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RULES AND REGULATIONS FOR THE PREPARATION AND SUBMISSION OF PLANS FOR SEWER SYSTEMS AND WASTEWATER TREATMENT PLANTS

New Jersey
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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, established the following rules and regulations for employment in the administration of R.S. 58:12-1 et seq., 58:11-2, 58:11-3 and 58:11-10.

The "Department of Environmental Protection Act of 1970," Chapter 33, Laws of New Jersey 1970, transferred all functions, powers and duties relating to water pollution heretofore exercised by the Department of Health and the Commissioner thereof to the Department of Environmental Protection and the Commissioner thereof.

STATE DEPARTMENT OF
ENVIRONMENTAL PROTECTION
OF THE STATE OF NEW JERSEY

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SECTION 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 Environmental Protection reserves the authority to specify more or less stringent requirements in any case as in his judgment may be in the interest of environmental protection.

1.2

One of the major objectives of the State Department of Environmental Protection in promoting modern sanitary sewerage works is to attain, as far as practicable, integrated multi-municipal, or regional facilities conforming to long-range planning for stream valleys and other areas of the State. Proposals submitted to the Department for approval are expected to conform to such reasonable plans. One facet of the Department's objective is to consolidate existing and future sewerage facilities. Proposals not conforming with these objectives will not be approved.

1.3

Preparation of a preliminary report and plan is advisable before detail design proceeds. Preliminary data shall be discussed with the Department Engineers before final decisions are made. Formal comments will be made by the Department on preliminary data if requested.

SECTION 2—GENERAL REQUIREMENTS

2.1 Applications for Approval

a. Applications for the approval of plans and specifications shall be submitted on forms provided by the Department by a registered professional engineer qualified to practice in New Jersey. Plans submitted by such engineer must bear his seal (R.S. 45:8-45) and must be preceded or accompanied by a letter of appointment from the proper official of the city, county, district, company or other unit certifying that the engineer has been duly authorized to prepare such plans and specifications.

b. Applications are to be signed by the proper 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.

c. 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.

d. Applications submitted on behalf of a unit other than a municipality, or an agency created thereby, must be approved by the local governing body of the municipalities in which the proposed project is to be located.

e. Applications submitted on behalf of a newly constituted private utility shall be approved by the local governing body of the municipality in which the utility is located. Such approval shall constitute a municipal franchise for the purpose of these regulations. Permits will be withheld from private utilities until they have been incorporated.

f. The review of plans by the Department is limited to sanitary engineering (including hydraulic) features of environmental protection significance; it does not include structural, mechanical or electrical design.

2.2 Engineering Data to be Submitted to the Department

a. An Engineer's report as outlined in 3.8 (one copy).

b. Detailed plans and specifications (2 complete sets).

c. "As Built" plans and/or specifications on treatment plants and interceptor sewers if different from the approved plans (one set to Department, one set to owner).

2.3 Operation during Construction

When a modification or an addition to an existing facility is proposed, the responsible engineer will submit a program for keeping existing units in operation during construction; and if a shutdown will be necessary, a schedule will be prepared and submitted for approval which will minimize the pollutional load on the receiving stream and will be included in the specifications when approved.

SECTION 3—SEWERAGE

3.1 Separate Sewers Generally Required

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 Summary of Information Required

a. A general map of the entire project including a key map showing the location of the project with respect to municipal boundaries.

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

c. Plans and profiles of all proposed sewers.

d. Details of construction of manholes, siphons, pumping stations and other sewer appurtenances.

e. General and detail plans for treatment plants.

f. Specifications for all proposed construction.

g. A report upon the proposed system by the designing or consulting engineer (See Section 3.8).

h. Engineering estimate of costs in sufficient detail to indicate the basis for the estimate and the approximate separation of costs for sewers and for treatment.

3.3 Preparation of Sewer Maps and Plans

a. General

(1) Plans shall be drawn to standard scales and shall show the entire area of the project. The name

of the Engineer and his seal shall be shown. In case there is more than one sheet, all shall be bound together and an 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 a general plan less than six (6) years old is already on file with the Department. Plans should not generally exceed 30 by 42 inches in size.

(2) Plans shall show district boundaries and all existing and proposed streets and the surface elevations at all street intersections where sewer lines are proposed. Existing structures, both above and below ground, will be shown.

(3) Plans also shall show clearly the location of all existing and proposed sewers, either "separate" or "combined" (so indicated), the location of 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. Streams, with the direction of flow, will be shown.

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 grade occurs. The elevation 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. All elevations will be referenced to a standard datum.

d. Distances, Grades, Sizes and Types

The horizontal distance and stationing between manholes, grades in percent and sewer sizes and types 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, siphons, pumping stations, etc., shall be designated on the plans by suitable symbols and referenced by a legend near the title.

3.4 Profiles

a. Profiles shall indicate all manholes (with manhole numbers), siphons, pumping stations, etc. and, in the case of stream crossings, elevations of stream beds, normal flow lines and the type of pipe. Figures showing the sizes and gradients of sewers; surface elevations, sewer inverts, etc., shall be shown at or between each manhole.

b. Profiles of sewer lines shall be drawn to standard scales which shall be shown upon each sheet.

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

3.5 Details of Construction of Manholes, etc.

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

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

3.6 General and Detail Plans for Treatment Plants

a. Plans for treatment plants shall include a general plan showing site boundaries including areas reserved for future extensions; all buildings or building lots within 500 feet of plant property; and detail plans of the various units and structures which comprise a plant.

b. Detail plans shall show longitudinal and transverse sections sufficient to explain the construction of each unit including hydraulic gradient through plant. Such plans will be in accordance with the design requirements outlined in Sections 6 to 18, inclusive.

3.7 Specifications

a. Specifications directly applicable to the sanitary engineering (including hydraulic) features of the proposed project shall accompany all plans.

b. Specifications previously approved and filed may be omitted for sewer extensions, provided that reference (including date of approval) to the filed specifications is made on the application forms.

3.8 The Engineer's Report

A report by the designing or consulting engineer shall accompany all plans and specifications. The report shall include or be accompanied by a signed and notarized statement by the engineer averring that the proposed project complies with all of the Rules and Regulations of the Department; provided, however, if there are any exceptions thereto, the averment of compliance shall include a listing of such exceptions and an explanation of the reasons therefor. The report itself shall give all pertinent data upon which the design is based, including, where applicable and appropriate, the following:

Required 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 drain ultimately into the system, including sections not within the boundaries of the affected municipality.

b. The number of houses and the population to be served, both present and estimated for at least twenty-five years hence, with computations and curves.

c. The estimated per capita daily flow of sewage to be cared for, with supporting data.

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 and other studies when applicable.

k. Logs of test borings and ground water elevations will be shown.

Information Concerning Treatment Plants

a. Design population and sewage flow (Refer to 8.1 and 8.2).

b. The character of the sewage to be treated and the method of treatment proposed.

c. A description of the units of plants, with rates and capacities, and provisions for stand-by power if required.

d. Hydraulic profiles of the passage of sewage and sludge within the treatment plant.

e. Laboratory facilities and equipment to be provided.

f. The general quality, including dissolved oxygen, and the hydrographical characteristics, including run-off, during periods of dry weather, of the body of water into which the effluent will be discharged.

g. The final disposal of sludge and screenings.

h. The results expected from the treatment processes.

i. If the site is subject to flooding, the possible effect of flooding and the measures to be taken to prevent damage or interference with operation.

SECTION 4—SEWER DESIGN

4.1 Capacity and Design Period

a. All sanitary sewers, including outfalls, shall be designed to carry at least twice the estimated average design flow when flowing half full. In the case of large interceptor sewer systems, consideration may be given to modified designs.

b. The design period for the estimated flow shall be at least twenty-five years; longer periods are recommended for major projects.

c. For sewers other than circular in cross section, 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

a. All sewers shall be constructed of materials acceptable to the Department for the purposes and conditions they are intended to serve.

b. 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. The fall in feet per 100 ft. of sewer shall be not less than the following:

Pipe Diameter	Fall in feet per 100 feet of sewer
8″	.40
10″	.29
12″	.22
14″	.17
15″	.16
16″	.14
18″	.12
20″	.10
21″	.095
24″	.080
27″	.067
30″	.058
36″	.046

c. Grades producing velocities in excess of 10 ft. per second are not recommended.

d. The minimum size of sewers will be 8-inch.

e. Curved sewers will be approved only under special conditions. The minimum diameter will be 8-inch; the minimum radius of curvature will be 100 ft.; and manhole spacing will not exceed 300 ft. Approval will be limited to areas where curved streets comprise the general layout, or where the use of curved sewers would permit substantial savings in cost, or avoid very deep cuts, rock or obstructions of a serious nature.

f. 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 steel, reinforced concrete, cast iron or other suitable material and shall be properly protected.

g. Sewers and water mains generally shall be separated, a distance of at least 10 ft. horizontally. If such lateral separation is not possible, the pipes shall be in separate trenches with the sewer at least 18 inches below the bottom of the water main; or such other separation as approved by the Department shall be made. In general, the vertical separation at a crossing of sewer and water line shall be at least 18 inches. Where this is not possible, the sewer shall be constructed of cast iron pipe using mechanical or slip-on joints, or hot poured lead joints for a distance of at least 10 ft. on either side of the

crossing or other suitable protection shall be provided.

h. Any sewer within 100 feet of a water supply well or a below-grade reservoir shall be of steel, reinforced concrete, cast iron or other suitable material; shall be properly protected, of completely watertight construction, and shall be tested for watertightness after installation.

i. When grades less than those specified above are proposed, an explanation for the use of such grades shall be included in the engineer's report; and said explanation shall be included in the averment called for under 3.8.

4.3 Inverted Siphons

Inverted siphons shall be of cast iron or other approved material and shall have not less than two barrels. Provision shall be made for rodding and for flushing. 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 clay shall be primed and formed by a fibrous packing and mastic compound poured hot. Standard slip-on or other manufactured joints for vitrified clay pipe and asbestos cement pipe may be used. Joints for cast iron pipes shall be of slip-on or mechanical type or formed by calking with oakum and pouring with hot lead.

4.5 Manholes

a. Manholes shall be provided at the ends of each sewer line and at intersections and at all changes in grade, size or alignment. Lampholes will not be used.

b. Distances between manholes shall not exceed 400 feet for sewers 18 inches or less in diameter; 500 feet for sewers greater than 18 inches in diameter.

c. 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.

d. No manholes or connections on a sanitary sewer system shall be permitted within 100 feet of a water supply well or a below-grade reservoir.

e. Adequate provision shall be made for ventilation.

4.6 Outfalls

Ocean outfalls shall be at least 1,000 feet in length beyond the mean low water mark. Manholes are required on the shore end of all gravity outfalls.

All other outfalls should be submerged and located so as to accomplish the effective dispersion of the sewage flow.

SECTION 5—PUMPING STATIONS

5.1 General

a. Raw sewage shall be screened before pumping unless special pumping equipment approved by the Department is used. Comminutors may be approved in lieu of screens.

b. 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.

c. An auxiliary source of power shall be provided for electrically driven pumps, unless an alternate is approved by the Department.

d. Automatic sound alarms, operating independently of the station power, shall be installed to give warning of high water, power failure, or breakdown. Such alarm system shall extend by wire to the police station or other location where competent assistance can be obtained in emergency.

e. Pumping stations shall not be subject to flooding and must be accessible by motor vehicles.

f. Adequate light and ventilation shall be provided at all pumping stations. Where operational or maintenance duties are required in enclosed areas or pits, forced ventilation by suitable means shall be provided with sufficient capacity to induce at least twelve air changes per hour. Explosion-proof equipment shall be utilized.

g. Adequate fresh-water facilities shall be provided to permit routine washdown and cleaning operations at all pumping stations. Where a domestic water service connection is provided to a pumping station, the water supply shall be properly protected as described in 7:6b. No connections between fresh-water and sewage pumps or pipes shall be permitted.

5.2 Pumps

a. Pumping station capacity should be compatible with the ultimate capacity of the influent sewer. At least two pumps, each designed to handle peak flows for 10 years hence, shall be provided. If more than two pumps are provided their capacities shall be such that, upon failure of the largest pump, the others will handle such peak flows. When ejectors are provided as the method of raising sewage, two compressor units are required, and they shall be so interconnected that the duplicate unit will commence operation in the event of failure of the one in use.

b. Pumps shall be installed in dry wells and preferably should operate under a positive suction head. Submerged pumps for raw sewage will not be approved. A means of flow measurement is desirable. Shut-off valves will be provided on suction and discharge piping, which shall be flanged or otherwise removable, and check valves shall be provided on discharges.

c. Special repair tools and accessories required for maintenance shall be provided.

d. Force main velocities shall not be less than 2 ft./second at normal pumping rates. Properly designed air release valves shall be provided on the high points of the force line.

5.3 Dry Wells and Wet Wells

a. Dry and wet wells shall be completely separated and shall be provided with adequate ventilation and drainage; and means of entrance and exit, preferably by a stairway, shall be provided.

b. Dry wells shall provide sufficient space for accessibility for the repair and removal of pumps. Provision shall be made for the removal, if necessary, of pumps and motors.

c. The capacity of a wet well should not exceed ten minutes when flow is at the average dry weather rate.

d. The floors of wet wells shall slope at least 45 degrees toward pump suctions to prevent solids accumulation.

e. Dry wells will be provided with a sump pump.

5.4 Electrical Equipment

a. Electric motors shall be so located as to be protected from flooding.

b. Electric motors and electrical power equipment should not be installed in subsurface chambers; where installation in such a location is necessary the motors and equipment shall be of the explosion-proof and damp-proof type.

c. All electrical equipment and work shall comply with Fire Underwriters' regulations for the location involved and to the National Electric Code.

SECTION 6—TREATMENT

6.1 General

a. Treatment shall be provided for all domestic sewage before discharge to waters of the State. The minimum 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 or so-called "rapid sand filters" as treatment methods.

b. The choice of treatment proposed, in addition to its adequacy, shall include consideration of the topography of the plant site, receiving waters, operating costs and effects of industrial wastes.

6.2 Operation of Treatment Plants

Suitable provision for operation by a licensed operator must be assured; and the responsible design engineer will be required, with the said operator, to provide the start-up and satisfactory operation of the plant for the duration of one year. The design engineer's contract with the applicant shall provide for operating supervision during the first year of operation of all new treatment plants and in all situations where major additions such as additional methods of treatment are involved.

6.3 New Treatment Methods

a. 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.

b. The Department may disapprove new treatment methods if in its opinion such denial is in the interest of environmental protection.

6.4 Basis of Design of Industrial Waste Treatment Plants

a. Specific design criteria for industrial waste treatment plants are not detailed. However, the general requirements relative to submission of detailed plans, specifications and engineer's report shall apply.

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

SECTION 7—TREATMENT PLANTS

7.1 General

Treatment plants shall be located as far from existing or future structures as practical. Where possible, the treatment plant units shall be situated not closer than 500 feet from the plant property lines. If this is not possible the Department may require special conditions respecting plant design, location and landscaping (See 7.7). Treatment plants shall be placed above maximum flood levels or be adequately protected from flooding, and shall be served 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, workshop, laboratory, and storage space should be provided.

7.3 Sanitary Facilities

Facilities including drinking water, toilet, and lavatory shall be provided. A shower is recommended.

7.4 Laboratory Equipment

Adequate laboratory facilities and equipment shall be available for the operational control of all sewage treatment plants. The nature and extent of such facilities and equipment will depend upon the size of plant and the processes of treatment. Section 20 of these Rules and Regulations sets forth a list of Recommended Laboratory Equipment for plants having a capacity of 150,000 gallons or more a day. Such of the items on this list as may be necessary for the operational control of a proposed treatment plant shall be provided as part of the original construction contract.

7.5 Maintenance and Operating Equipment

Depending on the size of the plant and the character of treatment provided, an ample and complete outfit of tools and accessories will be provided for in the specifications. These will include but will not be limited to a portable pump; a small electric generating unit; squeegees; wrenches; snow handling equipment; lawn mower; valve keys; rakes and shovels; a portable power lift; a blower with hose or smoke ejector; and an approved gas mask of the canister or compressed air type.

7.6 Water Supply

a. An adequate supply of water under pressure shall be installed.

b. Where a domestic water service connection is provided to a sewage treatment plant, the water supply shall be protected by an approved backflow prevention device acceptable to the Department. Air-gap separation shall be used to prevent cross connections within the plant and shall mean a physical break between a supply pipe and a receiving vessel. The air-gap shall be at least double the diameter of the supply pipe, measured vertically above the top rim of the vessel, in no case less than one inch. All hose connections from the domestic water supply shall be protected with an approved backflow-prevention device acceptable to the Department.

c. Taps supplying nonpotable water shall be clearly labeled "Unfit for Drinking."

7.7 Grading

Treatment plant sites shall be graded, and drains installed to prevent wash into tanks, basins or filters and to prevent erosion. Landscaping is recommended. If dwellings are located within 500 ft. of the plant property line, adequate landscaping, including evergreen screening, is required (See 7.1).

7.8 Safety Features

Plants shall be equipped with necessary safety features to include railing at tanks and walkways; guards around belts or other moving parts; handrails at stairs or steps; flame traps at all gas outlets; a blower and hose; and adequate ventilation of enclosures. Non-slip treads on stairs shall be provided and slope of stair will meet New Jersey Labor Department requirements; warning signs shall be posted in hazardous locations. A First Aid Kit shall be provided. The plant site shall be enclosed with an approved type of fence with lockable gates.

7.9 Emergency Power

An auxiliary source of power for essential equipment shall be provided. Where a plant is not to be manned on a 24-hour basis, this system shall be automatically activated.

7.10 Alarm System

a. An alarm system operating on an independent source of power shall be provided for all treatment plants wherein 24-hour supervision is not provided.

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

7.11 Electrical Work

All electrical equipment work shall comply with Fire Underwriters' regulations for the location involved and with the National Electric Code.

7.12 Measuring and Recording

Means for continuous measuring, indicating and recording of the sewage flows shall be installed. Meters shall be installed in such manner and location so as to provide a true indication of actual flow.

7.13 Bypasses

Plant bypasses which allow raw sewage to be discharged directly to a watercourse shall not be installed except when such are necessary to protect plant equipment, and only by special permission of the Department. Provision for the sealing of such bypasses shall be made.

7.14 Dewatering

Adequate means shall be provided for dewatering all treatment units for inspection and maintenance without disrupting the treatment processes.

7.15 Piping Under Plant Units

Piping located under plant units shall be concrete encased with approved joints.

SECTION 8—TREATMENT PLANT DESIGN

8.1 Design Objectives

Treatment plants shall be designed to produce an effluent which will be conducive to the attainment and maintenance of such stream quality criteria for the various classifications of surface waters of the State as the Department may from time to time establish.

8.2 Design Period

Treatment units shall be designed for population and sewage flow anticipated not less than ten (10) years after completion of construction. A longer design period should be used where future economies are indicated. Refer to 3.8 for information required in Engineer's report.

8.3 Design Flow

a. Sewage treatment plants for a new sewer system shall be designed for an average domestic flow, including infiltration, of not less than 100 gallons per capita per 24-hour period, plus industrial waste volume. The total flow so obtained shall be defined as the Design Flow, and is hereinafter so referred to in these regulations.

b. Where a sewer system is already in existence, actual gauging shall be used as a basis, plus an allowance for future increase in sewage flow.

c. Design flows of less than 100 g.p.c. may be considered when supported by adequate engineering data.

8.4 Design Loading

a. The design of the various units of a sewage treatment plant shall be based on the design flow as defined in 8.3 except that when total daily flow is to be received at the plant in a lesser period than 24 hours, units shall be designed on a basis of the actual average hourly flow, and due consideration should be given to peak flows. Hydraulic design will be compatible with the design of the inlet sewer.

b. Unless accurate data justifying a lesser design are submitted, the hydraulic design of piping, channels, flumes, and pumps shall be based on not less than 250 percent of design flow.

c. Where recirculation is employed, the resulting additional flow from this source shall be considered in the design.

d. Organic loading shall be based upon a minimum 5-day B.O.D. content of 250 p.p.m. for domestic sewage, to which shall be added B.O.D. values for industrial wastes; excepting when, as in the case of

an existing sewer system, analyses based on composite samplings indicate a higher actual B.O.D. Under such conditions, the actual value shall be used. Consideration shall also be given to the use of home garbage grinders and the load resulting from them. The solids loading will be assumed to be 0.2 lb. per capita per day for design purposes, plus the probable additional load resulting from garbage grinding. Special consideration, based on supporting data, may be applied to schools, factories, and other special situations.

SECTION 9—SCREENING

9.1 General

a. All sewage treatment plants shall be provided with means for screening or comminuting coarse material in the sewage. Except in very small plants, screening equipment should be of the mechanical type.

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

c. Fine screens will not be approved as the sole method of treatment.

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 1½ inches and not less than 1 inch.

b. Clear openings for mechanically cleaned screens shall not be less than five-eighths of an inch.

c. Bar clearance for coarse racks or screens preceding mechanically cleaned screens or comminutors may be greater than given under (a).

d. At sewage pumping stations, openings in 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 screen chamber shall be designed to provide a velocity through the screen of not less than one (1) foot per second at average flow and not more than three (3) feet per second, based on the screen openings projected vertically between the invert and the crown.

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

h. Auxiliary hand-cleaned screens shall be provided for use in case of failure of the mechanically cleaned screens where only one mechanical screen is provided.

9.3 Screenings

a. Adequate facilities shall be provided for prompt removal, handling and sanitary disposal of screenings. A platform shall be provided at the 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. Such chambers should have a stairway and good lighting.

d. Screen chambers shall be adequately ventilated. Where required, forced draft fans with explosion-proof motors shall be installed.

9.4 Comminution

a. Comminuting devices shall have slots not less than ¼ 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 peak flows when the largest unit is out of operation.

b. A bypass screen shall be provided except where there are multiple units.

c. Gates shall be provided to isolate each comminutor channel, and provision shall be made for the removal of mechanisms for repair and maintenance.

SECTION 10—GRIT REMOVAL

10.1 General

a. Except in very small sewage treatment plants, grit removal devices shall be provided. Mechanically cleaned equipment is recommended.

b. Grit chambers receiving combined sewage shall have duplicate hand-cleaned units or, preferably, a single mechanically cleaned unit with bypass.

10.2 Design

a. Grit chamber channels and flumes 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. Provision for dewatering shall be made.

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

c. Grit removal facilities shall include adequate means for the collection and temporary storage of grit material prior to sanitary disposal. A stairway or ladder shall be provided for entrance if the unit is 4 feet or more below ground level. Adequate lighting and ventilation will also be provided.

SECTION 11—SETTLING TANKS

11.1 General

a. Multiple units or independent compartments shall be provided except in very small installations.

b. Channels shall be designed to maintain a velocity of 1 foot per second at 50 percent of 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 collectors shall be provided. 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. Recommendations for the use of upward flow settling tanks may be considered when accompanied by suitable data on their hydraulic characteristics and results of operation in actual plants.

g. Single-story settling tanks without separate sludge digestion and settling tanks without mechanical equipment for sludge removal will not be approved except by special permission of the Department.

h. In general, walls of settling tanks should extend at least 18 inches above the surrounding ground surface.

11.2 Imhoff Tanks

The use of Imhoff tanks will not be approved except by special permission of the Department. If permitted, the following shall apply:

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, consideration being given also to excessive daytime or other flows.

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 in tanks having more than one hopper.

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

11.3 Mechanically Cleaned Settling Tanks

a. Primary tanks, except those preceding the activated sludge process (See 15.2b), shall have a surface settling rate not exceeding 600 gallons per square foot per day for the design flow, a minimum water depth of six (6) feet and a maximum depth of ten (10) feet.

b. Inlets shall be designed to dissipate inlet velocity promptly, to diffuse the flow, and to prevent short-circuiting.

c. Adjustable outlet weirs shall be provided. For settling tanks not followed by secondary treatment, the weir overflow rate shall not exceed 15,000 gallons per day per lineal foot of weir.

d. Final settling tanks shall be designed according to the following:

Type Treatment	Side Water (feet) Depth	Maximum Surface Settling Rate (At Design Flow)
Standard Rate Trickling Filter	6 to 8	1,000 gals./s.f./day
High Rate Trickling Filter	8 to 10	800
Activated Sludge (2.0 m.g.d. and less)	8 to 10	800
Activated Sludge (Over 2.0 m.g.d.)	10 to 12	1,000

11.4 Other Types

The use of combined units employing settling and digestion or other processes will be given consideration only where there has been full-scale operation for a sufficient period of time to provide data governing efficiency and operating costs and to assure that mechanical and maintenance problems have been solved.

SECTION 12—SLUDGE DIGESTION AND SLUDGE DISPOSAL

12.1 General

a. Except as provided in 7.8 the Department does not examine plans as to fire and explosive hazards, heat controlling equipment, or safety devices.

b. Supernatant liquor from sludge digestion tanks should be returned to the raw sewage except that at activated sludge plants or other plants utilizing air as a method of biological treatment provision may be made for disposal in aeration or reaeration tanks.

c. The minimum diameter of all sludge pipes shall be eight (8) inches for gravity flow and six (6) inches for sludge pumping, unless otherwise approved by the Department.

d. A fresh-water hydrant near the sludge digestion tanks is recommended, but it must be provided with a suitable backflow-prevention device in accordance with Section 7.6.

e. Provisions shall be made for the introduction of chemicals into all sludge storage or digestion tanks.

12.2 Imhoff Tanks

a. Refer to 11.2. The upper limit 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 six (6) feet shall be provided for gravity withdrawal, and two (2) feet if sludge is pumped. Valves shall be provided for each hopper and these shall be placed outside of the tank for accessibility, except in areas where they may freeze in which case plug valves will be placed inside the tank. 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 that, in very small installations where a lagoon or open tank is available for emergency use without creating local nuisance, and where pumps and piping are available for such emergency, a single digestion tank may be approved if the plan and report show fully the emergency provisions.

b. Suitable equipment to insure mixing or circulation of the tank contents shall be provided for primary digesters.

c. The proportion of tank depth to area should be such as to permit the formation of a reasonable depth of supernatant liquor.

d. Tank bottoms should slope toward the withdrawal pipe not less than three inches per foot. Flat bottom tanks will not be approved.

e. At least two access manholes of adequate size shall be provided in the top of digester in addition to the gas dome. An access manhole in the side wall of the tank is recommended.

f. 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 any tank. In rectangular tanks the raw sludge inlet shall be at the opposite end from overflow and digested sludge drawoff lines.

Separate Sludge Digestion Tanks

g. An emergency overflow shall be provided. Provision shall be made for sampling and removal of supernatant from several levels.

h. Means shall be provided for sampling of digested sludge. Digested sludge withdrawal piping shall extend from the center and bottom of circular tanks. Means shall be provided for backflushing digested sludge withdrawal piping using sewage effluent or surface water. Adequate transfer piping shall be provided.

i. Unheated primary digestion tanks will not be approved except under unusual conditions.

j. The mixing of the contents of anaerobic digesters by air is prohibited.

12.4 Capacity

Separate sludge digestion capacity shall be as follows:

Type of Plant	Minimum Cubic Feet per Capita
Primary	2 to 3
Primary plus standard filter	2.5 to 3
Primary plus high rate filter	3 to 4
Chemical coagulation	4 to 6
Activated sludge	4 to 6

The larger volumes should be provided for smaller plants.

The capacities shall be increased when industrial wastes and/or garbage solids are present, and may be reduced if the sludge is thickened. Volumes should be computed on the basis of the bottom sloping up 30 degrees from the horizontal unless mechanical sludge collection is employed.

12.5 Gas Collection

a. Waste gas burners shall be provided for excess gas. These shall be placed at least 25 feet away from structures if placed at ground level, or may be located on roofs of buildings provided they are sufficently remote from digestion tanks. Waste gas burners shall be equipped with pilot lights and means for igniting manually, and shall be equipped with flame traps.

b. All enclosures containing gas piping or apparatus shall be equipped with forced draft ventilation either of the wind-driven or motor-operated type. If of the motor type the design shall be such that the motor does not come in contact with gases; or spark-proof motors shall be used.

c. A gas meter should be provided and a bypass installed.

d. Boilers utilizing gas shall be located in a separate enclosure having adequate means of ventilation and preferably located at ground level. All gas lines shall have suitable flame traps and other safety equipment.

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 the coils for cleaning and maintenance. 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°F to 95°F at all times. Suitable controls shall be provided for automatic operation.

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. Duplicate sludge pumps shall be provided, so valved and arranged that either may be used, in emergencies, for handling either raw or digested sludge.

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 nor more than two hours. Pump capacity shall be adjustable.

c. 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 dynamic suction lift of plunger pumps shall be 10 feet.

d. Sludge sampling facilities shall be provided on sludge lines. The size of valve and piping should be at least 1½ inches.

e. 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, the sludge of which is digested by an anaerobic method. Where garbage solids and/or industrial wastes are to be handled, a suitable increase should be made.

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

b. **Design**

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

(2) Gravel shall be 12 inches deep with the 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 ⅛ to ¼ inch in size.

(3) Depth of sand shall be at least 6 inches and shall consist of clean coarse sand.

(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 o.c.

(5) Walls shall be of reinforced concrete or other masonry and extend 15 to 18 inches above and to firm ground at least 18 inches below the sand surface. Walls shall be at least 6 inches above the surrounding ground elevation to prevent soil from washing on 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 and suitable means shall be provided for the satisfactory disposal of the sludge cake.

12.9 Shallow Lagoons

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

a. The lagoons shall be sufficiently isolated from existing and possible future residences as to afford such residences reasonable protection from odors or other nuisances which may arise from the operation of such lagoons.

b. The soil is reasonably porous and the bottom of the lagoon is at least 18 inches above the maximum ground water plane.

c. The area provided shall be at least double that specified for open drying beds; and a sufficient number of lagoon units is available to permit withdrawals from service and cleaning at necessary intervals.

12.10 Vacuum Filtration of Sludge

a. For installations where undigested or partially digested sludge is to be filtered, vacuum filters shall be provided in duplicate unless nuisance-free storage of sludge is provided in a manner approved by the Department. Duplicate installation shall include duplicate conditioning equipment, conveyors, feeders and other appurtenances. Capacity shall be sufficient to process the sludge to prevent any day-to-day accumulation. The engineer's report will include complete data on filter capacity, sludge volume to be handled, conditioning methods and equipment, chemical storage and satisfactory disposal of sludge cake. The plans shall show provisions for housing the filter, for ventilation and odor control, for handling and/or loading the sludge cake and the area and method proposed for final disposal.

b. For installations where digested sludge is to be filtered, duplicate installations may not be required if adequate capacity is provided with a single unit on the basis of 30 hours' operation weekly under the design load. The requirements under 12.10 (a) for the engineer's report and the plans shall apply for installations filtering digested sludge.

SECTION 13—CHEMICAL COAGULATION

13.1 Consideration of Method

This method of sewage treatment shall be considered as a degree of treatment intermediate between sedimentation, and sedimentation plus 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 a suitable and approved form proportional to the sewage flow.

b. A chamber or 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 design 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 11.3.

e. Sludge Digestion and Dewatering—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 electrically driven mechanisms 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.

SECTION 14—TRICKLING FILTERS

14.1 General

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

b. Filters shall be preceded by effective preliminary treatment.

c. Filters shall be followed by individually controlled and mechanically cleaned settling tanks.

14.2 Design

a. Reduction in 5-day B.O.D. in primary settling tanks shall be considered as not exceeding 35% for filter design criteria.

b. When the average 5-day B.O.D. of the raw sewage exceeds 325 p.p.m., two stages of trickling filter treatment are recommended, with or without intermediate sedimentation. Consideration may be given to designs providing supplementary preliminary treatment in the case of strong sewages or industrial wastes.

c. The sewage shall be distributed uniformly over the filter so that at least 95% of the surface area receives sewage directly.

d. Distribution devices may be actuated by twin syphons, pumps, or gravity discharge from preceding treatment plant units.

e. The filter media shall be crushed rock, or other approved material. Where applicable, the upper 18 inches of the filter bed 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 the current A.S.T.M. Standard, Designation No. C-131.

Rock media 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 2½ inch screen. Material shall be screened or forked, and washed to remove fines and shall be so placed as to avoid breaking the underdrains.

f. The underdrainage system shall be resistant to the action of sewage wastes and shall cover the entire floor. Inlet openings into the underdrains shall have an unsubmerged gross combined area equal to at least 15% of the surface area of the filter. Use of half-tile for underdrains will not be approved.

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

14.3 Standard Rate Filters

a. The volume of sewage to be treated by standard rate filters shall not exceed 14,400 gallons per day per thousand cubic feet (630,000 gallons per acre foot) of filtering media nor shall the average rate of organic loading exceed 15 lbs, of 5-day B.O.D. per thousand cubic feet (0.4 lb. per cubic yard) per day.

b. The average rate of application during dosing periods shall not exceed 22 gallons per thousand cubic feet of media (950 gallons per acre foot) per minute. The time intervals between dosing cycles to the filter should generally not exceed five minutes at design flow.

c. The minimum depth of filtering media at any point in the filter, measured from the top of the underdrains to the surface of the media, shall not be less than five (5) feet, and the maximum depth shall not exceed eight (8) feet.

d. Means for Psychoda fly control, such as provisions for backflooding and filter flushing, or the application of chemicals, shall be provided.

e. Means shall be provided for recirculating a portion of the effluent from intermediate or final settling tanks during periods of low flow.

14.4 High Rate Filters

a. Organic loading to high rate filters shall not exceed 67 lbs. of 5-day B.O.D. per thousand cubic feet (1.8 lbs. per cubic yard) of filter media per day, based on the total volume of the filters.

b. The depth of filtering media at any point in the filter, measured from the top of the underdrain block to the surface of the media, shall not be less than five (5) feet nor more than eight (8) feet. The distributor shall clear the media by 8 to 9 inches; and the filter retaining walls shall be not less than 3 inches higher than the media.

c. High rate trickling filters shall be equipped with rotary distributors. Flushing devices shall be provided at the outer end of each distributor arm.

d. Provision shall be made for controlled recirculation to maintain a continuous application rate of not less than 230,000 gallons per thousand square feet

(10 million gallons per acre), per day. Devices shall be provided to measure flows to the filter, and of the recirculated effluent.

e. The number and capacities of the recirculating pumps shall be such that the conditions of (d) of this regulation can be met if the largest pump for each point of return is out of service unless other provision is made, which will permit an effective degree of treatment if power or pump failure occurs.

14.5 Two-stage or Double Filtration

Under conditions where treatment of unusually strong sewage is necessary and two-stage filtration is adopted, intermediate settling tanks may be required, with suitable sludge and scum removal devices to provide a detention period of one hour based upon design flow.

SECTION 15—ACTIVATED SLUDGE

15.1 General

a. **Applicability**—The activated sludge process may be used where the sewage entering the aeration tanks is amenable to biological treatment.

b. Design data outlined herein are presumed to achieve a removal of 90% or more of the B.O.D. and suspended solids susceptible to treatment from sewage of normal characteristics and may not apply where only partial removals are intended.

c. Plans for plants contemplating abnormally strong concentrations of sewage, an unusual aeration period, or special equipment or arrangements, may be considered for approval upon presentation of appropriate supporting data obtained from existing installations demonstrating the efficacy of the process.

d. Provision for prechlorination of the raw sewage shall be made.

15.2 Settling Tanks

a. A skimming tank, or equivalent, shall be provided for sewage which contains excessive oil or grease.

b. Except in very small plants, there will be provided a minimum of two preliminary settling tanks having a total capacity to provide not more than one-hour detention period and a maximum surface settling rate of 1,000 gals./s.f./day based upon design flow.

c. Final settling tanks shall be provided in multiple units except in small installations. (See 11.3 d.)

d. Mechanical means shall be provided for the collection and removal of sludge from all settling tanks.

e. Upward flow settling tanks will be considered under the provisions of 11.1 (g).

15.3 Preaeration

If the incoming sewage is stale, preaeration of the presettled sewage is recommended before the admixture of returned sludge.

15.4 Aeration Tanks

a. Multiple units, capable of independent operation, shall be provided for all installations.

b. Total required detention period of aeration tanks, based upon 125 percent of design flow, shall not be less than 6 hours. However, if provision is made for the reaeration of the returned sludge before admixture with the presettled sewage, a lesser detention period in the aeration tanks will be considered. In general, the greater the return sludge aeration period, the less the required mixed liquor detention period.

c. Applied loading shall not exceed 38 pounds of B.O.D. (exclusive of return sludge) per 1,000 cubic feet of tank volume.

d. In general, the design for mechanical aeration units shall be subject to the provisions of 15.1c and of 15.7a.

e. Liquid depths of not less than ten, nor more than fifteen feet, shall be provided.

f. Means shall be provided to minimize foaming in aeration tanks.

15.5 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-cleaning velocities, or shall be equipped with mechanical devices for keeping solids in suspension continuously.

15.6 Measuring Devices

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

15.7 Air Supply

a. Air requirements at all times shall be sufficient to:

(1) Maintain at least two parts per million of dissolved oxygen in all parts of the aeration tank.

(2) Maintain sufficient turbulence to maintain intimate contact of sludge particles with sewage.

(3) Prevent deposition of solids in any part of aeration unit.

b. Aeration capacity at standard temperature and pressure shall be at least 1.5 cubic feet per gallon of incoming raw sewage plus the capacity required for reaeration of returned sludge.

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

d. Blower capacity required to deliver air to channels, sludge pumps, foam-control pumps, or similar demands shall be in addition to that required for tank aeration as specified in 15.7 (a).

e. The air diffuser system shall be capable of delivering 150% of normal requirements. Such requirements ordinarily may be considered as 1,000 cu. ft. per pound of B.O.D. to be removed from the sewage entering aeration tanks.

f. Air filters shall be such as to maintain continuously an air supply having a dust content of not more than 0.5 m.g. per 1,000 cu. ft.

g. It is recommended that each blower be equipped with a silencer.

15.8 Air Diffusers and Control Valves

a. Aeration plates, tubes or jets shall be designed to permit removal for inspection or cleaning, and for maintaining an even distribution of air properly dispersed throughout the aeration tanks.

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

15.9 Sludge Handling Equipment

a. Return activated sludge pumps or air lifts shall have variable combined capacity, capable of pumping at least 25% of the design flow with the largest single unit out of service. Normal return sludge capacity shall be at least 50 percent of the average dry-weather sewage flow.

b. In addition to capacity required for return sludge pumping, waste sludge pumping facilities shall be provided with a minimum capacity not less than 0.5 percent of design flow, or ten gallons per minute, whichever may be larger.

c. Waste activated sludge may be discharged to the preliminary settling tanks, concentration tanks, or digestion tanks.

15.10 Sludge Digestion

a. The general provisions contained in Section 12 relative to sludge digesters shall apply when anaerobic sludge digesters are provided.

b. Supernatant liquor from anaerobic sludge digesters shall be treated before being returned to the main aeration units.

SECTION 16—INTERMITTENT SAND FILTERS

16.1 General

a. At least two filter units shall be provided.

b. Sod and similar coverings over intermittent sand filters are prohibited.

16.2 Loading

a. Organic loading of 5-day B.O.D. shall not exceed 3.8 lbs. per thousand square feet (165 lbs. per acre) per day.

b. With acceptable primary treatment of normal sewage, volumetric loading shall not exceed 2,875 gallons per thousand square feet (125,000 gallons per acre) per day. For stronger sewage the rate of filtration shall be proportionately lower.

c. For chemical coagulation and sedimentation the volumetric loading shall not exceed 5,750 gallons per thousand square feet (250,000 gallons per acre) per day.

d. For standard or high rate trickling filters or activated sludge followed by secondary settling tanks, the volumetric loading shall not exceed 9,200 gallons per thousand square feet (400,000 gallons per acre) per day.

e. For schools, camps, and institutions, not having a full-time operating staff, volumetric loading should not exceed 1,150 gallons per thousand square feet (50,000 gallons per acre) per day for primary tank effluent.

16.3 Media

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 1½" to ¾", ¾" to ¼" and ¼" to ⅛".

b. Underdrains shall have maximum spacing not exceeding six (6) feet o.c. and shall be at least four inches in diameter, or of equivalent area.

c. Pipes shall be laid on a firm base with open joints with a space of approximately ¼ inch between ends. A single layer of muslin, cheese cloth or burlap, shall be wrapped around each joint of open joint underdrains. Tar paper or other waterproof material shall not be used. Perforated clay or other approved perforated pipe may be used for underdrains.

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 30 inches. The sand shall be free from clay, loam or silt.

16.4 Dosing

a. A dosing tank or its equivalent with a capacity to dose each filter at least twice in a day shall be provided. Where practical, a dosing tank or equivalent shall have a maximum detention of 2 hours based on the design flow.

b. The dosing tank volume shall be such that any filter bed will be covered to a depth not less than two (2) nor more than four (4) inches with each dose.

c. 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. Rotary distributor may be used if nozzles are adjusted so flow will not erode the sand bed.

b. 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 10 feet. Provision shall be made at each discharge port for adjustment of the flow.

c. Splash slabs shall be provided at each point of discharge.

d. A drain opening from troughs or discharge piping shall be provided.

16.6 Earth Base

The earth base of the filters shall be firm, compacted if necessary, and be sloped uniformly to the trenches in which the underdrains are laid.

SECTION 17—DISINFECTION

17.1 General

a. Chlorination devices shall be of the solution feed type, installed generally in duplicate or with duplicate essential parts. Stand-by duplicate chlorinators shall be provided at sewage treatment plants discharging into ocean bathing areas and at other locations within prejudicial distances of bathing or shellfish waters. Except in small plants, chlorinators shall be automatic, proportional-to-flow controlled.

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 provided with suitable ventilation. The doors shall open outward. Provisions for heating during the winter season are required. A suitable gas mask shall be provided and maintained in good operating condition, and shall be stored in an accessible location outside the chlorine room. An automatic alarm, or an observation window to permit visual inspection without opening the door, should be provided.

d. A chlorine contact period of at least ½ hour, based on design flow, shall be provided in a separate baffled tank. A contact period of not less than 20 minutes shall be provided during peak hourly flow.

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.

h. Automatic chlorinators with residual recorders and alarm systems to indicate chlorinator failures may be required in certain instances.

17.2 Capacity of Chlorinators

a. For disinfection, the capacity of chlorinators shall be adequate to produce a free chlorine residual of 2.0 p.p.m. 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

17.3 Other Disinfectants

a. Use of disinfectants other than chlorine will not be permitted.

SECTION 18—OTHER SEWAGE TREATMENT PROCESSES

18.1 General

The use of treatment processes other than those listed in these regulations may be considered on the basis of the results accomplished under adequately controlled installations elsewhere and on the characteristics of the wastes and the local conditions at the proposed installation. (See Section 6.3.)

18.2 Micro-Strainers

The use of micro-strainers may be considered where additional treatment (reduction in B.O.D. and Suspended Solids) is required after secondary treatment and final settling. When the use of micro-strainers is proposed, the engineer's report shall present full data on the installations and shall be accompanied by suitable plans. It is recommended that proposals for using such devices be discussed with the Department in advance of actual design. Data on reductions at generally similar installations will be presented.

18.3 Rapid Sand Filters

Use of rapid sand filters may be considered where a high degree of final treatment is required and where skilled operational personnel will be assured. In general, rates should not exceed 3 gallons per square foot per minute; backwash facilities will be provided; the sand bed will be not less than 20 inches in depth; and suitable underdrainage of graded gravel will be provided. Operating head on the filter will not exceed 8 feet.

SECTION 19—PACKAGE TREATMENT PLANTS

19.1 General

a. **Definition**—As applied to these regulations the term "Package Treatment Plant" shall mean a factory built sewage treatment plant consisting, in whole or substantially, of prefabricated units, such as aeration, settling, digestion tanks, contact stabilization and trickling filters. The provisions of this Section however shall generally be applicable to all small treatment plants having a capacity of not more than 150,000 gallons per day.

b. **Applicability**—Package treatment plants may be used where sewage is amenable to biological treatment. They will generally be considered by the Department as temporary installations to be abandoned when permanent facilities become accessible to the places served.

c. Design data outlined in this Section are presumed to achieve a removal of not more than 80% of B.O.D. and suspended solids. Where greater removals are required, tertiary treatment such as intermittent sand filters must be provided.

d. All general requirements of these Rules and Regulations shall apply to any plant designed according to this Section.

19.2 Extended Aeration

a. Screening equipment consisting of a comminuting device with bar screen in parallel is required on installations having capacities of 40,000 gallons per day or more, and are recommended for smaller installations as well.

b. Aeration tanks shall provide a detention period of at least 24 hours based on design flow without recirculation. At least two tanks shall be provided in plants with capacities of 100,000 gallons per day or more.

c. Air blower equipment shall be at least in duplicate and shall have capacity with the largest unit out of service to provide either at least 3 cu. ft. per minute per foot length of aeration tank or at least 2,100 cu. ft. of air per pound B.O.D. of raw sewage, whichever is greater. Equipment shall provide for variation in the volume of air to be delivered in at least three steps. Additional air capacity shall be provided if required for air lifts or other needs.

d. Air diffusers shall be arranged so that they can be removed quickly for inspection and replacement, without dewatering the tank.

e. The above requirements are established on the basis of diffused air equipment being provided. Mechanical aeration equipment will be considered upon submission of acceptable data indicating the efficiency and performance of such equipment.

f. The installation of froth-breaking spray equipment is recommended.

g. Final settling tanks shall provide at least a 3.5 hour detention period based on design flow without recirculation. Two or more tanks shall be provided on installations having capacities of 100,000 gallons per day or more. For tanks with hopper bottoms, the upper third of depth of hopper may be considered as effective settling capacity.

h. Return sludge capacity of at least 100% of design sewage flow shall be provided.

i. Appropriate means such as a V-notch weir shall be provided for measurement of sewage flow. For installations having capacities of 100,000 gallons per day or more, indicating-recording-totalizing equipment is required.

j. Waste sludge holding tanks with a capacity of at least 1 cubic foot per capita shall be provided.

19.3 Contact Stabilization

a. Screening equipment—same as Section 19.2 (a).

b. Combined volumes of the contact aeration and sludge reaeration tanks shall provide a detention period of at least 9 hours based on design flow without recirculation. Aerobic digester tanks shall provide a capacity of at least 3 cubic feet per capita. At least duplicate tanks shall be provided in plants with capacities of 100,000 gallons per day or more. When anaerobic digestion is employed, the provisions of Section 12 will apply.

c. Air blower equipment shall be at least in duplicate, and shall have capacity with the largest unit out of service to provide at least 1,600 cu. ft. of air per pound B.O.D. of raw sewage for contact aeration, sludge reaeration and aerobic digester requirements. Equipment shall provide for variation in the volume of air to be delivered in at least three steps. Additional air capacity shall be provided if required for air lifts or other needs.

d. Requirements of 19.2 d, e, f, g, h and i shall also apply to Contact Stabilization.

19.4 Trickling Filtration

Package treatment plants employing trickling filters shall be designed in accordance with Section 14.

19.5 Design Flow For Small Plants For Various Establishments

In lieu of other values established by the engineer and satisfactory to the Department, the values listed below may be used in computing the design flow of package treatment plants:

Type of Establishment	Measurement Unit	Gallons/ Day
Private Dwelling	Person	100
Apartment Buildings	Person	75
Transit Dwelling Units		
Hotels	Bedroom	75
Lodging Houses and Tourist Homes	Bedroom	60
Motels and Tourist Cabins	Bedroom	60
Boarding Houses (Resident)	Boarder	50
Camps		
Trailer Camps (Private Bath)	Person	75
Trainer Camp (Central Bath, etc.)	Person	50
Luxury Camps (Private Bath)	Person	75
Children's Camps (Central Bath, etc.)	Person	50
Labor Camps	Person	40
Day Camps—No Meals	Person	15
Restaurants (Including Washrooms)		
Average Type	Patron	15
Bar and Cocktail Lounges	Patron	5
Short Order or Drive-In-Service	Patron	5
Clubhouses		
Residential Type	Person	75
Non-Residential (Serving Meals)	Person	35
Institutions		
Hospitals	Person	200
Other Institutions	Person	125
Schools		
Elementary (No Shower or Cafeteria)	Person	10
With Cafeteria	Person	15
With Cafeteria and Showers	Person	20
With Cafeteria, Showers and Laboratories	Person	25
Boarding	Person	75
Automobile Service Stations		
No Car Washing	Car Served	5
Car Washing	Car Washed	75

Miscellaneous	Measurement Unit	Gallons/ Day
Stores, Shopping Centers and Office Bldgs.	Sq. Ft.	0.125
Factories (8-hour shift)	Person	25
Self-Service Laundries	Wash	50
Bowling Alleys	Alley	200
Swimming Pools and Beaches	Person	15
Picnic Parks (with Flush Toilets)	Person	10
Fairgrounds (Based upon average attendance)	Person	5
Assembly Halls	Seat	5
Airports (Based on Passenger Use)	Passenger	3
Churches	Seat	3
Theatre (Indoor)	Seat	5
Theatre (Drive-In With Food Stand)	Car	5

SECTION 20—LABORATORY EQUIPMENT

In general all plants designed to treat an average daily volume of sewage of 150,000 gallons or more shall provide for a laboratory which shall contain such of the items of the following Recommended Laboratory Equipment, together with the appropriate reagents, as are necessary for the operational control of a proposed treatment plant.

Items General	Quantity Suggested
Tared balance pan	1
Spatulas, 5″ and 10″	1 each
Flasks, Erlenmeyer, 125 and 250 ml.	6 each
Flasks, Volumetric, 100, 200, 500 and 1,000 ml.	2 each
Beakers, low form, 10, 25, 50, 100, 500 and 1,000 ml.	2 each
Pipets, Mohr, 1/10 ml. divisions, 5 and 10 ml.	2 each
Pipets, Volumetric, 25, 50 and 100 ml.	2 each
Shelf Storage bottles, 500 and 100 ml.	12 each
Aspirator bottle, 4 liter	1
Carboy (bottle) 5 gallon	1
Wash bottle, polyethylene, 8 or 16 oz.	2
Distilling apparatus for water	1
Burets 50 ml.	2
Buret stand	1
Lab burners with wing tip	2
Rough balance with wing tip	2
Rough balance with weights	1
Polyethylene stirring rods	6
Stopcock grease	1 tube
Thermometer—20 Deg. to 110 Deg. C.	1
Thermometer—10 Deg. to 260 Deg. C.	1
Magnetic stirring device	1
Tongs	1 pair

Items General	Quantity Suggested
Triangle File	1
Pinch Clamps	6
Mortar and Pestle	1
Glass and rubber tubing	20′ each
Labels	1 box
Cleaning brushes	1 each
Watch glasses 12 cm.	6
Ring stands with rings	2 each
Tripod with triangles	1 each
Copy of Standard Methods	1
Funnels	2
Forceps, plastic tipped	1 pair
PRIMARY SEDIMENTATION	
Settleable Solids	
Imhoff Cones	4
Cone support, Imhoff, triple	1
Interval timer	1
Suspended Solids	
Goach crucibles	12
Crucible holders	2
Glass fiber filter discs	6 boxes
Side Arm (vacuum flasks)	3
Vacuum pump	1
Desiccator and indicating desiccant	1
Drying oven	1
Balance, analytical	1
Set of weights, if necessary	1
Total Solids	
Flat bottom evaporating dishes—90 ml.	12
DISSOLVED OXYGEN	
B.O.D. bottle	24
Bottles, dropping, with 2.5 ml. pipet	4
BIOCHEMICAL OXYGEN DEMAND	
B.O.D. incubator	1
HYDORGEN ION CONCENTRATION (pH)	
Line Operated pH Meter	1
PERCENT SOLIDS IN RAW SLUDGE	
Ohaus Moisture Balance	1
CHEMICAL COAGULATION BEFORE SEDIMENTATION	
Jar Tests	
Multiple Stirring Device	1
1,000 or 1,500 ml. beakers	12
CHLORINATION	
Comparator (with chlorine disks)	1
ACTIVATED SLUDGE	
Metal Clad Thermometer	1