide gas is used for recarbonation, a minimum detention period of 20 (twenty) minutes shall be provided.
  - (2) The design shall include the provision of rapid filter units.
  - (3) The design shall include provision for disinfection.
  - (4) Excess lime treatment will not be accepted as a substitute for chlorination or other approved disinfection process as required by Section 13.
- d. Ion-exchange softening
  - (1) Except where adequate pretreatment is provided, ion-exchange processes shall not be used as a substitute for filtration.
  - (2) The design shall be such that bed regeneration is not required more frequently than once per 6 hours of service.
  - (3) The design criteria for ion-exchange units used also as filters shall meet the applicable design requirements stated in Section 12.
  - (4) Banks of household-type units in parallel will not be considered as acceptable for public water treatment plants.

## 10.3 Iron and Manganese Removal

- a. A public water supply, prior to distribution, shall be subjected to an appropriate removal process if the raw water contains concentrations exceeding 0.6 ppm of iron, or 0.1 ppm manganese.
- b. Class 2 waters in which the iron or manganese concentration does not exceed the limits imposed in subsection 10.3a may be treated with hexametaphosphate or similar compound.
- c. The equipment for the removal of iron or manganese shall be so designed as to afford adequate protection to the water being treated.
- d. Examination of designs for iron or manganese removal equipment will not include an evaluation of the efficacy of such equipment, but such equipment shall produce a water complying with the appropriate requirements of the New Jersey Potable Water Standards.
- e. Wastewater shall be treated in accordance with the requirements of subsection 3.5.
- f. Banks of household-type units in parallel will not be considered as acceptable equipment for public water treatment plants.

## 10.4 Corrosion Control

- a. Provision shall be made for corrective treatment when waters are corrosive to the distribution system or plumbing. A water shall be con-

sidered corrosive when there is an increase in iron or alkalinity within the distribution system.

- b. Chemical feed equipment shall comply with the provisions of Section 9.
- c. Compounds intended to be fed to water for providing a protective film on the walls of distribution mains, and their proposed feed rates, shall receive the prior approval of the Department.
- d. Cathodic protection will be accepted as a suitable method for the protection of elevated storage tanks and standpipes against corrosion, but will not be considered acceptable for such protection of water mains.

#### **10.5 Taste and Odor Control**

- a. Provision shall be made for corrective treatment for objectionable tastes and odors in all waters derived from a surface source, and for ground waters which have objectionable tastes and odors.
- b. The equipment for the removal of objectionable tastes and odors shall be so designed as to afford adequate protection to the water being treated.
- c. When sodium chlorite is to be used for the generation of chlorine dioxide, proper provision shall be made for its storage and handling so as to eliminate any danger of explosion.
- d. When powdered activated carbon is to be used, there shall be adequate forced draft of the feeding equipment so as to eliminate any danger of explosion. It should be stored in a building or compartment which is as fireproof as possible, and nothing else shall be stored in the same building or compartment. The carbon feeder room shall be equipped with explosion-proof electrical outlets, lights, and motors.
- e. When copper sulphate or other copper compounds are to be used, provision shall be made to assure that the residual of copper in the treated and distributed water shall not exceed the recommended maximum concentration as specified in the New Jersey Potable Water Standards.
- f. Examination of designs for taste and odor control equipment will not include an evaluation of the efficacy of such equipment, but such equipment shall produce a water complying with the appropriate requirements of the New Jersey Potable Water Standards.

#### **10.6 Fluoridation**

- a. Plans and engineering data submitted for fluoridation shall show the capability of the proposed plant to provide an accurately controlled fluoride-ion concentration in the finished water of not less than one part per million (1.0 ppm) nor more than one and five-tenths part per million (1.5 ppm).
- b. Fluorine compounds shall be added at as many points in the water supply system as are necessary to ensure that all water being distributed to the consumer will have the proper concentration of fluoride-ion.
- c. The following compounds will be accepted for use in public water supplies:
  - (1) Sodium fluoride
  - (2) Sodium silicofluoride
  - (3) Hydrofluosilic acid

- d. Fluoride chemicals shall be stored in covered or unopened shipping containers unless transferred to approved, covered, storage containers. Where storage containers are used, they shall be large enough to hold sufficient chemical for a minimum of one day's use. Hydrofluosilic acid must be stored in covered, acid-resistant, containers.
- e. Feeding equipment shall comply with the applicable provisions of Section 9, and with the following special requirements:
  - (1) Solution feed equipment may be used to feed solutions of sodium fluoride or hydrofluosilic acid. The feeding of sodium silicofluoride slurries will not be approved.
  - (2) Dry feeders may be of volumetric or gravimetric type. If volumetric feeders are used, they shall be mounted on suitable weighing scales. At least twelve (12) gallons of water per pound of sodium fluoride, or sixty (60) gallons per pound of sodium silicofluoride, shall be provided. A detention period of at least five (5) minutes is required for sodium fluoride, and fifteen (15) minutes for sodium silicofluoride. The solution shall not be introduced directly into any pipe or conduit under negative pressure, and suitable means shall be provided to prevent siphonage of the fluoride solution.
  - (3) Floor surfaces adjacent to feeders shall have a smooth and impervious finish, and they shall be sloped to adequate drains to permit hosing the floor.
  - (4) Waste liquids or sludge containing fluorine compounds shall be disposed of by such means as may be approved by the Department.
  - (5) Approved dust control methods shall be used in handling dry chemicals. Exhaust air from vacuum conveying equipment shall be filtered and discharged outdoors. Where chemical containers are being dumped, an exhaust fan with filter and suitable duct work shall be used which provides an air velocity of at least two hundred (200) feet per minute at the opening through which the chemical is being dumped. Containers may be dumped in enclosures or through dust-tight connections without use of fan exhausts. Crystalline or granular forms of the chemical may be used to reduce dust control problems.
  - (6) Approved vapor and gas control methods shall be used when hydrofluosilic acid is handled. The acid shall not be handled in open vessels, but shall be pumped through a closed system with an air inlet from the outside.
  - (7) Specifications for fluoridation equipment shall include the provision of sufficient rubber or neoprene gloves and, where dry fluoride compounds are handled, Bureau of Mines approved dust respirators, for all personnel handling the chemical. Facilities shall be provided for washing hands and gloves.
  - (8) Fluoridation storage and feeding facilities shall be in rooms separate from other plant facilities, except they may be housed in the separate rooms also utilized for gas chlorinators. Rooms in which fluorine compounds are to be stored or handled shall be secured against entrance by unauthorized persons.
  - (9) An approved kit shall be provided for the routine testing of water samples for fluoride content.

## SECTION 11 — PRETREATMENT

### 11.1 Applicability

The term "pretreatment" as used in this section refers to the water treatment processes employed to prepare water for filtration, which include mixing, flocculation or softening, and sedimentation.

### 11.2 General

- a. The number of pretreatment units shall be such that the requirements in subsection 11.7 will be met when any single unit is out of service.
- b. Sufficient data shall be included in the engineer's report to establish the type of dosage of the chemicals required for treatment.
- c. Each pretreatment basin shall be equipped with a drain or drains to permit dewatering.
- d. Adequate provision shall be made for the removal of sludge. Where sludge is expected to be voluminous, consideration should be given to mechanical methods of removal.
- e. Unless otherwise permitted, sludge shall not be discharged into any of the waters of this State. (See subsection 3.5.)

### 11.3 Rapid Mixing

The application of chemicals to water in pretreatment shall be at locations where there is sufficient agitation to ensure rapid dispersion of each chemical throughout the water, such as at pump suction or rapid mix basins.

### 11.4 Flocculation

- a. Flocculation is required for all Class 3 and Class 4 waters.
- b. Flocculation shall be accomplished by agitation under suitable mixing conditions.
- c. The flocculation unit shall be designed with suitable compartments and inlet and outlet facilities to minimize short-circuiting, and to permit floc to pass from the flocculator to the subsequent treatment unit without impairment. Ordinarily this will limit velocities to one foot per second (1 f.p.s.).

### 11.5 Sedimentation

- a. Pretreatment by sedimentation will ordinarily be required for Class 3 waters, and shall be provided for all Class 4 waters.
- b. Sedimentation basins may be rectangular or circular.
- c. Depth of sedimentation basins shall be such as to make ample allowance for sludge accumulation or sludge removal equipment, and to provide for a reasonable depth of flow, normally at least six feet (6 ft.).
- d. Inlet and outlet facilities shall be designed to minimize short circuiting. If submerged inlet ports are used, they shall be so located as to avoid creating a disturbance of the settled floc.
- e. When around-end baffling in a horizontal plane is proposed, the maximum surface loadings required in subsection 11.7 shall be reduced fifty percent (50%).

- f. The Engineer's Report should provide data to justify the surface loading proposed. If no surface loading justification is shown, a minimum detention period of four (4) hours shall be required.

**11.6 Solids-Contact Units**

- a. Use of solids-contact units will be considered for flocculation, lime softening, iron or manganese removal, and for settling.
- b. Evidence shall be submitted to satisfy the Department that the equipment to be installed will operate satisfactorily.
- c. Each unit shall have facilities for satisfactory flocculation of the water before it enters the settling areas.
- d. Units shall be equipped with suitable sampling provisions to permit collection of samples from critical points in the process.
- e. Units shall be installed under supervision of the manufacturer's representative who shall also supervise initial operation.
- f. Outlet weir loadings shall not exceed twenty (20) gallons per minute per foot of length for softened water, nor ten (10) gallons per minute per foot for flocculated water. Where orifices are used rather than weirs, their size, number and arrangement shall be such as to produce loadings equivalent to the requirements for weirs. Weirs or orifices shall be so arranged as to produce uniform vertical flow rates over the area of the tank.
- g. Each solids contact unit must have effective means for concentrating sludge for draw-off disposal.
- h. Sludge piping shall be arranged so as to facilitate operation and cleaning. It shall not be less than three inches (3") in diameter. Arrangements shall be provided for flushing the sludge piping with clear water.
- i. Sludge valves shall be located outside of the tank.
- j. Each unit shall be provided with equipment to attain intermittent automatic withdrawal, and manual takeover.

**11.7 Detention Times and Surface Loadings**

- a. Flocculating, softening, and settling basins, and solids contact units, shall comply with the following minimum requirements:

| Requirement                  | Flocculation<br>or Iron<br>or Manganese<br>Removal | Lime<br>Softening |
|------------------------------|--|-------------------|
| <b>Minimum Reaction Time</b> |  |                   |
| <b>Solids Contact Units</b>  |  |                   |
| Class 2 and 3 waters .....   | 10 minutes   | 20 minutes        |
| Class 4 waters .....         | 20 minutes   | 20 minutes        |
| <b>Horizontal Flow Units</b> |  |                   |
| Class 2 and 3 waters .....   | 20 minutes   | 20 minutes        |
| Class 4 waters .....         | 30 minutes   | 30 minutes        |

### Maximum Surface Loading

Per square foot per minute (See Subsection 11.5e)

#### Solids Contact Units

|                            |              |             |
|----------------------------|--------------|-------------|
| Class 2 and 3 waters ..... | 1.0 gallons  | 2.0 gallons |
| Class 4 waters .....       | 0.75 gallons | 1.5 gallons |

#### Horizontal Flow Units

|                            |               |              |
|----------------------------|---------------|--------------|
| Class 2 and 3 waters ..... | 0.5 gallons   | 1.0 gallons  |
| Class 4 waters .....       | 0.375 gallons | 0.75 gallons |

- b. Flocculation (or reaction) time for solids contact units shall be calculated on the basis of the input flow and the volume occupied by the agitated mixture of slurry with the water being treated; and for horizontal flow units, on the volume of the flocculation or reaction chamber.
- c. Surface loading rates for solids contact units will be calculated on the basis of the input flow and the horizontal area of upward flow in the clarification zone at a level five feet (5 ft.) below the level of the discharge weirs or orifices; and for horizontal flow units, on the horizontal area of the water at the surface.

## SECTION 12—FILTRATION

### 12.1 General

- a. Filter units should be so designed that the filter medium will be visible for inspection during operation and cleaning.
- b. Where closed units are used, access openings should be provided, together with windows and illumination such that the condition of the filter medium may be inspected at any time.
- c. Means shall be provided for cleaning and scraping of filters, and for placing or replacing the filter medium.
- d. If the filter medium is to be reused, means shall be provided for washing it.

### 12.2 Filter Unit Capacity

Total filter unit capacity shall be such that, with one unit out of service, the maximum filtration rate of any of the remaining units will not exceed the requirements imposed by subsection 12.3e.

### 12.3 Filter Design Characteristics

- a. Filter design shall be such as to afford adequate protection to the water distributed for public potable and domestic purposes.
- b. No filters shall contain any sanitary hazards; there shall be no common walls between treated and untreated waters; nor plumbing cross connections.
- c. Filters for waters of Class 1 or Class 2 shall be of a design based upon operating experience at comparable locations.
- d. Waters of Class 3 and Class 4 shall be subjected to adequate pretreatment prior to filtration, in accordance with the provisions of Section 11.

- e. Except as provided in subsection 1.2, filters for Class 3 or Class 4 waters shall comply with the following minimum requirements:

**Filter Requirement According to Water Classification**

| Class of Water                                   | 3                     | 4                     |
|--|-----------------------|-----------------------|
| Maximum filtration rate .....                    | 5 gpm/ft <sup>2</sup> | 3 gpm/ft <sup>2</sup> |
| Maximum effective size of filter media           |                       |                       |
| Rounded Materials .....                          | 0.60 mm               | 0.55 mm               |
| Angular Materials .....                          | 0.50 mm               | 0.45 mm               |
| Maximum uniformity coefficient .....             | 1.6                   | 1.6                   |
| Minimum thickness of filter medium ..            | 18 inches             | 24 inches             |
| Maximum head loss through filter<br>medium ..... | 12 ft. of<br>water    | 8 ft. of<br>water     |

- f. Suitable means shall be provided for control of filtration rates.
- g. Dual beds of sand and anthracite are acceptable and, where used, the anthracite may be twice the effective size stated under subsection 12.3e. Sand thickness should be at least twelve inches (12").
- h. At least twelve inches (12") of graded gravel should be placed over underdrains.
- i. Slow sand filters may be used on special justification.
- 12.4 Backwash Water**
- a. Backwash water shall have been filtered.
- b. For rapid sand filters, available wash rate shall be sufficient to provide a minimum of thirty percent (30%) expansion of the filter medium. Supplemental washing facilities such as surface wash or air scour units are recommended.
- c. Washwater storage allowance shall be sufficient to wash not less than two (2) filter units or to provide not less than two percent (2%) of the daily output capacity.
- d. Unless otherwise permitted, untreated filter backwash shall not be discharged into any of the waters of this State. (See subsection 3.5.)

**SECTION 13 — DISINFECTION**

**13.1 General**

- a. Disinfection of water supplies shall not be considered as a basis for deviation from the requirements of all other Sections.
- b. Disinfection of water supplies shall be accomplished with chlorine or chlorine compounds; the use of other disinfectants will not be permitted.
- c. Installations which are to be merely replacement of equipment will be approved without the submission of plans, but an application and specifications shall be submitted.
- d. Disinfection should follow all other forms of treatment, except that prechlorination may be practiced if it is applied in addition to post-chlorination.

- e. Chlorination without other treatment will be accepted only for Class 1 waters.
- f. Where chlorination and screening or straining are proposed as the sole treatment for surface waters, the engineer shall provide supporting data including raw water characteristics showing seasonal variations.

### **13.2 Acceptable Equipment**

- a. Gas chlorinators shall be of the solution feed type.
- b. Hypochlorite feeders of the positive-displacement type will be acceptable; in general these should be considered satisfactory only for the disinfection of a water source with a capacity not exceeding one million gallons per day (1.0 mgd).
- c. If chlorine dioxide is used as the disinfectant, sodium chlorite shall be injected into the discharge line of a solution feed gas type chlorinator, with subsequent formation of the chlorine dioxide in a reaction chamber.
- d. If ammonia is added, the ammonia system shall be separated from the chlorine system so that the ammonia and chlorine gases will not mix.
- e. Superchlorination followed by dechlorination will be accepted, provided that the minimum chlorine contact periods required in subsection 13.5 are complied with.

### **13.3 Capacity**

For postchlorination, the capacity of the disinfection device shall be such as to produce free chlorine residuals after the required contact periods as are required in subsection 13.5. These conditions must be attainable even when the maximum flow rates coincide with an anticipated maximum chlorine demands.

### **13.4 Stand-by Equipment**

- a. Chlorination equipment shall be in duplicate for all plants with a capacity in excess of one million gallons per day (1 mgd). For smaller plants sufficient essential spare parts shall be provided to guarantee no interruption in the delivery of a properly disinfected water.
- b. For larger installations the Department may require the provision of sufficient equipment to assure that full disinfection may be maintained where the largest single chlorinator is out of service.

### **13.5 Chlorine Contact Period and Chlorine Residuals**

- a. To afford adequate protection of the various classes of waters as defined in subsection 1.5, provision shall be made in the design of the facilities to ensure the following minimum chlorine contact periods prior to delivery of disinfected water to the first consumer. The engineer's report shall demonstrate that this requirement will be met.
  - (1) Waters of Class 1 and Class 2 shall be provided with a chlorine contact period of at least five (5) minutes to produce the minimum free chlorine residuals as are required in paragraph c of this subsection; or at least thirty (30) minutes in the case of combined chlorine residuals.

(2) Waters of Class 3 shall be provided with a chlorine contact period of at least thirty (30) minutes to produce the minimum free or combined chlorine residuals as are required in paragraph c of this subsection.

(3) Waters of Class 4 shall be provided with a chlorine contact period of at least thirty (30) minutes to produce the minimum free chlorine residuals as are required in paragraph c of this subsection.

- b. In the event that both pre- and postchlorination are to be applied to waters of Class 3 and Class 4, the requirements of paragraph a.2 and a.3 of this subsection shall apply only to the prechlorination process. Postchlorination may comply with the requirements of paragraph a.1 of this subsection.
- c. The required chlorine residuals at various pH values shall comply with the requirements of the following table:

**Required Chlorine Residuals at Various pH Values**

| pH Value         | Available Chlorine Residual |          |
|------------------|-----------------------------|----------|
|                  | Free                        | Combined |
| Up to 7.0 .....  | 0.2 ppm                     | 1.0 ppm  |
| 7.0 to 8.0 ..... | 0.3 ppm                     | 1.5 ppm  |
| 8.0 to 9.0 ..... | 0.4 ppm                     | 2.0 ppm  |

**13.6 Requirements for Gas Chlorinators**

- a. Gas chlorinating devices shall be placed in separate rooms with outside entrance only and provided with suitable ventilation including an exhaust fan near floor level. The doors of such rooms shall open outward. Provision for heating during the winter season is required.
- b. An automatic alarm, or observation window to permit visual inspection without opening the door of the chlorination room, shall be provided.
- c. Scales shall be provided for determining the loss of weight of chlorine.
- d. Automatic chlorinators with residual recorders and alarm systems to indicate chlorinator failure may be required in certain instances.
- e. Ample supply of water shall be available for operating the chlorinator. The water supply shall be adequately protected against back-siphonage.
- f. A gas mask, preferably with air-pack or hose to the exterior, shall be provided and maintained in good operating condition. It shall be stored in an accessible location outside the chlorine room.

**13.7 Requirements for Hypochlorinators**

- a. Provision shall be made for heating the room in which the hypochlorinator is housed.
- b. Hypochlorinators shall be provided with an anti-siphon device to prevent the siphoning of the chlorine solution into the water supply during periods of negative pressure.
- c. Duplicate solution tanks, each having at least thirty-six hours storage capacity are required.
- d. An ample supply of water shall be available for the preparation of the hypochlorite solution, and shall be adequately protected against back-siphonage.

**13.8 Auxiliary Equipment**

- a. A comparator and supplies of orthotolidine, shall be provided for measuring chlorine residuals.
- b. Where gas-chlorinating equipment is used, an ammonia solution shall be available for testing for chlorine leaks.