CHAPTER VI

WASTEWATER TREATMENT PLANT

6.01 Before the approval of project plans, the builder or any authorized person must obtain in writing from the Planning Board, Environmental Quality Board, Regulations and Permits Administration, and the Puerto Rico Aqueducts and Sewer Authority the approval for the proposed site. As well as the endorsement from the Department of Natural Resources and the United States Army Corps of Engineers for the discharge of the effluent to the selected receiving body of water.

6.02 Plant Location

6.02.01 Requirements

1. The plant must be located as far as possible from present or future developmented areas and not less than fifty (50 mts) distance from housing unit, or any other construction where people meet. This distance shall be measured from the construction to the nearest plant structure or treatment unit.

2. Take into consideration the direction of the prevailing winds.

3. It shall be located at an elevation above flood level, or otherwise be adequately protected against flood damage.

4. Easily accesible by all-weather roads.

5. Plot should be large enough to allow expansion and addition of future facilities.

6. Local soil characteristics, geology, hydrology, and topography available to minimize pumping.

7. Access to receiving body of water.

8. Treatment process compatibility with the present and planned future land use, including noise, potential odors, air quality, and anticipated technics for the sludge processing and disposal.

6.03 Quality of Effluent

The degree of wastewater treatment required shall be based on

the effluent requirements and water quality standards established by the Environmental Quality Board, the Health Department, and the Environmental Protection Agency.

6.04 Design

6.04.01 Type of Treatment

In the selection of the type of treatment, as a minimum, the following items shall be considered;

1. Present and future effluent requirements;
2. Location of and local topography of plant site;
3. Space available for future plant constructions;
4. The effects of industrial wastes that might be encountered;
5. Sludge ultimate disposal;
6. Capital cost of the system;
7. System operating and maintenance cost, including basic energy requirements;
8. Process complexity governing operating personnel requirements and;
9. Environmental impact on present and future land use.

6.04.02 New Processes, Methods and Equipment

The Authority will consider the use of new processes, methods, or equipment for the treatment of wastewaters under the condition that the operational reliability and effectiveness of the processes or device shall have been demostrated with a suitably-sized prototype existing installation operating at its design load conditions. The Authority may approve its use on an experimental basis.

6.04.03 Industrial Wastes

If industrial wastes are involved, their nature should be taken into consideration when designing

the plant. Contaminant wastes must be pretreated at the site of the industry before discharging to the sewer system.

6.04.04 Flow

The design flow for the plant should be determined by the contribution as stipulated on Section 3.02 adding the industrial flow involved.

6.04.05 Design Load for Existing Systems

1. Field Information.

2. Sewage Flow and Concentration. When there is an existing system, the volume and strenght of existing flows shall be determined for both dry-weather and wet-weather. Flow will be measured and the strength shall be determined by laboratory analysis of samples taken and composited, so as to be accurately representative, for a period of 24 hours.

6.04.06 Hydraulic Load

The design of the treatment units must be based on the average future flow rate except on special cases. Industrial flows will be determined by its rate during critical periods.

6.04.07 Volume of Maximum and Minimum Flow

Prolonged maximum and minimum flows can affect adversely the retention period of the units or the flow characteristics in the pipes, so it should be taken into consideration in the design. The percentages to be considered for flow variations will be as follows:

Less than 5678 m^3/day (1.5 MGD):

Minimum Flow = 30% Average Flow
Maximum Flow = 250% Average Flow

More than 5678 m^3/day (1.5 MGD):

Minimum Flow =50% Average Flow
Maximum Flow =200% Average Flow

6.04.08 Design Load for New Systems

In the case of new systems, information and data from similar communities in the area may be used; however, a thorough previous investigation that is adequately documented should be made to establish the reliability and applicability of such data. If not possible a BOD loading of 300 mg/l and suspended solids load of 325 mg/l will be used.

6.04.09 Flows During Raining Periods

This should be taken into consideration especially if they are frequent, when determining the volume of flow, an infiltration/inflow study shall be made if required by the Authority.

6.04.10 Recirculation

Recirculation should be given consideration in accordance with the type of process selected.

6.04.11 Organic Load

It should be determined in the same way as the design flow and include the following consideration:

1. Receiver sources should be able to assimilate the waste when the treatment units receive the organic loads during a period shorter than 24 hours.

2. Impact due to large contributions in short periods of time during the treatment process.

6.04.12 Conduits

All piping and channels must be designed to carry the maximum flow expected. Piping for incoming sewer should be designed for unrestricted flow. Bottom of channesl must be filleted. Conduits must be designed to avoid creation of pockets and corners where solids can accumulate. Suitable gates should be placed in channels to seal off unused sections which might accumulate solids.
The use of shear gates or stop planks is permitted where they can be used instead of gate valves or sluice gates.

Non-corrodible materials shall be used for these control gates.

6.04.13 Arrangement of Units

Units should be arranged for greatest operating and maintenance convenience, flexibility, economy, continuity of maximum effluent quality, and ease of future units installation.

6.05 The wastewater treatment facilities shall be able to operate satisfactorily during emergencies and maintenance periods. This shall be accomplished by including in its design the installation of multiple equipment and units. All treatment plants with flow design of 378.5 m^3/d (100,000 GPD) or greater shall be so equiped.

6.06 Treatment Plant Details

6.06.01 Installation of Mechanical Equipment

The specifications should be so written that the installation and initial operation of major items of mechanical equipment will be supervised by representatives of the manufacturer and the Authority.

6.06.02 Units By-pass

Except in cases where duplex units exists, properly located and arranged by-pass structures and piping shall be provided so that each unit of the plant can be removed from service independently. The design of the by-pass shall be such that facilitates plant operation during unit emergency repair and maintenance so as to minimize deterioration of effluent quality and insure rapid process recovery upon return to normal operational mode. By-passes permitting discharge of unprocessed wastewater into the receiving body shall not be permitted.

6.06.03 Drains

Each unit shall be provided with means to dewater it to an appropriate point in the process. Due consideration shall be given to the possible need

for hydrostatic relief devices to prevent flotation of structures. Means for mechanical cleaning or flushing shall be provided for all pipe lines subject to clogging.

6.06.04. Construction Materials

Because of possible presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage, due consideration should be given to the selection of materials which are to be used in sewage treatment works. This is particularly important in the selection of metals and paints. To minimize galvanic action the contact between dissimilar metals should be avoided.

6.06.05. Painting

The paints to be used must be in accordance with section 6.34 of this chapter. The use of paints containing lead or mercury should be avoided. It is suggested that the different pipe lines be color-coded, in order to facilitate identification of piping. OSHA's color code or the following color scheme is recomended for puposes of standardization.

Sludge line.....brown

Gas line.....red

Potable water line.....blue

Chlorine line.....yellow

Sewage line.....gray

Compressed air line.....green

6.06.06. Operation Tools

The specification must include provision for supplying a complete outfit of tools, accesories, portable pump, and spare parts for the use of the operator. Readily-accessible storage space facilities shall be provided.

6.06.07. Grading and Landscaping

The ground should be graded upon completion of the plant. Concrete or gravel walkways should be provided for access to all units. Concrete road for heavy vehicles access to all units must be provided. Steep slopes, where possible, should be avoided to prevent erosion. No suface water shall be permitted to drain into any unit. Particular care shall be taken to protect trickling filter and sludge beds from stormwater runoff. Provision should be made for landscaping, specially when a plant must be located near residential areas.

6.07 Plant Outfall

6.07.01. Flow Dispersion

Consideration should be given in each case to the dispersion of the outfall flow in the receiving water body, as needed to protect aquatic life movement and growth.

6.07.02. Outfall Pipe

The outfall pipe line should, when possible, be extended up to the minimum water level of the receiving water to assure the right disposal of the waste. The outfall extreme must be submerged. Headwalls can be used when adequate diffusion is obtained without the extension of the discharge pipe into the receiving water.

6.07.03. Design and Construction

The outfall pipe shall be so constructed as to be protected against the effects of floodwater, tide, or other hazards. At the shore end of all gravity sewers extended into the receiving waters, a manhole should be provided. When designing a submarine outfall, all permits required should be obtained from the appropriate agencies, such as E.P.A., E.Q.B., N.R.D., C.of E., and P.B.

6.08 Essential Facilities

6.08.01. Emergency Power Facilities

An automatic start electrical power generator run by a Diesel engine, will be provided to allow continuity of operation of the basic treatment units, the pumping station, and the lighting system, during power failures. For more information see Art. 5.02.03.

6.08.02. Water Supply

An adequate supply of potable water under pressure should be provided for used in all the plant areas. No piping or any connections shall exist in any part of the tratment works which, under any conditions, might cause the contamination of a potable water supply. A back-flow preventer must be provided for the protection of the potable water system. (See Fig. No. 19). Potable water from the public supply system may be used directly at the following points:

a. Lavatory;
b. Water closet;
c. Laboratory sink;
d. Shower;
e. Drinking fountain;
f. Eye wash fountain; and
g. Safety shower.

6.08.03. Check Valves

Check valves must be used in all faucets and hose bibs.

6.08.04. Indirect Connections

When a potable water supply is to be use for any purpose other than those mention in Art. 6.08.02, a break tank, pressure pump, and pressure tank shall be provided. Water shall be discharged to the break tank through an air gap at least 15.2 cm. (6 inches) above the maximun flood line or the spill line of the tank, whichever is higher. A warning sign shall be permanently posted at every faucet, hose bib, hydrant located on the water system beyond the break

tank indicating that the water is not safe for drinking.

6.08 b. Separate Potable Water Supply

If it is not possible to obtain potable water from a public water supply, a separate well may be provided. Its location and construction must comply with the requirements of the Department of Health and the Enviromental Quality Board.

6.08.06. Separarate Non-Potable Water Supply

Where a separate non-potable water supply is to be provided, a break tank is not necessary, but all outlets shall be posted with a permanent sign indicating the water is not safe for drinking.

6.09 Sanitary Facilities

Lavatory, toilet, and shower facilities should be provided.

6.10 Laboratory

Every plant must be provided with a laboratory equiped as specified and accepted by the Authority and the Enviromental Quality Board to make the necessary analysis and tests required. Refer to Section 6.60 of this chapter.

6.11 Flow Measurement

Facilities to measure and register automatically the sewage flow at the inlet and outlet points of the plant, must be provided.

6.12 Floor Slope

Floor surfaces shall be sloped adequately to a point of drainage.

6.13 Stairs

Refer to Art. 5.02.06, (Pumping Stations), 8.01.02, 8.01.10 (Safety Regulations).

6.14 Screening, Grit Removal, and Settling

a. Screening Devices
b. Bar Racks

6.14.01. When Required

Protection for pumps and other equipment must be provide by installing bar screens or bar racks, (4.45 to 6.35 cm.) (1 3/4" to 2. 1.2'). These racks should be readily accessible for operation and maintenance. At least two units must be provided.

6.14.02. Location

1. Screening areas shall be provided with stairs, access, adequate lighting and ventilation, and a convenient and adequate means for removing the screenings.

2. Screening devices should be accessible only through a separate outside entrance, when installed in a building where other equipment or offices are located.

6.14.03. Design and Installation

1. Bar spacing

   a- Manually Cleaned - Clear openings between bars should not be less than 2.54 cm. (1 inch)

   b- Mechanical Cleaned - Clear openings may be as small as 1.59cm. (5/8 inch)

   c. Maximum clear openings should be 4.44 cm. (1 3/4 inches)

6.14.04. Slope

Except those for emergency use, manually cleaned screens should be placed on a 30 to 45 degrees slope from the horizontal.

6.14.05. Velocities

For manually and mechanical raked bar screens, th

chamber should be designed to mantain a velocity through the chamber of approximately 46 cm./sec. (1.5ft./seg.) at average flow. For average flow the velocity should not exced 61 cm./seg. (2 ft/sec. and for maximum flow shall not exceed 91 cm./sec. (3 ft/seg.)

6.14.06 Channels

The channels preceding and following the screen shall be shaped to avoid settling and stranding of solids. Corners should be rounded to prevent accumulation of solids.

6.14.07 Inverts

The invert of the screen channel should be a minimum of 15.2 cm. (6 inches) below the invert of the incoming sewer to provide space for the accumulation of retained material. A 15.2 cm. (6 inches) minimum additional space should be considered to compensate for head losses through the screen. In all cases, the head losses should be calculated.

6.14.08 Control System

1- Timing Divices

All mechanical units which are operated by timing devices shall be provided with auxiliary controls which will set in operation the cleaning mechanism at a preset high water elevation.

2- Electrical Fixtures and Controls

Electrical fixtures and controls located in screening areas where hazardous gases may accumulate shall meet the requirements of the "National Board of Fire Underwrites; the Electric Power Authority, and OSHA.

6.15 Disposal of Screenings

Facilities must be provided for removal, handling, storage, and disposal of screenings in a sanitary manner. Separate grinding of screenings and return to the sewage flow is unacceptable.

An accessible platform from which the operator may rake screenings easily and safety should be included in manually cleaned screening facilities. Suitable drainage facilities shall be provided for both the platform and the storage areas. Consideration should be given to the disposal of screenings by burying or by incinaration. Disposal in open areas is prohibited.

6.16 Channels

Channels shall be equipped with the necessary gates to divert flow from any screening unit. Provision for dewatering each unit must be made.

6.17 Auxiliary Screens

When mechanical cleaned screen or comminutors are used, an auxiliary manually cleaned screen shall be provided. The design should include provisions to deviate sewage flow (peak design flow) through the auxiliary screens, when the regular units fail.

6.18 Fine Screens

The use of fine screens in lieu of sedimentation is not permitted. Fine screens should not be considered equivalent to primary sedimentation. Where fine screens are used, additional provision for the removal of floatable oils and greases shall be considered.

6.19 Grit Removal Facilities

6.19.01 When Required

For all sewage treatment plants, mechanical grit removal facilities should be provided and are required for plants receiving subtancial amount of grit from sewer systems. In plants with a capacity of less than 1.9 MLD (0.5 MGD) the Authority may, depending on the conditions, approve the use of manual grit removal. The design shall include provision for future installation.

6.19.02 Location

Grit removal facilities, except under special

conditions, should be located ahead of pumps and comminuting devices and should be preceded by coarse bar racks.

6.19.03. Type and Number of Units.

Grit removal facilities for sewer treatment plants should have at least two (2) mechanical cleaned units. In plants of less than 1.9 MLD (0.5 MGD) and where the Authority so permits, the use of one mechanically cleaned unit and one manually cleaned unit may be provided, depending on each case. Facilities other than channel-type may be acceptable if provided with adequate and flexible controls for agitation and/or air supply devices and with grit collection and removal equipment.

6.19.04. Design Factors

The design effectiveness of a grit removal system shall be commensurate with the requirements of the subsequent process units.

a- Inlet - The turbulance at the inlet should be minimized.

b- Velocity and Detention - Channel type chambers shall be designed to control velocities, as close as possible to 30 cm./s (1foot/sec.), during normal variations in flow. The size of the particles to be removed shall be the base for determining the detention time. Adequate automatic control devices to regulate detention time, agitation, and air supply shall be provided for all grit removal facilities.

c- Grit Washing - The method of final grit disposal shall determining the need for grit washing.

d- Drains and Isolation - Provision shall be made for isolating and dewatering each unit.

e- Water - An adequate supply of water under pressure shall be provided for cleanup.

6.19.05 Grit Removal

Facilities for grit removal, located in deep pits shall be provided with mechanical equipment for hoisting or transporting grit to ground level.

6.19.06 Grit Handling

Impervious, non-slip, working sufaces with adequate drainage shall be provided for grit handling areas. Grit transporting facilities shall be provided with protection against loss of material.

6.20 Flocculation

Flocculation of the sewage by air or chemical agitation with or without coagulating agents, shall be considered if reduction of the strength prior to the treatment is desired. For this purpose a minimum of two (2) units shall be used.

6.20.01 Arrangement

The units should be design so that removal from service will not interfere with the normal operation of the rest of the plant.

6.20.02 Retention Period

Coagulation - If air or mechanical agitation is used in conjuntion with chemicals for coagulation or flocculating the sewage, the retention period should be about thirty (30) minutes at the design flow. When reduction in B.O.D. is desired, the detention period should be at least forty five (45) minutes at the design flow. However, if polymers are used, this may be varied.

6.20.03 Agitators

a. Paddles - The peripheral speed of the paddles should range from 46 to 76 cm./sec. (1 1/2 to 2 1/2 ft./sec.) to prevent deposition of solids.

b. Aerators - Any of the type of equipment used for aerating activated sludge may be used. Provision to control agitation; should be included in order to obtain good mixing and maintain self cleaning velocities across the tank bottom.

6.20.04 Details

The design shall include adequate inlet and outlet devices to insure proper distribution and prevent short-circuiting. Convenient means for grit removal, should be provided.

6.20.05 Rapid Mix

At plants designed with flocculation tanks using chemicals, a device shall be provided for rapid mixing of the chemicals with the sewage so that the sewage passing to the flocculator tanks will be of uniform composiiton. The detention period provided in the rapid-mix chamber should be short, 1/2 to 3 minutes.

6.21 Settling Tanks

6.21.01 Inlets

Inlets should be designed to dissipate the inlet velocity, to distribute the flow equally both horizontally and vertically, and to prevent short-circuiting. Channels should be designed to maintain a velocity of at least 30 cm./sec. (1 ft./sec.) at one-half of the design flow. Corner pockets and dead ends should be eliminated and corners fillets or channeling used where necessary. Provisions shall be made for elimination or removal of floating material in the inlet structure.

6.21.02 Dimensions

Unless special provisions are made to prevent short circuiting, the minimum length of flow inlet to outlet should be 3 meters (10 feet). The liquid depth of mechanically cleanded settling tanks shall be as shallow as practicable, but not less than 2.1 meters (7 feet). Final clarifiers following the activated sludge process shall have depths of at least 2.44 meters (8 ft.).

6.21.03 Scum Removal

Effective scum collection and removal, including baffling, shall be provided ahead of the outlet weir on all settling tanks and shall be located so

that the direction of the prevailing winds aids in the removal of the scum. Provisions may be made for discharge and treatment of scum with the sludge. However, other provisions, such as incineration, may be necessary to dispose of floating materials which may adversely affect sludge handling and disposal.

6.21.04 Weirs

Overflow weirs shall be adjustable for leveling. Weir loading should not exceed 124 m^3/1.m./day (10,000 gal./day/1ft.) for plants designed for average flows of 3785 m^3/d (1.0 mgd) or less. Higher weir loadings may be used for larger average flows, but should not exceed 186 m^3/m/d (15,000 g/day/linear foot).

6.21.05 Submerged Surfaces

The tops of troughs, beams, and submerged construction elements shall have a minimum slope of 1.4 vertical to 1 horizontal. The underside of such elements should have a slope of 1 to 1 to prevent accumulation of scum and solids.

6.21.06 Multiple Tanks

Where removal from service of a single unit for a short period will result in objectionable conditions or material damage, multiple units shall be provided. (See Art. 6.2.09)

6.21.07 Protective and Service Facilities

All settling tanks shall be provided with easy access for maintenance and protection to operators. Such features shall appropriately include stairways, walkways, handrails of non-corrosive materials, etc. If side walls are extended above the liquid level to provide flood protection or for other purpose, convenient walkways shall be provided to facilitate care and maintenance.

6.21.08 Surface Settling Rates

1. Primary Settling Tanks

a- Follow by secondary treatment:

Plants up to 7.57 MLD (2 MGD) - 93.3 L/D/Cm^2 (800 gal/day/ft^2)
More than 7.57 MLD (2 MGD) - 124.2 L/D/Cm^2 (1000 gal/day/ft^2)

b- Not follow by secondary treatment:

Plants up to 7.57 MLD (2 MGD) -70.3 L/D/Cm^2 (600 gal/day/ft^2)
More than 7.57 MLD (2 MGD) - 99.3 L/D/Cm^2 (800 gal/day/ft^2)

2. Intermediate Settling Tanks:

124.2 L/D/Cm^2 (1000 G/D/$Ft.^2$)

3. Final Settling Tanks:

a- Plants up to 7.57 MLD (2.0 MGD) - 99.3 L/D/Cm^2 (800 gal/day/ft^2)

b- More than 7.57 MLD (2.0 MGD)- 124.2L/D/Cm^2 (1000 gal/day/ft^2)

c- The surface settling rates in plants with digested sludge shall be computed according to the desired load of settled sludge at the final tank.

6.21.09. Sluge Removal

A sludge well shall be provide or adequate equipment installed for observing and sampling the sludge. Facilities for the continuos removal of sludge from the final settling tanks shall be provided. Each sludge hopper shall have and individually valved sludge withdrawal line at least 15 cm. (6 inches) in diameter. The static head available for withdrawal of sludge shall be 76 cm. (30 inches) or greater. Sludge hoppers shall be accessible for maintenance from the operating level. Sludge hoppers side walls shall have a minimum slope of 1.7 vertical to 1.0 horizontal. Clearance between the end of the withdrawal line and the hoppers walls shall be sufficient to prevent "bridging" of the sludge. Hopper bottoms shall have a maximum dimension of 61 cm. (2 feet).

6.21.10 Efficiency of Primary Settling Tanks

In the design of a treatment plant, it will be presumed that primary settling will remove 50% to 60% of the suspended solids and a 30% to 35% of the influent BOD.

6.22 Flow Equalization

Flow equalization can reduce the dry-weather variations in organic and hydraulic loadings at any wastewater treatment plant. It should be provided where large diurnal variations are expected.

6.22.01 Location

Equalization basins should be located down-stream of pretreatment facilities such as bar screens, comminutors, and grit chambers.

6.22.02 Type and Size

Flow equalization can be provided by using separate basins or on-line treatment units, such as aeration tanks. Equalization basin capacity should be sufficient to effectively reduce expected flow and load variations to the extent deemed to be economically advantageous.

6.22.03 Operation and Control

To maintain adequate mixing, aeration or mechanical equipment should be provided. Corner fillets and hopper bottoms with draw-offs should be provided to alleviate the accumulation of sludge and grit. Inlets and outlets for all basin compartments shall be suitably equipped with accessible external valves, weirs, or other devices to permit flow control and the removal of an individual unit from service. Facilities shall also be provided to measure and indicate liquid levels and flow rates.

6.23 Sludge Handling and Disposal

Sludge digestion process may be classified as anaerobic or aerobic.

6.23.01. Anaerobic Sludge Digestion

1. Multiple Units - The use of multiple units is required. Provision for sludge storage and supernatant separation in an additional tank may be required, depending on raw sludge concentration and disposal methods for sludge supernatant.

2. Depth - The proportion of depth to diameter should be such as to allow for the formation of a reasonable depth of supernatant liquor.

3. Maintenance Provisions - The following features are recomended:.

   a. Slope - The tank bottom should slope to drain toward the withdrawal pipe. For tanks with mechanical suction for withdrawal of sludge, a bottom slope not less than 1:12 is recomended. A slope of 1:4 is recomended where the sludge is to be removed by gravity alone.

   b. Access Manholes - At least two 91 cm. (36 inch) diameter access manholes should be provided in the top of the tank in addition to the gas dome. To reach the access manholes stairways should be provided. A separate sidewall manhole shall be provided with an opening large enough to permit the use of mechanical equipment to remove grit and sand.

4. Sludge Inlets and Outlets - Multiple recirculation withdrawal and return points, to enhance flexible operation and effective mixing, should be provided, unless mixing facilities are incorporated within the digester. In order to assist in scum breakup, the returns should discharge above the liquid level and be located near the center of the tank. The sludge withdrawal to disposal should be from the bottom of the tank.

5. Tank Capacity - In recent years a number of modifications to the conventional anaerobic digestion process have been developed, specially in the area known as high rate digestion. The design standards, operating data, and experience for some of these modifications are not well established. This should be consider when selecting and designing the process. The total digestion tank capacity should be determined by rational calculations based in the latest accepted mathematic model that include such factors as sludge concentration, solid percent and nature, the temperature to be maintained in the digesters, the degree or extent of mixing to be obtained, the degree of volatile solids reduction required, and the size of the installation with adequate allowances for sludge and supernatant storage. Calculations should be submitted to justify the basis of design. The kinetic coefficient should determined by laboratory tests. When not possible and after consulting with the Authority, the values listed in the following tables should be used:

Coeft.	ANAEROBIC DIGESTER	20° TO 35° RAW SLUDGE
K	6.67 day^{-1}	
K_c	1.8 grm COD/L	1/2 COEF-COMB
1/a	0.04 grm/grm COD	(a, L, P)
1/	0.103 grm/grm COD	
b	0.03 day^{-1}	

	KINETIC COEFFICIENT FOR ACTIVATED SLUDGE AT 20°C (AERATION TANK)
Y	0.35 - 0.45 mg. MLVSS/mgCOD
b	0.05 - 0.10 day^{-1}
k	6-8 mgCOD/mg MLVSS/Day
k_s	25-100 mg/L COD

In cases where the mathematic model can not be used, the digester tank capacity may be designed based on other factors, approved by the Authority.

6. Gas Collection, Piping and Appurtenances

a- All portions of the gas system, including the space above the tank liquor, the storage facilities and the piping, shall be so designed that under all normal conditions, including sludge withdrawal, the gas will be maintained under positive pressure. All enclosed areas where any gas leakage might occur shall be adequately ventilated.

b- Safety Equipment - Where gas is produced, all necessary safety facilities shall be included. Pressure and vacuum reliefs valves and flame traps, together with automatic safety shut off valves, shall be provided. Water seal equipment shall not be installed. Gas safety equipment and gas compressors should be housed in a separate room with and exterior entrance.

c- Gas piping and Condensate - Gas piping shall be of adequate diameter and shall slope to condensate traps at low points. The use of float- controlled condensate traps is not permitted.

d- Gas Utilization Equipment - Gas-fired boilers for heating digesters should be located at ground level and in a separate room not connected to the digester gallery, and well ventilated. Gas lines to these units shall be provided with adequate flame traps.

e- Electrical Fixtures - Electrical fixcures and controls, in enclosed areas where hazardous gas may accumulate shall comply with the specifications of the National Board of Fire Underwritters, the P.R. Electric Power Authority, and O.S.H.A., for hazardous conditions.

f- Waste Gas - Waste gas burners should be readily accessible and should be located at least 7.6 meters (25 ft.) away from any plant structure if placed at ground level, or may be located on the roof of the control building if sufficiently separated from the tank. In remote locations it may be permissible to discharge the gas to the atmosphere through a return-bend screened vent terminating at least 3 meters (10 ft.) above the

ground surface, provided the assembly incorporates a flame trap.

g- Ventilation - Any underground enclosures connecting with digestion tanks or containing sludge or gas piping or equipment shall be provided with forced ventilation. To minimize the spread of gas at connecting passageways and tunnels, tightly fitting, self closing, automatic-locking doors should be provided.

h- Meter - A gas meter with by pass shall be provided to meter total gas production.

i- It is understood that in no case these conditions shall prevail, if are in violation of OSHA's regulations.

7. Digester Mixing - Where required for proper digestion because of loading rates or other features of the system, facilities for mixing the digester contents, shall be provided.

8. Supernatant Withdrawal

a- Piping Size - Supernatant piping should not be less than 15.2 cm. (6 inches) in diameter.

b- Withdrawal Levels - Piping should be arranged so that withdrawal can be made from 3 or more levels in the tank. A positive unvalved vented overflow should be provided.

c- Withdrawal Selection - The supernatant withdrawal level, on fixed cover tanks, should preferably be selected by means of interchangeable extension valves at the end of the piping.

d- Backwash - High pressure backwash facilities shall be provided.

9. Sampling - Provision should be made for sampling at each supernatant draw-off level. Sampling pipes shall be at least 1 1/2 inches in diameter and should terminate at a suitably-sized sampling sink or basin.

10. Alternate Supernatant Disposal - Supernatant should be returned to the plant inlet. Consideration should also be given to supernatant conditioning, where appropriate, in relation to its effect on plant performance and effluent quality.

6.23.02 Aerobic Sludge Digestion

1. General - Aerobic sludge digestion can be accomplished in a single or in multiple tanks, designed to provide stabilization and reduction of the organic matter in the presence of air.

2. Digestion Tanks - The use of multiple tanks is recommended. A single sludge digestion tank may be used in the case of small treatment plants (1 MGD or less) or where adequate provision is made for sludge handling and where a single unit will not adversely affect normal plant operation.

3. Mixing - Aerobic sludge digestion tanks shall be designed for effective mixing by satisfactory aeration equipment. If diffusers are used, the nonclog type is recommended, and they should be designed to permit removal for inspection, maintenance, and replacement without dewatering the tanks.

4. Tank Capacity - The size and number of aerobic sludge digestion tank or tanks should be determined by means of the calculations based on the most recently accepted mathematic model, considering such factors as percent solids reduction required, size of installation with appropriate allowance for sludge and supernatant storage. Calculations should be submitted to justify the basis of design. If the mathematic model cannot be use, the Authority should be consulted as to the method to be used.

Note: Page VI-24 was deleted.

6.23.03. Sludge Pumps

1. Capacity - Pumps capacities should be adequate. Variable speed pumps are required, whenever possible.

2. Duplicate Units - Duplicate units shall be provided where failure of one unit would seriously hamper plant operation.

3. Type - Plunger pumps, screw feed pumps, and other types of pumps with demostrated solids handling capability shall be provided for handling raw sludge.

4. Minimum Head - A minimum positive head of 61 cm. (2 feet) shall be provided at the suction side of centrifugal-type pumps and is desirable for all types of sludge pumps. For plunger pumps, the maximum suction lift should not exceed 3.0 meters (10 feet).

6.23.04. Sludge Piping

1. Size and Head - Sludge withdrawal piping should have a minimum diameter of 6 inches for pump discharge and 8 inches for gravity withdrawal lines. Where withdrawal is by gravity, the available head on the discharge pipe, should not be less than 1.52 m. (5 feet).

2. Slope - Gravity piping should be laid on uniform grade and alignment. Slope of gravity discharge piping should not be less than 3 percent. Provisions should be made for cleaning, draining and flushing discharge line.

6.24 Sludge Dewatering

6.24.01. Sludge drying beds - The drying beds should be of the type with concrete floor and with percolation channel. (See Fig. No. 44).

1. Area - In determining the area for sludge drying beds, consideration shall be given to climatic conditions, the volume and the character of

the sludge to be dewatered, the method and schedule of sludge removal, and other methods of sludge disposal. It shall never be less than 0.19 m^2/ person (2.0 ft^2/ capita)

2- The sizing of the drying bed may be estimated on the basis of 0.19 m^2/person (2 ft./capita) when the drying bed is the primary method of dewatering, and 0.09 m^2/ person (1.0 $ft.^2$/capita) if it is to be used as a back-up dewatering unit.

3- Percolation Type

a- Gravel - The lower course of gravel around the underdrains should consist of gravel 0.64 cm. to 1.98 cm. (1/4 to 3/4 inch) in size and should be 30.5 cm. (12 inches) in depth, extending at least 15.2 cm. (6 inches) above the top of the underdrains. It is desirable to place this in two or more layers. The top layer of at least 7.6 cm. (3 inches) thick should consist of gravel 0.32 to 0.64 cm. (1/8 inch to 1/4 inch) in size.

b- Sand - The top layer should consist of 15.2 to 22.9 cm. (6 to 9 inches) of clean coarse sand. The finished sand surface should be level.

c- Underdrains - The underdrain should be clay pipe or concrete drain tile at least 4 inches in diameter laid with open joints covered with cheese cloth.

4- Walls - The walls should be watertight and extent at least 46 cm. (15 to 18 inches) above the sludge level. Outer walls should be curbed to prevent soil from washing onto the beds.

5- Sludge Removal - At least two beds should be provided and should be arranged to facilitate sludge removal. Truck access to all percolation type sludge beds should be provided.

6- Sludge Influent - The sludge pipe to the drying beds should terminate at least 30.2 cm. (12 inches) above the surface and be so arrange that it will drain.

6.24.02 Additional Dewatering Facilities

At both ends of the percolation channel overflow rings should be provided at a distance not more than 30.2 cm. (12 inches) from the walls.

6.24.03. Drainage and Filtrate Disposal

Drainage from beds or filtrate from dewatering units shall be returned to the sewage treatment process at the plant inlet at an appropiate point to insure the same treatment as the influent.

6.24.04. Other Dewatering Methods

If the use of other methods are proposed the Authority should be consulted and its approval obtained before proceeding with the design.

6.25 Sludge Final Disposal

6.25.01. Final Disposal

The final sludge disposal shall be subject to E.Q.B. Standards and other pertinent requirements.

6.25.02. Incinaration and Other Oxidation Methods

Facilities for residue disposal and air pollution control should be provided.

6.25.03. Sanitary Landfill

Sanitary landfill must be considered as another alternative for sludge disposal.

6.26 Biological Treatment

6.26.01. Trickling Filters

1. Applicability - Trickling filters may be used for treatment of sewage amenable to treatment by aerobic biologic process. Effective settling tanks equiped with scum and grease collecting devices, or other suitable pretreatment facilities must preceed trickling filters.

2. Design Basis - Filters shall be designed to provide for reduction in biochemical oxygen demand in accordance with water quality standards established by the pertinent agencies, or to properly condition the sewage for subsequent treatment processes.

3. Distribution - The sewage may be distributed over the filter by rotary distributors or other suitable devices which will ensure uniform distribution to the surface area. At design average flow the deviation from a calculated uniform distributed volume per square meter (ft^2) to the filter surface shall not exceed plus or minus 10 percent at any point from the calculate volume.

4. Dosing - Sewage may be discharge to the filters by siphons, pumps or by gravity discharge from the preceding treatment units when suitable flow characteristics have been developed. Discharge of the sewage shall be practically continous. Recirculation shall be considered when designing the piping system.

5. Hydraulics - All hydraulic factors involving proper distribution of sewage on the filters shall be carefully calculated. Such calculations should be submitted to the Authority for approval. For the reaction type distributors, a minimum head of 61 cm. (24 inches) between the invert of the efluent channel of the clarifer and center of the arms is desirable.

6. Clearance - A minimum clearance of 15 cm. (6 inches) between the filter media and the distributor arms shall be provided.

7. Media - The media may be crushed stone, or specially manufactured material approved by the Authority. The media shall be durable, resistant to spalling or flaking and relatively insoluble in sewage. The top 46 cm. (18 inches) shall have a loss by the 20 cycle, sodium sulfate soundness test of not more than 10 percent, as prescribed by ASCE Mannual of Engineering Practice; No. 13. The balance is to pass a 10-cycle test using the same criteria. Manufactured media should be structurally stable, chemical and biological inert.

8. Depth - Crushed stone filter media shall have a minimum depth of .91 m (3 feet) above the underdrain and should not exceed 1.83 m (6 feet) in depth, except when special construction is justified through extensive pilot studies. In the case of specially manufactured material the depth shall be determined by means of studies.

9. Size and Grading of Media

   a- Rock and similar media shall not contained more than 5 percent by weight of pieces whose longest dimension is three (3) times the least dimension. They shall be free from thin, elongated and flat pieces, dust, clay sand or fine material.

They shall conform to the following size and grading when mechanically graded over vibrating screen with square openings.
Passing 11.4 cm. (4 1/2 inch) screen-100% by weight.
Retainded on 7.6 cm. (3 inch) screen - 95-100% by weight.
Passing 5.1 cm. (2 inch) screen - 0-2% by weight
Passing 2.5 cm. (1 inch) screen - 0-1% by weight.

b- Stone Place by Hand

Maximum stone dimension - 12.7 cm. (5")
Minimum stone dimension - 7.62 cm. (3")

c- Manufactured Media - Suitability of this media will be evaluated on the basis of experience with installations handling similar wastes and loadings.

d- Handling and Placing of Media - Material delivered to the filter site shall be stored on wood-planked or other approved hard-surfaced, clean areas. Similar material shall not be screen again at the filter site. This material shall be carefully place by hand to a depth of 30 cm. (12 inches) above the drains, so as not to damage them. The remainder of material may be placed by means of belt conveyors or any other method approved by the Engineer. Trucks, tractors, and other heavy equipment shall not be driven over the filter during or after construction.

10. Underdrains System

a- Arrangement - Underdrains with semicircular inverts or equivalent should be provided and the entire floor of the filter shall be covered by drainage system. Inlets openings into the underdrains shall have an unsubmerged gross combined area equal to at least 15 percent of the surface area of the filter.

b- Slope - The underdrains shall have a minimum of 1 percent. Effluent channels shall be design to produce a minimum velocity of 61 cm./sec. (2 ft./sec.) at average flow plus recirculation.

c- Flushing - Provision should be made for flushing the under drains. The use of a peripheral head channel with vertical vents, is accepted for flushing purposes in small filters. Inspection facilities should be provided.

d. Ventilation - The underdrainage system, effluent channels, and effluent pipe shall be design to permit free passage of air. The size of drains, channels, and pipe should be so that not more than 50 percent of their cross-section area will be submerged under the design peak hydraulic loading. Consideration should be given to possible future increase in hydraulic load, when designing the effluent channels.

11. Special Features

a- Flooding - Consideration should be given when designing the filters to provide appropiate valves to enable flooding for fly (psychoda) control.

b- Freeboard - To maximize the control of windblown spray, a free board of 1.2m (4 feet) or more should be provided for tall filters using manufactured media.

c- Maintenance - All distribution devices, underdrains, channels and pipes, shall be installed so that they may be properly maintained , flushed or drained.

12. Two-Stage Filters - The foregoing standards also apply to second stage filters.

6.26.02 Design of Stone Media Filters

0.15 - 0.30 Kg/m³ day

1. The organic filter load must be of 1814 kg. (4000 lbs.) BOD per acre/ft. equivalent to 41 kg/m³. (90 lbs/1000 ft³). 41.6 Kg/1,000 ft³

1 acre = 43,560 ft²

2. The hydraulic load of the filter must be between 38 and 114 million liters (10 and 30 million gallons) per acre of filter surface per day.

3. The yield of the final filtered and settling system will be calculated by combine formulas of the National Research Council, WPCF No. 8 Sewage Treatment Plant Design, last edition.

4. The recirculation factor shall not be less than 1:1 nor higher than 4:1

5. Recirculation Pumps

a- The return rate of each pump will not be less

1,814 Kg BOD/acre.ft ≅ 4,000 lb BOD/acre.ft = 4,000 lb BOD/43,560 ft³
= 0.0918 lb BOD/ft³

0.0918 lb BOD/ft³ (1000 ft³/1,000 ft³) = 91.8 lb BOD/1000 ft³

0.0918 lb BOD/ft³ (0.3 / 1 Kg ...) (35.319837 ft³) = 1.47 Kg/m³

than half of the volume used for the plant design.

b. Two pumps which will operate alternately shall be provided for each sump. In total four (4) pumps will be installed.

c. Recirculation pumps will be provided with ajustable mechanical weirs to vary the recirculation factor when necessary.

d. Recirculation pumps must meet the following requirements:

1. Epoxy encapsulated motor for exposed pumps.

2. Nema 4 enclosed float switch.

3. One quart solenoid oiler, for exposed pumping stations.

4. Pump discharge should not be less than 2 1/2 inches and the piping not less than 4 inches.

5. A 3/4 inch diameter piping with an 1/8 inch diameter opening of flexible copper must be installed, surrounding the pump chamber to break the scum, and this one connected to the recirculation discharge (overflow).

6. A shear gate must be provided in the inlet piping.

e. Recirculation pump suction chamber should be constructed with a hopper type bottom, with a 45 degrees slope toward pump suction to prevent dead ends at corners, and in accordance with section 5.02.02.

6.26.03. Activated Sludge

1. Applicability - The activated sludge process and its various modifications may be used where sewage is amenable to biological treatment. Close attention and competent operating supervision, including routine laboratory control is required for this process. These requirements shall be considered when proposing this type of treatment.

2. Energy Requirements - To meet aeration demands, mayor usage of energy is required by this process. Energy costs and potential mandatory emergency public power reduction events in relation to critical water quality conditions most be carefully evaluated. While still maintaining process viability, capability of energy usage phasedown, both under normal and emergency energy availability conditions, must be included in the activated sludge design.

3. Specific Process Selection - The activated sludge process and its several modifications may be used to accomplish various degrees of removal of suspended solids and reduction of five (5) days B.O.D. The degree and consistency of treatment required, type of waste to be treated, proposed plant size, anticipated degree of operation and maintenance, and operating and capital costs will influence the choice of the process most applicable. All designs must provide for flexibility in operation. Plants treating more than 3.785 MLD (1 MGD) shall be design to facilitate easy conversion to various operation modes.

4. Pretreatment - Effective removal or exclusion of grit, debris, excessive oil or grease, and comminution of solids shall be accomplished prior to the activated sludge process.

5. Settling Tanks - The following requirements are in addition to those set forth in Art. 6.21.01 of these Standards.

   a- Where primary settling is used, provision shall be made for discharging raw sewage directly to the aeration tanks following pretreatment.

6. Final Settling Tanks

   a- The inlets, collection facilities and sludge removal should be designed to minimize the density currents and to provide rapid sludge return to the aeration tanks.

b- Floating Material Removal - For all final settling tanks, provision for effective baffling, including equipment for scum removal, should be made.

c- Capacity - Since the rate of recirculation of return sludge from the final settling tanks to the aeration or reaeration tanks is quite high in activated sludge process, surface settling rate and weir overflow rate should be adjusted for the various processes to minimize the problems with sludge loadings, density currents, inlet hydraulic turbulence, and occasional poor sludge settleability. The following design parameters should be observed in the design of final settling tanks for the following activated sludge processes, except that due consideration must be given to the flow duration (for example, school flows may occur in a 6 hour period).

Type of Process	Average Design Flow (M.L.D.) (M.G.D.)	Detention Time Hours	Surface Settling Rates liter/day/ sq. cm. (gal./day/ sq. ft.)
Conventional, Modified or High Rate and Step Aeration	Up to 1.89 (0.5)	3.0	2.44 (600)
	1.89 (0.5) to 5.68 (1.5)	2.5	2.85 (700)
	5.68 (1.5) up	2.0	3.26 (800)
Contact Stabilization	Up to 1.89 (0.5)	3.6	2.04 (500)
	1.89 (0.5) to 5.68 (1.5)	3.0	2.44 (600)
	5.68 (1.5) up	2.5	2.85 (700)
Extend Aeration	Up to 0.19 (0.05)	4.0	1.22 (300)
	0.19 (0.05) to 0.57 (0.15)	3.6	2.04 (500)
	0.57 (0.15) up	3.0	2.44 (600)

7. Aeration

a- General - A number of modifications of the activated sludge process have been developed, some of which are referenced herein. Design standards, operation data and experience for some of this are not well established. This should be considered when selecting a process modification. The conventional process and its various modifications, except for the so called "High Rate" process, may be expected to remove 85 to 90 percent of the BOD applied to the aeration tanks within the boundaries of the design parameters described herein, with effective operation and, in the case of extended aeration, provision for sludge wasting. The so called "High Rate" modification may be expected to remove from 50 to 90 percent of the BOD applied, depending on loadings, solids under aeration and other variables.

b- Aeration Tanks - The size of the aeration tank for any particular adaptation of the process shall be determined by full scale experience, pilot plant studies, or rational calculations based mainly on such factors as the size of the plant, degree of treatment desired, mixed liquor suspended solids concentration, BOD loading, and ratio of mixed liquor solids to BOD loading. Calculations should be submitted to justify the basis for design of aeration tank capacity.

8. Arrangement of Aeration Tanks

a- General - Ordinarily, liquid depths should not be less than 3.05 m (10 feet) nor more than 4.57 m (15 feet) except in special design cases. For very small tanks or tanks with special configuration, the shape of the tank and the installation of aeration equipment should provide for positive control of short circuiting through the tank.

b- Inlets and Outlets Controls - Inlets and outlets for each aeration tank unit shall be suitably equipped with valves, gates, stop plates, weirs, or other devices to permit controlling the flow to any unit and to maintain reasonably constant liquid level. The hydraulic properties of the system shall permit

the maximum instantaneous hydraulic load to be carried with any single aeration tank unit out of service.

c- Conduits - Channel and pipes carrying liquids with solids in suspension shall be designed to maintain self-cleaning velocities or shall be agitated to keep such solids in suspension at all rates of flow within the design limits.

d- Measuring Devices - In all plants, devices should be installed for indicating flow rates of raw sewage or primary effluent, return sludge, and air to each tank unit. For plants designed for sewage-flows of 3.785 MLD (1MGD) or more, these devices should totalize and record, as well as indicate flows. Where the design provides for all return sludge to be mixed with the raw sewage (or primary effluent) at one location, then mixed liquor flow rate to each aeration unit should be measured.

e- Freeboard - All aeration units shall have a freeboard of not less than 46 cm. (18 inches). Additional freeboard or windbreak may be necessary to protect against windblown spray.

9. Aeration Equipment

a- General - Oxygen requirements generally depend on BOD loading, degree of treatment and level of suspended solids concentration to be maintain in the aeration tank mixed liquor. Aeration equipment shall be capable of maintaining a minimum of 2.0 mg/l of dissolved oxygen in the mixed liquor at all times and providing a thorough mixing of the mixed liquor. Weather protection shall be provided for all electrical controls.

b- Diffused Air Systems - Air requirements shown below will be considered normal requirements. In any case, the general requirements of previous clause 9 (a) should be met.

Minimum air to be applied, Cubic Meters of Air/Gm. BOD_5 (Cubic Feet of Air/lb. BOD_5), Aeration Tank Load.

Process	Load of Aeration Tank
Conventional	0.81 (1,500)
Step Aeration	0.81 (1,500)
Contact Stabilization	0.81 (1,500)
Extended Aeration	1.26 (2,000)
Modified or "High Rate"	0.26 to 0.81 (400 to 1,500) (Depending on expected BOD_5 removal)

The above requirements assume equipment capable of transffering at least 1.0 lb. of oxygen to the mixed liquor per pound of BOD_5 aeration tank loading. To air requirements calculated above shall be added air required for channel, pumps, or other air-use demand.

The specified capacity of blowers or air compressors, particularly centrifugal blowers, should take into consideration that the air intake temperature may reach 40°C (140°F) or higher and the pressure might be less than normal.

Blowers shall be provided in multiple units, so arranged and in such capacities as to meet the maximum air demand with the single largest unit out of service. The design shall also provide for varying the volume of the air delivered in proportion to the load demand of the plant.

Diffuser systems shall be capable of providing for the diurnal peak oxygen demand or 200% of the design average oxygen demand whichever is larger. The air diffusion piping and diffuser system shall be capable of delivering normal air requirements with minimal friction loss. The spacing of diffucers should be in accordance with the oxygen requirements through the length of the channel or tank, and shall be design to facilitate adjustment of their spacing without mayor revision to air header piping. The arrangement of diffusers shall also permit their removal for inspection, maintenance and replacement without dewatering the tank and without shutting off the air supply to other diffusers in the tank.

Individual assembly units of diffusers shall be equipped with control valves, preferably with indicator markings for throttling, or for complete shutoff. Diffusers in any single assembly shall have substantially uniform pressure loss.

c. Mechanical Aeration Systems - The mechanism and drive unit shall be designed for the expected conditions in the aeration tank in terms of the power performance approved. Multiple mechanical aeration unit installations shall be so designed as to meet maximum oxygen demand and maintain process performance with the largest unit out of service. Provision should be made for varying the amount of oxygen transferred in proportion to the load demand in the plant.

10. Return Sludge Equipment

a. Return Sludge Rate - The return sludge rate shall be established according to each case or by pilot study. Experience have shown that this rate generally varies between 10 to 200 percent and should be determined according to an accepted mathematical model.

The rate of sludge return shall be varied by means of variable speed motors, drives, or timers (small plants) to pump sludge at the above rates.

11. Return Sludge Pumps - If motor driven return sludge pumps are used, the maximum return sludge capacity shall be obtained with the largest pump out of service. A positive head should be provided on pump suctions. Pumps should have at least 7.6 cm. (3 inches) suction and discharge openings. If air lifter are used for returning sludge from each settling tank hopper, no stand-by unit will be required, provided that the design of the air lifter are such to facilitate their rapid and easy cleaning and provided other suitable stand-by measures are provided. Air lifters should be at least 7.6 cm. (3 inches) in diameter.

12. Return Sludge Piping - Discharge piping should be at least 10 cm. (4 inches) in diameter and should be design to maintain a velocity of 0.61 m/sec. (2 ft./sec.) when return sludge facilities are operating at normal return sludge rates. Suitable devices shall be provided for observing, sampling and controlling return sludge flow from each settling tank hopper.

13- Waste Sludge Facilities - Waste sludge control facilities should be designed using the established mathematic models.

a- Anaerobic Digestion - The digestion capacity shall be determined by the established mathematic model. The detention time varies from 20 to 60 days.

b- Aerobic Digestion - The detention time for aerobic digestors shall be from 5 to 20 days. The mathematic model reffered to in this standards are in the latest edition of Metcalf and Eddy text Book.

c- Air Requirements - Sufficient air should be provided to keep the solids in suspension and maintain dissolved oxygen between 1 and 2 mg/l. The mathematic model shall be used to determine the air to be provided for aerobic digestion process.

6.27 Disinfection

6.27.01 Purpose

Since the effluent from sewage treatment plants might create a public health hazard, disinfection of the effluent will be required. The use of chlorine or other chemical agents is necessary to kill all microorganisms or pathogenic germs.

6.27.02 Chemical Agents

Chlorine is the most commonly used chemical for wastewater disinfection, and the forms most often used are liquid chlorine and calcium or sodium hypochloride. If approved by the Authority other disinfectants, including chlorine dioxide, ozone, and others, may be used. The chemical should be selected after due consideration of waste flow rates, application and demand rates, pH of the wastewater, equipment cost, chemicals availability and maintenance problems.

6.27.03 Feed Equipment

1. Type - Solution-feed vacuum-type chlorinators are generally preferred for large chlorination installations. The preferred method of

generator of chlorine dioxide is the injection of a sodium chloride solution into the discharge line of a solution-feed gas-type chlorinator, with subsequent formation of the chlorine dioxide in a reaction chamber at a pH of 4.0 or less.

2. Capacity - Required chlorinator capacity will vary depending on the uses and the points of application of the disinfecting chemical.
For disinfection, the capacity should be adequate to produce a concentration of residual chlorine in the plant effluent, measured by a standard method, that will dependably and consistently reduce the coliform concentration to meet the limits specified by the Environmental Quality Board for the receiving waters.

3. Stand-by Equipment and Spare Parts- Stand-by equipment of sufficient capacity to replace the largest unit during shut down, should be available. Spare parts shall be available for all chlorinators to replace parts which are subject to wear and breakage.

4. Water Supply - An ample supply of water for the operation of the chlorinator, shall be available. When the water pressure in the chlorinator is less than 1.76 kg/cm^2 (25 lbs./sq. in.)a booster pump is required. Duplicate equipment should be provided, and when necessary, stand-by power as well.

6.27.04 Chlorine Supply

1- Cylinders - Where the average daily chlorine consumption is over 68 kg. (150 lb.), the use of one-ton containers should be considered.

2- Scales - Scales for weighing cylinders shall be provided at all plants using chlorine gas. At large plants (5.0 MGD or over), scales of the indicating and recording type are recommended. At least a platform scale shall be provided. Scales shall be of corrosion-resistant material.

3- Evaporators - Consideration should be given to the installation of evaporators, to produce the quantity of gas required, where manifolding of several cylinders is required.

4. Leak Detention and Controls - A bottle of ammonium hydroxide solution shall be available for detecting chlorine leaks. A leak repair kit, approved by the Chlorine Institute, shall be provided. At large chlorination installations, consideration should be given to the installation of automatic gas detection and alarm equipment.

5. For chlorination equipment housing and respiratory protection equipment see Chapter VIII.

6.27.05 Piping and Connections

Piping systems shall be as simple as possible, specifically selected and manufactured to be suitable for chlorine service, with a minimum number of joints. The correct weight or thickness of steel is suitable for use with DRY chlorine, liquid or gas. Even minute traces of water added to chlorine results in a corrosive attack that can only be resisted by pressure piping utilizing materials such as silver, gold, platinum or Hasteloy "C".

Low pressure lines made of hard rubber, saran - lined, polyethylene, polyvinylchloride (PVC), or Uscolite materials are satisfactory for wet chlorine or aqueous solutions of chlorine. All lines designed to handle dry chlorine should be protected from the entrance of water or air containing water, due to the corrosiveness of wet chlorine.

6.27.06 Application of Chlorine

1. Contact Time - After thorough mixing, as rapidly as possible, a minimum contack period of 15 minutes at peak hourly flow or maximum rate of pumpage, shall be provided.

2. Contact Tank - In primary plants, chlorine should be applied in two stages: ahead of the settling tank and following the settling tank. The chlorine contact tank should be constructed so as to reduce short-circuiting of flow to a practical minimum. To minimize short circuiting, "Over-and-under" or "end-around" baffling, shall be provided. The tank design shall provide facilities for maintenance and cleaning without reducing effectiveness of disinfectation. The drain should be valved. The point of discharge, which may require pumpage, shall be

such as to assure adequate treatment. Duplicate contact tanks shall be provided. A submerged outfall sewer may be use in lieu of a final chlorine contact tank. Flushing facilities should be provided.

6.27.07 Evaluation of Effectiveness

1. Sampling - Facilities shall be included for sampling the disinfected effluent after contact. Grab or continous sampling, as conditions warrant, may be considered.

2. Residual Chlorine Testing and Control - Equipment sahll be provided for measuring chlorine residual employing accepted procedures. The equipment used should enable residual measurement to the nearest 0.1 mg/l and to an accuracy of approximately 25 percent above 0.5 mg/l.

   The installation of demostrated effective facilities for automatic residual analysis, recording and proportioning systems, should be considered at all installations, where the discharge occurs at points requiring rigid bacteriological controls such as in water supply watersheds, recreational watersheds or shell fish waters or water tributary thereto.

6.28 Dual facilities and adequate equipment to chlorinate the effluent, will be provided. Chlorinators will be solution feed of adequate capacity and automatic type. Additonal automatic facilities to regulate and register graphically the residual chlorine should be available. The automatic chlorination system will depend on the receiving waters of the plant effluent and the minimum will be controlled by volume. Calculation for the selection of chlorine capacity will be based on a minimum residual chlorine strength of two (2) parts per millon and at least three (3) times the normal capacity. In special cases the Authority may require automatic chlorinators regulated by the chlorine residual.

6.28.01 The contact period in the contact chamber will not be less than 30 minutes based on average flow. The contact chamber will be divided in two (2) sections so that the operation will not be interrupted while cleaning one of them.

6.29 General Considerations

The positive hydraulic head from the center of the sludge removal piping, from the inlet channel of the sludge beds, or to the minimum water level in the digester tank, or to the sludge beds will not be less than 1.53 meters (5 feet).

6.29.01 When the sludge is discharged by gravity, the piping slope should not be less than 3 percent.

6.30 The plot grounds, where the sewage treatment plant is located will be graded and conditioned. Slopes and adequate drainage will be provided for rain water.

6.30.01 Concrete sidewalks, one meter wide and not less than 10 cm. (4 inches) thick, reinforced with 6x6 wire mesh, will be provided between structures to facilitate access to them.

An access road 4 meters wide and one meter wide shoulders at both side will be built. In case of a concrete road construction joints every 5.49 meters (18 feet) should be provided. Access final grading should be 0.60 meters minimum above maximum flood elevation. The road should reach the sludge drying beds, providing space for the trucks to turn.

6.31 For water service to the plant, cast iron piping, not less than two (2) inches in diameter shall be installed, connected to the nearest aqueduct pipe line with enough capacity and pressure. A back flow preventer valve shall be installed in this piping located between the control house and the rest of the plant structures.

6.32 For watering the grass on the grounds of the plant, a sprinkle system will be provided of copper or plastic piping not less than 3/4 inch in diameter with check valve, hose bibbs and sprinkles.

6.33 The plot of the plant, which will be transferred to the Authority, shall be fenced with 1.83 meter (6 feet) high galvanized wire mesh (Cyclone Fence) with a concrete base not less than 10 cm. (4 inches) width and 30 cm. (1 foot) high above ground, with three strands of barbed wire at the top. Gates will be installed at the access to the plant grounds. See Fig. [illegible]

6.34 All metallic equipment will be factory painted with #9374 Orange Primer, first layer and #9390 white primer for second coat, manufactured by Rust Oleum Corp. Also a finish coat (#9300) after installation, of a color selected by the Authority. Piping at treatment plants and pumping stations will be color coded and indentified according to Art. [illegible]. Refer to Art. [illegible] for paint for concrete surfaces.

6.35 Adequate lighting will be provided in all the plant control and operation structures, also light post, outside lighting and receptacles at convenient and accesible locations.

6.35.01 All the electric installations shall be done using adequate size conduits and must be indicated as built on the final construction plans for the plant. The electrical installation should meet the latest requirements of the "National Electrical Code of the National Board of Fire Underwriters" and the P.R. Electric Power Authority.

6.35.02 The wiring should be color coded to facilitate its identification and the maintenance of the electrical installation.

6.36 Where the sewage treatment plants include pumping stations, three units of vertical centrifugal pumps (dry pit types) shall be provided. Each one with 1.25 average flow capacity. Two of these pumps will be of variable flow and in accordance with norms on Chapter V (Sewage Pumping Stations).

6.37 When discharge by gravity is not possible a pump for the sludge removal of the primary tank will be provided, and located as near to the tank as possible.

6.38 The control house shall be provided with an adequate size restroom, including shower, lavatory and toilet bowl.

6.39 All piping conveying sludge will be provided with drills 1" diameter with corporation stops to facilitate cleaning.

6.40 Windows shall be made of aluminum, "Miami" type of a design and quality previously accepted by the Authority. They shall be factory painted in a color selected by the Authority.

6.41 Sludge drying beds shall be of concrete and constructed as close as possible to the digester tanks or clarigester.

6.42 Sludge drying beds shall be built using as a guide Fig. No. but designed for each particular case.

6.43 Changes during construction shall be limited to strictly neccessary ones and must be submitted for the approval of the Authority in one sepia and five copies of the plan sheets affected by the change requested.

6.44 All electric and mechanical equipment shall be labeled and numbered to facilitate identification.

6.45 At the time of final inspection the builders and/or contractor will deliver all keys and other tools supplied with the equipment installed. Also all catologs, and plans, installation, operation and maintenance manuals of the equipment installed at the plant must be delivered.

6.46 All plans of sewage treatment plants, prepared for approval, shall include a hydraulic profile along the plant axis showing plant operation including elevations, dimensions, etc.

6.47 An instrument to measure and register grafically the effluent must be provided. Fiberglass, Koroseal, bronce, stainless steel or cast iron will be the material used for those instruments.

6.48 Oil drainage in the transmission box of primary and secondary clarifier tank, will be provided.

6.49 To facilitate the elimination of waste, an incinerator will be provided next to the screen chamber if PRASA approves.

6.50 Piping to recirculate the digestor supernatant to the recirculation pump pit that goes to the primary tank or to the wet pit of the pumping station at the entrance of the plant should be provided. In case this can not be accomplished by gravity, a pump must be provided.

6.51 The maximum flood level of the receiving water body must be determined to prevent floods.

6.52 A house or space, 1.22 by 1.83 meters (4 ft. by 6 ft.) minimum, with access to the exterior, should be provided at the control or pump house for the storage of materials and tools.

6.53 A gas burner for the digestor tank shall be provided.

6.54 A control plank or a gate valve should be provided at the plant intake, before the screen chamber.

6.55 In installations where the digester is located separately from the primary clarifier, a telescopic valve should be provided at the primary tank to discharge the sludge into a separate chamber, from which the sludge pump, will in turn pump it to the digester.

6.56 Aluminium bar screen should be used at the entrance of the plant. Where, due to its weight, the screen can not be removed or replaced manually, it shall be divided in sections or mechanical means provided to facilitate this operation and the bar screen ahould be of stainless steel.

6.57 All controls installed in the exterior shall be weather and dust proof (NEMA-4)

6.58 Facilities should be provided for scum pit pumps manual and mechanical operation by the installation of an electrode activated switch.

6.59 Plastic material of 0.64 mm (1/4 inch) thickness or other material of better quality and approved thickness, should be used for outlet weirs. Screws for the weirs shall be brass and placed at a maximum distance of 30 cm. (12 inches) center to center.

6.60 Guides for Laboratory Facilities at Sewage Treatement Plants

1. Introduction

The recent adoption of guidelines for the water quality control, makes mandatory the improvement of the sewage treatment and its optimum operational control. In general, better facilities will include at least secondary treatment, phosphorus removal, and facilities for better bacteriological control.
Efficient operation control is the main function of an adequate plant laboratory. A carefully planned and well equipped laboratory with efficient personnel is the control center of the plant and of each one of the processing units. The analytical results provide information that is used to:

a- Evaluate the efficiency of the plant and its processing units.

b. To determine the effluent's characteristics and to control its quality.

c. To determine the effluent's effect on the receiving body.

d. To insure that regulating requirements are met and to inform of operational trends.

e. To forsee difficulties and suggest operational changes to prevent and solve difficulties, if any.

f. To determine future changes in design.

g. To produce public information related to plant operation, costs, and needs.

2. Design

The three key words for any laboratory of sewage treatment plants are:

a. Flexibility - Which provide for future changes in requirements.

b. Adaptability - For cnanges in arrangement.

c. Expansion - For changes in future needs for expansion.

3. Location

The laboratory should be located on ground level, easily accessible to all sampling points, with environmental control as an important consideration. It shall be oriented to the north light, away from vibrating machinery and equipment which might have adverse effects on the performance and precision of laboratory instruments or the analyst or shall be designed to prevent adverse effects from vibrations. The optimum use of the laboratory is possible in a pleasant and confortable environment.

4. Space

a. A minimum of 9.3 square meters (100 feet^2) of floc

space should be allocated for the laboratory. The final space to be required in each case in particular, would be determined by the authority, according to the capacity of the plant.

b. Minimum ceiling height should be 2.59 meters (8'-6"). This height, if possible, could be increase for the installation of wall-mounted equipment with extended height requirements.

c. The above minimum space does not provide office or administration space.

5. Materials

a. Accustical tile should be used for ceilings, except in high humidity areas, where they should be constructed of cement plaster.

b. Interior walls will have light-colored ceramic tile from floor to ceiling.

c. Floor surfaces should be either vinyl or rubber, fire resistance, and highly resistance to acids, alkalies, solvents, and salts.

d. Windows (Refer to Art. 6.40 of this Norms)
Doors shall be located to permit a straight egress from the laboratory, preferably at least one to outside of the building. They should have large glass windows, for easy visibility of approaching or departing personnel, panic hardware, and automatic door closers. Swinging doors should not be used due to the hazzard to persons carrying chemicals.

6. Cabinets and Working Table Tops

a. Wall-hung cabinets are useful for dust-free storage of instruments and glassware. Sliding glass door units are preferable. They should be hung so the top shelve is easily accessible but still not interfere with the equipment on the working table. At least one cupboard-style cabinet shall be provided, the rest should be drawer units. Drawers should slide out so that the entire contents is visible and provided with stops.

b. Cabinets should be build of #18 or better metal and covered with a corrosion-proof layer after built. All cabinet shelving must be resistant to acids, alkalies, solvents, abrasives, and water. Stainless steel cabinets should meet AISI type 3-16 specifactions. Warm glasses should be 1/4 inches thick and heat resistant.

c. Water, gas, air, and vacuum service fixtures; traps, strainers overflows, plugs and tailpieces, and all electrical service fixtures shall be supplied with the laboratory furniture.

d. Generally, working tables and bench-top height should be 91 cm. (36 inches) and will cover 35% of the laboratory area. However, areas to be used exclusively for sit-down type operations should be 76 cm. (30 inches) high. Tops should be constructed of hard natural stone impregnated with resine and a 2.54 cm. (one-inch) overhangs and drip grooves should be provided.
The tops should be furnished in large sections, 3.18 cm. (1-1/4 inches) thick and should be field joined into a continous surface with acid, alkali, and solvent-resistant cements which are at least as strong as the material of which the top is made.

7. Hoods

a. Location

Fume hoods shall be located where air disturbance at the face of the hood is minimal. Persons walking past the hood, heating, ventilating or air-conditioning systems, and drafts from opening or closing doors may create air-disturbance.

Safety factors should be considered in locating a hood. A secondary means of egrees must be provided if a hood is situated near a doorway. Bench surfaces should be available next to the hood so that chemicals need not be carried long distances.

b. Design and Materials

Gas hoods shall be made of plastic or a material of equal chemical resistance. Exterior finish should harmonize with the laboratory furniture. Interior lining and defectors shall be made of "Resisto-Roc" or its equivalent. A glass case shall be provided. Using sliding windows (vertical or horizontal).

c. Fixtures

A cup sink should be provided inside each fume hood. All switches, electrical outlets, and utility and baffle adjustment handles shold be located outside the hood. Light fixtures should be explosion-proof.

d. Exhaust

Continous, twenty-four hour exhaust capability should be provided. Exhaust fans should be explosion-proof. Exhaust velocities should be checked when installing the fume hoods.

e. Alarms

A static pressure gauge and a buzzer for indicating exhaust fan failure, should be placed in the exhaust duct. High temperature sensing device located inside the hood should be connected to the buzzer.

f. Canopy Hoods

Canopy hoods should be installed over the bench-top areas where hot, plate, steam baths, or other heating equipment or heat-releasing instruments are used. The canopy should be made of steel, plastic, or equivalent material, and finished in enamel to blend with other laboratory furnishings.

8. Sinks

A minimum of three (3) sinks (not including cup sinks) should be provided in the laboratory. At least two (2) of them should be double-well with drainboards. Additional sinks should be provided in separate work areas as needed, and identified for the use intended.

Sinks should be made of epoxy resin or plastic material with all appropriate characteristics for laboratory applications. Waste openings should be located toward the back so that a standing overflow will not interfere. All water fixtures on which hoses may be used should be provided with reduced zone pressure backflow preventers to avoid water lines contamination. Traps should be made of glass, plastic, or lead and easily accessible for cleaning.

9. Ventilation and Lighting

Laboratories should have independent air conditioning units, with external air supply for 100% make-up volume. In addition, separate exhaust ventilation should be provided. Ventilation outlet locations should be remote from ventilation inlets.
In the laboratory, good lighting, free from shadows, is important for reading dials, meniscuses, etc.

10. Electric Power

To eliminate voltage fluctuactions, electric lines supplying the laboratories should be controlled with a constant voltage, harmonic neutralized, CVS type transformer. This transformer should contain less than 3% total root mean square (RMS) harmonic content in the output, should regulated to 1% for an imput of 15% of nominal voltage. With an output of 118 volts. The 240-volt lines for high voltage requirements, should be similarly regulated.

11. Gas and Vacuum

The laboratory should be supplied with natural gas. Digester gas should not be used.
With outlets throughout the laboratory, an adequate-sized line source of vacuum should be provided.

12. General

A balance table which will minimize vibration of the balance shall be provided. It shall be located so that air movement and excessive vibrations will not affect the scale readings.

The administration personnel of the laboratory should have a library at their disposal with reference books, catalogs, and pertinent magazines.

For illustration of proper laboratory arrangements see Figs. No. 47, 48, 49, 50 and 51

CHAPTER VII

GUIDES FOR DESIGN AND REVISION OF ELECTRICAL PLANS

For an electrical system optimum design, two basic points shall be very carefully considered by the designer of an electrical system for a plant ..... this should be a system adequate for present and future probable loads, economical and safe.

The designer should know the voltage, etc. available from the P.R.E.P.A., should know its total load, present and future and the norms that follow:

CHAPTER VII

GUIDES FOR DESIGN AND REVISION OF ELECTRICAL PLANS

7.01 Offsite Facilities

7.01.01 Plans must be approved by the Electric Power Authority and must:

a- Indicate point of connection for three phase service.

b- Show extension of existing lines and/or installation of new lines if necessary.

c- Include details of existing rights-of-way and/or new ones to be acquired.

In the case of new rights-of-way to be acquired a plot plan shall be included to facilitate the acquisition of the right-of-way by the Aqueduct and Sewer Authority and transfer and cede to the Electric Power Authority not later than a year.

d- A note indicating the charges assessed by the A.E.E. for work to be performed by that Authority.

e- Note indicating that the three (3) transformers for the electrical substation shall be mounted in a pole located within the lot, for the use of the Authority, supplied and included in the Contract. The pumps should operate alternately, that is, only one pump at a time. Only one motor load, lighting, etc. shall be consider for the total load to be required by the substation.

f- In urban areas, the installation for the substation shall be done on concrete utilities poles according to A.E.E. standards if so required.

g- In special cases and after previous approval by

both the Aqueduct and Sewer Authority and the Electrical Power Authority, the A.E.E. shall supply the transformers to be used, only for the substation of the project, according to the general clauses for rates in force.

7.02 Electrical Connection for Interior Lighting

7.02.01 Aerial connections shall be provided, if ground conditions permits it, no longer than 22.86 meters (75 feet) using stranded weatherproof cable and heavy duty clamps.

7.02.02 Minimum entrance feeder shall be T.H.W. for 100 amps in galvanized rigid conduit.

7.02.03 The base for the meter, shall be for 100 amps minimum, adjustable thermal magnetic main circuit breaker "HI-LO" weather proof type for exterior use.

7.03 Motor Remote Control System

7.03.01 Tanktrol - Equipment known as tanktrol or approved equal shall be used at pumping stations which pump to distribution tanks.

7.03.02 Cable Wire - At pumping systems, open tanks, or filtration plants, electrodes, mercury switches or combination of both shall be used as necessary for each particular case. Communication cable, telephone low capacitance (voice graded type) cable or messenger cable shall be used. At least a minimum of two cables (spare, tapped, capped), watertight shall be provided for future use.

7.04 Equipment Protection System

7.04.01 Phase Failure Reversal and Under Voltage Relay:-

Phase failure, low voltage or phase reversal: An adequate device connected to the bus bars at the entrance of the control panel shall be provided. It shall be electrically protected by a block of current limiting fuses at the entrance of the equipment. A set of spare fuses shall be provided for future use. This device shall maintain a pair

of contactors normally closed.

7.04.02 Water Low Level Cut-Off

At the pump suction end or at the pit, electrodes shall be provided to prevent pumping while dry. In underground or in line pumping stations, the water connection to the electrodes holder shall be installed between the strainer and the pump. An air vent, properly located, shall be provided to prevent air pockets. An adjustable (15 to 180 seconds) time delay relay shall be provided to avoid unnecessary on and off cycles due to flow fluctuations. The delay relay should be installed in the control panel, the vent and electrode holder in the pump box.

7.05 Chemical Feeders Control System in Filtering Plants

7.05.01 Provide auxiliary contactors to open control circuits of the magnetic starters of the feeders to stop its operation when the plant is not operating.

The same shall be provided for the solenoid valve installed at the water inlet in plants supplied by gravity. In plants supplied by a pumping system the raw water intake pumps operation shall be interrupted when the plant is not in operation.

7.05.02 The plans should indicate that the chlorine application system should be automatically suspended when the plant is not in operation.

7.05.03 Where dual pumps are installed for the application of chemicals, they shall operate alternatelly and follow provisions indicated in Section 7.04.04 (b) regarding starting of the other motor when one fails to start.

7.06 Control Panels

All control panels shall be for exterior installation and of the outdoor type, raintight, weatherproof for duplex pump control for dead-front (switchboard) operation, double door design with lock facilities and factory wired. Including:

7.06.01 Magnetic starters, combination type with magnetic only circuit breaker, adequate heaters, quick-trip adjustable overload relays + 10% full load.

7.06.02 Time delay relays and contactors shall be provided so that when a pump motor is to start and does not after the reasonable adjustable, 15 to 180 seconds, lapse of time, the other motor will start and a red light alarm should come on. A push-to-test bottom should be provided to test condition of the alarm light and also spare bulbs.

7.06.03 A drained area to locate the equipment with entrances, exits and water connections shall be provided independently of the section for electric connections and equipment. The construction shall be such that water leakage will not be a hazard to personnel or equipment.

7.06.04 Only one hand-off-auto selector switch shall be provided to prevent that non skilled personnel will connect or start two motors simultaneously.

7.06.05 Secondary lightning arresters shall be installed at the breakers of each of the magnetic starters when installed underground or outdoors.

7.06.06 Phase failure, undervoltage, reversable relay.

7.06.07 Low level cut-off relay.

7.06.08 Time delay relays.

7.06.09 Alternators

7.06.10 Tanktrol or remote control relay

7.06.11 Circuit breakers, 1 pole - 120V - 20A each to provide protection to lighting, receptacles and control lines.

7.06.12 Duplex convenient outlets, 120V - 20A, specification grade grounding type with industrial galvanized cover for occasional use.

7.06.13 Lighting wall or ceiling outlet with rosette and 100 volts bulb and switch.

7.06.14 Connections and electric wiring diagram.

7.06.15 Diagrams of the water connections, tanktrol, etc. Pressure graphs shall be equipped with two pens for in line stations and one pen for filtration plants or distribution tanks.

CHAPTER VIII

SAFETY REGULATIONS

Two basic Safety Categories exists in the design of an Aqueduct or Sewer System:

1. Enviromental Health
2. Physical Safety

This norms emphasied the Physical Safety and the designer is made responsable for the Environmental Health.

CHAPTER VIII

SAFETY REGULATIONS

8.01 General Regulations

8.01.01 Two main basic categories of environmental concern exist in the design of "Aqueducts and Sewer Systems," these being, the Occupational Health and Physical Safety.

Because the norms or premises to be used in the phase of Occupational Health vary according to the design criteria established by the designer, this Authority has emphasize the Physical Safety matter, however, it is the designer's responsability to consider in the design the requirements for the protection of the Occupational Health.

8.01.02 Every vertical and/or conventional stairway will comply with the requirements of the "General Safety Regulations", OSHA 2206 (29 CFR 1910).

8.02.03 Every lot where an installation is built, will be protected on all sides by a 1.83 meters (6 feet) high chain link fence with barbed wire on its upper part and a 0.30 meter (1 foot) high concrete continuous base. (See Fig. No. 1). High voltage warnings shall be placed on each side.

8.01.04 Rubber mats shall be installed in front of electric panels. They will have a Dielectric Strength of 20,000 volts and will be 0.76 meters (30 inches) wide and 4.8 millimeters (3/16 inches) thick.

8.01.05 Exposed moving parts of the machinery (pulleys, belts, shafts, etc.) shall be protected with guards to prevent accidental contact of persons with them.

8.01.06 Inside structures manhole covers shall be made of aluminium.

8.01.07 Hand rails and guards, around tanks, trenches, pits, stairwells and other hazarduous structures, shall be provided and built fastened to concrete.

8.01.08 All electric equipment shall be connected to a common ground.

8.01.09 Platforms or suspended passage ways over 1.07 meters (3.5 feet) above floor will be protected with rails on all open sides.

8.01.10 Vertical stairways, 6.10 meters (20 feet) high or more, shall be provided with a safety cage.

8.01.11 Fire extinguishers shall be installed 1.07 meters (3.5 feet) above floor level, from the hooking point.

8.01.12 Conventional stairsways with four (4) or more steps, shall have hand rails on the closed sides and a rail installed on open sides.

8.01.13 A cold water fountain shall be provided at all installations where Authority personnel is on duty.

8.01.04 At all installations where chlorine cylinders are used, equipment shall be provided to check and control gas fumes.

8.02 Aqueduct Systems

8.02.01 The manhole covers of the tanks shall be made of aluminum and provided with padlocks. See Fig. No. 26.

8.02.03 A ten (10) pound CO_2 fire extinguisher shall be provided at Filtration Plants and a five (5) pounds one at Pumping Stations.

8.02.04 Provision shall be made for exterior lighting at Filtration Plants and Pumping Stations.

8.02.05 Railing for safety around filter areas adjacent to sidewalks or catwalks shall be provided.

8.02.06 Aluminum hand rails, 1.52 meters (5 feet) long and 1.07 meters high, (3.5 feet) shall be installed at a ninety (90) degree angle, at the corner where the manhole is located, on the roof of distribution tanks that are 1.22 meters (4 feet) high or higher.

8.02.07 Electric panels will not be built embeded in or fastened to any tank wall.

8.02.08 A rail shall be installed to protect open sides of the float valve enclosure.

8.03 Sewer Pumping Stations

8.03.01 The aluminum rail around floor or wall openings to unload, lower or bring up equipment and/or materials shall be fastened to the floor. The side in front of entrance door and one side of the floor opening will be removable. Floor openings will be provided with a concrete or block curb.

8.03.02 Lighting in the dry pit shall be explosion and rust proof. No lighting will be installed in the wet pit.

8.03.03 All exposed electrical conduits shall be P.V.C.

8.03.04 The inlet valve shall be controlled from the control floor by means of an extension.

8.03.05 Pumps shall be driven by explosion proof motors.

8.03.06 A five (5) pound CO_2 fire extinguisher shall be provided and located near the entrance door.

8.03.07 The pump station shall be provided with exterior lighting.

8.03.08 The generator's vent pipe shall be protected with an asbestos cover and will discharge above the roof level of the pumping house.

8.04 Sewer Treatment Plants

8.04.01 Near the entrance door to the main building a ten (10) pound CO_2 fire extinguisher shall be installed.

8.04.02 Exterior lighting shall be provided

8.04.03 The gas burner shall be 1.83 meters (6 feet) above the upper level of the digestor dome.

8.04.04 Recirculation pump pits shall be provided with aluminum grating of 1.2 centimeter maximum diameter openings.

8.04.05 The stairway to the digestor dome shall be of the spiral type following the lateral curve of the digestor. A hand rail shall be provided on the open side and a minimum width of 0.61 meter (2 feet).

The stair treads shall be 20 centimeter (8 inch) and the riser will be 25 centimeters (10 inches). From the upper end of the stair to the center top of the dome a rail on both sides shall be provided.

8.04.06 Conventional stairways to the tanks and other units of the plant shall have slopes between 50° and 30° (preferably near the latter) from the horizontal to facilitate carrying samples, tools etc. Hand rails, 84 centimeters (34 inches) high shall be provided.

8.04.07 Aluminum posts and removable chains shall be provided at all rail openings leading to basements or pits.

8.04.08 Spiral stairs with handrail or railing shall be provided for access to basements. The hight of the stairs shall not exceed 4.57 m (15 ft.). The design should follow the model approved by the Authority (See Fig. 46). No hight limit will be required for inclined stairs.

8.04.09 Lighting in the dry pit shall be explosion and corrosion proof. No lighting will be installed in the wet pit.

8.04.10 P.V.C. pipe shall be used in all exposed electrical piping.

8.04.11 The generator exhaust pipe shall be protected with an asbestos covering and will discharge above the roof level of the house.

8.05 Chlorination Room

8.05.01 If chlorine cylinders or gas chlorination equipment are to be in a building used for other purposes, a gas-tight room shall separate this equipment from the rest of the building. Floor drains from the chlorine room should not be connected to floor

drains from other rooms. Doors to the chlorine room shall open only to the outside of the building, and shall be equipped with panic hardware. These rooms shall be at ground level and should permit easy access to all the equipment. Chlorine storage area should be separated from the feed area. To permit the chlorinator to be viewed without entering the room, a clear glass, gas-tight, window shall be installed in an exterior door or interior wall of the chlorinator room.

The chlorination rooms should be protected from excess heat. Cylinders shall be kept at room temperature. A forced or mechanical ventilation shall be installed which provides one complete air change per minute when the room is occupied.
The system shall be made of corrosion-resistant material and the motor shall be explosion proof and located away from the air path. The entrance to the air exhaust duct from the room shall be near the floor and the point of discharge shall be so located as not to contaminate the air inlet to any buildings or inhabited areas. Locate air inlets so as to provide cross ventilation with air and at such temperature that will not adversely affect the chlorination equipment. The vent hose from the chlorinator shall discharge to the outside atmosphere above grade.

8.05.02 A depressed floor slab shall be designed to place the scale platform at floor level, and an adequate discharge will be provided.

8.05.03 The air exhaust shall be installed 0.15 meters (6 inches) off the floor and discharge to the outside atmosphere.

8.05.04 All doors shall be metal (steel or aluminum) doors of a type and quality accepted by the Authority and provided with lock and door pull. Doors should open to the outside, and supplied with one coat of factory applied protective primer.

8.05.05 Switches for lights and fans shall operate automatically when the door is open, and also manually from the outside of the room without opening the door.

8.05.06 At least two (2) gas masks, in good operating condition and of a type approve by MSHA and by OSHA, as suitable for high concentrations of chlorine gas shall be available at all installations where chlorine gas is handled. These shall be stored outside any room where chlorine is used or stored and at a convinient location. Instruction for testing and using the equipment shall be posted. The use of self-contained, oxygen - supplying equipment shall be considered.

8.05.07 One ton cylinder lifting equipment shall be provided when this size cylinders are used.

8.05.08 At least a pair of rubber gloves, a respirator of a type certified by NIOSH for toxic dusts or acid gas (as necessary), an apron, or other protective clothing, and goggles or face mask shall be provided all in accordance with the requirements of the Authority.

A water holding tank that maintains water at room temperature will be installed to supply the line feeding the deluge shower and eye-washing device.

8.06 Electric Sub-Stations

8.06.01 The chain link fence protecting the sub-station shall be connected to common ground.

8.06.02 On each side of the fence a warning sign shall be installed, reading "Danger, High Voltage", size 25 cm.x36cm (10"x14"). Equal or similar to sign #135-A from catalog #14 of Stonehouse Signs Co.

8.07 Unfire Pressure Vessels

8.07.01 The unfire pressure vessel for the compressors will be ASME coded and stamped.

8.07.02 A safety valve with a tester shall be connected directly to the vessel.

8.07.03 So that the inside pressure can be check a manometer shall be connected to the vessel.

8.07.04 The safety valve with the tester shall have a sign, showing the pressure at which the valve will open.

8.07.05 The manometer shall be graded for a higher pressure than the design pressure of the tank.

CHAPTER IX

WATER SUPPLY NORMS FOR APARTMENTS AND CONDOMINIUM BUILDINGS

Is is of common knowledge the existing problems in the supply, metering and billing of water to apartments and condominium buildings. The Authority has studied and established a series of alternatives to be considered by the potential customers in this category.

CHAPTER IX

WATER SUPPLY NORMS FOR APARTMENTS BUILDINGS AND CONDOMINIUMS

9.01 Foreword

The basic system to measure water consumption in apartment buildings and condominiums is by a main water meter, which will measure the total water consumption of the building. However, at the request of the owner of the building or condominium, the Authority will accept the installation of individual meters for each apartment. In which case, each tenant is made responsible for the contract and payment of the water and sewer facilities supplied to each apartment. Any of these methods, with their different variations, will be in accordance with the requirements of the following alternatives.

9.02 Manners of Measuring and Billing Water Consumption

See Fig. No. 55

9.02.01 Alternative A

Total water consumption of the building will be measured by a general meter. The Owner of the building or the Administration of the condominium will be invoiced. Installation of facilities so that the Owner or the Administration of the condominium establishes and invoices, the individual consumption of each tenant, by means of individual water meters, located every three (3) floors as explained in the special conditions.

9.02.02 Alternative B

Separate water consumption and invoicing to tenants, by individual meters installed on the ground floor or basement of the building. A separate meter will be installed to measure water used for common needs of the building.

9.02.03 Alternative C

Water consumption measured and invoiced separately to each tenant by meters installed every three (3) floors as explained in the special conditions. Water used for common needs measured by a meter.

9.02.04 Alternative D

Separated water consumption and billing directly to tenants by individual meters and without main water meter.

9.03 Special Conditions

The following special conditions will affect each individual alternative as indicated below:

9.03.01 Alternative A

Total water consumption of the building will be measure by a main water meter. The Owner of the building or the Admistration of the condominium will be invoiced. In addition, if so wished and at his own cost, the Owner may supply and install individual meters to measure and bill each tenant himself. These meters shall be installed every three floors, grouped on the intermediate floor, in a "closet" and in an area accessible to personnel of the Authority. A stop valve shall be installed in the supply line for each apartment accessible only to the tenant or owner.

a- The operation and maintenance of these meters will be the responsability of the Owner or Administration of the Condominium.

b- At the request of the Owner of the building or Administration of the condominium, the Authority will calibrate and repair the meters, charging for this service.

When the Owner or Administration requests the verification of any fluctuations in the water consumption registered by the main meter and the total registered by the individual meters, the Authority will limit itself to determine whether the readings were correct or not, without any intervention with individual or common service installations.

9.03.02 Alternative B

Separate consumption measuring and invoicing to tenants by individual meters installed at ground level floor or basement. A separate meter shall be installed to measure water used for common needs.

a- The owner of the building or condominium shall supply and install water meters, meter boxes, and any other necessary accessories to measure the individual water consumption of each apartment. These meters will be installed parallel to each other, on the ground floor or basement of the building in an accessible area, where vehicles can not be parked. They will become the property of the Authority.

b- The Authority will invoice each tenant according to the reading of the corresponding meter.

c- The Authority will bill the Owner of the building or the Administration of the condominium for the balance between the main meter reading and the total of the consumption registered in the individual meters, which difference may be the result of defects in the system or unauthorized connections. Such water consumption of the building measured by the main meter, will be paid subject to the rates established by the Authority.

d- The Authority will be responsible for the maintenance of the water connection up to the main water meter and the individual meters. The Owner or the Administration will be responsible for the operation and maintenance of the installation between the main water meter and the individual meters, as well as beyond the individual meters.

e- If the water meters are installed within the property limits of the building, the Authority will be exonerated of any responsability for damages to the building, tenants, or any other person, as the result of the operation or maintenance of these meters. (A clause to that effect will be included in the contract documents).

9.03.03 Alternative C

Water consumption and invoice to tenants by individual meters, installed every three floors and grouped at the intermediate floor. Water used for common needs shall be measure by a separate meter installed for that purpose.

a- The Owner of the building or the Administration shall supply and install the water meters, meter boxes, and other equipment, according to requirements of the Authority, to register the water used by each apartment. The meters may be of the remote reading type.

b- The meters may be grouped every three floors, installed on the intermediate floor in a room or cabinet, located as near to the elevator exit as possible. The room or cabinet shall be provided with a door and lock to prevent access to non-authorized persons in such a manner that permits the easy reading and maintenance by the Authority personnel. The type of locks shall be selected by the Authority so as to master keyed them.

c- The remote reading mechanism shall be grouped and installed on the ground or basement level in an area or cabinet accessible only to the Authority's personnel.

d- These meters, remote reading devices and accessories shall become the property of the Authority.

e- The Authority shall not be held responsible for damages to the building, to any person or property as a result of operation and maintenance of these meters. (A clause to that effect shall be included in the service contract).

f- Each tenant shall be billed by the Authority for the water used according to the reading registered in the corresponding meter.

g- The Authority will invoice the Onwner or the Administration for the balance shown between the reading of the main meter and the total

consumption register by the individual meters. This difference will be assumed to be the amount used for common use, defficiencies in the installation and un-authorized connections. Water consumption, register by the main meter shall be subject to the rates established by the Authority.

h- The Authority shall be responsible for the maintenance of the water connection up to the main water meter or for the individual water meters. The Owner or Administration shall be responsible for the operation and maintenance of the installation between the main water meter and the individual meters, as well as the installations beyond the meters.

i- The piping system for the common needs shall be separated from the system for the tenants use, and shall be provided with a meter and shutoff valve.

9.03.04 Alternative D

Water consumption metered and invoiced to the individual tenant, with no main water meter.

a- Installation of individual meters may be permitted in those buildings where water service may be totally provided by gravity.

b- In such installation the Authority shall provide the meters.

c- The Owner or Administration of the building shall supply and install the meter boxes and other necessary equipment, according to the Authority requirements, needed to measure and register the water consumption by each apartment and for common needs. The meters shall be installed parallel to each other and located in the planting strip, side walk or other place approved by the Authority.

d- The Authority will bill each tenant or condominee the corresponding water used and the Owner or Administration the water used for common needs.

e- If the meters are installed within the property limits, the Authority shall be exempted of all responsability for any damages to the building, persons, resulting from the operation and/or maintenance of the water meters. A hold harmless agreement shall be included in the contract for services.

9.04 General Conditions

9.04.01 The following general conditions will govern in all cases:

a- The Authority shall determine the diameter of main water meter to be installed and shall supply it free of charge.

b- The Owner or Administration of the building will supply the facilities needed for the installation of the meter, including the lateral bypass if it is larger than 2 inches in diameter. Will also build a concrete protection box with steel frame and cover. These accessories will become the property of the Authority.

c- When the installation of a pumping system is necessary, the water supply to the building shall be stored in a suction pit, from where it will be pumped. The main water meter shall be installed before the suction pit.

d- A combined system which will supply the building partly by direct connection to the main line and partly by a pumping system will not be permitted. Either a complete pumping system or a direct connection to main line system shall be used.

e- In case the fire hydrants, installed in the building are use, either to put out a fire or for a bonafide fire drill, the water used for these purposes will be free of charge.

A credit will be given to the amount registered by the meter. No credit will be given for water used for any other purpose. The installation of a "Detector Device" shall be required, to check the use given to the water from the fire hydrants.

f- During the designing or planning stages the designer should consult the Authority regarding the water and sewer facilities available in the area where the building will be constructed.

g- The Authority requires that plans for the water and sewer installations for apartment buildings three stories or higher, or providing service for ten (10) or more apartments, shall be submitted for approval.

h- In addition to the Special and General conditions aforementioned, the Regulations for Water Supply and Sewer Service of the Authority, described in Chapter 10 of this Norms, shall apply.

i- In front of each meter box, a bronze plaque will be provided, indicating the floor and apartment to which it corresponds.

j- The service contract for water supply for the common use of the building shall be signed by the Owner or Administration of the Condominium.

k- In those cases where the water meters are located within the property limits (ground floor, basement, parking areas, etc.) they shall be protected in such a way that will permit access, at all times, to the meters.

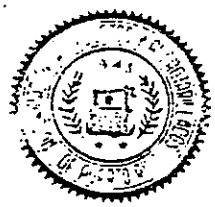
Clause that should be included in all service contracts for apartment buildings or condominiums where individual water meters are installed within the property limits of the building:-

If the installation of individual water meters is approved by the Puerto Rico Aqueducts and Sewer Authority for the apartments and or

common use of the building, located on the ground floor, basement or other approved location, the owner of the building and tenants hereby exonerate the Puerto Rico Aqueduct and Sewer Authority of any responsability for any damages, either personal or to the property, caused as a result of the operation and maintenance of said water meters.

1- The case of water meters embedded in a wall or vertically installed, shall be considered.

RULES AND REGULATIONS FOR THE SUPPLY OF WATER AND SEWER SERVICE



PUERTO RICO AQUEDUCT AND SEWER AUTHORITY

1976

CHAPTER X

RULES AND REGULATIONS FOR THE SUPPLY OF WATER AND SEWER SERVICE

Considered very usefull for those who deal with Aqueduct and Sewer, our Rules and Regulations for the services we render as of 1976.

Content

The contents are included within the Regulation.

INDEX

ALPHABETICAL INDEX

CHAPTER I

PRELIMINARY PROVISIONS

Section 1.01:- Legal Basis

These Rules and Regulations issued in compliance with and pursuant to Section 4, Paragraphs 5 (j) and (k) and Section 19 of the Aqueduct and Sewer Act, as amended by Law 163 of May 3, 1949 (22 L.P.R.A. 144 and 159), shall have force of law and any violation thereof shall be deemed a misdemeanor.

Section 1.02:- Statement of Motives

The purposes of these Rules and Regulations are to comply with the provisions of the Aqueduct and Sewer Act, which requires their promulgation (see Legal Basis, Section 1.01); facilitate the rendering of the public services, for which purpose the Authority was created, in an orderly way; protect the installations of said instrumentality's systems; safeguard the public health, and establish the rights and obligations of the customers and users, the public, and the Authority.

These Rules and Regulations are intended to be administered in a spirit of cooperation with the public, consumers, and users, without failing to enforce compliance therewith.

Section 1.03:- Definitions

The following words and phrases appearing herein shall have the following meanings, unless other meanings can be clearly construed from the context of the provisions or from the Rules and Regulations:

1- Customer - Any natural or legal person having an account registered with the Authority under his name as regards the services rendered by the latter.

2. Service Connections:

(a) Water Service Connection - The connection from the main pipeline to the water meter, or in its absence, to the point where it enters the particulars property.

(b) Sewer Service Connection - The connection from the main sewer pipe to the point where it enters the particular property.

3. Fast Meter - Registration by a water meter in excess of the correct consumption.

4. Tributary - A stream or river flowing into a bigger one.

5. Sewage - The waste products flowing from the customer's or user's interior installations or sludge discharged therefrom, not including stormwater.

6. Sewer - Shall only mean the sanitary sewer.

7. Authority - The Puerto Rico Aqueduct and Sewer Authority.

8. Charge - The amount invoiced the customer for water and/or sewer service rendered, according to the rates in force.

9. Sewer Main - The primary pipeline collecting sewage.

10. Consumption - The volume of water supplied a customer or user.

11. Meter - The measuring device registering water consumption.

12. Testing - To prove the exactness of a water meter.

13. Account - The individual record maintained by the Authority for services rendered to customers.

14. Branch - The extension or diversion of the water pipelines.

15. Illegal Discharge - The unauthorized disposal of sewage, inclu-

ding water from private sources, or any unauthorized substance, through the Authority's sewer systems.

16. Industrial Waste - Any discharge in liquid, gaseous, or solid form, or any combination thereof, resulting from industrial, manufacturing, and/or commercial processes.

17. Accessory Building - Any building dependent upon another for its use, located within the limits of the same property.

18. Apartment Building - Any structure of two or more units belonging to the same owner, regardless of whether these units are used for residences, offices, commercial establishments, or any other use.

19. Condominium Building - Any structure of two or more units of housing, offices commercial establishments, or for any other use pursuant to the Horizontal Property Act or the provisions of the Puerto Rico Civil Code.

20. Reservoir - The body of water created for the community's supply. This term shall also include the adjacent grounds and surrounding structures.

21. Source of Supply - The springs, river beds, torrents, streams, rivers, deep wells, shallow wells, reservoirs, lakes, lagoons, and any other natural or artificial body of water supplying the Authority's waterworks.

22. Interior Installations - The whole set of pipelines and/or appurtenances thereto located beyond the service connection.

23. Main Line - The principal pipeline.

24. Shutoff Valve - The valve located just before the meter, interrupting the flow of water through it.

25- Organic Matter - The matter causing a degrading in the quality of water.

26. Nipple - A piece of pipe used to connect the meter with the customer's or user's private pipeline.

27. Person - Any natural or legal person.

28. Sewerage Wells:

    (a) Septic Tank - The tank where sewage settles and decays.

    (b) Filter Well - A well that allows filtration into the surrounding ground.

    (c) Cesspool - An absorbing well.

29. The Public - Any person or persons with the exception of the Authority.

30. Leakage - Water escaping from pipes or installations.

31. Hidden Leakage - An undetected leakage from subterraneous pipes or from pipes located beneath tiles or embedded in walls.

32. Water Service - The water supplied to customers or users.

33. Combined Water Service - The use of water for combined residential and non-residential purposes.

34. Sewer Service - The service rendered to customers or users by means of a sanitary sewer system.

35. Water System - The installations, pipelines, and appurtenances thereto functioning as a unit to provide water service to a community.

36. Sewer System - The installations, sewer mains, and appurtenances thereto functioning as a unit to provide sewer service to a community.

37. Illegal Connection - An illegal connection to the Authority's water and/or sewer system. This term shall also include the unauthorized reconnection to a suspended or discontinued service.

38. Cleanout Hole - An opening to facilitate the cleaning of the sewer service connections.

39. User:- Person enjoying the water and/or sewer service.

(a) Registered User - The person enjoying the water and/or sewer service registered in his name at the Authority.

(b) Non-registered User - The person enjoying water and/or sewer service registered in the name of another person.

(c) Illegal User - Person enjoying water and/or sewer service without authorization.

CHAPTER II

GENERAL PROVISIONS

Section 2.01:- Regularity of the Services Rendered by the Authority

The Authority shall render its water and sewer services in the most regular and continuous possible manner, but may interrupt them by reason of special circumstances, such as, but not limited to, a decrease in the volume of water, repair and improvements to the systems in operation. The Authority, however, reserves the right to interrupt these services without prior notification, for emergency repairs and to prevent damages to its property in case of strikes, orders from competent authorities, or due to accidental causes or acts of God, public enemies, or when dangerous situations threaten the life, health, or property of the citizenry. Such interruptions shall not constitute a breach of contract on the part of the Authority and, neither the Authority, nor its employees shall be held responsible for service interruptions due to such causes. Nevertheless, the Authority shall use all the reasonable means available to reestablish the services as soon as possible. Whenever possible, the Authority shall inform the public of any necessary interruption of the services.

Section 2.02:- Operation of the Water and Sewer Systems - Interference with these Systems Prohibited

Only the employees and duly authorized agents of the Authority shall operate the water and sewer systems of this instrumentality and shall install connections and perform other works in said systems. It is hereby prohibited to any unauthorized person to perform said acts to manipulate, alter, obstruct, deface, mutilate, destroy, or tamper with any installation or any part of said systems.

Section 2.03:- Visits to the Authority's Plants

Visits to the Authority's plants will only be permitted by means of an authorization in writing.

No person, group, or entity shall visit said plants without the corresponding authorization.

Section 2.04:- Protection of the Water Supply Sources

It is hereby prohibited to throw into the water supplys sources or its tributaries, untreated sewage, industrial wastes and substances, liquids or any matter or objects that may pollute the waters and/or cause any harm to its plants and equipment. This prohibition includes the throwing or depositing on the banks or shores of water sources or in any service box of said wastes, or any substances, liquids, solid matter or objects. In general, any act that may pollute the waters of the Authority's waterworks or hinder its effectiveness, is prohibited.

Section 2.05:- Other Provisions for the Safeguard of the Public Health

It is likewise prohibited to bathe, swim, wash clothes, water and bathe animals, spit, wash vehicles, in the water sources or to use the waterworks and the waters of their tributaries in any such way as to jeopardize the public health or alter the physical, chemical, or bacte-

riological state of the waters. It is also prohibited to urinate, defecate, throw or deposit urine, excrement, or manure on the sorrounding grounds, on the tributaries banks as well as depositing molasses, any waste or garbage, animal carcasses, refuse from slaughter houses, pounds, or meat - markets where the water sources might become polluted, or any refuse containing organic matter, or chemicals harmful to the quality of the waters, such as, but not limited to: detergents and petroleum derivatives, etc.

The Authority may order the removal or interment of the infectious matter and, if not removed within twenty-four hours (24) it may do so at the expense of the offender.

Section 2.06:- Location of Septic Tanks and Cesspools

Pursuant to regulations on water pollution control of the regulatory agencies of the Commonwealth of Puerto Rico, it is hereby prohibited to locate latrines, septic tanks, or cesspools in the vicinity of the water supply sources of the Authority's waterworks, where they may contaminate the waters therein.

Section 2.07:- Additional Prohibitions

Any activity jeopartizing the water and sewer systems of the Authority, or detrimental to the purity and conservation of the water supply sources, is hereby prohibited. The Authority is empowered by law to correct or eliminate such situations.

Illicit intake or discharge connections shall constitute a violation to these Rules and Regulations and the Authority shall eliminate them at the violator's expense if he does not remove them voluntarily within fifteen (15) days after being notified in writing.

Section 2.08:- Prohibitions to Employees

The Authority's employees are hereby prohibited from soliciting or accepting any compensation for their personal benefit in exchange

for services rendered to the public while representing the Authority. It is also prohibited to carry out, modify, or overlook any charges, obligations, terms, or conditions of contracts or documents, except when such action is done pursuant to the Authority's rules and regulations.

Section 2.09:- Judicial Procedures

The Executive Director of the Authority, in representation thereof, may request an injunction procedure an any such other legal resources according to law to make efective the terms contained in these Rules and Regulations.

Section 2.10:- Other Provisions

None of the provisions of these Rules and Regulations shall be construed as a restriction on the power of the Authority's Governing Board to amend and impose other terms and conditions that are not against the law.

CHAPTER III

COMMERCIAL RELATIONS OF THE AUTHORITY

Section 3.01 - Charges for Services Rendered by the Authority

The Authority shall operate on an economic basis that will permit it to be self-sufficient; thus, it will offer no service free of charge. All services rendered will be charged according to the rates or charges set for said services and will be subject to the rules and conditions stated in the following sections.

Section 3.02 - Applications for Service

Water and sewer services are available to the public upon filing a written application, personally or by telephone, subject to the prevailing or amended rates at the time of said application, provided

that in compliance to the procedures and requirements of the Authority the applicant has access to the supply mains in use, and provided that the available facilities permit rendering such service. Any person utilizing water and sewer services without a duly registered application with the Authority will be responsible for payment thereof and for compliance with the applicable rules and regulations.

Section 3.03 - Guarantees or Deposits

(a) The Authority reserves the right to require from any customer or user the guarantees deemed proper and satisfactory to secure payment for water and/or sewer service, by means of a deposit, bond from an insurance company acceptable to the Authority, or by any other means authorized by law. This guarantee is non-transferable.

(b) In order to insure its best interest, the Authority also reserves the right to require or increase the amount of the deposit, bond or any other accepted guarantee, to any customer or user who persistently fails to pay his bills on time. The amount may also be justifiable altered following changes in the customer's consumption pattern.

(c) Failure to pay this deposit within ten (10) days from the date the connection was made or the service was iniciated, or within ten (10) days after notification of any deposit increase due to delinquency or changes in the consumption pattern, may cause the Authority to suspend water and/or sewer service to the customer or user. The deposit required shall be computed on the basis of the average estimated consumption for two invoicing periods.

Section 3.04 - Payments, Suspensions, and Restoration of Service

(a) The Authority may schedule the meter reading, invoicing and collection procedures for water and/or sewer service at its discretion, either on a monthly or bimonthly basis, or otherwise, aiming at a better, more efficient and more economical service to the public. This scheduling shall take into consideration the characteristics and

nature of the water and sewer services rendered under different rates. Invoices shall be paid before the date due indicated thereon. If the date due for payment of the invoice falls on a Saturday, Sunday, or legal holiday, then the next working day shall be considered the date due. Lack of receipt of invoice does not relieve customer from payment thereof. Failure to pay the invoices prior to said date entails a written notification from the Authority advising the customer of its intention to suspend service for lack of payment. Once the customer is notified, he should pay within the prescribed time only at the commercial office in charge of his account. The Authority shall not be held responsible for suspension of service if payment is made elsewhere.

(b) If a customer or user disagrees with the invoiced charges, he may request an investigation within the next ten (10) calendar days from the date of receipt of invoice. This request may be made in writing or personally and should state the reasons for the claim.

(c) A customer or user requesting said investigation within the prescribed time shall not have service suspended nor shall be requested to post additional bond or deposit while the investigation is being carried out. If the investigation shows that the invoices are correct or that a revised payment thereof is due, claimant shall be notified said results in writing and advised that he has ten (10) calendar days from the date of notice to make payment or request an administrative hearing if still in disagreement with the outcome of the investigation. Claimant has the right to request said hearing before a higher ranking officer from an office other than the office that conducted the investigation or decided upon his claim. Once the ten day period is over, if claimant does not effect payment or request the before mentioned hearing, the Authority may suspend service.

(d) The customer or user requesting an administrative hearing within the prescribed time, shall pay, before this hearing is held, the amount determined by the investigation already conducted, or the average computed by the Authority based on the last three (3)

periods of normal consumption in accordance with this, the Authority shall not suspend service.

(e) The customer or user shall have the right to be represented by an attorney during the administrative hearing and shall be able to introduce oral and documentary evidence in support of his claim, as well as able to examine the evidence introduced by the Authority to support its determination. If it follows from the administrative hearing that the customer's or user's allegations are correct, and that an adjustment in the charges is to be made, the Authority shall return or credit any amount paid in excess. If, on the contrary, it follows that the charges invoiced are correct, and the customer or user neither pays nor request judicial revision within ten (10) calendar days after being notified of the findings, the Authority shall suspend service.

(f) For the computation of the prescriptive ten day periods of this section, the date that shall prevail shall be the date when the customer or user, or his representative visits the corresponding office. If the claim is made through the mails, the date on the cancelled postage stamp shall prevail. The Authority shall turn down any claim made outside the prescribed time, unless claimant can prove to the Authority's satisfaction that for reason beyond his control this claim was not made within the mandatory tenday period.

(g) When service has been suspended for lack of payment, and the customer or user request reconnection, the amount of $10.00 shall be charged to cover the costs therefrom incurred by the Authority.

Section 3.05 - Charges for Water and/or Sewer Services when a Meter Reading is not feasible

Whenever it is not possible to determine the actual consumption due to a meter failure or if a meter reading cannot be effected, the Authority can charge for the concerned period an amount equivalent to the user's normal consumption. In case there is no record of the normal consumption a reasonable estimate shall be determined. In case of cessation of such cause, the Authority shall determine the

corresponding adjustment to the account.

Section 3.06 - Liability of Registered Customer

Each registered customer shall be liable for payment of all services rendered under his name. Said liability shall continue in effect even when said customer has ceased to use the services and the same continue to be used by other persons, with or without his consent. Said liability will only cease when the registered customer duly requests cessation of services.

Section 3.07 - Liability of Non-Registered Users

Each non-registered user shall file an account under his name and shall deemed responsible for total payment of services put to use. When said non-registered user has profit from services filed by a registered user both shall be held jointly and severally responsible for payment thereof. Likewise, the Authority can register said service under the name of the non-registered user and request him to fulfill all established requirements. Failure to comply with these within ten (10) calendar days from the date of notice shall constitute sufficient cause for suspension of service.

Section 3.08 - Refusal to Render Service

The Authority can refuse to provide its services to any person owing any charges for services rendered and to any person who in any way violates these Rules and Regulations of the Puerto Rico Aqueduct and Sewer Act or any other applicable act or regulations.

Section 3.09 - Transfer of Debts to Current Accounts

The Authority may transfer any debt for services rendered to a customer or user to another account registered under his name and may charge the account of an customer or user with any debt contracted under the circumstances held within the preceeding Section 307.

Section 3.10 - Illicit Intakes and/or Discharges

All illicit intake and/or discharge connections are hereby prohibited. Any person using an illegal intake and/or discharge connection shall pay to the Authority the total estimated charges for aqueduct service and sewer discharges. A violation of this provision shall be sufficient cause for disconnecting said intake and/or discharge connection and decree the appropriate judicial procedures.

Section 3.11 - Legalization of Illicit Intakes and/or Discharges

Illicit intake and/or discharge connections as specified in the previous section may be legalized if the condition of the installation and service so warrant, provided that the other requirements established by the Authority are complied with and the interested party pays the debt for all services rendered plus those expenses incurred by the Authority to legalize the services.

Section 3.12 - Supply of Meters by the Authority

The Authority shall provide water meters up to a size of four inches (4"), except in condominiums o' apartment buildings where it will only furnish a general meter. Meters larger than four inches (4"), shall be furnished by the subscriber and turned over to the Authority. In the case of condominiums and apartment buildings the provisions under the Standards of Design of the Authority shall apply.

Section 3.13 - Customer's Liability in Regard to the Authority's Property

All meters, house connections and any such other equipment supplied by the Authority shall remain its property and the latter reserves its rights to substitute, remove or repair such equipment. Nevertheless, the customer or user shall deep guard to protect the Authority's property and take the necessary precautions in order to avoid any damage to said installations. Furthermore, the user shall watch over any tampering or otherwise interfering with the meters or

any other service equipment.

Section 3.14 - Handling of Water Meters

(a) The handiling or tampering in any way the water meters by persons other than the duly authorized agents of the Authority shall be prohibited. This includes the handling of all corresponding fittings, including the shutoff valve to said meters.

(b) Any violation of this provision shall be considered a misdemeanor. Furthermore, the violator shall be made responsible for all charges not registered as a result of such handling. This charge shall be compute according to his average consumption. All cost of the investigation and repairs shall also be his responsability.

Section 3.15 - Obstructions on the Water Meters

Nothing shall be layed on top of the meters or their protective housing that may prevent the meter reading or handling. Any such obstacle shall be considered a public nuisance and subject to the provisions of Section 19 of the Aqueduct and Sewer Act shall be removed by the Authority at the customer's or user's expense.

Section 3.16 - Destruction of Meters and/or Fittings

Any person who partially or totally destroys a water meter and/or its fittings shall be held responsible for the cost and reinstallment of said meter and/or fittings installed in the property if said damages prove malitious or negligent action on his part. In case the person held responsible for such action is an Authority's customer or user and fails to pay the costs of reinstallment, his service shall be discontinued and the deposited guarantee shall be forfeited. When necessary, legal action shall be initiated in order to recover the total cost of damages.

Section 3.17 - Relocation of Damaged Meter

Whenever a broken or damage meter is fixed on public property, the Authority may move it to a safer place which could be the private property being served. When moved at the request of the customer, user or any other concerned person or by any cause attributed to them, it shall be done at their expense.

Section 3.18 - Meter Testing by the Authority

The Authority shall test, at its own expense, the water meters when in its judgment, there shall be sufficient grounds to doubt of their efficient and exact functioning.

Section 3.19 - Meter Testing at Customer's or User's Request

Every customer or user shall have the right to require that the Authority test his water meter upon payment of the Authority's established fee for said purpose. He also shall have the right to watch the test, if he so specify, when making said request. Said fee shall be reimbursed if the results show that the meter is more than 2°/o fast.

Section 3.20 - Adjustment in Case of Deffective Meters

Once the test is completed, if the meter is found to be 2°/o slow or fast of the correct measure, the Authority shall adjust the customer or user's account for the last three billings.

Section 3.21 - Adjustment Due to Deficiency in Water Service

The Authority shall adjust the charges billed for water and sewer service when the customer or user has been subject to an irregular and insufficient water service for over a month, in accordance with the criterion established by the Standards for Adjustments on Deficient Water Service.

Section 3.22 - Inspection of Interior Installations

A customer or user with a high water consumption may request

the Authority to carry out an inspection of the interior installations of the affected property, persuant to the provisions of Article 3.04 of this chapter, to determine the cause for such a high consumption. However, the Authority is empowered, but no bound, to carry out an inspection on its own initiative at any moment it deems convenient. The customer shall allow the Authority's duly identified employees to enter his premises or properties in order to carry out an inspection. When an investigation is to be performed in a condominium or apartment building with only one meter, it shall be limited to a verification of the billed charges and the meter operation without in any way interfering with the service installations of any particular apartment or the building's communal areas.

Section 3.23 - Adjustment in case of a Hidden Leakage

If in any case the Authority concludes that a high consumption of water is due to a hidden leakage, the consumer or user shall be entitled to an adjustment of his account equal to half the amount in excess of his normal consumption and for not more than three consecutive billing periods, provided said leakage is repaired within fifteen (15) calendar days of the Authority's notifications in writing. No adjustments or reductions shall be made to the customer or user's account due to leakages or wastes of water when these are caused by cracks or deffective appliances such as sanitary fixtures, receiving tanks, water heaters, cooling systems, etc.

Section 3.24 - Diversified Water Service

The Authority may, in certain cases, permit a combined water service. As for the application of rates, the Authority shall classify said service as non-residential.

Section 3.25 - Adjustment of Charges in Water Consumed for Fire-Fighting

The Authority shall not charge for water used for fire extinguishing and shall make the necessary deductions to that effect,

provided such fires, regardless of their proportions, are reported to the Fire Department.

Section 3.26 - Extension of Water Service Contract to Include Sewer Service

All accounts or contracts registered with the Authority for water service, shall automatically be extended to cover sewer service as soon as the customer or user connects his property to such service. Customers or users of water service who desire to benefit from sewer service shall request an authorization from the Authority before making such connection. Any connection without the corresponding permit shall be considered illegal, pursuant to Article 3.10.

Section 3.27 - Sewer Service Invoicing

Whenever any customers or users benefit from both services, all bills for water service shall include the corresponding charges for sewer service.

Section 3.28 - Adjustments for Sewer Service

Upon application from the customer, accompanied by the necessary information, the Authority shall adjust the sewer service charges to business enterprises or industries not discharging a considerable amount of the water served. Such adjustment shall never be retroactive. The Authority may require the installation of the necessary measuring devices to determine the exact volume of the sewer discharge.

CHAPTER IV

WATER SERVICE

Section 4.01 - Who May Receive Water Service

The Authority shall furnish water service upon application by any

natural or legal person, whose property is accesible to the supply lines in operation and who has complied with all requirements established by the Authority in accordance with its purposes as a public corporation to provide the community with the most efficient and economical services.

Section 4.02 - Rights and Obligations Concerning Water Service Furnished

The Authority will adopt the necessary measures to furnish an efficient service and the customer or user of the water services shall be entitled to the pipe, quality and regularity of service that the Authority can fairly furnish within the available to it.

Section 4.03 - Pressure at Which the Water Service Shall be Furnished

The Authority shall not be required to furnish water service at any specific pressure. Those in need of a higher water pressure shall provide, themselves, at their own expense the necessary equipment to achieve the desire pressure. The use of any divice, equipment or installation in connection therewith shall have the Authority's official permission.

Section 4.04 - Water Tapping Service - Property, Maintenance and Diameter

All water installations connected to the water main, up to and including the meter shall be the property of the Authority and remain under its sole control, even when the customer or user defrays the cost of installation.

The Authority shall take care of maintenance services on its installations up to the meter or, in its absence, up to the private property limits. Beyond that point, maintenance shall be the customer's or user's responsibility.

Diameter of the requested tapping and the size of the meter shall

be determined by the Authority according to its use and to the conditions of the existing system.

Section 4.05 - Branch Service Connections

Branch service connections to adjacent properties or independent installations not included under the service contract shall be forbidden. However, such connections to accesory buildings are allowed.

Section 4.06 - Multiple Services

Service may be furnished through one water meter to two or more housing, office or commercial units under special rates in force for water and/or sewer services.

Section 4.07 - Pump Connection

The use of pumping implements directly connected to the Authority's water systems pipelines is hereby prohibited.

Section 4.08 - Connection of Independent Water Systems

The connections of independent or private water supply systems to the Authority's waterworks, without its previous consent are hereby prohibited. Failure to comply with this provision, besides constituting a violation to these Rules and Regulations, shall also constitute sufficient grounds for suspension of water service rendered by the Authority.

Section 4.09 - Use of the Water Service - Cession of Services

The use of water for purposes other than those contracted for and the partial or total use of said services for the benefit of others are also forbidden, except in case of fire.

Section 4.10 - Handling of Public Fire Hydrants. Restraint for other Uses

The use and handling of public service fire hydrants for other than emergency uses and fire exiguishing or official fire drills is hereby prohibited, except if previously authorized by the Authority.

Section 4.11 - Water Service for Fire - Fighting in Private Systems

Connections to private fire-fighting systems shall be allowed provided they comply with the Authority's requirements and regulations in force, the payment of established rates and that said service is used solely for that purpose. The use of said service for other purposes shall constitute a violations of these Rules and Regulations and the Authority shall charge extra payment in addition to the regular rates.

In case of a second violation, the Authority can discontinue the service.

The use of water from private fire-fighting systems for purposes other than fire extinguishing or official fire drills is hereby prohibited, except by previous authorization from the Authority.

Section 4.12 - Payment for Unauthorized Use of Services for Fire Protection

Any unauthorized use of water shall constitute a violation of these Rules and Regulations. Any person or persons who incur in such violation shall pay the charges imposed for the water consumed for such purposes.

Section 4.13 - Waste of Water

(a) Every customer or user is under the obligation to avoid the waste of water and shall be responsible for all waste of water due to deficiencies in his inner installations. To this end, said connections shall be kept in good conditions.

(b) If and when the circumstances so justify it, the Authority is empowered to adopt the necessary measures for the best use of water, and to prohibit its use for certain activities. The Authority shall enforce the fulfillment of these provision. Failure to comply with them shall

entail suspension for services besides constituting a violation of these Rules and Regulations.

Section 4.14 - Prohibitions on the Use of Public Fountains

Public fountains shall only be installed by the Authority or by its consent. All public fountains installed in violation of these regulations shall be disconnected without notification. Regarding their use, the following is hereby prohibited:

1- Depriving others of their righful enjoyment.

2- Hose connections.

3- Car-washing or bathing of persons and/or animals.

4- Branch service connections.

CHAPTER V

SANITARY SEWER SERVICE

Section 5.01 - To Whom Shall the Authority Render the Sanitary Sewer Service

The Authority shall render sanitary sewer services to any natural or legal person whose property has access to sewer mains in use and has complied with all established requirements. The owner, tenant or administrator of any building or structure adjacent to any street, avenue or thoroughfare having a sanitary sewer system or which may have access to same, shall register as a subscriber under the terms and conditions required by the Authority. Said person shall cease to use any other means for the disposition of waste waters and other wastes, unless such person owns an independent system for such disposition, constructed and operated in accordance with the laws of the Commonwealth of Puerto Rico and the rules and regulations in force in the Government instrumentalities concerned.

Section 5.02 - Sanitary Sewer Service Tapping

Sewer service installations from the main sewer tapping up to the subscriber's or customer's installation at the particular property line, shall remain under the exclusive control of the Authority and shall become the property of the Authority even though the cost of said installations may have been defrayed by the subscriber or customer.

The Authority shall be responsible for the maintenance of the connections up to the subscriber's or customer's property limits. The latter shall be responsible for the maintenance of all installations within its property limits.

Section 5.03 - Discharge of Industrial Wastes into the Sanitary Sewer System

A- Industrial discharges into the sanitary sewer system shall not be permitted unless a formal service contract has been submitted as provided by these Rules and Regulations.

B- Subscribers to the sewer system who discharge industrial wastes into the system shall submit information as to quantity and characteristics of said wastes as determined by the Authority.

Should the subscriber fail to submit the information herein required, the Authority shall make an estimate and determine the volume and nature of said discharges, as hereafter provided.

C- The subscriber or customer shall install at his expense, in an appropriate location within the limits of the property, an inspection man-hole and a measuring device, or a monitoring station, subject to the Authority's need and approval. This shall allow the Authority to gauge and sample the effluent, in order to determine its volume, flow rate, and any such other characteristic of the discharge of said effluent into the sanitary sewer system.

D- The inspectors and other authorized representatives of the Authority shall have access to the installations hereinbefore indicated,

without undue dealy during the subscriber's or customer's normal operating hours, to gauge, evaluate, and otherwise test the discharge. The Authority may estimate the discharge and its characteristics when the subscriber's or customer's instruments are not operating properly, when not possible to have access to the installations, or for any such other reason or cause.

E- All measurements, tests, evaluations, and analyses of the industrial wastes shall be made as prescribed in the latest edition available of the "Standard Methods for Examination of Water and Wastewater", and pursuant to the provisions of these Regulations. The estimates made by the Authority shall be based on the most recent known characteristics of the discharge.

F- The Authority may require from the subscriber or customer the installation, operation, and maintenance of a pH meter to gauge, register, and regulate the pH of the industrial wastes to be discharged into the sanitary sewer system. The instrument shall be approved by the Authority prior to its installation. The graphs obtained therefrom shall be available to the Authority when it so requires.

G- The discharge of the following substances into the sanitary sewer system is hereby prohibited:

1- Stormwater, surface water, underground water, roof runoff water, subsurface drainage, unpolluted cooling or industrial process waters.

2. Wastes containing pollutants as those described below:

a) Gasoline, benzene, naphta, fuel oil or any liquid, solid or gaseous substances in sufficient amounts to, as deemed by the Authority, constitute a health hazard or harm to humans, animals; or produce stench, or become undersirable; or may cause explosions of fire, or harm the Authority's sewer system.

b) Any toxic or poisonous solids, liquids, and gaseous subs-

tances in sufficient amount which, in the opinion of the Authority after consideration of the peculiar conditions of each case, either singly or by interaction may interfere with the sewage collection or treatment process, or constitute a hazard to the health and life of human beings and animals; or become a public nuisance or constitute any other undesirable risk.

c) Any liquids or vapor having a temperature higher than one hundred fifty degrees Fahrenheit (150°F) or sixty-five degrees Centigrade (65°C), at the point closet to the discharge into the sewer system.

d) Concentrations higher than two milligrams per liter (2 mg/1) of cyanides or heavy metals such as nickel, lead, iron, chromium, copper, zinc, and any other similar objectionable or toxic substances, unless expressly allowed by the Authority. The Authority reserves the right to adopt or establish more restrictive standards than those herein stated and may require from the subscriber pre-treatment of the discharge in compliance with its own established standards and rules or some other order.

e) Substances having any corrosive property capable of causing damage to the Authority's sewer systems or to the personnel in charge of them. No industrial wastes with a pH lower than 6.5 or higher than 9.0 may be discharged, unless the Authority expressly allows it only after considering the special conditions and circumstances in each case.

f) Phenols in a concentration higher than 0.005 milligrams per liter (0.005 mg/1).

g) High concentrations of inert solids such as fuller's earth, diatomaceous earth, lime slurries and lime residues, metalic

compounds, and other undersirable substances that may obstruct the flow or normal operation of the sanitary sewer systems.

h) Concentrations of dissolved solids such as chlorides and sulfates that should cause the Authority to undertake extraordinary measures to keep its systems operating properly.

i) Any isotope or radioactive substance. The Authority may issue a special permit for the discharge of certain isotopes or radioactive substances if it considers that the half-life or concentration of said isotopes or radioactive substances does not exceed the limits established by the concerned government agencies in their standards for potable water.

j) Concentrations, of any kind, requiring the use of excessive amounts of chlorine, as determined by the Authority.

k) Wastes with concentrations of suspended solids and biochemical oxygen demand BOD (5 days at 20°C) in excess of 2,500 milligrams per liter (mg/1), and those with settling solids in concentrations over 1,250 milligrams per liter (mg/1). Under special circumstances the Authority may allow the discharge of wastes exceeding the limits hereinbefore mentioned, subject to the imposition of surcharges in accordance with the Authority's rates in force and the User Charge System.

l) Wastes, of any kind whatsoever, which, as determined by the Authority, contain excessive coloration, such as, but not limited to, dyes and tanning solutions.

m) Wastes containing noxious elements or antibiotic effects that, either singly or jointly, may alter the biological processes of the sanitary sewerage system.

3. Bones, egg shells and similar matter. Also prohibited is the

discharge of wastes from garbage grinders unless the particles have been reduced to less than half an inch in size. Under special circumstances the Authority may allow the installation and operation of garbage grinder equipped with a motor of three-fourths (3/4) horsepower or greater.

H- Whenever a subscriber or customer cause damages or obstructs the sanitary sewerage system with discharges substances exceeding the limits hereby established by these Regulations, he should refund the Authority the expenses incurred in the correction of said damages.

I- The Authority shall reserve the right to set limits regarding pollution levels, volume and flow rate of the discharges.

J- The rights reserved for the Authority by virtue of these Regulations are unequivocal and perpetual until they are modified, suspended or othewise relinquished by the Puerto Rico Aqueduct and Sewer Authority or by a higher authority.

K- The Authority may suspend water and sewer services to any subscriber or customer who violates in any way the provisions of these Regulations and specially those contained in this chapter.

Section 5.04:- Compulsory Use of Means for Separating Substances such as Fats and Oils from Certain Discharges

A- Gasoline stations, restaurants, hospitals, supermarkets, shops industries, or any such other kind of establishment producing wastes containing among other undersirable substances the following: lard, fats, oil, or settling matter such as sand or similar matter, shall install a trap or interceptor for such substances. Its design has to be approved by the Authority. The trap or interceptor shall be constructed before admitting the wastes into the sanitary sewerage system and shall be properly operated and maintained by its owner. The Authority may cancel the water and sewer services should it find that the trap or interceptor is not adequately operated and maintained. The Authority may provide at its discretion and free of charge drawings

and specifications of an acceptable trap or interceptor.

B- The discharge into the sewer system of any wastes containing lard, wax, fats, or oil, whether emulsified or not, in excess of one hundred milligrams per liter (100 mg/1), or containing substances which may solidify or become vicous, is hereby prohibited.

Section 5.05:- Bulk Discharges

A. The discharge into the sanitary sewer system by means of trucks, tanks, suction pumps, individual tanks, containers, or any such other medium, is hereby prohibited.

Under special circumstances, upon the issuance of the corresponding permit by the Authority and pursuant to the provisions in force, such discharges may be allowed only at the sewer treatment plants selected by the Authority for such a purpose. This service shall be charged according to the volume and concentration of the wastes.

CHAPTER VI

ADDITIONAL PROVISIONS

Section 6.01:- Provisions in Force - Repealed

These Rules and Regulations, adopted and approved by the Governing Board of the Puerto Rico Aqueduct and Sewer Authority, shall become in force immediately upon compliance with the provisions of Act. No. 112, approved June 30, 1957, known as the Regulations Act of 1958 (3 L.P.R.A. Sections 1041 to 1059).

Chapters I, II, III, IV, V, and VII of the former Rules and Regulations, which provisions, correspond to Sections 159-1 to 159-11 and 159-101 to 159-141 of Title 22 of the Rules and Regulations of Puerto Rico, are hereby repealed.

Section 6.02: - Separability

Should any section, clause, paragraph, or any part ot these Rules and Regulations be declared unconstitutional, or void, by a court with jurisdiction over them, such sentence shall not affect or invalidate the rest. Its effect shall be limited to the section, clause, paragraph, or part so declared.

Section 6.03:- Penalties

Any person who violates or causes anybody to violate any provision of these Rules and Regulations, shall be guilty of a misdemeanor, and the water and sewer service rendered to such person is subject to be suspended.

I, ISMAEL PAGAN COLBERG, Secretary of the Governing Board of the Puerto Rico Aqueduct and Sewer Authority, hereby CERTIFY, that these Rules and Regulations have been approved by the Governing Board at its meeting held on May 10, 1976.

ISMAEL PAGAN COLBERG

Printed at the duplicating machines of the Puerto Rico Aqueduct and Sewer Authority.

CHAPTER XI

ACT FOR THE CONSERVATION DEVELOPMENT AND USE OF THE WATER RESOURCES OF PUERTO RICO

LAW #136 APPROVED JUNE 3ra 1976.

(Subs. for
H.B. 516)
(Reconsidered)
(Conference)

No 136

(Approved June 3, 1970)

AN ACT

To establish a new Law of Waters for Puerto Rico; to declare the waters of Puerto Rico patrimony and wealth of the People of Puerto Rico; to grant to the Secretary of Natural Resources authority to plan and regulate the use and utilization, conservation and development of the waters of Puerto Rico; and to implement the public policy and the regulations and norms pertinent to the waters of Puerto Rico; to repeal provisions of the Civil Code and of the Law of Waters of March 12, 1903; and to establish a special account in behalf of the Department of Natural Resources in the Treasury Department, and for other purposes.

STATEMENT OF MOTIVES

Water constitutes a versatile resource. It satisfies multiple needs of our daily life and man has applied it to a vast variety of uses. This versatility of water reveals to us that we are in the presence of a resource essential to the existence of the natural and social systems, of a natural property which must be administered with a strict sense of caution.

The misuse, waste and degradation of water contribute to the shortage of the resource in Puerto Rico and represent a quantifiable loss of its value for domestic consumption, [illegible] development

and recreation. This loss impairs the welfare and prosperity and the safety of the Island which, because it does not have an unlimited and well-distributed abundance of the resource, it must extract from what it has the maximum benefit in terms that will satisfy the public interest.

The ever-growing competition for the use of water among different sectors of the Puertorrican society, the lack of a juridical system providing for the planning and administration of the resource in keeping with the development of the Island, as well as the waste which it all entails, justify the Commonwealth of Puerto Rico to adopt, with a sense of urgency, the legislation and Regulations and to establish the planning and administrative mechanisms necessary to protect our waters and insure their most efficient use. Toward those ends is aimed the public policy established through this act by the Legislature of Puerto Rico.

For an adequate administration of this policy it is necessary that we view our hydrological problems as a whole, in an integrated perspective. The very hydrological cycle, where the resource appears in its multiple modalities and forms, constitutes, bear in mind, a unit instead of a succession of isolated phenomena. Likewise, it is as an integral whole that this act must be administered.

BE IT ENACTED BY THE LEGISLATURE OF PUERTO RICO:

Section 1.- Title.- This act shall be known as an "Act for the Conservation, Development and Use of the Water Resources of Puerto Rico".

Section 2.- Declaration of Public Policy.- It is the public policy of the Commonwealth to maintain the degree of purity of the waters of Puerto Rico required for the welfare, safety and development of the Island, to insure the water supply that may be needed by the present and future Puertorrican generations by establishing water reservation areas and using the waters and bodies of water in accordance with the public interest and with their best, most beneficial and most reasonable use. To this end, and apropos, it is expressly declared, in order to protect our people from the adversities of the shortage, misuse, waste and pollution of such an essential resource, as well as to attain that its utilization be compatible with the physico-natural realities surrounding it and with the social and economic needs of our Island, that the waters and bodies of water of Puerto Rico are the property and wealth of the People of Puerto Rico. The Commonwealth Government shall administer and protect this patrimony in the name and on behalf of the Puertorrican people.

Likewise it is the policy of the Commonwealth to achieve the most equitable and fairest distribution of its waters.

To that effect it is established that the water requirements inherent in domestic consumption and particularly human consumption, shall be satisfied with priority over any others and that in the adjudication of the surplus available, the public interest shall prevail over any other interest or claim.

Section 3.- Definitions.- For the purposes of this act, the following terms shall have the meaning stated below, unless within the context where they are used another meaning arises, or it is specifically otherwise indicated:

a. Waters and Bodies of Water.- This term includes the surface, subterranean coastal and any other waters within the jurisdiction of the Commonwealth. Except where specifically otherwise indicated, waters and bodies of water shall have the same meaning.

b. Atmospheric Waters.- All waters in aqueous steam suspended in the air in the form of clouds.

c. Coasted Waters.- Those of the sea within the jurisdiction of the Commonwealth of Puerto Rico and all such interior waters where the flow and ebb of the sea is sensible.

d. Subterranean Waters.- Those which are under the surface of the earth, under the bed of a river, stream or brook, or under the bottom of the sea, lake, dam or other body o

water, irrespective of its origin or status, or of the geological formation or unit in which they happen to be, flow, percolate or move. Subterranean waters shall mean that which exists in the interior of caves and caverns.

e. Surface Waters.- Those which flow continuously or discontinuously through natural or artificial channels or which emerge continuous or discontinuously in public or private lands or which are contained in lakes, lagoons, dams or any other body of water on land surface in Puerto Rico.

f. To Pollute, Pollution.- To alter the natural properties of a body of water so that it causes damage or is prejudicial to human health, or to animal and plant life, or causes bad odors or impurities, or alters adversely its physical, chemical, microbiological or radioactive properties, in such a way that mars the enjoyment of life or property or violates the criteria about the standards of purity established by the regulation to that effect of the Environmental Quality Board.

g. Department.- The Department of Natural Resources.

h. Franchise.- Written authorization of the Secretary for the use or utilization of surface or subterranean waters.

i. Governor.- The Governor of Puerto Rico.

j. Act.- The Act for the Conservation, Development and Use of the Water Resources of Puerto Rico.

k. Permit.- Written authorization of the Secretary for the drilling of wells for the purpose of using subterranean waters.

l. Person.- Any individual or juridical entity, groups organized under one firm, partnerships, public and private corporations including municipalities, agencies and instrumentalities of the Government of the Commonwealth of Puerto Rico.

m. Well.- Any system, process, method, device or combination thereof used by man for the main or incidental purpose of extracting subterranean waters.

n. Puerto Rico.- Embraces the whole area within the geographical or territorial boundaries under the jurisdiction of the Commonwealth of Puerto Rico.

o. Secretary .- The Secretary of the Department.

p. Water Connection or Water Connection System.- Any natural or artificial method to use or utilize a body of water

Section 4.- Assignment of Dominion.- All waters and bodies of water of Puerto Rico are hereby declared to be the property and wealth of the People of Puerto Rico. Their use, utilization and development shall be subject to the provision of this act and of the regulations prescribed thereunder.

Section 5.- Assignment of functions to the Secretary.- The Secretary shall have the following duties and powers in connection

with the water resources in Puerto Rico:

a. To prepare, adopt and maintain an integral plan of conservation, development and use of the water resources of Puerto Rico in consultation with the Water Resources Committee established hereinafter. This plan shall determine with precision the present uses of the bodies of water of the Island and shall project future uses. In preparing said plan, the Secretary shall bear in mind the hydrological cycle, as well as the requirements of the natural, social and economic systems which depend on the resource for their subsistence and development.

b. To establish a classification system of the water resources based on the utilizations and uses; on the consumption needs, the priorities of present and future use, the state and condition of the resource, as well as on the quality of the supply required for human consumption and for the economic and social development foreseen for Puerto Rico. This system, like the integral plan for the use, conservation and development of the waters, shall constitute the basis for implementing and administering the permit and franchise system hereby established.

c. To adopt the regulation he may deem necessary on uses and areas of use of the bodies of water, the quantity which may be used of each body, formulation of aquatic zones, lakes, lagoons and dams, recovery of land, guidelining of flooded areas, and other aspects relating to the waters. The decisions that the Secretary may adopt under this provision shall be based on considerations of public interest and shall take into account the hydrological cycle, the versatility of the bodies of water, the variety of possible utilizations, and the projections relative to quantity and quality of supply that the Island requires to meet its needs.

d. To establish water areas or districts in a critical status and to adopt, in reference thereto, the special rules and system of priorities necessary to guarantee their best conservation, use and utilization. The decisions of the Secretary to this effect shall be based on scientific criteria of public interest and on criteria about the best, most beneficial and most reasonable use of the resources. In the exercise of this power, the Secretary shall take into account the different phases of the hydrological cycle and shall pay special attention to the rythm of extraction of subterranean waters, the rythm of supply of the sources,

the permissible reduction of the subterranean water-mark, and the possible pollution of aquifers.

e. To promulgate the criteria about the best, most beneficial and most reasonable use of the waters and to establish the consumption priorities which shall be followed in the administration of the permit and franchise system prescribed by this act. In connection with this function the Secretary shall bear in mind the hydrological differences registered in the regions of Puerto Rico, the quantity and quality of the waters in each region, the demand that new consumption sources would represent, the social need and economic potential of those new sources, the reasonability of the existing uses and utilizations, the possibility of producing fresh water or of reusing water already utilized, the social and economic cost of meeting the present and future needs of Puerto Rico, and the ways that may be found to satisfy public interest to the optimum.

f. To carry out the technical researches he may deem convenient in order to determine with precision the adequacy for certain uses of the waters of Puerto Rico, as well as to identify the means of protecting, conserving and using efficiently the aquifers.

g. To recommend to the Planning Board the adoption of standards and regulations relative to the development and use of lands, that affect the water resources.

h. To recommend to the Governor, upon consultation with the agencies and instrumentalities of the Commonwealth interested in each particular case that he declare an emergency situation with respect to the use of waters throughout Puerto Rico or in certain specific areas when the shortage of the supply so warrants, or when the quality of the water jeopardizes the health, welfare or safety of the people, or whenever any such situation is foreseen.

For the purposes of a declaration of emergency, not provoked by an unforeseeable act requiring immediate action, the Secretary shall hold public hearings before submitting his recommendation to the Governor. These hearings shall be announced in two newspapers of general circulation in Puerto Rico at least ten days prior to the date of the hearings. The recommendation of the Secretary to the Governor shall be for the purpose of suspending the granting of new permits and licenses or to render ineffective, in whole or in part, for not more than six (6) months, the existing permits or licenses, or both. The emergency period may be extended by the Governor for an additional term of six months. The Governor may render ineffective a declaration of emergency for reasons of

public interest or when the causes which originated it have disappeared.

Nothing contained herein shall be understood as a limitation of the powers of the Aqueduct and Sewer Authority of Puerto Rico or of the Water Resources Authority of Puerto Rico to impose a water rationing on their users when there are reasons to warrant it, or of the powers granted to the Environmental Quality Board by Act No. 9 of June 18, 1970, as amended, to order any person or juridical entity to cease such acts as cause or may cause damage to the environment or which may jeopardize the public health and safety.

i. To carry out surveys, researches and scientific experiments in connection with the water resources, in coordination with other agencies and instrumentalities of the Commonwealth and of the United States Government, or with persons and organizations interested in the hydrological problems of Puerto Rico. The knowledge acquired through these means shall be kept in a hydrological information center and shall be at the disposal of the different government agencies concerned with the waters of Puerto Rico and of persons interested therein.

j. To establish a permit and franchise system for the use and/or utilization of the waters and bodies of water of Puerto Rico

and to fix the fees to be charged in each case. The Aqueduct and Sewer Authority and the Water Resources Authority are exempt from the payment of such fees.

k. To regulate the design, construction, operation and everything pertinent to the closing of installations, structures or devices used to extract or to surface subterranean waters, in coordination with other agencies concerned with these matters.

l. To make the inventories and to establish the registries necessary to achieve the purposes of this act, including those referring to surface and subterranean waters, wells, vested rights under prior legislation and to permits and franchises granted. The information contained in the registries, as well as in the inventories, shall be of a public nature and shall be made available to any person requesting it.

m. To perform inspections and exercise surveillance over the bodies of water of Puerto Rico.

n. To disclose information and promote the knowledge about the water problems and resources of Puerto Rico.

o. To promulgate rules of a substantial and processal nature for the adjudication of controversies between private persons on the utilization of waters.

p. To adopt the necessary regulations for the implementation of this act in keeping with the provisions of Act No. 112 of June 30, 1957. In the promulgation of these regulations the Secretary

shall consult the Aqueduct and Sewer Authority and the Water Resources Authority, so as not to affect the normal operation of these instrumentalities.

Section 6.- Water Resources Committee.- The Secretary shall appoint a Water Resources Committee to advise him in the preparation of the integral plan for the use, conservation and development of the water resources and to assist him in any other function entrusted to him by this act. The Committee shall be composed of representatives of the Planning Board, the Economic Development Administration, the Environmental Quality Board, the Aqueduct and Sewer Authority, the Water Resources Authority, the Department of Agriculture, the Department of Health, the Department of Transportation and Public Works and the University of Puerto Rico. The Secretary may, when he deems it convenient, enlarge the Committee by appointing representatives of other agencies of the Commonwealth and of the United States Government, and private persons concerned with the water resources of Puerto Rico. The operating costs of the Committee shall be defrayed by the Department of Natural Resources.

Section 7.- Functions of the Environmental Quality Board, the Department of Health and the Planning Board.- In the preparation and implementation of the integral plan for the use, conservation and development of the water resources, the Secretary shall strictly follow the rules and findings which as regards the quality and

potableness of the waters may adopt the Environmental Quality Board and the Department of Health, respectively. It is further provided that such integral plan for the use, conservation and development of the water resources shall be considered as a sectorial plan, as provided in Act No. 75 of June 24, 1975.

Section 8.- Prohibition.- No person may construct, establish or operate a water-connection system, or use or utilize the waters and bodies of water of Puerto Rico without the corresponding permit or franchise issued by the Secretary. These rights shall not be acquired by prescription.

Section 9.- Permits and Franchises.-

a. The Secretary shall establish a system of permits for drilling wells and another system of franchises for the utilization of superficial waters or surfaced waters. The permits shall fix the specifications of the works and installations they authorize and the franchises shall establish, among other conditions, those relating to the quantity, the rythm of extraction, the use and the fees to be paid for the volume of water whose utilization or surfacing they permit. The Secretary shall establish the standards he may deem useful and necessary for using artificial means to provoke rainfall and for utilizing in any other form the atmospheric waters.

b. The permits and franchises shall be granted on petition of the interesting party. The Secretary shall ask the petitioner for such information and surveys as he, may deam necessary for the permit and franchise system to operate in keeping with the purposes of this act.

c. In the cases of petitions involving a volume of water in excess of a limit previously fixed by the Secretary, or which refer to certain specific bodies of water or to certain specific locations, areas, districts or regions, the Secretary shall not issue any permit without having first determined the impact that the proposed utilization might have on those existing. On the other hand, when the case deals with utilizations to satisfy the needs of domestic or agricultural consumption not involving a considerable or substantial volume of water, the Secretary may relieve the interested party from the administrative process required for the issuance of the permit or license, as well as from the corresponding payment. The Secretary shall prepare model plans of minor works for the collection of rainwater which may fall within the limits of a property, such as ponds, reservoirs and tanks, which would be devoted to domestic or agricultural use. The model plans shall be distributed, free of charge, to interested persons requesting them.

d. The permits and franchises shall have the duration that the Secretary may establish by regulation, but they shall never be issued for periods over two (2) and ten (10) years, respectively. This limitation shall not be applicable to permits and franchises of government instrumentalities. Renewal thereof shall follow the procedure corresponding to their original issuance, except that when the renewal plus previous permits granted hereunder do not exceed ten (10) years in all, the Secretary shall not be bound to follow said procedure.

e. The Secretary may issue the permits and franchises prescribed herein, provided they are of public interest, the petitioners or applicants comply with the prevailing legal and regulatory requirements, the use for which the waters are requested be optimum, beneficial and reasonable, the resource be not wasted, its utilization be in conformance with the priorities established herein and do not impair vested rights under previous legislation.

f. In the evaluation of the public interest attached to a use or utilization, the Secretary shall bear in mind, among others, the following factors:

1. Its compatibility with the plan of use, conservation and development of the waters of Puerto Rico.

2. Its impact on the economy of the Island.
3. The use to which the water would be devoted.
4. The volume of water that would be used.
5. Its effect on potential uses or utilizations which could become effective within a reasonable limit of time if the waters were not committed under the permit or franchise sought.
6. Its impact on other resources.
7. Potential damages to persons and to the community.
8. Its effect on the public health and safety.
9. Possible impairment of existing rights, including the right of ownership over the tract where the waters are.
10. Its impact on the integrity of the natural systems and, in general, on the ecosystem.

g. Permits and franchises may be transferred by their holders only when the public interest warrants the transfer and the Secretary approves it. Every permit or license shall establish the conditions for its transfer. Transfers shall not entail any payment for the value represented by the permits or franchises, but only such payment as corresponds to the assessment of the structures and equipment used in the utilization of the surfacing. For the purposes of authorizing the transfer of a permit or franchise, the Secretary shall hold public hearings if he thinks there is controversy.

Section 10.- Accidental or Illegal Surfacing.-

a. The provisions of this act relating to permits and franchises shall not apply to surfacing resulting from activities carried out for other purposes. The Secretary shall provide by regulation the procedure to be followed in such cases.

b. Waters surfaced in violation of this act shall not legally benefit the person who surfaced them.

Section 11.- Substitution of Sources.-

a. Permits and franchises for the use of waters constitute authorizations to utilize and extract certain specific quantities of water and not a right over a source. The Secretary may substitute the source of supply of a user provided he guarantees to the latter waters of quality and in quantity comparable to those he is using. Likewise, and in order to protect bodies of water which at the time this act is approved require special attention, the Secretary may satisfy water rights acquired under the previous law by the utilization of other sources that provide the supply needed by their possessors. The costs corresponding to the substitution of sources shall be determined by the Secretary, or on his petition, by the Superior Court and shall be paid by the Commonwealth of Puerto Rico. The Secretary may transfer, in whole or in part, to the party benefited by the substitution the costs corresponding thereto.

b. For the purposes of substituting sources, the Secretary may establish time limits and other reasonable conditions that may permit the enjoyment of vested rights and protect the public interest.

c. Nothing provided herein imposes on the Government of the Commonwealth an obligation to guarantee the quality or quantity of waters whose utilization it authorizes.

Section 12.- Fees to be Paid.- The Secretary shall establish by regulation the fees to be paid for each permit or franchise this act authorizes him to grant. In establishing the regulation to that effect, the Secretary shall bear in mind the nature of the permits and franchises, the duration thereof, the capital investment required to render effective the permit or franchise, the quantity and quality of the waters the use of which he would authorize, the use to which they would be put, the impact of the utilization on the natural systems and on other rights, and any other factors he may deem necessary for fixing a reasonable fee.

No fee shall be required to be paid by the municipalities, public agencies or instrumentalities and persons who by reason of rights acquired under prior legislation may be exempted from such payment.

The funds deriving from these fees shall be covered into a special account which the Secretary of the Treasury shall establish in behalf of the Department of Natural Resources. Said fund shall be used by the Secretary to cover the expenses of the administration of this act.

Section 13.- Grounds for Revocation of Permits and Franchises.- The Secretary may, upon notice and hearing to that effect, modify, suspend temporarily, or cancel a permit or franchise for any of the following reasons:

1. Intentional violations of this act, of Act No. 9 of June 18, 1970, of Act No. 23 of June 20, 1972, as amended, or of the standards, decisions and regulations adopted thereunder.
2. Violation of any of the conditions established in the permit or franchise and, particularly, those referring to the volume, form, rythm, place, time and purpose of the utilization.
3. The nonusing, without good cause, of the permit or franchise for the time fixed therein, or if none is fixed, for the period of one year.
4. Where the holder refuses to furnish the information requested by the Environmental Quality Board and the Secretary, or furnishes false information.

The Environmental Quality Board may request the Secretary to revoke a permit or franchise when it realizes that, as a result of the corresponding utilization, damage or significant adverse effect is being caused or may be caused to the environment or to any natural system.

Section 14.- Dispensations.- In furtherance of the public interest, the Secretary may grant dispensations within his plan and regulation for the use, conservation and development of the waters and bodies of water of Puerto Rico. Said dispensations shall be preceded by public hearings which shall be announced as provided in Section 19 of this act. The applicant for the dispensation shall bear the burden of proof and must show clearly and conclusively that he would utilize the waters he seeks in the best and most beneficial and reasonable way; that the dispensation would not entail a significant adverse effect on the environment or natural systems; that it would not impair vested rights or the enjoyment of another's property, and that it would not jeopardize the health, safety and welfare of the community. After hearing the evidence, the Secretary shall enter an order based on findings of fact and issues of law. The decision of the Secretary may be reviewed by the Superior Court of Puerto Rico upon the filing of a petition to that effect by any interested party within thirty (30) days after its official notice.

Any use, dispensed in whole or in part, shall be subject to the emergency powers which Section 5 (h) of this act grants to the Governor, and to the regulatory requirements that may be established by the Environmental Quality Board and the Secretary.

Section 15.- Priorities of Use.- Where several petitions are presented for the purpose of utilizing beneficially and reasonably a body of water and it lacks the sufficient volume to meet them all, or when there is sought the beneficial and reasonable utilization of a body of water that is incompatible with another foreseeable use also beneficial and reasonable, or when there is sought the utilization of a source for a purpose more beneficial and reasonable than any of the existing ones, the Secretary shall grant the petitions which represent the most beneficial and reasonable utilization and best satisfy the public interest and the purposes of this act. The adjudication of an insufficient volume of water shall be based on an analysis of costs and social benefits, The utilization of waters for domestic consumption and particularly for human consumption shall have priority over any others.

The Secretary shall establish the regulatory procedures necessary to enforce this section. The compensation or payment corresponding to holders of permits or franchises which may be affected by decisions which the Secretary may adopt by virtue of the powers granted to him by this section shall be determined pursuant to the procedure established in Section 11 a. of this act.

Section 16.- Vested Rights.- Every beneficial and reasonable use and utilization of waters existing on the date this act takes effect, including those acquired under grants from the government of Spain, or which existed within the preceding year, or was to commence at the termination of works in progress on the effective date of this act shall be considered as a vested right under the previous legislation and shall be protected by this act. The Secretary may recognize a vested right of a lesser amount than that claimed by the holder.

This provision does not limit the powers which Section 5 of this act grants to the Secretary, and in no way reduces his authority to establish the true existence of the rights claimed, or to require the inscription and registration thereof, or to require information on existing wells and water connections, or to inspect those wells or water connections, or to require, in accord with reasonable terms and conditions, the conformation of existing installations or those under construction to the regulations that may be established, or to order the installation of water meters or systems that gauge the volume of water used, or to require the repair of installations or the introduction of improvements that may reduce water waste.

Section 17.- Registry of Rights of Use.- The Secretary shall establish special procedures for the registration of the rights of use and utilization of waters acquired under the previous legislation. To this effect the Secretary may set dates for the filing of the corresponding statements and require the information he may consider useful to establish the true existance and exact amount of the rights claimed. Likewise, he may, motu proprio, adopt such decisions as may be pertinent regarding the right of those who, having such right, have not claimed it or have not met the requirements established to that effect.

Within a period of not more than thirty (30) days after the approval of this act, the Secretary shall begin to prepare an inventory of the wells existing in Puerto Rico. This inventory may be prepared according to a procedure different from the one used to determine vested rights under the previous legislation.

Section 18.- Orders of the Secretary, Administrative Fines and Aid of Jurisdiction.-

a. The Secretary or his authorized representatives shall have power to receive testimony, administer oaths, issue summons requiring the appearance of witnesses or the introduction of documentary evidence or of any other kind. The Secretary may issue orders to do or not to

do, to cease and desist and, after a hearing, to impose sanctions or administrative fines up to a maximum of fifty thousand (50,000) dollars for violations of this act, its regulations or the orders issued thereunder. The Secretary may appear before the Superior Court to pray the latter to order compliance with any summons or order issued by him.

b. No person may refuse to comply with a summons of the Secretary or of his duly authorized representatives, or with a judicial order issued to that effect, alleging that the testimony or evidence which he is required to give, might incriminate him or give rise to the imposition of a penalty. Such testimony or evidence may not be presented against that person in any other proceeding.

Section 19.- Right to a Hearings.-

a. The Secretary shall hold public hearings when the matters on which he must pass refer to:

   1. Adoption of rules and regulations or amendments thereto.
   2. Adoption of the integral plan for the conservation, use and development of the water resources or modifications thereto.
   3. Establishment of priorities for consumption.

4. Granting of dispensations as authorized by Section 14 of this act.
5. Substitution of supply sources.
6. Determination of vested rights.
7. Denial of petition for a permit or franchise or the limitation or revocation of existing permits and franchises when there is controversy.
8. Declaration of an emergency in accordance with provisions of Section 5 (h) of this act.
9. Imposition of administrative fines and penalties.

b. The parties concerned with any of the matters listed in the preceding clause may waive their right to a hearing.

c. The hearings that the Secretary may hold on the adoption of rules and regulations or amendments thereto, or on the adoption of the integral plan for the conservation, use and development of water resources or modifications thereto, or on the establishment of priorities for consumption, or on the granting of dispensations as authorized by Section 14 of this act, or on the substitution of supply sources; or on the determination of vested rights shall be announced by publication in two newspapers of general circulation at least two (2) weeks in advance of the date fixed for their holding.

d. In the quasi-judicial hearings listed in clause "a" of this section the persons affected or concerned shall be entitled:

1. To be notified, personally or by registered mail with return receipt requested, of the proceeding to be held, and to be informed of the facts on which it is based at least fourteen (14) days prior to the date fixed for the hearing.
2. To appear personally or through counsel and with the technical assistance they deem necessary.
3. To testify and to present oral and documentary evidence.
4. To examine and cross examine witnesses.
5. To request that the appearance of witnesses and the presentation of evidence be ordered.
6. To request the preparation of a stenographic record of the hearing or an equivalent record.
7. That the decision be adopted solely on the basis of the evidence presented at the hearing.
8. That the hearing be public unless this right be waived.
9. That persons involved in the investigation giving rise to the proceeding do not preside over the hearing.

e. The Secretary may order the parties requesting the hearings to pay for the expenses and professional and consultant service fees incurred by the Department of Natural Resources in the hearings and corresponding investigations. The Secretary shall

determine the form in which and the time when the payments shall be made, upon the approval of the bills presented by the persons who rendered the services, and these payments shall be covered into a special fund to defray the expenses had by reason of the hearings.

f. At the quasi-legislative hearings listed in clause (a) of this Section, the persons affected or concerned shall be entitled to appear personally or through counsel and to present the evidence they may deem necessary.

Section 20.- Procedure at the Hearings and Review Thereof.- At every administrative hearing of a quasi-judicial nature required by this act the following procedures shall be observed:

1. The Secretary or a representative shall preside over the hearing.
2. The appearing parties shall be entitled to offer all the evidence and to argue their case.
3. Insofar as applicable, the fundamental principles of the Law of Evidence shall prevail, without being subject to technicalities and said law shall be construed as liberally as possible.
4. The Secretary shall issue his order or decision within thirty (30) days following the date when the hearing is terminated and he shall notify it to the party or parties affected, except that in cases of prolonged hearings and lengthy

records or of complicated cases, the period of thirty (30) days may be extended to a maximum of ninety (90) days.

5. The order or decision of the Secretary shall be final unless, within thirty (30) days following the date of notice, a review is sought before the Superior Court.

Section 21.- Public Information.- The information related to the supplies and bodies of water of Puerto Rico, including the coastal waters, shall be held as information of a public character and shall be available for inspection by the public in general. Studies on the quality of waters and the deposits of effluents in bodies of water shall partake of the same character.

b. Documents and information brought before the Secretary by owners or managers of commercial or industrial enterprises and which refer to the production or production processes, or to the volume of sales, or which if known could injure the competitive position of the entity, shall be of a confidential nature except where the person presenting them expressly consents otherwise. This provision shall not preclude the Secretary from using the confidential documents and information submitted to him in analyses or summaries related to the general condition of the waters or of the air, provided he does not disclose the sources presenting the information.

Section 22.- Actions of Citizens.- Any citizen domiciled in Puerto Rico may bring a civil action under this act in the following cases:

1. Against any person, instrumentality, agency, municipality, or public or quasi-public corporation of the Commonwealth who is found to be in violation of this act or of any regulation, standard or order issued thereunder by the Secretary.
2. Against the Secretary of Natural Resources when it is alleged that he has failed to comply with a non-descretionary duty imposed by this act.
3. Against the Secretary of Natural Resources when it is alleged that he has committed an abuse or excess of discretion, or an arbitrary act, in enforcing any limitation or standard of effluents established hereunder.

The Superior Court of Puerto Rico shall have jurisdiction over these actions irrespectively of the amount in issue.

In issuing any final order on actions instituted under this section, the Court may levy such costs as it may deem proper on any of the parties in the action.

Section 23.- Penal Sanctions.- Any person who personally or through his agents, representatives or employees, engages in constructing, establishing or operating a water connection system, or who uses or utilizes the waters and bodies of water in Puerto Rico without the corresponding permit or franchise issued by the Secretary shall be guilty of a misdemeanor and, upon conviction, shall be punished by a fine of not more than five hundred ($500.00)

dollars or by imprisonment for not to exceed six (6) months, or both, in the discretion of the Court.

It shall also be a misdemeanor, punishable by the aforesaid penalties, to violate any order, decision or decree issued by the Secretary, or any condition or requirement established in a permit or franchise, or any of the provisions of this act or of the regulations promulgated thereunder.

Each day during which there persists the violation of any provision, requirement, determination, order or regulation of the Secretary, or of any of the provisions of this act, or of a final decree issued by the Superior Court of Puerto Rico shall constitute a separate and distinct violation.

Exclusive jurisdiction is granted to the Superior Court of Puerto Rico to hear the offenses established in this section.

Section 24.- Separability.- If any clause, paragraph, section, article or part of this act is declared unconstitutional by a court of competent jurisdiction, the judgment rendered to that effect shall not affect, prejudice, or invalidate the rest of this act, its effects being limited to the clause, paragraph, section, article or part of this act so declared unconstitutional.

Section 25.- Repeals.- The following sections of the Civil Code of Puerto Rico, 1930 Edition, are hereby repealed: Sections 342, (except clause 5), 343, 344, 346, 348, 349, 351, 352, 353, 358. The Law of Waters of March 12, 1903 is likewise repealed, excepting the following sections: 4, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104,

105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129, 130, 131, 132, 151, 154, 158, 176, 179, 226.

Section 26.- Effectiveness.- This act shall take effect immediately after its approval.