Michigan Criteria for Subsurface Sewage Disposal

Division of Environmental Health
Bureau of Environmental and Occupational Health
Michigan Department of Public Health

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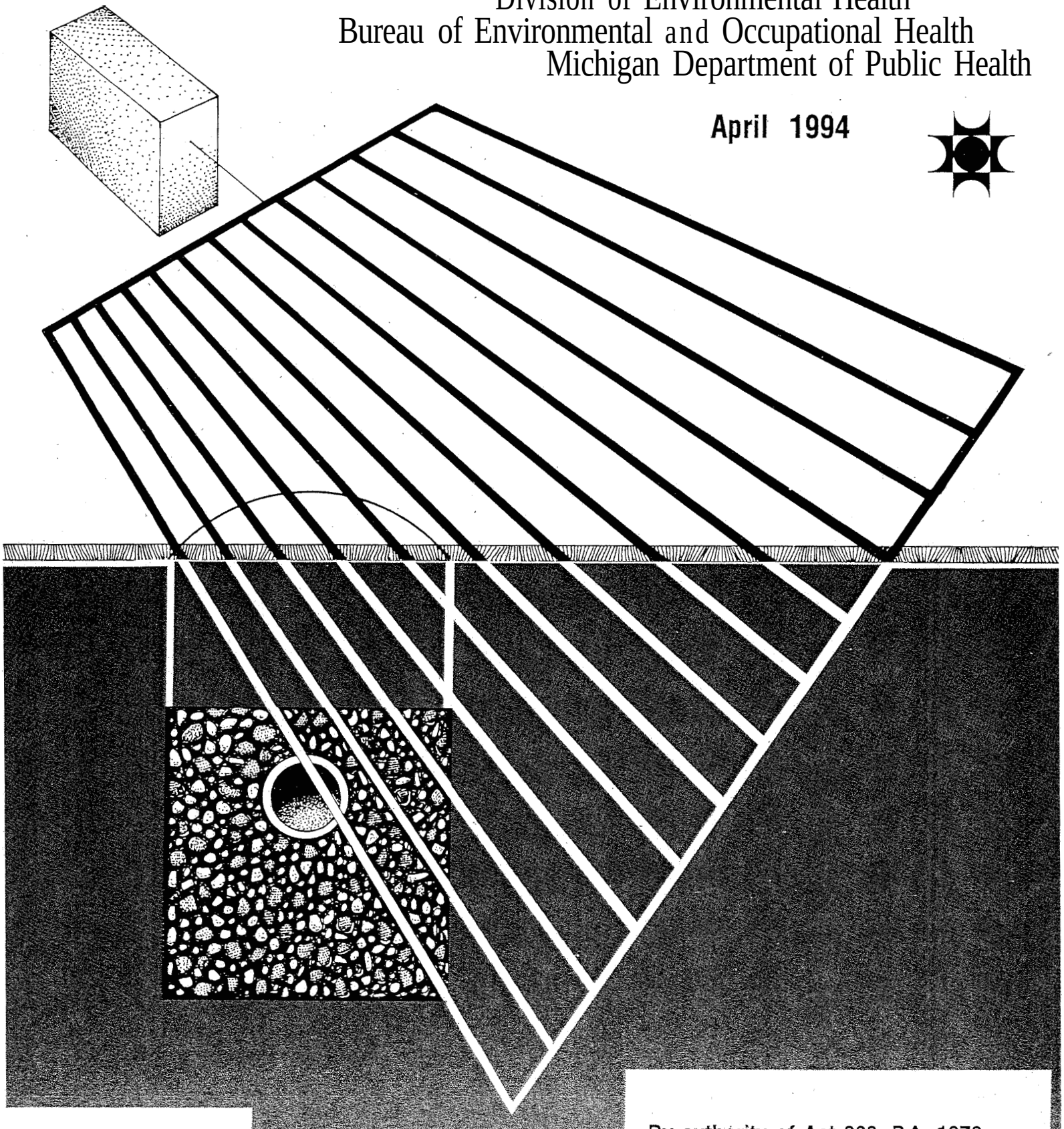

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By authority of Act 368, P.A. 1978, as amended, and Act 245, P.A. 1929.

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NOTE

Pursuant to Executive Order No. 1991-31, the Water Resources Commission was abolished by the Governor with all duties and responsibilities transferred to the Michigan Department of Natural Resources. All references in this document to the "Water Resources Commission" should be replaced by the "Michigan Department of Natural Resources."

Acknowledgement

These revised criteria were prepared by a committee of representatives of local county and district health departments, the Michigan Department of Natural Resources, and the Michigan Department of Public Health. After ten years of use in the field, a new committee was convened in 1987 to review and revise the criteria consistent with current technology. A list of the individuals participating on both committees is located in Appendix I.

Statement of Intent

This document replaces the "Michigan Guidelines for Subsurface Sewage Disposal" dated December 1977 and published by the Michigan Department of Public Health.

The document title has been changed from a "guideline" to "criteria" to more accurately reflect its purpose. A guideline is used primarily as a standard by which judgments are made. Since the Water Resources Commission cannot delegate its authority to approve permits (only the Legislature can do this), it must be careful in certifying local health departments to carry out this program not to delegate "authority." The term "criteria" has a stronger connotation suggesting a standard by which decisions are made. The document contains very specific requirements, which certified local health departments are expected to follow in making decisions on proposals of less than 10,000 gallons per day. Proposals which do not meet the criteria must be forwarded to the Water Resources Commission for issuance of a permit under the provisions of Act 245, Public Acts of 1929. In this way the Commission is pre-approving proposals which meet these very specific criteria, and certified local health departments act as a screening agency to determine if the conditions adopted by the Commission are met. Local health departments do not have the authority to approve proposals which do not meet this criteria, except through the variance provisions included in the criteria. All appeals of decisions made by a certified local health department must be addressed to the Water Resources Commission.

Applicability

GUIDELINE as defined in Act 306, Public Acts of 1969, as last amended by Act 108, Public Acts of 1977, means "An agency statement or declaration of policy which the agency intends to follow, which does not have the force or effect of law, and which binds the agency but does not bind any other person." It is intended that "agency" as used above also includes local health departments, when acting as an agent of the Michigan Department of Public Health and the Water Resources Commission in accordance with the Water Resources Commission Policy Statement adopted August 18, 1983.

MICHIGAN CRITERIA FOR SUBSURFACE SEWAGE DISPOSAL

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
BUREAU OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH

I. Introduction

These criteria have been developed for use by local and state agencies responsible for the review and approval of subsurface sewage disposal systems in accordance with the Water Resources Commission Policy Statement adopted August 18, 1983. The criteria is to provide minimum uniform standards of design and construction for such systems in Michigan. Nothing in these criteria shall prevent local health departments or other government agencies from adopting and enforcing requirements more stringent than these criteria.

IT SHOULD BE NOTED THAT THESE CRITERIA AND THE ACCOMPANYING POLICY STATEMENT PERTAIN TO THE TREATMENT AND DISPOSAL OF SANITARY SEWAGE ONLY (e.g. toilet wastes, sink and laundry waste, bath water). The treatment and disposal of wastes from industrial and commercial processes (laundromats, car washes, floor drains, etc.) requires a separate permit from the Water Resources Commission. These criteria do not apply to private single and two family residential sewage systems constructed pursuant to local sanitary codes.

The purpose of the criteria is to assure that disposal of sanitary sewage in quantities of less than 10,000 gallons per day:

1. Will not contaminate any existing or future drinking water supply.

2. Will not give rise to a public health hazard or present the potential for a hazard.

3. Will not contaminate surface or groundwaters.

4. Will not give rise to a nuisance due to odor or unsightly appearance.

5. Will not otherwise violate laws or regulations governing water pollution or sewage disposal. Sewage systems treating less than 1,000 gallons per day may be approved in accordance with local health department sanitary codes.

II. Definitions

A. Acceptable Permeability – A soil that will accept water at a rate of less than or equal to 45 minutes per inch using Michigan Department of Public Health Procedure for Percolation Tests (Appendix D).

B. Bed System – A subsurface sewage disposal system laid on a continuous bed of aggregate.

C. Contamination – The impairment of groundwater or surface water quality beyond acceptable limits, because of the discharge of sanitary sewage and other wastes.

D. Engineer – An individual licensed as a Professional Engineer in accordance with Act 299, P.A. of 1980.

E. Institution – A school or other facility specializing in the day-to-day care or extended care of individuals.

F. Public System - A sanitary sewer system as defined under Act 98, P.A. of 1913.

G. Registered Sanitarian – A person registered as a Sanitarian under Act 147, P.A. of 1963.

H. Sanitary Sewage – Water and contaminants discharged from the sanitary conveniences (i.e., bathroom, kitchen fixtures, and household laundry) of dwellings, office buildings, industrial plants, commercial buildings, and institutions. Commercial laundry waste and wastes from industrial and commercial processes are not considered sanitary sewage and generally require a separate permit from the Water Resources Commission.

I. Surface Water – Water that rests or flows on ground surface.

J. Transmissivity – The characteristics of a soil formation that affect the rate of water movement through the soil. Transmissivity is determined by soil texture and structure.

K. Trench System – A subsurface sewage disposal system laid in trenches separated by undisturbed earth.

III. Site Review Process

A. A registered sanitarian or professional engineer from the reviewing agency must determine the suitability of a site based on necessary field tests and evaluations of other factors as deemed necessary in these criteria.

B. The reviewing agency shall not approve the site when site conditions such as type of soil, water table, terrain, lack of size or other conditions, will prevent the satisfactory operation of a subsurface sewage disposal system in a manner which fulfills the purpose of these criteria.

C. Proposals for alternative means of on-site sewage disposal may be submitted in the form of an application to the Water Resources Commission for a discharge permit when a site is not approved for a subsurface sewage disposal system for reasons described above. Provisions of Section 8(b), Act 245, P.A. of 1929, as amended. Section 8(b) states, in part, that:

> "A person who is using the waters of the state for sewage or other waste disposal purposes, or who requires a new or substantial increase over and above the present use now

made of the waters of the state for sewage or other waste disposal purposes, shall file with the Commission a written statement setting forth the nature of the enterprise or development contemplated, the amount of water required to be used, its source, the proposed point of discharge of the wastes into the waters of the state, the estimated amount so to be discharged and a fair statement setting forth the expected bacterial, physical, chemical and other known characteristics of the wastes. Within 60 days of receipt of the statement, the Commission shall issue a permit stating such restrictions as in the judgement of the Commission may be necessary to guard adequately against such unlawful uses of the waters of the state as are set forth in Section 6. The Commission may deny a proposed new use in lieu of issuing a permit upon determining that unlawful pollution cannot be guarded adequately against by available waste treatment or control measures."

D. Proposals for new or increased uses at existing structures shall comply with all provisions of these criteria.

IV. Connection to Public Utilities

Connection to a public sanitary sewer system is required when available as defined by Act 368, P.A. of 1978 (see Appendix B), and when the local governmental agencies having jurisdiction will allow connection to that sewer. In cases where the sanitary sewer is farther from the proposed facility than as defined in Act 368, connection may still be feasible and **is** encouraged. Prior to evaluation of a site where the availability of a public sewer system is in question, a statement regarding availability of the sewer should be obtained by the reviewing agency from the appropriate governmental entities.

In regard to multiple unit land developments, several factors other than those included in Act 368 must be considered in determining the availability of a public sanitary sewer system. No attempt is made to list those factors here.

V. Construction Plans, Permits, Inspections

The reviewing agency shall require the submittal of detailed construction plans, prepared by a registered professional engineer in private practice or registered sanitarian in private practice, for systems constructed under these criteria. Where the cost of the total project: is $15,000 or greater, Act 299, P.A. of 1980 requires that plans be submitted by a registered professional engineer only.

The requirement for submittal of plans may be waived at the discretion of the reviewing agency for small systems with flows less than 2,000 gallons per day (provided the cost of such **a** system ***is*** less than $15,000).

The reviewing agency may require that a hydrogeological study be performed for submittal and approval by the reviewing agency.

Prior to the construction of a sewage system under these criteria, a permit must be obtained from the reviewing agency having jurisdiction. Construction of the building served by the sewage system shall not begin until a permit for the sewage system has been obtained.

The reviewing agency shall include on the permanent documents the intended building use and the design basis for its sewage disposal system.

The reviewing agency is to make such inspections as deemed necessary during construction to assure compliance with approved plans and the permit. The reviewing agency may require written certification by the project's consulting engineer that construction was completed in accordance with approved plans and specifications. Under no circumstances are treatment 'facilities to be backfilled until the reviewing agency has given its approval.

The installer shall not deviate from the approved design without the approval of the reviewing agency and the design consultant.

VI. Estimates of Sewage Quantities

Records of measurements of actual flow from existing installations or from similar establishments in similar locations should be used for system sizing when they can be obtained. In the absence of such data, Appendix **C** should be used as a guide in estimating the expected flow.

VII. Sewage Lift Stations Within Collection Systems

Raw sewage pumping facilities are to be designed and installed in accordance with the "Recommended Criteria for Sewage Pumping at Nonmunicipal Installations"[1], as published by the Bureau of Environmental and Occupational Health of the Michigan Department of Public Realth. Sewage pumping facilities must comply with the National Electrical Code. A minimum of a visual alarm is required, but both an audio and visual alarm are strongly recommended. Raw sewage lift pumps shall be so connected into the plumbing system to avoid turbulence in the septic tank.

VIII. Septic Tank and Dosing, Tank

A. General

The septic tank shall be constructed of sound and durable material not subject to excessive corrosion or decay and structurally capable of supporting loads to which it will be subjected. The tank shall be watertight.

Tanks constructed of materials other than concrete shall not be installed into water table or bedrock conditions.

B. Septic Tanks[2]

Septic tanks shall have an effective liquid capacity sufficient to provide at least *24* hours retention at design flow. Food service establishments require special design (see Appendix F). The minimum size tank shall be 1,000 gallons, regardless of flow, and have a length to width ratio of no less than 2 to 1, or so partitioned as to provide protection against short-circuiting *of* flow. The water depth shall be no less than *4* feet nor greater than 6 feet 6 inches. The septic tank outlet shall be provided with a tee or baffle that extends into the middle third of the water depth to prevent floating solids from carrying over into the disposal field or bed. Such devices are not recommended at the tank inlet. It is recommended that the septic tank be partitioned into two or three compartments, when capacity is greater than *4,000* gallons per day, with the first compartment having a capacity of one-half to two-thirds of the total required. This can be accomplished by using two or three tanks when precast tanks are used.

Adequate access must be provided to each compartment of the tank(s) for inspection, cleaning, and repairs. Both inlet and outlet devices must be accessible. A minimum of an 18 inch diameter opening, extended to the surface, must be provided. A secure cover designed to prevent surface water infiltration shall be provided.

C. Dosing Tanks

For systems where the design flow exceeds 2,000 gallons per day, a dosing tank shall be installed. The purpose of a dosing tank is two-fold. It provides much better distribution of sewage effluent in large soil absorption systems and it provides intermittent periods of wetting and drying of the soil into which the effluent percolates, thus helping the system to remain aerobic. Experience ha5 shown that this latter advantage will improve the life of the system.

IX. Soil Absorption System

A. General

When evaluating a site and designing a system for the underground disposal of sewage effluent, the protection of the ground and surface waters and the limitations of the soil must be thoroughly considered. The proper operation of a soil absorption system is largely premised upon two factors: acceptable permeability and transmissivity of the natural soil formation; and the rate of application of sewage effluent. The effluent must first infiltrate the soil and then move from the area through vertical and horizontal percolation. The rate of infiltration and percolation must exceed the rate of application. Failures generally occur when the rate of application exceeds the rate of infiltration or percolation, when an organic mat forms at the stone-soil interface that restricts infiltration, or when there are other soil or drainage limitations at the site.

Where aquifers capable of being used for drinking water supply are involved, rapid permeability may be unacceptable because contamination of the groundwater may occur.

A soil absorption system is considered to have failed if any one of the following conditions occur:

1. The system cannot accept sewage effluent at the rate of application.

2. Sewage effluent seeps from, or ponds on or around, the system.

3. The system contaminates an aquifer capable of being used for drinking water supply or surface waters of the state.

B. Site and Soil Conditions

Rational design of absorption fields must consider a number of factors in determining site suitability and system design:

1. Protection of Surface and Groundwaters - Under all soil conditions, consideration must be given to the protection of surface waters and groundwaters. This is especially critical in very permeable soils and in areas where rock formations are near the ground surface. Appropriate data on test wells or nearby wells should be included as part of the plans submitted, or test wells and/or deep borings and backhoe cuts may be required to permit evaluation of the protection provided for the waters of the state.

2. Soils Evaluation - A complete evaluation requires borings or backhoe cuts to at least four feet below the proposed bottom elevation of the absorption field, a determination of the seasonal high groundwater elevation, a review of the soils information as may be obtained from a modern soil map which meets the standards of the National Cooperative Soil Survey, and a review of available well logs for the area. Slope, limiting soil layers, and other factors that affect the operation of the sewage disposal system also must be considered. The reviewing agency shall require backhoe excavations or adequate information to determine soil suitability (where hand augering is not possible) where the range in permeability varies significantly, where soil stratification exists, where soil conditions are marginal, or when determination of groundwater table elevations requires examination of the undisturbed earth, where other factors occur that cannot be evaluated by use of a soil auger. The percolation test is a method for estimating the ability of soils to absorb sewage from drainfields, drain beds, or other similar devices. Under the best of conditions, the percolation test is of limited value due to many variable factors which may influence the final test result. If a percolation test is proposed, it shall be performed in absolute accordance with the "Criteria for Percolation Tests" (see Appendix D) and the reviewing agency must be consulted prior to tests being conducted. There is no need to perform a percolation test when soil or other site conditions are clearly unsuitable.

3. Groundwater - The depth of groundwater and the slope *of* the groundwater table are factors that are critical to the proper operation of a soil absorption system. Groundwater mounding can occur under a system to the point of causing a failure if these factors are not properly evaluated and considered in site evaluation and design. These factors become more critical as the size of the system increases, the permeability of the soil decreases, and/or the depth of the groundwater table decreases. In most cases, it is not sufficient to simply determinethe depth to the groundwater, but it is also necessary to determine whether the quantity of sewage effluent applied will move from the area of application at a rate sufficient to prevent system failure. This is especially critical when it is proposed to place a system on fill to gain the required vertical isolation distance to water table. In many cases the reviewing agency, together with the design consultant, can make this determination based on their past experience and professional judgement given the soils information collected in the site evaluation. But, when this determination cannot be easily made, the reviewing agency may require an analysis of the site by a groundwater hydrogeologist or consulting engineer qualified in groundwater hydrogeology.

Proposals to lower the groundwater table must be reviewed by the local reviewing agency and the Michigan Department of Public Health. These projects usually are not successful. Approval shall be withheld pending evidence of effective lowering of the water table by the installation of the drainage system and until provisions are made for continued maintenance of the drainage system. (See requirements under "Design Factors," item 2, Page 9, regarding "Location and Isolation.")

4. Slopes - Since a relatively level area is needed for the installation of a standard soil absorption system, areas with 12% or greater slope are *to* be avoided. Systems should not be installed where extensive cut and fill is required. These earth moving practices destroy the natural soil structure which is relied upon for proper system operation. Systems are not to be installed at the base of slopes unless surface water draining toward the system is diverted. Systems must be placed a minimum of 10 feet back from the top edge of the steep slopes (25% or greater). Greater distances may be required if site conditions warrant.

5. Drainage - Sites for soil absorption systems must be well drained. They shall not be located in areas subject to flooding or in the path of a catchment area of surface runoff. Absorption fields are not to be located where parking lot drainage will cross or collect in the field area. Building downspout drains must be directed away from the absorption field area.

6. Filling - The installation of soil absorption systems should be limited to locations where natural *soils* meet the criteria set forth in these criteria. Filling shall not be approved in areas where the seasonal high water table is less than two feet from

the ground surface. Filling shall not be approved for sewage disposal systems where the natural soils do not meet the permeability criteria of these criteria. Care must be taken around the perimeter of fill systems to gradually slope fill to match existing grades. Fill should be carried a minimum of ten feet beyond the edge of stone before beginning slope. The side slopes shall be a minimum of 4 on 1. Fill material used for systems constructed under these criteria shall be clean or washed sand.

7. Deep-Cut Excavations – The removal of upper layers of the soil profile to reach more permeable soil beneath is undesirable because of the potential created for contamination of usable groundwater aquifers. This potential must be completely evaluated prior to the installation of such systems. If there is concern that the sewage system may contaminate existing or future wells, excavations shall not be approved.

   In deep excavations (greater than 6 feet), evaluation of the underlying permeable soil and determination of the seasonal high water table elevation is difficult. This is due to the disruption of the soil by the equipment used in making the cut and the lack of soil mottling at deep depths in some soils. It also is necessary to have sufficient soils data to confirm the extent and continuity of the underlying permeable soil.

   The excavation of upper layers shall not be approved without supporting hydrogeologic data, if the seasonal high water table saturates the underlying material. Prior to approval of such a site, compilation of hydrogeologic data including, but not limited to, water table gradient, direction of groundwater flow, and fluctuation in water table elevation, must be provided to the reviewing agency.

   Proposals for excavation of upper layers shall require 100% removal of the unsuitable material under the system and replacement with clean medium to coarse or washed sand.

C. Design Factors – General

1. General Criteria – Research[5] and experience have shown that the best performance of a soil absorption system is obtained when:

   a. Continuous saturation of the infiltrative surface is avoided.

   b. Aerobic conditions are maintained in the soil.

   C. The entire absorption system is dosed as uniformly and simultaneously as possible.

   d. Compaction and smearing of the infiltrative surface is avoided.

   e. The absorption system provides a large amount of sidewall surface as compared to the bottom surface area.

f. Systems are properly operated and maintained (consult with local health department or Michigan Department of Public Health).

g. For all systems, if site conditions allow, trench systems are preferred. If bed systems are used, they should be constructed maximizing length to width ratio and with the long dimension placed perpendicular to groundwater flow.

2. Location and Isolation - Soil absorption systems must be protected from vehicular traffic, including snowmobiles, trail bikes, etc., or other possible damage. In determining proper locations for absorption systems, the following conditions shall apply:

a. Absorption systems shall not be located within 100 feet of surface water.

b. Absorption systems shall be a minimum of 100 feet (50 feet for systems with a design flow of less than 1,000 gallons per day) from building footing drains or storm drains unless:

1) There is no question that these drains will be above the expected high water table elevation after groundwater mounding is considered; or,

2) Water table elevations indicate there is adequate slope of the groundwater table from these drains toward the absorption system, after groundwater mounding is considered, to eliminate concerns over the possibility of the drains picking up sewage effluent.

However, the absorption system shall never be permitted within 25 feet of building footing drains or storm drains.

The absorption system shall be a minimum of 100 feet (50 feet if the design flow is less than 1,000 gallons per day) from drains designed to lower the groundwater table.

These minimum distances may be increased, if the reviewing agency determines it is necessary after evaluating the site.

Local health departments, engineers, and contractors are cautioned that a footing drain could act as an open conduit to channel sewage effluent around a building to contaminate a nearby well or surface water if these precautions are ignored.

c. **It** is essential that groundwater aquifers which are, or may be, used for domestic water supply be protected from contamination. The following minimum isolation distances for systems and replacement areas shall be adhered to:

1. Type I and IIa wells -- *200* foot minimum

2. Type IIb and III wells -- 75 foot minimum

3. Single family home wells -- 50 foot minimum

Where special circumstances warrant, a'hydrogeological analysis of the site can be required to insure aquifer protection is maintained. Recommendations from such an analysis should be followed. If the hydrogeological analysis of the site indicates installation of a sewage system under these criteria would adversely affect usable water supply aquifers, then approval for construction shall not be given.

d. Absorption systems are not to be located within 10 feet (more when possible) of all property lines and 15 feet, providing there are no footing drains, from building foundations to facilitate maintenance and corrective action should a failure occur. For elevated or mound systems, the base of the fill shall be isolated a minimum of 10 feet from all property lines.

e. Absorption systems are not to be located beneath buildings, under parking lots, roadways, or other similar areas.

f. Absorption systems shall be constructed such that the bottom of the system is one foot above the 10 year floodplain.

g. Construction shall not be allowed within 10 feet of right-of-ways.

h. Applicants proposing projects which may impact wetlands shall be referred to the Michigan Department of Natural Resources for approval prior to issuance of a permit under these criteria.

3. Reserve Area – Sufficient suitable area shall be available and reserved to provide for a minimum of one replacement system without utilization or disruption of the initial installation. Food service establishments require special design (see Appendix F).

4. Depth of Groundwater - To facilitate the maintenance of aerobic conditions in the soil under the absorption system, the bed or field must be located only where a minimum of four feet can be maintained between the bottom of the trench or bed, and the high groundwater elevation or zone of saturation, as may occur during the normally wet periods of the year.

5. Loading – The application rate shall be determined by the U.S.D.A. soil texture and/or soil classification. The most limiting layer shall be used as the design factor. Poor soil structure or stratification of the soil will reduce the permeability.

Absorption systems shall be sized on the basis of the maximum daily sewage flows, according to the following table (food service preparation establishments require special design - see Appendix F):

Soil Texture and Structure	Permeability		Maximum Acceptable Application Rate* Gallons/sq. ft.	
	In./hr.	Min./in.	Trench***	Bed ****
Coarse Sand Medium Sand	6 or more	Less than 10	1.00	0.75
Fine Sand and Loamy Sand	3 - 6	10 - 20	0.75	0.50
Sandy Loam	2 - 3	20 - 30	0.50	
Loam Sandy Clay Loam	1.3 - 2**	30 - 45**	0.25	
Clay Loam Silt Loam	Less than 1.3	Over 45	Underground sewage disposal shall not be approved.	
Clays, Silts, Muck, Peat, Marl				

*Maximum daily flow ÷ application rate = total bottom area required (square feet).

**Loam and sandy clay loam soils with permeabilities less than 2 in./hr. (over 30 minutes per inch) are not acceptable for systems with a maximum daily flow greater than 2,000 gallons per day.

***For the purposes of this table, the maximum width of trenches shall be 36 inches.

****For systems with maximum daily flows less than 2,000 gallons per day, the application rate may be 1.0 gpd/ft^2.

6. Distribution Box – The use of a distribution box is optional. If distribution boxes are utilized, footings for distribution boxes shall extend below the frost line.

7. Aggregate Used Around Distribution Pipe - Pipe lines shall be surrounded with clean or washed graded aggregate. Michigan Department of Transportation's "Specification 6A Stone" has been most commonly used in absorption system installations (see Appendix E). In areas where 6A stone is not available, other suitable clean aggregate from 1/2 to 1-1/2 inch size may be approved. A minimum of six inches of stone below and two inches above the pipe lines shall be provided. Aggregate shall not be mounded around the tile, but shall be continuous and uniform in depth throughout the seepage bed. Prior to backfilling, a layer of straw or other suitable porous material shall be placed above the stone.

a. Depth of Earth Cover – A minimum of 12 inches and a maximum of 24 inches of suitable earth cover shall be placed over the absorption system. Suitable earth cover means a permeable soil that will allow aeration and that will support the growth of grass. The surface must be graded such that water will not pond on the system.

9. Construction Factors – One of the common causes of failure of percolation systems is the damage done by the careless and improper methods used in construction. Among the most serious causes of permanent loss of infiltrative capacity are:

   a. Smearing of sidewall and bottom surfaces during construction.

   b. Compaction of bottom surface by dozer tracks or wheels of heavy equipment.

   c. Poor scheduling of the project which results in excavations being open for extended periods and subject to inclement weather.

   Damage by smearing and compaction is most severe where soil particles are small and soil moisture is high. These problems are most critical with bed-type systems. The criterion must be to keep the infiltrative surface representative of the undisturbed soil. Construction shall not be undertaken when soils are saturated from heavy rains or snow melt, or when soils are frozen unless specific approval is granted by the reviewing agency.

   Care shall also be used during backfill and grading operations to avoid unnecessary compaction of backfill.

   Backfill should be seeded or sodded immediately after completion to reduce erosion and possible system damage.

10. Deep Trenches – Traditionally, a reduction in the area of the drainfield was given if additional stone was provided below the bottom of the pipe. Accordingly, the drainfield area may be reduced by the square footage of sidewall area obtained by deepening the trench and providing additional stone. The maximum the trench may be deepened below the pipe is 18 inches.

D. Design Factors – Gravity Flow Systems

1. Criteria for Approval – Only proposals generating less than 2,000 gallons per day will be considered for utilization of gravity flow systems under these criteria. However, site conditions such as high groundwater table, limiting soil layers, or other factors determined by the reviewing agency may require utilization of a dosed system regardless of the daily flow volume.

2. Spacing and Construction of Pipe Lines - All systems shall be constructed with a non-perforated watertight header pipe. For trench systems, a minimum of 4 feet of undisturbed earth shall be provided between trench walls. For bed systems, a maximum of 6 feet on center may be provided between laterals.

Laterals should be laid as close to level as possible, but not to exceed a grade of 2 inches fall in 100 feet.

3. Pipe Material Specifications - Perforated plastic pipe and fittings shall comply with Michigan Department of Public Health "Standards for Certification and Utilization of Perforated Plastic Tubing for Drainfields".4

E. Design Factors – Dosed Systems

1. Standard Dose Systems

a. Dosing - A dosing tank provides rest periods between periods of flooding in the soil absorption system. The longer the rest period between doses, the better the life expectancy of the system. For larger systems, it is recommended that the field or bed be split and the halves dosed with alternating pumps or siphons. If the volume dosed is kept the same and the liquid capacity of the drainfield correspondingly increased, twice the normal rest period will be provided. A similar advantage can be gained by splitting the system and manually alternating flow to two or more beds or fields on a scheduled basis.

The liquid capacity of the dosing tank must be sufficient to dose the soil absorption field or bed no more than three to four times a day at design flow.

The access inlet to the dose tank shall extend to grade, be of adequate size to allow easy inspection, cleaning, and repair of pumps or siphons and have a secure watertight cover. Where pumping rates exceed 150 gpm, it may be necessary to install a screened vent on the dose tank.

b. Spacing and Construction of Pipe Lines - All systems shall be constructed with a non-perforated watertight header pipe. For trench-type systems, a minimum of 4 feet of undisturbed earth shall be provided between trench walls. For bed systems, a maximum of 6 feet on center may be provided between laterals.

Laterals should be laid as close to level as possible, but not to exceed a grade of 2 inches fall in 100 feet.

c. Pipe Material Specifications (Laterals) - Perforated plastic pipe and fittings shall comply with the Michigan Department of Public Health "Standards for Certification and Utilization of Perforated Tubing for Drainfields."4

d. Pipe Material Specifications (Force Main) - The force main piping connecting the dose chamber to the drainfield shall be constructed from minimum Schedule 40 PVC or SDR 26 plastic pipe.

e. Dosing Devices

1) Pumps - Dosing pumps and accessories shall be designed and installed in accordance with the "Recommended Criteria for Sewage Pumping at Nonmunicipal Installationsrt1as published by the Bureau of Environmental and Occupational Health of the Michigan Department of Public Health. Sewage pumping facilities shall comply with the National Electrical Code. A minimum of a visual alarm shall be provided, but both an audio and visual alarm are strongly recommended.

Pumps should be sized to empty the dosing tank in no more than 20 minutes. Automatic alternating pumps shall be provided in all systems where design flow exceeds 2,000 gallons per day and in locations where continuous reliability is essential.

2) Siphons - Where head conditions and topography permit, automatic siphons are an acceptable method of dosing. Siphons require less maintenance than pumps and, of course, require no electrical energy.

The siphon should be sized to empty the dosing tank in no more than 20 minutes. A slower rate may result in the bed or field being only partially flooded.

For larger systems, a further advantage to the life of the soil absorption system can be gained by providing alternating siphons to alternately discharge to two absorption fields or beds.

Careful consideration must be given to manufacturer s specifications during design and installation of automatic siphons.

2. Pressure Distribution Networks

a. Pressure distribution is a recent modification to the conventional dosed sewage system. Uniform distribution over the bottom area of the drainfield is achieved and provides certain advantages over conventional systems. They are:

1) Formation of the clogging mat is substantially delayed.

2) System provides for unsaturated flow into underlying soil.

3) System design *is* not limited to rectangular configuration.

b. Pressure distribution network technology is recommended whenever these criteria require that a dosed sewage disposal system be provided. The reviewing agency may require that pressure distribution technology be utilized.

c. Pressure distribution networks shall be designed in accordance with the Michigan Department of Public Health publication entitled "Pressure Distribution Networks"[3] (see Appendix G), or the Environmental Protection Agency Design Manual on "On-Site Wastewater Treatment and Disposal Systems

X. Variances

A. It is the intent of this document to provide minimum standards to be used in site evaluation, design, and construction of subsurface sewage disposal systems. However, there may be special circumstances which justify a variance from particular provisions. Such variances may be granted by the reviewing agency having jurisdiction only when all the following are met:

1. Where the requirements contained within the criteria cannot be met.

2. Where other more acceptable alternatives are not available.

3. Where the requested variance will not create the potential for a health hazard, nuisance condition, or the pollution of surface or groundwater, or otherwise violate the purpose of these criteria as stated in Part I.

B. The following procedure shall be followed in granting requests for variances:

1. The local health department shall consult with the appropriate Environmental Health Division staff of the Bureau of Environmental and Occupational Health, Michigan Department of Public Health, prior to granting a variance. A record of that consultation shall be made and maintained in both agency's files. All necessary information describing the physical characteristics of the site, reasons for requesting the variance, justification for granting the variance, and sufficient information to verify the protection of the public health, surface and groundwaters shall be documented.

2. With the exception of facilities requiring construction permits from state agencies, only the director of Environmental Health of the city, county, or district health department, or that director's designated representative, has authority to grant variances.

3. Variances thus granted apply only to the specific project under consideration and do not serve as precedents in other cases.

XI. Appeals

The appeal of any decision made pursuant to these criteria, including proposals of less than 1,000 gallons per day, shall be made to fhe Michigan Water Resources Commission in accordance with Item 8 *of* the policy statement for "New Uses of the Waters of the State for Underground Disposal of Sanitary Sewage" (see Appendix A).

REFERENCES

1. "Recommended Criteria for Sewage Pumping at Nonmunicipal Installations", Division of Environmental Health, Michigan Department of Public Health, *3423* N. Martin L. King, Jr. Boulevard, P.O. Box *30195,* Lansing, Michigan *48909, 1971* (available on request).

2. "Environmental Protection Agency Design Manual on On-Site Wastewater Treatment and Disposal Systems", Office of Water Program, Washington, D.C. *20460.*

3. "Pressure Distribution Networks", Division of Environmental Health, Michigan Department of Public Health, *3423* N. Martin L. King, Jr. Boulevard, P.O. Box *30195,* Lansing, Michigan *48909* (Under revision. Available August *1995).*

4. "Michigan Department of Public Health Standards for Certification and Utilization of Perforated Plastic Tubing for Drainfields", Division of Environmental Health, Michigan Department of Public Health, *3423* N. Martin L. King, Jr. Boulevard, P.O. Box *30195,* Lansing, Michigan *48909* (available on request).

5. "Michigan Department of Public Health Bulletin on Dosing Siphons", Division of Environmental Health, Michigan Department of Public Health, *3423* N. Martin L. King, Jr. Boulevard, P.O. Box *30195,* Lansing, Michigan *48909* (available on request).

OTHER REFERENCES

"Drainage Hydrology of Land Disposal Sites", a paper by Robert C. Minning, Keck Consulting Services, Inc., East Lansing, Michigan, December 1972.

"A Study of Methods of Preventing Failure of Septic-Tank Percolation Systems", U.S. Department of Housing and Urban Development by P. H. McGauhey and J. H. Winneberger, October *1967.* (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. *20402).*

"Soil Manual for Sanitarians", Division of Environmental Health, Michigan Department of Public Health, *3423* N. Martin L. King, Jr. Boulevard, P.O. Box *30195,* Lansing, Michigan *48909.*

"Soil Interpretation Sheets", Soil Conservation Service, U.S.D.A., East Lansing, Michigan.

The "Manual of Septic-Tank Practice", U.S. Department of Health, Education, and Welfare, Public Health Service. (For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. *20201.)*

APPENDIX A

POLICY STATEMENT

of the Water Resources Commission
for New Uses of the Waters of the State for
Underground Disposal of Sanitary Sewage

(THIS POLICY SUPERCEDES SIMILAR POLICIES ADOPTED BY THE WATER RESOURCES COMMISSION AT MEETINGS HELD September 22, 1972, September 22, 1977, April 19, 1979, and June 18, 1981.)

The following policy of the Michigan Water Resources Commission will apply to all new uses of the waters of the State of Michigan for underground disposal of sanitary sewage through the use of subsurface soil absorption systems.

1. Private, single and two-family sanitary waste disposal systems are not considered to be significant uses of the waters of the state and do not require submission of an application for a permit to discharge under the provisions of Section 8(b) of Act 245, Public Acts of 1929, as amended.

2. A person proposing a new or increased use of the waters of the state for waste disposal by the underground discharge of sanitary sewage effluent from any facility other than those cited in Item No. 1 above, in an amount less than 10,000 gallons per day, shall not be required to file an application for, and obtain a state discharge permit from the commission as required by Section 8(b) of Act 245, P.A. 1929, as amended, if the facility is a public system which receives a construction permit under Act 98, P.A. of 1913, or a mobile home park, campground, home for the aged, or hospital which receives a construction permit or construction approval from the Michigan Department of Public Health.

3. A person proposing a new or increased use of the waters of the state for waste disposal by the underground discharge of sanitary sewage effluent from any facility other than those cited in Item No. 1 and No. 2 above, in an amount of 1,000 gallons per day or less, shall not be required to file an application for, and obtain a state discharge permit from the commission as required by Section 8(b) of Act 245, P.A. of 1929, as amended, if the site is approved by the local county, district, or city health department having jurisdiction, in accordance with the requirements of the local sanitary code.

4. A person proposing a new or increased use of the waters of the state for waste disposal by the underground discharge of sanitary sewage effluent from any facility other than those cited in Item No. 1 and No. 2 above, in an amount greater than 1,000 gallons per day and less than 10,000 gallons per day, shall not be required to file an application for, and obtain a state discharge permit from the commission as required by Section 8(b) of Act 245, P.A. of 1929, as amended, if:

a. The disposal system is designed and constructed in accordance with the provisions of the "Michigan Criteria for Subsurface Sewage Disposal", published by the Michigan Department of Public Health and incorporated herein by reference, and the construction plans are approved by the local county, district, or city health department having jurisdiction.

b. The commission, upon recommendation of the Michigan Department of Public Aealth, has determined and certifies that the local health department having jurisdiction has the capability and intention to exercise proper control over the location, design, construction and operation of the treatment and disposal facilities and has so notified the local health department of such determination in writing. Such certification shall be reviewed annually by the commission and may be revoked at any time upon recommendation of the Michigan Department of Public Health.

c. In local health department jurisdiction not certified under 4(b) above, an application for state discharge permits under Act *245* must be filed with the Water Resources Commission for such systems.

5. A person proposing a new or substantially increased use of the waters of the state for waste disposal by the underground discharge of sanitary sewage effluent in an amount of 10,000 gallons per day or more, must file an application for, and obtain a valid permit to discharge, as required by Section 8(b) of Act *245,* P.A. of 1929, as amended.

6. If *a* local health department is refused certification, or has its certification revoked, the department shall be notified in writing *of* the decision and the reasons for the action. Any local health department which has been refused certification, or had its certification revoked, may appeal that decision to the commission, or reapply for certification after corrective action has been taken. All such appeals must be in writing.

7. When a local health department cannot approve a site for waste disposal purposes while administering the program described in No. 3 and No. 4 above, the local health department shall so notify the applicant in writing stating the reasons why the site cannot be approved. A copy of the letter shall be sent to the Water Resources Commission and the Michigan Department of Public Health.

8. If a person is aggrieved by a decision of the local health department having jurisdiction concerning his proposed development, and wishes to appeal the decision, the appeal shall be made by filing an application for a state discharge permit with the Water Resources Commission. Such application shall be accompanied by an explanation of the reasons for appeal, the details of the proposal, and a statement of the relief requested. The provisions of Act *245* and rules promulgated thereunder, regarding processing of discharge permits, shall apply.

Nothing in this policy statement is intended to prevent, or in any way interfere with the adoption and enforcement of local regulations which are more stringent than this statement or the "Michigan Criteria for Subsurface Sewage Disposal" referenced in paragraph No. 4(a) above.

THIS POLICY IS TO TAKE IMMEDIATE EFFECT.

This policy adopted by the Michigan Water Resources Commission this 18th day of August, 1983.

APPENDIX B

Public Health Code (Excerpts)
Act 368, P.A. 1978, as amended by Act 421, 1980

The People of the State of Michigan enact:

Part 127 (Excerpts)
Sewer Systems

Section 12751. As used in sections 12752 to 12758:

(a) "Acceptable alternative greywater system" means a system for the treatment and disposal of wastewater which normally does not receive human body wastes or industrial waste and is approved for use by a local health department.

(b) "Acceptable innovative or alternative waste treatment system" means a decentralized or individual waste system which has been approved for use by a local health department and which is properly operated and maintained *so* as not to cause a health hazard or nuisance. An acceptable innovative or alternative waste treatment system may include, but is not limited to, an organic waste treatment system or compost toilet which operates on the principle of decomposition of heterogeneous organic materials by aerobic and facultatively anaerobic organisms and utilizes and effectively aerobic composting process which produces a stabilized humus. Acceptable innovative or alternative waste treatment system does not include a septic tank-drain field system or any other system which is determined by the department to pose a similar threat to the public health, safety and welfare, and the quality of surface and subsurface waters of this state.

(c) "Available public sanitary sewer system" means a public sanitary sewer system located in a right-of-way, easement, highway, street, or public way which crosses, adjoins, or abuts upon the property and passing not more than 200 feet at the nearest point from a structure in which sanitary sewage originates.

(e) "Public sanitary sewer system" means a sanitary sewer or a combined sanitary and storm sewer used or intended for use by the public for the collection and transportation of sanitary sewage for treatment and disposal.

(f) "Structure in which sanitary sewage originates" or "structure" means a building in which toilet, kitchen, laundry, bathing, or other facilities which generate water-carried sanitary sewage are used or are available for use for household, commercial, industrial, or other purposes.

Section 12753. (I) Structures in which sanitary sewage originates lying within the limits of a city, village, or township shall be connected to an available public sanitary sewer in the city, village, or township if required by the city, village, or township.

(2) Structures in which sanitary sewage originates lying outside the limits of the city, village, or township in which the available public sanitary sewer lies shall be connected to the available public sanitary sewer after the approval of both-the city, village, or township in which the structure and the public sanitary sewer system lies and if required by the city, village, or township in which the sewage originates.

(3) Except as provided in subsection (4), the connection provided for in subsections (1) and (2) shall be completed promptly but not later than 18 months after the date of occurrence of the last of the following events or before the city, village, or township in which the sewage originates requires the connection:

(a) Publication of a notice by the governmental entity which operates the public sanitary sewer system of availability of the public sanitary sewer system in a newspaper of general circulation in the city, village, or township in which the structure is located.

(b) Modification of a structure so as to become a structure in which sanitary sewage originates.

(4) A city, village, or township may enact ordinances, or a county or district board of health may adopt regulations *to* require completion of the connection within a shorter period of time for reasons of public health.

APPENDIX C

Estimates of Sewage Quantities*

Where there are water meters in existing buildings, the quantity of sewage may best be estimated from the recorded meter readings.

In using water meter readings for estimating the quantity of sewage to be contributed, some allowance should also be made for maximum conditions that may not be readily apparent from the readings. For example, water consumption by an ordinary family of four in an apartment building may average *48* gallons of water per person per day over a period of three months, but actually range from perhaps 30 gallons per person on certain days to something in excess of 80 gallons per person on days when water consumption is heaviest, as on wash days. Besides these peak loads, some allowance should be made for the sewage contributed by occasional guests. Therefore, when computing sewage flows from average meter readings, a minimum factor of safety of about 25 percent should be allowed to cover the range of variations. Accordingly, the design of a disposal system for the apartment house referred to, where the average usage is *48* gallons per person per day, should be based upon a computed maximum usage of at least 60 gallons per person per day.

Conversely, unusually high meter readings may be caused by lawn sprinkling or by leakage of water that does not enter the disposal system. Due allowances should be made for abnormalities of this kind.

Where measurements of water consumption are not possible, as where water meter records are not available, or where disposal facilities are being planned for a new building, it is necessary to use other methods of estimating the amount of sewage to be discharged. One way is to base the estimated flow on the number of bedrooms. Another way is to compute the flow on the basis of the number and kinds of plumbing fixtures. If the building is used as a restaurant, the number of patrons or the number of meals served may be the best criterion.

The competent designer will base his estimates upon a combination of the various influencing factors. He will consider each case on its own merits, especially when disposal facilities are being designed for a large institution where the cost of construction will amount to a considerable sum. If definite information and accurate water measurements are not available, the quantity of sewage may be estimated from experiences at establishments similar to that for which the new sewage disposal facilities are intended. Table 1 may be helpful in such cases.

The quantities listed in the table are merely the best averages available at this time, and they should be modified in localities or establishments where experience indicates a need for so doing.

It is sometimes economical and advisable to construct separate disposal systems for different types of wastes at a given establishment. The decision as to the number of disposal systems may be influenced by conditions of terrain, topography, and locations of the buildings contributing to the wastes. At large camps, for example, and at some resorts, kitchens and central dining facilities may be located at appreciable distances from the barracks or cottages and cabins. Under such circumstances, the kitchens may be provided with separate disposal systems, including facilities for the removal of grease ahead of the septic tank.

Separate systems may also be used for community bathhouses. When this is done, the total per capita flow must be broken down into its component parts, and some allowance should be made for the amount of sewage tributary to the different disposal systems. Table 2 illustrates how this may be done where there are no definite data as to the exact distribution of flow.

For certain types of new establishments, the designing consultant may be unable to obtain from his clients accurate estimates as to the number of patrons to be served by the disposal facilities. This is particularly true in the case of restaurants and at recreational places, such a picnic areas, country clubs, and the like. In such cases, computations and estimates may best be made from the number of plumbing fixtures installed. Table 3 indicates average values for quantities of sanitary wastes per fixture at country clubs with modern plumbing.

Estimates of sewage quantities from golf clubs should be checked and calculations based on the weekend population. Allowances of 10 gallons per person for showers and 7 gallons per person for toilet and kitchen wastes, both for the average weekend population, have been found reasonable.

Table 3 shows one method used in estimating the amount of sewage discharged hourly during the hours when public parks are open. Similar figures may be used for fairgrounds, carnivals, ball parks, etc.

*This discussion has been retyped from the "Manual of Septic Tank Practice", published by the U.S. Public Health Service, with some minor modifications. Some flow figures in the tables have been modified to Michigan standards.

Table 1 – Quantities of Sewage Flows

Type of Establishment	Gallons Per Person Per Day (Unless Otherwise Noted)
Airports (per passenger)	2.6
Auto service stations (per vehicle served)	3
Bathhouses and swimming pools.	(See Table 2)
Camps:	
Campgrounds – individual sewer outlets (per site)	100
– served by service building (per site)	75
Construction camps (semi-permanent)	50
Day camps (no meals served)	15
Resort camps – with limited plumbing (per bed space).	50
Luxury camps (per bed space).	100
Church (per auditorium seat)	3
Church (with substantial kitchen wastes, per auditorium sear).	7.5
Country clubs and golf clubs	(See Table 2)
Dwellings:	
Luxury residences and estates	150
Multiple family dwellings (apartments & condominiums) per bedroom	150
Group hones for developmentally disabled (per bed space).	150
Factories (gallons per person, per shift, exclusive of industrial wastes	35
Health clubs	(See Table 3)
Hair styling salons (per chair).	170
Hotels and Motels with kitchens (per bed space).	50
Hotels and Motels without kitchens (per bed space)	*40*
Institutions – other than hospitals (per bed space).	125
Marinas (full service, i.e., service building, pump-out, etc.) per slip.	60
Mobile home parks (per space).	200
Office buildings (per square foot of building space)	1/10 gallon
Picnic parks with bathhouses, showers, and flush toilets	(See Table 3)
Rental Halls with intermittent use:	
(Township Halls, Banquet Halls) per seat	5
Restaurants (toilets and kitchen wastes per patron).	(See Appendix F)
Restaurants (kitchen wastes per meal served)	(See Appendix F)
Restaurants – additional for bars and cocktail lounges	(See Appendix F)
Schools (per student):	
Boarding (per bed space)	75
Day, without gyms, cafeterias, or showers	15
Day, with gyms, cafeterias, and showers	25
Day, with cafeterias, but without gyms or showers	20
Swimming pools	10
Theaters:	
Movie (per auditorium seat)	5

Flow Reduction

Proposals claiming reduced flows, from what would be calculated using Table 1 quantities, must be accompanied with documentation to be considered. Documentation, should consist of actual flows from similar type and size facilities. Flow records for a minimum of 12 months should be provided.

Table 2 - Sewage Flow From Country Clubs and Golf Courses

Type of fixture	Gallons per day per fixture	Type of fixture	Gallons per day per fixture
Showers	500	Toilets	150
Baths	300	Urinals	100
Lavatories.	100	Sinks	50

Table 3 - Sewage Flow at Public Parks (During hours when park is open)

Type of fixture	Gallons per hour per fixture	Type of fixture	Gallons per hour per fixture
Flush toilets . . .	36	Showers	100
Urinals	10	Faucets	15

APPENDIX **D**

Procedures for Percolation Tests

1. The portion of the soil profile to be tested should be the six to eight inches immediately below the bottom of the proposed drainfield installation. The percolation holes should be about eight inches deeper than the drainfield. If trenches will cut through less permeable soils to more permeable substratum, the percolation test should be made in the substratum. Likewise, if less permeable substratum will be relied upon for absorption of the effluent, the percolation rate should be determined in the less permeable soil.

2. The rate of drop must only be measured in the lower eight inches *of* a test hole.

3. The soil should be tested in a well-saturated condition to reflect the condition that will exist when the effluent from the septic tank is constantly applied to the soil. The time it takes to reach a stabilized rate will vary considerably, depending on the swelling characteristics of the soil and the moisture conditions prior to conducting the test. Soils such as sand or gravel having percolation rates less than five minutes per inch usually are not easily saturated if such soils are present throughout the area to significant depths, Soils with **a** clay content should be presoaked at least twenty-four hours prior to the time the test is conducted. It may still take several hours of measuring the rate *of* drop before a stabilized rate is observed.

4. Sufficient tests shall be made in separate test holes spaced uniformly over the proposed site to establish representative stabilized rates. The safest method is to run at least six or more tests in any one soil type for a period of four hours after saturated conditions have been obtained. The stabilized rates for the six or more test holes are averaged for a rate which should compare favorably with the permeability of the various soils as indicated on the engineering soils interpretation sheets developed by the Soil Conservation Service.

5. The percolation test hole should be eight to twelve inches in diameter with vertical sides.

6. Carefully scratch the bottom and sides of the hole with a knife blade or sharp pointed instrument in order to remove any smeared soil surfaces and to provide a natural soil interface into which the water may percolate. Remove all loose material from the hole and add two inches of coarse sand or fine gravel to protect the bottom from scouring and plugging by sediment.

7. Saturate the soil in accordance with procedures described above, carefully filling the hole with clear water to a minimum depth of twenty-four inches over the gravel. If necessary, refill the hole by supplying a surplus reservoir of water, possibly by means of a siphon, to keep water in the hole for the desired period of time.

8. With the exception of sandy soils or gravel, the percolation rate measurements should be made on the day following the procedure described under item 7 above.

9. To make the measurement:

   a. Adjust the depth of water in the test hole to approximately eight inches over the gravel. From a fixed reference point, measure the drop in water level over a thirty minute period. This drop is used to calculate the percolation rate. Measure the drop at thirty-minute intervals for four hours, refilling eight inches over the gravel as necessary. If the percolation rates have stabilized, the drop that occurs during the final thirty-minute period in each test hole is used when calculating the rate for that particular soil type in the test area. The drops during the prior periods are used to determine if the rates have stabilized. A plot of time versus percolation will show when stabilization occurs, since at that time the curve will become horizontal.

   b. In sandy soils where the water seeps away in less than thirty minutes, the time interval between measurements should be ten minutes with the tests run for at least one hour. The drop that occurs during the final ten minutes is used to calculate the percolation rates by the average of all of the test holes. The percolation test results should then be compared with the estimated permeabilities in the soils classification interpretation sheets.

Important information required for proper analysis of suitability of soils for subsurface sewage disposal can be obtained from the following references:

1. Environmental Protection Agency Design Manual, On-Site Wastewater Treatment and Disposal Systems.

2. Soils and Septic Tanks, Soil Conservation Service Bulletin *349* .

3. Soil Manual for Sanitarians, Soil Conservation Service, East Lansing, Michigan

4. Soil Interpretation Sheets, Soil Conservation Service, East Lansing, Michigan

APPENDIX E

Michigan Department of Transportation
Excerpt from Grading Requirements for Coarse Aggregate

Class	Material	Total Percent Passing (Square Sieve Opening-U.S. Standard Sieve) 1-1/2"	1"	1/2"	No. *4*	Loss by Washing
6A	Gravel Stone Slag	100	95-100	30-60	0-8	0.8 max.

APPENDIX F

Food Service Design Criteria

Review and evaluation of sewage systems serving restaurants has determined that utilization of septic tank tile-field systems at restaurants requires a much more conservative approach to site evaluation, design, and construction, if success is to be achieved. As a result of our investigations, we have come to the following conclusions concerning these installations:

1. Soils suitability for installation of an on-site sewage disposal system serving a food service establishment is much more critical.

   In normal situations soil textures such as fine sand, Loam, and sandy clay loam, are acceptable for utilization of on-site sewage systems under these criteria. However, for food service establishment, experience shows that only coarse sand, medium sand, loamy sand, and sandy loan are the types of soil which should be utilized, if success is to be achieved.

2. The maximum acceptable application rate for design of sewage systems serving food service establishments is critical, if success is to be achieved. Where as in normal situations, application rates as high as 1.0 gallons per square *foot* per day are allowable, experience dictate application rates of .25 gallons per square foot per day are warranted when designing systems for food service establishments.

3. Experience has shown that even with additional precautions, design and construction system failure is more frequent when sewage systems serve food service establishments. Accordingly, provisions to provide more reserve area is warranted when new food service establishments are proposed.

In view of the aforementioned comments, sewage systems serving restaurants shall follow the following design criteria:

1. The application rate used to design the sewage system shall conform to the following table:

Soil Texture and Structure	Permeability		Maximum Acceptable Application Rate GPD/ft^2	
	In/Hr	Min/Inch	Trench	Bed
Coarse Sand Medium Sand	6 or More	Less Than 10	.5	.5
Loamy Sand	3-6	10-20	.33	Not Acceptab1e
Sandy Loam	2-6	10-30	.25	Not Acceptable

3. Design flows for restaurants shall be calculated using the following formula:

Design Flow = No. seats x No. seat turnovers x gallons per seat.

Gallons Per Seat = 5-10 gallons, based on the type of facility (fast food versus full-service restaurant), type of equipment (paper service, versus dishes) and hours of operation.

Seat Turnover = A number based on the estimate of the type of business after discussion with restaurant owner and design consultant, consideration of restaurant location, and consideration of type of business.

Example 1: A full-service restaurant, located near a large retail mall, with 9 seat turnovers per day and 100 seats.

100 seats x 9 seat turnovers **x** 10 gallon/seat = 9,000 gallons

Example 2: A fast food restaurant with 100 seats and 5 seat turnovers each day.

100 seats x 5 seat turnovers **x** 5 gpd = 2,500 gallons per day

4. Trench systems are preferred over bed systems.

5. Septic tanks shall be designed to provide a minimum of 72 hours retention. Either multiple tanks or a multiple compartmeat tank shall be used. The first tank or compartment shall have a minimum capacity of approximately 2/3 the total volume. Alternatively, separate plumbing with a grease interception device for kitchen waste may be installed and septic tank capacity reduced to *24* hour retention time for a total wastewater flow. Grease interception devices shall be designed in accordance with the Environmental Protection Agency design manual on on-site sewage treatment and disposal.

Example *1:* A full service restaurant generating a daily flow of 9,000 gallons per day without installation of a grease trap.

An *18,000* gallon septic tank followed by a *9,000* gallon septic tank.

Example 2: A full service restaurant generating a daily flow of 9,000 gallons per day with a grease interception device installed on the kitchen waste line.

A 6,000 gallon septic tank followed by a *3,000* gallon septic tank with a *14,000* gallon grease interception device installed on the kitchen waste line. Grease interception device calculated as per formula on page *323* of Environmental Protection Agency "Design Manual on On-Site Wastewater Treatment and Disposal Systems".

APPENDIX *G*

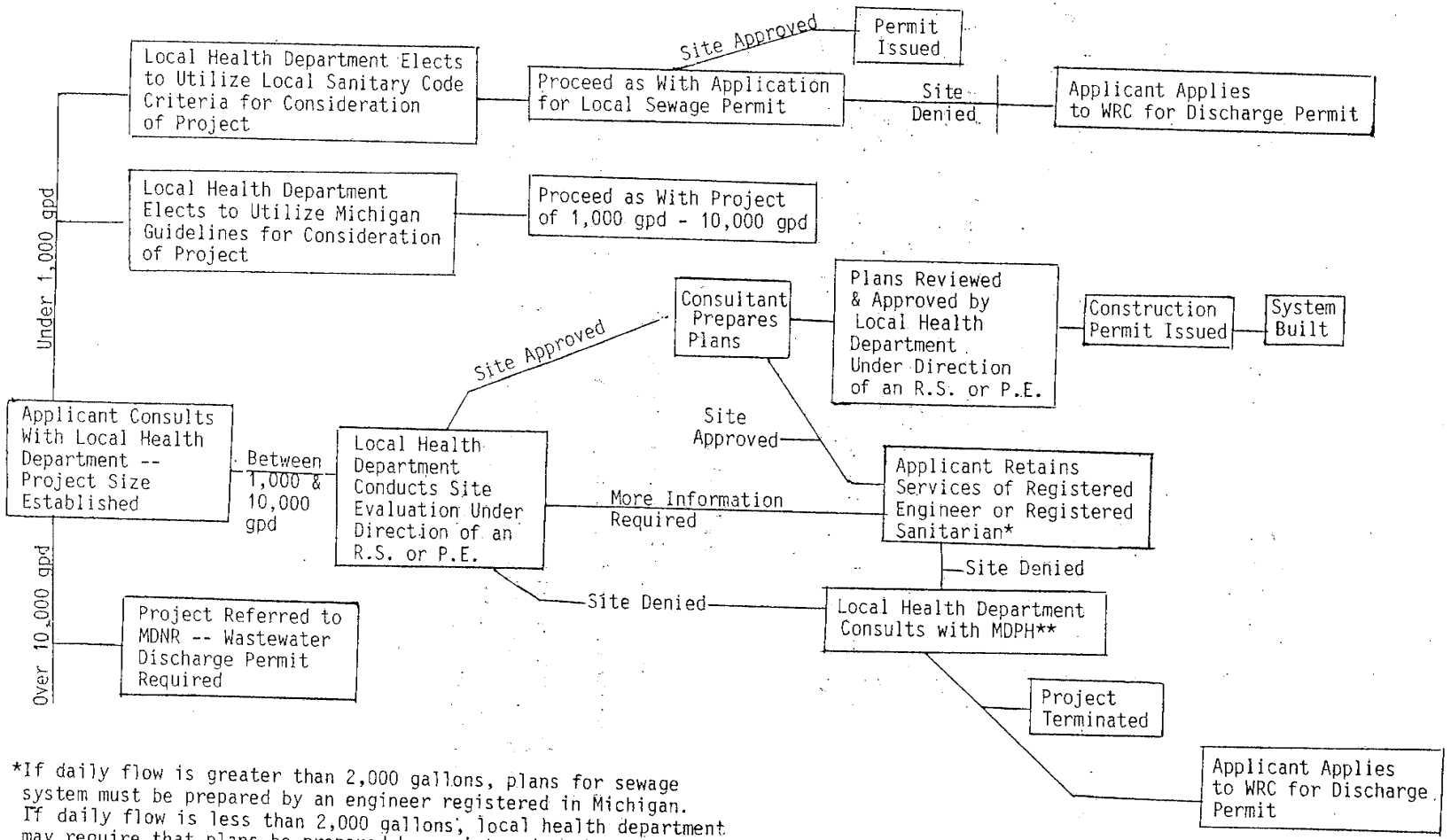
Pressure Distribution Networks

Pressure Distribution Network Design Manuals are available from:

Michigan Department of Public Health
Bureau of Environmental and Occupational Health
3423 North Logan - P.O. Box *30195*
Lansing, Michigan *48909*

APPENDIX H

FLOW CHART



*If daily flow is greater than 2,000 gallons, plans for sewage system must be prepared by an engineer registered in Michigan. If daily flow is less than 2,000 gallons, local health department may require that plans be prepared by registered engineer or registered sanitarian.

**Local Health Department may consult with Michigan Department of Public Health at any time in process.

APPENDIX I

The following individuals participated in the committee meetings which resulted in these criteria:

John Bohunsky – MichiganDepartment of Natural Resources
Oscar Royea – Oakland County Realth Department
Barry Burns – Livingston County Health Department
Jon Caterino – Michigan Department of Public Health
Jim Draze – Luce-Mackinac-Alger-Schoolcraft District Health Department
Dave Kraker - Kent County Health Department
John Long – Michigan Department of Public Health
Larry Losinski – District Health Department *#4*
Scott Ross – Michigan Department of Natural Resources
Dick Silver – District Health Department *#4*
Larry Stephens – Michigan Department of Public Health
Don Veeser – Michigan Department of Public Health, U.P. Office
Mark Weber – Michigan Department of Public Health, U.P. Office
Noel Wiley – Branch-Hillsdale-St. Joseph District Health Department

It is the recommendation of the committee that these criteria be periodically reevaluated. Reviewing agencies are encouraged to keep accurate records of installations approved or denied under these criteria to facilitate this reevaluation.

APPENDIX J

Summary of Minimum Site Suitability Criteria

Evaluation Required – Borings or excavations *4* feet below proposed field (6 feet minimum depth)

Soil Permeability
- Under 2,000 gpd, minimum less than *45* min/inch
- Over 2,000 gpd, minimum less than 30 min/inch

NOTE: Fill shall not be approved where the natural soils do not meet the permeability criteria

Depth to groundwater
- 4 Feet minimum below proposed absorption field
- 2 feet minimum of natural permeable soil before fill allowed

Location
- Floodplains unacceptable
- Protected from vehicular traffic

NOTE: Drainfields are not to be 'located under buildings, parking lots, or roadways

Depth to Impervious Barriers – *4* feet minimum below proposed absorption field

Slopes – Relatively level area needed (slopes $\geq$ 12% unacceptable)

Reserve Area – Full-size area required for replacement system

Drainage – Must be well drained

Isolation Distances –

Slopes	10' set back for slopes greater than 25%
Property Lines	Not less than 10 feet
Surface Bodies of Water.	Not less than 100 feet
Storm Drains and Building Foundations with Footing Drains	Not less than 100 feet (if design flow less than 1,000 gallons per day, not less than 50 feet)
Building Foundations without Footing Drains	Not less than 15 feet

NOTE: A minimum of 25 feet isolation is allowed when there is no possibility of drains picking up sewage effluent.

NOTES

1. Detailed construction plans, prepared by a registered professional engineer, are required unless waived at the discretion of the reviewing agency.

2. A reviewing agency, at its own discretion, may require that a hydrogeological study be performed by a qualified groundwater hpdrogeologist or consulting engineer to determine if a proposed system will fulfill the purposes of these criteria.

3. When a site cannot be approved for subsurface sewage disposal under these criteria, the applicant can appeal in the form of an application to the Water Resources Commission for a discharge permit.