

Biosphere Environment and Health Systems Series

**Volume 2**  
**Policies and Guidelines**  
**on**  
**Wastewater Disposal Systems**



**WASTEWATER**

Compiled by

**Bonifacio B. Magtibay**

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LIBRARY IRC  
PO Box 93190, 2509 AD THE HAGU  
Tel.: +31 70 30 689 80  
Fax: +31 70 35 899 64  
BARCODE: 17628  
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BONIFACIO B. MAGTIBAY**

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# **DEDICATION**

**This piece of work is sincerely dedicated:**

- \* To my wife - Memotte  
and my sons - Christian Paul and  
Christiel John;**
- \* To my brothers and sisters, my in-laws  
and in remembrance of my parents;**
- \* To my fellow Sanitary Engineers in the  
Philippines;**
- \* To my colleagues in the water and sanitation  
sector.**

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# PREFACE

This book is a compilation of **Policies and Guidelines on Wastewater Disposal Systems**. This is an attempt to address the scarcity of such reference materials available in one book that will guide a sanitary engineer in the practice of his or her profession in the Philippines, particularly on wastewater disposal systems. Pertinent policies and guidelines included here were obtained from existing laws, regulations, and standards such as Republic Acts, Presidential Decrees, Board Resolutions, Administrative Orders, Implementing Rules and Regulations, and other relevant statutes which are packaged in chronological order to track down the sequence of policy development. To maintain emphasis on wastewater, full text is used if the policies and guidelines are directly concerned about the subject while excerpts were presented if otherwise.

Since wastewater is also the concern of other groups, this compilation is also intended for the use of other related professionals, local government units, planning officers, researchers, policy makers, teachers, consultants, business firms, board exam reviewees, students, and the public in general who may be interested in the field of wastewater disposal, environmental health and environmental management.

Because imperfection is inevitable, the compiler welcomes any suggestion or comment that will further improve the presentation of this book. Calling his attention for any error that may be noticed will be highly appreciated.

B.B.M.

E-mail: [bmagtibay@yahoo.com](mailto:bmagtibay@yahoo.com)

30 October 1999

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The compiler will not forget the efforts of his former bosses at DOH (Engr. Delfin Gonzalez, Engr. Pablo Imperio, Dr. Lina Manapsal, and Dr. Manuel Roxas) and at UNICEF (Mr. Philippe Heffinck and Mr. Hernan Jaramillo) who provided a valuable inspiration in pursuing his career in the field of water and sanitation.

The encouragement and support of his wife and children is a motivating factor for the completion of this book. Finally, he would like to give his praise and thanksgiving to God Almighty who provided him strength, patience, endurance and needed resources.

**B.B.M.**



# INTRODUCTION

Wastewater as used in this book would mean sewage, sullage, storm water and other liquid wastes generated from domestic, commercial and industrial activities. Systems as considered in this book include sewerage and drainage dealing with the processes of collection, disposal, treatment and reuse of wastewater.

Wastewater disposal systems is not only the concern of modern man. Ancient civilizations, such as the Roman Empire, were very particular with these. Aqueducts had been built to transport water from the mountains to the city to meet their water supply demand. To dispose wastewater, sewer lines and drainage were constructed.<sup>1</sup>

In the Philippines, disposal of wastewater is turning to be an enormous challenge. This is the concern of NEDA Board Resolution No. 5, series of 1994 which stated the national policy for urban sewerage and sanitation. The country's rapid population increase coupled with industrialization efforts produced pressures to the capacity of the environment to absorb generated wastes. Untreated wastes are hazards to health and environment. Epidemics, fish kills, floods, and other related disasters on record proved the menace brought by poor management of wastewater which claimed several lives and debilitated a number of people mostly affecting children. Wastewater, if not properly handled, will further reduce the remaining limited quantity of good water to the detriment of all. Being aware of these, the Philippine government has formulated policies and guidelines that will ensure proper management of the country's wastewater.

The professionals mandated by law (R.A. 1364) to deal with wastewater disposal are the **sanitary engineers**. Related to this, a professional **sanitary engineer** once said, "Only the

**sanitary engineers** have the express authority to survey, design, direct, manage, be consulted, and investigate any activity pertaining and related to pollution, whether in water, air and land.<sup>1</sup> Considering the legal mandate, it is necessary that a **sanitary engineer** must be familiar with the concerned policies and guidelines on environmental pollution in particular to wastewater as contained in this book so as to maintain his or her good practice of sanitary engineering in the Philippines.

<sup>1</sup>L. Sprague de Camp (1963), *The Ancient Engineers*, Ballantine Books, USA, pp. 202-219

<sup>2</sup>*Environmental Pollution: The Challenge to the Sanitary Engineering Profession. A paper presented by Engr. Eludero S. Salvo to the 4th National Convention of the Philippine Society of Sanitary Engineers, Manila Midtown Hotel, 2-4 December 1992.*

# ACRONYMS/ABBREVIATIONS

ABS-	Acrylonitrile-Butadiene Styrene
ACGIH-TLV's-	American Conference of Governmental Industrial Hygienist Threshold Limit Values
A. O. -	Administrative Order
APHA -	American Public Health Association
ASCE-	American Society of Civil Engineers
ASTM-	American Society for Testing and Materials
BOD -	Biochemical Oxygen Demand
COD -	Chemical Oxygen Demand
CPSO -	Central Sanitation/Sewerage Program Support Office
DBM -	Department of Budget and Management
DENR-	Department of Environment and Natural Resources
DILG -	Department of Interior and Local Government
DOF -	Department of Finance
DOH -	Department of Health
DPWH -	Department of Public Works and Highways
EHS-	Environmental Health Service
EMB-	Environmental Management Bureau

E.O. -	Executive Order
FU-	Fixture Unit
IAC -	Inter-Agency Committee
INFRACOM -	Infrastructure Committee
IPS-	Iron Pipe Size
IRR -	Implementing Rules and Regulations
ITN -	International Training Network
LGU -	Local Government Unit
LWUA -	Local Water Utilities Administration
MDF -	Municipal Development Fund
MLSS-	Mixed Liquor Suspended Solids
MWSS-	Metropolitan Waterworks and Sewerage Systems
NEDA -	National Economic and Development Authority
NPCC -	National Pollution Control Commission
NPI -	New/Proposed Industry
O & M -	Operation and Maintenance
OEI -	Old or Existing Industry
P.D. -	Presidential Decree
PCB -	Polychlorinated Byphenyl
PSSE -	Philippine Society of Sanitary Engineers
PVC-	Polyvinyl Chloride

<b>PWU -</b>	<b>Philippine Women's University</b>
<b>R.A. -</b>	<b>Republic Act</b>
<b>RBW -</b>	<b>Receiving Body of Water</b>
<b>TDS -</b>	<b>Total Dissolved Solids</b>
<b>TSS -</b>	<b>Total Suspended Solids</b>
<b>UNICEF -</b>	<b>United Nations Children's Fund</b>
<b>WHO -</b>	<b>World Health Organization</b>

# **001 DRAINAGE OF BUILDINGS**

## **(CIVIL CODE)**

*EXCERPTS from the CIVIL CODE OF THE PHILIPPINES R. A. No. 386 (Approved, June 18, 1949)*

### **Title VII - EASEMENTS OR SERVITUDES**

#### **CHAPTER 2**

#### **LEGAL EASEMENTS**

#### **SECTION 6 - Drainage of Buildings**

- Art. 674. The owner of a building shall be obliged to construct its roof or covering in such manner that the rain water shall fall on his own land or on a street or public place, and not on the land of his neighbor, even though the adjacent land may belong to two or more persons, one of whom is the owner of the roof. Even if it should fall on his own land, the owner shall be obliged to collect the water in such a way as not to cause damage to the adjacent land or tenement.
- Art. 675. The owner of a tenement or a piece of land, subject to the easement of receiving water falling from roofs, may build in such a manner as to receive the water upon his own roof or give it another outlet in accordance with local ordinances or customs, and in such a way as not to cause any nuisance or damage whatever to the dominant estate.
- Art. 676. Whenever the yard or court of a house is surrounded by other houses, and it is not possible to give an outlet through the house itself to the rain water collected thereon, the establishment of an easement of drainage can be demanded, giving an outlet to the water at the point of the contiguous lands or tenements where its egress may be easiest, and establishing a conduit for the drainage in such manner as to cause the least damage to the servient estate, after payment of the proper indemnity.

## 002 SEWERAGE AND SANITATION PROVISIONS (PLUMBING LAW)

*EXCERPTS FROM THE PLUMBING LAW- AN ACT TO  
REGULATE THE TRADE OF MASTER PLUMBER, R.A.  
1378 (Approved, June 18, 1955)*

Sec. 5. The President of the Philippines is hereby authorized to issue rules and regulations to carry into effect the objectives of this Act, upon recommendation of the Board of Examiners for Master Plumbers and in consultation with a duly registered national association of master plumbers, in accordance with the following basic principles, except in cases where it may prove oppressive or exclusively burdensome to those without sufficient means and to such buildings, structures or constructions valued at five thousand pesos or less;

(e) Every building having plumbing fixtures installed and intended for human habitation, occupancy or use on premises abutting on a street, alley, or easement in which there is a public sewer shall have a connection with the sewer.

(f) Each family dwelling unit on premises abutting on sewer or with a private sewage-disposal system shall have, at least, one water closet and kitchen-type sink. It is further recommended that a lavatory and bath-tub or shower shall be installed to meet the basic requirements of sanitation and personal hygiene.

All other structures for human occupancy or use on premises abutting on a sewer or with a private sewage-disposal system shall have, at least, one water closet and kitchen-type sink. It is further recommended that a lavatory and bath-tub or shower shall be installed to meet the basic requirements of sanitation and personal hygiene.

All other structures for human occupancy or use on premises abutting on a sewer or with a private sewage-disposal system

shall have adequate sanitary facilities but in no case less than one water closet and one other fixture for cleansing purposes.

- (g) Plumbing fixtures shall be made of smooth, non-absorbent material, and shall be free from concealed fouling surface.
- (h) The drainage system shall be designed, constructed, and maintained so as to guard against fouling, deposits of solids, and clogging, and with adequate cleanouts so arranged that the pipes may be readily cleaned.
- (i) The piping of the plumbing system shall be of durable materials, free from defective workmanship and so designed and constructed as to give satisfactory service for its reasonable expected life.
- (j) Each fixture directly connected to the drainage system shall be equipped with a water-seal trap.
- (k) The drainage system shall be designed to provide an adequate circulation of air in pipes with no danger of siphonage, aspiration, or forcing of trap seals under conditions of ordinary use.
- (l) Each terminal shall extend to the outer air and be so installed as to minimize the possibilities of clogging and the return of foul air to the building.
- (m) The plumbing system shall be subject to such tests as will effectively disclose all leaks and defects in the work.
- (n) No substances which will clog the pipes, produce explosive mixtures, destroy the pipes or their joints, or interfere unduly with the sewage-disposal process shall be allowed to enter the building drainage system.
- (o) Proper protection shall be provided to prevent contamination of food, water sterile goods, and similar materials by backflow of sewage. When necessary, the fixture, device or appliance shall be connected indirectly with the building drainage system.



- (p) No water closet or urinal shall be located in a room or compartment which is not properly lighted and ventilated.
- (q) If water closets or other plumbing fixtures are installed in building where there is no sewer within a reasonable distance, suitable provision shall be made for disposing of the building sewage by some accepted method of treatment and disposal.
- (r) Where a plumbing drainage system may be subjected to backflow of sewage, suitable provision shall be made to prevent its overflow in the building.
- (s) Plumbing system shall be maintained in a sanitary and serviceable condition.
- (t) All plumbing fixtures shall be so installed with regard to spacing as to be reasonably accessible for their intended use.
- (u) Plumbing shall be installed with due regard to the preservation of the strength of structural members and prevention of damage to walls and other surfaces through fixtures usage.
- (v) Sewage or other waste from a plumbing system which may be deleterious to surface or subsurface waters shall not be discharged into the ground or into any waterway unless it has first been rendered innocuous through subjection to some accepted form of treatment.

## 003 SOURCES OF FUND FOR FLOOD CONTROL PROJECTS

*(EXCERPTS FROM P.D. No. 18-Signed by President Ferdinand E. Marcos, 7 October 1972)*

In order to provide for the proper financing of the project, there is hereby created a Greater Manila Metropolitan Area and Drainage Fund Account to be deposited in the National Treasury which shall be constituted from the following sources:

- (a) Proceeds from a special metropolitan flood tax of twenty-five (P0.25) centavos levied on all admission tickets of movie houses in Greater Manila for a period of fifteen (15) years;
- (b) Fund releases from appropriation of various Public Work Acts for the Project;
- (c) Proceeds from additional real estate taxes (not exceeding one-eighth (1/8) of 1 % of the assessed value of real state located within Metropolitan Manila), other taxes or sources which may be imposed if and when the funds generated by the special metropolitan flood tax on theater admission is not sufficient to complete and maintain the flood control and drainage project.

## **004 SEWERAGE PROVISIONS**

### **(PROVINCIAL WATER UTILITIES ACT)**

*(EXCERPTS FROM P.D. NO. 198, Signed by President Ferdinand E. Marcos on 25 May 1973)*

#### **TITLE II - LOCAL WATER DISTRICT LAW**

##### **Chapter VII - Powers of District**

*Sec. 29. Sewerage.* - A district may require, construct, operate and furnish facilities and services, within or without the district, for the collection, treatment and disposal of sewage, waste and storm water. The district may only furnish such services outside the district by means of facilities designed primarily to serve inside the district. Upon providing a sewer system in any area of the district, the district may require all buildings used by human beings to be connected to the sewer system within such reasonable time as maybe prescribed by the district, provided that the property upon which such building to be connected stands is located within 35 meters of an existing main of the district's sewer system. After due notice thereof and refusal on the part of the property owner to so connect with the district's sewer system, the district may declare the further maintenance or use of cesspools, septic tanks, or other local means of sewerage disposal in such area to be a public nuisance and, after notice and writing of at least 10 days, deprive said property owner of any and all services provided by the district, which sanction may be co-extensive with the period during which the property owner persists in refusing to connect with the district's sewer system.

##### **Chapter IX - Revenues**

*Sec. 38. Service and Stand-By Charges - Sewer.* - A district may prescribe and collect rates and other charges for sewer services furnished. A district may also fix, levy and collect a sewerage and wastewater service stand-by or availability charge in the event sewer service is available and no connection is made. Such rates and charges may be collected with the water charges of the district. In the event of failure to pay the whole or any part thereof, district may continue any and all services for which such bill is rendered, including water, sewer, and other district services: Provided, That this provision shall not be construed to prohibit the district from collecting rates and other charges in any other lawful manner.

## 005 SEWAGE DISPOSAL PROVISIONS (IRR of P.D. 522)

*(EXCERPTS FROM THE IRR of P.D. 522, DOH Department Circular No. 220, s. 1974, Signed on 5 August 1974)*

### GENERAL PROVISIONS - WASTE DISPOSAL

**1. Comfort Rooms** - All eating and recreational establishments, rest areas, service stations, picnic grounds, airports, seaports, and other similar business establishments catering to the traveling public shall be provided with adequate number of comfort rooms and sanitary facilities conveniently located and in conformity with the following requirements:

- a) *Approval of plans* - Plans of the comfort rooms, individual sewage disposal system and sub-surface absorption system or other treatment devise shall be approved by the local health authority.

The number of sanitary facilities for each sex shall be determined by the health authority upon submission of the plans, but in all cases shall have at least one for each sex.

- b) *Structural requirements:*
- i. **Size of toilet rooms** - No toilet room shall have a floor area less than one and a half (1.5) square meters nor height less than 2.5 meters.
  - ii. **Lighting and ventilation**- All toilet rooms shall have sufficient lighting and ventilation either natural or artificial. If windows shall be provided , the window area shall not be less than one-fourth (1/4) the floor area.
  - iii. **Floors and walls** - The floors and walls shall be made of non-impervious materials like concrete and constructed to be easily cleanable and smooth. If floor is finished with colored cement or tiles, some should be laid evenly and easily

cleanable.

The walls shall be evenly plastered, smooth and easily cleanable, finished in light color or can be provided with tile wainscoting of a minimum height of 1.2 meters evenly laid.

The toilet compartment shall be provided with ceiling finished in light color.

The floor, walls and ceiling shall always be kept clean and maintained in good repair at all times.

- iv. Doors - Doors of toilet compartments shall be self-closing and shall not open directly to any food preparation area or to areas where utensils are washed and stored.

c) *Sanitary facilities:*

- i. Water closet - the water closet shall be seat type made of vitreous china or even material. It could either be a compact type or provided with an elevated tank to contain sufficient volume of water enough to flush the water closet after use.
- ii. Lavatory facilities - adequate and conveniently located hand washing facilities shall be provided in toilet compartment for each sex. A sign "Wash Your Hand After Using the Toilet" shall be posted at a conspicuous place.
- iii. Urinal - Urinal shall be provided in the men's toilet compartment. It can be either wall-hung urinal or built-in. If built-in urinals are provided, it shall be of sufficient length, properly tiled and provided with sufficient water flowing at all times.
- iv. Garbage cans - there shall be provided at least one garbage can near the lavatory with tight fitting cover for the disposal of used paper towels and other waste materials.

- d) *Sanitary maintenance* - all toilet compartments including the sanitary facilities shall be kept clean and sanitary at all times. No wastewater shall be permitted to be exposed to flies and animals. The surrounding area shall be free from accumulation

of rubbish and maintained clean at all times.

## 2. Sewage Collection and Disposal

- a) *Sewage Collection* - the sewage from the house plumbing system shall be connected to a public sewerage system if available or to a septic tank.
  - i. **Septic tank** - shall be generally rectangular in shape built of concrete or other materials. Brick or concrete blocks may be used where practical. The walls of the septic tank shall be plastered inside, be water tight and free from leaks. Septic tank of any other type or materials shall need the approval of the health authority before being installed.
  - ii. **Capacity** - the septic tank capacity shall be determined from the estimated unit flow per table attached "Quantities of Sewage Flow" based on adequate detention time. For residences, hotels, motels, boarding houses, apartment houses, and rooming houses, the number of persons to be served shall be computed on the basis of the number of rooms with each bedroom occupied by 2 persons or on the basis of the actual number of persons served by the tanks whichever is greater.
- b) **Disposal of Septic Tank Effluent** - the septic tank effluent shall be discharged into a sub-surface soil absorption field where applicable or shall be treated with some type of purification device. The treated effluent shall conform to the quality standards prescribed by the National Pollution Control Commission. The requirement of absorption field is as follows:
  - i. All drain tiles shall be laid in washed and screened gravel, slag or rock of similar material of such size retained on a six millimeter screen. Broken shell if retained on a twelve millimeter screen may be used where practical. The previous material shall extend from a minimum distance of ten centimeters below the drain tile up to top of drain tile.
  - ii. The maximum depth from the bottom of drain tile to the finished grade of the ground shall not exceed sixty centimeters and the drain field shall be laid above the ground

water table by at least ninety centimeters.

- iii. The minimum width of the trench containing the drain tile shall be thirty centimeters. The maximum width shall be forty-five centimeters.
- iv. Pipes used in the absorption field shall be not less than ten centimeters inside diameter and shall be made of concrete, vitrified clay or other approved materials.
- v. Drain pipe shall be laid with open joints not to exceed six millimeters. All open joints shall be covered on top and down along the open sides with heavy asphalt-treated building paper or other approved material before careful backfilling of trench.
- vi. All drain lines shall be graded from the outlet of the tank and distribution box with a downward slope of 0.3 % to 0.5%.
- vii. Distance between laterals shall be no less than ninety centimeters with 2.40 meters or more recommended.
- viii. The maximum lateral length shall not exceed 25 meters and when more than one lateral is used all trenches shall be the same lengths as near as practical with topographic condition.
- ix. In the disposal of septic tank effluent, grease and/or kitchen waste or laundry waste, pumps, dry wells, seepage pits or drain wells shall not be used.
- x. The area of absorption field shall be determined from maximum daily sewage flow as estimated after conduction of percolation test.
- xi. Distribution boxes shall be provided on all drain field and shall be of sufficient size to accommodate the required number of drain field lines. Each drain field lines shall be connected individually to the distribution box.
- xii. Areas for absorption beds of drain fields shall consists of comparatively uniform soils free of impervious materials

to depth of 1.8 meters and shall give an adequate percolation time under saturated conditions.

- c. **Plumbing Connections** - All plumbing installations shall be in accordance with the National Plumbing Code of the Philippines and shall have proper size installed and maintained as to carry adequate quantities of water and to properly convey sewage and other liquid wastes from the toilet compartments to the sewerage or sewage disposal system.



## **006 SEWAGE DISPOSAL AND DRAINAGE PROVISIONS (SANITATION CODE)**

*(EXCERPTS FROM THE CODE ON SANITATION OF THE PHILIPPINES P.D. 856-Signed by President Ferdinand E. Marcos, Manila, 23 December 1975)*

### **CHAPTER XVII - SEWAGE COLLECTION AND DISPOSAL, EXCRETA DISPOSAL AND DRAINAGE**

*Sec. 71.* Definition of Terms. As used in this Chapter, the following terms shall mean:

- a. Public sewerage system - a system serving twenty-five (25) persons or more.
- b. Septic tank - a water tight receptacle which receives the discharge of a plumbing system or part thereof, and is designed to accomplish the partial removal and digestion of the suspended solid matter in the sewage through a period of detention. Its construction shall be in accordance with specifications prescribed in this Chapter.
- c. House sewer - the pipe line conveying sewage from the house or building to the septic tank or to any point of discharge.
- d. Septic tank absorption bed or drain field - an underground system of pipes leading from the outlet of the septic tank, consisting of open-joined or perforated pipes so distributed that the effluent from a septic tank is oxidized and absorbed by the soil.
- e. Effective capacity of a septic tank - the actual liquid capacity of a septic tank as contained below the liquid level line of the tank.
- f. Effective depth of a septic tank - the actual liquid depth of a septic tank as measured from the inside bottom of the septic tank to the liquid level line.
- g. Freeboard or air space of a septic tank - the distance as measured from the liquid level line to the inside top of the septic tank.

- h. Distribution box - a small concrete receptacle between the septic tank and the drain field from which lines of drain tile extends and which acts as surge tank to distribute the flow of sewage equally to each line of drain tile.
- i. Approved excreta disposal facilities shall mean any of the following:
  - 1. Flush toilets properly connected to a community sewer;
  - 2. Flush toilets properly connected to a septic tank constructed in accordance with this Chapter;
  - 3. Any approved type pit privy built in accordance with this Chapter; and
  - 4. Any disposal device approved by the Secretary or his duly authorized representative.
- j. Privy - a structure which is not connected to a sewerage system and is used for the reception, disposition and storage of feces or other excreta from the human body.
- k. Septic privy - where the fecal matter is placed in a septic tank containing water and connected to a drain field but which is not served by a water supply under pressure.
- l. Box and can privy - a privy where fecal matter is deposited in can bucket which is removed for emptying and cleaning.
- m. Concrete vault privy - a pit privy with a pit lined with concrete in such manner as to make it water tight.
- n. Chemical privy - a privy where fecal matter is deposited into a tank containing a caustic chemical solution to prevent septic action while the organic matter is decomposed.

*Sec. 72.* Scope of Supervision of the Department. The approval of the Secretary or his duly authorized representative is required in the following matters:

- a. Construction of any approved type of toilet for every house

including community toilet which may be allowed for a group of small houses of light materials or temporary in nature;

- b. Plans of individual sewage disposal system and the sub-surface absorption system, or other treatment device;
- c. Location of any toilet or sewage disposal system in relation to a source of water supply;
- d. Plans, design, data and specifications of a new and existing sewerage system or sewage treatment plant.
- e. The discharge of untreated effluent of septic tanks and/or sewage treatment plants to bodies of water;
- f. Manufacture of septic tanks; and
- g. Method of disposal of sludge from septic tanks or other treatment plants.

*Sec. 73.* Operation of Sewage Treatment Works. Private or public sewerage system shall:

- a. Provide laboratory facilities for control tests and other examinations needed;
- b. Forward to the local health authority operating data, control tests and such other records and information as may be required;
- c. Inform the local health authority in case of breakdown or improper functioning of the sewage treatment works; and
- d. Provide for the treatment of all sewage entering the treatment plant.

*Sec. 74.* Requirements in the Operation of Sewage Works and Sewage Treatment Plants.

The following are required for sewerage works and sewage treatment plants:

- a. All houses covered by the system shall be connected to the sewer

in areas where a sewerage system is available.

- b. Outfalls discharging effluent from a treatment plant shall be carried to the channel of the stream or to deep water where the outlet is discharged.
- c. Storm water shall be discharged to a storm sewer, sanitary sewage shall be discharged to a sewerage system carrying sanitary sewage only; but this should not prevent the installation of a combined system.
- d. Properly designed grease traps shall be provided for sewers from restaurants or other establishments where the sewage carries a large amount of grease.

*Sec. 75. Septic Tanks.* Where a public sewerage system is not available, sewer outfalls from residences, schools, and other buildings shall be discharged into a septic tank to be constructed in accordance with the following minimum requirements:

- a. It shall be generally rectangular in shape. When a number of compartments are used, the first compartment shall have a capacity from one-half to two-thirds of the total volume of the tank.
- b. It shall be built of concrete, whether precast or poured in place. Brick, concrete blocks or adobe may be used.
- c. It shall not be constructed under any building and within 25 meters from any source of water supply.

*Sec. 76. Disposal of Septic Tank Effluent.* The effluent from septic tank shall be discharged into a sub-surface soil, absorption field where applicable or shall be treated with some type of purification device. The treated effluent may be discharged into a stream or body of water if it conforms to the quality standards prescribed by the National Water and Air Pollution Control Commission.

*Sec. 77. Determination of Septic Tank Capacity.* The septic tank capacity may be determined from the estimated unit flow contained in Table 1 "Quantities of Sewage Flow", based on adequate detention time interval resulting in efficient sedimentation. Daily

flow from metered results, may be used as estimated flow when available. For edifices with occupants, the number of persons to be served shall be computed on the number of rooms with each room considered as occupied by two persons or on the basis of the actual number of persons served by the tank, whichever is greater.

**Table 1. QUANTITIES OF SEWAGE FLOW**

<u>Type of Establishment</u>	<u>Gals./Day/Person</u>
Small dwellings and cottages	50
Large dwellings with numerous fixtures	75-100
Multiple family residence	50
Rooming houses	40
Boarding houses	50
Hotels and motels	50
Restaurants (toilet and kitchen wastes per person)	7-10
Restaurants (kitchen wastes per meal served)	1-2/2-3
Kitchen wastes at hotels, camps, boarding houses, etc., serving 3 meals/day	7-10
Tourist camps or trailer parks	35-50
Resort camps (night and day) with limited plumbing	50
Luxury camps	75-100
Work or construction camps (semi-permanent)	50
Day school without cafeterias, gymnasiums or showers*	8
Day school with cafeterias but no gyms or showers* (Quantity estimated from no. of meals served or 80% of enrolment)	12
Day school with cafeterias, gyms and showers (Quantity estimated from maximum no. expected to use gyms and showers in one day)	20
Boarding schools	75-100
Day workers at schools and offices	15
Hospitals* (Gallons per bed)	150-250
Public institutions other than hospitals	75-125
Factories (Gal./person/shift, exclusive of industrial wastes)	15-35
Public picnic parks (toilet wastes only)	5
Picnic parks, with bathhouse, showers and flush toilets	10
Swimming pools and bathing places*	10
Luxury residences and estates	100-150
Country clubs per resident members*	25-50

\*Subsurface drain fields not recommended for secondary treatment

*Sec. 78. Sanitary Privies.* The privy recommended for use is the sanitary privy. It shall conform with the following minimum requirements:

- a. It shall consist of earthen pit, a floor covering the pit, and a water-sealed bowl. It shall be so constructed in order that fecal matter and urine will be deposited into the earthen pit which shall be completely fly-proof.
- b. The pit shall be at least one meter square.
- c. The floor should cover the pit tightly to prevent the entrance of flies. It shall be constructed of concrete or other impervious material.
- d. The water-sealed bowl shall be joined to the floor so as to form a water-tight and insect proof joint.
- e. A suitable building, shall be constructed to provide comfort and privacy for the users of the privy.
- f. Wooden floors and seat risers shall not be used.

*Sec. 79. Drainage.*

- a. *Responsibility of cities and municipalities.* It shall be the responsibility of all cities and municipalities to provide and maintain in a sanitary state and in good repair a satisfactory system of drainage in all inhabited areas where waste water from buildings and premises could empty without causing nuisance to the community and danger to public health.
- b. *Connection to the municipal drainage system.* Buildings or premises producing waste water shall be connected to the municipal drainage system in all areas where it exists.

*Sec. 80. Special Precaution for Radioactive Excreta and Urine of Hospitalized Patient.*

- a. Patients given high dosages of radioactive isotope for therapy should be given toilet facilities separate from those used by "non-radioactive" patients.
- b. Radioactive patients should be instructed to use the same toilet bowl at all times and to flush it at least three times after its use.

## **007 DRAINAGE PROVISIONS (WATER CODE)**

*(EXCERPTS FROM THE WATER CODE OF THE PHILIPPINES -PD 1067 -Signed by President Ferdinand E. Marcos, 31 December 1976)*

### **Chapter IV**

#### **UTILIZATION OF WATERS**

- Art. 44. Drainage systems shall be so constructed that their outlets are rivers, lakes, the sea, natural bodies of water, or such other water course as may be approved by the proper government agency.
- Art. 45. When a drainage channel is constructed by a number of persons for their common benefit, the cost of construction and maintenance of the channel shall be borne by each in proportion to the benefits derived.
- Art. 46. When artificial means are employed to drain water from higher to lower land, the owner of the higher land shall select the routes and methods of drainage that will cause the minimum damage to the lower lands., subject to the requirements of just compensation.

## **008 WASTEWATER DISPOSAL AND DRAINAGE PROVISIONS (NATIONAL BUILDING CODE)**

*EXCERPTS FROM THE NATIONAL BUILDING CODE  
PD 1096 -Signed by President Ferdinand E. Marcos,  
Manila, 19 February 1977)*

### **Chapter 9 - Sanitation**

#### *Sec. 903. Wastewater Disposal System -*

- (a) Sanitary sewage from buildings and neutralized or pre-treated industrial wastewater shall be discharged directly into the nearest street sanitary sewer main of existing municipal or city sanitary sewerage system in accordance with the criteria set by the Code on Sanitation and the National Pollution Control Commission.
- (b) All buildings located in areas where there are no available sanitary sewerage system shall dispose their sewage to "Imhoff" or septic tank and subsurface absorption field.
- (c) Sanitary and industrial plumbing installations inside buildings and premises shall conform to the provisions of the National Plumbing Code.

#### *Sec. 904. Storm Drainage System.*

- (a) Rainwater drainage shall not discharge to the sanitary sewer system.
- (b) Adequate provision shall be made to drain low areas in buildings and their premises.



## **009 LIQUID WASTE DISPOSAL PROVISIONS (ENVIRONMENT CODE)**

*EXCERPTS FROM THE PHILIPPINE ENVIRONMENT  
CODE, P.D. 1152 (Approved by President Ferdinand E.  
Marcos, 6 June 1977)*

### **TITLE V - WASTE MANAGEMENT**

#### **Chapter III - Methods of Liquid Waste Disposal**

*Sec. 50.* Liquid Waste Disposal. Wastewater from manufacturing plants, industries, community, or domestic sources shall be treated either physically, biologically or chemically prior to disposal in accordance with the rules and regulations promulgated by proper government authority.

1. Location, dimensions, and elevations of existing and proposed plant facilities.
2. Elevation of high and low water levels of the body of water to which the plant effluent is to be discharged.
3. Type, size, pertinent features, and manufacturer's rated capacity of all pumps, blowers, motors and other mechanical devices.
4. Minimum, average, and maximum hydraulic flow in profile.
5. Adequate description of any features not otherwise covered by specifications in the engineering report.

**SEC.20.** Specifications. - Complete technical specifications for the construction of sewers, sewage pumping stations, sewage treatment plants, and all appurtenances, shall accompany the plans.

The specifications accompanying construction drawings shall include, but not be limited to, all construction information not shown on the drawings which is necessary to inform in detail the builder of the design requirements as to the quality of materials and workmanship and fabrication of the project and the types, size, strength, operating characteristics and rating of equipment, including machinery, valves, piping, and jointing of pipe; electrical apparatus, wiring, meters; laboratory fixtures and equipment; construction materials; special filter materials such as stone, sand, gravel or slag; miscellaneous appurtenances; chemicals when used; instructions for testing materials and equipment as necessary for meet design standards; and operating tests for the completed works and component units.

**SEC.21.** Revisions of Approved Plans. - No deviation from the approved plans or specifications affecting capacity, flow or operation of units shall be implemented without prior written approval from the Commission.

**CHAPTER IV**

**SEWERS AND SEWAGE PUMPING STATION**

**SEC.22. Capacity of Sanitary Sewers. -**

(a) New sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 200 liters per day. This figure is assumed to cover normal infiltration in the system, but an additional allowance should be made where conditions are unfavorable.

(b) The maximum hourly quantity of domestic sewage, commercial and industrial wastes, and groundwater infiltration shall be considered in determining the capacities of sanitary sewers.

(c) Laterals and minor sewers shall be designed, when flowing full, by assuming flows equivalent to four times the average daily flows, unless lesser design flows are justified by studies covered in the engineering report.

**SEC.23. Minimum Size.-** No gravity sewer conveying raw sewage shall be less than 200 mm. in diameter. The use of 150 mm. diameter pipe will be given consideration where the design computations justify its use.

**SEC.24. Slope.-**All sewers shall be so designed and constructed as to give mean velocities, when flowing full, of not less than 0.6 m/s based on Manning's formula using an "n" value of 0.013. Use of other practice "n" values may be permitted if deemed justifiable on the basis of research or field data presented. The following are the minimum slopes which should be provided; however, slopes greater than these are desirable:

Sewer Size I.D. (in mm)	Minimum Slope Meter/100m.
150	0.65
200	0.40
250	0.28
300	0.22
360	0.17

410	0.14
530	0.10
600	0.08
760	0.058
900	0.046

Note: For lines larger than 900 mm (36") in diameter, the slope shall be determined by a standard recognized formula to maintain a minimum velocity of 0.6 m/s (2 feet per second).

*SEC. 25. High Velocity Protection.* - In the case of sewers where the slope and volume are such that a velocity of 4.6 m/s is realized at average flow, special provisions shall be made to protect against erosion and shock.

*SEC. 26. Alignment.*- Sewers 600 mm. (24" or less in diameter shall be laid in straight alignment with uniform grade between manholes. The alignment shall be checked by lamping.

*SEC. 27. Changes in Pipe Size.* - When a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient as in the previous pipe.

*SEC. 28. Superimposed Loads.* - All sewers shall be designed to prevent damage from superimposed loads. Proper allowance for loads on the sewer shall be made because of the width and depth of the trench. Where necessary to withstand extra-ordinary superimposed loading, special bedding, concrete cradle or special construction may be used.

*SEC. 29. Trenching.* - The width of the trench shall be ample to allow the pipe to be laid and jointed properly and to allow the backfill to be placed and compacted as needed. The trench side shall be kept as nearly vertical as possible. When wider trenches are dug, appropriate bedding class and pipe strength shall be used.

Ledge rocks, boulders, and large stones shall be removed to provide a minimum clearance of 10 centimeters below and on each side of all pipes.

*SEC. 30. Backfill.*-Backfill shall be made of a suitable material removed from excavation except where other material is specified. Debris,

large clods or stones, organic matter, or other unstable materials shall not be used for backfill within 0.60 m. of the top of the pipe. Backfill shall be placed in such a manner as not to disturb the alignment of the pipe.

*SEC. 31. Joints.* - The manner of the installation of joints and the materials used shall be included in the specifications. Sewer joints shall be designed to minimize infiltration and to fully prevent the entrance of roots into the pipe throughout the life of the system.

*SEC. 32. Leakage Test.* - Leakage test shall be specified. This may include appropriate water or low pressure air testing. The leakage outward or inward (exfiltration or infiltration) shall not exceed 20 liters per millimeter of pipe diameter per kilometer per day for any section of the system. An exfiltration or infiltration test shall be performed with a positive head of equal to the depth of the upstream manhole but not less than 0.60 meter.

*SEC. 33. Manholes.* -

(a) Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 120 meters for sewers 380 mm in diameter or less and 150 meters for sewers 460 to 760 mm in diameter. Greater spacing may be permitted in larger sewers.

(b) The location of manholes in streams should be avoided.

(c) The flow channel through manholes should be read to conform in shape and slope to that of the sewers.

(d) A drop pipe should be provided for a sewer entering a manhole at an elevation of 0.60 m. or more above the manhole invert. Where the difference between the incoming sewer and the manhole invert is less than 0.60 m. the invert should be filleted to prevent solid deposition. In general, drop manholes shall be constructed with an outside drop connection. The entire drop connection shall be encased in concrete material.

(e) The minimum diameter of manholes shall be 900 mm; larger diameters are preferable for large diameter sewers. A minimum access diameter of 560 mm shall be provided.

(f) Manholes shall be of pre-cast concrete, poured-in-place concrete, or other approved water-tight types. Manholes of brick or segmented block shall be waterproofed on the exterior with plastic coatings. In unstable soils, inlet and outlet pipes shall be joined to the manhole with a gasketed flexible watertight connection arrangement that allows differential settlement of the pipe, and watertight manhole covers are to be used wherever the manhole tops may be flooded by street runoff or high water. Locked manhole covers may be desirable in isolated casement locations or where vandalism may be a problem.

*SEC. 34. Inverted Siphons.*- The use of inverted siphons shall be kept to a minimum; but, where they must be used, they shall consist of at least two lines, one of which is of a size of not less than 200 mm. in diameter. The minimum velocity use, in their design shall be 0.90 m/s considering the average dry weather flow. Under the minimum dry weather flow conditions, the independent operation of one of the lines shall provide the minimum velocity of 0.90 m/s. Where the above conditions cannot be met, some other means shall be provided. The inlet and outlet details shall be so arranged that the normal flow is diverted to one barrel, and that either barrel may be out of service for cleaning.

*SEC. 35. Cross - connection.*-

(a) There shall be no physical connection between a public or private potable water supply system and sewer or appurtenance thereto which would permit the passage of any sewage or polluted water into the potable water supply. No water pipe shall pass through or come in contact with any part of a sewer manhole.

(b) Whenever possible, sewers should be laid at least 3 meters horizontally from any existing or proposed water main and should be at lower elevation than the water main.

(c) Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 0.45 meter below the bottom of the water main. This should be arranged so that the sewer joints must be equidistant and as far as possible from the water main-joints.

(d) Whenever it is impossible to obtain proper horizontal and vertical separation as stipulated above, both the water main and the sewer pipe shall be constructed of cast-iron pipe with mechanical or equivalent type joint and shall be pressure-tested to assure water tightness prior to backfilling. For greater safety the water main may be encased in concrete of at least 15 cm. thick, and the elevation of the top of the sewer (crown) shall be at least 45 cm below the bottom of the water main.

**SEC. 36. Selection of Sites of Sewage Pumping Stations.** - In selection of site for a sewage pumping station, consideration should be given to its accessibility and its potential nuisance aspects. The station shall not be prone to flooding, and it shall be accessible to all types of weather with mobile equipment. Stations shall be located as remote as possible from populated areas. Adequate measures shall be provided for continuous operation, or for emergency treatment or storage of the sewage in the event of an unanticipated breakdown of the station facilities or during power failures.

**SEC. 37. Design of Pump Stations.** - Pumping stations should preferably be of the dry well type. The following items, or such other additional items as may be necessary, shall be given consideration in the design of sewage pumping stations.

(a) At least two pumps shall be installed except that where the pumping installations will serve not more than 50 homes, a single unit will be permitted, provided: (1) the station is designed to permit the installation of a future duplicate pump with no structural changes, and (2) an overflow is permissible and the occasional discharge of sewage will not be unduly objectionable. If only two units are installed, they should have the same capacity and each shall be capable of handling flows in excess of the expected maximum flow. Where the size of the installation warrants a mechanically cleaned bar, a screen with grinder/comminutor is recommended.

(b) Pumps handling raw sewage should be preceded by readily accessible bar racks with clear openings not exceeding 5 cm unless special devices are installed to protect the pumps from clogging or damage.

- (c) Pumps should be capable of passing spheres at least 75 mm in diameter. Suction and discharge openings shall be at least 100 mm in diameter.
- (d) Pumps should be so placed that under normal operating conditions they will operate under a positive suction head.
- (e) Each pump should have an individual intake. Wet well design should be such as to avoid turbulence near the intake. Intake piping should be as straight and short as possible.
- (f) Suitable shut-off valves shall be placed on the suction and discharge line between the shut-off valve and the pump.
- (g) Provisions should be made to facilitate removal of pumps and motors for repairs and cleaning.

*SEC. 38. Ventilation in Pump Stations.-*

- (a) Adequate ventilation shall be provided for all pump stations. Where the pump pit is below the ground surface, mechanical ventilation is required.
- (b) In wet wells, ventilation should be continuous and should provide at least twelve complete air changes per hour. For intermittent operation, at least thirty complete air changes per hour shall be provided.
- (c) In dry wells, ventilation may either be continuous or intermittent. For continuous operation at least six complete air changes per hour should be provided. For intermittent operation at least thirty air changes per hour should be provided.

*SEC. 39. Force Mains.-*

- (a) At design average flow, a velocity in excess of 0.60 m/s shall be maintained.
- (b) An automatic air relief valve shall be placed at high points in the force main to prevent air locking.
- (c) Force mains should enter the gravity sewer system at a point



not more than 0.60 m above the flow line of the receiving manhole.

(d) No public force main shall be less than 100 mm in diameter.

(e) Friction losses through force mains shall be based on the Hazen and Williams formula or other acceptable methods. When the Hazen and Williams formula is used, the following values for "c" shall be used for design:

Unlined iron or steel	- 100
All others	- 120

*SEC. 40.* Power supply. - Power supply for pumping stations should be available from at least two independent generating sources; otherwise, emergency power equipment should be provided. Where this situation is not feasible, an overflow should be provided at such an elevation as to prevent the basement flooding or backwater from stream affecting operation. Where power failure would result in objectionable conditions because of the resulting discharge or basement flooding, means for emergency operation shall be provided.

## CHAPTER V

### SEWAGE TREATMENT WORKS

*SEC. 41.* Plant Locations.- In selecting a plant site the following items shall be considered:

- a. Proximity to residential areas;
- b. Proximity to water mains and other which may be affected by plant operation or vice-versa;
- c. Direction of prevailing winds;
- d. Accessibility by all-weather roads;
- e. Area available for expansion;
- f. Local zoning requirement;

- g. Local soil characteristics, geology, hydrology; and topography available to minimize pumping;
- h. Access to receiving stream or other disposal areas;
- i. Downstream uses of the receiving stream; and
- j. Compatibility of treatment process with the present and planned future land use, including noise, potential odors, air quality and anticipated sludge processing and disposal techniques.

*SEC. 42.* Quality of Effluent. - The required degree of wastewater treatment and the desired quality of effluent for sewage treatment plants shall be based on the effluent requirements and water quality standards established by the Commission.

*SEC. 43.* Required Engineering Data for New Process Evaluation. The exclusion or non-inclusion in these Rules and Regulations of some types of wastewater treatment processes or equipment should not be construed as precluding their use. The Commission may approve the use of other types of wastewater treatment processes and equipment under the condition that the operational reliability and effectiveness of the process or device shall have been demonstrated with a suitably-sized prototype unit operating at its design load conditions; and provided that monitoring observations, including test results and engineering evaluations demonstrating the efficiency of such process, are available.

*SEC. 44.* Hydraulic Loading.-

- a. The design for sewage treatment plants to serve new sewerage system, the volume and strength of existing flows shall be based on an average daily flow of 200 liters per capita unless water use data or other justifications upon which to better estimate flow are provided.
- b. Where there is an existing sewerage system, the volume and strength of existing flows shall be determined. The determination shall include both dry-weather and wet-weather conditions. Samples shall be taken and composited so as to be accurately representative of the strength of the

wastewater. At least one year's flow data should be taken as the basis for the preparation of hydrographs for analysis to determine the following types of flow conditions of the system:

- i. the annual average daily flow - as determined by averaging flows over one year, exclusive of inflow due to rainfall;
  - ii. the minimum daily flow - as determined by observing 24-hour flows during dry weather flow (low rainfall period) when infiltration/inflow is at a minimum;
  - iii. wet-weather peak flow- as determined by observing 24-hour flows during a period of one year when infiltration/inflow is at a maximum;
  - iv. wet-weather flows of 7-day duration -as determined by observing for a period of one year the daily flows during the immediate 7-day period following rainfall sufficient to cause ground surface run off;
  - v. peak hourly flow -as determined by observing the maximum hydraulic load to the plant; and
  - vi. industrial waste flows - as determined by flow data, including water use records, for each of the industries tributary to the sewer system.
- c. Facilities for the equalization of flows and organic shock load shall be considered at all plants which are critically affected by surge loadings.

*SEC. 45. Organic loadings.-*

- a. Domestic wastewater treatment design shall be on the basis of at least 0.05 kg of BOD per capita per day and 0.09 kg of suspended solids per capita per day, unless information is submitted to justify alternate designs.
- b. Domestic waste treatment plants that will receive industrial wastewater flows shall be designed to include these industrial waste loads.

- c. When an existing treatment works is to be upgraded or expanded, the organic design shall be based upon the actual strength of the waste water as determined from the measurements taken in accordance with Section 44 (b) above, with an appropriate increment for growth.

**SEC. 46. Flow Equalization.**- Flow equalization shall be provided where large variation of flows are expected and shall be located downstream of pre-treatment facilities such as bar screens, comminutors, and grit chambers.

**SEC. 47. Plant Details.**-

- a. The specifications should be so written that the installation and initial operation of major items of mechanical equipment will be supervised by a representative of the manufacturer.
- b. Except where duplicate units are available properly located and arranged bypass structures and piping shall be provided so that each unit of the plant can be removed from service independently. The bypass design shall facilitate plant operation during unit maintenance and emergency repair so as to minimize the deterioration of effluent quality and insure rapid process recovery upon return to normal operational mode.
- c. Means shall be provided to dewater each unit an appropriate point in the process. Due consideration shall be given to the possible need for hydrostatic pressure relief devices to prevent flotation of structure. Pipes subject to clogging shall be provided with means for mechanical cleaning or flushing.
- d. Due consideration should be given to the selection of materials which are to be used in sewage treatment works because of the possible presence of hydrogen sulfide and other corrosive gases, greases, oils and similar constituents frequently present in sewage. This is particularly important in the selection of the of metals and paints. Contact between dissimilar metals should be avoided to minimize galvanic action.

- e. The use of paints containing lead or mercury should be avoided. In order to facilitate identification of piping, particularly in the large plants, it is suggested that the different lines be color-coded.

The following color scheme is recommended for purposes of standardization:

Sludge line - brown  
Gas line - orange  
Potable water line - blue  
Chlorine line - yellow  
Sewage line - gray  
Compressed air line - green

Water lines for heating digesters or buildings - blue (with a 15 cm red band spaced 75 cm apart)

**SEC. 48. Plant Outfalls. -**

- a. The outfall sewer should be designed to discharge to the receiving stream or other disposal points in a manner acceptable to the Commission.
- b. The outfall sewer shall be so constructed and protected against the effects of floodwater, tide, or other hazards as to reasonably insure its structural stability and freedom from stoppage. A manhole shall be provided at the shore end of all gravity sewers extending into the receiving waters. Hazards to navigation shall be considered in designing outfall sewers.
- c. All outfalls shall include provisions for sampling the effluent at a point after the final treatment process and before discharge to or mixing with the receiving waters.

**SEC. 49. Essential Facilities.-**

- a. Emergency Power Facilities - All plants shall be provided with an alternate source of electric power to allow continuity of operation during power failures.

- b. **Water Supply.** An adequate supply of potable water under pressure should be provided for use in the laboratory and for general cleanliness around the plant. No piping or other connections shall exist in any part of the treatment works which, under any condition, might cause the contamination of a potable water supply. The chemical quality should be checked for suitability for its intended uses such as in heat exchangers, chlorinators, etc.
- c. **Sanitary Facilities.** - Toilet, shower, lavatory, and loader facilities should be provided in sufficient numbers and in convenient locations to serve the expected plant personnel.
- d. **Flow measurement -** Flow measurement facilities shall be provided in all plants. Indicating, totalizing, and recording flow measurement devices shall be provided for all mechanical plants. Flow measurement facilities for lagoon systems shall not be less than pump-calibration time clocks or calibrated flume.

**SEC. 50. Safety.**- Adequate provision shall be made to effectively protect the operator and visitors from hazards. The following shall be provided to fulfill the particular needs of each plant:

- a. Enclosure of the plant site with a fence designed to discourage the entrance of unauthorized persons and animals;
- b. Hand rails and guards around tanks, trenches, pits, stairwells, and other hazardous structures;
- c. First air equipment;
- d. "No Smoking" signs in hazardous areas;
- e. Protective clothing and equipment, such as the pacs, goggles, gloves, hard hats, safety harnesses, etc.;
- f. Portable blower and sufficient hose;
- g. Portable lighting equipment;

Detailed Plans - Detailed plans shall be submitted to show the following:

- h. Appropriately-placed warning signs for slippery areas, non-potable water fixtures, low head clearance areas, open service manhole, hazardous chemical storage areas, flammable fuel storage areas, etc.

**SEC. 51. Laboratory** - All treatment works shall include a laboratory for making the necessary analytical determinations and operating control tests, except in individual situations where the omission of a laboratory is approved by the Commission. The laboratory shall be of sufficient size and shall have adequate bench space, sufficient equipment and supplies to perform all self-monitoring analytical work required by discharge permits, and to perform the process control tests necessary for good management of each treatment process included in the design. The facilities and supplies necessary to perform analytical work to support industrial waste control programs, when necessary, shall normally be included in the same laboratory. The laboratory size and arrangement must be sufficiently flexible and adaptable to accomplish these assignments. The layout should consider future needs for expansion in the event that more analytical work is needed.

## CHAPTER VI

### PRELIMINARY TREATMENT, FLOW EQUALIZATION, AND SETTLING

**SEC. 52. Screening Devices**. - Bar racks or bar screens shall be provided through which all raw wastewater shall pass in order to protect pumps and other equipment and to give better assurance of continuous operation of the plant.

- a. Bar spacing and shape - Manually cleaned bar screens shall be constructed with a slope of 30 to 45 degrees from the horizontal and shall have openings not less than 2.54 cm. Construction should be such that they can be conveniently raked. Clear openings for mechanically cleaned screens may be not less than 1.6 cm and not greater than 4.4 cm.

- b. Velocities - Approach velocities at normal operating flow conditions shall not be less than 0.38 m/s to prevent settling and not greater than 0.90 m/s to prevent forcing material through the openings.
- c. Channels - Dual channels shall be provided and equipped with the necessary gates to isolate flow from any screening unit. Provisions shall also be made to facilitate dewatering each unit. The channel preceding and following the screen shall be shaped to eliminate stranding and settling of solids.
- d. Invert - The screen channel invert shall be located 7.5 to 15.0 cm below the invert of the incoming sewer.
- e. Disposal of Screenings - Facilities must be provided for removal, handling storage, and disposal of screenings in a sanitary manner. Manually cleaned screening facilities shall include an accessible platform from which the operator may rake screenings easily and safely. Suitable drainage facilities shall be provided for both the platform and the storage areas.
- f. Auxiliary Screens - Where a single mechanically cleaned screen is used, an auxiliary manually cleaned screen shall be provided. Where two or more mechanically cleaned screens are used, the design shall provide for taking any unit out of service without sacrificing the capability to handle the peak design flow.

**SEC. 53. Fine Screens** - Fine screens may be used in lieu of primary sedimentation provided that subsequent treatment units are designed on the basis of anticipated screen performance. Fine screens shall not be considered equivalent to primary sedimentation. When fine screens are used, additional provisions for the removal of floatable oils and greases shall be considered. A minimum of two fine screens shall be provided, each unit being capable of independent operation. They shall be preceded by a mechanically cleaned bar screen or other protective devices. Comminuting devices shall not be used ahead of fine screens. Hosing equipment shall be provided to facilitate cleaning. The screens should be installed in a manner that allows their removal for servicing.



*SEC. 54. Comminutors -*

- a. Comminutors shall be used in plants that do not have primary sedimentation or fine screens, and shall be preferably provided in cases where mechanically cleaned bar screens will not be used.
- b. Design Considerations - Comminutors should preferably be located downstream of any grit removal equipment and shall have adequate capacity to handle peak flow. If not preceded by grit removal equipment, it shall be protected by a 15 cm deep gravel trap.
- c. By-pass - Where shredding devices are employed, the comminutor shall be arranged in such a manner as to provide automatic diversion of sewage flow exceeding the design capacity of the comminutor into an auxiliary screening unit. Provision shall be made for servicing the units in place and removing units from their location for servicing.

*SEC. 55. Grit Removal Facilities -* Grit removal facilities are recommended for plants treating sewage from sanitary sewers where the accumulation or grit is anticipated. The Engineering Report should include full justification of grit chambers are not included in the design. Grit removal facilities shall be located ahead of pumps and comminuting devices. Coarse bar racks should be placed ahead of grit chambers.

- a. Grit removal units featuring mechanical means of removal shall have dual channels so arranged that one grit removal unit is in service while the other is being cleaned. One chamber may be arranged to furnish a manually cleaned bar screen. For a small treatment plant, single band cleaned channels with bypass are acceptable. The velocity of wastewater flow through the unit shall be reduced to 0.30 meter per second at maximum flow.
- b. Manually cleaned grit channels shall be provided with facilities for draining them to permit proper cleaning.

*SEC. 56. Measuring Devices.* Measuring devices shall be provided for measuring the wastewater flow received and/or the rates and

total daily amounts of effluent discharged at all plants. Devices for measuring an average flow of 250 liters per second or greater for all mechanical plants shall include instrumentation for continuously recording, indicating and totalizing flows.

*SEC. 57. Settling-General and Design Considerations.-*

- a. Multiple settling units capable of independent operation are desirable and shall be provided in all plants where design flows exceed 400 m<sup>3</sup>/day. Plants not having multiple units shall include provisions to insure continuity of treatment.
- b. Dimensions - The minimum length of flow from inlet to outlet should be 3.0 meters unless special provisions are made to prevent short-circuiting. The sidewater depth for primary clarifier shall be as shallow as practicable, but not less than 2.0 m. Clarifiers following the activated sludge process shall have sidewater depths of at least 3.7 m to provide adequate separation zone between the sludge blanket and the overflow weirs. Clarifiers following fixed film reactors shall have sidewater depth of at least 2.0 m.
- c. Surface Settling Rates (Overflow Rates)
  - i. Primary Settling Tanks - Surface settling rates for primary tanks should not exceed 40 m<sup>3</sup>/m<sup>2</sup>.d at design average flows or 60 m<sup>3</sup>/m<sup>2</sup>.d for peak hourly flows. Clarifier sizing shall be calculated for both flow conditions and the larger surface area determined shall be used. Primary settling of normal domestic sewage can be expected to remove 30 to 35 percent of the influent BOD. However, anticipated BOD removal for sewage containing quantities of industrial wastes ( or chemical additions to be used) should be determined by laboratory tests and consideration of the quantity and character of the wastes.
  - ii. Intermediate Settling Tanks - Surface settling rates for intermediate settling tanks following a series units of fixed film reactor processes shall not exceed 60 m<sup>3</sup>/m<sup>2</sup>.d based on peak hourly flow.

- iii. Final Settling Tanks - Settling tests should be conducted wherever a pilot study of biological treatment is warranted by unusual waste characteristics or treatment requirements. Testing shall be done where proposed loadings go beyond the limits set forth in this Section.

Surface settling rates for settling tanks following trickling filters or rotating biological contactors shall not exceed  $50 \text{ m}^3/\text{m}^2.\text{d}$  based on peak hourly flow.

To perform properly while producing a concentrated return flow, activated sludge settling tanks must be designed to meet thickening as well as solids separation requirements. Since the rate of recirculation of return sludge from the final settling tanks to the aeration or re-aeration tanks is quite high in activated sludge processes, the weir overflow rate should be adjusted for the various processes to minimize the problem with sludge loadings, density currents, inlet hydraulic turbulence, and occasional poor sludge settleability. The hydraulic design of intermediate and final settling tanks following the activated sludge process shall be based upon the anticipated peak hourly rate for the area downstream of the inlet baffle. The hydraulic loadings shall not exceed  $50 \text{ m}^3/\text{m}^2.\text{d}$  for conventional, step aeration, contact stabilization carbonaceous stage of separate-stage nitrification;  $40 \text{ m}^3/\text{m}^2.\text{d}$  for extended aeration and  $33 \text{ m}^3/\text{m}^2.\text{d}$  for the separate-stage nitrification. The solids loading for all activated sludge processing shall not exceed  $250 \text{ kg}/\text{m}^2.\text{d}$  at the peak rate. Consideration should be given to flow equalization.

- d. Inlet Structures - 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  $0.30 \text{ m/s}$  at one-half of the design flow. Corner pockets and dead ends should be eliminated and corner fillets or channeling used where necessary. Provisions shall be made for elimination or removal of floating materials in inlet structures.
- e. Weirs - Overflow weirs shall be designed so as to prevent

turbulence in the sedimentation units and shall be adjustable for leveling. Weir loadings shall not exceed  $124 \text{ m}^3/\text{m}^2.\text{d}$  for plants designed for average flows of  $3,800 \text{ m}^3/\text{d}$  or less. Special consideration shall be given to weir loadings for plants designed for flows in excess of  $3,000 \text{ m}^3/\text{d}$  but such loadings shall preferably not exceed  $186 \text{ m}^3/\text{m}^2.\text{d}$ . If pumping is required, weir loading shall be related to pump delivery rates to avoid short-circuiting. Weir throughs shall be designed to prevent submergence at maximum design flow, and to maintain a velocity of at least  $0.3 \text{ m/s}$  at one-half design flow.

- f. Submerged Surfaces - The tops of throughs, beams and similar 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 the accumulation of scum and solids.
- g. Unit Dewatering - Unit dewatering features shall conform to the provisions outlined in Section 47 (C) above. The bypass design should also provide for redistribution of the plant flow to the remaining units.
- h. Freeboard - Walls of settling tanks shall extend at least  $0.15 \text{ m}$  above the surrounding ground surface and shall provide not less than  $0.30 \text{ m}$  freeboard. Additional freeboard or the use of wind screens is recommended where larger settling tanks are subject to high velocity wind currents that would cause tank surface waves and inhibit effective scum removal.

**SEC. 58. Non-Mechanical Settling Tanks.** - In general, the use of non-mechanical settling tanks shall not be approved except in installations too small to warrant the use of mechanically equipped tanks.

**SEC. 59. Sludge and Scum Removal.** -

- a. Effective scum collection and removal facilities including baffling, shall be provided ahead of the outlet weirs for primary settling tanks and should be provided for settling tanks following trickling filters. The unusual characteristics

of scum which may adversely affect pumping, piping, sludge handling and disposal, should be recognized in design. Provisions may be made for the discharge of scum with the sludge; however, other special provisions for disposal may be necessary.

- b. **Sludge Removal - Sludge collection and withdrawal facilities shall be designed to assure rapid removal of the sludge. Suction withdrawal should be provided for activated sludge plants designed for reduction of nitrogenous oxygen demand and is encouraged for those plants designed for carbonaceous oxygen demand reduction.**
- c. **Sludge Hopper - The minimum slope of the side walls shall be 1.7 vertical to 1 horizontal. Hopper wall surfaces shall be made smooth with rounded corners to aid in sludge removal. Hopper bottoms shall have a maximum dimension of 0.6 m. Extra depth sludge hoppers for sludge thickening are not acceptable.**
- d. **Cross Collectors - Cross collectors serving one or more settling tanks may be useful in place of multiple sludge hoppers.**
- e. **Sludge Removal Piping - Each hopper shall have an individually valved sludge withdrawal line at least 150 mm in diameter for pump suction and discharge, or 200 mm for gravity withdrawal. The static head available for pumping withdrawal of sludge shall be 0.76 m or greater and 1.80 m for gravity, as necessary to maintain a 0.9 m/s velocity in the withdrawal pipe. The slope of gravity-discharge piping shall not be less than 3 percent. Clearance between the end of the withdrawal line and the hopper walls shall be sufficient to prevent "bridging" of sludge. Adequate provisions shall be made for rodding or back-flushing individual pipe-runs. (Piping shall also be provided to return waste sludge to primary clarifiers.)**
- f. **Sludge Removal Control - Sludge walls equipped with telescopic valves or other appropriate equipment shall be provided for viewing, sampling and controlling the rate of sludge withdrawal. The use of easily maintained sight glass**

and sampling valves may be appropriate. A means for measuring sludge removal rate shall be provided. Air lift type of sludge removal will not be approved for removal of primary sludge, sludge pump motor control systems shall include time clocks and valve activators for regulating the duration and sequencing of sludge removal.

## CHAPTER VII

### SLUDGE HANDLING AND DISPOSAL

*Sec. 60.* Process Selection Consideration.- The selection of sludge handling and disposal methods shall include the following considerations: (a) energy requirements; (b) efficacy of sludge thickening; (c) complexity of equipment; (d) staffing requirements; (e) toxic effects of heavy metals and other substances on sludge stabilization and disposal; (f) treatment of side-stream flow such as digester and thickener supernatant; (g) a back-up method of sludge handling and disposal; (h) and methods of ultimate sludge disposal.

*SEC. 61.* Sludge Thickeners. - As the first step of sludge handling, the need for sludge thickeners to reduce the volume of sludge should be considered. The design of thickeners (gravity, dissolved-air floatation, centrifuge, and others) shall consider the type and concentration of sludge, the sludge stabilization process, the method of ultimate sludge disposal, chemical needs, and the cost of operation. Particular attention shall be given to the pumping and piping of the concentrated sludge and possible onset of anaerobic conditions. The sludge should be thickened to at least 5 percent solids prior to transmission to digesters.

*SEC. 62.* Anaerobic Sludge Digestion.-

- a. Multiple Units - Multiple tanks are recommended. Where a single digestion tank is used, an alternate method of sludge processing or emergency storage, such as lagoon, to maintain continuity of service shall be provided.
- b. Depth - For those units proposed to serve as supernatant separation tanks, the depth shall be sufficient to allow for the formation of a reasonable depth of supernatant liquor.

A minimum sidewater depth of 0.60 m is recommended.

- c. Slope - The tank bottom should slope to drain toward the withdrawal pipe. For a tank equipped with a suction mechanism for withdrawal of sludge, a bottom slope not less than 1:12 is recommended. Where the sludge is to be removed by gravity alone, 1:4 slope is recommended.
- d. Access Manholes - At least two 560 mm diameter access manholes should be provided in the top of the tank in addition to the gas dome. There shall be stairways to reach the access manholes. A separate sidewall manhole shall be provided. The opening shall be large enough to permit the use of mechanical equipment to remove grit and sand.
- e. Sludge Inlets and Outlets - To enhance flexible operation and effective mixing, multiple recirculation withdrawal and return points or mixing facilities shall be considered. To assist in scum breakup, the returns shall be discharged above the liquid level and be located near the center of the tank unless mechanical scum breakers are provided. Sludge withdrawal to disposal shall be from the bottom of the tank and shall be interconnected with the recirculation piping to increase versatility in mixing the tank contents, if such piping is provided.
- f. Tank Capacity - The total digestion tank capacity shall be determined by rational calculations based upon such factors as volume, percent solids and character of sludge added, the temperature to be maintained in the digesters, the degree or extent of mixing to be obtained, and the degree of volatile solids reduction required. Calculations shall be submitted to justify the basis of design.

When such calculations are not based on the above factors, the minimum combined digestion tank capacity outlined below will be required. Such requirement assume that a raw sludge is derived from ordinary domestic wastewater, that a digestion temperature is to be maintained in the range of 32°C to 38°C, that 40 to 50 percent volatile matter will be maintained in a digested sludge, and the digested sludge will be removed frequently from the system.

Type of Plant	Liters per Capita
Imhoff tank	90 to 110
Imhoff tank and filter	110 to 170
Primary	60 to 90
Primary and standard filter	90 to 110
Primary and high-rate filter	110 to 140
Primary and activated sludge	110 to 170

- g. Completely-Mixed Systems - Completely-mixed systems shall provide for intimate and effective mixing to prevent stratification and to assure homogeneity of digester content. The system may be loaded at a rate up to 1.28 kg/m<sup>3</sup> of volume per day in the active digestion units. When grit removal facilities are not provided, the reduction of digester volume due to grit accumulation shall be considered.
- h. Gas Collection, Piping and Appurtenances - All portions of the gas system, including the space above the tank liquor, the storage facilities and the piping, shall be designed that under all normal operating 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.

All necessary safety facilities shall be included where gas is produced. Pressure and vacuum relief valves and flame traps, together with automatic shutoff 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 an exterior entrance. Gas piping should be of adequate diameter and shall slope to condensate traps at low points. The use of float-controlled condensate traps is not permitted.

Waste gas burners shall be readily accessible and should be located at least 7.5 m. away from any plant structure if placed at ground level or may be located on the roof of the control building if sufficiently removed from the tank.

All waste gas burners shall be equipped with automatic ignition, such as pilot light or a device using a photoelectric



cell sensor. Consideration should be given to the use of natural or propane gas to insure reliability of the pilot light.

In remote locations it may be permissible to discharge the gas to the atmosphere through a return-bend screened vent terminating at least 2 meters above the ground surface, provided that the assembly incorporates a flame trap.

- i. Supernatant Withdrawal - Supernatant piping shall not be less than 15 cm in diameter.

Piping shall be so arranged that withdrawal can be made from three or more levels in the digester. A positive unvalved vented overflow shall be provided.

Provisions should be made for sampling at each supernatant drawoff level. Sampling pipe shall be at least 38 mm in diameter, and should terminate at a suitably-sized sampling sink or basin.

### SEC. 63. Aerobic Sludge Digestion.-

- a. Digestion Tanks - Multiple tanks are recommended. A single sludge digestion tank may be used in the case of small treatment plants or where adequate provision is made for sludge handling and where a single unit will not adversely affect normal plant operations.
- b. Mixing and Air Requirements - Aerobic sludge tanks shall be designed for effective mixing by satisfactory aeration equipment. Sufficient air shall be provided to keep the solids in suspension and maintain dissolved oxygen between 1 and 2 mg/l. A minimum mixing and oxygen requirement of 0.50 l/m<sup>3</sup>/s shall be provided with the largest blower out of service. If diffusers are used, the non-clog type is recommended, and they should be designed to permit continuity of service. If mechanical aerators are utilized, a minimum of 35 HP/1000 m<sup>3</sup> (26.3 W/m<sup>3</sup>) should be provided.
- c. Tank Capacity - It is recommended that the volatile suspended solids loading do not exceed 1.60 kg/m<sup>3</sup> of

volume per day in the digestion units.

Required minimum solids retention time for stabilization of biological sludges vary depending on type of sludge. A minimum of 12 days retention shall be provided for waste activated sludge, and 16 days for combination of primary and waste activated sludge, and 16 days for combination of primary and waste activated sludge, or primary sludge alone.

- d. Supernatant Separation - facilities shall be provided for effective separation and withdrawal of supernatant and for effective collection and removal of scum and grease.

**SEC. 64. Sludge Pumps.** - Duplicate units shall be provided where failure of one unit would seriously hamper plant operation.

- a. Type- Plunger pumps, screw feed pumps, recessed impeller type centrifugal pumps, progressive cavity pumps, or other types of pumps with demonstrated solids handling capability shall be provided for handling raw sludge. Where centrifugal pumps are used, a parallel plunger-type pump should be provided as an alternate to increase reliability of the centrifugal pump.
- b. Pumping Head - A minimum positive head of 0.60 m shall be provided at the suction side of centrifugal-type pumps and is desirable for all type of sludge pumps. Maximum suction lifts shall not exceed 3.0 m for plunger pumps.
- c. Sampling Facilities - Unless sludge sampling facilities are otherwise provided, quick-closing sampling valves shall be installed at the sludge pumps. The size valve and piping shall be at least 38 mm.

**SEC 65. Sludge Piping.**-

- (a) Size and Head - Sludge withdrawal piping should have a minimum diameter of 150 mm for gravity withdrawal and 100 mm for pump suction and discharge lines. Where withdrawal is by gravity, the available head on the discharge type should be adequate to provide at least 0.9 m per second

velocity.

- (b) Slope - Gravity piping shall be laid on uniform grade and alignment. The slope of gravity discharge piping shall not be less than 3 percent. Provisions should be made for cleaning, draining, and flushing discharge lines.

*SEC. 66. Sludge Drying Beds.-*

- a. Area - In determining the area of sludge drying beds, consideration shall be given to weather conditions, the character and volume of the sludge to be dewatered, the method and schedule of sludge removal, and other methods of sludge disposal. In general, the sizing of the drying bed may be estimated on the basis of 0.2 m<sup>2</sup> per person when the drying bed is the primary method of dewatering, and 0.1 m<sup>2</sup> if it is to be used as a back-up dewatering unit. An increase of bed area by 25 percent is recommended for paved beds.
- b. Percolation Type - The lower course of gravel around the underdrains should be properly graded and should be 0.3 m in depth, extending at least 0.15 m above the top of underdrains. It is desirable to place this in two or more layers. The top layer of at least 0.08 m shall consist of gravel 3.18 to 6.35 mm (1/8" to 1/4") in size. The top course should consist of 0.15 to 0.23 m of clean course sand. The finished sand surface shall be level. Underdrains shall be asbestos cement, PVC or concrete pipe at least 100 mm in diameter laid either with open joints or perforated. Underdrains shall be spaced not more than 6 meters apart. The disposal of the underdrains filtrate is covered in the following section.
- (c) Partially Paved Type - The partially paved drying bed should be designed with consideration for space requirement to operate mechanical equipment for removing the dried sludge.
- (d) Walls - Walls should be watertight and extend 0.38 to 0.45 m above and at least 0.15 m below the ground surface. Outer walls should be curbed to prevent soil from washing

onto the beds.

- (e) Sludge Removal - At least two beds shall be provided and shall be arranged to facilitate sludge removal.
- (f) Sludge Influent - The sludge pipe to the drying beds should terminate at least 0.3 m above the surface and be so arranged that it will drain. Concrete splash plates for percolation-type beds should be provided at sludge discharge points.

*SEC 67. Mechanical Dewatering Facilities.-*

- a. Provisions shall be made to maintain sufficient continuity of service so that sludge may be dewatered without accumulation beyond storage capacity. The number of vacuum filters, centrifuges, filter presses, belt filters, or other mechanical dewatering facilities shall be sufficient to dewater the sludge produce with one largest unit out of service. Unless other standby facilities are available, adequate storage facilities shall be provided. The storage capacity should be sufficient to handle at least a three-month sludge production.
- b. Auxiliary Facilities for Vacuum Filters - There shall be a back-up vacuum pump and filtrate pump installed for each vacuum filter. It is permissible to have an uninstalled back-up vacuum pump or filtrate pump for every three or less vacuum filters, provided that the installed unit can easily be removed and replaced.
- c. Ventilation - Adequate facilities shall be provided for ventilation of the dewatering area. The exhaust air shall be properly conditioned to avoid odor nuisance.
- d. Chemical Handling Enclosures - Lime-mixing facilities shall be completely enclosed to prevent the escape of lime dust. Chemical handling equipment should preferably be automated to eliminate the manual lifting requirement.

*SEC. 68. Drainage and Filtrate Disposal.-* Drainage from beds or filtrate from dewatering units shall be returned to the sewage treatment process at appropriate points.

*SEC. 69. Other Dewatering Facilities.-* If it is proposed to dewater or dispose of sludge by other methods, a detailed description of the process and design data shall accompany the plans including suitable evidence of the satisfactory performance of the process.

*SEC. 70. General Limitations for Municipal Sludge Disposal on Land.-*

- a. **Stabilized Sludge** - Only stabilized sludge shall be surface-applied to land used for agricultural purposes or pasture. Stabilized sludge is defined as processed sludge in which the organic and bacterial contents of raw sludge are reduced to levels deemed necessary by the regulatory agency to prevent nuisance odors and public health hazards. Any process which produces sludge equivalent in quality to the above in terms of public health factors and odor potential may be accepted. Additional treatment would be required to further reduce pathogens when the sludge is to be spread on dairy pastures and other crops which are in the human food chain.
- b. **Raw Vegetables** - Sludge should not be applied to land which is used for growing food crops to be eaten raw, such as leafed vegetables and root crops.
- c. **Minimum pH**- Sludge shall not be applied on land if the soil pH is less than 6.5 when sludge is applied. The pH shall be maintained above 6.5 for at least two years following the end of sludge application.
- d. **Persistent Organic Chemicals** - At the present time, sufficient information is not available to establish the criteria of sludge spreading in regard to persistent organic chemicals, such as pesticides and polychlorinated biphenyls (PCB). However, if there is a known source in the sewer system service area which discharges or discharged in the past such chemicals, and the Commission shall be consulted for recommendations concerning sludge spreading.
- e. **Site Selection** - By proper selection of the sludge application site, the nuisance potential and public health hazard can be minimized. The following items shall be considered, and the Commission shall be consulted for specific limits:

1. Land ownership information;
2. Groundwater table and bedrock location;
3. Location of dwellings, road and public access;
4. Location of wells, springs, creeks, streams, and flood plains;
5. Slope of land surface;
6. Soil characteristics;
7. Climatological information including wind speed, prevailing wind direction and velocity;
8. Land use plan; and
9. Road weight restrictions.

*SEC. 71. Management of Spreading Operations.-*

- a. **Hauling Equipment-** The sludge hauling equipment should be designed to prevent spillage, odor, and other public nuisance.
- b. **Valve Control-** The spreading tank truck should preferably be provided with a control that will permit the discharge valve to be opened and closed by the driver while the vehicle is in motion. The spreading valve should be of the "fail-safe" type (i.e. self-closing) or an additional manual stand-by valve should be employed to prevent uncontrolled spreading or spillage.
- c. **Sludge Storage-** Sufficient sludge storage capacity shall be provided for periods of inclement weather and equipment failure. The storage facilities shall be so designed, located, and operated as to avoid nuisance conditions.
- d. **Spreading Methods-** The selection of spreading methods depends on the sludge characteristics, environmental factors, and others. When control of odor nuisance and run-off is required, immediate incorporation of sludge after spreading or subsurface injection should be considered. The sewage sludge should be spread uniformly over the surface when tank truck spreading, ridge and furrow-irrigation, or other methods are used. The spray system, except for downward directed type, shall not ordinarily be used.
- e. **Boundary Demarcation-**The boundaries of the site shall be marked (e.g., with stakes at corners) so as to avoid confusion

regarding the location of the site during sludge application. The markers should be maintained until the end of the current growing season.

- f. Public access to the disposal site shall be controlled by either positive barriers or remoteness of the site.

*SEC.72. Monitoring and Reporting.* - The requirements of the Commission on the monitoring and reporting of the sludge spreading operation shall be followed. As a minimum, the producer of sludge shall regularly collect and record information on the sludge and soil characteristics and the volume of sludge spread on a particular site.

*SEC.73. Other Sludge Disposal Methods.*- When other sludge disposal methods, such as incineration and landfill, are considered, pertinent requirements from the Commission shall be followed.

## CHAPTER VIII

### SECONDARY TREATMENT

*SEC.74. Trickling Filters.*-

- a. **General Conditions-** Trickling filters may be used for treatment of sewage amenable to purification by aerobic biological processes. Trickling filters shall be preceded by effective settling tanks equipped with scum and grease collecting devices, or other suitable pretreatment facilities. Filters shall be designed to provide for reduction in carbonaceous and/or nitrogenous oxygen demand in accordance with water quality standards and objectives for the receiving waters as established by the Commission, or to properly condition the sewage for subsequent treatment processes.
- b. **Dosing Equipment for Trickling Filters-**
  - (1) **Dosing-** Sewage may be applied to the filters by siphons, pumps or by gravity discharge from preceding treatment units when suitable flow characteristics have been developed. Application of the sewage shall be

practically continuous. The piping system shall be designed for recirculation.

- (2) Uniformity of 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 uniformly distributed volume per square meter of the filter surface shall not exceed plus or minus 10 percent at any point. All hydraulic factors involving proper distribution of sewage on the filters shall be carefully calculated. Such calculations shall be submitted to the Commission.
  - (3) Head Requirements- For reaction type distributors, a minimum head of 0.6 meter between low water level in the siphon chamber and center of the arms is generally desirable. Similar allowance in design shall be provided for added pumping head requirements where pumping to the reaction type distributor is used.
  - (4) Clearance- A minimum clearance of 0.15 meter between media and distributor arms shall be provided.
  - (5) Piping System - The piping system, including dosing equipment and distributor, shall be designed to provide capacity for the peak hourly flow rate, including recirculation required under Section 76(d) hereof.
- c. Media - The media may be crushed rock, slag, or specially manufactured material. The media shall be durable, resistant to spalling or flaking and relatively insoluble in sewage. The top 0.45 meter shall have a loss by the 20-cycle, sodium sulfate soundness test of not more than 10 percent, as prescribed in the ASCE Manual of Engineering Practice, Number 13. The balance is to pass a 10-cycle test using the same criteria. Slag media shall be free from iron. Manufactured media shall be resistant to ultraviolet degradation, disintegration, erosion, aging, all common acids and alkalis, organic compounds, and fungus and biological attack. Such media shall be structurally capable of



supporting a man's weight or a suitable access walkway shall be provided to allow for distributor maintenance.

(1) Depth- Rock and/or slag filter media shall have a minimum depth of one and one-half (1.5) meters above the underdrains. Manufactured filter media should have a minimum depth of 3 meters to provide adequate contact time with the wastewater. Rock and/or slag filter media depths shall not exceed 9 meters, except where special construction is justified through extensive pilot studies.

(2) Size and grading of Media- Filter media shall conform to the following size and grading. The media shall be free from thin elongated and flat pieces and shall not contain more than five percent by weight of pieces whose longest dimension is three times the last dimension. It shall be free from dust, clay, sand, or fine material.

(i) Mechanically graded media over vibrating screen with square openings shall conform to the following:

Passing 114 mm screen-100 percent by weight  
Retained on 76 mm screen-95-100 percent by weight  
Passing 51 mm screen- 0-2 percent by weight  
Passing 25 mm screen- 0-1 percent by weight

(ii) Handpicked field stones:

Maximum dimension of stone- 127 mm  
Minimum dimension of stone- 76 mm

(3) Handling and Placing of Media - Material delivered to the filter site shall be stored on woodplanked or other approved clean, hard-surfaced areas. All material shall be rehandled at the filter site and no material shall be dumped directly into the filter. Crushed rock, slag and similar media shall be washed and rescreened or forked at the filter site to remove all fines. Such material shall

be placed by hand to a depth of 0.3 m above the underdrains. The remainder of the material may be placed by means of belt conveyors or equally effective methods approved by the Commission. All material shall be carefully placed so as not to damage the underdrains. Manufactured media shall be handled and placed as approved by the Commission. Trucks, tractors, and other heavy equipment shall not be driven over the filter at anytime during or after construction.

*SEC. 75. Underdrainage System.*

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

The underdrains shall have a minimum slope of one percent. Effluent channels shall be designed to produce a minimum velocity of 0.6 m/s at average daily rates of application to the filter.

- b. Hydraulic Capacity and ventilation- The underdrainage system, effluent channels, and effluent pipe shall be designed to permit free passage of air. The size of drains, channels and pipe should be such that not more than 50 percent of their cross-sectional area will be submerged under the design peak hydraulic loading, including proposed or possible future recirculated flows. Consideration shall be given to the use of forced ventilation, particularly for covered filters and deep manufactured media filters.
- c. Flushing - Provisions shall be made for flushing the underdrains. In small filters, the use of a peripheral head channel with vertical vents is acceptable for flushing purposes. Inspection facilities shall be provided.

*SEC. 76. Special Features.-*

- a. Flooding- Appropriate valves, sluice gates, or other structures shall be provided to enable flooding of filters comprised of rock

or slag media for filter fly control.

- b. Freeboard- A freeboard of 1.2 m or more should be provided for tall, manufactured media filters to maximize the containment of windblown spray.
- c. Maintenance- All distribution devices, underdrains, channels and pipes shall be installed so that they can be properly maintained, flushed or drained.
- d. Recirculation- The piping system shall be designed for recirculation as required to achieve the design efficiency. The recirculation rate shall be variable and subject to plant operator control.
- e. Recirculation Measurement- Devices shall be provided to permit measurement of the recirculation rate. Time lapse meters and pump head recording devices are acceptable for facilities treating less than 3800 m<sup>3</sup>/d.

*SEC. 77.* Final Settling Tanks for Trickling Filters.- For design requirement applying to tanks used for final settling of trickling filter effluents, refer to Section 57 (Chapter VI) above.

*SEC. 78.* Multi-Stage Filters.- The foregoing standards also apply to all multi-stage filters.

*SEC. 79.* Unit Sizing.- Required volumes of rock or slag media filters shall be based upon pilot testing with the particular wastewater or upon any of the various empirical design equations that have been verified through actual full-scale experience. Such calculations must be submitted if pilot testing is not utilized. Pilot testing is recommended to verify performance predictions based upon the various design equations, particularly when significant amounts of industrial wastes are present.

Expected performance of filters packed with manufactured media shall be determined from documented full-scale experience on similar installations or through actual use of a pilot plant on site.

*SEC. 80.* Design Safety Factors.- Trickling filters are affected by diurnal load conditions. The volume of media determined from either

pilot plant studies or use of acceptable design equations shall be based upon the design peak hourly organic loading rate rather than the average rate. An alternative would be to provide flow equalization.

*SEC.81. Standard Rate Trickling Filters.-* The maximum BOD<sub>5</sub> loading shall be less than 0.2 kg BOD per day per cubic meter of filter media.

*SEC.82. High Rate Trickling Filters.-*

- a. Recirculation- A controlled recirculation system should be provided to maintain continuous dosing at a rate of at least 8,000 liters per square meter per day of surface area (8 m<sup>3</sup>/m<sup>2</sup>.d).
- b. Single Stage Filters- The BOD loading should not exceed 7.5 kg. of BOD per cubic meter of filter media, with a 1 to 1 recirculation ratio, except where low BOD removals are acceptable.
- c. Two-Stage Filters- Where the BOD is much higher than normally found in domestic sewage, and a high degree of treatment is required, two stage filters may be used.

*SEC.83. Activated Sludge.-*

- a. Applicability- The activated sludge process and its various modifications may be used where sewage is amenable to biologic treatment. This process requires close attention and competent operating supervision, including routine laboratory control. These requirements shall be considered when proposing this type of treatment. The activated sludge process and its several modifications may be employed to accomplish varied degrees of removal of suspended solids and reduction of carbonaceous and/or nitrogenous oxygen demand. Choices of the process most applicable will be influenced by 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. All designs shall provide for flexibility in operation. Plants over 3800 m<sup>3</sup>/d capacity shall

be designed to facilitate easy conversion to various operation modes.

- b. Pretreatment- Where primary settling tanks are not used, effective removal or exclusion of grit, debris, excessive oil or grease, and comminution or screening of solids shall be accomplished prior to the activated sludge process.

Where primary settling tank is used, provision shall be made for discharging raw sewage directly to the aeration tanks to facilitate plant start-up and operation during the initial stages of the plant's design life.

- c. Final Settling Tanks- Multiple units capable of independent operation are desirable and shall be provided in all plants where the total tank volume requirement for final settling exceeds 70 m<sup>3</sup>.

**SEC. 84. Capacities and Permissible Loadings.** - 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 food to MLSS microorganism (F/M) ratio and mixed liquor suspended solids (MLSS) level. Other factors such as size of treatment plant, diurnal load variations, and degree of treatment required shall also be considered. In addition, temperature, pH, and reactor-dissolved oxygen shall be considered when designing for nitrification. Calculations should be submitted to justify the basis for design of aeration tank capacity. Calculations using values differing substantially from those in the accompanying table should refer to actual operational plants. Mixed liquor suspended solids level greater than 5000 mg/l may be allowed provided adequate data is submitted showing the aeration and clarification system capable of supporting such levels.

When process design calculations are not submitted, the aeration tank capacities and permissible loadings for the several adaptations of the processes shown in the following table shall be used. These values apply to plants receiving peak to average diurnal load ratios ranging from about 2:1 to 4:1. Thus, the utilization of flow equalization facilities to reduce the diurnal peak organic load may be considered by the Commission as

justification to approve organic loading rates that exceed those specified in the table.

**PERMISSIBLE AERATION TANK CAPACITIES AND LOADINGS**

Process	Aeration Tank Organic Loading -kg BOD <sub>5</sub> /day per m <sup>3</sup>	F/M Ratio kg BOD <sub>5</sub> /day per kg MLSS	MLSS <sup>a</sup> mg/l
Conventional Step Aeration	0.65	0.2-0.5	1000-3000
Complete Mix Contact Stabilization	0.80	0.2-0.6	1000-3000
Extended Aeration Oxidation Ditch	0.25	0.05-0.1	3000-5000

*\* MLSS values are dependent upon surface area provided for sedimentation and the rate of sludge return as well as the aeration process.*

**SEC. 85. Arrangement of Aeration Tanks.-**

- a. **General Tank Configuration; Dimensions-** The dimensions of each independent mixed liquor aeration tank or return sludge reaeration tank shall be such as to maintain effective mixing and utilization of air. Ordinarily, liquid depths should not be less than 3 m or more than 9 m, except in special design cases.

For very small 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. **Number of Units-** Total aeration tank volume shall be divided among two or more units, capable of independent operation, when required by the appropriate reviewing agency to meet applicable effluent limitations and reliability guidelines.
- c. **Inlets and Outlets.-**
  - i. **Controls-** Inlets and outlets for each aeration tank unit

shall be suitably equipped with valves, gates, stop plates, wires, 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.

ii. Conduits- Channels and pipes carrying liquids with solids in suspension shall be designed to maintain self-cleansing velocities or shall be agitated to keep such solids in suspension at all rates of flow within the design limits. Adequate provisions should be made to drain segments of channels which are not being used due to alternate flow patterns.

d. Freeboard- All aeration tanks should have a freeboard of not less than 0.5 meter. Additional freeboard or windbreak may be necessary to protect against wind blow spray.

*SEC. 86* Aeration Equipment.- General Requirements- Considering that oxygen requirements generally depend on maximum diurnal organic loading, degree of treatment, and level of suspended solids concentration to be maintained 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 thorough mixing of the mixed liquor. In the absence of experimentally determined values, the design oxygen requirements for all activated sludge processes shall be 1.1 kg. oxygen/kg. peak BOD<sub>5</sub>, with the exception of the extended aeration process, for which the value shall not be less than 1.5.

*SEC. 87.* Diffused Air System.- The design of the diffused air system to provide the oxygen requirements shall be done by either of the two methods described below in (a) and (b), augmented as required by consideration of items (c) through (h).

a. Having determined the oxygen requirements under Section 85, air requirements for a diffused air system shall be determined by the use of any of the well-known equations incorporating such factors as:

1. Tank depth;
2. Alpha factor of waste;
3. Beta factor of waste;
4. Certified aeration device transfer efficiency;
5. Minimum aeration tank dissolved oxygen
6. Critical wastewater temperature; and concentrations;
7. Altitude of plant.

In the absence of experimentally determined alpha and beta factors, wastewater transfer efficiency shall be assumed to the 30 percent of clean water efficiency for plants treating primarily (90% or greater) domestic sewage. Treatment plants where the waste higher percentages of industrial wastes shall use a correspondingly lower percentage of clean water efficiently and shall have calculations submitted to justify such a percentage.

- b. Normal air requirements for all activated sludge processes, except extended aeration (assuming the equipment is capable of transmitting to the mixed liquor the amount of oxygen required in Sec. 85), shall be considered to be 95/kg. BOD<sub>5</sub>. For the extended aeration process the value shall be 125 m<sup>3</sup>.
- c. To the air requirements calculated above shall be added air required for channels, pumps, aerobic digesters, or other air-use demand.
- d. The specified capacity of blowers or air compressors, particularly centrifugal blowers, should take into account that the air intake temperature may reach 40°C (104°F) or higher and the pressure may be less than normal.
- e. Blowers shall be provided in multiple units, so arranged and in such capacities to meet the maximum air demand with the single largest unit out of service. The design shall also provide for varying the volume of air delivered in proportion to the loud demand of the plant. Aeration equipment shall be easily adjustable in increments and shall maintain solids suspension within these limits.
- f. Diffuser system shall be capable of providing for the diurnal



peak oxygen demand or 200 percent 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 losses.

Air piping system shall be designed such that total head loss from blower outlet (or silencer outlet where used) to the diffuser inlet does not exceed 0.04 kgf/cm (0.5 psi) at average operating conditions.

The spacing of diffusers should be in accordance with the oxygen requirements through the length of the channel or tank, and should be designed to facilitate adjustment of their spacing without major revision to air header piping.

All plants employing less than four independent aeration tanks shall be designed to incorporate removable diffusers that can be serviced and/or replaced without dewatering the tank.

- g. Individual assembly units of diffusers shall be equipped with air control valves, preferably with indicator markings for throttling, or for complete shutoff. Diffusers in any single assembly shall have substantially uniform pressure loss.
- h. Air filters shall be provided in numbers, arrangements, and capacities to furnish at all times an air supply sufficiently free from dust to prevent damage to blowers and clogging of the diffuser system used.

*SEC. 88. Mechanical Aeration System.-*

- a. Oxygen Transfer Performance-The mechanism and drive unit shall be designed for the expected conditions in the aeration tank in terms of the power performance. Certified testing shall verify mechanical aerator performance.
- b. Design Requirements- The design requirements of a mechanical aeration system shall accomplish the following:
  - 1. Maintain a minimum of 2.0 mg./l. of dissolved oxygen in the mixed liquor at all times through out the tank or

basin;

2. Maintain all biological solids in suspension;
3. Meet maximum oxygen demand and maintain process performance with the largest units out of service; and
4. Provide for varying the amount of oxygen transferred in proportion to the load demand on the plant.

*SEC. 89. Return Sludge Rate.*-The minimum permissible return sludge rate of withdrawal from the final settling tank is a function of the concentration of suspended solids in the mixed liquor entering it, the sludge volume index of these solids, and the length of time these solids are retained in the settling tank. Since undue retention of solids in the final settling tanks may be deleterious to both the aeration and the sedimentation phases of the activated sludge process, the rate of sludge return expressed as a percentage of the average design flow of sewage should generally be variable between the limits set forth as follows:

	<b>Rate of Sludge as Percent of Average Design Flow</b>	
	<b>Minimum</b>	<b>Maximum</b>
Standard	15	75
Carbonaceous Stage of Separate Stage Nitrification	15	75
Step Aeration	15	75
Contact Stabilization	50	150
Extended Aeration	50	150
Nitrification Stage of Separate Stage Nitrification	50	200

The rate of sludge return shall be varied by means of variable speeds motors, drives, or timers (shall plants) to pump sludge at the above rates. Devices for indicating rate of sludge return may be provided for better control.

*SEC.90.* 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 suction. Pump should have at least 76 mm suction and discharge openings.

If air lifts are used for returning sludge from each settling tank hopper, no standby units will be required provided the design of the air lifts is such as to facilitate the rapid and easy cleaning and provided other suitable standby measures are provided. Air lifts should be at least 76 mm in diameter.

*SEC.91.* Return Sludge Piping.-Discharge piping shall be designed to maintain a velocity of not less than 0.61 m/s when return sludge facilities are operating at normal return sludge rates. Suitable devices for observing, sampling and controlling return activated sludge flow from each settling tank hopper shall be provided, as outlined in Section 59 (f) above.

*SEC.92.* Waste Sludge Facilities.- Waste sludge control facilities should have a maximum capacity of not less than 25 percent of the average rate of sewage flow and function satisfactorily at rates of 0.5 percent of the average sewage flow or a minimum of 0.63 l/s, whichever is larger. Means for observing, measuring, sampling, and controlling waste activated sludge flow shall be provided. Waste sludge may be discharged to the concentration or thickening tank, primary settling tank, sludge digestion tank, vacuum filters, or any practical combinations of these units.

*SEC.93.* Measuring Devices.- Devices should be installed in all plants 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 m<sup>3</sup>/d or more, these devices should totalize (and record in case of plants with 20,000 m<sup>3</sup>/d) 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, the mixed liquor flow rate to each aeration unit should be measured.

*SEC. 94.* Other Biological Systems. - New biological treatment schemes with promising applicability in wastewater treatment may be considered if the required engineering data for new process evaluation is provided in accordance with Section 43 on new process evaluation.

## CHAPTER IX

### DISINFECTION

*SEC. 95.* When Disinfection Is Required. - Where a public health hazard may be created by the wastewater treatment plan effluent, disinfection of the effluent will be required. The use of chlorine or other chemicals accepted by the Commission may be required for such purpose.

If chlorination is utilized, it may be necessary to dechlorinate if the chlorine level in the effluent would impair the natural aquatic habitat of the receiving stream.

*SEC. 96.* Chlorination Facilities. -

- a. An equipment that is capable of applying chlorine continuously (preferably chlorine gas solution) shall be selected and installed. The chlorination equipment shall likewise be installed in order to control odors and aid treatment generally. To accomplish these objectives, points of chlorine application shall be established for prechlorination and ahead of the final clarifier or chlorine contact chamber.
- b. Means for automatic proportioning the amount of the chlorine to be applied in accordance with the rate of wastewater being treated shall be provided at plants treating more than 11,000 m<sup>3</sup>/d. Where the rate of wastewater flow is relatively constant or where such operations are considered to be more economical and meet the objectives of sub-section (a), manual control will

be permitted.

- c. Facilities shall be provided for determining the amount of chlorine used daily, as well as the amount of chlorine remaining in the container.
- d. Provisions shall be made for emergency chlorination at points where bypasses have been provided and other means of treatment are not available.

*SEC. 97. Capacity of Feed Equipment.*- Required disinfection capacity will vary, depending on the uses and points of application of the disinfecting chemical. For disinfection, the capacity should be adequate to produce a chlorine residual of 1 mg/l in the final effluent. For normal domestic sewage, the following may be used as a guide in sizing chlorination facilities:

Type of Treatment	Dosage
Trickling filter plant effluent	10 mg/l.
Activated sludge plant effluent	8 mg/l.
Tertiary filtration effluent	6 mg/l.
Nitrified effluent	6 mg/l.

*SEC. 98. Leak Detection and Controls.*- A bottle of 56 percent ammonium hydroxide solution shall be available for detecting chlorine leaks. Consideration should be given to the provision of caustic soda solution reaction tanks for absorbing the contents of leaking one-ton containers where such containers are in use. At large chlorination installations, consideration should be given to the installation of automatic gas detection and related alarm equipment. For ozone installations, similar purpose equipment shall be provided.

*SEC. 99. Housing.*-The chlorinator building or room shall have ample forced air ventilation. If gas chlorination equipment and chlorine containers are to be placed in a building used for other purposes, a tight partition shall separate this room from any other portion of the building. Doors should open only to the outside of the building. Storage area shall be separated from the feed area.

*SEC. 100.* Respiratory Protection.-Respiratory air-pac protection equipment, meeting the requirements of the Ministry of Labor and Employment and/or Ministry of Health shall be available where chlorine gas is handled, and shall be stored at a convenient, but not inside any room where chlorine is used or stored. Instruction for using the equipment shall be posted. The units shall use compressed air, have at least 30-minute capacity, and be compatible with the units used by the fire department responsible for the plant.

*SEC. 101.* Contact Period.-For a chlorination system, a minimum contact period of 15 minutes at peak hourly flow or maximum rate of pumpage shall be provided after thorough mixing. Consideration should be given to running a field tracer study to assure adequate contact time. If dechlorination is required, no contact time is necessary after complete mixing of the effluent with the chemical.

The required contact time for an ozonation unit varies with the type of dissolving equipment used. Certain high rate devices require contact times less than one minute to achieve disinfection, while conventional dissolving equipment may require contact times similar to chlorination systems.

*SEC. 102.* Contact Tank. - The chlorine or ozone contact tank should be constructed so as to reduce shortcircuiting of flow to a practical minimum. "Over -and - under" or "end-around" baffling shall be provided to minimize short-circuiting.

The tank shall be designed to facilitate maintenance and cleaning without reducing the effectiveness of disinfection. Duplication tanks, mechanical scrapers, or portable deck-level vacuum cleaning equipment shall be provided. Consideration should be given to providing skimming devices on all contact tanks. Covered tanks are discouraged.

*SEC. 103.* Evaluations of Effectiveness.-

- a. Sampling - Facilities shall be included for sampling the disinfected effluent after contact. In large installations, or where stream conditions warrant, provision should be made for continuous monitoring of effluent chlorine

residual.

- b. Testing and Control- Equipment shall be provided for measuring chlorine residual using accepted test procedures. The installation of demonstrated effective facilities for automatic chlorine residual analysis, recording, and proportioning systems should be considered at all installations.

## CHAPTER X

### LAND TREATMENT AND DISPOSAL

*SEC. 104.* Preliminary Consideration in Land Disposal.- Land treatment and/or disposal installations are normally used where the waste contains pollutants which can successfully be removed through distribution to the soil mantle. These pollutants can be removed through organic decomposition in the vegetable-soil complex and by adsorptive, physical, and chemical reactions with earth materials. Preliminary considerations of a site for land disposal should be the compatibility of the waste with the organic and earth material and the percolation rates and exchange capacity of the soils. The application of wastewater on land may eventually recharge the local groundwater; therefore, the quality, direction and rate of movement, and local use of the groundwater, present and potential, are prime considerations in evaluating a proposed site. The major factors in the design of land treatment and disposal fields are topography, soils, geology, hydrology, weather, agricultural practice, adjacent land use, and equipment selection and installation.

*SEC. 105.* Design Report - The design report shall include maps and diagrams and other information as outlined below:

- a. Location-
  - i. topographic map of total area showing boundaries, location of buildings, waste disposal system wastewater application field, buffer zones, all water supply wells identified as to use (e.g., potable,

industrial, agricultural, etc.), and abandoned wells.

- ii. topographic map with contour interval of 0.50 m showing disposal field topography, building and land use on adjacent lands within 500 meters from the project boundary.
- b. Geology- Information and data on geologic formations and the rock types at the sites, degree of weathering of the bedrock, local bedrock structure including the presence of faults, fractures and joints, character and thickness of the surficial deposits (residual soils and glacial deposit), and in limestone terrain, additional information about solution openings and sinkholes is required. The source of the above information must be indicated.
  - c. Hydrology-
    1. Depth to seasonal high water table (perched and/or regional), static water levels at each depth for each aquifer in the depth under concern, direction of groundwater movement, the point(s) of discharge, chemical analyses of groundwater at the site, the source of the foregoing data must be indicated.
    2. The following information shall be provided from existing wells and from such test wells as may be necessary:
      - a. Construction details as depth, well log, pump capacity, static water levels, pumping water levels, casing, grout material, and such other information as may be pertinent.
      - b. Groundwater quality: e.g., nitrates, total nitrogen, chlorides, sulphates, pH, alkalinities, total hardness, coliform bacteria, etc.
    3. A minimum of one groundwater monitoring well must be drilled in each dominant direction of



groundwater movement and between the project site and public well(s) and/or high-capacity private wells, with provision for sampling at the surface of the water table and at 1.50 m below the water table at each monitoring site. The location and construction of the monitoring well(s) must be approved by the Commission. These may include one or more of the test wells where appropriate.

d. Soils-

1. A soils map of the wastewater application field, indicating the various soil types; may be included on the topographic map.
2. The types of soils, slopes and agricultural practice on the wastewater application field, the thickness of soils, and the surface-drainage characteristics of the soil materials shall be identified. Proposed application rates shall take into consideration the drainage and permeability of the soils, the discharge capacity, and the distance to the highest water table.

e. Agricultural Practice- The present and intended soil-crop management practices, including forestation, and the kinds of cultivated crops used and the harvesting frequency shall be indicated.

f. Adjacent Land Use - Present and anticipated use of the adjoining lands shall be indicated (this information can be provided on one of the maps and may be supplemented with notes.). The plan shall show existing and proposed screens, barriers, or buffer zones to prevent any wastewater from entering adjacent land areas. If expansion of the facility is anticipated, the lands which are likely to be used for expanded wastewater application fields must be shown on the map.

*SEC. 106.* Treatment Before Land Disposal. - In general, the equivalent of secondary treatment will be required. All wastes must

be amenable to treatment by the soil prior to application. All wastes to be spray-irrigated shall be disinfected. Disinfection may be required for other types of irrigation. Screening shall be provided in all cases where solids are expected of a size equal to or greater than the nozzlehole diameter.

Storage shall be provided to the maximum capacity required to accommodate flows in excess of quantities to be irrigated.

*SEC. 107. Methods of Application-*

- a. Piping to Sprinklers- The piping should be arranged to allow the irrigation pattern to be varied easily. Stationary systems are preferred, but if a movable system is proposed, one main header must be provided with individual connection for each field and sufficient spare equipment must be available to ensure uninterrupted irrigation. Facilities must be provided to allow the pipes to be completely drained at suitable points to prevent pollution and freezing.
- b. Sprinkling System- Sprinkling must be so located as to give a non-irrigation buffer zone around the irrigated area, and the design of the buffer zone must consider wind transport of the wastewaters. The system shall be designed to provide an even distribution over the entire field.

The application rate must be selected low enough to allow the waters to percolate into the soil and to assure proper residency within the soil mantle. Proposed application rates will not be accepted without substantiating data.

In general, sufficient monitoring controls should be provided to indicate the degree of efficiency with which the sprinklers are working. A pressure gauge and flow meters should be provided.

- c. Runoff- The system shall be designed to prevent surface runoff from entering or leaving the project site.

- d. Fencing and Warning Signs-The project shall be enclosed with the suitable fence to exclude livestock and discourage trespassing. A vehicle access gate of sufficient width to accommodate mowing equipment should be provided. All access gates should be provided with locks.

Appropriate signs should be provided along the fence around the project boundaries to designate the nature of the facility and advise against trespassing.

## CHAPTER XI

### WASTE STABILIZATION PONDS

*SEC. 108.* Location.-The site selected should be suitable for sewage stabilization basin operation without adversely affecting existing or proposed residential properties from an aesthetic standpoint or by reason of possible odors. A pond should be located as far as practicable from habitation or any area which may be built up within a reasonable future.

- (1) Whenever practical, stabilization basins should be so located that the local prevailing wind will direct sewage odors away from residential development.
- (2) Location of ponds in watersheds receiving significant amounts of storm water runoff is discouraged. Adequate provision must be made to divert storm water runoff around the ponds and protect pond embankments from erosion.
- (3) Construction of ponds in close proximity to water supplies and other facilities subject to contamination should be avoided. A minimum separation of 1.2 m between the bottom of the pond and the maximum groundwater elevation should be maintained.
- (4) The site should be large enough to maintain clear unobstructed, undeveloped area that will extend a minimum distance of 100 m in all directions from the

center line of the basin embankments. Consideration should be given to any proposed basin expansion of the future addition of cells when laying out this distance.

**SEC. 109. Basis of Design.-**

- (1) **Surface Area and Loadings-** The maximum stabilization basin loading should be approximately 250 lots per hectare of liquid surface.
- (2) **Aerated Pond System-**The maximum detention time for aerated pond system may be estimated using the following formula;

$$t = \frac{E}{3k_1 \times (100 - E)}$$

*t* = detention time days

*E* = percent of BOD to be removed in an aerated pond

*k*<sub>1</sub> = reaction coefficient, aerated lagoon, base 10. For normal domestic sewage, the *k*<sub>1</sub> value for normal domestic sewage may be assumed to be 0.4/day at 20°C for a single cell or for the first cell in a series.

The reaction rate coefficient for domestic sewage, which includes some industrial wastes, other wastes and partially treated sewage must be determined experimentally for various conditions which might be encountered in the aerated ponds. Conversion of the reaction rate coefficient at other temperatures shall be made based on experimental data.

Aeration equipment shall be capable of maintaining a minimum dissolved oxygen level of 2 mg/l, in the ponds at all times. Suitable protection from weather shall be

provided electrical controls.

- (3) Industrial Wastes-Consideration shall be given to the type and effects of industrial wastes on the treatment process. In some cases, it may be necessary to pre-treat industrial or other discharges.

Industrial wastes shall not be discharged to ponds without assessment of the effects such substances may have upon the treatment process or discharge requirements in accordance with the Commission's Rules and Regulations.

- (4) Multiple Units-At a minimum, a pond system should consist of three cells designed to facilitate both series and parallel operations. The maximum size of a pond cell should be 16 hectares. Two-cells system may be utilized in very small installations.

All systems should be designed with piping flexibility to permit isolation of any cell without affecting the transfer and discharge capabilities of the total system. In addition, ability to discharge the influent waste load to a minimum of two cells and/or primary cells in the system should be provided.

- a) Controlled-Discharge Stabilization Ponds - For controlled-discharged systems the area specified as the primary pond should be equally divided into two cells with the third or secondary cell volume a minimum of one-third the total volume of the entire system.
- b) Flow-Through Pond System - At a minimum, primary cells shall provide adequate detention time to maximize BOD removal. Secondary cells should then be provided for additional time with depths to 2.4 m to facilitate solids reduction. Design should also consider recirculation within the system.
- c) Aerated Ponds System - For a total aerated system,

a minimum of three cells employing a tapered mode of aeration is recommended.

- (5) **Pond Shape** - The shape of all cells should be such that there are no narrow or elongated portions. Round, square or rectangular ponds with a length not exceeding three times the width are considered most desirable. No islands, peninsulas, or coves shall be permitted. Dikes should be rounded at corners to minimize accumulations of floating materials. Common-well dike construction wherever possible, is strongly encouraged.
- (6) **Additional Treatment** - Consideration should be given in the design stage to the utilization of additional treatment units as may be necessary to meet applicable discharge standards.

**SEC. 110. Pond Construction Details.-**

- (1) **Design Depth** - The minimum operating depth should be sufficient to prevent growth of aquatic plants and damage to the dikes, bottom, control structures, aeration equipment and other appurtenances. In no case should pond depths be less than 0.6 m.
  - a) For controlled discharge stabilization ponds and flow-through ponds, the maximum water depth shall be 1.5 meters in primary cells. Greater depth in subsequent cells are permissible, provided that supplemental aeration or mixing is provided for.
  - b) For aerated pond systems, the water depth should be from 3 to 4.5 meters, although this depth limitation may be altered depending on the aeration equipment, waste strength and climatic conditions.
- (2) **Material** - Dikes shall be constructed of relatively impervious materials and compacted to at least 90 percent Standard Proctor Density to form a stable structure. Vegetation and other unsuitable materials shall be removed from the area where the embankment is to be placed.

- (3) Top Width - The minimum dike width shall be 2.4 m. to permit access of maintenance vehicles.
- (4) Minimum Slopes - Inner slopes should not be flatter than 1 vertical to 4 horizontal. Flatter slopes can be specified for larger installations because of wave action but have the disadvantage of added shallow areas being conducive to emergent vegetation. Outer slopes shall be sufficient to prevent surface runoff from entering the ponds.
- (5) Maximum Slopes - and outer dike slopes shall not be steeper than 1 vertical to 3 horizontal.
- (6) Freeboard - Minimum freeboard shall be 1.0 m. For very small system, 0.6 m may be acceptable.
- (7) Protection of Embankment - Embankment should be seeded above the water level. Only shallow root crops will be effective for this purpose as the use of long root grasses may cause sewage seep through the embankment. Protection such as riprap, sod or paving is recommended when excessive erosion is anticipated.

*SEC. 111. Pond Bottom.-*

- (1) Soil - Soil used in constructing the pond bottom (not including seal) and dike cores shall be relatively incompressible and tight and compacted at or up to 4 percent above the optimum water content to at least 90 percent Standard Proctor Density.
- (2) Seal - Ponds shall be sealed such that seepage loss through the seal is as low as practically possible. Seals consisting of soils, bentonite, or synthetic liners may be considered provided the permeability, durability, and integrity of the proposed material can be satisfactorily demonstrated for anticipated conditions. Results of a testing program which substantiates the adequacy of the proposed seal must be incorporated into and/or accompany the engineering report. Standard ASTM

procedures or acceptable similar methods shall be used for all tests.

- (3) Uniformity - The pond bottom shall be as level as possible to all points. Finished elevations shall not be more than 7.5 cm. from the average elevation of the bottom.

*SEC. 112. Influent Lines-*

- a) Flow Distribution - Flow distribution structures shall be designed to effectively split hydraulic and organic loads equally to primary cells.
- b) Placement of Influent Lines - Influent lines shall be located along the bottom of the pond so that the top of the pipe is just below the average elevation of the pond seal; however, the pipe shall have adequate seal below it.
- c) Manhole- A manhole or vented cleanout wye shall be installed prior to entrance of the influent line into the primary cell and shall be located as close to the dike as topography permits. Its invert shall be at least 15 cm above the maximum operating level of the pond without surcharging the manhole.
- d) Flow Distribution - Flow Distribution of structures shall be designed to effectively split hydraulic and organic loads equally to primary cells.
- e) Point of Discharge - All primary cells shall have individual influent lines which terminate at approximately the center of the cell so as to minimize short circuiting. Consideration should be given to multi-influent discharge points for primary cells of eight hectares or larger to enhance the distribution of waste load in the cell.

All aerated cells shall have influent lines which distribute the load within the mixing zone of the aeration equipment. Consideration of multiple



inlets should be closely evaluated for any diffused aeration system.

**SEC. 113. Interconnecting Piping** - All piping shall be of cast iron or other acceptable material. The piping shall not be located within or below the seal. Pipes should be anchored with adequate erosion control.

- (1) **Submerged Takeoffs** - For ponds designed for shallow or variable depth operations, submerged takeoffs are recommended. Intakes shall be located a minimum of 3.0 m. from the toe of the dike and 0.6 m. from the top of the seal, and shall employ vertical withdrawal.
- (2) **Multi-level Takeoffs**- For ponds that are redesigned deep enough to permit stratification of pond content, multiple takeoffs are recommended. There shall be a minimum of three withdrawal pipes at different elevations. The bottom pipe shall conform to a submerged takeoff. The others should utilize horizontal entrance. Adequate structural support shall be provided.
- (3) **Surface Takeoffs**- For use under constant discharge conditions and/or relatively shallow ponds under warm weather conditions, surface overflow-type withdrawal is recommended. Design should evaluate floating weir box or slide tube entrance with baffles for scum control.
- (4) **Maintenance Drawdown** - All ponds shall have a pond drain to allow complete emptying, either by gravity or by pumping, or maintenance. These should be incorporated into the above-described structures.
- (5) **Emergency Overflow** - To prevent overtopping of dikes, emergency overflow should be provided.
- (6) **Hydraulic Capacity** - The hydraulic capacity for continuous discharge structures and piping shall allow for a minimum of 250 percent of the design flow of the system. The hydraulic capacity for controlled-discharge systems shall permit transfer of water at a minimum

rate of 15 cm of pond water depth per day at the available head.

*SEC. 114.* Miscellaneous-

- (1) Fencing - The pond area shall be enclosed with an adequate fence to prevent entry of livestock and discharge trespassing. Fencing should not obstruct vehicular traffic on top of the dike.
- (2) Access- An all weather access road shall be provided to the pond site to allow year-round maintenance of the facility.
- (3) Flow Measurement - Flow Measurement requirements as provided for in Section 56 shall be provided.
- (4) Groundwater Monitoring - An approved system of wells or lysimeters may be required around the perimeter of the pond site to facilitate groundwater monitoring. The need for such monitoring will be determined on a case-by-case basis.
- (5) Pond Level Gauges shall be provided.

## CHAPTER XII

### PENALTIES AND FINAL PROVISIONS

*SEC. 115.* Penalties. - Any person found violating or failing to comply with any order or Decision of the Commission of these Rules and Regulations shall be liable under Section 9 of the Pollution Control Law (P.D. No. 984) and/or Section 106 of the 1978 NPCC Rules and Regulations.

*SEC. 116.* Transitory Provision.- Existing subdivisions, condominiums, hospitals, public buildings and other similar human settlements shall, upon petition and after due notice and hearings, be given adequate period of time for compliance with the requirements of these Rules and Regulations under such terms and conditions as the Commission may impose.

- SEC. 117.* Separability Clause.- If any section or provision of these Rules and Regulations is held or declared unconstitutional or invalid by a competent court, the other sections or provisions hereof shall continue to be in force as if the sections or provisions so annulled or voided had never been incorporated herein.
- SEC. 118.* Amendments. - These Rules and Regulations may be amended and/or modified from time to time by the Commission.
- SEC. 119.* Effectivity. - These Rules and Regulations shall take effect 30 days after publication in the Official Gazette.

Approved:  
(Sgd.) GUILLERMO A. PECACHE  
Brig. General, AFP (Ret.)  
Commissioner

Date Published: Official Gazette, 22 June 1981

## 013 UPDATED SOURCES OF FUND FOR FLOOD CONTROL PROJECTS

*(EXCERPTS FROM EXECUTIVE ORDER No. 52,  
Signed by President Corazon C. Aquino, 20 October 1986)*

Sec. 5. Metropolitan Manila Flood Control and Drainage Fund Account. A Metropolitan Manila Flood Control and Drainage Fund Account is hereby created and established in the National Treasury to finance flood control operation and projects implementation. The said Fund Account shall be sourced from the following:

- (a) all proceeds from the special metropolitan flood tax levied on all admission tickets of movie houses in Metropolitan Manila;
- (b) fund releases from appropriations of various Public Work Acts for flood control and drainage in Metropolitan Manila;
- (c) all proceeds from additional real estate taxes not exceeding one eighth (1/8) of one per cent (1 %) of the assessed value of real state located within Metropolitan Manila;
- (d) all proceeds of loans and grants intended for flood control and drainage in Metropolitan Manila;
- (e) all other taxes as may be imposed by law for the necessary operation, construction, and maintenance of flood control and drainage projects in Metropolitan Manila.

# 014 REVISED EFFLUENT REGULATION OF 1990

*March 20, 1990*

*DENR ADMINISTRATIVE ORDER NO. 35*

*Series of 1990*

## **SUBJECT: REVISED EFFLUENT REGULATIONS OF 1990, REVISING AND AMENDING THE EFFLUENT REGULATIONS OF 1982**

Pursuant to the provisions of Section 6 (i) of the Presidential Decree No. 984, otherwise known as the "Pollution Control Decree of 1976", and by virtue of Executive Order No. 192, Series of 1987, the Department of Environment and Natural Resources hereby adopts and promulgates the following rules and regulations:

*Section 1. Title.* - These rules and regulations shall be known as the "Revised Effluent Regulations of 1990".

*Section 2. Scope.* - These rules and regulations shall apply to all industrial and municipal wastewater effluents.

*Section 3. Definitions.* - The following words and phrases, as used in these rules and regulations, shall have the following meaning unless the context clearly indicates otherwise:

- a) "BOD" means a measure of the approximate quantity of dissolved oxygen that will be required by bacteria to stabilize organic matter in wastewater or surface water. It is a semi-quantitative measure of the wastewater organics that are oxidizable by bacteria. It is also a standard test in assessing wastewater strength.
- b) "Coastal Water" means an open body of water along the country's coastline starting from the shoreline (MLLW) and extending outward up to the 200-meter isobath or three-kilometer distance, whichever is farther.

- c) "Department" refers to the Department of Environment and Natural Resources.
- d) "Effluent" is a general term denoting any wastewater, partially or completely treated, or in its natural state, flowing out of a manufacturing plant, industrial plant or treatment plant.
- e) "Inland Water" means an interior body of water or watercourse such as lakes, reservoirs, rivers, streams, creeks, etc., that has beneficial usage other than public water supply or primary contact recreation. Tidal affected rivers or streams are considered inland waters for purposes of these regulations.
- f) "Mixing Zone" is the place where the effluent discharge from a point source mixes with a receiving body of water. The area or extent of the zone shall be determined by the discharger and approved by the Department on a case-to-case basis.
- g) "NPI" means New/Proposed Industry or wastewater treatment plants to be constructed.
- h) "OEI" means Old or Existing Industry.
- i) "Primary Contact Recreation" means any form of recreation, where there is intimate contact of the human body with the water, such as swimming, water skiing, or skin diving.
- j) "Protected Water" means a water course or a body of water, or any segment thereof, that is classified as a source of public water supply, propagation and harvesting of shellfish for commercial purposes, or spawning areas for *Chanoschanos* and similar species, or primary contact recreation, or that which is designated by competent government authority or by legislation as tourist zone, national marine park and reserve, including coral reef park and reserve.
- k) "Strong Water" refers to wastewater whose initial BOD

value before treatment is equal to or greater than 3,000 mg/L.

*Section 4.* Heavy Metals and Toxic Substances. Industrial and other effluents when discharged into bodies of water classified as Class A, B, C, D, SA, SB, SC, and SD in accordance with Section 68, as amended, of the 1978 NPCC Rules and regulations shall not contain toxic substances in levels greater than those indicated in Table 1.

*Section 5.* Conventional and Other Pollutants Affecting Aesthetics and Oxygen Demand. Effluents from domestic sewage and industrial wastewater treatment plants not covered under Section 6 of these Regulations, when discharged into receiving waters as Class A, B, C, D, SA, SB, SC and SD in accordance with Section 68, as amended, of the 1978 NPCC Rules and Regulations shall not contain the following pollutants in concentrations greater than those indicated in Tables 2A and 2B.

*Section 6.* Effluent Standards for BOD for Strong Industrial Wastes

- a) Interim Requirements for Old or Existing Industries. - For strong industrial wastewaters with high BOD and where the receiving body of water is Class C, D, SC and SD in accordance with Section 68, as amended, of the 1978 NPCC Rules and regulations, the interim effluent requirements for old industries which will be applicable within the period indicated in Table 3A.
- b) Requirements for New Industries. - Upon the effectivity of this regulations, new/proposed industries, or those old/existing industries that are yet to construct their wastewater treatment facilities, which are producing or treating strong wastewaters shall comply with the requirements in Table 3B below. By January 1995, this Table shall be applicable to all industries producing strong wastes.

*Section 7.* Mixing Zone Requirements. - The following general conditions shall govern the location and extent of the mixing

zone:

- a) No mixing zone or combination of mixing zones shall be allowed to significantly impair any of the designated uses of the receiving body of water.
- b) A mixing zone shall not include an existing drinking water supply intake if such mixing zone would significantly impair the purposes for which the supply is utilized.
- c) A mixing zone for rivers, streams, etc., shall not create a barrier to the free migration of fish and aquatic life.
- d) A mixing zone shall not include a nursery area of indigenous aquatic life nor include any area designated by the Department of Environment and Natural Resources for shellfish harvesting, tourist zones and national marine parks and reserves, coral reef parks and reserves and declared as such by the appropriate government agency.
- e) In general, the length of the mixing zone or plume in rivers or similar waterways shall be as short as possible and its width shall be preferably not more than one-half of the width of the waterway.
- f) In discharging hot effluents from power plants, mineral ore milling and similar generators of large volume of liquid wastes the permissible size of the mixing zone shall be determined through modeling taking into consideration the size, hydraulic and hydrological data of the receiving body of water and the design and siting of the wastewater outfall.
- g) For the protection of aquatic life resources, the mixing zone must not be used for, or be considered as a substitute for wastewater treatment facility.

**Section 8. Additional Requirements**

- a) In addition to fulfilling the above-stated requirements



in Sections 4 to 6, no effluent shall cause the quality of the receiving body of water to fall below the prescribed quality in accordance with its classification or best usage.

- b) Where the combined effect of a number of individual effluent discharges causes one or more water quality parameters to exceed the prescribed limits, the maximum permissible concentrations of such parameters shall be reduced proportionately so as to maintain the desired quality.
- c) When discharging effluents into coastal waters, the location and design of the submarine outfall shall be based on oceanographic and wind conditions so that discharged materials shall not find their way back to the shore and that there shall be minimum deposition of sediments near and around the outfall.
- d) Effluents discharged into protected inland and coastal waters category II, such as Class A, B, and SB, shall meet the requirements of Section 4 and 5 above.
- e) Starting January 1, 1995, old or existing industries shall comply with the standards set for new industries in these regulations.
- f) For a period to be determined by the Department Secretary and provided that the resulting effect on receiving waters does not pose an immediate threat to life, public health, safety or welfare to animal or plant or life property, any existing industry that produces strong wastes which cannot meet the limits for BOD in Tables 3A and 3B, may be allowed to operate and be issued a temporary permit to operate on condition that it pays first a penalty fee for polluting a receiving body of water in the amount equivalent to five pesos (P 5.00) per kilogram of BOD discharged per day in exceedance of the allowable effluent limit provided further that the calculated fine shall not exceed P 5,000 per day in accordance with P.D. 984 and its implementing rules and regulations. (Conversion Factor: 1 mg/L = 1 g/cu.

m.)

- g) Each discharger covered under these regulations shall monitor its effluent and its effect on the receiving body of water regularly in order to ensure compliance with Section 4, 5 and 6 hereof and Section 69, as amended of the 1978 NPCC Rules and Regulations.

*Section 9.* Prohibitions.

- a) No industrial or domestic sewage effluent shall be discharged into Class AA and SA waters.
- b) In order to avoid deterioration of the quality of the receiving body of water, no new industrial plant with high waste load potential shall discharge into a body of water where the dilution or assimilative capacity of said water body during dry weather condition is insufficient to maintain its prescribed water quality according to its usage or classification.
- c) No person shall discharge, wholly or partially, untreated or inadequately treated industrial effluents directly into bodies of water or through the use of bypass canals and/or pumps and other unauthorized means except upon prior approval of the Department Secretary.
- d) Other Restrictions:
1. All water pollution control facilities/installations shall be properly and consistently maintain an effluent quality that complies with Section 4 to 6 of these regulations.
  2. No industrial or manufacturing plant shall be operated without the control facilities or wastewater treatment system in good order or in proper operation except with the permission of the Department Secretary when special circumstance arise.
  3. No industrial or manufacturing plant or source of

pollution shall be operated at capacities beyond the limits of operation or capability of the wastewater treatment facility in order to maintain the effluent quality within the standards or pertinent conditions required by law and/or stipulated in the permit to operate.

4. No person shall build, erect, install or use any equipment, contrivance or any means the use of which will conceal and/or dilute an effluent discharge and which otherwise constitute a violation of any provisions of these regulations or the 1978 NPCC Rules and Regulations, as amended.

*Section 10.* Methods of Analysis for Effluents. - For purposes of these Regulations, any domestic or industrial effluent discharged into any body of water or watercourse shall be analyzed in accordance with the latest edition of the "Philippine Standard Methods for Air and Water Analyses", the "Standard Method for the Examination of Water and Wastewater" published jointly by the American Public Health Association, the American Waterworks Association and the Water Pollution Control Federation of the United States, or in accordance with other methods of analysis as the Department may prescribe. The approved methods of analysis are given in Table 4.

*Section 11.* Maximum Quantity to be Discharged. - For the protection of public health and the aquatic resources of the country and in cases where the volume, strength and nature of one or more pollutants, enumerated in, or not otherwise covered in the preceding Sections, are expected to cause a serious deterioration of receiving body of water or cause harm or injury to aquatic life and resources, the Department Secretary shall promulgate guidelines for the use of the concerned line agencies, providing for the maximum quantity of any pollutant or contaminant that may be allowed to be discharged into the said body of water or watercourse, including the maximum rate at which the contaminant may be so discharged.

This Section particularly applies, but is not limited to industrial effluents covered under Section 6 of these regulations, specifying kilograms per day the BOD that may be discharged considering the classification and dry weather flow of the receiving body of water.

- Section 12.* Penalties. - Any person or group of persons found violating or failing to comply with any Order or Decision of the Department and/or the Pollution Adjudication Board or any provision of these Regulations, shall be liable under Section 9 of the Pollution Control Law (P.D. No. 984) and/or Section 106 of the 1978 NPCC Rules and Regulations, as amended.
- Section 13.* Separability Clause. - Any Section or provision of these regulations declared to be unconstitutional or invalid by a competent court, the other sections or provisions hereof shall remain to be in force.
- Section 14.* Repealing Clause. - Any provision of the 1978 Rules and Regulations, as amended, the Effluent Regulations of 1982, and other existing rules and regulations of the Department which are inconsistent herewith are hereby repealed.
- Section 15.* Amendments. - This Regulation may be amended and/or modified from time to time by the Department.
- Section 16.* Effectivity. - This Regulation shall take effect thirty (30) days after publication in the Official Gazette or any newspaper of general circulation.

APPROVED.

(SGD) FULGENCIO S. FACTORAN, JR  
Secretary  
Department of Environment  
and Natural Resources

TABLE 1 - EFFLUENT STANDARDS : TOXIC AND OTHER DELETERIOUS SUBSTANCE  
(Maximum Limits for the Protection of Public Health) <sup>(a)</sup>

PARAMETER	UNIT	Protected Waters Category I (Class AA & SA)		Protected Waters Category II (Class A, B & SB)		Inland Waters Class C		Marine Waters Class SC		Marine Waters Class SD	
		OEI	NPI	OEI	NPI	OEI	NPI	OEI	NPI	OEI	NPI
Arsenic	mg/L	(b)	(b)	0.2	0.1	0.5	0.2	1.0	0.5	1.0	0.5
Cadmium	mg/L	(b)	(b)	0.05	0.02	0.1	0.05	0.2	0.1	0.5	0.2
Chromium (hexavalent)	mg/L	(b)	(b)	0.1	0.05	0.2	0.2	0.5	0.2	1.0	0.5
Cyanide	mg/L	(b)	(b)	0.2	0.1	0.3		0.5	0.2	-	-
Lead	mg/L	(b)	(b)	0.2	0.1	0.5	0.3	1.0	0.5	-	-
Mercury (Tot.)	mg/L	(b)	(b)	0.005	0.005	0.005	0.005	0.005	0.005	0.05	0.01
PCB	mg/L	(b)	(b)	0.003	0.003	0.003	0.003	0.003	0.003	-	-
Formaldehyde	mg/L	(b)	(b)	2.0	2.0	2.0	1.0	2.0	1.0	-	-

Note:

- (a) - Except as otherwise indicated, all limiting values in Table 1 (Section 4) are maximum and therefore shall not be exceeded.
- (b) - Discharge of sewage and/or trade effluents are prohibited or not allowed.

**Table 2A - EFFLUENT STANDARDS: Conventional and Other Pollutants in Protected Waters Category I and II and in Inland Waters Class C <sup>(a)</sup>**

PARAMETER	UNIT	Protected Waters				Inland Waters Class C	
		Category I (Class AA & SA)		Category II (Class A, B & SB)		OEI	NPI
		OEI	NPI	OEI	NPI		
Color	PCU	(b)	(b)	150	100	200 <sup>(c)</sup>	150 <sup>(c)</sup>
Temperature <sup>(d)</sup> (max. rise in degree Celsius in RBW)	°C rise	(b)	(b)	3	3	3	3
pH (range)		(b)	(b)	6.0-9.0	6.0-9.0	6.0-9.0	6.5-9.0
COD	mg/L	(b)	(b)	100	60	150	100
Settleable Solids (1-hour)	mg/L	(b)	(b)	0.3	0.3	0.5	0.5
5-Day 20 °C BOD	mg/L	(b)	(b)	50	30	80	50
Total Suspended Solids	mg/L	(b)	(b)	70	50	90	70
Total Dissolved Solids	mg/L	(b)	(b)	1,200	1,000	-	-
Surfactants (MBAS)	mg/L	(b)	(b)	5.0	2.0	7.0	5.0
Oil/Grease (Petroleum Ether Extract)	mg/L	(b)	(b)	5.0	5.0	10.0	5.0
Phenolic Substances as Phenols	mg/L	(b)	(b)	0.1	0.05	0.5	0.1
Total Coliforms	MPN/100mL	(b)	(b)	5,000	3,000	15,000	10,000

Table 2B - EFFLUENT STANDARDS: Conventional and Other Pollutants in Inland Waters Class D, Coastal Waters Class SC and SD and other Coastal Waters not yet Classified

PARAMETER	UNIT	Inland Waters (Class D)		Coastal Waters (Class SC)		Class SD & Other Coastal Waters Not Classified	
		OEI	NPI	OEI	NPI	OEI	NPI
Color	PCU	--	--	(c)	(c)	(c)	(c)
Temperature (max. rise in degree Celsius in RBW)	°C rise	3	3	3	3	3	3
pH (range)		5.0-9.0	6.0-9.0	6.0-9.0	5.0-9.0	5.0-9.0	5.0-9.0
COD	mg/L	250	200	250	200	300	200
5-Day 20 °C BOD	mg/L	150(d)	120	120 (d)	100	150(d)	120
Total Suspended Solids	mg/L	200	150	200	150	(g)	(f)
Total Dissolved Solids	mg/L	2,000 (h)	1,500 (h)	--	--	--	--
Surfactants (MBAS)	mg/L	--	--	15	10	--	--
Oil/Grease (Petroleum Ether Extract)	mg/L	--	--	15	10	15	15
Phenolic Substances as Phenols	mg/L	--	--	1.0(i)	0.5 (i)	5.0	1.0
Total Coliforms	MPN/100m L	(j)	(j)	--	--	--	--

NOTES for Table 2A and 2B:

1. In cases where the background level of Total Dissolved Solids (TDS) in freshwater rivers, lakes, reservoirs and similar bodies of water is higher than the Water Quality Criteria, the discharge should not increase the level of TDS in receiving body of water by more than ten percent of the background level.
2. The COD limits in Tables 2A and 2B generally apply to domestic wastewater treatment plant effluent. For industrial discharges, the effluent standards for COD should be on a case to case basis considering the COD -BOD ratio after treatment. In the interim period that this ratio is not yet established by each discharger, the BOD requirements shall be enforced.
3. There are no effluent standards for chloride except for industries using brine and discharging into inland waters, in which case the chloride content should not exceed 500 mg/L.
4. The effluent standards apply to industrial manufacturing plants and municipal treatment plants discharging more than thirty (30) cubic meters per day.

**LEGEND for Tables 2A and 2B:**

- (a)- Except as otherwise indicated, all limiting values in Tables 2A and 2B are 90<sup>th</sup> percentile values. This is applicable only when the discharger undertakes daily monitoring of its effluent quality, otherwise, the numerical values in the tables represent maximum values not to be exceeded once a year.
- (b) - Discharging of sewage and/or trade effluents is prohibited or not allowed.
- (c) - Discharge shall not cause abnormal discoloration in the receiving waters outside of the mixing zone.
- (d) - For wastewaters with initial BOD concentration over 1,000 mg/L but less than 3,000 mg/L, the limit may be exceeded up to a maximum of 200 mg/L or a treatment reduction of ninety (90) percent, whichever is more strict. Applicable to both old and new industries.
- (e) - The parameters Total Suspended Solids (TSS) should not increase the TSS of the receiving water by more than thirty (30) percent during the dry season.
- (f) - Not more than 30 mg/L increase (dry season)
- (g) - Not more than 60 mg/L increase (dry season)
- (h) - If effluent is the sole source of supply for irrigation, the maximum limits are 1,500 mg/L and 1,000 mg/L, respectively, for old industries and new industries.
- (i) - Not present in concentration to affect fish flavor or taste or tainting.
- (j) - If effluent is used to irrigate vegetable and fruit crops which may be eaten raw, Fecal Coliforms should be less than 500 MPN/100 ml.



**TABLE 3A - Interim Effluent Standards for BOD Applicable to Old or Existing Industries Producing Strong Industrial Wastes, (1990-1994)**

Industry Classification Based on BOD of Raw Wastewaters Produced	Maximum Allowable Limits in mg/L, according to Time Period and Receiving Body of Water			
	Effectivity date-Dec. 31, 1991		Jan. 1, 1992-Dec. 31, 1994	
	Inland Waters (Class C&D)	Coastal Waters (Cl. SC & SD)	Inland Waters (Class C & D)	Coastal Waters (Cl. SC & SD)
1. Industries producing BOD within 3,000 to 10,000 mg/L	320 or 95% removal	650 or 90% removal	200 or 97% removal	320 or 95% removal
2. Industries producing BOD within 10,000 to 30,000 mg/L	1,000 or 95% removal	2,000 or 90% removal	600 or 97% removal	1,000 or 95% removal
3. Industries producing more than or 30,000 mg/L	1,500 or 95% removal	3,000 or 90% removal	900 or 97% removal	1,500 or 95% removal

**NOTE:**

1. Use either the numerical limit or percentage removal whichever is lower (or whichever is more strict).
2. Starting January 1, 1995, the applicable effluent requirements for old or existing industries are indicated in Table 3B.
3. For parameters other than BOD, Table 2A and Table 2B both under Section 5 shall apply.

**TABLE 3B - Effluent Standards for New\* Industries Producing Strong Wastes upon Effectivity of these Regulations, and for All Industries Producing Strong Wastes starting January 1, 1995**

Industry Classification Based on BOD of Raw Wastewaters	Maximum Allowable Limits in mg/L, Based on Receiving Body of Water	
	Inland Waters (Class C&D)	Coastal Waters (Cl. SC & SD)
1. Industries producing BOD within 3,000 to 10,000 mg/L	130 or 98% removal	200 or 97% removal
2. Industries producing BOD within 10,000 to 30,000 mg/L	200 or 99% removal	600 or 97% removal
3. Industries producing more than or 30,000 mg/L	300 or 99% removal	900 or 97% removal

**NOTE:** \* Including old or existing industries producing strong waste whose wastewater treatment plants are still to be constructed.

1. Use either numerical limits or percentage removal whichever is lower (or whichever is more strict).
2. For parameters other than BOD, Tables 2A and 2B shall apply.

TABLE 4. APPROVED METHODS OF ANALYSIS

PARAMETER	METHOD OF ANALYSIS
ARSENIC	Silver Diethyldithiocarbamate Method (Colorimetric)
BOD <sub>5</sub>	Azide Modification (Dilution Technique)
BORON	Carmine Method (Colorimetric Method)
CADMIUM	Atomic Absorption Spectrophotometry (Wet ashing with concentration HNO <sub>3</sub> + HCL)
CHLORINATED HYDROCARBONS	Gas Chromatography (ECD)
CHROMIUM (Hexavalent)	Diphenyl Carbazine Colorimetric Method
COLOR	Visual Comparison Method (Platinum Cobalt Scale)
CYANIDE	Specific Ion Electrode Method
DISSOLVED OXYGEN	Azide Modification (Winkler Method), Membrane Electrode (DO meter)
FECAL COLIFORMS	Multiple-Tube Fermentation Technique or Membrane Filter
LEAD	Atomic Absorption Spectrophotometry
NITRATE AS NITROGEN	Brucine Method for Saline Waters, specific Ion Electrode Meter for Fresh Water
OIL AND GREASE	Gravimetric Method (Petroleum Ether Extraction)
ORGANO PHOSPOROUS COMPOUNDS	Gas Chromatography (FPD)
POLYCHLORINATED BYPHENYL (PCB)	Gas Chromatography (ECD)
pH	Glass Electrode Method
PHENOLIC SUBSTANCES	Chloroform Extraction Methods
PHOSPHATE AS PHOSPOROUS	Stannous Chloride Method
SETTLABLE SOLIDS	Imhoff Cone Method
SURFACTANTS (MBAS)	Methylene Blue Method (Colorimetric)
TEMPERATURE	Use of Mercury-Filled Thermometer
TOTAL COLIFORMS	Multiple-Tube Fermentation Technique or Membrane Filter
TOTAL MERCURY	Cold Vapor Technique, (Mercury Analyzer, AAS)
TOTAL SUSPENDED SOLIDS	Gravimetric Method

Note: Other methods found in the Philippine Standard Methods for Air and Water Analysis, the " Standard Methods for the Examination of Water and Waste Waters", published jointly by American Public Health Association (APHA), the American Waterworks Association and the Water Pollution Control Federation of the US or in accordance with such other method of analyses as the DENR may prescribe.

## **015 SEWERAGE AND SANITATION PROVISIONS (INDUSTRIAL HYGIENE)**

*EXCERPTS from DOH A.O. No. 111, s. 1991 (issued on 22 August 1991) containing the Rules and Regulations for Implementing Chapter VII (Industrial Hygiene) of the Sanitation Code of the Philippines (P.D. No. 856)*

### **RULE II SANITARY REQUIREMENTS FOR OPERATING AN INDUSTRIAL ESTABLISHMENT**

*Section 1.* Prior to operation, all industrial establishments shall obtain a sanitary permit from the Secretary or his duly authorized representative under the following conditions:

- A.2 The following shall be conditions precedent to the issuance of sanitary permit:
  - b.) Sewerage System. Sewage Works and Treatment Plants shall comply with the following requirements:
    - b.1) All establishments covered by the system shall be connected to the sewer in areas where a sewage system is available.
    - b.2) Outfalls discharging effluent from a treatment plant shall be carried to the channel of the stream or to deep water where the outlet is discharged.
    - b.3) Storm water shall be discharged to a storm sewer; sanitary sewage shall be discharged to a sewerage system carrying sanitary sewage only; but this should not prevent the installation of a combined system.
    - b.4) Properly designed grease traps shall be

installed in establishments where the sewage carries a large amount of grease.

- c) Septic Tank. Where a public sewerage is not available, sewer outfalls from industrial establishments shall be discharged into a septic tank to be constructed in accordance with the following minimum requirements:
  - c.1 ) It shall be generally rectangular in shape. When a number of compartments are used, the first compartment shall have the capacity from one half to two thirds of the total volume of the tank.
  - c.2) It shall be built of concrete, either precast or poured-in-place. Bricks, concrete blocks or adobe may be used.
  - c.3) It shall not be constructed under any building and within 25 meters from any source of water supply.
- d) Disposal of Septic Tank Effluent. The effluent from septic tanks shall be discharged into a sub-surface soil, absorption field where applicable or shall be treated with some type of purification device. The treated effluent may be discharged into a stream or body of water if it conforms to the quality standards prescribed by the Environmental Management Bureau (EMB-DENR).
- e) Disposal of Industrial Wastes. The following requirements shall be complied with:
  - e.1 All wastes incident to the operation of the industrial plant shall be collected, stored or disposed of in a manner that will prevent health hazards, nuisance and pollution (e.g. settling ponds in the collection of effluents). Where a city or municipal collection and disposal system

exists, it shall be utilized.

e.2 All industrial establishments discharging toxic wastes shall submit a copy of the method of the treatment approved and certified by the EMB to the Department or its duly authorized representatives.

f) Compliance with Threshold Limit Values for Hazards

The sanitary permit shall be in accordance with the Threshold Limit Values for hazards as adopted by the Department from the American Conference of Governmental Industrial Hygienist-Threshold Limit Values (ACGIH - TLV's). ...

h) Facilities Required. The following facilities shall be installed in all industrial establishments.

h.1) Adequate and suitable toilet and bath facilities for both male and female employees at the following ratio:

- 1) Where the number of female employees exceeds 100, one (1) toilet for every 20 female employees up to the first 100 and one (1) for every 30 thereafter.
- 2) Where the number of male employees exceeds 100 and sufficient urinals have been provided, one (1) toilet for every 25 males up to the first 100 and one (1) more for every 40 thereafter.
- 3) Where the number of males employed exceeds 500, it is sufficient to provide one toilet for every 60 males if sufficient urinals are provided...

- h.4) One bathing/washing facility regardless of sex for every 25 employees up to the first 100 and one more for every 40 thereafter.
- i. The following minimum standards shall be strictly observed:

  - i.1) Every toilet shall be provided with enclosure, partitioned off so as to provide/ ensure privacy and shall have a proper door and fastenings, so doors shall be tight-fitting and self-closing.
  - i.2) Urinals shall be so placed or screened so as not to be visible from other parts of the factory where employees work or pass.
  - i.3) Rest rooms and mess halls shall be so arranged so as to be conveniently accessible to the workers and shall be kept clean and orderly at all times.
  - i.4) Bathing/Washing facilities shall include a supply of clean running, hot and cold or warm water, soap, clean towels or other suitable means of cleaning or drying.
  - i.5) Adequate hand washing facilities shall be so provided within or adjacent to toilet facilities.
  - i.6) Toilet and bath facilities shall be so arranged so as to be conveniently accessible to the workers at all times while they are at the establishment and shall be kept clean and in orderly condition.
  - i.7) Every toilet and bath facility shall be sufficiently ventilated and shall not be joined with any workroom, kitchen or dining room, except through the open air

or through an intervening ventilated space.

- i.8) In cases where persons of both sexes are employed, toilet and bath facilities for each sex shall be situated or partitioned so that the interior will not be visible even when the door of any facility is open from any place where persons of the other sex have to work or pass.
- i.9) If toilet and bath facilities for one sex adjoin those for the other sex, the approaches shall be separate and toilet and bath facilities for each sex shall be properly indicated.
- i.10) The minimum space provided for a rest room for 10 workers shall be 6.0 square meters for each additional employee, the minimum addition shall be at least 0.2 square meter.



# 016 SANITATION AND DRAINAGE PROVISIONS (LOCAL GOVERNMENT CODE)

*EXCERPTS FROM THE LOCAL GOVERNMENT CODE,  
R.A. 7160 - AN ACT PROVIDING FOR A LOCAL  
GOVERNMENT CODE OF 1991 (Approved by President  
Corazon Aquino, October 10, 1991)*

## BOOK I

### GENERAL PROVISIONS

#### Title One

#### BASIC PRINCIPLES

#### CHAPTER 2. General Powers and Attributes of Local Government Units

*SEC. 17.* Basic Services and Facilities.

- (a) Local government units shall endeavor to be self-reliant and shall continue exercising the powers and discharging the duties and functions currently vested upon them. They shall also discharge the functions and responsibilities of national agencies and offices devolved to them pursuant to this Code. Local government units shall likewise exercise such other powers and discharge other functions and responsibilities as are necessary, appropriate or incidental to efficient and effective provision of the basic services and facilities enumerated herein.
- (b) Such basic services and facilities include, but are not limited to, the following:
  - (1) For a Barangay:
    - ....
    - (iii) Services and facilities related to general hygiene and sanitation, beautification, and solid waste collection;

...

(2) For a Municipality:

...

(vi) . ... services and facilities related to general hygiene and sanitation;

...

(viii). Infrastructure facilities intended primarily to service the needs of the residents of the municipality and which are funded out of municipal funds , including, but not limited to, ... drainage, and sewerage and flood control;...

...

(3) For a Province:

...

(vii). Infrastructure facilities intended to service the needs of the residents of the province and which are funded out of provincial funds including, but not limited to ... drainage and sewerage, flood control,....

...

(4) For a City:

All the services and facilities of the municipality and province, .....

## **017 SANITATION AND DRAINAGE PROVISIONS (LOCAL GOVERNMENT CODE IRR)**

*EXCERPTS FROM THE RULES AND REGULATIONS  
IMPLEMENTING THE LOCAL GOVERNMENT CODE  
OF 1991, Approved by President Corazon Aquino,  
February 6, 1992)*

### **RULE V**

#### **BASIC SERVICES AND FACILITIES**

Art. 25. Responsibility for Delivery of Basic Services and Facilities. -  
The LGUs shall, in addition to their existing functions and  
responsibilities, provide basic services and facilities devolved  
to them covering, but not limited to, the following:

##### **Barangay**

....

- (c) Services and facilities related to general hygiene and sanitation, beautification, and solid waste collection;

...

##### **Municipality...**

...

- (f). Provision of ... services or facilities related to general hygiene and sanitation;

- (g). Construction and maintenance of infrastructure facilities funded by the municipality to serve the needs of the residents including, but not limited to:

...

- (7) ...sewerage and flood control;

##### **Province**

...

- (g). Construction and maintenance of infrastructure facilities funded by the province to serve the needs of the residents including, but not limited to:

...

(2) ... drainage and sewerage, flood control..

City

All services and facilities provided by the municipality  
and the province...

...

**018 WASTEWATER PROVISIONS  
(NATIONAL PLUMBING CODE  
1993-1994 REVISION)**

*(EXCERPTS FROM THE NATIONAL PLUMBING  
CODE (1993-1994 REVISION))*

**CHAPTER 5**

**GENERAL REGULATIONS, INSTRUCTIONS AND  
REQUIREMENTS**

**ARTICLE I - DISPOSAL OF LIQUID WASTE**

- P-1. It shall be unlawful for any person to cause, suffer or permit the disposal of sewage, human excrement or other liquid wastes, in any place or manner except through and by means of an approved plumbing and drainage system, installed and maintained in accordance with the provisions of this Code.

**ARTICLE II - CONNECTIONS TO PLUMBING  
SYSTEMS REQUIRED**

- P-1. All plumbing fixtures, drains, appurtenances and appliances used to receive or discharge liquid wastes or sewage shall be connected properly to the drainage system of the building or premises.

**ARTICLE III - SEWER REQUIRED**

- P-1. Every building in which plumbing fixtures are installed has a connection to a public or private sewer except as provided in this Code.
- P-2. When a public sewer is not available for use, drainage piping from buildings and premises shall be connected to an

approved private sewage disposal system.

- P-3. In provinces, cities and/or municipalities where the installation of building is under the jurisdiction of a department other than the provincial, city or municipal Plumbing Official, the provisions of this Code relating to building sewers need not apply.

#### ARTICE IV - DAMAGE TO DRAINAGE SYSTEM OR PUBLIC SEWER

- P-1. It shall be unlawful for any person to deposit, by any means whatsoever, into any plumbing fixture, floor drain, interceptor, sump, receptor, receptacle or device, which is connected to any drainage system, public sewer, private sewer, septic tank or cesspool, any ashes, cinders, solids, rags, inflammable, poisonous or explosive liquids or gases, oils, grease or any other thing, whatsoever which would, or could cause damage to the drainage system or public sewer.
- P-2. Roofs, inner courts, vent shafts, fight wells, or similar areas having rain water drain, shall discharge outside of the building or to the gutter and shall not be connected to the drainage system unless first approved by the Provincial/City/Municipal Plumbing Official.

#### ARTICLE V - INDUSTRIAL WASTES

- P-1. Wastes detrimental to the public sewer system or detrimental to the functioning of the sewage treatment plant shall be treated and disposed of as found necessary and directed by the Provincial/City/ Municipal Plumbing Official.
- P-2. Sewage or other waste from a plumbing system which may be deleterious to surface or subsurface waters, shall not be discharged into the ground or in any waterway unless it has first been rendered innocuous through subjection to some acceptable form of treatment.

## ARTICLE VI - PLANS REQUIRED

- P-1. The Provincial/City/Municipal Plumbing Official may require the submission of plans, specifications, drawings, and such other information as he may deem necessary prior to the commencement of, and at any time during the progress of any work as regulated.
- P-2. The issuance of a permit upon plans and specifications shall not prevent the Provincial/City Municipal Plumbing Official from thereafter requiring the correction of error in said plans and specifications or from preventing construction operations being carried on thereunder when in violation of this Code or of any other pertinent laws and ordinances or from revoking any certificate of approval when issued in error.

## ARTICLE VII - LOCATION

- P-1 Except as otherwise provided in this Code, no plumbing system, drainage system, building sewer, private sewage disposal system or parts thereof, shall be located in any lot other than the lot which is the site of the building, structure, of premises served by such facilities.
- P-2. No subdivision, sale or transfer of ownership of existing property shall be made in such manner that the area, clearance and access requirements of this Code are decreased.

## ARTICLE VIII - IMPROPER LOCATION

- P-1. Piping, fixtures, or equipment shall not be so located as to interfere with the normal use thereof or with the normal operation and use of windows, doors, or other required facilities.

## ARTICLE IX - WORKMANSHIP

- P-1. All design, construction and workmanship shall be in conformity with accepted engineering practices and shall be of such character as to secure the results sought to be obtained.

- P-2. It is unlawful to conceal cracks, holes or other imperfections in materials by welding, brazing or soldering or by using therein or thereon any paint, wax, tar or other leak-sealing or repair agent.

#### ARTICLE X- PROHIBITED FITTINGS AND PRACTICES

- P-1. No double hub fitting, single or double tee branch, single or double tapped tee branch, side inlet quarter bend, running thread, bend or saddle shall be used as a drainage fitting, except that a double hub sanitary tapped tee may be used on a vertical line as a fixture connection.
- P-2. No drainage or vent piping shall be drilled and tapped for the purpose of making connections, thereto, and no cast iron soil pipe shall be threaded.
- P-3. No waste connection shall be made to a closet bend or stub of a water closet or similar fixture.
- P-4. Except as hereinafter provided, no vent pipe shall be used as a soil or waste pipe.
- P-5. No fitting, fixture and piping connections, appliance, device or method of installation which obstructs or retards the flow of water, wastes, sewage or air in the drainage or venting system in an amount greater than the normal frictional resistance to flow, shall be used unless it is indicated as acceptable in this Code or is approved by the Plumbing Official as having desirable and acceptable function and as of ultimate benefit to the proper and continuing functioning of the plumbing system. The enlargement of 7.62 cms. (3 inches) closet bent or stub to 10.16 cms. (4 inches) shall not be considered an obstruction.
- P-6. Except for necessary valves, where intermembering or mixing of dissimilar metals occur, the point of connection shall be confined to exposed or readily accessible locations.
- P-7. All valves, pipes and fittings shall be installed in correct relationship to the direction of flow.



## ARTICLE XI - INDEPENDENT SYSTEMS

- P-1. The drainage system of each new building and of new work installed in any existing building shall be separate and independent from that of any other building and when available, every building shall have an independent connection with a public or private sewer.

Exception " Where one building stands in the rear of another building on an interior lot, and no private sewer is available or can be constructed to the rear building through an adjoining court, yard or driveway, the building drain from the front building may be extended to the rear building.

## ARTICLE XII - REPAIRS AND ALTERATIONS

- P-1. In existing buildings or premises in which plumbing installations are to be altered, repaired or renovated, deviations from the provisions of this Code are permitted, provided such deviations are found to be necessary and are first approved by the Plumbing Official.
- P-2. Existing building sewers and building drains may be used in connection with new buildings or new plumbing and drainage work only when they are found on examination and test to conform in all respects with the requirements governing new work, and the proper Plumbing Official shall notify the owner to make any changes necessary to conform to this Code. No building or part thereof, shall be erected or placed over any part of a drainage system which is constructed of materials other than those approved elsewhere in this Code for use inside of a building.
- P-3. All openings in to a drainage or vent system, excepting those openings to which plumbing fixtures are property connected or which constitute vent terminals, shall be permanently plugged or capped in an approved manner, using the appropriate materials required by this Code.

ARTICLE XIII- PROTECTION OF PIPING,  
MATERIALS AND STRUCTURES

- P-1. All piping passing under or through walls shall be protected from breakage. All piping passing through or other cinders or under corrosive materials, shall be protected from external corrosion in an approved manner. Approved provisions shall be made for expansion of hot water piping. Voids around piping passing through masonry floors on the ground shall be appropriately sealed.
- P-2. All piping in connection with a plumbing system shall be so installed that piping or connections will not be subject to undue strains or stresses, and provisions shall be made for expansion, contraction and structural settlement. No piping shall be directly embedded in concrete or masonry walls or footings. No structural member shall be seriously weakened or impaired by cutting, notching or otherwise, and unless impractical due to structural conditions, all wood beams, girders, joists, studs and similar construction shall be bored with holes approximately the same diameter as the pipe passing through them.
- P-3. All trenches deeper than the footing of any building or structure and paralleling the same must be at least 45 degrees therefrom, unless permission, be otherwise granted by the Plumbing Official.
- P-4. No building sewer or other drainage piping or part thereof, constructed materials other than those approved for use under or within a building, shall be installed under or within 1.524 meters (5 feet) of any building or structure, or less than 30.48 cms. (1 foot) below the surface of the ground.
- P-5. Piping subject to undue corrosion, erosion, or mechanical damage shall be protected in an approved manner.
- P-6. No water, soil or waste pipe shall be installed or permitted outside of a building or in an exterior wall, unless where necessary, adequate provision is made to protect such pipe from freezing.

## ARTICLE XIV - HANGERS AND SUPPORTS

### P-1. - Vertical Piping

- A. Attachment. - Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents. Stacks shall be supported at their bases, and if over two stories in height at each floor, by approved metal floors clamps.
- B. Screwed Pipe. - Screwed pipe (IPS) shall be supported at not less than every other story height.
- C. Copper Tubing. - Copper tubing shall be supported at each story for piping 3.81 cms. (1-1/2 inches) and larger in diameter and at not more than 1.82888 meters (6 feet) intervals for piping 3.175 cms. (1-1/4 inches) and smaller in diameter.
- D. Lead Pipe. - Lead pipe shall be supported at intervals not exceeding 1.292 meters (4 feet).
- E. Plastic Pipe . - Plastic pipe shall be maintained in a straight alignment.

### P-2. - Horizontal Piping

- A. Supports. - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
- B. Cast Iron Soil Pipe. - Where joints occur, suspended cast iron soil pipe shall be supported at not more than 1.524 meters (5 feet) intervals; except that pipe exceeding 1.524 meters (5 feet) in length, may be supported at not more than 3.0488 meters (10 feet) intervals. Supports shall be adequate to maintain alignment and prevent sagging and shall be placed within 45.72 cms. (18 inches) of the hub joint. Hubless or compression gasket joints must be supported at least at every other joint except that when the developed

length between supports exceeds 1.2192 meters (4 feet) shall be provided at each joint. Supports shall be also provided at each horizontal branch connection. Supports shall be placed on or immediately adjacent to the coupling. Suspended lines shall be suitably braced to prevent horizontal movement.

- C. Screwed Pipe.- Screwed pipe (IPS) except as provided in P-6, Article XIII, Chapter XIV and Table 14-5, shall be supported at approximately 3.0488 meter (10 feet) intervals.
- D. Copper tubing.- Copper tubing shall be supported at approximately 1.8288 meters (6 feet) intervals for piping on 388.1 MM. (1-1/2 inches) and smaller in diameter and 3.048 meters (10 feet) intervals for piping 50.8 mms. (2 inches) and larger in diameter.
- E. Lead Pipe. - Lead pipe shall be supported by strips.
- F. In Ground. - Piping in the ground shall be laid on a firm bed for its entire length, except where support is otherwise provided which is adequate in the judgment of the Plumbing Official.
- G. Plastic Pipe.- Plastic pipe shall be supported at not to exceed 1.292 meters (4 feet).

### P-3. - Hangers and Anchors

- A. Material.- Hangers and anchors shall be of metal of sufficient strength to maintain their proportional share of the weight of pipe and contents.
- B. All pipings, fixtures and equipment shall be adequately supported to the satisfaction of requirements.

## ARTICLE XV - TRENCHING, EXCAVATION AND BACKFILL

- P-1. - Use of mechanical excavating equipment is prohibited within 60.96 cms. (2 feet) of existing piping or appurtenances.

P-2. - Tunneling and driving may be done in yards, courts, or driveways of any building site. Where sufficient depth is available to permit, tunnels may be used between open cut trenches. Tunnels shall have a clear height of 60.96 cms. (2 feet) above the pipe and shall be limited in length to 1/2 the depth of the trench, with a maximum length of 2.4383 meters (8 feet). When pipes are driven, the drive pipe shall be at least one size larger than the pipe to be laid.

P-3. - Open Trenches. - All excavations required to be made for the installation of a building drainage system or any part thereof, within the walls of a building, shall be open trench work and shall be kept open until the piping has been inspected, tested and accepted.

P-4. - All excavations shall be completely backfilled as soon after inspection as practicable. Adequate precaution shall be taken to insure proper compactness of backfill around piping without damage to such piping. Trenches shall be backfilled in thick layer 30.48 cms. (12 inches) above the top of the piping with clean earth which shall not contain stones, boulders, cinderfill or other materials which would damage or break the piping or cause corrosive action. Mechanical devices such as bulldozers, graders, etc. may then be used to complete backfill to grade. Fill shall be properly compacted. Suitable precautions shall be taken to insure permanent stability for pipe and laid in filled or made ground.

P-5. Water service pipes or any underground water pipes shall not be run or laid in the same trench with non-metallic building sewer or drainage piping, except as provided in this Code.

A. The water service pipe may be placed in the same trench with such building drain and building sewer, provided both of the following conditions are met:

(1) The bottom of the water service pipe at all points shall be at least 30.48 cms. (12 inches) above the top of the sewer line.

(2) The water service pipe shall be placed on a solid

shelf excavated at one side of the common trench.

## **CHAPTER 6 DRAINAGE SYSTEMS**

### **ARTICLE 1 - MATERIALS**

**P-1.-** Drainage pipe shall be cast iron, galvanized steel, galvanized wrought iron, lead, copper, brass, ABS, PVC, or other approved materials having a smooth and uniform bore, except:

- A.** That no galvanized wrought iron or galvanized steel pipe shall be used underground and shall be kept at least 15.24 cms. (6 inches) above ground.
- B.** ABS or PVC installation limited building construction not more than six or 60 feet in height.

**P-2.-** Drainage fittings shall be of cast iron, malleable iron, lead, brass, copper, ABS, PVC or other approved materials having a smooth interior waterway of the same diameter as the piping served and all such fittings shall conform to the type of pipe used.

- A.** Fittings on screwed pipe shall be of the recessed drainage type. Burred ends shall be reamed to the full bore of the pipe.
- B.** The threads of drainage fittings shall be tapped so as to allow on 6.35 mms. (1/4 inch) per foot grade.

### **ARTICLE II - FIXTURE UNIT EQUIVALENT**

**P-1.-** The unit equivalent of the plumbing fixtures shown in Table 6-1 shall be based on the size of the top required, and the unit equivalent of fixtures and devices shall be based on the rated discharge capacity in GPM (Gallons Per Minute) or LPM (Liters Per Minute) in accordance with Table 6-2.

P-2.- Maximum trap loadings for size up to 10.16 cms. (4 inches) are as follows:

Inches	Millimeters	Units
1-1/4	31.75	1
1-1/2	38.10	2
2	50.80	4
3	76.20	6
4	101.60	8

Exception on self- service laundries.

### ARTICLE III- SIZE OF DRAINAGE PIPING

P-1.- The minimum sizes of vertical and/or horizontal drainage piping shall be determined from the total of all fixture units connected thereto, and additional, in the case of vertical drainage pipes in accordance with their length.

P-2.- Table 6-3 shows the maximum number of fixture units allowed on any vertical or horizontal drainage pipes, building drain or building sewer of a given size; the maximum number of fixture units allowed on any branch interval of a given size; the maximum length of any vertical drainage pipe of a given size.

TABLE 6-1  
FIXTURE UNIT EQUIVALENT

Kinds of Fixtures	Minimum Trap and Trap Arm Size		Units
	Mms	Inches	
Bathtubs	38.1	1-1/2	2
Bidets	38.1	1-1/2	2
Dental units or cuspidors	31.75	1-1/4	1
Drinking fountains	31.75	1-1/4	1
Floor drains	50.8	2	2
*Interceptors for grease, oil, solids, etc.	50.8	2	3
*Interceptors for sand, autowash, etc	76.2	3	6
Laundry tubs	38.1	1-1/2	2
Clothes washers	50.8	2	2
*Receptors (floor sinks) indirect wastes Receptors for refrigerators, coffee urn, water stations, etc	38.1	1-1/2	1
Receptors, indirect waste receptors for commercial sinks, dishwashers, air washers, etc	50.8	2	3
Showers, single stalls	50.8	2	2
*Showers, gang (1 unit per head)	50.8	2	
Sinks, bar, private ( 1-1/2 min. waste)	38.1	1-1/2	1
Sinks, commercial or industrial, schools, etc. including dishwashers, washup sinks and wash fountains (2" min.waste)	38.1	1-1/2	3
Sinks, service	50.8	2	3
Trailer perk traps ( 1 for each trailer)	76.2	3	6
Urinals, pedestal	76.2	3	6
Urinals, stall	50.8	2	2
Urinals, wall (2" min. waste)	38.1	1-1/2	2
Urinals, wall trough (2" min. waste)	38.1	1-1/2	3
Wash basins (lavatories) single	31.75	1-1/4	1
Wash basins, in sets	38.1	1-1/2	2
**Water closet, tank type	76.2	3	4
Water closet, flush valve type	76.2	3	6

\*NOTE: The size and discharge rating of each indirect waste receptor and each interceptor shall be based on the total rated discharge of all fixtures, equipment or appliance discharging thereto in accordance with Table 6-2.

Drainage piping serving batteries of appliances capable of producing continuous flows shall be adequately sized to provide



Drainage piping serving batteries of appliances capable of producing continuous flows shall be adequately sized to provide for peak loads. Clothes washers in groups of 3 or more shall be rated at 6 units each for the purpose of common waste pipe sizing.

Tank type toilets shall be computed as fixture units when determining septic tank size, Article XII, Chapter 13.

Trap size shall not be increased to a point where the fixture discharge may be inadequate to maintain their self-scouring properties.

**TABLE 6-2  
DISCHARGE CAPACITY (IN LTRS. PER MIN.)  
FOR INTERMITTENT FLOW ONLY**

Up to 288.42 Ltrs	(7-1/2 Gals.)	Equals	1 unit
30.32 to 56.85 Ltrs	(8 to 15 Gals.)	Equals	2 units
60.64 to 113.70 Ltrs.	(16 to 30 Gals)	Equals	4 units
117.49 to 189.50 Ltrs	(31 to 50 Gals)	Equals	6 units

Over 189.50 Ltrs. (50 gals.) shall be determined by the Plumbing Official.

For a continuous flow into a drainage system, such as from a pump, pump ejector, air conditioning equipment, or similar device, two fixture units shall be allowed for each liter (gallon) per minute of flow.

#### ARTICLE IV- FIXTURE CONNECTIONS (DRAINAGE)

- P-1.- Drainage piping shall be provided with approved inlet fittings for fixture connections, currently located according to the size and type of fixture proposed to be connected.
- P-2.- Two fixtures set back to back or side by side, within the distance allowed between a trap and its vent, may be served by a single drainage pipe provided that each fixture wastes

separately into an approved double fitting having inlet openings at the same level.

#### ARTICLE V- CHANGES IN DIRECTION OF DRAINAGE FLOW

- P-1.- Changes in direction of drainage piping shall be made by the appropriate use of approved fittings and shall be of the angle presented by a 1/16 bend, 1/8 bend, or 1/6 bend, or other approved fittings of equivalent sweep.
- P-2.- Horizontal drainage lines, connecting a vertical stack, shall enter through 45( "Y" branches, combination "Y" and 1/8 bend branches, sanitary tee or sanitary tapped tee branches, or other approved fittings of equivalent sweep. No fitting having more than one branch at same level shall be used unless such fitting is constructed so that the discharge from one branch cannot readily enter any other branch. Double sanitary tees may be used when the barrel of the fitting is at least two pipes sizes larger than the largest branch, (pipe sizes recognized for this purpose are 50.8 cms., 63.5 cms., 76.2 cms., 101.6 cms., 114.3 cms., 127 cms., 152.4 cms., etc.).
- P-3.- Horizontal drainage lines connecting with other horizontal drainage lines shall enter through 45( "Y" branches, combination "Y" and 1/8 bend branches, or other approved fittings of equivalent sweep.
- P-4.- Vertical drainage lines connecting with horizontal drainage lines shall enter through 45( branches, or other approved fittings of equivalent sweep. 60( branches or offsets may be used only when installed in a true vertical position.

#### ARTICLE VI-CLEANOUTS

- P-1- Each horizontal drainage pipe shall be provided with a cleanout at its upper terminal, and each run of piping, which is more than 30.488 meters (100 feet) in total developed length shall be provided with a clean-out for each 30.48 meters (100 feet) or fraction thereof, in length of such piping.

Exceptions:

- A. Cleanouts may be omitted on a horizontal drain line less than 1.524 meters (5 feet) in length unless such line is serving sinks or urinals.
  - B. Cleanouts may be omitted on any horizontal drainage pipe installed on a slope of 72( or less from the vertical angle (angle of 1/5 bend).
  - C. Excepting the building drain and its horizontal branches, a cleanout shall not be required on any pipe or piping which is above the first floor of the building.
  - D. An approved type of two-way cleanout fitting installed inside the building wall near the connection between the building drain and building sewer or installed outside of a building at the lower end of a building drain and extended to grade may be substituted for an upper terminal cleanout.
- P-2.- An additional cleanout shall be provided in a horizontal line for each aggregate change of direction exceeding 135°.
- P-3.- Each cleanout shall be installed so that it opens in a direction opposite to the flow of the soil or waste or at right angles thereto, and except in the case of "WYE" branch and end-of-the-line cleanouts, shall be installed vertically above the flow line of the pipe.
- P-4.- Each cleanout extension shall be considered as drainage piping each 90( cleanout extension shall be extended from a "Y" type fitting or other approved fitting of equivalent sweep.
- P-5.- Each cleanout, unless installed under an approved cover plate, shall be above grade, readily accessible and so located as to serve the purpose for which it is intended. Cleanout located under cover plates shall be so installed as to provide clearances and accessibility required by this Code.
- P-6.- Each cleanout for an interceptor shall be outside of such interceptor.

- P-7.- Each cleanout in piping 5.08 cms. (2 inches) or less in size shall be so installed that there is a clearance of not less than 30.48 cms. (12 inches) in front of the cleanout,. Cleanouts in piping larger than 5.08 cms. (2 inches) shall have a clearance of not less than 45.72 cms. (18 inches) in front of the cleanout. Cleanouts in underfloor piping shall be extended to or above the finished floor or shall be extended outside the building when there is less than 45.72 cms. (18 inches) vertical and 76.2 cms. (32 inches) horizontal clearance form the means of access to such cleanout. No underfloor cleanout an any residential occupancy shall be located more than 6.096 meters (20 feet) from an access door, trap door or crawl hole.
- P-8.- Cleanout fittings shall be not less in size than that given in Table 4-3.
- P-9.- Cleanouts shall be provided for pressure drainage system as classified in P-7, Article IX, Chapter 6.

#### ARTICLE VII-GRADE OF HORIZONTAL DRIANAGE PIPING

- P-1.- Horizontal drainage piping shall be run in practical alignment and a uniform slope of not less than 1/4 of cm. per meter or 20— toward the point of disposal; provided, that where it is impractical due to the depth of the street sewer or to the structural features or to the arrangement of any building or structures to obtain a slope of 1/4 of a cm. per meter or 25, any such pipe or piping 10.16 cms. (4 inches) or larger in diameter may have a slope of not less than 1/8 of a cm. per meter or 10 when first approved by the Plumbing Official.

#### ARTICLE VIII- GRAVITY DRAINAGE REQUIRED

- P-1.- Wherever practicable all plumbing fixtures shall be drained to the public sewer or private sewage disposal system by gravity.

ARTICLE IX- DRAINAGE BELOW CURB  
AND ALSO BELOW MAIN SEWER LEVEL

- P-1.- Drainage piping serving fixtures, the flood level rims of which are located below the elevation of the curb or property line at the point where the building sewer crosses under the curb or property lines, and above the crown level of the main sewer, shall drain by gravity into the main sewer, and shall be protected from backflow of sewage by installing an approved type backwater valve, and each such backwater valve shall be installed only in that branch or section of the drainage system which receives the discharge from fixtures located below the elevation of the curb or property line.
- P-2.- Drainage piping serving fixtures that are located below the crown level of the main sewer, shall discharge into an approved watertight sump or receiving tank, so located as to receive the sewage or wastes by gravity. From such sump or receiving tank the sewage or other liquid wastes shall be lifted and discharge into the building drain or building sewer by approved ejectors, pumps or other equally efficient approved mechanical device.
- P-3.- The minimum size of any pump or any discharge pipe from a sump having a water closet connected thereto shall not be less than 5.08 cms. (2 inches).
- P-4. - The discharge line from such ejector, pump or other mechanical device shall be provided with an accessible backwater or swing check valve and gate valve, and if the gravity drainage line to which such discharge line connects is horizontal, the method of connection shall be from the top through a "WYE" branch fitting.
- P-5.- Building drains or building sewers receiving discharge from any pump or ejector shall be adequately sized to prevent over-loading. Two fixture units shall be allowed for each liter (gallon) per minute of continuous flow.
- P-6.- Backwater valves, gate valves, motors, compressors, air tanks or other mechanical devices required by this Code shall be located where they will be readily and easily accessible

for inspection and repair at all times, and unless continuously exposed, shall be enclosed in a watertight masonry pit fitted with an adequately sized removable cover.

P-7.- The drainage and venting systems in connection with fixture sumps, receiving tanks and mechanical waste lifting devices, shall be installed under the same requirements as provided for in this Code for gravity systems.

P-8.- Sumps and receiving tanks shall be watertight and shall be constructed of concrete, metal or other approved materials. If constructed of poured concrete, the walls and bottom shall be adequately reinforced and designed to recognized acceptable standards. Metal sumps or tanks shall be of such thickness as to serve their intended purpose and shall be treated internally and externally to resist corrosion.

P-9.- All sumps and receiving tanks shall be automatically discharge and when in any "public use" occupancy shall be provided with dual pumps or ejectors arranged to function independently in case of overload or mechanical failure. The lowest inlet shall have a minimum clearance of 5.08 cms. (2 inches) from the high water or 'starting' level of the sump.

P-10.- Sumps and receiving tanks shall be provided with substantial covers having a bolt and gasket type manhole or equivalent opening to permit access for inspection, repairs, and cleaning. The top shall be provided with a vent type which shall extend separately through the roof, or when permitted, may be combined with other vent types. Such vent shall be large enough to maintain atmospheric pressure within the sump under all normal operating conditions and in no case shall be less in size than that required by Table 6-3 for the number of fixtures discharging the sump, nor less than 3.81 cms. (1-1/2 inches) in diameter. When the foregoing requirements are met and the vent, after leaving the sump, is combined with vents from fixtures discharging into the sump, the size of the combined vent need not exceed that required for the total number of fixtures discharging into the sump. No vent from an air-operating sewage ejector shall combine with other vents.

P-11.- Air tanks shall be so proportioned as to be of equal

cubical capacity to the ejectors connected therewith in which there shall be maintained an air pressure of not less than two pounds for each .3048 meter of height the sewage is to be raised. No water-operated ejectors shall be permitted.

P-12.- When subsoil drainage systems are installed, they shall be discharged in a manner satisfactory to the Plumbing Official.

TABLE 6-3  
LISTS OF MAXIMUM UNIT LOADING AND MAXIMUM LENGTH  
OF DRAINAGE AND VENT PIPING

Size of Pipe	FU		Mtrs		FU		Mtrs		Unh mite d	FU		Mtrs		Inches
	Inches	Mtrs.	Mtrs	FU	Mtrs	FU	Mtrs	Mtrs		FU	Mtrs			
.0318	1-1/2	.0254	12	.0254	1	13.716	45	.3048	1	13.716	45			
.0318	1-1/2	.0508	23	.0254	1	19.812	65	2.4384	8	18.288	60			
.0508	2	.4064	163	.2032	8	25.908	85	7.3152	24	36.576	120			
.0635	2-1/2	.8128	324	.3556	14	45.1104	148	14.6304	48	54.864	180			
.0762	3	1.2192	48	.8890	35	64.6178	212	25.6032	84	64.6176	212			
.1016	4	6.5024	256	5.4864	216	91.440	300	78.0288	258	91.44	300			
.1270	5	15.2400	600	10.8712	428	118.872	390	182.88	600	118.872	390			
.1524	6	35.0520	1380	18.2880	720	155.448	510	420.624	1380	155.488	510			
.2032	8	91.4400	3600	67.0560	2640	228.6	750	1097.28	3600	228.6	750			
.2540	10	142.2400	5600	118.8720	4680									
.3048	12	213.3600	8400	208.2800	9200									

<sup>1</sup> Excluding Trap Arm

<sup>2</sup> Except sinks and urinals.

<sup>3</sup> Except six-unit traps or water closets

<sup>4</sup> Only 4 water closets or six-unit traps allowed on any vertical pipe or stack and not to exceed 3 water closets or 6-unit traps on any horizontal branch or drain provided any one of the 3 discharges is separated from the other 2 by a minimum horizontal developed length of 4.572 meters (15 feet) whether connecting to vertical to horizontal piping.

<sup>5</sup> Based upon 6.35 (1/4 inch) per .3048 mtr. (1 foot) slope. For 3.175 mms. (1/8 inch) per .3048 mtr. (1 foot) slope multiply horizontal fixture units by a factor of 0.88

Note: The diameter of an individual vent shall not be less than 31.75 mms. (1/4 inch) nor less than 1/2 the diameter of the trail to which it is connected. Fixture unit load valued for drainage and vent piping shall be computed from Tables 4-1 and 4-2. Not to exceed 1/3 of the total permitted length of any vent may be installed in a horizontal position. When vents are increased one pipe size for their entire length, the maximum length limitations specified in this table do not apply.

## CHAPTER 8

### INDIRECT WASTE PIPING, WET VENTED SYSTEMS, AND SPECIAL WASTES

#### ARTICLE I - INDIRECT WASTE CONDITIONS

- P-1. No evaporative cooler, air washer or similar air conditioning equipment and no cold storage room, refrigerator, cooling counter, compartment, receptacle, appurtenance or device which is used, designed or intended to be used for the storage or holding of food or drink shall have any drain pipe in connection therewith directly connected to any soil, waste or vent pipe. Such equipment shall be drained by means of indirect waste pipes as defined in this Code and all wastes drained by them shall discharge through an air break into an open floor sink or other approved type receptor which is properly connected to the drainage system.
- P-2. - The foregoing does not apply to any dishwashing or culinary sink in any food preparation room, unless such receptacle is used for soaking or washing ready-to-serve food, or to walk-in refrigerators and combination walk-in, reach-in refrigerators used for storage and sales of products packaged in bottles, cartons or containers.

#### ARTICLE II - APPROVALS

- P-1. - No plumbing fixtures served by indirect waste pipes or receiving discharge therefrom shall be installed until first approved by the Plumbing Official.

#### ARTICLE III - INDIRECT WASTE PIPING

- P-1.- Except as hereinafter provided, the size and construction of indirect waste piping shall be in accordance with other paragraphs of this Code applicable to drainage and vent piping. No vent from indirect waste piping shall combine with any sewer



connected vent, but shall extend separately to the outside air.

- P-2. - Indirect waste pipes exceeding 1.524 meters (5 feet) but less than 4.572 meters (15 feet) in length shall be directly trapped, but such traps need not be vented. Indirect waste pipes less than 4.572 meters (15 feet) in length need be no larger in diameter than the drain outlet of the tail-piece of the fixture, appliance or equipment served, but in no case less than 1.27 cms. (1/2 inch) in size. Angles and changes of direction in such indirect waste pipes shall be provided with cleanouts so as to permit flushing and cleaning.

#### **ARTICLE IV - INDIRECT WASTE RECEPTORS**

- P-1.- All plumbing fixtures or other receptors receiving the discharge or indirect waste pipes shall be approved for the use proposed and shall be of such shape and capacity as to prevent splashing or flooding and shall be located where they are readily accessible for inspection and cleaning. No stand-pipe receptor for any clothes washer shall extend more than 76.2 cms. (30 inches), no less than 45.72 cms. (18 inches) above its trap. No trap for any clothes washer standpipe receptor shall be installed below the floor, but shall be roughed-in not less than 15.24 cms. (6 inches) above the floor. No indirect waste receptor shall be installed in any toilet room closet, cupboard, or storeroom, nor in any other portion of a building not in general use by the occupants thereof; except standpipes for clothes washers may be installed in toilet and bathroom areas when the clothes washer is installed in the same room.

- P-2. - Where water service connections are installed for a clothes washer, an approved method of waste disposal shall be provided.

#### **ARTICLE V- PRESSURE DRAINAGE CONNECTIONS**

- P-1. - Indirect waste connections shall be provided for drains, over-flows of relief vents from the water supply system, and no piping or equipment carrying wastes or producing wastes or other discharges under pressure shall be directly connected to any part

of the drainage system.

- P-2. - The foregoing shall not apply to any approved sump pump or to any approved pressure-wasting plumbing fixture or device when the Plumbing Official has satisfied himself that the drainage system is adequately sized to accommodate the anticipated discharge thereof.

#### **ARTICLE VI - FOOD WASTE DISPOSERS**

- P-1. No commercial or domestic food waste disposer shall be connected to any drainage system until a production prototype thereof has first been tested and approved.

#### **ARTICLE VII - STERILE EQUIPMENT**

- P-1. - Appliances, devices or apparatuses such as stills, sterilizers and similar equipment requiring water and waste and used for sterile materials shall be indirectly connected or provided with an air gap between the trap and the appliance.

#### **ARTICLE VIII- APPLIANCES**

- P-1.- Appliances, devices, equipment or other apparatus not regularly classed as plumbing fixtures, which are equipped with pumps, drips or drainage outlets may be drained by the indirect waste pipe discharging into an approved type open receptor.
- P-2. No domestic dishwashing machine shall be directly connected to a drainage system or food waste disposer without the use of an approved dishwasher air-gap fitting on the discharge side of the dishwashing machine.

#### **ARTICLE IX - COOLING WATER**

- P.1.- When permitted by the department having jurisdiction, clean running water used exclusively as a cooling medium in an appliance, device or apparatus, may discharge into the drainage

system through the inlet side of a fixture trap in the event that a suitable fixture is not available to receive such discharge. Such trap connection shall be by means of a pipe connected to the inlet side of an approve fixture trap, the upper end terminating in a funnel-shaped receptacle set adjacent to, and not less than 15.24 cms. (6 inches) above, the overflow rim of the fixture.

#### ARTICLE X- DRINKING FOUNTAINS

P-1.- Drinking fountains may be installed with indirect wastes.

#### ARTICLE XI- STEAM AND HOT WATER DRAINAGE CONDENSORS AND SUMPS

P-1.- No steam pipe shall be directly connected to any part of a plumbing or drainage system, nor shall any water having a temperature above 140 (F be discharged under pressure directly into any part of a drainage system. Such pipes may be indirectly connected by discharging into an open or closed condenser, steam or intercepting sump of approved type, that will prevent the entrance of steam or such water under pressure into the drainage system. All closed condensers or sumps shall be provided with a vent, which shall be taken off the top and extended separately, full size above the roof. All condensers and sumps shall be properly trapped at the outlet with a deep seal trap extending to within 15.24 cms. (6 inches) of the bottom of the tank. The top of the deep seal trap shall have a 19.05 mm.(3/4 inch) opening located at the highest point of the trap to serve as a siphon breather. Outlets shall be taken off from the side in such manner as to allow a water line to be maintained that will permanently occupy not less than 1/2 capacity of the condenser or sump. All inlets shall enter above the water line. Wearing plate or baffles shall be installed in the tank to protect the shell. The sizes of the blow-off line inlet, the water outlets, and the vent shall be as shown in Table 8-1. The contents of condensers receiving steam or hot water under pressure must pass through an open sump before entering the drainage system.

**TABLE 8-1  
PIPE CONNECTIONS IN BLOW-OFF CONDENSORS AND SUMPS**

BOILER BLOW-OFF		WATER OUTLETS		VENT	
Mms	Inches	Mms	Inches	Mms	Inches
19.05*	3/4	19.05	3/4	50.80	2
25.40	1	25.40	1	63.50	2-1/2
31.75	1-1/4	31.75	1-1/4	76.20	3
50.80	2	50.80	2	127.00	5
63.50	2-1/2	63.50	2-1/2	152.40	6

\* To be used only with boilers of 2.54 sq. meter (100 sq. ft.) of heating surface or less.

P-2. Sumps, condensers or intercepting tanks which are constructed of concrete shall have walls and bottom not less than 10.16 cms. (4 inches) in thickness, and the inside shall be cement plastered not less than 1.27 cms. (1/2 inch) in thickness. Condensers constructed of metal shall be not less than 12 U.S. Standard Gauge (2.7686 meters) and all such meter condensers shall be protected from external corrosion by an approved bituminous coating.

P-3. Sumps and condensers shall be provided with suitable means of access for cleaning and shall contain a volume of not less than twice the volume of water removed from the boiler or boilers connected thereto when the normal water level of such boiler or boilers is reduced not less than 10.16 cms. (4 inches).

## ARTICLE XII - CHEMICAL WASTES

P-1. Chemical or industrial liquid wastes which are likely to damage or increase maintenance costs on the sanitary sewer system, detrimentally affect sewage treatment or contaminate surface or subsurface waters, shall be pretreated to render them innocuous prior to discharge into a drainage system. Detailed

plans and specifications of the pretreatment facilities may be required by the Plumbing Official.

- P-2. Piping conveying industrial, chemical or process wastes from their point of origin to sewer connected pretreatment facilities shall be of such material and design as to adequately perform its intended function to the satisfaction of the Plumbing Official. Drainage discharge piping from pretreatment facilities or interceptors shall conform to standard drainage installation procedures.
- P-3. Each waste pipe receiving or intended to receive the discharge of any fixture in which acid or corrosive chemical is placed and each ventilating pipe connected thereto, shall be constructed of chemical resistant glass, high silicon iron pipe, lead pipe not less than 3.1750 mms. (1/88 inch) wall thickness, an approved type ceramic glazed or unglazed vitrified clay or other approved corrosion resistant materials.
- P-4. All joining materials shall be of approved type and quality.
- P-5. Wherever practicable, all piping shall be readily accessible and installed with the maximum of clearance from other services.
- P-6. The owner shall make and keep a permanent record of the location of all piping and venting carrying chemical wastes.
- P-7. No chemical vent shall intersect vents for other services.
- P-8. No chemical wastes shall be discharged into the ground, local sewer or other means without approval of the Plumbing Official.
- P-9. The provision of this Article relative to materials and methods of construction, need not apply to minor installations such as small photographic or X-ray dark rooms or small research or control laboratories where minor amounts of adequately diluted chemicals are discharged.

### ARTICLE XIII- VERTICAL WET VENTING

- P-1. - Wet venting is limited to vertical drainage piping receiving the discharge from the trap arm of one or two fixture units that also serve as a vent for not more than four fixtures. All wet vented fixtures must be on the same floor level.
- P-2. - The vertical piping between any two consecutive inlet valves shall be considered a wet vented section. Each wet vented section shall be a minimum of one pipe size larger than its upper fixture inlet.
- P-3. - Common vent sizing shall be the sum of the fixture units served but in no case smaller than the minimum vent pipe size required for any fixture served.

### ARTICLE XIV - SPECIAL VENTING FOR ISLAND FIXTURES

- P-1. - Traps for island sinks and similar equipment shall be roughed-in above the floor and may be vented by extending the vent as high as possible, but no less than the drainboard height and then returning it downward and connecting to the horizontal sink drain immediately downstream from the vertical fixture drain.
- P-2. - The returned vent shall be connected to the horizontal drain through a Y-branch fitting and shall in addition be provided with a foot vent taken off the vertical fixture vent by means of a Y-branch immediately below the floor and extending to the nearest partition and thence a point not less than 15.24 cms. (6 inches) above the flood level rim of the fixture served. Drainage fittings shall be used on all parts of the vent below the floor level and a minimum slope of 6.35 mms. (1/4 inch) per meter back to the drain shall be maintained. The return bend used under the drain board shall be a one-piece fitting or an assembly of a 45(, 90( and a 40( elbow in the order named. Pipe sizing shall be as elsewhere required in this Code.

### ARTICLE XV- COMBINATION WASTE AND VENT SYSTEM

- P-1. - Combination waste and vent system shall be permitted

only where structural conditions preclude the installation of conventional systems as otherwise prescribed by this Code.

- P-2. - Plans and specifications for each combination waste and vent system shall be first approved by the Plumbing Official before any portion of any such system can be installed.
- P-3. - Each combination waste and vent system shall consist of a wet vented installation of waste piping in which the trap for one or more plumbing fixtures is not separately or independently vented, and in which the waste pipes or piping shall be provided with an adequate vent or vents to assure free circulation of air therein, and in which any branch more than 4.572 meters (15 feet) in length is separately vented in an approved manner. The area of any vent installed in a combination waste and vent system shall be approximately equal to  $1/2$  the cross-sectional area of the drain pipe served.
- P-4.- Each waste pipe and each trap in any such system shall be at least two pipe sizes larger than the sizes required by this code, and at least two pipe sizes larger than any fixture tailpiece or connection.
- P-5.- Unless specifically required or permitted by the Plumbing Official, no vertical waste pipe shall be used in any such system, except the tail piece or connection between the outlet of a plumbing fixture and the trap therefor. Such tail piece or connection shall be as short as possible, and in no case shall exceed 60.96 cms. (2 feet).
- P-6.- Cleanouts may not be required on any wet vented branch serving a single trap when the fixture tailpieces or connections are not less than 5.08 cms. (2 inches in diameter and provides ready access for cleaning through the trap.
- P-7.- Except where permitted to discharge into a wet-vented trailer park drainage system, no water closet or urinal shall be installed on any such system. Either 1,2 or 3 unit fixtures remotely located from the sanitary system and adjacent to a combination waste and vent system may be connected to such system in the conventional manner by means of waste and vent pipes of regular sizes, provided that the two-pipe size increase

required is based on the total fixture unit load connected to the system.

**CHAPTER 13  
BUILDING SEWERS AND PRIVATE SEWAGE  
DISPOSAL SYSTEMS**

**ARTICLE I - SEWER REQUIRED**

- P-1. - Every building in which plumbing fixtures are installed and every premises having drainage piping thereon, shall have a connection to a public or private sewer, except as provided in this Article.
- P-2. - When no public sewer, intended to serve any lot or premises is available in any thoroughfare or right of way abutting such a lot or premises, drainage piping from any building or works shall be connected to an approved private sewage disposal system.
- P-3. - Within the limits prescribed by P-4 hereof, the rearrangement or subdivision into smaller parcels of a lot which abuts and is served by a public sewer shall not be deemed cause to permit the construction of a private sewage disposal system, and all plumbing or drainage systems on any such smaller parcel or parcels shall connect to the public sewer.
- P-4. - The public sewer may be considered as not being available when such public sewer or any building or any exterior drainage facility connected thereto is located more than 60.96 meters (200 feet) from any proposed building or exterior drainage facility on any lot or premises which abuts and is served by such public sewer.
- P-5. - No permit shall be issued for the installation, alteration or repair of any private sewage disposal system or part thereof, on such lot or premises shall be connected with such public sewer.
- P-6. - On every lot or premises hereafter connected to a public sewer, all plumbing and drainage systems or parts thereof, on



such lot or premises shall be connected with such public sewer.

Exception: Single family dwellings and buildings or structures accessory thereto, existing and connected to an approved private sewage disposal system prior to the time of connecting the premises to a public sewer may, when no hazard, nuisance or insanitary conditions is evidenced and written permission has been obtained from the Plumbing Official, remain connected to such properly maintained private sewage system when there is insufficient grade or fall to permit drainage to the sewer by gravity.

## ARTICLE II - DAMAGE TO PUBLIC SEWER OR PRIVATE SEWAGE DISPOSAL SYSTEM

- P-1. - It shall be unlawful for any person to deposit, by any means whatsoever, into any plumbing fixture, floor drain, interceptor, sump, receptacle or device which is connected to any drainage system, public sewer, private sewer, septic tank or cesspool any ashes, cinders, solids, rags, flammable, poisonous or explosive liquids or gas, oils, grease and any other thing whatsoever which would, or could cause damage to the public sewer, private sewer or private sewage disposal system.
- P-2. - No rain, surface or subsurface water shall be connected to or discharge into any drainage system, unless first approved by the Plumbing Official.
- P-3. - No cesspool, septic tank, seepage pit or drainfield shall be connected to any public sewer or to any building sewer leading to such public sewer.
- P-4. - No commercial food waste grinder shall be connected to a private sewage disposal system unless permission has first been obtained from the Plumbing Official.
- P-5. - An approved type watertight sewage or waste water holding tank, the contents of which, due to their character, must be periodically removed and disposed of at some approved off-site location, shall be installed only when required by the Plumbing Official or the Health Officer to prevent anticipated surface or subsurface contamination or pollution, damage to the public

sewer, or other hazardous or nuisance condition.

### **ARTICLE III - BUILDING SEWER MATERIALS**

- P-1.- The building sewer, beginning 60.96cms. (2 feet) from any building or structure, shall be of such materials as may be approved by the Plumbing Official under the approval procedures set forth in Chapter 4 of this Code.
- P-2.- Joining methods and materials shall be as prescribed in Chapter 10 of this Code.

### **ARTICLE IV - MARKINGS**

- P-1.- All pipes, bricks, blocks, prefabricated septic tanks, prefabricated seepage pit or septic tank covers or other parts or appurtenances incidental to the installation of building sewers or private sewage disposal systems, shall conform to the approval requirements of Chapter 4 of this Code and shall be marked and identified in a manner satisfactory to the Plumbing Official.

### **ARTICLE V - SIZE OF BUILDING SEWERS**

- P-1.- The minimum size of any building sewer shall be determined on the basis of the total number of fixture units drained by such sewer, in accordance with Table 6-2.

### **ARTICLE VI - GRADE, SUPPORT AND PROTECTION OF BUILDING SEWERS**

- P-1.- Building sewers shall be run in practical alignment and at a uniform slope of not less than 6.35mms. (1/4 inch) per .3048 meter toward the point of disposal; provided, that where it is impractical, due to the depth of the street sewer or to the structural features or to the arrangement of any building or structure, to obtain a slope of 6.35 mms. (1/4 inch) per .3048 meter, any such pipe or piping 10.16 cms. (4 inches) or larger may have a slope of not less than 3.175 mms. (1/8 inch) per

.3048 meter when approved by the Plumbing Official.

- P-2.- Building sewer piping shall be laid on a firm bed throughout its entire length, and any such piping laid in or filled in ground shall be laid on a bed of approved materials and shall be adequately supported to the satisfaction of the Plumbing Official.
- P-3.- No building sewer or other drainage piping or part thereof, which is constructed of materials other than those approved for use under or within a building, shall be installed under or within 60.96 cms. (2 feet) of any building, or structure or parts thereof, nor less than 30.48 cms. (1 foot) below the surface of the ground. The provisions of this paragraph include structures such as porches and steps, whether covered or uncovered, breezeways, roofed portecocherers, roof patios, carports, covered walls, covered driveways and similar structures or appurtenances.

#### ARTICLE VII - CLEANOUTS

- P-1.- Cleanouts shall be placed inside the building near the connection between the building drain and building sewer or installed outside the building at the lower end of a building drain and extended to grade. Additional building sewer cleanouts shall be installed at intervals not to exceed 30.48 meters (100 feet) in straight runs.
- P-2.- When a building sewer or a branch thereof does not exceed 3.048 meters (10 feet) in length and is a straight line projection from a building drain which is provided with a cleanout of connection to the building drain.
- P-3.- Every change in alignment or grade in excess of 22.5 (in a building sewer shall be served by a cleanout, except that no cleanout shall be required for not more than one 45( change of direction or one 45( offset. Then extension of building sewer cleanouts to grade is optional. When building sewers are located under building the cleanout requirements of Article VI, Chapter 6 shall apply.

- P-4.- Each cleanout shall be installed so that it opens in a direction opposite to the flow of the soil or waste or at right angles thereto, except in the case of "wye" branch and end-of-line cleanouts, vertically above the flow of the pipe.
- P-5. - Cleanouts installed under concrete or asphalt paving shall be made accessible by yard boxes, or extending flush with paving with approved materials and be adequately protected.
- P-6. - Approved manhole may be installed in lieu of cleanouts when first approved by the Plumbing Official. The maximum distance between manholes shall not exceed 91.44 meters (300 feet).

#### ARTICLE VIII - SEWER AND WATER PIPES

- P-1. - Non-metallic building sewer or drainage piping shall not be run or laid in the same trench with water service pipes or any underground water pipes unless both of the following requirements are met:
- A. The bottom of the water piping at all points shall be at least 30.48 cms. (12 inches) above the top of the sewer pipeline.
  - B. The water piping shall rest on a solid shelf at one side of the common trench.

#### ARTICLE IX - DRAWING AND SPECIFICATIONS

- P-1. - The Plumbing Official, Health Officer or other departments having jurisdiction may require any or all of the following information before a permit is issued for a building sewer or a private sewage disposal system, or at any time during the construction thereof.
- A. Plot plan drawn to scale, completely dimensioned, showing direction and approximate slope of surface, location of all present or proposed retaining walls, drainage channels, water supply lines or wells, paved

areas and structures on the plot, number of bedrooms or plumbing fixtures in each structure and location of the building sewer and private sewage disposal system with relation to lot lines and structures.

- B. Details of construction necessary to assure compliance with the requirements of this Chapter together with a full description of the complete installation including quality, kind and grade of all materials, equipment, construction workmanship and methods of assembly and installation.
- C. A log of soil formations and ground water level as determined by test holes dug in close proximity to any proposed seepage pit or disposal field, together with a statement of water absorption characteristics of the soil at proposed site as determined by approved percolation tests.

#### **ARTICLE X - LOCATION**

P-1.- Except as provided in this Article, no building sewer or private sewage disposal system or parts thereof, shall be located in any lot other than the lot which is the site of the building or structure served by such sewer or private sewage disposal system; nor shall any building sewer or sewage disposal system or part thereof be located at any point having less than the minimum distances indicated in Table 13.1

P-2.- Nothing contained in this Code shall be construed to prohibit the use of all or part of an abutting lot to:

- A. Provide access to connect a building sewer to an available public sewer, when proper cause and legal easement not in violation of other requirements has been first established to the satisfaction of these Plumbing Official.
- B. Provide additional space for a building sewer or a private sewage disposal system or part thereof, when proper cause, transfer of ownership, or change of

boundary not in violation of other requirements has been first established to the satisfaction of the Plumbing Official. The instrument recording such action shall constitute an agreement with the Plumbing Official which shall clearly state and show that the areas so joined or used shall be maintained as a unit during the time they are so used. Such an agreement shall be recorded in the office of the province city/municipality as part of the conditions of ownership of said properties, and shall be binding on all heirs, successors and assigns to such properties. A copy of the instrument recording such proceedings shall be filed with the Plumbing Official.

#### ARTICLE XI - PRIVATE SEWAGE DISPOSAL (GENERAL)

P-1. Where permitted by Article 1, Chapter 13, the building sewer may be connected to a private sewage disposal system complying with the provisions of this Chapter. The type of system shall be determined on the basis of location, soil porosity, and ground water level and shall be designed to receive all sanitary sewage from the property. The system, except as otherwise provided, shall consist of a septic tank with effluent discharging into a subsurface disposal field, into one or more seepage pits into a combination of subsurface disposal field and seepage pits.

P-2. Where conditions are such as the above system cannot be expected to function satisfactorily; for commercial, agricultural and industrial plumbing system; for installations where appreciable amounts of industrial or indigestible wastes are produced; for hotels, hospitals, office buildings, schools and other occupancies not listed in Table 13-3; for occupancies producing abnormal quantities of sewage or liquid wastes; or when grease interceptors are required by other parts of this Code, the method of sewage treatment and disposal shall be first approved by the Plumbing Official. Special sewage disposal systems for minor, limited or temporary uses shall be first approved by the Plumbing Official.

P-3.- Disposal system shall be designed to utilize the most

porous or absorptive portion of soil formation. Where the ground water level extends to within 3.6576 meters (12 feet) or less of the ground surface or where the upper soil is porous and the underlying stratum is rock or impervious soil, a septic tank and disposal field system shall be installed.

P-4.- All private sewage disposal system shall be so designed that additional seepage pits or subsurface drain fields, equivalent to at least one hundred (100%) percent of the required original system, may be installed if the original system cannot absorb all the sewage. No division of the lot or erection of structures on the lot shall be made if such division or structure impairs the usefulness of the one hundred (100%) percent expansion room for its intended purpose.

P-5.- No property shall be improved in excess of its capacity to properly absorb sewage effluent in the quantities and by the means provided in this Code.

P-6.- When there is insufficient lot area or improper soil conditions, for adequate sewage disposal for the building or land use proposed, and the Plumbing Official so finds, no building permit shall be issued and no private sewage disposal shall be permitted. Where space or soil conditions are critical, no building permit shall be issued until engineering data and test reports satisfactory to the Plumbing Official have been submitted and approved.

P-7.- Nothing contained in this Chapter shall be construed to prevent the Plumbing Official from requiring compliance with higher requirements than those contained herein where such are essential to maintain a safe and sanitary condition.

## ARTICLE XII - CAPACITY OF SEPTIC TANKS

P-1.- The liquid capacity of all septic tanks shall conform to Tables 13-2 and 13-3 as determined by the number of bedrooms or apartment units in dwelling occupancies and the occupant load or the number of Plumbing fixture units as determined from Table 6-1, whichever is greater in other building occupancies. The capacity of any one septic tank and its drainage system shall

be limited by the soil structure classification as specified in Table 13-5.

### ARTICLE XIII- AREA OF DISPOSAL FIELDS AND SEEPAGE PITS

P-1.- The minimum effective absorption area in disposal fields is .3048 sq. meter of trench bottom, and in seepage pits is .30488 sq. meter of side wall, shall be predicated on the required septic tank capacity in gallons and shall conform to Table 13-4 as determined for the type of soil found in the excavation, and shall be as follows.

- A. When disposal fields are installed, a minimum of 45.72 sq. meters (150 sq. ft.) of trench bottom shall be provided for each system exclusive of any hard pan, rock, clay or other impervious formations. For large specially designed and approved system, side wall area in excess of the required 30.48 cms. (12 inches) and not to exceed 91.44 cms. (36 inches) below the leach line may be added to the 45.72 sq. meters (150 sq. feet) trench bottom area when computing absorption areas.
- B. The minimum effective absorption area in any seepage pit shall be calculated as the excavated side wall area below the inlet exclusive of any hard pan, rock, clay or other impervious formations. The minimum required area of porous formation shall be provide in one or more seepage pit. No excavation shall extend into the water table nor to a depth where sewage may contaminate underground water stratum that is usable for domestic purposes. Each seepage pit shall have a minimum side wall, not including the arch of 3.048 meters (10 feet) below the inlet.
- C. Soils, other than those appearing in Table 13-4, shall be tested for porosity as required by Article XIV.

### ARTICLE XIV - PERCOLATION TESTS

P-1. - Wherever practicable, disposal field and seepage pit



sizes shall be computed from Table 13-4.

- P-2. - In order to determine the absorption qualities of questionable soils other than those listed in Table 13-4, the proposed site shall be subjected to percolation tests acceptable to the Plumbing Official.
- P-3. - Each test shall be made with clear water in an excavation which has been thoroughly soaked prior to the test.
- P-4. - When a percolation test is required, the proposed system shall have the capability of absorbing a quantity of clear water in a 24-hour period equal to at least five times the liquid capacity of the proposed septic tank. No private disposal system shall be permitted to serve a building if a percolation test shows that absorption capacity of the soil is less than 1.11 glass per .0348 square meters of leaching area per 24 hours.

#### ARTICLE XV - SEPTIC TANK CONSTRUCTION

- P-1. - Plans for all septic tanks shall be submitted to the Plumbing Official for approval. Such plans shall show all dimensions, reinforcing, structural calculations and such other pertinent data as may be required. Independent laboratory tests and calibrations shall be provided on prefabricated septic tanks as required by the Plumbing Official.
- P-2. - Septic tanks shall be constructed of sound durable materials, not subject to excessive corrosion or decay and shall be watertight. Each such tank shall be structurally designed to withstand all anticipated earth or other loads and shall be installed level on a solid bed.
- P-3. - The walls and floor of each poured-in-place concrete septic-tank shall be monolithic; the maximum length of any section of unreinforced concrete septic tank wall shall be 1.8288 meters (6 feet), and no cross-section of any such reinforced concrete wall or floor shall be less than 12.7 cms. (5 inches) in thickness. The minimum compressive strength of any concrete septic tank wall, top and covers, or floor shall be 2500 pounds per 25.4 sq. mms.

- P-4.- Concrete septic tank covers shall be reinforced and shall have a minimum strength of 2,500 pounds per 25.4 sq. mms.
- P5. - All septic tank covers shall be capable of supporting an earth load of not less than 300 pounds per .3048 sq. meter when the maximum coverage does not exceed 91.44 cms. (3 feet).
- P-6. - The minimum wall thickness of any steel septic tank shall be N0. 12 U.S. Gauge (.109) and each such tank shall be protected from corrosion both externally and internally by an approved bituminous coating or by other acceptable means.
- P-7. - Septic tank design shall be such as to produce a clarified effluent consistent with accepted standards and shall provide adequate space for slugs and scum accumulations.
- P-8. - Septic tanks shall have a minimum of 2 compartments. The inlet compartment of any septic tank shall be not less than 2/3 of the total capacity of the tank nor less than 500 gallons liquid capacity, and shall be at least 91.44 cms. (3 feet) wide and 1.524 meters (5 feet) long. Liquid depth shall be not less than 60.96 cms. (2 feet) and 15.24 cms. (6 inches) nor more than 1.8288 meters (6 feet). The secondary compartment of any septic tank shall have a minimum capacity of 250 gallons and a maximum capacity of 1/3 of the total capacity of such tank. In septic tanks having over 1500 gallons capacity, the secondary compartment may be not less than 1.524 meters (5 feet) in length.
- P-9. - Access to each septic tank shall be provided by at least two manholes 50.8 cms. (20 inches) in minimum dimension or by an equivalent removable cover slab. One access manhole shall be located over the inlet and one access manhole shall be located over the outlet. Wherever a first compartment exceeds 3.6576 meters (12 feet) in length, an additional manhole shall be provided over the baffle wall. Septic tanks installed under concrete or black top paving shall have the required manholes accessible by either extending the manhole openings to grade in a manner acceptable to the Plumbing Official, or by providing a removable concrete or other approved section, not less than 50.8 cms. (20 inches) in the least dimension, in such concrete or black top paving, which is located directly over the required septic tank manholes.

- P-10. - The inlet and outlet pipe or baffle shall extend 10.16 cms. (4 inches) above and at least 30.488 cms. (12 inches) below the water surface. The invert of the inlet pipe shall be at a level not less than 5.08 cms. (2 inches) above the invert of the outlet pipe.
- P-11. - Inlet and outlet pipe fittings or baffles and compartment partitions shall have a free vent area equal to the required cross-sectional area of the house sewer or private sewer discharging thereinto to provide free ventilation above the water surface from the disposal field or seepage pit through the septic tank, house sewer and stack to the outer air.
- P-12. - The total depth shall not be less than 22.86 cms. (9 inches) greater than liquid depth. The cover of the septic tank shall be at least 5.08 cms. (2 inches) above the back vent opening.
- P-13. - Partitions or baffles between compartments shall be of sound durable material and shall extend at least 10.16 cms. (4 inches) above the liquid level. An inverted fitting equivalent in size to the tank inlet, but in no case less than 10.16 cms. (4 inches) in size, shall be installed in the inlet compartment side of the baffle with the bottom of the fitting placed midway in the depth of the liquid. Wooden baffles are prohibited.
- P-14. - All concrete septic tanks shall be protected from corrosion by coating the inside with an approved bituminous coating or by other acceptable means. The coating shall extend to at least 10.16 cms. (4 inches) below the water main line, and shall cover all of the internal area above that point.

#### ARTICLE XVI - DISPOSAL FIELDS

- P-1.- Distribution lines shall be constructed of tile laid with open joints, except that perforated clay tile, perforated bituminous fiber pipe, or other approved materials may be used, provided that sufficient openings are available for distribution of the effluent into the trench areas.
- P-2.- Before placing filter material or drain lines in a prepared

excavation, all smeared or compacted surfaces shall be removed from trenches by raking to a depth of 25.4 mms. and the loose material removed. Clean stone, gravel, slag or similar filter material acceptable to the Plumbing Official varying in size from 19.05 mms. to 63.5 mms. shall be placed in the trench to the depth and grade required by this Article. Drain pipe shall be placed on filter material in an approved manner. The drain lines shall then be covered with filter material to the minimum depth required by this Article and this covered with untreated building paper, straw or similar porous material to prevent closure of voids with earth backfill. No earth backfill shall be placed over the filter material cover until after inspection and acceptance.

- P-3. When seepage pits are used in combination with disposal fields, the filter material in the trenches shall terminate at least 1.524 meters (5 feet) from the pit excavation and the line extending from such points to the seepage pit shall be approved with watertight joints.
- P-4. - Where two or more drain lines are installed, an approved distribution box of sufficient size to receive lateral lines shall be constructed at the head of each disposal field. The inverts of all outlets shall be level and the invert of the inlet shall be at least 25.4 mms. (1 inch) above the outlets. Suitable baffles shall be provide to insure equal flow. Distribution boxes shall be built on a level concrete slab installed in natural or compacted soil.
- P-5. - All laterals from an approved distribution box to the disposal field where the grade exceeds 15.24 cms. (6inches) per 30.48 meters (110 feet) shall be bell and spigot vitrified clay or other approved pipe with watertight joints. Multiple disposal field laterals, whenever practicable, shall be of uniform length.
- P-6.- Connections between a septic tack and a distribution box, or between a distribution box and drain field, shall be laid with approved watertight joints on natural ground or compacted fill.
- P-7.- Automatic siphon or dosing tacks shall be installed when required or as permitted by the Plumbing Official.

P-8.- Disposal fields shall be constructed as follows:

- Minimum number of drain lines per field ..... 1
- Minimum length of each line .....(100 feet) 30.48 meters
- Minimum bottom width of trench ..... (18 inches) 45.72 cms.
- Maximum bottom width of trench ..... (36 inches) 91.44 cms.
- Minimum spacing lines center to center ..... (6 feet) 1.8288 meters
- Minimum depth of earth cover over lines. (12 inches) 30.48 cms.
- Preferred depth of cover lines ..... (18 inches) 45.72 cms.
- \*Maximum grade of lines ..... (6 inches per 100 feet)  
15.24 cms. per 30.48 meters)
- \*Minimum grade of lines ..... (3 inches per 30.48 meters)
- Minimum filter material over drain line ..... (2 inches) 5.08 cms.
- Maximum spacing between trenches or leaching beds: Shall be 1.2192 meters (4 feet plus 60.96 cms. (2 feet) for each additional .30488 maters of depth in excess of 30.48 cms. (1 foot) below the bottom of the drain line.

P-9.- Where leaching beds are permitted in lieu of trenches the area of each such bed shall be at least fifty (50%) percent greater than the tabular requirements for trenches. Distribution drain lines in leaching beds shall not be more than 1.8288 meters (6 feet) apart on the centers and no part of the perimeter of the leaching bed shall be more than 91.44 cms. ( 3 feet) from a distribution drain line.

P-10.- When necessary on sloping ground to prevent excessive line slope, leach line on leach beds shall be stepped. The lines between each horizontal section shall be made with watertight joints and shall be designed so each horizontal leaching trench or bed shall be utilized to the maximum capacity before the effluent shall pass to the next lower leach line or bed. The lines between each horizontal section shall be made with approved watertight joints.

### ARTICLE XVII - SEEPAGE PITS

P-1.- The capacity of seepage pits shall be based on the quantity of liquid waste discharging thereinto, and on the character and porosity of the surrounding soil and shall conform to Article XIII of this Chapter.

- P-2.- Multiple seepage pit installations shall be served through an approved distribution box or be connected in series by means of a watertight connection laid or undisturbed or compacted soil, the outlet from the pit shall have an approved fitting extending at least 30.48 cms. (12 inches) below the inlet fitting.
- P-3.- Each seepage pit shall be circular in shape and shall have an excavated diameter of not less than 1.2192 meters (4 feet). Each pit shall be lined with approved type whole new hard burned clay, brick, concrete brick, concrete circular type cesspool blocks or other approved materials. Approval shall be obtained prior to construction for any pit having an excavated diameter greater than 1.524 meters (5 feet).
- P-4.- The lining in every seepage pit shall be laid on a firm foundation. Lining materials shall be placed tight together and laid with joints staggered. Except in the case of approved type pre-cast concrete circular sections, no brick or block shall be greater in height than its width and shall be laid flat to form at least a 10.16 cms. (4 inches) wall. Brick or block greater than 30.48 cms. (12 inches) in length shall have chamfered matching ends and be scored to provide for seepage. Excavation voids behind the brick, block or concrete liner shall have a minimum of 15.24 cms. (6 inches) of clean 1.905 cms. gravel or rock and shall be progressively backfilled while the lining is being installed.
- P-5.- All brick or block used in seepage pit construction shall have a minimum compressive strength of 2500 pounds per 2500 pounds per 25.4 sq. mms. (1 sq. inch).
- P-6.- Each seepage pit shall have a minimum sidewall (not including the arch) of 3.048 meters (10 feet) below the inlet.
- P-7.- The arch or dome of any seepage pit may be constructed in one of three ways:
- A. Approved type hard burned clay brick or solid concrete brick or block laid in cement mortar.
  - B. Approved brick or block laid dry.

In both of the above methods an approved cement

mortar covering of at least 5.08 cms. (2 inches) in thickness shall be applied, said covering to extend at least 15.24 cms. (6 inches) beyond the sidewalls of the pit.

- C. Approved type one or two pieces reinforced concrete slab of 2500 pounds per 25.4 sq. mms. minimum compressive strength, not less than 12.7 cms. (5 inches) thick and designed to support an earth load of not less than 400 pounds per .3048 sq.m. Each such cover shall be provided with a 22.86 cms. (9 inches) minimum inspection hole with plug or cover and shall be coated on the underside with an approved bituminous or other non-permeable protective compound.

P-8.- The top of the arch or cover must be at least 45.72 cms. (18 inches) but not more than 1.2192 meters (4 feet) below the surface of the ground.

P-9.- An approved vented inlet fitting shall be provided in every seepage pit so arranged as to prevent the inflow from damaging the sidewall.

#### ARTICLE XVIII- CESSPOOLS

P-1.- A cesspool shall be considered only as a temporary expedient, pending the construction of a public sewer, as an overflow facility when installed in conjunction with an existing cesspool, or as a means of sewage disposal for limited, minor or temporary uses when first approved by the Plumbing Official.

P-2.- Where it is established that a public sewer system will be available in less than two years and soil and ground water conditions are favorable to cesspool disposals, cesspools without septic tanks may be installed for single family dwellings or for other limited uses when first approved by the Plumbing Official.

P-3. - Each cesspool, when permitted, shall conform to the construction requirements set forth in this Chapter for seepage pits and shall have a minimum sidewall ( not including the arch)

of 6.096 meters (20 feet) below the inlet, provided, however, that when a strata of gravel or equally pervious material of 1.2192 meters (4 feet) in thickness is found, the depth of such sidewall need not be more than 3.048 meters (10 feet) below the inlet.

- P-4. - When overflow cesspools or seepage pits are added to existing installations the effluent shall leave the existing pit through an approved vented leg extending at least 30.48 cms. (12 inches) downward into such existing pit and having its outlet flow line at least 15.24 cms. (6 inches) below the inlet. All pipes between pits shall be laid with approved watertight joints.

#### ARTICLE XIX - ABANDONED SEWERS AND SEWAGE DISPOSAL FACILITIES

- P-1.- Every abandoned building (house) sewer or part thereof, shall be plugged or capped in an approved manner with 1.524 meters (5 feet) or the property line.

- P-2.- Every cesspool, septic tank and seepage pit which has been abandoned or has been discontinued otherwise from further use or to which no waste or soil pipe from a plumbing fixture is connected, shall have the sewage removed therefrom and be completely filled with earth, sand, gravel, concrete or other approved material.

- P-3.- The top cover or arch over the cesspool, septic tank or seepage pit shall be removed before filling and the filling shall not extend above the top of the vertical portions of the sidewalls or above the level of any outlet pipe until inspection has been called and the cesspool, septic tank or seepage pit has been inspected. After such inspection, the cesspool, septic tank or seepage pit shall be filled to the level of the top of the ground.

- P-4.- No person owning or controlling any cesspool, septic tank, or seepage pit on the premises of such person or in that portion of any public street, alley or other public property abutting such premises, shall fail, refuse or neglect to comply with the provisions of this Article or upon receipt of notice so to comply from the authority having jurisdiction.



- P-5.- Where disposal facilities are abandoned consequent to connecting any premises with the public sewer, the permittee making the connection shall fill all abandoned facilities as required by the Plumbing Official within 30 days from the time of connecting to the public sewer.

TABLE 13-1  
LOCATION OF SEWAGE DISPOSAL SYSTEM

Minimum Hor. Clear Distance in Required Form:	Building Sewer		Septic Tank		Disposal Field		Seepage Pit or Cesspool	
	Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters
Building or Structures <sup>1</sup>	2	0.6096	5	1.524	8	2.4384	8	2.4384
Property line adjoining private property	-	Clear	5	1.524	5	1.524	8	2.4384
Water supply wells	50 <sup>2</sup>	15.24	50	15.24	100	30.38	150	45.72
Streams	50	15.24	50	15.24	50	15.24	100	30.48
Large trees	-	-	10	3.048	-	-	10	3.048
Seepage pits or cesspools	-	-	5	1.524	5	1.524	12	3.6576
Disposal field	-	-	5	1.524	4	1.2192	5	1.524
Domestic water line	1 <sup>3</sup>	0.3048	5	1.524	5	1.524	5	1.524
Distribution box	-	-	-	-	5	1.524	5	1.524

Note:

When disposal fields and/or seepage pits are installed in sloping horizontal distance between any part of the leaching system and ground surface shall be 0.45 meters (15 feet).

<sup>1</sup> Including porches and steps whether covered or uncovered, breezeways, roofed portecocherers, roofed patios, car ports, covered walks, covered driveways and similar structures or appurtenances.

<sup>2</sup> All non-metallic drainage piping shall clear domestic water supply wells by at least 15.24 meters (50 feet). This distance may be reduced to not less than 7.62 meters (25 feet) when approved type metallic piping is installed.

<sup>3</sup> See Article VIII, Chapter 13

**TABLE 13-2  
CAPACITY OF SEPTIC TANKS\***

Single Family Dwellings-Number of Bedrooms	Multiple Dwelling Units or Apartments -One Bedroom Each	Other Uses: Maximum Fixture Units Served per Table 6-1	Minimum Septic Tank Capacity in	
			Liters	Gallons
1 or 2		15	2842.50	750
3		20	3790.00	1000
4	2 units	25	4548.00	1200
5 or 6	3 units	33	5685.00	1500
	4 units	45	7580.00	2000
	5 units	55	8527.50	2250
	6 units	60	9475.00	2500
	7 units	70	10422.50	2750
	8 units	80	11370.00	3000
	9 units	90	12317.50	3250
	10 units	100	13265.00	3500

Extra Bedroom, 5688.50 liters (150 gallons) each.

Extra Dwelling Units over 388,847.50 liters (10,250 gallons) each.

Extra fixture units over 379,947.50 liters (100,250 gallons) per fixture unit.

\*NOTE: Septic tank sizes in this table include sludge storage capacity and the connection of domestic food waste disposal units without further volume increase.

TABLE 13-3  
PRIVATE SEWAGE DISPOSAL ACCORDING TO CAPACITY

Type of Building	Daily Per Capita*		Basic Factor
	Liters	Gallons	
Grammar School	56.85	15	35 students per classroom
Grammar school with cafeteria	75.80	20	
High school with cafeteria and shower baths	94.75	25	
Factories	75.80	20 (without showers)	Each 8-hour shift
	94.75	25 (with showers)	
Restaurants	189.50	50	Per seat
Trailer Parks-Community Baths	189.50	50	3 persons per trailer
Trailer Parks-Private Baths or Independent Trailers	227.40	60	3 persons per trailer
Motels-Baths and Toilets	189.50	50	3 persons per unit
Motels-Baths, Toilets and Kitchen	227.40	60	3 persons per unit
Self-service laundry	1137.00	300 (per machine per day)	
Drive-in theaters	18.95	5 (per car per day)	

\* Normal sludge storage capacity is included excepting waste from food disposal units.

TABLE 13-4  
RATED ABSORPTION CAPACITY OF 5 TYPICAL SOLIDS

Type of Soil	Required Sq. Meter or Leaching Area per 379 Liters (100 Gallons)		Maximum Absorption Capacity Liters/Sq. Meter (Gallons/Sq. Meter) of Leaching Area for a 24-hour Period	
	Sq. Feet	Sq. Meters	Sq. Feet	Sq. Meters
1. Coarse sand and Gravel	20	6.096	5	1.2192
2. Fine sand	25	7.62	4	1.2192
3. Sandy loam or sandy clay	40	12.192	2.5	0.762
4. Clay with considerable sand	60	18.288	1.66	0.506
5. Clay with small amount of sand or gravel	90	27.432	1.11	0.3383

**TABLE 13-5  
SEPTIC TANK CAPACITY**

Required Sq. Meter of Leaching Area/379Liters (100 Gallons) Septic Tank Capacity		Maximum Septic Tank Size Allowable	
Sq. Feet	Sq. Meters	Sq. Feet	Sq. Meters
20-25	6.090-7.6200	7500	2286
40	12.1920	5000	1524
60	18.2880	3500	1066.8
90	27.4320	3000	914.4

# **019 NATIONAL POLICY ON URBAN SEWERAGE AND SANITATION OF 1994**

*NEDA BOARD RESOLUTION NO. 5, SERIES OF 1994*

## **APPROVING THE RECOMMENDATIONS OF THE INFRASTRUCTURE COMMITTEE (INFRACOM) ON THE NATIONAL POLICY, STRATEGY AND ACTION PLAN FOR URBAN SEWERAGE (LIQUID WASTE) AND SANITATION**

On motion duly seconded,

BE IT RESOLVED, as it is hereby resolved to approve as the same is hereby approved and confirmed the following recommendations of the INFRACOM:

### **A. NATIONAL POLICY**

1. Provision of improved sewerage/sanitation services in urban areas shall be considered a high priority.
2. On-site sanitation facilities for all urban households/establishments readily adaptable to further sewerage systems shall be required.
3. All new subdivisions/housing developments shall provide simplified or conventional sewerage system/sanitation facilities.
4. Conventional or low-cost sewerage for central business districts and for potentially high income residential areas where economically and financially viable shall be provided.
5. Treatment of industrial as well as collected city/municipality waste waters to established standards set forth by the DENR prior to disposal into the drainage system shall be required.
6. Provision of services shall be based on consumer demand and willingness to pay.

## B. NATIONAL STRATEGY

1. A sanitation/sewerage program and a Central Sanitation/Sewerage Program Support Office (CPSO) to coordinate subsector activities at the national level and to assist LGUs to plan and manage sanitation/sewerage programs at the community level shall be established.
2. External sources of assistance shall be explored and provided as may be appropriate to enable Municipal Development Fund (MDF) facility or other financing sources to extend loans to LGUs for sanitation and sewerage projects.
3. LGUs shall primarily be the implementors of the sanitation/sewerage programs with the national government providing assistance to develop their capacities in the following areas: community participation, sub-sector planning, program management, regulation of development, selection of technologies, financial management, construction supervision, O & M, monitoring and reporting.

## C. ACTION PLAN

1. A CPSO shall be created and housed at LWUA with the LWUA Board exercising over-all jurisdiction over its operation. An inter-departmental Advisory Committee (IAC) composed of representatives from DPWH, DOH, DILG, DOF, DBM, LWUA, DENR, MWSS and NEDA shall likewise be created and act as the coordination body in the implementation and monitoring of urban sewerage and sanitation programs particularly the five (5) pilot areas (Davao City, Calamba, Dagupan City, Roxas City and Cotabato City). The representatives to the IAC shall preferably be Ass. Sec. or Dir. level. The Chairman of the IAC and the Dir. of the CPSO shall be appointed by the LWUA Board.
2. LWUA shall fully staff the CPSO from within its existing manpower as soon as possible. An international development consultant shall be engaged to assist the CPSO to design and implement the activities. The CPSO shall exist for a period of about 3 to 5 years or until after its functions have been fully devolved to the LGUs.

UNANIMOUSLY APPROVED, 15 March 1994.

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## **020 OFFICIAL DEFINITION OF SEWERAGE AND SANITATION TERMS (1995)**

*NEDA BOARD RESOLUTION NO. 12, SERIES OF 1995*

### **APPROVING THE COMMON DEFINITION OF TERMS RELATIVE TO WATER SUPPLY, SEWERAGE AND SANITATION**

On motion duly seconded,

BE IT RESOLVED, as it is hereby resolved to approve as it is hereby approved, the official and common definition of terms relating to water supply, sewerage and sanitation. All government agencies/instrumentalities, including local government units (LGUs), shall henceforth adopt the aforementioned common definition of terms as formulated by NEDA

UNANIMOUSLY APPROVED, 13 June 1995.

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*Annex B (For Annex A, please refer to Volume I- Water Supply Systems)*

#### **DEFINITION OF TERMS in SEWERAGE AND SANITATION**

**Access -** availability of toilet facility within the household premises which can be used anytime by any member of the household.

**Environmental Sanitation -** the control of all those factors in man's physical environment which exercise or may exercise a deleterious effect on his physical development, health and survival.

**Households Without Toilet -** household without any toilet facility but uses other areas for defecation like bodies of water like rivers, lakes, open field, coastal areas, etc.



- Human Waste -** solid (fecal matter) and liquid (urine) wastes which originate from humans.
- Off Site -** human waste is transported for treatment away from where the toilet facility is located.
- On Site -** human waste is deposited and treated where the toilet facility is located.
- Sanitary Toilet -** is a government-approved type of toilet facility used for receiving and disposing human waste (feces and urine).
- Sanitation -** the development and practical application of sanitary measures for the sake of cleanliness and protecting health.
- Sewerage -** facilities that collect human wastes and sullage from residents and establishments usually piped and conveyed in structures (sewers, pump stations) for eventual treatment) and safe disposal. Piped sewerage includes a collection system (street laterals), a conveyance system (trunk sewers and pump stations), and a treatment plant/disposal system.
- Storm Drainage System -** a system comprising of conduits, pipes and other appurtenances for effecting drainage and used for conveying rain water, surface water or similar wastes.
- Sullage -** liquid waste that do not carry excreta and which normally results from washing, bathing and laundry.
- Unsanitary Drainage System -** an open ditch system of conveying domestic wastes and rainwater into final disposal site without treatment. Includes open canals.
- Unsanitary Toilet -** a type of facility used for receiving and disposing human waste which does not fall under the category of approved types of toilet facilities.

## APPROVED TYPES OF TOILET FACILITIES

### Type I

- a. Facilities requiring small amount of water to wash excreta into the receiving space/pit.

e.g. pour-flush toilets

- b. Non-water carriage toilet facility requiring no water to wash excreta into the receiving space/pit.

e.g. ventilated improved pit latrine, sanitary pit privy

### Type II

Water carriage type having a pour-flush or flush-type toilet facility and a septic vault/tanks as the disposal facility.

### Type III

Water carriage type with pour-flush type toilet facilities connected to septic tanks/or to sewerage system to treatment plants.

1. Flush - type of toilet facility with a water-sealed toilet bowl or water closet and a mechanical device used to wash excreta into the receiving public sewer or any private sewage disposal plants/units by the use of flushing water with traps to provide "water seal".
2. Pour Flush - type of toilet facility with a water-sealed toilet bowl that is flushed by manually pouring water to wash excreta into the receiving space/pit.
3. Ventilated Improve Pit - refers to an on-site toilet facility wherein the pit receives excreta directly from the user and therefore does not require water for flushing; it comprises a lined pit, vent pipe with a fly screen, cover slab and a superstructure which allows entry of fresh air into the pit.
4. Sanitary Pit Privy - type of toilet facility without using any amount of water, with a pit of at least 1-2 meters depth, a hole

of one square meter, provided with a floor covering, a riser, seat with cover which are all fly and rodent proof and a building for privacy.

### LEVELS OF TOILET USE

1. Communal - a toilet facility shared by two or more households.
2. Public - a toilet facility located at public places like markets, bus station, etc. intended for public use.
3. School - a toilet facility located in a school essentially for the use of students.
4. Household - a toilet facility being used by an individual household.

### UNAPPROVED/UNSANITARY TYPES

1. Open Pit Privy - a pit of at least the same dimension as the sanitary pit privy, provided with pit flooring, with or without riser and seat and without cover to protect from flies and rodents.
2. Overhang - structure provided with flooring and with an opening built above the body of water or above the ground without pit under it, used for defecation or the disposal of human waste. It may be a part of the house or a separate structure outside the house.

## **021 SEWAGE DISPOSAL AND DRAINAGE IRR (SANITATION CODE)**

*IMPLEMENTING RULES AND REGULATIONS OF  
CHAPTER XVII - "SEWAGE COLLECTION AND  
DISPOSAL, EXCRETA DISPOSAL AND DRAINAGE"  
OF THE CODE ON SANITATION OF THE PHILIPPINES  
(P.D. 856)*

**To carry out the provisions of Chapter XVII - "Sewage Collection and Disposal, Excreta Disposal and Drainage" , these rules and regulations are hereby formulated for implementation and strict compliance of all concerned.**

### **SECTION 1 : SCOPE**

These implementing rules and regulations shall apply to all public and private sewage and excreta collection and disposal system project planned by any government agency or instrumentality including government-owned or controlled corporations, private organizations, firms, individuals or other entities.

### **SECTION 2 : DEFINITION OF TERMS**

As used in these Rules and Regulations, the terms below shall be defined as follows:

1. Approved excreta disposal facilities shall mean any of the following:
  - 1.1 Any approved type of privy such as:
    - a. Flush toilet connected to:
      - a.1 community sewer
      - a.2 imhoff tank

- a.3 septic tank
  - a.4 digester tank
  - a.5 chemical tank
  - b. Pit privy such as:
    - b.1 VIP latrine
    - b.2 Pit type
    - b.3 "Antipolo" toilet
- 1.2 Any disposal device approved by the Secretary of Health or his duly authorized representative.
2. Communal Excreta Disposal System - an excreta disposal system serving a group of dwelling unit.
  3. Chemical Privy - a privy where fecal matter is deposited into a tank containing a caustic chemical solution to prevent septic action while the organic matter is decomposed.
  4. Department - the Department of Health.
  5. Digestive Cesspool - a pit for the reception or detention of sewage.
  6. Distribution Box - a small concrete receptacle between the septic tank and the drain field from which lines of drain tiles extend and which acts as surge tank to distribute the flow of sewage equally to each line of drain tiles.
  7. Distribution line of a leaching tile system - the pipe from within the distribution box to the drainfield.
  8. Domestic Sewage - the sewage containing human excrement and liquid household waste. Also called sanitary sewage.
  9. Drainage System - the drainage pipes of a plumbing system taking the waste water from the plumbing fixtures and delivering it to

the sewer or some other outlet.

10. Freeboard or Airspace of a Septic Tank - the distance as measured from the liquid level line to the inside top of the septic tank.
11. House Sewer - the pipeline conveying sewage from the house or building to the septic tank or to any point of discharge.
12. Individual Excreta Disposal System - an excreta disposal system serving a dwelling unit.
13. Individual Sewage Disposal System - a sewage disposal system serving a dwelling unit/building.
14. Local Health Officer - Provincial, City or Municipal Health Officer.
15. Local Health Authority - an official or employee responsible for the application of a prescribed health measure in a local political subdivision. For the provincial level, the Local Health Authority is the Governor, and the Mayor for a city or municipality as the case maybe.
16. Operational Permit - the permit to discharge effluent from sewage disposal system.
17. Privy - a structure which is not connected to a sewerage system and is used for the reception, disposition and storage of feces or other excreta from the human body.
18. Public Sanitary Sewer - is a common sewer to which all abutters have equal rights of connections.
19. Public Toilet - a toilet facility located at public places like markets, bus stations, buildings, etc. intended for public use.
20. Sanitary Engineer - a person duly registered with the Board of Examiners for Sanitary Engineers (R.A. 1364) and who heads the sanitation division or section or unit of the provincial/city/municipal health office or employed with the Department of Health or its regional field health units.

21. Sanitation Inspector - a government official or personnel employed by the national, provincial, city or municipal government, who enforces sanitary rules, laws and regulations and implements environmental sanitation activities under the supervision of the provincial/city/municipal health officer/ sanitary engineer.
22. Secretary - the Secretary of Health.
23. Septic Tank - a water tight receptacle which receives the discharge of a plumbing system or part thereof, and is designed to accomplish the partial removal and digestion of the suspended solid matter in the sewage through a period of detention.
24. Septic Tank Absorption Bed or Drain Field - an underground system of pipes leading from the outlet of the septic tank, consisting of open jointed or perforated pipes so distributed that the effluent from a septic tank is oxidized and absorbed by the soil.
25. Sewage Disposal System - a system of collection, transportation, treatment and disposal of sewage.
26. Sewer - pipe, conduit or channel intended to convey sewage.
27. Sewerage or Sewerage Works - system of pipes, pumps, devices and other appurtenant structures for the collection, transportation and final disposal of waste water.

SECTION 3 : INDIVIDUAL EXCRETA AND SEWAGE DISPOSAL SYSTEM

3.1 Individual Excreta Disposal System.

- 3.1.1 Every new house/building to be constructed shall be provided with plan and specifications for excreta disposal system approved by the local health authority prior to construction. The city or municipal Building Official shall refer all applications for Sanitary (Plumbing) Permit to the local health authority for checking of sanitary facilities, prior to

the issuance of the building permit.

3.1.2 All houses/buildings without an approved excreta disposal system shall be required to construct such facilities under the supervision of the local health officer.

3.1.3 The privy recommended for use is the sanitary privy. It shall conform with the following minimum requirements:

- a. It shall consist of an earthen pit, a floor covering the pit, and a water-sealed bowl. It shall be so constructed in order that fecal matter and urine be deposited into the earthen pit which shall be completely fly-proof.
- b. The pit shall be at least one meter square.
- c. The floor should cover the pit tightly to prevent the entrance of flies. It shall be constructed of concrete or other impervious material.
- d. The water-sealed bowl shall be joined to the floor so as to form a water-tight and insect proof joint.
- e. A suitable enclosure, shall be constructed to provide comfort and privacy for the users of the privy.
- f. Wooden floors and seat risers shall not be used.

## 3.2 Individual Sewage Disposal System

### 3.2.1 Installation requirements

- a. When a public sanitary sewer is not available in any street abutting such a lot or premises, waste water piping from any building or works shall be provided with individual sewage



disposal system of approved type and design.

- b. The public sanitary sewer may be considered as not being available when such public sanitary sewer is located more than 100 meters from any proposed building on any lot or premises.
- c. Individual sewage disposal system shall not be installed, maintained or operated on property accessible to public sanitary sewerage system.
- d. Sanitary (Plumbing) Permit shall not be issued for the installation, alteration or repair of any private sewage disposal system or part thereof, on any lot for which a connection with public sanitary sewer is available.
- e. Each individual sewage disposal system shall serve a dwelling on an individual lot and shall be properly maintained in good working condition by the owner. Any failure to provide and properly maintain such a system or to discharge all the sewage from the premises into the disposal system may be declared a public health hazard by the local health authority.
- f. Whenever an approved public sanitary sewerage system is accessible to the property, any individual sewage disposal system shall be abandoned and the house sewer shall be directly connected to the public sewer.

### **3.2.2 Approval**

- a. The property owner or his authorized representative agent shall file an application for a Sanitary (Plumbing) Permit with the local health authority for construction, installation, alteration, or extension of an individual sewage disposal system and the sub-surface absorption

system or other treatment device prior to start of work.

- b. The application shall be made in writing on a form prescribed by the Department of Health and shall contain all pertinent information relative to the location, construction, installation, alteration or extension of an individual sewage disposal system.
  
- c. Drawings and specifications

The Local Health Authority having jurisdiction may require any or all of the following information before a Sanitary (Plumbing) Permit is issued for a house or building sewer or an individual sewage disposal system:

- i. Plot plan drawn to scale completely dimensioned, showing direction and approximate slope of surface, location of all present or proposed retaining walls, drainage channels, water supply lines or wells, paved areas and structures on the plan, number of bedrooms or plumbing fixtures in each structure and location of the building sanitary sewer and individual sewage disposal system with relation to lot lines and structures.
  
- ii. Necessary plans and specification shall be prepared, signed and sealed by a Registered Sanitary Engineer or a Registered Master Plumber, as the case may require.
  
- iii. A log of soil formations and ground water levels as determined by test holes dug in close proximity to any proposed seepage pit or disposal field, together with a statement of water absorption

characteristics of the soil at proposed site as determined by approved percolation tests.

- d. Location of any toilet or sewage disposal system shall be in accordance with the plans and specifications prescribed by the Department of Health.

### **3.2.3 Disposal of Sewage**

- a. Untreated sewage and effluent of septic tank or other putrescible or offensive wastes shall not be discharged onto the surface of the ground or into any street, road, alley, open excavation, storm water sewer, land drain ditch, adjoining property, watercourse or body of water.
- b. Sewage and effluent of a septic tank or other putrescible, impure or offensive wastes shall not be discharged into an abandoned water supply well, spring, or cistern or into a natural or artificial well, sink hole, crevices or other opening extending into limestone, sandstones or other rock or shale formation.
- c. Individual sewage disposal system utilizing leaching fields, leaching beds, or leaching wells shall not be permitted where the depth to normal ground water or rock strata is less than 1.20 meters.
- d. A leaching system shall not be installed in an area where the texture, structure and porosity of the soil are not suitable as determined by a percolation test performed by a registered civil/sanitary engineer. The local health authority may require as many percolation tests as may be necessary to determine the acceptability of the site.

- e. No leaching tile field or bed shall be installed where percolation rate is less than 2.54 cm. (1 in.) fall in water level in the test holes in 60 minutes.
- f. No seepage pit or leaching well shall be installed where the percolation rate is less than 2.54 cm. (1 in.) fall in water into the test holes in 30 minutes.
- g. No person shall install individual household sewage disposal system in a new subdivision, unless site is considered to be impracticable and inadvisable to install a public sewage collection system with the required treatment.

#### 3.2.4 Operational Permit

- a. No person shall discharge or permit or cause to be discharged the effluent from an individual sewage disposal system or other putrescible or offensive wastes from his premises unless an application for an operational permit has been approved by the local health authority.
- b. Only a person or dwelling owner who complies with the requirements of these rules and regulations shall be entitled to receive and retain an operational permit.
- c. The local health authority at any reasonable time may inspect the sewage disposal system, sample the effluent, or take any other step which he deems necessary to ensure compliance with these rules and regulations. The local health authority may utilize inspection and reports submitted by local health officer, sanitary engineer or other qualified national or local government

personnel to determine operational compliance.

### 3.2.5 Lot Dimensions and Areas

- a. Individual sewage disposal systems shall be installed on sufficient area and suitable topography to permit compliance with these rules and regulations.
- b. The design, construction, installation, location, maintenance, and operation of individual sewage disposal systems including septic tanks, leaching tile fields, leaching beds, leaching wells, house sewers, privies and any other treatment system or part thereof shall comply with the minimum standards and engineering practices which are acceptable to the Department of Health.

## SECTION 4 : DESIGN AND CONSTRUCTION OF SEPTIC TANKS, LEACHING TILE FIELD AND HOUSE SEWERS

### 4.1 Septic Tank

#### 4.1.1 Design Capacity

The septic tank capacity may be determined from the quantities of sewage flow contained in Table I Chapter XVII of the Code on Sanitation of the Philippines (see Annex), based on adequate detention time interval resulting in efficient sedimentation. Daily flow from metered water consumption may be used to estimate flow when available. For buildings with occupants, the number of persons to be served shall be computed based on the number of rooms and considering each room as occupied by two persons or on the basis of the actual number of persons served by the tank, whichever is the greater.

Tanks constructed in series may be used to accomplish the required capacity provided the first tank will furnish at least half of the required capacity. This capacity requirement allows for the use of all household appliances including garbage grinders and automatic washers.

#### 4.1.2 Inlet and outlet

- a. The invert level of the inlet shall not be less than 5 centimeters (2 inches) above the liquid level of the tank.
- b. A vented inlet baffle or sanitary tee shall be provided to divert the incoming sewage downward. The baffles or tee shall penetrate at least 15 cm. (6 inches) below the liquid level, but the penetration shall not be greater than that allowed for the outlet baffle or sanitary tee.
- c. The outlet shall be fitted with a sanitary tee or baffle.
- d. The outlet baffle or sanitary tee device shall extend through the scum layer above the liquid level of the tank to approximately 2.5 cm. (1 inch) from the inside top from the tank.
- e. The invert of the inlet pipe shall be at a level not less than 5 cm. (2 in.) above the invert of the outlet pipe
- f. Inlet and outlet pipe fittings or baffles, through compartment partitions shall have a free vent area equal to the required cross-sectional area of the house sewer discharging therein.

#### 4.1.3 Tank Proportions

- a. The septic tank may have various shapes

provided the capacity, inlet, outlet and depth requirements are met. Generally the septic tank is rectangular in shape. If 2 or more compartments are used, the first compartment shall have the capacity from one half to two thirds of the total volume of the tank.

- b. The septic tank shall have a liquid drawing depth not less than 1.20 meters (4 feet)
- c. The vertical distance from the liquid level to the inside top of the tank shall be at least 20 cm. (8 in.).

#### 4.1.4 Inspection Manholes

The septic tank shall be provided with an inspection manhole 0.36 m<sup>2</sup> (4 ft<sup>2</sup>) in minimum area or by an equivalent removable cover slab to provide access to the inlet and outlet devices and to the compartment of the tank for inspection and cleaning. One access manhole shall be located over each compartment. Septic tanks installed under concrete or block top paving shall have the required manholes accessible by extending the manhole openings to grade.

#### 4.1.5 Construction of Septic Tank

- a. Plans and specifications for all septic tanks shall be submitted to the local health authority for approval. Such plans and specifications shall show all dimensions, reinforcement, structural calculations and such other pertinent data as maybe required. Independent laboratory tests and calibrations shall be provided on pre-fabricated septic tanks as may be required by the local health authority.
- b. Septic tanks shall be constructed of sound durable materials, not subject to excessive corrosion or decay and shall be watertight. Each such tank shall be structurally designed

to withstand all anticipated earth or other loads and shall be installed level on a solid bed. Structural and hydraulic design shall be in accordance with good engineering practice.

- c. Approved pre-fabricated septic tanks may be used. After installation, the tank shall be filled with sufficient amount of water to prevent floating.
- d. Roof drains, foundation drains, area drains or cistern overflows shall not be made to enter the septic tank or any part of the treatment system.

#### **4.1.6 Location**

- a. The septic tank shall be located not less than 25 meters from any well, spring, cistern, or other sources of drinking water supply; not less than 1.5 m.(5 ft.) from any water service line; and not less than 3.0 m. (10 ft.) away from water main.
- b. Septic tanks shall be located such that desludging equipment can have access to the opening manholes conveniently.
- c. Septic tanks shall not be located under the building.

#### **4.1.7 Maintenance**

- a. Septic tanks shall be cleaned before excessive sludge or scum is allowed to accumulate and seriously reduce the settling efficiency.
- b. Septic tanks shall be inspected at least once a year and be cleaned when the bottom of the scum mat is within 7.50 cm (3 inches) of the bottom of the outlet device or the sludge and



scum has reduced the liquid capacity by 50%.

- c. Tanks shall not be washed or disinfected after cleaning. A small residual of sludge shall be left in the tank for seeding purposes.
- d. Sludge from septic tanks shall be disposed of by burial or by any other method approved by the Secretary or his duly authorized representative and not by being emptied into open field, ditches or bodies of water.

## 4.2 Leaching Tile Field

### 4.2.1 Design

- a. A leaching tile system utilizing trenches 0.45 m. - 0.90 m. wide is considered to be a leaching tile field.
- b. A leaching tile system utilizing trenches more than 0.90 meter (36 inches) wide is considered to be a leaching bed.
- c. Leaching tile fields and leaching beds, based on percolation tests, shall have a minimum absorption area equivalent to that required for a small dwelling unit having sewage flow of 50 gal/cap/day. Only the trench bottom area is to be calculated as the absorption area.
- d. Absorption area requirements for residences shall conform to the following:

Average time required for water to fall 2.54 cm. (1") is indicated by percolation test	Suitability of leaching soil	Square meters of trench bottom of leach bed base required
1 minute or less	good	6.5 (70 ft. <sup>2</sup> )
5 minutes	good	11.61 (125 ft. <sup>2</sup> )
10 minutes	good	15.33 (165 ft. <sup>2</sup> )
15 minutes	fair	17.65 (190 ft. <sup>2</sup> )
30 minutes	fair	23.22 (250 ft. <sup>2</sup> )
45 minutes	poor	27.87 (300 ft. <sup>2</sup> )
60 minutes	poor	30.66 (330 ft. <sup>2</sup> )

- e. Leaching tile field or leaching bed or leaching well or chamber shall not be installed in any of the following:
- i. In swampy area or where ponding or flooding is likely to occur.
  - ii. Where the percolation rate exceeds 60 mins. per 2.5 cm. ( 1 in.) of water fall.
  - iii. Where the depth to normal ground water or rock strata is less than 1.2 m (4 ft.) below the bottom of the device

#### 4.2.2 Construction

- a. Drain lines shall be constructed of materials not subject to excessive deterioration and shall be laid with open joints, except that perforated clay tile, perforated bituminous fiber pipe, or

other approved materials may be used, provided that sufficient openings are available for distribution of the effluent into the trench areas. ( Total area of perforations shall be at least 150% of the cross-sectional area of the pipe.)

- b. The drain lines shall have a minimum diameter of 100 mm. (4 in.) and shall have a relative level grade, but in no instance shall have a fall greater than 1 cm. in 60 minutes.
- c. In leaching tile fields the minimum distance between centerline of trenches shall be at least 1.80 m. ( 6 ft.).
- d. In leaching beds, lines for distributing effluent shall be spaced 0.90 m. (3 ft.) from side to side of trench walls.
- e. Final grading shall be completed prior to installing a leaching field or leaching bed.
- f. The leaching tile field or leaching bed shall have a minimum depth of 30.0 cm. (12 in.) of clean gravel, stone or slag fill, extending at least 5.0 cm. (2 in.) above and 15 cm. (6 in.) below the drain lines. The filter material shall be 2 cm. to 6.5 cm. (0.80 to 2.5 in.) in size.
- g. The absorption trenches shall have a minimum depth of 45 cm. (18 in.) but not more than 75 cm. (30 in.).
- h. Before placing filter material and drain lines in a prepared excavation, all smeared or compacted surfaces shall be removed from trenches by raking to a depth of 2.5 cm. and the loose material is removed. Clean stone, gravel, slag or similar filter material varying in size from 2.0 cm. to 6.5 cm. shall be placed in the trench to the depth and grade required

by this section. Drain pipe shall be placed on filter material in an approved manner. The drain lines shall then be covered with pervious material to the minimum depth of 5 cm. as required by this section, and this covered with untreated building paper, straw or similar porous material to prevent closure of voids with earth backfill.

- i. Where two or more drain lines are installed, an approved distribution box of sufficient size to receive lateral lines shall be constructed at the head of each disposal field. The inverts of all outlets shall be level and the invert of the inlet shall be at least 2.5 cm. above the outlets. Suitable baffles shall be provided to insure equal flow. Distribution boxes shall be built on a level concrete slab installed in natural or compacted soil.
- j. All laterals from an approved distribution box to the disposal field where the grade exceeds 1:2000 (0.0005%) shall be bell and spigot vitrified clay or other approved pipe with water tight joints. Multiple disposal field laterals, whenever practicable, shall be of uniform length.
- k. Connections between a septic tank and a distribution box, or between a distribution box and drainfield, shall be laid with approved watertight joints on natural ground or compacted fill.
- l. Heavy equipment shall not be used over the tile field or bed after the tile and gravel are in place.
- m. Disposal fields shall be constructed as follows:

Minimum number of drain lines per field	1
Maximum length of each line	30.0 m

Minimum bottom width of trench	0.45 m
Minimum spacing side wall to side wall plus 0.6 m for the additional 0.3m of depth	0.90 m
Minimum depth of earth cover over lines	0.30 m
Maximum grade of lines	0.5 %
Minimum grade of lines	0.25 %
Minimum filter material over drain line	5.0 cm.

#### 4.2.3 Location

The leaching tile field or leaching bed shall be located not less than twenty five (25) meters (80 ft.) from any well, spring, cistern, or other source of drinking water supply; not less than 3 m. (10 ft.) from an occupied building; and not less than 1.5 m. (5 ft.) from any lot line.

### 4.3 House Sewers

#### 4.3.1 Design

The size of any house sewer shall be determined on the basis of the total number of fixture units drained by such sewer. Minimum size shall not be less than 100 mm. (4 in.) in diameter.

#### 4.3.2 Materials

- a. Vitrified clay sewer pipe
- b. Asbestos cement pipe
- c. Cast iron pipe
- d. Bituminized fiber pipe
- e. Glass pipe
- f. Any other pipe approved by the Bureau of Standards, Department of Trade and Industry

### 4.3.3 Installation

- a. The house sewer shall be laid in good alignment and at a uniform slope of not less than 1:50 (0.02%) toward the point of disposal; provided that, where it is impracticable, due to the depth of the street sewer or to the structural features or to the arrangement of any building or structure, to obtain a slope of 1:50 (0.02%), any such pipe or piping 100 mm diameter or larger may have a slope of not less than 1:100 (0.01%).
- b. Whenever the house sewer is located within 25 meters of a well or spring or any drinking water source, the house sewer shall meet the ten (10) foot head of water test for fifteen minutes. When water is not available or when there is a danger of freezing, the air or smoke test may be used.
- c. House or building sewer piping shall be laid on a firm bed throughout its entire length, and any such piping laid in ground shall be laid on a bed of approved materials and shall be adequately supported.
- d. House sewer or other drainage piping or part thereof, which is made of materials other than those approved for use under or within a building, shall not be installed under or within 0.60 m. (2 ft.) of any building, or structure or parts thereof, nor less than 0.30 m. (1 ft.) below the surface of the ground. The provisions of this paragraph include structures such as porches and steps, whether covered or uncovered, roof patios, carports, covered walls, covered driveways and similar structures or appurtenances.
- e. Non-metallic house sewer piping shall not be run or laid in the same trench with water

service pipes or any underground water pipes unless both of the following requirements are met:

- i. The bottom of the water piping at all points shall be at least 30 cm. ( 1 ft.)above the top of the sewer pipeline.
- ii. The water piping shall rest on a solid shelf at one side of the common trench.

## SECTION 5 : PUBLIC SEWERAGE SYSTEM

5.1 Any person, government or private entity, firm and/or agency, corporation, institution or local government unit which intends to construct a public sewerage system or sewage treatment plant shall be required to submit plans, design and the necessary data and specifications to the Secretary of Health or his duly authorized representative, for approval thereof prior to start of work. In case there is an existing one, its as-built plan and specifications shall be submitted for review and approval.

5.1.1 It shall be unlawful for any person, entity, or firm to discharge untreated effluent of septic tanks and/or sewage treatment plants to bodies of water without obtaining approval from the Secretary of Health or his duly authorized representatives.

5.1.2 Sludge from septic tanks and sewage treatment plant shall be disposed of in a manner approved by the Department of Health.

### 5.2 Provision of Sewerage System

#### 5.2.1 Subdivision

##### a. Approval

- i. Plans of subdivisions indicating all lots therein shall be submitted to the *Department of Health* for approval of the sewage disposal system before any construction is started or before any of the lots in the subdivision are sold or offered for sale whether or not each sale entails transfer of title or deed.
- ii. If individual sewage disposal systems or individual water supply systems or both are proposed, the plot shall contain all pertinent information relative to the installation of these systems.

b. **Provision of Sewerage**

Whenever feasible, the proposed subdivision shall be served by extension of the existing public sanitary sewerage system or by a community sewerage and sewage treatment system.

c. **Proper Disposal of Sewage**

The proper disposal of sewage in subdivisions shall conform with the provision of Section 3 of these rules and regulations.

5.2.2 **Operation of Sewage Treatment Plants**

- a. The sewage treatment plant shall be capable of treating the flow of sewage discharged by the community in the area.
- b. The type of sewage treatment plant shall be approved by the Secretary or his duly authorized representative and the effluent from such treatment plants shall meet the standards



formulated by the Department of Environment and Natural Resources.

- c. The sewage treatment plant shall provide laboratory facilities for control tests and other examinations needed.
- d. Operating data, control tests and such other records as may be required shall be forwarded to the local health authority.
- e. The local health authority shall be informed in case of breakdown or improper functioning of the treatment works.
- f. Where sewage treatment plant is provided, no sewage shall be allowed to by-pass the plant.
- g. The sewage treatment plant shall be managed by a registered sanitary engineer.

**SECTION 6 : DAMAGE TO PUBLIC SEWER OR SEWAGE DISPOSAL SYSTEM**

It shall be unlawful for any person to discharge, by any means whatsoever, into any plumbing fixtures, such as floor drain, sump, receptacle or device which is connected to any drainage system, public sewer, septic tank or cesspool any ashes, cinders, solids, rags, flammable, poisonous or explosive liquids or gases, oils, grease and any other thing whatsoever which would or could cause damage to the public sewage disposal system, whether the system is government or privately-owned.

**SECTION 7 : ABANDONED SEWER AND SEWAGE DISPOSAL FACILITIES**

- 7.1 Every abandoned building or house sewer or part thereof, shall be plugged or capped within 1.5 meter of the property line.

- 7.2 Every cesspool, septic tank and seepage pit which has been abandoned or has been discontinued otherwise from further use or to which no waste or soil pipe from a plumbing fixture is connected, shall have the sewage removed therefrom and be completely filled with earth, gravel, concrete or other approved material.
- 7.3 The top cover of the cesspool, septic tank or seepage pit shall be removed before filling and the filling shall not extend above the top of the vertical portions of the sidewalls or above the level of any outlet pipe until inspection has been called . After an inspection by the local health office, the cesspool, septic tank or seepage pit shall be filled to the level of the top of the ground.
- 7.4 It is unlawful for a person owning or controlling any cesspool, septic tank, or seepage pit on his premises or in that portion of any public street, alley or other public property abutting such premises to refuse or neglect to comply with the provision of this section or upon receipt of notice from the local health authority.
- 7.5 Where disposal facilities are abandoned, consequent to connecting any premises with the public sewer, the person making the connection shall fill all abandoned facilities within 30 days from the time of connecting to the public sewer.

**SECTION 8 : DRAINAGE**

- 8.1 It shall be the responsibility of every local government unit to provide and maintain in a sanitary state and in good repair a satisfactory system of drainage in all inhabited areas where waste water from buildings and premises could empty without causing nuisance to the community and danger to the public health.
- 8.2 Buildings or premises producing waste water shall be connected to the municipal drainage system in all areas where it exists.

SECTION 9 : SPECIAL ESTABLISHMENT

Establishments such as industrial, laundry, slaughterhouses, dairies, poultries, piggeries, mining, hospitals, clinics, funeral parlors, laboratories and other similar establishments discharging waste water into receiving river or other water bodies which create pollution problems shall be required to obtain approval from the Department of Environment and Natural Resources before construction and issuance of sanitary permit by the local health office.

SECTION 10 : SPECIAL PRECAUTION FOR  
RADIOACTIVE EXCRETA AND URINE  
OF HOSPITALIZED PATIENT

- 10.1 Patients given high doses of radioactive isotope for therapy shall be given toilet facilities separate from those used by "non-radioactive" patients.
- 10.2 Radioactive patients shall be instructed to use the same toilet bowl at all times and flush it at least three times after its use.

SECTION 11 : PENAL PROVISION

- 11.1 Any person who shall violate, disobey, refuse, omit or neglect to comply with any of the provisions of these rules and regulations, shall be guilty of misdemeanor and upon conviction shall be punished by imprisonment for a period not exceeding six (6) months or by a fine not exceeding P 1,000.00 or both, depending upon the discretion of the court.
- 11.2 Any person who shall interfere or hinder, oppose any officer, agent or member of the Department of Health or of the bureaus and offices under it, provincial, city or municipal health officers, sanitary engineers and sanitary inspectors in the performance of his duty as provided for under these rules and regulations, or shall tear down, mutilate,

deface or alter any placard, or notice, affixed to the premises in the enforcement of these rules and regulations shall be guilty of misdemeanor and punishable upon conviction by imprisonment for a period not exceeding six (6) months or by a fine not exceeding P 1,000.00 or both depending on the discretion of the court.

SECTION 12 : SEPARABILITY CLAUSE

In the event that any rule, section, paragraph, sentence, clause or words of these rules and regulations is declared invalid for any reason, the other provisions thereof shall not be affected thereby.

SECTION 13 : REPEALING CLAUSE

All pertinent rules and regulations which are inconsistent with the provisions of these implementing rules and regulations are hereby repealed or amended accordingly.

SECTION 14 : EFFECTIVITY

These rules and regulations shall take effect after fifteen (15) days from date of publication in the official gazette or a newspaper of general circulation.

Approved on this 21st day of December nineteen hundred ninety-five.

(SGD) HILARION J. RAMIRO, JR., M.D., M.H.A.  
Secretary of Health

Date of Publication:  
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ANNEX

**Table 1. QUANTITIES OF SEWAGE FLOW**

<b>Type of Establishment</b>	<b>Gals./Day/Person</b>
Small dwellings and cottages	50
Large dwellings with numerous fixtures	75-100
Multiple family residence	50
Rooming houses	40
Boarding houses	50
Hotels and motels	50
Restaurants (toilet and kitchen wastes per person)	7-10
Restaurants (kitchen wastes per meal served)	1-2/2-3
Kitchen wastes at hotels, camps, boarding houses, etc., serving 3 meals/day	7-10
Tourist camps or trailer parks	35-50
Resort camps (night and day) with limited plumbing	50
Luxury camps	75-100
Work or construction camps (semi-permanent)	50
Day school without cafeterias, gymnasiums or showers*	8
Day school with cafeterias but no gyms or showers* (Quantity estimated from no. of meals served or 80% of enrolment)	12
Day school with cafeterias, gyms and showers (Quantity estimated from maximum no. expected to use gyms and showers in one day)	20
Boarding schools	75-100
Day workers at schools and offices	15
Hospitals* (Gallons per bed)	150-250
Public institutions other than hospitals	75-125
Factories (Gal./person/shift, exclusive of industrial wastes)	15-35
Public picnic parks (toilet wastes only)	5
Picnic parks, with bathhouse, showers and flush toilets	10
Swimming pools and bathing places*	10
Luxury residences and estates	100-1 50
Country clubs per resident members*	25-50

\*Subsurface drain fields not recommended for secondary treatment

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## **About the Compiler**

Engr. Bonifacio B. Magtibay is a registered civil/sanitary engineer, a freelance consultant in the field of water and environmental sanitation and a faculty member of De La Salle University-Cavite.

He was born in Calapan, Oriental Mindoro where he completed his elementary (1974) and secondary (1978) education both as Salutatorian. He obtained his B.S. Civil Engineering (1983) and B.S. Environmental and Sanitary Engineering (1985) at the Mapua Institute of Technology, Manila. He holds a Diploma in Sanitary Engineering (1988) from the International Institute of Hydraulics and Environmental Engineering, Delft, The Netherlands. He is currently completing his M.S. in Environmental Management at the Philippine Women's University.

He started his career in water and environmental sanitation at the Environmental Health Service, Department of Health, Manila as Sr. Civil Engineer (1985-1987) and Sanitary Engineer (1987-1990). From 1990 to 1997, he was engaged by United Nations Children's Fund (UNICEF) as National Project Officer for Water and Sanitation. Since 1997, he has been involved in water and sanitation consulting works. He has rendered consulting services to the following agencies: World Bank, World Health Organization, UNICEF, Department of Interior and Local Government, and Snowy Mountains Engineering Corporations. In 1999, he established the Biosphere Environmental Health Systems Consultancy Services.

Engr. Magtibay's involvement in the water and sanitation sector exposed him to numerous travels here and abroad. He was able to visit many provinces and cities in the Philippines as well as in other countries, such as: the Netherlands, Germany, France, Switzerland, Belgium, Luxembourg, England, Italy, United States, Barbados, Thailand, Bangladesh, Vietnam and Cambodia to accomplish a combination of field work, study tour, training, conference and consultancy.

As a writer, he has contributed water and sanitation - related articles in local magazines and sector newsletters. While at work, he has written technical papers which include program plans, operational plans, project proposals, rapid assessments and project evaluations. In 1999, he conceptualized a series of books highlighting environment and health systems.

He is a member of the following professional organizations: Philippine Society of Sanitary Engineers, Philippine Institute of Civil Engineers, Philippine Waterworks Association and League of Public Health Engineers.

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