STATE

DEPARTMENT OF HEALTH (OF THE)

STATE OF NEW JERSEY

Rules and Regulations for the Preparation and Submission of Designs for Sewer Systems, Sewage and Industrial Waste Treatment Works and Water Supplies and Water Treatment Works.

Trenton, New Jersey

1956

CONTENTS

RULES AND REGULATIONS

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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. 58:12-3, 58:11-2, 58:11-3, 58:11-10 and 58:10-17. 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regulations in these matters adopted on various dates by the Department of Health of the State of New Jersey are hereby rescinded.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

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CHAPTER 1 - INSTRUCTIONS

1.1 These Rules and Regulations are minimum general and specific requirements. They are intended to apply to the usual, not the exceptional conditions. They are subject to amendment and the State Commissioner of Health reserves the authority to specify more or less stringent requirements in any case as in his judgment may be in the interest of the public health.

1.2 Applicants and/or engineers are advised to confer with the Department's engineers before proceeding with a design, and, in general it is advisable to submit a preliminary plan and report before designing in detail.

CHAPTER 2 - GENERAL REQUIREMENTS

2.1 Applications

Applications for the approval of plans and specifications shall be submitted on forms provided by the Department. Applications are to be signed by the proper municipal officials, or by the owner or owners, or by the proper official (with title) of the corporation; or, if signed by an authorized agent shall be accompanied by a certified copy of the authorization. Applications by individuals or corporations shall be approved by the municipality whose water or sewerage works may be affected. Applications for the approval of plans for sewers which would discharge to a sewerage facility not owned by the applicant shall be endorsed by the owners of the affected sewerage facility. Applications by newly constituted private utilities shall be approved by the local governing body of the municipality in which the utility is located. Permits will be withheld from private utilities until they have been incorporated and until they have been granted an appropriate franchise by the State Public Utilities Commission.

2.2 Engineering Data to be Submitted

Preliminary plans - 1 set. Engineer's Report - 1 copy. Detailed plans and specifications - 2 sets. As built plans - 1 set. "As built" plans are required only when construction is substantially different from approved plans.

CHAPTER 3 - SEWERAGE - GENERAL

3.1 Sewer System on Separate Plan

The Department will approve plans for proposed new sewerage systems or extensions only when designed upon the separate system plan, in which all water from roofs, cellars, streets, and other areas is to be excluded, except that extensions of "combined" systems may be approved when it is demonstrated conclusively that there is no practical alternative.

3.2 By-passes

By-passes which may allow raw or partially treated sewage to be discharged from sewers or treatment plants shall not be installed, except as provided by article 7.5 or by special permission of the Department. Installation of by-passes to protect plant equipment is considered good policy. Provision for sealing of by-passes shall be made as required by the Department.

3.3 Information Required

(a) A general map of entire project.

(b) An area map covering probable future tributary areas for sewer system projects.

(c) Profiles of all sewers proposed.

(d) Details of construction of manholes, flush tanks, siphons, and other sewer appurtenances.

(e) Specifications for all proposed construction.

(f) General and detail plans for treatment plants.

(g) A comprehensive report upon the proposed system by the designing or consulting engineer.

(h) Estimate of costs.

3.4 General and Area Maps

(a) Details

Plans shall be drawn to standard scales and shall show the entire area of the project. In case there is more than one sheet all shall be bound together and a small index map supplied, showing by number the area and districts covered by the various sheets. A general plan shall accompany each application for a new sewer system or any extension or modification of any existing sewer system unless such general plan has already been submitted.

The plan shall show all existing or proposed streets and the surface elevations at all street intersections where sewer lines are proposed.

Plans also shall show clearly the location of all existing sewers, either "separate" or "combined" (so indicated), the location of the treatment works, and the location of existing and proposed sewer outlets or overflows, the true or the magnetic meridian, the boundary lines, title, date and scale. The elevations of the highest known freshets or tides at the outlets and site of the treatment plant shall be given. Any area from which sewage is to be pumped shall be indicated clearly.

(b) Symbols

Sewers to be built at present and sewers to be constructed later shall be shown by standard conventions. Existing sanitary sewers and combined sewers shall be shown by special designations. All topographical symbols and conventions used are to be the same as those of the United States Geological Survey.

(c) Elevations

Elevations of the surfaces of streets shall be placed outside the street lines opposite their respective positions in the street. The elevations of sewer inverts shall be shown at street intersections, ends of lines, and wherever a change of grades occurs. The elevations of sewers shall be written close to the point to which they refer, parallel with the sewer lines and between the street lines. The elevations of the surfaces shall be shown to the nearest 0.1 foot; those of the sewer inverts to the nearest 0.01 foot.

(d) Distances. Grades and Sizes

The horizontal distance and stationing between manholes, grades in percent and sewer sizes shall be shown on all proposed sewer lines. Arrows shall be drawn to indicate the direction of flow.

(e) Sewer Appurtenances

All sewer appurtenances, such as manholes (manhole numbers), flush tanks, siphons, pumping stations, etc.., shall be designated on the plans by

3.8 General and Detail Plans for Treatment Plants

The plans for treatment plants shall include a general plan showing the boundaries of reserve area for future extensions and all buildings within 500 feet of plant property; and, detail plans of the various units and structures which comprise a plant.

The detail plans shall show longitudinal and transverse sections sufficient to explain the construction of each unit. They also shall show the distribution and drainage systems, details of automatic devices, depths of stone, gravel or sand used as filtering material and all other information required for the clear understanding of the plans.

3.9 The Engineer's Report

A report by the designing or consulting engineer shall accompany all plans, except those for sewer extensions, and shall give all data upon which the design is based including:

Information concerning sewer systems

(a) The nature and extent of the area which it is proposed to include within the present system of sewerage, and of the area which it is planned shall ultimately drain into the system, including sections not within the municipal limits.

(b) The population to be served, both present and estimated for at least twenty-five years hence, with computations and curved.

(c) The estimated per capita daily flow of sewage to be cared for.

(d) The total and per capita water consumption of the district to be served at the present time, if available.

(e) The allowance made for infiltration in the sewers.

(f) The estimated daily flow of sewage, including infiltration.

(g) The character of the sewage (whether domestic or industrial wastes or process waters, and in case of the latter, the nature and approximate quantity of the same stated in specific terms); also a breakdown of all quantities.

(h) That portion of the system to be built at the present time.

(i) The minimum grades of sewers for each size used.

(j) Distance of sewer outlet from shore and maximum and minimum depths of water at outlet.

Information concerning treatment plants

(a) The character of the sewage to be treated and the method of treatment proposed.

(b) A description of the units of plants, with rates and capacities.

(c) The nature of the body of water into which the effluent will discharge, including the run-off during dry weather.

(d) The final disposal of sludge and screenings.

(e) The results expected from the treatment processes.

CHAPTER 4 - SEWERS - SPECIFIC

4.1 Capacity and Design Period

All sanitary sewers, including outfalls, shall be designed to carry at least four times the estimated average flow when flowing full. The design period for the estimated flow shall be at least twenty-five years; longer periods are recommended for major projects. For sewers other than circular in cross sections, the data to be submitted shall include the geometrical shape, dimensions and hydraulic characteristics of the proposed sewer.

4.2 Materials, Minimum Grades and Velocity of Flow

Sewers shall be designed with such hydraulic slope as will give a mean velocity of not less than two feet per second when flowing full or half full,

based on Kutter's or Manning's formula with n = 0.013 for glazed tile, concrete, brick, segmental block or cast-iron; and, with n = 0.011 for asbestos cement pipe or enamel lined pipe.

Pipe Diameter	Fall in feet per 100 feet of sewer	
	n = 0.013	n = 0.011
8"	.40	.24
10"	.29	.18
12"	.22	.14
14"	.17	.11
15"	.16	.10
16"	.14	.09
18"	.12	.08
20"	.10	.07
21"	.095	.063
24"	.080	.060
27"	.067	.046
30"	.058	.040
36"	.046	.031

Sewers crossing streams or to be located within ten (10) feet of a stream embankment or otherwise where unusual strength is indicated, shall be of cast-iron.

When grades lower than those specified above are proposed, an explanation and reasons for the use of such grades shall be included in the engineer's report. Grades lower than those so specified may cause additional sewer maintenance expense.

4.3 Inverted Siphons

Inverted siphons shall be in duplicate and provision shall be made for flushing them. A velocity of 3.0 feet per second should be maintained and flow control gates in chambers should be provided.

4.4 Joints

Joints in sewer lines constructed of vitrified tile shall be primed and formed by a fibrous packing and bitumastic compound poured hot. Standard manufactured joints for asbestos cement pipe may be used. Joints for cast-iron

pipes should be made by fibre packing and lead or approved lead substitute poured hot. Prefabricated joints are also acceptable.

4.5 Manholes

Manholes shall be provided at the ends of each sewer line and at intersections and at all changes in grade or alignment. Distances between manholes shall not exceed 500 feet for sizes 24 inches or less. A drop pipe shall be provided for lateral sewers entering manholes above the manhole invert wherever the difference in elevation is two feet or more.

4.6 Outfalls

Ocean outfalls at bathing beaches along the Atlantic Coast shall be at least 1,000 feet in length from the mean low water mark. Manholes are required on the shore end of all gravity outfalls.

CHAPTER 5 - PUMPING STATIONS

5.1 Raw sewage shall be screened before pumping unless equipment capable of handling large sewage solids is used. At least two pumps or ejectors each designed to handle total peak flows shall be provided; if more than two pumps are provided their capacities shall be such that, upon the failure of the largest pump, the others will handle the peak flows. Force main velocities should be not less than 2 ft./second at normal pumping rates. When pumping stations are located at sewage treatment plants the design shall provide for stage pumping, preferably by the use of variable speed pumps so as to eliminate, as far as practical, surges of flow through the treatment plants. Pumps shall be installed in dry wells. Wet and dry wells shall be provided with adequate means of entrance, ventilation and drainage. Wet wells shall slope toward pump suctions to prevent solids accumulation. Normally the capacity of the wet well should not exceed ten minutes in flow at the average dry weather rate. Dry wells

shall provide sufficient space for accessibility for repair and removal of pumps. An auxiliary source of power shall be provided for electrically driven pumps. Electric motors shall be located so as to be protected from flooding, and, the motors and electrical power equipment should not be installed in subsurface chambers. All electrical equipment and work shall comply in full with Fire Underwriters regulations for the location involved. Automatic sound alarms operating independently of the station power shall be installed to give warning of high water, power failure or breakdown. Adequate light, ventilation and a fresh water supply should be provided at all pumping stations. Pump specifications shall include complete standard repair tools and accessories.

CHAPTER 6 - TREATMENT METHODS REQUIRED

6.1 General

Treatment shall be provided for all domestic sewage before discharge to waters of the state. The degree of sewage or industrial waste treatment shall be as specified by the Department. Effective sedimentation is the minimum treatment method recognized by the Department. The Department does not recognize fine screens, magnetite filters or so-called "rapid sand filters" as treatment methods.

The type of treatment in addition to its adequacy shall take into consideration the topography of the plant site, operating costs, effects of industrial wastes, and the probable quality of supervision the plant will receive.

6.2 New Treatment Methods

Designs for new treatment methods or for methods not included in these rules and regulations shall be accompanied by detailed data on full scale tests under competent supervision. The Department may approve such installations

as experimental if the applicant is fully aware of the experimental nature of the proposal. The Department reserves the right to disapprove new treatment methods if in its opinion such denial is in the interest of the public health.

6.3 Basis of Design of Industrial Waste Treatment Plants

No specific design criteria for industrial waste treatment plants are included due to the diversity and complexity of the subject. However, the general requirements relative to submission of detailed plans, specifications and engineer's report shall apply.

Each industrial waste treatment plant will be considered on its individual merits and in relation to the over-all stream pollution control program of the New Jersey State Department of Health. It is recommended that Department engineers be consulted prior to preparation of the final design.

CHAPTER 7 - TREATMENT PLANTS

7.1 General

Treatment plants shall be located as far from existing structures as practical. They shall be placed above maximum flood levels and be accessible by an adequate road. The plant layout shall be designed with a view toward ease of operation, safety and accessibility.

7.2 Operating Building

A suitable operating building shall be provided. The building shall be heated, ventilated and lighted. Office space, workshop, laboratory, toilet facilities and storage should be provided.

7.3 Measuring and Recording

Means for continuous measuring, indicating and recording of the sewage flows shall be installed.

7.4 Operating Tools

Complete operating tools and required laboratory equipment shall be provided.

7.5 By-Passes

A by-pass shall be installed except where two or more units are provided. By-passes with two or more units may be provided (see section 3.2).

7.6 Dewatering

Means shall be provided for dewatering all treatment units for inspection and maintenance.

7.7 Emergency Power

Dual sources of power shall be provided where temporary discharge of inadequately treated sewage would endanger public health or cause serious damage.

7.8 Alarm System

An alarm system shall be provided for all treatment plants wherein 24-hour supervision is not provided and wherein discharge of inadequately treated sewage would endanger public health or cause serious damage.

The alarm system shall extend by wire to the police station or other location where competent assistance can be obtained in emergency.

7.9 Water Supply

An adequate supply of water under pressure shall be installed.

7.10 Maintenance Equipment

Adequate equipment shall be furnished for plant operation to include squeegees, skimmer, sludge sounder, hoses and tools for mechanical work and for ground maintenance. A portable pump shall be provided.

7.11 Laboratory Equipment

All plants shall be equipped with adequate laboratory equipment commensurate with the degree of treatment. Minimim equipment shall include:

3 - Imhoff cones
Comparator with pH and chlorine discs
12 - 300 ml bottles for relative stability tests

7.12 Safety Features

Plants shall be equipped with necessary safety features to include railings around tanks, handrails at stairs or steps, flame traps at all gas outlets, and adequate ventilation of enclosures. Warning signs shall be posted in hazardous locations. A First Aid Kit shall be provided.

7.13 Grading

Treatment plant sites shall be graded and drainage installed to prevent wash into tanks, basins or filters and to prevent erosion. Landscaping is recommended.

7.14 Sanitary Facilities

Facilities such as drinking water, toilet and lavatory should be provided. A shower is recommended.

7.15 Electrical Work

All electrical work shall conform to the National Electric Code. Fixtures in hazardous locations shall be of the explosion-proof type.

CHAPTER 8 - TREATMENT PLANT DESIGN BASIS

8.1 Design Period

Treatment units shall be designed for population and sewage flow anticipated not less than ten (10) years after completion of construction. Units which cannot be readily increased in capacity shall be designed for a

period of 15 to 25 years in the future.

8.2 Flow

Treatment units for a new sewer system shall be designed for an average domestic flow, including infiltration, of not less than 100 gallons per capita to which shall be added industrial waste volume.

Where a sewer system exists, actual gaging shall be used as a basis plus allowance for future increase in sewage flow.

8.3 Design Loading

Unless accurate data justifying a lesser design are submitted the hydraulic design shall be based on not less than 250 percent of average rate of sewage flow except that in all cases maximum rate shall be considered. This requirement is intended to provide for passage of at least 250 percent of average flow through the plant including such by-passes as are approved.

Where recirculation is employed, additional flow from this source shall be taken into consideration.

Organic loading shall be considered on the same basis as flow loading.

CHAPTER 9 - SCREENING

9.1 General

(a) All sewage treatment plants shall be provided with means for screening or comminuting coarse material in the sewage.

(b) Operation of mechanically cleaned devices should be continuous or automatically controlled.

9.2 Bar Screens

(a) Bars of nonmechanical screens preceding treatment plants shall be spaced so that the maximum clearance between bars is not greater than

1-1/2 inches and not less than 1 inch.

(b) Clear openings for mechanically cleaned screens may be as small as five-eighths of an inch.

(c) Coarse screens preceding mechanically cleaned screens or comminutors may be greater than given under (a).

(d) At sewage pumping stations, bar screens shall be at least 1 inch smaller than the solid size which can be handled by the pump.

(e) Motors shall be of the type suitable for operation in a damp atmosphere if placed below ground.

(f) The screening chamber shall be designed to provide a velocity of not less than two (2) feet per second and not more than three (3) feet per second.

(g) Hand-cleaned screens, except for emergency use, shall be inclined from 30° to 45° from horizontal.

9.3 Screenings

(a) Adequate facilities shall be provided for removal, handling and disposal of screenings. A platform shall be provided at top of hand-raked screens. Satisfactory containers shall be provided for removal of screenings.

(b) Means shall be provided for drainage of screenings both on the platform and in containers.

(c) Where screen chambers are located substantially below grade, a suitable hoist shall be provided.

(d) Screen chamber shall be adequately ventilated. Where required forced draft fans shall be installed.

9.4 Comminution

(a) Comminuting devices shall have slots not less than 1/4 inch

wide and be designed to cut or shred material below the surface of the sewage. The capacity of each unit shall be adequate to handle 250 percent of average rate of flow except where three or more units are provided in which case capacity with any one unit out of service shall be adequate for maximum rate of flow. Device shall be placed so that the effective area of the screen is utilized at average flow.

(b) A by-pass screen shall be provided.

(c) Gates shall be provided to isolate each comminutor channel and means provided for removal of mechanisms for repair and maintenance.

CHAPTER 10 - GRIT CHAMBERS

10.1 General

(a) Grit chambers shall be provided at all treatment plants receiving combined sewage.

(b) A grit chamber shall be provided at those plants receiving separate sanitary wastes unless evidence can be submitted that the sewage will not contain an appreciable amount of grit.

(c) Grit chambers receiving combined sewage shall have duplicate hand-cleaned units or a single mechanically cleaned unit with by-pass. Mechanically cleaned chambers are recommended. Single hand-cleaned chambers with by-pass are acceptable for plants receiving separate sanitary wastes.

10.2 Design

(a) Channel and control features such as gate, weir or Parshall flume, shall be designed to produce velocities of not less than 0.5 foot per second and not greater than 1.0 foot per second. Detention shall be adequate to deposit grit coarser than 0.20 millimeters.

(b) All mechanically cleaned grit chambers shall be provided with means for washing the grit either below the surface of the sewage or above the flow.

(c) Mechanically equipped chambers shall be equipped with screw or bucket elevators to remove grit from channels to ground level or to a hoist. Containers shall be provided for hand-cleaned chambers and means of hoisting containers to truck or other conveyance.

CHAPTER 11 - SEDIMENTATION TANKS

11.1 General

(a) Tanks shall be provided with two or more independent compartments.

(b) Channels shall be designed to maintain a velocity of 1 foot per second at 0.5 design flow.

(c) Baffling shall be provided to dissipate inlet velocity and diffuse flow equally across the cross section of the tank.

Baffles shall also be provided to retain scum in primary tanks. Scum troughs are recommended, preferably of the tilting type. Scum troughs shall not be used as the sole means of effluent baffling.

(d) Weirs shall be adjustable.

(e) The minimum slope of the side walls of sludge hoppers shall be 1.7 vertical to 1 horizontal.

(f) Means shall be provided for dewatering all tanks.

11.2 Mechanically Cleaned Settling Tanks

(a) Primary tanks shall have a surface settling rate not exceeding 550 gallons per square foot per day for the design flow and a minimum water depth of six (6) feet and a maximum depth of ten (10) feet.

(b) Secondary Settling Tanks

(1) Trickling filters or activated sludge aeration tanks shall be followed by duplicate individually controlled, secondary settling tanks.

(2) Mechanical means shall be provided for collecting sludge and scum excepting in very small installations having hopper bottoms with minimum side slopes of 1.7 vertical to 1.0 horizontal.

(3) Inlets shall be designed to dissipate inlet velocity promptly, diffuse the flow and prevent short circuiting. Adjustable outlet weirs shall be provided. Minimum length of flow from inlet baffle to outlet shall be ten feet.

(4) Secondary settling tanks shall be designed according to the following:

Type Treatment	Depth in Feet	Surface Settling Rates Gals/Sq.Ft./Day
Standard Rate Trickling Filters	5 to 6	1,000
High Rate Trickling Filters	8 to 9	800
Activated Sludge (2.0 mgd and less)	8 to 9	800
Activated Sludge (over 2.0 mgd)	10 to 11	1,000

It is the intent of this requirement to secure approximately one hour detention on standard rate trickling filters and two hours on the others.

11.3 Nonmechanical Settling Tanks

The use of nonmechanical settling tanks is not recommended except for installations too small to warrant use of mechanical sludge collectors.

11.4 Single Story Sedimentation Tanks (without separate sludge digestion)

Single story sedimentation tanks without separate sludge digestion tanks will not be permitted except by special permission of the Department. When this method of treatment shall have been approved by the Department the following shall apply:

(a) Two or more units shall be provided.

(b) The capacity of settling tank units, exclusive of sludge capacities, shall be at least eight (8) hours, based on average flow. The total sludge capacities of all units shall be two (2) cubic feet per capita.

(c) The depth below the water line shall be not less than six (6) feet, nor more than twelve (12) feet.

(d) Scum boards shall be provided at inlet and outlet ends of each unit. The design of inlets and outlets should provide for uniform distribution.

11.5 Imhoff Tanks

(a) The detention period shall not be less than two and one-half hours based on design flow.

(b) Surface settling rates shall not exceed 600 gallons per square foot per day at design flow.

(c) Bottom slopes of flow-through chamber shall not be less than 1.4 vertical to 1.0 horizontal and shall be smooth.

(d) The slot opening shall be at least eight (8) inches wide measured on the sloping bottom.

(e) The slot overlap shall be eight (8) inches minimum measured on a horizontal plane.

(f) Tanks shall be provided with at least 18 inches of freeboard. The water level shall not be more than 24 inches below the walkways or operating level.

(g) Gas vents shall not be less than 18 inches wide and not less than 20 percent of the total superficial tank area.

(h) Means shall be provided for reversal of flow.

(i) The inlets and outlets shall be so designed as to equally distribute the sewage flow among and through the tanks.

11.7 Other Types

The use of combined units employing sedimentation will be given consideration only where full-scale units have been in operation for a sufficient period of time to provide data covering efficiency and operating costs and to assure that mechanical and maintenance problems have been worked out. Experimental units will be approved only when the municipality or industry have been fully advised as to the experimental nature and is agreeable to its installation.

CHAPTER 12 - SLUDGE DIGESTION AND DISPOSAL

12.1 General

(a) Except as provided in article 7.12, the Department does not examine plans as to fire and explosive hazards, heat controlling equipment, or safety devices.

(b) Supernatant liquor should be returned to the raw sewage except at activated sludge plants.

(c) The minimum diameter of all sludge pipes shall be eight (8) inches for gravity flow and six (6) inches for sludge pumping.

(d) A fresh water hydrant near sludge digestion tanks is recommended.

12.2 Imhoff Tanks

(a) The upper limits for computing sludge storage shall be the plane 18" below the tank slot. Storage for separate systems shall not be less than three (3) cubic feet per capita and not less than four (4) cubic feet per capita for combined systems. Additional allowance shall be made for secondary sludge if resettled in the Imhoff tank.

(b) A net static head of 6 feet shall be provided for gravity withdrawal and 2 feet if sludge is pumped. Valves shall be provided for each hopper and these shall be placed outside of the tank for accessibility. Entrance

to sludge withdrawal lines shall be designed to prevent clogging and pipes shall be sloped so that they will drain.

12.3 Separate Sludge Digestion Tanks

General

(a) Two or more units shall be provided except where a lagoon or open tank is available for emergency use and where piping or pumping is available for use of emergency facilities.

(b) The proportion of depth to diameter shall be such as to allow for the formation of a reasonable depth of supernatant liquor.

(c) Bottom slope of tanks shall not be less than three inches per foot toward withdrawal piping unless tank is equipped with sludge collection mechanism.

(d) At least two access manholes of adequate size shall be provided in the top of digester in addition to the gas dome.

(e) Inlet piping of rectangular tanks shall be at the opposite end from overflow piping. In circular tanks the raw sludge inlet shall be at a point at least equal to the radius of the tank from overflow or supernatant drawoffs. In the case of multiple tanks, provision shall be made to direct raw sludge to each tank.

(f) Any emergency overflow shall be provided. Provision shall be made for sampling of supernatant and for removal of supernatant slowly over an extended period.

(g) Means shall be provided for sampling of digested sludge. Digested sludge withdrawal piping shall extend from the center and bottom of circular tanks and from the effluent end of rectangular tanks. Means shall be provided for backflushing digested sludge withdrawal piping. Adequate transfer

piping shall be provided. An access manhole in the side wall of the tank is recommended.

(h) Provision shall be made for circulation of sludge either by means of a mixer or sludge circulation pump.

12.4 Capacity

Separate sludge digestion capacity shall be as follows:

Type of Plant	Cubic Feet Per Capita	
	Heated	Unheated
Primary	2 to 3	4 to 6
Primary plus standard filter	2.5 to 3	4 to 6
Primary plus high rate filter	3 to 4	5 to 7
Chemical coagulation	4 to 5	6 to 8
Activated sludge	4 to 6	8 to 10

The capacities may be increased if industrial wastes are to be considered, and may be reduced if the sludge is dewatered. Volumes should be computed on the basis of bottom sloping up 30 degrees from the horizontal withdrawal piping unless mechanical sludge collection is employed. Additional capacity shall be provided where garbage solids are to be included.

12.5 Gas Collection

(a) Waste gas burners shall be provided for excess gas and these shall be placed at least 25 feet away from structures if placed at ground level or may be located on roof of buildings provided they are sufficiently remote from digestion tanks. Waste gas burners shall be equipped with pilot lights and means for igniting manually.

(b) All enclosures containing gas piping or apparatus shall be equipped with forced draft ventilation either of the winddriven or motor operated type. If of the motor type the design shall be such that the motor does not come in contact with gases.

(c) Boilers utilizing gas shall be located in a separate enclosure having adequate means of ventilation.

12.6 Digester Heating

(a) The use of hot water coils as a method of heating is not recommended unless means are provided for removing and maintaining the coils. Coils if used shall be of wrought or cast iron. Preference should be given to means of external heating by means of a heat exchanger.

Heating capacity shall be adequate to maintain sludge at 85° to 95° at all times.

(b) Thermometers shall be provided to show temperatures of sludge in the digester, and the sludge going to and from the heat exchanger. Thermometers shall also be provided to show the temperature of the water going to and from the heating coils or heat exchanger.

(c) An auxiliary fuel shall be provided, such as oil or commercial gas.

12.7 Sludge Pumps

(a) A minimum of two duplicate sludge pumps shall be provided.

(b) The capacity of each pump for handling raw sludge shall be such as to remove sludge from hoppers of settling or concentration tanks in not less than one hour or more than two hours or each pump shall have a 24 hour capacity equal to one percent of plant design flow. Pump capacity shall be adjustable.

(c) Plunger pumps are preferred for handling raw sludge.

(d) A minimum positive head of 24 inches shall be provided at the suction side of centrifugal pumps and is desirable for all types of pumps. Maximum suction lift of plunger pumps shall be 10 feet.

(e) Unless sampling facilities are otherwise provided, quick opening valves shall be installed at sludge pumps. The size of valve and piping should be at least 1 inch.

(f) Pressure gauges shall be provided on the discharge line of sludge pumps to denote pumping and to indicate unusual discharge heads due to clogging.

12.8 Sludge Dewatering

Drying Beds

(a) The following table of requisite areas applies to domestic sewage. Where industrial wastes are to be handled, a suitable allowance should be made.

Type of Treatment	Area in sq. ft./cap. Open Beds	Covered Beds
Primary with digestion	1.50)	
Standard Rate Filter	1.75)	60%
High Rate Filter	1.75)	area
Activated Sludge	2.00)	of
Chemical Precipitation	2.25)	open beds

(b) Design

(1) Not less than two beds or compartments shall be provided.

(2) Gravel shall be 12 inches deep with top at least 6 inches above underdrains. It shall be graded with the top layer consisting of at least 3 inches of gravel or crushed stone 1/8 to 1/4 inch in size.

(3) Depth of sand shall be at least 6 inches and have an effective size of 0.30 to 0.50 millimeters and a uniformity coefficient not greater than 5.0.

(4) Underdrains shall be of bell and spigot vitrified clay tile pipe, porous tile or perforated pipe. Lateral drains shall be at least 4 inches in diameter laid with open joints. Burlap or similar material shall be provided around joints. They shall be spaced not more than 8 feet apart.

(5) Walls shall be watertight and extend 15 to 18 inches above and at least 12 inches below the sand surface. Walls shall be at least 6

inches above the surrounding ground elevation to prevent soil from washing on to beds.

(6) Means shall be provided to facilitate removal of dried sludge from drying beds.

(7) Influent piping shall terminate at least 12 inches above the sand surface and be arranged to drain to drying beds. Splash slabs shall be provided.

(8) Sludge bed effluents shall be treated.

12.9 Shallow Lagoons

The use of lagoons for drying of digested sludge is permissible provided:

(a) The soil is reasonably porous and the bottom of the lagoons must be at least 18 inches above the maximum ground water plane.

(b) The area to be provided shall be at least double that specified for drying beds.

12.10 Vacuum Filtration

Vacuum filters shall be in duplicate unless storage for thirty (30) days' accumulation of sludge is provided. Duplicate installations shall include duplicate appurtenances, including conditioning equipment, conveyors, etc.

Capacity should be sufficient to process the sludge so that there will be no accumulation from day to day. The engineer's report shall give complete data upon filter capacity, sludge volume to be handled, conditioning method and equipment, chemical storage and disposal of sludge cake.

CHAPTER 13 - CHEMICAL COAGULATION

13.1 Consideration of Method

This method of sewage treatment shall be considered as a degree of treatment intermediate between what are commonly known as sedimentation, and sedimentation and oxidation. In no case shall it be considered as a substitute for oxidation.

13.2 Requirements

(a) Coagulants shall be applied to the sewage in liquid form proportional to the sewage flow.

(b) A chamber or mixing tank for the rapid and thorough mixing of the sewage and coagulant(s) shall be provided. The detention period shall be not less than one (1) minute based on average flow. A means for thorough mixing consisting of power-driven paddles, propellers or diffused air shall be provided.

(c) Two or more flocculation tanks providing a combined detention period of between twenty (20) and thirty (30) minutes shall be provided. Diffused air or paddles shall provide continuous agitation of the full content of the tanks. Slow rotary motion should be provided for in the flocculation tanks. Independent controls for each tank shall be provided.

(d) Sedimentation Tanks - same as 11.2.

(e) Sludge Digestion - same as 12.4 and 12.8.

(f) Drains shall be provided to dewater all tanks.

13.3 Equipment

(a) Adequate automatic control of pumps shall be provided.

(b) An auxiliary source of power for the electrically driven mechanism shall be provided.

(c) Devices shall be installed to give warning of breakdown of mechanical equipment.

(d) The automatic control of apparatus feeding chemicals for coagulation shall include equipment to provide variation in chemical dosage with variation in sewage flow.

(e) Detailed information, including capacity, construction and operation of the proposed equipment, shall be submitted.

CHAPTER 14 - TRICKLING FILTERS

14.1 General

(a) Applicability - Trickling filters of the "standard rate" or "high rate" type may be used for treatment of sewage and industrial wastes amenable to purification by biological processes.

(b) Filters shall be preceded by effective preliminary treatment, preferably adequate sedimentation tanks with sludge removal and scum collecting devices.

(c) When the average 5-day B.O.D. of the raw sewage exceeds 325 ppm, trickling filter treatment is not desirable unless two stages of filters with or without intermediate sedimentation are provided or unless the primary sedimentation is supplemented by an additional method of treatment, such as chemical coagulation.

(d) Distribution devices may be actuated by twin siphons, pumps or by gravity discharge from preceding treatment plant units when suitable flow characteristics have been developed.

(e) The sewage should be distributed as uniformly as possible so that at least 95% of the surface area receives sewage directly.

(f) The medium shall be crushed trap rock having uniform physical properties. The upper 18 inches shall have a loss by the 20 cycle sodium

sulphate test of less than 10% and the balance shall pass the 15 cycle test. Percentage of wear shall not exceed 20 after 500 revolutions of the Los Angeles Rattler Test as determined by A.S.T.M. Standard, Designation C-131-51.

The medium shall be approximately cubical in shape, free from dust, clay, sand or fine material, and of a size to pass a four inch screen and be retained on a two inch screen. Material shall be screened or forked if necessary to remove fines and shall be so placed as to avoid breaking of underdrains.

(g) The underdrainage system shall cover the entire floor. Inlet openings into the underdrains shall have an unsubmerged gross combined area equal to at least 5% of the surface area of the filter.

Lateral underdrains shall have a minimum slope of one percent. Main underdrain and effluent channels shall be designed to provide a velocity of not less than 2 ft. per second.

The entire drainage system shall be designed to permit free passage of air and of such size that not more than 50 percent of cross sectional area will be submerged during operation of the filter at maximum rate. Provision shall be made for flushing lateral underdrains from the main drain or a peripheral head channel.

14.2 Standard Rate Filters

(a) The volume of sewage to be treated by standard rate filters shall not exceed 630,000 gals. per acre per day per ft. of depth nor shall the average rate of application during dosing period exceed 1,100 gals. per min. per acre ft. when the average 5-day B.O.D. of the raw sewage is less than 215 ppm or if the average B.O.D. of the raw sewage is more than 215 ppm maximum dosing rate shall not exceed:

$$\frac{215}{\text{5-day B.O.D. Raw Sewage}} \times 1{,}100$$

(b) The minimum depth of filtering medium at any point in the filter measured from top of underdrain to surface of the medium shall not be less than six feet and maximum depth shall not exceed nine feet.

(c) Time interval between application of sewage to the filter at design rate should generally not exceed five minutes. Where feasible, the layout should be such as to permit recirculation of filter or final tank effluent to reduce excessive detention periods or extended periods of no application of sewage to the filter.

(d) Temporary means for Psychoda fly control, such as provisions for back flooding, are desirable.

14.3 High Rate Filters

(a) High rate filters shall be preceded by at least duplicate mechanically-cleaned primary settling tanks (see 11.2). Reduction in 5-day B.O.D. in primary tanks preceding high rate filters shall be considered as not exceeding 35 percent.

(b) High rate trickling filters shall be of the rotary distributor type and shall be provided with mechanism for controlled recirculation to maintain a continuous application rate of not less than 10 million gallons per acre per day and such that application to the filter generally will not exceed approximately 1.8 pounds of 5-day B.O.D. per cu. yd. of filter medium.

(c) It is recommended that the filter retaining walls extend not more than three (3) inches above the filtering medium in the rotary distributor type filter to prevent ice formation from stopping the rotating arms.

(d) The number and capacity of recirculating pumps shall be such that the foregoing conditions can be met if the pump of largest capacity for

each point of return is out of service.

(e) Filter depth of not less than five feet above tops of underdrains is recommended.

(f) Devices shall be provided to record measurement of flow to the filter and of the recirculated effluent.

(g) Flushing devices shall be provided at the outer end of each distributor arm.

14.4 Double Filtration

(a) Under conditions where treatment of unusually strong sewage is necessary and two stage filtration is adopted the intermediate settling tanks may be one-half the capacity of the primary and final settling tanks.

CHAPTER 15 - ACTIVATED SLUDGE

15.1 General

Applicability - The activated sludge process may be used where the sewage entering the aeration tanks is amenable to biological treatment. This process is recommended for use only where competent operating supervision will be made available.

Design data outlined herein are presumed to achieve a removal of 90% or more of B.O.D. and suspended solids susceptible to treatment from sewage of normal characteristics and do not apply where only partial removals are intended. Plans for plants contemplating abnormal concentrations of sewage, unusual aeration period or special equipment or arrangements will be reviewed on their merits and may be conditionally approved for construction upon presentation of appropriate supporting data demonstrating the efficacy of the design for the specific project.

15.2 Settling Tanks

(a) A skimming tank, or equivalent, shall be provided if the sewage contains excessive oil or grease. If the sewage is very stale preaeration of the settled sewage is recommended before admixture of returned sludge.

(b) The installation shall provide a minimum of two presettling tanks having total capacity to provide one hour detention based upon design flow.

(c) Final settling tanks shall be provided in multiple units capable of independent operation unless special permission is granted for the installation of a single unit in plants where required total tank volume is less than 2,500 cu. ft.

(d) For upward flow tanks the vertical rise shall not exceed two inches per minute.

15.3 Aeration Tanks

(a) Multiple units, capable of independent operation, shall be provided for all installations where the total required volumetric capacity equals or exceeds 5,000 cu. ft.

(b) Required capacity of aeration tanks based upon 125 percent of average flow shall be within the following limits:

Design Flow	Detention Period
0.2 to 0.8 mgd	7.5 hrs.
0.8 to 1.0 mgd	(range from 7.5 hrs. at 0.8 mgd to 6.0 hrs. at 1.0 mgd)
1.0 mgd and over	6.0 hrs.

(c) Surface mechanical aeration alone will not be permitted.

(d) The dimensions and proportions of the independent units shall be such as to maintain effective utilization of air, prevent unaerated sections, and maintain nondepositing velocities.

(e) Liquid depths of not less than ten nor more than fifteen feet chall be provided.

15.4 Inlets and Outlets

(a) All inlets and outlets shall be equipped with suitable devices for controlling the flow to each tank unit and to withdraw any unit from service. Velocity between bays or around baffles shall not exceed 0.5 ft./sec.

(b) Channels and pipes shall be designed to provide self-cleansing velocities or shall be equipped with mechanical devices for keeping solids in suspension continuously.

15.5 Measuring Devices

Devices shall be provided for indicating rates of flow of presettled effluent, return sludge, and air to each tank unit and total volume of wasted sludge. Preferably, these devices shall also totalize and record as well as indicate flows.

15.6 Air Supply

(a) Aeration capacity shall be at least 1.5 cubic feet per gallon plus the capacity for reaeration of returned sludge. Reaeration of returned sludge is recommended.

(b) The air diffusion system shall be capable of delivering 150% of normal requirements which ordinarily may be considered as 1,000 cu. ft. per pound of B.O.D. to be removed from the influent.

(c) Blower capacity required to deliver air to supply channels, sludge pumps or similar demands shall be in addition to that required for tank aeration as specified in 15.6 (a).

(d) Blowers shall be in multiple units and of such capacity that full operation requirements can be met with the largest unit out of service.

(e) Air filters shall be such as to continuously maintain air supply having dust content of not more than 0.5 mg per 1,000 cu. ft.

15.7 Air Diffusers and Control Valves

(a) Aeration plates, tubes or jets shall be designed for easy cleaning.

(b) Individual assembly units of diffusers shall have a substantially uniform pressure loss and shall be equipped with control valves with indicator markings.

15.8 Sludge Handling Equipment

(a) Return activated sludge pumps or air lifts shall have variable combined capacity ranging from 10% to 50% of the design flow with the largest single unit out of service.

(b) In addition to capacity required for return sludge pumping, waste sludge facilities shall be provided with maximum capacity of not less than 50% of the average rate of sewage flow and shall function satisfactorily at rates of 0.5 percent of average sewage flow or a minimum of ten gallons per minute whichever may be larger.

(c) Waste activated sludge may be returned to the presettling tanks, concentration tanks, digestion tanks, or vacuum filters.

CHAPTER 16 - INTERMITTENT SAND FILTERS

16.1 General

At least two filter units shall be provided.

16.2 Loading

(a) With acceptable primary treatment of normal sewage, loading shall not exceed 165 pounds of 5-day B.O.D. nor 150,000 gallons per acre per

day. For stronger sewage the rate of filtration shall be proportionally lower.

(b) For chemical coagulation and sedimentation the loading shall not exceed 400,000 gallons per acre per day.

(c) For standard or high rate trickling filters or activated sludge, followed by secondary settling tanks, the loading shall not exceed 500,000 gallons per acre per day.

(d) For schools, camps and institutions not having a full-time operating staff, loading should not exceed 100,000 gallons per acre per day for primary tank effluent.

16.3 Medium

(a) Clean graded gravel, shall be placed in at least three layers, over the entire floor of the bed and around the underdrains and to a depth of at least 6 inches. Grading for the three layers shall be 1-1/2" to 3/4", 3/4" to 1/4" and 1/4" to 1/8".

(b) Underdrains shall have maximum spacing not exceeding eight (8) feet and shall be at least four inches in diameter, or of equivalent area.

(c) Pipes shall be laid with open joints with a space of approximately 1/4 inch between ends. A single layer of muslin, cheese cloth or burlap, shall be wrapped around each joint. Tar paper or other waterproof material shall not be used.

(d) Sand with an effective size of 0.3 to 0.6 mm and a uniformity coefficient of not more than 3.5 shall be provided to a depth of at least 24 inches. The sand shall be free from clay, loam or silt.

16.4 Dosing

(a) A dosing tank or its equivalent shall be provided. Detention period conducive to septicity shall be avoided in the design.

(b) Siphons shall have a discharge capacity, at minimum head, at least 100% in excess of the maximum rate of inflow to the dosing tank, and at average head, at least 1 cu. ft. per second per 5,000 sq. ft. of each filter bed.

16.5 Distribution

(a) Troughs or piping used for distribution of the settled sewage over the filter surface shall be so located that the maximum lateral travel is not more than 20 feet. Provision should be made at each discharge port for adjustment of the flow.

(b) Splash slabs shall be provided at each point of discharge.

(c) A drain opening from troughs or discharge piping shall be provided.

16.6 Earth Base

The earth base of the filters shall be sloped to the trenches in which the underdrains are laid.

CHAPTER 17 - DISINFECTION

17.1 General

(a) Chlorination devices shall be of the solution feed type, installed in duplicate or with duplicate essential parts.

(b) Installations which are to be merely replacement of equipment will be approved without the submission of plans but an application and specifications (in duplicate) shall be submitted.

(c) Chlorinating devices shall be placed in separate rooms with outside entrance only and suitable ventilation. Provisions for heating during the winter season are required. Suitable gas mask shall be provided and maintained in good operating condition. Gas mask shall be stored in an accessible location outside the chlorine room.

(d) The chlorine contact period in tanks or their equivalent, shall be at least one half (1/2) hour, based on the average sewage flow. Contact tanks shall be baffled.

(e) Provisions shall be made for the thorough mixing of the disinfectant and the sewage before discharge to the chlorine contact tank.

(f) Scales shall be provided for determining loss of weight of chlorine, and, a suitable comparator for measuring residual shall also be provided.

(g) If hypochlorite feeders are provided, duplicate solution tanks (crocks) each having at least thirty-six hours storage capacity are required.

17.2 Capacity of Chlorinators

(a) For disinfection, the capacity of chlorinators shall be adequate to produce a residual of 2.0 ppm in the final effluent. For normal domestic sewage the following minimum dosing capacity shall be required:

Type Treatment	Dosage (Based On Design Average Flow)
Raw Sewage	30 ppm
Primary Sedimentation Effluent	20 ppm
Trickling Filter Plant Effluent	15 ppm
Activated Sludge Plant Effluent	10 ppm
Sand Filter Effluent	10 ppm

CHAPTER 18 - OTHER SEWAGE TREATMENT PROCESSES

18.1 The use of treatment processes other than those listed in these regulations will be considered on the merit of the process involved.

CHAPTER 19 - WATER, GENERAL

Instructions and general requirements under Chapters 1 and 2 are applicable to design of water supplies and water treatment works.

19.1 Information Required

(a) A general plan of the institution, municipality or district to be supplied.

(b) If a surface supply, a map of the watershed; if from wells or collecting galleries, a map showing their location.

(c) General and detailed plans of water treatment plants.

(d) General and detailed plans of wells and collecting galleries.

(e) Specifications for treatment plants, wells and collecting galleries, and their appurtenances.

(f) A comprehensive report upon the proposed works by the designing or consulting engineer.

(g) Estimate of costs.

19.2 Maps to be Submitted

(a) Surface Supplies - A small scale map showing all details that may influence the quality of the water at the intake, such as sewage treatment plants, industrial plants, roads, etc.

(b) Wells and Collecting Galleries - A large scale map showing the location of the wells or galleries, the dwellings, septic tanks, cesspools and streams within five hundred (500) feet of the well field or galleries, the storm and sanitary sewer lines - with type of construction - passing over or near the wells and galleries, and other sanitary features.

19.3 General and Detail Plans of Treatment Plants

(a) Plans for treatment works shall include: a general plan upon which the reserve areas, or future extensions shall be shown; the general layout of the various units of the processes, together with the piping system, surface elevations of the various units, and the normal elevation and the highest known

flood water elevation of the stream.

(b) The detail plans shall show, if the water is from a surface source, details of the intake pipe, crib, screen, etc., and complete details of each unit of the works, including mixing chambers, collecting and piping systems, methods of applying chemicals, rate controllers, loss of head gauges, washing arrangements, pumps, special devices, etc., and size and depth of stone, gravel and sand used for filtering material.

19.4 General and Detail Plans of Wells and Collecting Galleries

(a) The general plan shall show the layout of the plant together with the pipe lines and land reserved for future development or the protection of the supply, the surface elevations and the elevations of the various units of the plant. The plan for the galleries, and, if the wells are adjacent to a stream, for the well, shall show the low water and maximum high water elevations of the stream if tidal, and if the stream is not tidal, the normal elevation and highest known flood water elevations. The location and type of construction of the toilets at the plant shall be shown, together with the location and type of construction of the sewer lines leading from them.

(b) The detail plans for the wells shall show the depth, size and construction of each well, including the depths of casings and the type of strainer and seals to be used, wellheads and head seals, sampling taps, the location of the ground strata through which the well is driven, the details of the pumping station, including equipment, collecting basins, special devices, etc., and all pipe lines with appurtenances at the well field and pumping station together with the connections to the water distribution system.

(c) The detail plans for collecting galleries shall show the depth, size and construction of the galleries, all details such as manholes, size of

pipes, valves, etc. The plans shall show the details of the pumping station including pumping equipment, and all pipe lines with appurtenances at the galleries and pumping station, together with the connections to the water distribution system, and, a sampling tap.

19.5 Engineer's Report

A report by the designing or consulting engineer shall accompany all plans for a new water supply, or any extension or modification of any water supply, or water treatment works. The report shall contain the following information:

(a) Water Consumption and Population

The present population to be served should be stated and the estimated population to be served and water consumption ten (10) and twenty-five (25) years hence, with computations and curves.

(b) The Source of Supply

If from a surface source, the results of the chemical and bacteriological examinations of the raw water shall be included. The area, population and a description of the watershed shall be given, the sources of pollution, including privately and publicly owned sewage treatment plants discharging effluents into the source of supply and plants discharging industrial wastes, and the protective measures to be installed or enforced for the protection of the supply, such as patrol, fishing and bathing regulations, etc. If from an underground source, information shall be given upon the various strata and, based on the results of analysis, or other reliable information regarding water from similar sources, the probable quantity and quality of the supply.

(c) Description of Pumping Equipment

A description shall be given of the pumping equipment, the method of connecting the pumps with well, suction lines, etc.

(d) Treatment

The method of treatment and a description of the units of the system must be given together with the rate of operation of each unit of the system; if chemicals are to be applied the nature and quantity to be used of each, with the description of the appliances for adding the same to the water. A description should be given of all conditions peculiarly characteristic of the water or locality which in any manner affect the design or operation of the system; a description of all special appliances used and any special methods of maintenance or operation of the plant.

CHAPTER 20 - WELL SUPPLIES

20.1 General Requirements

(a) Subsurface construction shall be such as to prevent the entrance of contaminating material, through casing joints, to the well structure. The annular space between the excavation line and the outside of the well casing should be filled in such a manner as to prevent surface water or shallow ground water from running down the outside of the casing and thence into the well or into the water-bearing strata.

(b) The wellhead and top of casing shall be so designed as to permit placing an adequate seal to prevent contamination from surface sources.

(c) Sampling taps shall be provided on the discharge from each well.

(d) Detailed drawings of the casing work are required.

CHAPTER 21 - WATER TREATMENT PLANTS

21.1 General

(a) Flow recording devices shall be installed.

(b) A laboratory is desirable and may be required for large plants. Laboratory analyses will be specified by the State Department of Health, according to the character of the treatment plant design. The laboratory shall be equipped for such analyses in accordance with the latest edition of the "Standard Methods for the Examination of Water and Sewage" as prepared, approved and published jointly by the American Public Health Association and the American Water Works Association.

(c) Provisions shall be made so that samples at each step in the treatment process can be obtained.

(d) The return to the system of any water used in and about the plant for any purpose, which might in any way become contaminated, will not be permitted.

(e) Means shall be provided for disinfecting new mains, tanks, basins, filters and other equipment in accordance with the latest recommended procedures of the American Water Works Association.

(f) If the rules and regulations do not strictly apply to plans for any new processes and/or equipment, said plans will be examined on the basis of conservative design factors, provided sufficient data are furnished on which the new processes and/or equipment may be examined.

21.2 Filtration - Surface Supplies

Slow Sand

(a) At least two units are required, each capable of supplying the entire demand. If more than two are proposed, this requirement is waived, provided that when one filter is out of service, the other units are of sufficient size to supply the necessary amount of water at the proper rate.

(b) The rate shall not exceed 4,500,000 gallons per acre per day.

(c) The effective size of the sand shall be between .25 and .45 milli-

meters, the uniformity coefficient not over 2.0.

(d) The depth of sand shall be not less than thirty-six (36) inches.

(e) At least twelve (12) inches of graded gravel shall be placed over underdrains.

(f) Enclosures for filters are desirable and will be required in northern sections of the State.

(g) Disinfection as a post-treatment is required.

(h) Each filter unit shall be provided with a rate of flow meter and a loss of head gage and should contain a rate controller.

(i) Means shall be provided for cleaning and scraping the filters, placing sand and washing the sand, if sand is to be reused.

Rapid Filters (Gravity or Pressure Types)

(a) At least two units are required, each capable of supplying the entire demand. If more than two are proposed, this requirement is waived, provided that when one filter is out of service, the other units are of sufficient size to supply the necessary amount of water at the proper rate.

(b) The rate shall not exceed 125,000,000 gallons per acre per day (2 gallons per square foot per minute) unless otherwise approved by the State Department of Health.

(c) Filter media may be sand or anthracite coal, placed on gravel, anthracite coal, or porous filter bottoms. At least 30 inches of fine media shall be used; if sand, it shall have an effective size, between .30 and .50 millimeters, with the uniformity coefficient of not over 1.6; if anthracite coal, the effective size may be up to .65 millimeters. If the fine media is supported on graded gravel, at least 12 inches of the graded gravel shall be used, the upper two inches of which shall have effective size of between two and three millimeters.

(d) Rate of flow and loss of head indicators and rate controllers are required.

(e) Wash water shall be filtered and chlorinated water.

(f) Adequate mixing and flocculation shall precede the settling basins in the coagulation process. The overall detention time for rapid mixing, coagulation and settling shall be not less than three hours.

(g) Provisions shall be made for prechlorination and postchlorination.

21.3 Iron Removal

Engineering data for iron removal plants shall be submitted in the same manner as for other water purification plants.

If units as covered by the rules and regulations for water treatment are to be installed, they shall be designed in accordance with the provisions thereof. Special units or installations shall not expose the water to contaminents and will be examined on the basis of their satisfying accepted or tried principles and practices.

21.4 Disinfection

(a) Installations which are to be merely replacement of equipment will be approved without the submission of plans but an application and specifications (in duplicate) shall be submitted.

(b) The building housing the chlorinating equipment shall be heated.

(c) Chlorinating equipment shall be in duplicate or spare parts shall be provided to guarantee no interruption in the delivery of a properly chlorinated water.

(d) Where chlorine cylinders are required, scales shall be provided for determining the loss of weight of chlorine.

(e) If hypochlorite feeders are provided duplicate solution tanks (crocks) shall be provided, each to have a capacity of forty-eight (48) hours

supply of hypochlorite solution.

(f) A suitable comparator for measuring residual chlorine shall be provided.

(g) If ammonia is added, the ammonia system shall be separated from the chlorine system so that the ammonia and chlorine gases will not mix.

(h) If chlorine dioxide treatment is used the same requirements for the installation as for chlorine above apply.

CHAPTER 22 - FLUORIDATION

22.1 (a) Objective

The technical objective of the fluoridation process is to maintain a fluoride ion concentration of at least one part per million, not more than one and four tenths (1.4) parts per million, in the water delivered to consumers.

(b) Equipment

1. Fluorine compounds shall be added at as many points in water supply systems as are necessary to insure that all water being distributed to the consumer will have the proper concentration of fluoride ion.

2. Equipment for the feeding of fluorine compounds may be of the solution or dry feed type depending upon the compound to be used and the size of the installation.

3. Feeding equipment which permits wide variations in the amount of fluorine compound added will not be approved.

(c) Safety

1. Respirators of a type approved by the U. S. Bureau of Mines shall be provided for all persons handling dry fluorine compounds.

2. Rubber Gloves shall be provided for all persons handling fluorine compounds.

3. Adequate means for the control of dust shall be provided where dry fluorine compounds are to be handled. If dust collecting or mechanical equipment is deemed necessary for specific feeders, such equipment shall be required.

4. Powdered or granulated fluoride compounds used in the fluoridation process shall be dyed or tinted in such manner that they will or may not be confused with any other compound or substance used at the water plant.

5. Rooms in which fluorine compounds are to be stored or handled shall be secured against entrance by unauthorized persons.

6. Waste liquids or sludge containing fluorine compounds shall be disposed of by such means as may be approved by the Department.