

STATE
N. J. Department of Health
OF THE
State of New Jersey

•
RULES AND REGULATIONS FOR THE
PREPARATION AND SUBMISSION
OF DESIGNS

For
SEWER SYSTEMS AND SEWAGE
TREATMENT WORKS
and
WATER SUPPLIES AND WATER
TREATMENT WORKS

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ABSTRACT OF LAWS
Relating to
PUBLIC WATER AND SEWERAGE SYSTEMS

R. S. 45:8-15. *Employment of licensed professional engineers, registered architects or land surveyors on certain public work.* Hereafter no county, city, town, township, village, borough or other municipal corporations or other political subdivisions in the state shall engage in the construction or maintenance of any public work involving professional engineering for which plans, specifications and estimates have not been made by, and the construction and maintenance supervised by a licensed professional engineer or a registered architect, nor shall any county, city, town, township, village, borough or other municipal corporation or other political subdivision in the state employ any person to perform work involving land surveying except a licensed land surveyor.

R. S. 58:12-3. *Pollution of waters by sewage prohibited.* Except under such conditions as shall be approved by the department, no person, corporation or municipality shall build any sewer, drain or sewerage system from which it is designed that any sewage or other harmful and deleterious matter, solid or liquid, shall flow into any of the waters of this state, or build, cause to be built or operate any plant for the treatment of sewage or other polluting substance from which the effluent is to flow into any such waters, or, after the date specified in the notice provided for by section 58:12-2 of this title, permit any sewage or other polluting matter to flow into such waters from any sewer, drain or sewerage system under its control. Before the building of any plant for the treatment of sewage or other polluting substance as aforesaid, any new plans therefor shall be submitted to the department.

R. S. 58:11-2. *Approval of source of supply by department of health.* Every person intending to furnish water for potable purposes shall submit to the department a detailed report containing all information regarding the source from which such supply is to be derived, and until such source has been approved by the department said person shall not distribute such water to any consumer for potable purposes.

R. S. 58:11-3. *Approval of plans of water purification plants.* No plant for the purification of water intended for potable use shall be constructed or operated until detailed plans and specifications thereof shall have been submitted to and approved by the department.

R. S. 58:11-10. *Approval of proposed changes and improvements in water and sewerage systems: exception.* No work upon the construction of changes, improvements, extensions or alterations to any water purification or treatment plant, sewer system or plant for the purification or treatment of sewage or industrial wastes shall be begun until detailed plans and specifications therefor have been submitted to and approved by the state department of health, but the provisions of this section shall not be deemed to apply to changes, improvements, extensions or alterations to any sewer system or plant for the purification or treatment of sewage or industrial wastes located

within the territory over which the Passaic valley sewerage commissioners have jurisdiction.

R. S. 58:10-17. *Permits required for locating factories.* No factory, workshop or place for the manufacture of materials or goods shall be located or established on any watershed in this state above the point at which any public supply of potable water is taken, unless the person responsible for the operation of such factory, workshop or place shall have obtained from the department a written permit to so locate or establish the same.

R. S. 58:11-18.10. *Definitions.* As used in this act (article):

(a) "Public water treatment plant" means any structure or structures by means of which water prior to discharge into a public water supply system is subjected to the addition of a substance or substances in order to enhance the safeness of the water used for potable or domestic purposes.

(b) "Public sewage treatment plant" means any structure or structures by means of which domestic wastes are subjected to any artificial process in order to remove or so alter constituents as to render the wastes less offensive or dangerous to the public health, comfort or property of any of the inhabitants of this state before the discharge of the plant effluent into any of the waters of this state; this definition includes plants for the treatment of industrial wastes as well as a combination of domestic and industrial wastes.

(c) "Public water supply system" means a system comprising structures which operating alone or with other structures result in the derivation, conveyance (or transmission) or distribution of water for potable or domestic purposes to consumers in twenty or more dwellings or properties; this definition does not include a public water treatment plant.

(d) "Superintendents or operators" means all persons under any local titles or other designations who are now or shall hereafter be in direct general charge of public water treatment plants, public sewage treatment plants or public water supply systems and who are responsible for and supervise the condition, operation and effectiveness of the structures comprising the said plants or systems and who are responsible for the safeness or quality of the effluents discharged or delivered from said plants or said systems and who are experienced in the operation of the structures and have knowledge of the methods and controls used in the treatment of water or sewage or the deliverance or conveyance of water for potable or domestic purposes.

R. S. 58:11-18.12. *Appointment; continuance in office; validity of licenses unaffected.* No municipality, corporation or person shall appoint any person as superintendent or operator in charge of any public water treatment plant or of any public sewage treatment plant or of any public water supply system, or permit any person to discharge the duties of superintendent or operator of any such plant or system who is not a holder of a license issued by the department under the provisions of this act.

RULES AND REGULATIONS

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

DANIEL BERGSMAN, M.D., M.P.H.

State Commissioner of Health

Dated: April 1, 1949.

Filed with the Secretary of State: April 1, 1949.

INSTRUCTIONS To Applicants and Engineers:

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.

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.

Applicants are urged to read the abstracts of laws contained in this booklet.

GENERAL

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, 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.

Number of Plans to be Submitted:

Plans and specifications for sewer extensions, two sets. Plans and specifications for sewer systems, sewage treatment plants and water treatment plants, three sets. One set will be stamped and returned to the applicant.

(If preliminary plans are submitted for examination, one set shall be forwarded to the Department.)

**SEWER SYSTEMS AND SEWAGE AND INDUSTRIAL
WASTES TREATMENT PLANTS****Sewer System on Separate Plan:**

The Department will approve plans for new sewerage systems only when designed upon the separate plan, in which all water from roofs, cellars, streets, and other areas is to be excluded.

By-passes:

No by-passes which may allow raw or partially treated sewage to be discharged from sewers or treatment plants shall be installed, except by special permission of the Department. The provision of by-passes to protect plant equipment is considered good policy in some instances.

Information Required:

1. A general map of entire project.
2. Profiles of all sewers proposed.
3. Details of construction of manholes, flush tanks, siphons, and other sewer appurtenances.
4. Specifications for sewer lines and appurtenances.
5. General and detail plans for treatment plants.
6. Specifications for treatment plants and appurtenances.
7. A comprehensive report upon the proposed system by the designing or consulting engineer.
8. Estimate of costs.

1. Map or General Plan:*(1-a). Details*

The plans shall be drawn to standard scales and shall show the entire area of the project. In case there are more than one sheet they 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 in the case of 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.

The 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.

(1-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.

(1-c). Elevations

Elevations of the surfaces of streets should 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.

(1-d). Distances. Grades and Sizes

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

(1-e). Sewer Appurtenances

All sewer appurtenances, such as manholes (manhole numbers), lampholes, flush tanks, siphons, pumping stations, etc., shall be designated on the plans by suitable symbols and referenced by a legend near the title.

2. Profiles:

Profiles of all sewers shall be submitted.

Upon the profiles shall be shown all manholes (manhole numbers), lampholes, flush tanks, siphons, pumping stations, and, in the case of stream crossings, elevations of stream beds and normal flow lines. Figures showing the sizes and gradients of sewers; surface elevations, sewer inverts, etc., should be shown at or between each manhole.

Profiles of sewer lines shall be drawn to such standard scales as to show clearly the structural features of the sewers. Scales shall be shown upon each sheet.

On each sheet of profiles shall be given, under the title, an index of the streets appearing on that sheet. Profile sheets shall be numbered consecutively.

With the profiles for sewer extensions shall be included a key map showing all existing sewer lines within a distance of two blocks of the district to be sewered as well as the proposed sewer lines.

3. Details of Construction of Manholes, etc.:

Detail drawings of all sewer appurtenances, such as manholes, lampholes, flush tanks, inspection chambers, siphons, pumping stations, etc., shall accompany the general sewer plans.

The detail plans shall be drawn to standard scales so as to show clearly the nature of the design and all details.

4. Specifications for Sewers:

Complete specifications shall accompany the plans. Specifications may be omitted with plans for sewer extensions, provided that these extensions are to be constructed in accordance with specifications complying with these rules and regulations and already filed and approved; and, provided further, that reference (including date of approval) to the filed specifications be made on the application blank.

5. 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 building 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, sizes and depths of stone, gravel, or sand used as filtering material and all other information required for the clear understanding of the plans.

6. Specifications for Treatment Plants and Appurtenances:

Specifications covering all sanitary features shall accompany the plans.

7. 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.

When sewage from an adjacent district or municipality is to be discharged into the proposed lines or system, or when an adjoining municipal or district system will be utilized as an outlet for the proposed lines or entire system, a copy of the contract relative to such transfer of sewage shall be forwarded with the plans and specifications.

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

(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.

(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). Method of flushing or periodically cleaning the sewers.

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

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

(k). If there are sections which cannot drain into the system, the extent of such sections and the probable future disposition of the sewage from those sections.

(l). 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 adopted.

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

(c). If disinfection is to be used, the name of the disinfecting agent, the method of application, and the quantity to be used per million gallons of sewage.

(d). The nature and uses of the body of water into which the effluent will discharge, with reference, in the case of inland streams, to the run-off during dry weather, and, in the case of tidal waters, to the tidal prism, end of tide and tide meets.

(e). The final disposal of sludge and screenings.

(f). All conditions peculiarly characteristic of the locality and which in any way affect the design of the plant.

(g). Special devices used in connection with the treatment plant.

(h). Special methods of maintenance or operation of the plant.

(i). The results expected from the treatment processes.

(j). Provisions made for reserve units in tanks, filters, pumping plants, pipe lines, etc.

SEWERAGE—SPECIFIC REQUIREMENTS

Capacity:

All sanitary sewers, including outfalls, shall be designed to carry twice the estimated average flow twenty-five years hence when flowing half full. 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.

Materials and Minimum Grades:

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

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
15"	.16	.10
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 should be included in the engineer's report.

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.

Joints:

Joints in sewer lines constructed of vitrified tile shall be formed by a fibre 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 lead compound poured hot.

Manholes:

Manholes are to 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.

Pumping Stations:

Raw sewage should be screened before pumping. 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. 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. Dry wells shall provide sufficient space for accessibility for repair and removal of pumps. An auxiliary source of power should 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. 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.

General Requirements for Sewage and Industrial Waste Treatment Plants:

An operating building, suitable for the purpose shall be provided. The building shall be heated, ventilated and lighted. Office space, workshop, laboratory, toilet facilities and storage should be provided. Means for continuous measuring, indicating and recording of the sewage flow shall be installed. Water supply, complete operating tools, and required laboratory equipment shall be provided. The plant layout shall be designed with a view toward ease of operation, safety, and accessibility, including hand-rails, walkways, ladders, stairs, lights, paths and roadways.

Basis of Design of Sewage Treatment Plants:

All sewage treatment plants shall be designed to provide for the estimated sewage flow and population ten (10) years hence. Plans for sewage treatment plants to serve new sewer systems will be examined on the basis of minimum average flow of 100 gallons per capita per day, to which shall be added the volume of industrial wastes and any other special contributions such as may be expected from various types of institutions and establishments including boarding schools, laundries, hospitals, etc. Plans for sewage treatment plants to serve an existing sewer system will be examined upon the aforesaid basis including gauging of the sewage flow existing at the time of the design.

Outfalls:

1. Outfalls shall discharge below low water elevation. Manholes will be required on outfalls if extending more than 500 feet.

2. Ocean outfalls at bathing beaches along the Atlantic Coast shall be at least 1,000 feet in length from the mean low water mark.

As to Treatment Methods and Processes:

1. Screening

All sewage treatment plants and pumping stations should be provided with sewage screens.

1.1. Bar Screens

- (a). Bars shall be spaced so that the maximum clearance between bars is not greater than one and one-half ($1\frac{1}{2}$) inches nor less than one (1) inch.
- (b). 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.
- (c). Means shall be provided at the top of bar screens to permit drainage of screenings.
- (d). Satisfactory containers for removal of screenings shall be provided.
- (e). Screen chambers located below ground shall be provided with an adequate access opening and hoists, to facilitate removal of screenings.
- (f). Screen chambers shall be ventilated.
- (g). A satisfactory method of screening shall be provided for operation when mechanical cleaning devices are out of order.
- (h). Operation of mechanical cleaning devices should be continuous or automatically controlled by the increase in depth of sewage or through a time clock.

1.2 Shredders or Macerators

- (a). Emergency means shall be provided for screening and/or removal of screenings as provided in 1.1.
- (b). Motors shall be of the type suitable for operation in a damp atmosphere if placed below ground.

1.3 Fine Screens

Fine screening will not be approved as a sole method of treatment.

- (a). Screens shall be mechanically operated and have guaranteed total capacity, with any one unit out of service, equal to the design flow.
- (b). The width of slots or openings shall not exceed one-sixteenth ($1/16$) of an inch.

2. SEDIMENTATION**2.1 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). Hopper bottoms shall be provided with slopes not less than sixty degrees (60°) to the horizontal.
- (e). Scum boards shall be provided at inlet and outlet ends of each unit. The design of inlets and outlets should provide for uniform distribution.
- (f). When sludge is to be removed by gravity the

minimum pipe size shall be eight (8) inches diameter and the minimum discharge head four (4) feet. If sludge is to be removed by pumping the minimum pipe size shall be six (6) inches diameter. Individual valves shall be provided to control the flow from each hopper.

- (g). Means for dewatering all units shall be provided.

2.2. Single Story Sedimentation Tanks with Separate Sludge Digestion Tanks

- (a). The detention period, based on average flow, shall be not less than three (3) hours unless otherwise specified elsewhere in the requirements of these rules and regulations dealing with particular treatment methods.
- (b). Sludge storage space in digestion tanks shall be not less than three (3) cubic feet per capita in unheated tanks, nor less than two (2) cubic feet per capita in heated tanks, unless otherwise specified elsewhere in the requirements of these rules and regulations dealing with particular treatment methods.
- (c). Mechanical sludge and scum collection and removal from the sedimentation tanks are recommended; in any case, means for the complete removal of sludge from settling tanks shall be provided.
- (d). The overflow from sludge digestion tanks shall be treated.
- (e). Other requirements—same as for single story sedimentation tanks without separate sludge digestion.

2.3 Imhoff Tanks

- (a). The detention period shall be not less than two and one-half ($2\frac{1}{2}$) hours based on average flow.
- (b). Baffled inlets and outlets shall be provided in flowing-through compartments, and the slope of the walls of such compartments shall not be less than one (1) horizontal to one and one-quarter ($1\frac{1}{4}$) vertical; slots shall be not less than eight (8) inches wide with an overlap of at least eight (8) inches.
- (c). The inlets and outlets shall be so designed as to equally distribute the sewage flow among and through the tanks.
Means shall be provided to prevent sedimentation in reversible open channels and drains to tank(s) shall be provided for unused portions of such channels.
- (d). For more than one sludge digestion hopper full width openings in division walls shall be provided, as well as means for the reversal of flow.
- (e). In tanks twenty-five (25) feet or more in depth, a minimum capacity of 1.75 cubic feet per capita shall be provided in a sludge digestion compartment; if less than twenty-five (25) feet in depth, two (2) cubic feet per capita is required. The capacity of a sludge digestion compartment is to be measured from a plane eighteen (18) inches below the point where the sloping walls of the flowing-through compartment would meet if extended. The floor of a sludge digestion hopper shall have a slope of at least one and one-half ($1\frac{1}{2}$) horizontal to one (1) vertical.
- (f). When sludge is to be removed by gravity the minimum pipe size shall be eight (8) inches diameter

and the minimum discharge head four (4) feet. If sludge is to be removed by pumping the minimum pipe size shall be six (6) inches diameter. Individual valves shall be provided to control the flow from each hopper.

3. CHEMICAL COAGULATION AND SEDIMENTATION

3.1 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.

3.2 Supervision and Operation

Sewage treatment works using the method of chemical coagulation, or, using the method of chemical coagulation along with other methods of treatment, shall be approved only when the applicant (owner; and, in case of a municipality or other governmental authority, the elective official or authorized body) by formal action advises the Department that the proposed works will be under skilled technical supervision at all times and that the works will be adequately manned twenty-four (24) hours per day.

3.3 Requirements

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

(b). Mixing Chambers: 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). Flocculation Tank: Two or more flocculation tanks providing a 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 in order to keep all floc in suspension. Independent controls for each tank shall be provided.

(d). Sedimentation Tanks: Sedimentation shall be provided by two or more tanks having a detention period of not less than two (2) hours, based on average flow. Mechanical means for sludge removal shall be provided in such tanks. Short-circuiting shall be prevented by proper baffling. Independent controls of mechanical equipment for each tank shall be provided.

Strainers: Mechanical strainers or filters as an adjunct to sedimentation tanks in the chemical coagulation method shall not be considered as a substitute for a method of oxidation.

(e). Sludge Digestion: Sludge storage space in digestion tanks shall be not less than six (6) cubic feet per capita in unheated tanks, nor less than four (4) cubic feet per capita in heated tanks.

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

(g). Equipment:

1. Adequate automatic control of pumps shall be provided.

2. An auxiliary source of power for the electrically driven mechanism shall be provided.

3. Devices shall be installed to give warning of breakdown of mechanical equipment.

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

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

(h). Manufactured Chemical Coagulants: Where it is desired to manufacture the coagulants, such as ferric chloride or sulphate, at the sewage plant, the equipment used shall be contained in an entirely separate unit. Laboratory facilities shall be provided for the determination of the strength of the manufactured coagulant.

4. SPRINKLING (OR TRICKLING) FILTERS—"Low" OR "STANDARD RATE"

4.1 General

(a). Sprinkling filters shall be preceded by efficient sedimentation.

(b). The minimum effective depth of filtering medium at any point in the filter shall be not less than six (6) feet and the maximum depth shall be not more than nine (9) feet. The effective depth shall be the distance from top of the medium to the top of underdrains. The effective volume shall be that volume that complies with the aforesaid effective depth.

(c). The filtering medium shall be from one (1) inch to two (2) inches in size, free of fines and flats.

(d). Means for the complete flooding of filters by sections are desirable.

(e). Underdrain ventilation shall be provided.

(f). When the average 5-day biochemical oxygen demand of the raw sewage exceeds 325 parts per million, sprinkling filter treatment is not desirable unless primary sedimentation is supplemented by an additional method of treatment, such as chemical coagulation.

(g). The volume of sewage to be treated by sprinkling filter shall not exceed 630,000 gallons per day per acre per foot of depth.

(h). The average rate of application of sewage during the dosing period shall not exceed either of the following:

1. 1,100 gallons per minute per acre per foot when the average 5-day biochemical oxygen demand of the raw sewage is equal to or less than 215 parts per million.

$$2. \quad \frac{215}{5\text{-day biochemical oxygen demand raw sewage}} \times 1,100$$

gallons per minute per acre per foot when the 5-day average biochemical oxygen demand of raw sewage is greater than 215 parts per million.

4.2 *Fixed Nozzles*

- (a). Twin dosing siphons shall be provided and they shall have a common nozzle field.
- (b). Half nozzles or equal shall be provided at the sides of filter beds.

4.3 *Rotary or Traveling Distributors*

- (a). Filter retaining walls shall not extend more than three (3) inches above the filtering media.
- (b). Valves shall be provided to permit cutting out of service of any filter unit.
- (c). Bleeders should be provided at the ends of distributing arms.

4.4 *Secondary Tanks*

- (a). Sprinkling filters shall be followed by duplicate settling tanks. The detention period, based upon the average daily flow, shall be not less than one (1) hour. Mechanical means for sludge and scum collecting shall be provided; also, means for dewatering shall be provided.
- (b). Sludge disposal from secondary tanks:
 - 1. If separate sludge digestion tanks are provided, the sludge from the secondary tanks shall be discharged thereto, and extra volume of not less than one-half ($\frac{1}{2}$) cubic foot per capita shall be provided in the sludge digestion tanks.
 - 2. If separate sludge digestion tanks are not provided, the sludge from the secondary tanks shall be discharged to glass-covered drying beds and the extra area provided therefor shall be not less than one-quarter ($\frac{1}{4}$) square foot per capita; otherwise, the matter of secondary tank sludge disposal shall be considered as a separate problem at each installation.
 - 3. If sludge pumping is necessary, the piping and pumping equipment shall be a permanent installation.

5. "HIGH CAPACITY" OR "HIGH RATE" SPRINKLING OR TRICKLING FILTERS

5.1 The designing engineer's report should show, in addition to the data specified under "The Engineer's Report" in these rules and regulations, the following:

- (a). Estimated minimum, maximum and average flow.
- (b). Estimated minimum, maximum and average biochemical oxygen demand of raw sewage.
- (c). Estimated volume and strength of returns.

5.2 Biochemical oxygen demand reduction to be accomplished through a primary tank will be considered as thirty per cent (30%) to thirty-five per cent (35%).

5.3 Primary tanks shall be in duplicate, as a minimum, mechanically cleaned, have a combined detention period of not less than two and one-half ($2\frac{1}{2}$) hours and an overflow rate generally of not more than approximately 800 gallons per square foot per day. Detention periods and overflow rates will be based on the average volume of raw sewage plus any returns.

5.4 Controlled recirculation shall be provided to maintain a continuous minimum rate of discharge on a filter of not less than ten (10) million gallons per acre per day. Recirculation shall be such that the application to the

filters generally will not exceed approximately 1.8 pounds of biochemical oxygen demand per cubic yard of filter medium.

5.5 The number and capacity of recirculating pumps shall be such that the above conditions will be met if the pump(s) of largest capacity for each point of return are out of service.

5.6 Filter medium shall be from two (2) to four (4) inches, free of fines and flats.

5.7 Means for adequate circulation of air through the underdrains of filters shall be provided.

5.8 Filter depths of five (5) feet to nine (9) feet are recommended.

5.9 Secondary tanks shall be of the mechanically cleaned type and be in duplicate, as a minimum. The detention period, including recirculation, shall be at least two and one-half ($2\frac{1}{2}$) hours and the overflow rate generally shall not exceed approximately eight hundred (800) gallons per square foot per day. Continuous sludge removal shall be provided for in the design.

5.10 Intermediate settling tanks for use between filters in two stage filtration may be one-half the capacity of the primary and secondary tanks.

5.11 Sludge digestion capacity of not less than three (3) cubic feet per capita in heated tanks shall be provided. If unheated tanks are proposed the digestion capacity shall be at least 4.5 cubic feet per capita.

5.12 Sludge drying beds shall provide an area of not less than 1.5 square feet per capita if open beds are used; the area may be reduced fifty per cent (50%) if glass-covered beds are used.

5.13 Means for draining all tanks shall be provided.

6. INTERMITTENT SAND FILTERS

- (a). At least two filters shall be provided.
- (b). If preceded by efficient sedimentation and if the effective size of sand is between .3 and .5 millimeters with a uniformity coefficient less than 3.5, the rate shall not be greater than 150,000 gallons per acre per day.
- (c). The minimum depth of sand shall be two and one-half ($2\frac{1}{2}$) feet. The sand shall be free from clay and loam.

(d). The minimum depth of the gravel or the stone over the entire floor of a bed and underdrains shall be six (6) inches. Gravel or stone shall not be mounded over the underdrains. Underdrains may be laid on boards in valleys dug in the floor of the bed, provided that sufficient material be excavated so that at least six (6) inches of the stone or gravel be placed on each side of the underdrains. The stone or gravel shall be graded from one and one-half ($1\frac{1}{2}$) inch size on the bottom and around the underdrains to one-quarter ($\frac{1}{4}$) inch size to form the mat or bearing surface for the sand layer.

(e). Muslin, cheesecloth or burlap covered joints are required on underdrains; the joints are to be spaced approximately one-quarter ($\frac{1}{4}$) inch apart. Tar paper or other waterproof material shall not be used.

(f). The maximum spacing of the underdrains shall not exceed eight (8) feet; lateral tile underdrains shall be not less than four (4) inches in diameter.

(g). No ventilators or manholes shall be constructed in sand beds.

(h). When the width of a sand filter exceeds twenty-five (25) feet, more than one distributor shall be provided.

(i). A dosing tank or its equivalent shall be provided. Detention periods conducive to septicity shall be avoided in the design of dosing tanks.

(j). The rate of filtration where intermittent sand filters are employed, following chemical coagulation and sedimentation units, shall not exceed 400,000 gallons per acre per day.

(k). The rate of filtration where intermittent sand filters are employed following standard sprinkling or trickling filters, high rate sprinkling or trickling filters or activated sludge units shall not exceed 500,000 gallons per acre per day.

7. ACTIVATED SLUDGE

7.1 A preliminary sedimentation tank having a detention period of not more than one (1) hour based on the average flow, and divided into two or more units shall be provided.

7.2 A skimming tank or equivalent should be provided if the sewage contains excessive oil or grease.

7.3 If the sewage is very stale preaeration of the settled sewage, before the returned activated sludge is mixed with it, is recommended.

7.4 Aeration

(a). A six (6) hour detention period, based upon one hundred and twenty-five per cent (125%) of average flow, shall be provided as the minimum; if the raw sewage is known to be exceptionally strong, the detention period shall be increased proportionately or preaeration shall be provided.

(b). Surface mechanical aeration alone is not recommended.

(c). 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.

(d). As a minimum, two blowers shall be provided, each with a capacity equal to the maximum requirements.

(e). The air pressure should be five (5) to ten (10) pounds per square inch. The air should be filtered, and, air output should be metered.

7.5 Means shall be provided for measuring the amounts of returned and "wasted" activated sludge.

7.6 Primary settling tanks shall provide a minimum detention period of two hours based upon the average flow. For upward flow tanks the vertical rise should be from one (1) to two (2) inches per minute. An average overflow rate of approximately 1,000 gallons per day per square foot is recommended.

7.7 Sludge Digestion

The digestion capacity for activated sludge alone shall be six (6.0) cubic feet per capita without heat and four (4.0) cubic feet with heat. If the excess activated sludge is returned to the preliminary sedimentation tank and

the combined sludge digested, five (5.0) cubic feet per capita of digestion capacity shall be provided without heat and three and one-half (3.5) cubic feet with heat.

7.8 Supernatant liquors from digestion tanks should not be returned to the raw sewage.

7.9 Drains shall be provided to dewater all tanks.

8. DISINFECTION

8.1 General

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

(b). Chlorinating devices shall be placed in separate rooms with outside entrance only. Provisions for heating during the winter season are required.

(c). The chlorine contact period in tanks or their equivalent, shall be at least one-half ($\frac{1}{2}$) hour, based on the average sewage flow. Contact tanks shall be baffled.

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

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

(f). If hypochlorite feeders are provided, duplicate solution tanks (crops) each having forty-eight (48) hours storage capacity are required.

8.2 Chlorinator Capacities

Capacities shall be provided to give the following dosage, based on average sewage flow.

(a). Tank effluents, up to thirty (30) parts per million available chlorine.

(b). Sprinkling filter effluents, followed by secondary sedimentation, up to eighteen (18) parts per million available chlorine.

(c). Sand bed effluents, up to twelve (12) parts per million available chlorine.

(d). High rate sprinkling filters, up to twenty (20) parts per million available chlorine.

(e). Activated sludge plant effluents, up to fifteen (15) parts per million available chlorine.

9. SLUDGE DIGESTION

9.1 General

(a). 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). Means for sludge recirculation are recommended.

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

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

9.2 Summary of Minimum Volumes in Cubic Feet per Capita

(also see under each treatment process)

Process	Heated Tanks	Unheated Tanks
Single Story Sedimentation	2	3
Chemical Coagulation and Sedimentation	4	6
Secondary Sedimentation (following sprinkling filters)	0.5	0.5
High Rate Sprinkling Filtration	3	4.5
Activated Sludge	4	6

10. SLUDGE DRYING

10.1 Beds—General

(a). Sludge lines should be installed so as to permit draining after each application of sludge.

(b). The effective depth of filter medium shall be at least twelve (12) inches above top of underdrains.

(c). The top six (6) inches of filter medium shall be sand, placed upon graded gravel or crushed stone. The sand used shall have an effective size between 0.30 and 0.50 millimeters and a uniformity coefficient not greater than 5.0.

(d). Underdrains should be spaced not more than eight (8) feet apart on centers.

(e). Surrounding walls should be of such height as to contain maximum application of sludge.

(f). Sludge drying bed effluents are to be treated.

10.2 Minimum Area Required (Open Beds)

(a). For Imhoff, hopper bottom tanks, and separate sludge digestion tanks one and one-half (1.5) square feet per capita, except with the chemical coagulation process in which case the minimum area shall be two (2.0) square feet per capita.

(b). For secondary treatment with trickling filters (standard or high rate) see under treatment method.

(c). For digested activated sludge, two (2.0) square feet per capita.

10.3 For glass-covered sludge drying beds, one-half (½) of the above areas will be required.

11. 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.

WATER SUPPLIES AND WATER TREATMENT PLANTS

Information Required—General:

1. See page 2 re: applications and number of plans and specifications to be submitted.
2. A general plan of the institution, municipality or district supplied.
3. If a surface supply, a map of the watershed; if from wells or collecting galleries, a map showing their location.
4. General and detailed plans of water treatment plants.
5. General and detailed plans of wells and collecting galleries.
6. Specifications for treatment plants, wells and collecting galleries, and their appurtenances.
7. A comprehensive report upon the proposed works by the designing or consulting engineer.
8. Estimate of costs.

Specifications:

Complete specifications shall accompany the plans.

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, shall be submitted.

General and Detail Plans of Treatment Plants:

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.

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 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.

General and Detail Plans of Wells and Collecting Galleries:

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 wells, 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.

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.

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.

The 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 valuable information regard-

ing 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.

General Requirements for Well Supplies:

(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 will be required.

Water Treatment Plants**1. General**

(a). A flow recording device shall be installed.

(b). A laboratory is desirable and may be required for large plants. Laboratory procedures will be specified by the State Department of Health, according to the character of the treatment plant designed.

(c). Sampling taps shall be provided so that samples at each step in the treatment process can be obtained.

(d). The return to the system of any water used for cooling purposes, etc., which might in any way become contaminated, will not be permitted.

2. Filtration**Surface Supplies.****2.1 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 3,000,000 gallons per acre per day.

(c). The effective size of the sand shall be between .25 and .40 millimeters, 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.

2.2 *Rapid 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 125,000,000 gallons per acre per day.

(c). Rate controllers and loss of head gauges are required.

(d). The effective size of the sand shall be between .30 and .50 millimeters, with a uniformity coefficient not over 1.6.

(e). The depth of sand shall be not less than thirty (30) inches.

(f). At least twelve (12) inches of graded gravel are required over underdrains.

(g). Coagulation and sedimentation shall precede filtration, the coagulation basin to have a minimum of four (4) hours detention. A baffled mixing tank shall precede the settling basin.

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

3. *Iron Removal*

Plans for iron removal will be examined as to sanitary features only, the Department exercising no jurisdiction over the "attractiveness" of water supplies.

4. *Disinfection*

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

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

(c). Scales shall be provided for determining the loss of weight of chlorine.

(d). If hypochlorite feeders are provided duplicate storage tanks will be required, each to have a capacity of forty-eight (48) hours supply of hypochlorite solution.

Section 1. The State of New Jersey, in and for the County of Hudson, do hereby certify that the within and foregoing is a true and correct copy of the original as the same appears on file in the office of the County Clerk.

IN WITNESS WHEREOF, I have hereunto set my hand and the seal of said County, at the City of Hudson, this 1st day of January, 1901.

JOHN J. HARRIS, County Clerk.

Section 2. The State of New Jersey, in and for the County of Hudson, do hereby certify that the within and foregoing is a true and correct copy of the original as the same appears on file in the office of the County Clerk.

IN WITNESS WHEREOF, I have hereunto set my hand and the seal of said County, at the City of Hudson, this 1st day of January, 1901.

JOHN J. HARRIS, County Clerk.

Section 3. The State of New Jersey, in and for the County of Hudson, do hereby certify that the within and foregoing is a true and correct copy of the original as the same appears on file in the office of the County Clerk.

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Section 5. The State of New Jersey, in and for the County of Hudson, do hereby certify that the within and foregoing is a true and correct copy of the original as the same appears on file in the office of the County Clerk.

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JOHN J. HARRIS, County Clerk.

Section 6. The State of New Jersey, in and for the County of Hudson, do hereby certify that the within and foregoing is a true and correct copy of the original as the same appears on file in the office of the County Clerk.

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JOHN J. HARRIS, County Clerk.

Section 7. The State of New Jersey, in and for the County of Hudson, do hereby certify that the within and foregoing is a true and correct copy of the original as the same appears on file in the office of the County Clerk.

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JOHN J. HARRIS, County Clerk.

Section 8. The State of New Jersey, in and for the County of Hudson, do hereby certify that the within and foregoing is a true and correct copy of the original as the same appears on file in the office of the County Clerk.

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JOHN J. HARRIS, County Clerk.

Section 9. The State of New Jersey, in and for the County of Hudson, do hereby certify that the within and foregoing is a true and correct copy of the original as the same appears on file in the office of the County Clerk.

IN WITNESS WHEREOF, I have hereunto set my hand and the seal of said County, at the City of Hudson, this 1st day of January, 1901.

JOHN J. HARRIS, County Clerk.

