First Reading
April 12, 1990
Item #14

Second Reading
April 26, 1990
Item #9

DGV:dw

ORDINANCE NO. 9352

ORDINANCE ADOPTING RULES OF THE CITY OF LUBBOCK, TEXAS FOR PRIVATE SEWAGE FACILITIES

WHEREAS, the Texas Department of Health and the Texas Board of Health have established construction standards for private sewage facilities to provide the citizens of this State with adequate public health protection and a minimum of environmental pollution; and

WHEREAS, the Legislature has enacted legislation, codified as Article 4477-7e of Vernon's Texas Civil Statutes Annotated, which authorizes a local government to regulate the use of on-site sewage disposal facilities in its jurisdiction in order to abate or prevent pollution, or injury to public health arising out of the use of private sewage facilities; and

WHEREAS, pursuant to Section 26.022 of Vernon's Texas Water Code Annotated and Article 6252-17 of Vernon's Texas Revised Civil Statutes Annotated, due notice was given of a meeting and public hearing to determine whether the City Council of the City of Lubbock should enact an ordinance controlling or prohibiting the installation or use of private sewage facilities in the City of Lubbock, Texas; and

WHEREAS, said meeting and public hearing were held in accordance with the notice thereof, and the evidence and arguments there presented were considered by the City Council of the City of Lubbock, Texas; and

WHEREAS, the City Council of the City of Lubbock, Texas, finds that the use of private sewage facilities in the City of Lubbock, Texas, is causing or may cause pollution, and is injuring or may injure the public health; and

WHEREAS, the City Council of the City of Lubbock, Texas, has considered the matter and deems it appropriate to enact an Ordinance adopting Rules regulating on-site private sewage facilities to abate or prevent pollution, or injury to public health in the City of Lubbock, Texas; NOW THEREFORE:

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LUBBOCK:

SECTION 1. THAT the matters and facts recited in the preamble hereof are hereby found and determined to be true and correct.

SECTION 2. THAT the use of private sewage facilities in the City of Lubbock, Texas, is causing or may cause pollution or is injuring or may injure the public health.

SECTION 3. THAT Chapter 12 of the Code of Ordinances of the City of Lubbock BE amended by adding thereto a new Article X, entitled "Private Sewage Disposal," which shall read as follows:

ARTICLE X. PRIVATE SEWAGE DISPOSAL

Sec. 12-255. Private Sewage System Rules.

Where a public sanitary sewer is not available, the building sewer shall be connected to a private sewage disposal system complying with the rules adopted in this Chapter.

Sec. 12-256. Private Sewage System Rules Adopted.

The Rules attached hereto, promulgated by the Texas Department of Health, for private sewage systems are hereby adopted and all officials and employees of the City of Lubbock having duties under said Rules are authorized to perform such duties as are required of them under said Rules. Wherever in said rules the word "County" is used, it shall be construed to mean "City" and wherever in such rules the words "County Commissioners" or other county official are used, they shall be construed to mean "City Council" or the equivalent City official. The Rules attached and appended hereto are incorporated herein as though fully set forth in writing in this Ordinance.

Sec. 12-257. Appeal; Special Hearing Examiner.

Appeals by persons aggrieved by an action or decision of the licensing authority may appeal such action or decision in accordance with Optional Substitute Rule Section 3.02 to a Special Hearing Examiner. The Public Health Administrator of the City of Lubbock is hereby designated Special Hearing Examiner.

Sec. 12-258. Area of Jurisdiction.

The Rules adopted by this Ordinance shall apply to all of the area of the City of Lubbock, within the extraterritorial jurisdiction of the City of Lubbock and elsewhere as provided by Sections 217.042 and 401.002 of Vernon's Local Government Code Annotated.

Sec. 12-259. Penalties.

In addition to such penalties as may be provided by state law, violation of any provision of this division shall be deemed a misdemeanor punishable in the Municipal Court of the City of Lubbock by a fine of not more than the maximum amount for the same offense provided by state law. Each day of a continuing violation is a separate offense.

Sec. 12-260. Same-Toilet facilities; construction jobs; community gatherings.

(A) General Provisions:

Regulation 1. Definitions.

Chemical toilet means a toilet structure equipped with a watertight, impervious container which receives waste discharged

through a hopper, seat, urinal or similar device and into which container may be placed disinfecting or deodorizing chemicals.

Off-site toilet means a water-flushed or chemical toilet located on ground not specified in a building permit which is within two hundred (200) feet of the construction job site.

Water flush toilet means a toilet meeting the requirements of the Lubbock plumbing ordinance for material and workmanship installed for the period of construction or assembly and connected with the city sewer or an approved septic tank.

Regulation 2. Toilet locations. No person shall initiate or proceed with a construction, erection, alteration, repair or razing project without first having provided an adequate number of suitable sanitary toilet facilities for the use of employees on the project, if such project has three (3) or more employees on the job at any time. Such toilet facilities shall be of the water-flushed or chemical type, located on or within two hundred (200) feet of the site of the project and approved by the health officer.

Regulation 3. Toilets at all public gatherings. At any public gathering for any commercial, religious or public event where adequate toilet facilities are not provided on the immediate premises, suitable approved sanitary toilet facilities of the water flushed or chemical type, adequate for the estimated attendance, shall be located within two hundred (200) feet of such gathering.

Regulation 4. Number of toilets. One toilet for each fifty persons present (segregated according to gender) shall be provided.

(B) Standards and Requirements:

Regulation 1. Off-site facilities. The use of off-site toilet facilities is permitted providing the holder of the building permit has secured written permission for such use from the owner of the toilets and providing further that employees on the project are permitted free and reasonable use of the facilities during working hours.

Regulation 2. Location and condition. No chemical toilet shall be installed within twenty (20) feet of occupied premises nor within ten (10) feet of a public thoroughfare or sidewalk, unless authorized by the health officer. Toilet facilities shall be of sanitary construction and maintained in a clean and sanitary condition by their owner. Toilet paper shall be available at all times.

Regulation 3. Construction and specifications.

(a) Toilet structures shall be enclosed on four (4) sides and top, excepting for ventilation openings which shall be covered with sixteen (16) gauge or finer screens to exclude insects, and shall be fitted with a self-closing door equipped with a durable latch. Toilet rooms shall be well lighted and ventilated.

(b) The floors of water-flushed type toilets may be of earth, but the floors of chemical toilets shall be of smooth finished, nonabsorbent material. Seats, walls and ceilings shall be of smooth, easily cleanable, light colored finish.

(c) In chemical toilets, seats shall be so installed as to insure that wastes drop unimpeded into a receiving tank. The receiving tank shall be of impervious, corrosion-resistant material with an easily accessible opening for cleaning. The thickness of the tank material shall be not less than twelve (12) gauge. The tank and bowl shall be ventilated by means of a screened pipe at least four (4) inches in diameter, which shall extend to outside air.

(d) The receiving tank shall be charged with an adequate quantity of a chemical having a high phenol coefficient, properly diluted with water, capable of reducing and liquefying wastes and preventing offensive odors. The chemical shall be renewed or the contents of the tank properly removed.

Regulation 4. Identification. Every chemical toilet structure shall have painted thereon in clear letters the name and telephone number of the owners.

(C) Penalty:

Any person found to be violating any provision of this section shall be served by the health officer with written notice stating the nature of the violation and providing a reasonable time limit for the satisfactory correction thereof. Any person failing to correct such violation within the time specified in the written notice, or within such extended period of time as may be granted by the health officer, shall be deemed to be maintaining a public nuisance, and shall be guilty of a misdemeanor punishable by fine not exceeding one thousand dollars ($1,000.00).

(D) Appeal:

The right of appeal provided for in section 12-257 of this Article shall apply also to this section.

(E) Construction of Provisions:

The provisions of this section shall be liberally administered and construed by the health officer or his authorized representative to secure substantial compliance with public health needs. (Ord. No. 3147, §1,5-26-60; Code 1959, §34-95.2)

Sec. 12-261. Procedure when public sewers made available.

At such time as a public sewer becomes available to property served by a private sewage disposal system, as provided in Section 28-73 of this Code, a direct connection shall be made to the public sewer in compliance with this article, and any septic tanks, cesspools and

similar private sewage disposal facilities shall be abandoned and filled with suitable material.

SECTION 4. THAT the City Secretary of the City of Lubbock, within five (5) days of the final passage of this Ordinance, shall make a certified copy of this Ordinance and the attached Rules and submit both to the Texas Department of Health for their written approval thereof, as required by Section 5 of Article 4477-7e of Vernon's Texas Civil Statutes Annotated.

SECTION 5. THAT violation of this Ordinance shall be a misdemeanor punishable by a fine not to exceed One Thousand Dollars ($1,000.00) as provided by Section 1-4 of the Code of Ordinances of the City of Lubbock, Texas.

SECTION 6. THAT the Rules attached hereto are incorporated herein as though fully set forth in writing in this Ordinance.

SECTION 7. THAT the City Secretary of the City of Lubbock BE and is hereby authorized and directed to publish this Ordinance and these Rules in a newspaper of general circulation published in the City of Lubbock, Texas, after the same are approved by the Texas Department of Health.

SECTION 8. THAT should any paragraph, sentence, clause, phrase or word of this Ordinance be declared unconstitutional or invalid for any reason, the remainder of this Ordinance shall not be affected thereby.

AND IT IS SO ORDERED.

Passed by the City Council on first reading this 12th day of April, 1990.

Passed by the City Council on second reading this 26th day of April, 1990.

B. C. McMINN, MAYOR

ATTEST:

Ranette Boyd, City Secretary

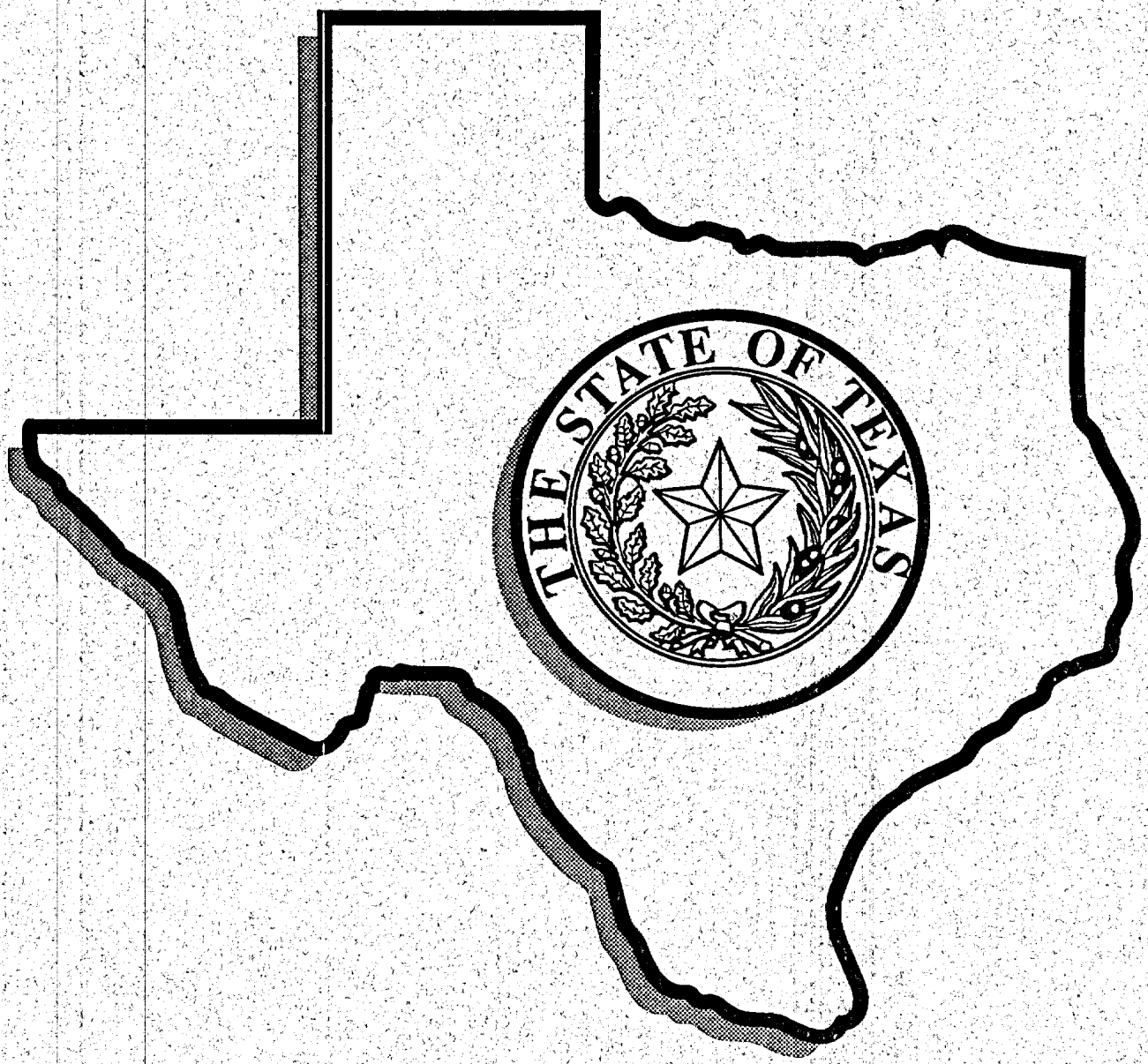
APPROVED AS TO CONTENT:

Doug Goodman, Public Health Administrator

APPROVED AS TO FORM:

Donald G. Vandiver, First Assistant City Attorney

CONSTRUCTION STANDARDS FOR ON-SITE SEWERAGE FACILITIES



Texas Department of Health
Adopted November 5, 1989
Effective January 1, 1990

CONSTRUCTION STANDARDS FOR ON-SITE SEWERAGE FACILITIES

Texas Department of Health

Division of Water Hygiene
1100 West 49th Street
Austin, Texas 78756-3192
Tele. (512) 458-7293

Adopted November 5, 1989
Effective January 1, 1990

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Sec. 301.11. General Procedures and Information

(a) Purpose. It is the policy of the Texas Department of Health that individual on-site sewerage facilities shall be designed, constructed, and operated to provide adequate sewage treatment and disposal that will not contaminate potable water supplies or threaten the health and welfare of the public. Therefore, the primary purpose of these standards is to establish minimally-acceptable standards for constructing on-site sewerage facilities. These construction standards will cover the aspects of on-site sewerage systems for use by individual homes, small business establishments, recreational areas, institutions, and other activities that conform to these sections and do not have access to a central collection system. On-site surface irrigation of treated wastewater is allowed in accordance with department policy. The various types of treatment processes covered by these standards do not have any open point discharges to the surface of the ground. Any process which proposes open point discharge should be designed in accordance with the requirements of the Texas Water Commission in 31 Texas Administrative Code, Chapter 317 (relating to the Design Criteria for Sewerage Systems) and must be operated under a waste discharge permit issued by the Texas Water Commission. For single or collective daily flows over 5,000 gallons per day that are proposed for on-site disposal, the determination of the necessity for a waste discharge permit must be obtained from the Texas Water Commission.

(b) Definitions. The following words and terms, when used in these sections, shall have the following meanings, unless the context clearly indicates otherwise.

(1) Aerobic digestion - The bacterial decomposition and stabilization of sewage in the presence of free oxygen.

(2) Alternate System - An on-site sewage disposal system utilizing evapotranspiration beds, pressure dosing, a mound, gravelless drainfield piping, composting toilets, sewage recycling, or items approved through departmental policy.

(3) Anaerobic digestion - The bacterial decomposition and stabilization of sewage in the absence of free oxygen.

(4) Bedrock - A continuous horizontal layer of hardened mineral deposits that does not support growth of common plant life.

(5) Blackwater - All sewage other than greywater that contains sufficient human or animal wastes to require the water to be treated prior to disposal to the earth's subsurface.

(6) Bore hole - A drilled hole four feet or greater in depth and one to three feet in diameter (See Section 301.16 of this title (relating to Unsatisfactory On-Site Disposal Systems)).

(7) Caliche - A white or pale yellow deposit of carbonate and/or sulfates of varying hardness that exists in the soil profile.

(8) Cesspool - A non-watertight, covered receptacle intended for the receipt and partial treatment of domestic sewage. This device is constructed such that its sidewalls and bottom are open jointed to allow the gradual discharge of liquids while retaining the solids for anaerobic decomposition. (See Section 301.16 of this title (relating to Unsatisfactory On-Site Disposal Systems)).

(9) Chemical - A liquid or powdered waste that in sufficient quantity could have a biotoxic effect on on-site sewerage facilities.

(10) Chemical toilet - A portable toilet using chemicals to mask odors, discourage insect breeding and provide partial disinfection.

(11) Collective system - An on-site sewage collection, treatment and disposal system designed to serve two or more sewage-generating units where the total combined flow from all units does not exceed 5,000 gallons per day.

(12) Commission - Texas Water Commission.

(13) Composting toilet - A self-contained disposal facility designed to decompose non-waterborne human wastes through bacterial action facilitated by aeration.

(14) Department - Texas Department of Health.

(15) Evapotranspiration system - A subsurface sewage disposal system which relies on soil capillarity and plant uptake to dispose of treated effluent through surface evaporation and plant transpiration.

(16) Figure - Any reference in these sections to a Figure # is a reference to a figure shown in Section 301.17 of this title (relating to Tables and Figures).

(17) Geotextile filter fabric - A non-woven fabric suitable for wastewater applications. The fabric filament bonding must be waterproof in accordance with the physical description in Section 301.13(c)(7)(B) of this title (relating to Design Standards for Effluent Disposal Systems).

(18) Gravelless drainfield pipe - A generically labeled large diameter (usually eight or 10 inches) geotextile fabric-wrapped piping product which is intended for use without gravel in a subsurface sewage disposal system.

(19) Greywater - Wastewater from clothes washing machines, showers, bathtubs, handwashing lavatories, and sinks that are not used for food preparation or disposal of chemical and biological ingredients.

(20) Holding tank - A watertight container equipped with a high-level alarm used to receive and store sewage in an anaerobic environment pending its delivery to, and treatment at, an approved treatment facility. This type of facility is generally intended for interim use, if and when approved by the local permitting authority.

(21) Individual - A person, group of persons, corporation, or entity permitted to own, or use real estate.

(22) Injection well - A hole drilled into permeable soil which is intended to receive either raw sewage or the effluent from some form of treatment process (See Section 301.16 of this title (relating to Unsatisfactory On-Site Disposal Systems)).

(23) Innovative design - Detailed drawings and specifications describing the construction of on-site sewerage facilities that utilize materials and concepts not entirely included in these standards.

(24) Licensing authority - The governmental entity having legal authority over construction, operation, enforcement and maintenance of on-site sewerage disposal systems.

(25) Mobile home park - Any facility or area developed for lease or rental of space for the placement of two or more mobile homes.

(26) Mound system - A soil absorption system which is installed in or below an artificially created mound of earth.

(27) Natural soil - Earthen materials deposited into place by natural processes and not disturbed by artificial processes.

(28) On-site aerobic treatment unit - A watertight covered receptacle designed to receive, store, and provide treatment to domestic sewage received through a building sewer. Its function is to separate solids from the liquid, promote the aerobic digestion of organic matter through the use of a forced air supply, store, and aerobically digest settleable solids, and allow the clarified liquid to be disposed of in an approved manner as stated in

Section 301.13 of this title (relating to Design Standards for Effluent Disposal Systems) and Section 301.14 of this title (relating to Disposal Alternatives/Special Applications).

(29) On-site sewerage facilities - Septic tanks, pit privies, cesspools, sewage holding tanks, injection wells used to dispose of sewage, chemical toilets, treatment tanks, and all other facilities, systems, and methods used for the disposal of sewage other than the disposal systems operated under a permit issued by the Texas Water Commission.

(30) Owner - Holder of the warranty deed and/or the responsible occupant of the property served by an on-site sewerage disposal facility.

(31) Pit privy - A vented vault intended to store human wastes and allow its decomposition through natural processes. In this type of treatment, no external water source is provided and there is no direct discharge to the surface. It is recommended for use only in primitive and remote areas.

(32) Platted - Recorded with the county in an official plat record.

(33) Portable toilet - A small portable enclosure with a built-in toilet seat and a raw sewage holding tank. It is primarily intended for use at construction sites and other areas where temporary restroom facilities are required. Domestic sewage collected in these facilities is generally retained in an anaerobic state pending delivery to, and treatment at, an approved treatment facility.

(34) Pressure dosing - The use of some form of pumping device and a network of small diameter piping to distribute treated effluent within a subsurface sewage disposal area.

(35) Sanitary control easement - A document securing all land, within 150 feet of a public or private potable water well location, from pollution hazards that include, but are not limited to, solid and liquid waste disposal sites, animal pens, improperly sealed or abandoned wells, major sewage pumping and treatment plants, and drainage ditches which contain industrial waste discharges.

(36) Scum - A mass of organic and/or inorganic matter which floats on the surface of sewage.

(37) Seepage pit - An unlined covered excavation in the ground which is designed to operate in essentially the same manner as a cesspool (See Section 301.16(c) of this title (relating to Unsatisfactory On-Site Disposal Systems)).

(38) Septic tank - A watertight covered receptacle designed to receive, store, and provide treatment to domestic sewage received from a building sewer. Its function is to separate solids from the liquid, digest organic matter under anaerobic conditions, store the digested solids through a period of detention, and allow the clarified liquid to be disposed of in an approved subsurface disposal system.

(39) Sewage - Water which contains, or which has been in contact with, organic and inorganic contaminants such as human or animal wastes, vegetable matter, cooking fats and greases, laundry and dishwashing detergents, and other chemical compounds and waste products.

(40) Sewage disposal plan - A thorough, technical report prepared by a registered professional engineer or registered professional sanitarian, either having demonstrated expertise in sewage disposal planning. The plan describes the circumstances involved with sewage disposal on a land tract that has been or is proposed to be, subdivided into lots of less than 10 acres.

(41) Single family dwelling - A habitable structure constructed on, or brought to its site, and occupied by members of one family.

(42) Sludge - A semi-liquid mass of partially decomposed organic and inorganic matter which settles at or near the bottom of a receptacle containing sewage.

(43) Soil - The unconsolidated mineral material on the surface of the earth that serves as a natural medium for the growth of plants.

(44) Soil absorption system - A subsurface sewage disposal system which relies on the soil's ability to absorb moisture and allow its dispersal by lateral and vertical movement through and between individual soil particles.

(45) Split system - A wastewater disposal system that treats and disposes of blackwater and greywater separately.

(46) Subsurface sewage disposal system - A network of perforated piping installed below ground level which is used to distribute pretreated sewage effluent over a given disposal area.

(47) Table - Any reference in these sections to a Table # is a reference to a table shown in Section 301.17 of this title (relating to Figures and Tables).

(48) Ultra low-flow toilets - Toilets that use 1-1/2 gallons or less per flush.

(49) Uniform gravel size - A gravel to be used in conventional absorption trench or bed installations that has been processed through shaker screens to produce a size passing one size screen and retained on another which is no more then 5/8" smaller than the first screen. (Example: passing 1" screen openings but retained on 1/2" screen openings)

(c) General environmental requirements.

(1) Background. These construction standards are being adopted under authority of the Health and Safety Code, Chapter 341 (Texas Civil Statutes, Article 4477-1). The on-site sewerage disposal system was originally developed to serve rural residences. For this purpose, the properly installed septic tank performed well and permitted the remote rural resident to utilize the convenience of indoor plumbing. During the past thirty years, the population distribution in the United States has shifted from rural to urban, thus creating rapid development in and on the fringes of urban areas. Many residential subdivisions have been located beyond the limits of organized water and sewerage facilities causing the residents to rely on individual resources available within the boundaries of small lots or tracts of land. On-site sewerage systems have been used frequently as the means of liquid waste disposal. Unfortunately, in many cases, subdivisions were located in areas with soil conditions unsuitable for conventional systems. Quite often, lot sizes are no larger than those found in subdivisions serviced by central water and sewerage systems. Residential areas with small lots served by individual systems, on many occasions, are subject to undesirable conditions such as widespread saturation of the soil, malfunction of the treatment unit, sewage on the surface of the ground and in roadside ditches and strained relationships between neighbors. The standards presented herein are based on the cumulative observations and experiences of the past and are intended to provide the citizens of this State with adequate public health protection and a minimum of environmental pollution.

(2) Facility owner's responsibilities. A properly designed on-site sewerage facility, properly constructed in a suitable soil, can malfunction if the amount of water it is required to dispose of is not controlled. It will be the responsibility of the owner to maintain and operate the facility in a satisfactory manner. The proper performance of an on-site sewerage facility cannot be guaranteed even though all provisions of these Standards have been met. Inspection and licensing of an on-site sewerage facility by the licensing authority shall indicate only that the facility meets minimum requirements and does not relieve the owner of the property from complying with County, State and

Federal regulations. On-site sewerage facilities, although approved as meeting minimum standards, must be upgraded by the owner, at the owner's expense, if the owner's operation of the facility results in objectionable odors, if unsanitary conditions are created, if pollution or nuisance conditions are threatened or occur, or if the facility when used does not comply with governmental regulations.

(3) **Locational and environmental standards.** The developers of subdivisions or mobile home parks that are remote from organized sewage collection systems shall consider the method of sewage disposal in the determination of lot size and arrangement. The provision of a collection system and central treatment plant is generally the preferred method of sewage disposal. However, if soil conditions permit, and other factors are favorable to the use of on-site sewerage systems, the standards in Table I shall be used with regard to the location of the systems' components. A sewage disposal plan shall be submitted to the appropriate local regulatory authority a minimum of 45 days prior to anticipated date of construction.

(d) **Authority of the Department to regulate on-site sewerage facilities.** The Health and Safety Code, Chapter 341 (Texas Civil Statutes, Article 4477-1) covers the department's authority to promulgate construction rules and standards. The Texas Civil Statutes, Texas Water Code, Section 26.031, directs the commission to consult with the Commissioner of Health for recommendations concerning the impact of the use of on-site sewerage systems on public health before entering an order regulating the installation or use of such facilities in a given area.

(e) **Relations with other governmental entities.**

(1) **Texas Water Commission.** The State level responsibility for the management and control of on-site sewerage system practices is shared by the commission and the department. The commission's authority is primarily of a regional nature insofar as the control of pollution caused by on-site sewerage systems. When the problems of a particular area are likely to produce hazards to public health through area-wide water pollution caused by on-site sewerage systems, the Texas Water Code gives the authority to limit the number and type of these systems, prohibit the installation and use of additional ones, and provide for their gradual and systematic reduction in that area.

(2) **Texas Water Well Drillers Board.** This state agency shares responsibility with the department and the commission for the regulation of water well siting and construction. If a private water well encroaches on an already established on-site sewerage system, the sewerage system owner should consult with the Texas Water Well Drillers Board in order to establish the fact of prior right to use the sewerage system.

(3) **Local health departments.** The Health and Safety Code, Chapter 341 (Texas Civil Statutes, Article 4477-1), requires local health officials to abate nuisances, and to aid the State Board of Health in the enforcement of its rules, regulations, requirements and ordinances and in the enforcement of all sanitary laws within the jurisdiction of the local health officials. Local health agencies may be required by city ordinance or waste control order to enforce regulations which exceed the requirements of these standards, but local authorities must not permit their standards to fall below those recommended by the department. Local regulations shall be reasonable and, if technical in nature, must be based on sound engineering principles.

(4) **River authorities and water districts.** River authorities or water districts may assist in water pollution control enforcement procedures through orders issued by the commission to control or prohibit the use of on-site sewerage systems in an area. The commission may delegate them as the licensing authority to develop procedures concerning administration, inspection, issuance of licenses and enforcement of a commission order. Through these procedures, river authorities and water districts may establish standards higher than those of the department, provided they are reasonable and, if technical in nature, are based on sound engineering principles.

(5) **County commissioners courts.** Section 26.032 of the Texas Water Code empowers the Commissioners Court of any county to adopt a waste control order controlling or prohibiting the installation or use of on-site sewerage systems in any area of a county under its jurisdiction. The commission must grant its approval of the adopted county order prior to its becoming effective. The order includes construction standards promulgated by counties which may be adjusted to local conditions so long as they do not fall below the standards of the department and also provided that the adjustments are reasonable and, if technical in nature, are based on sound engineering principles.

(6) **Municipal corporations.** Cities, towns and villages may control or prohibit the use of on-site sewerage systems by local ordinance. The standards set forth in any such ordinance must not fall below those stated in this publication, but these entities may establish standards which will produce a higher quality of operation, provided the standards are reasonable and, if technical in nature, are based on sound engineering principles.

(7) **Regional councils of government.** These agencies are principally created to establish and execute the planning process in a region designated by the Governor under authority of Texas Civil Statutes, Article 1011m. The regional councils may contribute to the effective and proper disposal of sewage by guiding developers to the more favorable alternative of sewerage collection systems and centralized sewerage facilities, preparing soil maps showing favorable, intermediate and unacceptable locations for sewerage systems dependent upon subsurface effluent disposal, and assisting local governments in recognizing the need for regulatory devices for sewage disposal.

(f) **Design approvals of on-site sewerage systems.**

(1) **Approval of conventional designs.** The construction standards contained herein are promulgated under authority of the Health and Safety Code, Chapter 341 (Texas Civil Statutes, Article 4477-1). In addition, Chapter 341 states that disposal of human excreta in populous areas must be by methods approved by the department. It further states the effluent from septic tanks (or aerobic treatment units) shall be disposed of through subsurface drainfields designed in accordance with good public health engineering practice. The design standards in this subsection constitute the minimum criteria established and approved by the department for methods of on-site sewage disposal.

(2) **Approval of innovative designs.** Agencies vested with the responsibility of enforcing on-site sewage disposal regulations may consider feasible innovative designs which are not specifically covered in these construction standards. Texas is a large state with many different types of topographical, geological, and climatic conditions. New systems may be conceived in the future to meet requirements demanded by these conditions. The systems may differ from the specific construction methods outlined in this publication. To both assist local regulatory agencies in determining the reliability of a new system and protect the public from improperly designed systems, the department will review and evaluate new systems on an individual basis. A system found to be designed in accordance with good engineering practice will be approved by the department for the one installation for which the design was intended. Subsequent similar designs for other installations will be reviewed by the local regulatory authority. All new and innovative designs must be submitted through a local regulatory authority to the department for review as a clearing house procedure. At the department's discretion, local regulatory authorities having qualified technical expertise will be assigned authority to review each design and administer a program to evaluate the design's in-place performance. A 12-month trial operational period shall be required prior to any final approval by the department of any innovative design.

(A) Innovative systems. Submissions of innovative systems for review must include:

(i) detailed plans sealed, dated and signed by a registered professional engineer or signed and dated by a registered professional sanitarian;

(ii) necessary research data to establish the validity of the process, including setup of the proposed innovative system;

(iii) development of operational data and maintenance instructions; and

(iv) all research and development data that has been verified by published results of a recognized college, university or research organization.

(B) Expenses. No expense in connection with research, pilot projects, and/or demonstration projects shall be borne by the department. Local agencies may elect to participate in these activities.

(3) Approval of proprietary systems. All new systems which deviate significantly from these construction standards shall be reviewed by the department for their installation and use suitability. Notice of disapproval by either the department or the local regulatory authority shall prevent such facilities from being installed. Categorical approval of proprietary systems will not be granted by the department.

(4) Residential lot sizing.

(A) General considerations. The failure of an on-site sewerage system may be caused by a large number of circumstances, including inadequate soil percolation, improper construction, design, installation and misuse. The single most important factor concerning public health problems resulting from these failures is the residential dwelling density which is primarily a function of lot size. The failure of a system in a highly populated area is the fundamental cause of public health hazards resulting from on-site sewage disposal. Surfacing sewage provides a medium for the transmission of disease and the fact that many people are in the vicinity causes concern over the spreading of disease. Sewerage systems using soil absorption for effluent disposal are more likely to malfunction in high population density situations because the soil available to absorb or evaporate the effluent is limited. The failure of an absorption system on a small lot can be financially disastrous to the owner because the lot may not contain sufficient room to construct a new absorption field in a new location.

(B) Platted or unplatted subdivisions served by a public water supply. Subdivisions of single family residences platted or designed after January 1, 1988, and served by a public water supply but utilizing individual subsurface methods for sewage disposal, shall provide for individual lots having surface areas of at least one-half acre, or shall have a site-specific design by a registered professional engineer or registered professional sanitarian and approved by the department or its designee. In no instance, shall the area available for such system be less than two times the design area. The surface area must be free of restrictions indicated in Table I and those referred to throughout this publication.

(C) Platted or unplatted subdivisions served by individual water systems. In subdivisions platted or designed after January 1, 1988, for single family residences where each lot maintains an individual water supply well and sewerage system with a subsurface soil system, the plat shall show the approved well location and a sanitary control easement around the well within a 150-foot radius in which no subsurface sewerage system may be constructed. A watertight sewerage unit or lined evapotranspiration bed with leak detection capability may be placed closer to the water well than 150 feet, provided the minimum separation stated in Table I is not violated. To minimize the possibility of the transmission of waterborne diseases due to the pollution of the water supplied for domestic use,

each lot in a platted subdivision shall contain no less area than one acre, or shall have a site-specific design by a registered professional engineer or a registered professional sanitarian and approved by the department or its designee. In no instance shall the area available for such systems be less than two times the design area. The surface area must be free of restrictions indicated in Table I and those referred to throughout this publication.

(D) Smaller lots or tracts. The construction or installation of an on-site sewerage facility on a lot or tract that is smaller than the size required in subparagraphs (B) and (C) of this paragraph shall not be allowed. However, on such smaller lots or tracts, designed or recorded with a county in its official plat record, deed, or tax records prior to January 1, 1988, an on-site sewerage facility may be permitted to be constructed and licensed to operate if it meets the following criteria. It must be demonstrated through a thorough investigation by a registered professional engineer, a registered professional sanitarian (either having demonstrated expertise in on-site sewerage system design) or by a designated representative of the licensing authority that an on-site sewerage facility on one of these lots can be operated without causing a threat or harm to an existing or proposed water supply system or to the public health, or creating the threat of pollution or nuisance conditions. Regardless of lot size utilized for an on-site sewerage facility, all other requirements contained in these sections still apply.

(5) **Mobile home parks and multi-use residential developments served by a central sewerage system.** Mobile home parks and multi-use residential developments which are owned or controlled by an individual and which rents or leases space, or mobile home parks and multi-use residential developments which are sold but ownership and control of a central water system and/or a central sewerage system are vested in a responsible entity, may utilize smaller lots than stated in paragraph (4)(B) of this subsection, provided an overall sewerage plan is submitted to the department or its agent and approved and water is supplied by a central water system. Parks and developments of this type may connect no more than 20 units to a single sewerage system, provided the system is designed by a registered professional engineer or registered professional sanitarian. The total anticipated sewage discharge shall not exceed 5,000 gallons per day from the connected homes and the sewerage facility must conform to the definition of on-site sewerage facilities in subsection (b)(29) of this section. Individual home sites must meet the requirements in paragraph (4) of this subsection unless applicable under this section.

(6) **Exemptions and variances.** Requests for exemptions or variances of any part or parts of these standards for the design, installation or operation of any on-site sewerage system shall be considered on an individual basis. The burden of proof is the responsibility of the registered professional engineer or registered professional sanitarian responsible for the design or installation of the system under consideration. This individual must demonstrate to the satisfaction of the department or permitting authority, that the exemption or variance has been requested because conditions are such that equivalent protection of the public health and environment can be provided by alternate means or construction features. Any such request must be accompanied by sufficient engineering or applicable data to meet the department's or permitting authority's satisfaction. The department shall, at the request of local authorities, provide evaluation and comment services for any such local authority. A registered professional engineer or a registered professional sanitarian shall certify in writing that the system he or she designed is constructed in accordance with the plans approved by the department or the local authority.

Sec. 301.12. Design Standards for Sewerage Systems.

(a) Septic tank design - residential.

(1) House sewer. The sewer from the house plumbing system to the septic tank shall be constructed of structurally sound pipe such as cast iron, ductile iron, or ASTM D 3034, polyvinyl chloride SDR 35 or stronger pipe with optional metallic locating tape, bedded in sand. Cast iron, ductile iron, Schedule 40 PVC, or high strength pipe should always be used under driveways. The pipe from the house to the septic tank shall have a minimum inside diameter of not less than three inches and be compatible with the house stub out pipe. The slope of the house sewer shall be no less than 1/4-inch fall per foot of pipe. The stub out location shall be at the highest possible elevation with respect to the house foundation to avoid deep treatment systems. The line must be of watertight construction. A cleanout plug must be provided within three feet of the building and at changes in alignment, both horizontal and vertical, and at every 50 feet of straight horizontal piping. Prospective installers and users of low flush commodes should consult with the manufacturers of these devices regarding their grade requirements. Too steep or too shallow slopes on pipes connecting the toilet and the treatment tank may require excessive maintenance. Piping from the treatment tankage to the disposal area must have at least two inches inside diameter, have at least a minimum fall of 1/8-inch per foot and be as sturdy as ASTM 3034, SDR 35 PVC piping. Metallic locating tape can be used at the discretion of the local authority with the installation of all piping to and within the disposal area. This tape, if utilized, must be readily detectable with a metal detector.

(2) Septic tank capacity based on sewage loading. A properly designed septic tank shall be watertight. The settleable and suspended solids will undergo partial decomposition under anaerobic conditions. As a result of use, the septic tank will accumulate partially decomposed solids which must be removed periodically. As additional sewage is introduced into the tank, partially clarified effluent is discharged into the subsurface disposal field. The best method for estimating the tank's sewage loading is based upon the number of bedrooms in the house. Table II shall be used to determine the required minimum septic tank liquid capacity.

(3) Inlet and outlet devices. To assure rapid drainage of house plumbing, the flowline of the inlet pipe shall be at least three inches higher than the operating tank liquid level which is determined by the flowline of the outlet pipe. Liquid penetration of the inlet device shall be at least six inches, but never greater than that of the outlet device. Liquid penetration of the outlet device shall be approximately one-fourth to one-half of the tank's liquid depth. "T" branches are required for inlet and outlet devices because they provide a means for venting the gases produced by the decomposition process from the tank and absorption system through the house plumbing. Otherwise, gases may escape from around the lid of the tank and cause an odor nuisance in the vicinity of the septic tank. "T" branches also offer ready access for required maintenance. To prevent the escape of floating solids from the tank to the subsurface disposal field and the possibility of inlet stoppages, the open spaces between the tops of the inlet and outlet devices and the underside of the tank cover shall be visible separations not larger than one inch (See Figure 1). In order to provide a good watertight septic tank, the inlet and outlet "T" branches shall be installed in a permanent manner at the time the septic tank is constructed. Prefabricated tanks shall have the "T" branches grouted in place before delivery to the job site so that the only connections to the tank at the point of installation will be the influent and effluent lines. Manufacturers of prefabricated tanks shall be allowed to install watertight flanges into the tank walls, into which inlet and outlet stubs can be easily fitted by field installers, causing watertight connections.

(4) Details of septic tank design.

(A) Two single compartment tanks in series, or a two-compartment tank, with approximately one-half to two-thirds of the total volume in the first compartment, will be required for acceptable solids removal. Minimum liquid depth shall be 30 inches. For flows greater than 500 gallons per day, three single compartment tanks may be used in series. The first compartment shall have one-half of the total volume and the other half divided equally between the other compartments. Tanks

may be round, rectangular, or of a shape that allows the department's standards to be met. The second compartment shall have inlet and outlet devices designed the same as for a single-compartment tank, except that the elevation, or flow- line, of the inlet device in the second unit of a two-compartment tank shall be at least three inches lower than the inlet device in the first unit. The intermediate "T" branch can, alternatively, be in a submerged horizontal position (See Figure 1). The liquid level in the second tank of a two-tank system must be the same or lower than the liquid level in the first tank. A 10-inch minimum diameter or square port shall be provided over the inlet and outlet "T" branches to each flow line device for inspection, cleaning, and maintenance. Both the inlet and outlet devices shall be accessible for inspection and maintenance without having to enter the septic tank. For tanks not having more than 12 inches of earthen cover, the use of sectional slab covers will conveniently and safely provide the needed access. For tanks buried more than 12 inches, manholes with risers are required. The septic tank shall be of sturdy, watertight construction. Materials used may be steel-reinforced poured-in-place concrete, steel-reinforced pre-cast concrete, fiberglass reinforced plastic polyethylene or other materials approved by the licensing authority. Metal septic tanks are prohibited because they are subject to corrosion. The septic tank shall be structurally designed to resist buckling from external hydraulic loading and exterior loading caused by earth fill, garden tractors, riding lawn mowers, or any expected maximum wheel weights. All tanks shall be tested by filling with fresh or construction grade water following installation prior to final backfilling and checked 24 hours later for leaks and structural integrity. At the discretion of the regulating authority, a dye test, or any other test for watertightness that is acceptable to the department, shall be performed on septic tanks to be installed in areas with high groundwater tables. Tanks exhibiting obvious deflections, leaks, or defects that will impair treatment must not be used. Where concrete tanks are installed, sweating, or condensation at construction joints is acceptable.

(B) In the case of poured-in-place concrete tanks, septic tank bottoms shall be at least six inches thick with 6x6x6 gauge welded Steel Mesh or No. 3 Reinforcing Bars on six-inch centers, with such reinforcing materials being extended up into the wall area of the tank so that it will mesh with the reinforcing materials in the walls of the tank. The floor and walls must be constructed monolithically. Walls are to be a minimum of six inches thick.

(C) Septic tank tops reinforced with 6x6x6 gauge welded Steel Mesh or No. 3 Reinforcing Bars on six-inch centers must be poured off-site rather than on the tank (not on top of a wooden frame over the tank) and must be moved onto the tank after hardening and then sealed to the tank with a permanent bonding material or rubber gasket having a one-half inch minimum thickness so as to form a seal between tank and top. To facilitate handling, tops may be poured in sections but must be sealed when in place. Tops must be a minimum of three inches thick.

(D) Pre-cast concrete, polyethylene, and prefabricated fiberglass tanks are subject to prior approval of the licensing authority, who should consult with the department regarding the uniquely differing materials, manufacturing methods, and designs used. All pre-cast or prefabricated tanks shall be clearly marked, tagged, or stamped with the manufacturer's name, and the capacity of such tanks near the level of the outlet in at least two positions so as to be clearly visible to the inspecting or permitting authority even after they have been placed in the ground. Direction of flow into and out of the tank shall be indicated by the words "in" and "out" or by arrows clearly marked at the inlet and outlet.

(E) Septic tanks must be installed so as to provide at least 12 inches drop in elevation from the bottom of the outlet pipe to the bottom of the disposal area. A washed sand or gravel (1-1/2 inch maximum) pad with a minimum thickness of four inches must be placed under all prefabricated tanks. Unless otherwise specified by a tank manufacturer's requirements, all septic tank excavations must be backfilled with

sand, pea gravel, select backfill or loam. It is acceptable to mound soil over a septic tank which is set high to maintain fall to the drainfield.

(F) When sewage must be pumped to a treatment unit or a disposal area, an appropriate pump shall be placed in a watertight tank. A check valve shall be provided if the receiving unit is upgrade and higher than the pump. The tank shall be provided with a high-water alarm having a power circuit separate from the pump. The electrical connections located inside the tank shall be "hard-wired". Electrical connections located outside the tank may be plug-in type. Pump tanks shall have a minimum excess volume equivalent to 10 minutes of pump flow after the alarm is activated, and shall be constructed as a separate unit or watertight chamber.

(b) Septic tank design - institutional.

(1) General consideration of use of septic tank systems. Septic tanks may be used as a means of sewage treatment for non-residential activities. However, experience indicates that the usefulness of the septic tank systems decreases as the size of the establishment served increases. When a septic tank is being considered for service to an activity that will produce more sewage than a single family residence, design guidance must be obtained from a local health department, regulatory agency or a consultant who is professionally registered as an engineer or sanitarian in Texas and is well versed in on-site sewerage system design.

(2) Sewage loading. The total quantity of sewage applied per day to the septic tank provides the basis for the determination of its size. Table III, entitled "Individual Usage Rate," will be of assistance in estimating the daily sewage flow per capita for a variety of living and activity situations. Organic loading of sewage from restaurants, hospitals, nursing homes, and other commercial establishments will require an increase in tank size.

(3) Compartments to be provided. A minimum of two compartments or a maximum of three shall be provided, the first created by a wall with a tee to permit liquid flow from the first compartment to the second one. The flowline of this intermediate fitting shall be at the elevation of the flowline of the outlet fitting of the second or third compartment. The fitting shall be three inches below the elevation of the flowline of the first compartment's inlet fitting. The minimum liquid depth of all septic tanks must be 30 inches. The capacity of the first compartment in a two-compartment arrangement shall be 50% to 67% of the total required volume. When three compartments are proposed, the first compartment must have one-half of the total volume and the other half divided equally between the other compartments. All tanks must be vented internally.

(4) Selection of septic tank capacity. The net volume or effective capacity below the flowline of a septic tank for flows up to 250 gallons per day shall be at least 750 gallons. For flows between 250 and 5,000 gallons per day, the capacity of the tank shall be equal to at least three days' sewage flow. For singular or collective daily flows over 5,000 gallons per day, the determination of the necessity for a waste discharge permit must be obtained from the commission.

(5) Pump tank usage. When sewage must be pumped to a treatment unit or a disposal area, an appropriate pump shall be placed in a separate watertight tank. A check valve shall be provided if the receiving unit is upgrade and higher than the pump. The tank shall be provided with a high-water alarm having a power circuit separate from the pump. The electrical connections located inside the tank shall be "hard-wired". Electrical connections located outside the tank may be plug-in type. Pump tanks for flows less than 500 gallons per day shall have a minimum volume of one day's storage after the alarm is activated. For daily flows over 500 gallons, a duplex pump configuration must be provided, and the tank shall have a storage volume of two hours at peak flow or four hours at average flow, whichever is larger. A dual pump system should have the "alarm

on" level at or below the "second pump on" level, and should have a lock-on feature in the alarm circuit so that once it is activated it will not go off when the second pump draws the liquid level below the "alarm on" level. The alarm should have a manual "reset" switch. Pump switchgear shall be selected such that both pumps shall operate as the first pump on an alternating basis.

(c) On-site aerobic sewerage plants.

(1) Introduction. A number of small (up to 1,500 gallons per day) aerobic wastewater disposal systems have been designed and marketed for the on-site treatment of sewage. The information in this subsection relates to the department's requirements concerning the installation and use of on-site sewerage plants for private residences, small businesses, and institutions. Sewerage plants designed to treat more than 1,500 gallons per day must meet the "Design Criteria for Sewerage Systems," published by the department and the commission.

(2) Appropriate usage. The installation and use of individual wastewater disposal units, other than septic systems, are acceptable to the department provided they meet department requirements.

(3) Permit policy. Subject to the requirements of the department or local regulatory authority, an owner of a home, small business, or institution may elect to use an aerobic individual wastewater disposal system.

(4) Effluent disposal practice. Effluent from an individual aerobic wastewater treatment plant may be discharged into a properly designed and constructed subsurface sewerage system or allowed to be surface discharged in accordance with state laws and policies established by the department and the commission.

(5) Operation and maintenance responsibility. Companies distributing aerobic individual small waste disposal systems shall provide an inspection and repair service since the system's owners, in most instances, will not be in a position to judge whether the device is working as designed. Local governments, in determining whether to approve any type of individual small wastewater disposal system, shall give consideration to the ability of the distributor or other firms qualified to service the installation. The prospective owner shall be given a copy of the prospective seller's service contract prior to making a decision regarding purchase. The contract shall be for a two year period, with provision for extending the period, at the owner's option.

(6) Emergency operation. The principal structure or containing vessel of an individual small wastewater unit is designed to provide treatment to a predetermined amount of daily incoming sewage. In the event of more than one day's failure of mechanical or electrical devices, anaerobic conditions will prevail when aeration equipment is inoperable. The unit's owner shall be prepared for emergencies by contractual arrangement with the plant's seller, by stocking spare parts, by hiring a licensed sewage pumping and hauling company, or by preventing the generation of more sewage until the emergency is eliminated.

(7) National Sanitation Foundation criteria. There are numerous manufacturers of individual small wastewater treatment systems. To the extent of available information, inquiries on individual systems from local governments or individuals will be answered by the department. Local governments interested in authorizing individual small aerobic wastewater disposal systems are advised of the testing and approval criteria of the National Sanitation Foundation (NSF). The NSF seal on a particular unit indicates its ability to meet the requirements of the Foundation's Standard 40 relating to "Individual Aerobic Wastewater Treatment Plants." Units not having a NSF approved rating will be required to undergo extensive testing equal to or greater than the Foundation's program prior to use in Texas. The department will maintain a list of approved aerobic systems.

(8) Treatment limitations. Unlike septic tanks, aerobic units are not sized according to their liquid capacity. These units are sized according to their treatment capability in terms of gallons per day (gpd) of wastewater flow. Aerobic treatment plants operate by mixing raw sewage together with air and masses of bacteria, which consume the sewage in the presence of air. Treated effluent still contains microscopic bacteria and viruses that were in the raw sewage. Therefore, the effluent must be kept out of contact with the general public as much as possible. It is possible to disinfect treated sewage with chlorine, bromine, ultraviolet light, ozone, or other commercially available products. However, existing disinfection technology will not make aerobically treated sewage safe enough to be used as potable water. Subsurface disposal systems for aerobic plant effluent shall be the same as for septic tank effluents.

(9) Siting considerations. Most aerobic treatment plants sized for single home or small commercial shop use are usually larger than a septic tank but may not be installed as deeply. The organic loading of commercial or institutional applications may require individual design considerations. The treatment unit inspection access is exposed to the surface.

(10) Solids accumulations. Periodic carryover of floating or settled solids can be the major reason for effluent quality deterioration from aerobic units. Bulking of sludge (sludge that will not settle), toxic chemical additions from the home, and excessive buildups of sludge are common causes of carryover. The owner or the contracted service should inspect the unit quarterly. Excess solids should be removed when the quarterly inspection indicates the need. Sludge bulking may be caused by an inefficient aeration system. The periodic inspections should include the blower and aerator of an aerobic treatment plant. An inoperable blower or aerator should be serviced or replaced as soon as possible.

(d) Grease traps and interceptors.

(1) Installation. A grease trap is a tank that holds 20 to 30 gallons of water in a single compartment. An interceptor is a larger device which has two compartments. Grease traps or interceptors shall be used on kitchen wastelines from institutions, hotels, restaurants, schools with lunchrooms, and other places that may discharge large amounts of greases and oils to the sewer. However, wastes from garbage grinders must not be allowed to enter a grease trap unless the grinder is connected to a separate, independent interceptor, the unit has been properly sized according to paragraph (2) of this subsection, and approval has been obtained from the local regulating agency. The trap or interceptor shall be installed near the plumbing fixture that discharges greasy wastewater and should be easily accessible for cleaning. For maximum grease removal, a dual-chambered interceptor that separates, then stores grease shall be utilized. If the dual-chamber interceptor is installed as close as possible to the source of hot greasy wastes, the separated grease can be conveyed to the secondary chamber, where it accumulates, cools, and solidifies. Grease traps and interceptors shall be cleaned out periodically to prevent the discharge of grease to the underground disposal system.

(2) Sizing. Grease trap and grease interceptor sizing will depend on the particulars of the application. Building code authorities and manufacturers should be consulted prior to sizing the unit. Grease traps must be sized in accordance with local requirements. No grease interceptor with a liquid holding capacity of less than 100 gallons, shall be approved for any institutional food preparatory establishment. Grease traps and interceptors shall be sized using either the Uniform Plumbing Code or local sizing requirements, whichever size is largest, to determine maximum flow rate. If garbage disposals are required or allowed by the permitting authority, they shall be plumbed into an interceptor. The interceptor primary compartment shall hold at least 60% of the total volume required; the secondary compartment shall hold 40% of the required volume.

(3) Inlets and Outlets. Grease trap and grease interceptor inlets and outlets should be submerged under the normal liquid level. The compartments of the grease trap or interceptor should be vented to the open air. Cleanouts at the inlets and outlets should be provided external to the grease interceptor.

Sec. 301.13. Design Standards for Effluent Disposal Systems.

(a) **Soil technology and disposal method selection.** Prior to project building construction, a site evaluation, soil characterization study, and project component positioning must be done. Site evaluation is a combination of field inspection, laboratory testing, and desk top analysis. It includes a thorough understanding of the codes and regulations governing the use of the site. Key elements of the evaluation are discussed in the following sections.

(1) Topography. A site's topography relates to the changes in surface height over the site's total area. Topography can influence the choice of system used. For instance, pressure dosing may be the only type of system possible where the only acceptable location for the disposal area is at a higher elevation than the treatment unit. Grading plans to alter the topography may be used in order to evaluate whether the site can be used. Care must be taken to protect or replace the site's topsoil.

(2) Soil characteristics. The most important characteristics of soil are the ability to absorb fluid, provide adequate treatment, and convey the treated water underground. Permeability is the characteristic relating to ease of water movement through soil. The main properties indicative of absorption capacity are soil texture, structure, color, thickness of permeable strata, and swelling characteristics.

(A) Soil properties are discussed in detail by the U.S. Department of Agriculture, Soil Conservation Service (USDA-SCS), in the soil survey reports which are available from county extension agents and field offices of the USDA-SCS in each county. These surveys include general soil maps which outline the areas of different soils onto aerial photos. General information is given regarding the soil's suitability for sewage effluent disposal on a broad scale and can be used for preliminary evaluation.

(B) A careful field investigation must be made by persons trained or having qualified experience in soils science or on-site sewage disposal to determine the capability of a site to absorb and treat wastewater. The investigation should be done during the wettest season of the site. The soil evaluation should address the eight site characteristics listed in Table V. A site plan must be submitted to the local regulatory authority showing the proposed location of the various components of the on-site sewerage system and the existing or future improvements, lot lines and any other item that restricts the choices of component locations.

(3) Groundwater. Seasonal high groundwater (perched water) tables can exist in any area of the State. Under such conditions, it is possible to locate perched water near the ground surface during wet periods each year. This situation is the result of seasonal rain storm runoff permeating into a shallow soil mantle that lies upon an impermeable material like a solid rock or very dense clay. The mechanism for the removal of this water is by very slow draining to open channels or areas not influenced by clay or rock. Some moisture is taken up by evaporation and transpiration of plants that are rooted into the permeable top soil.

(4) Flooding. Usual site development requires that the structure be built on the highest portion of the site. The sewerage system is developed in the remaining area of the site that is lower than the structure. Unfortunately, the lower area of a site may be subject to flooding as it naturally receives storm runoff from all areas upstream of it. Careful evaluation of flooding potential is necessary to determine whether flood preventative measures must be incorporated into the on-site sewerage system. All of a soil

absorption system must be constructed out of the flood-prone area, and not within areas subject to inundation or erosion by flood waters or rainfall runoff. An applicant for a permit to install a sewerage system shall consult with the local flood plain ordinance administrator, county engineer, State Highways and Public Transportation Department, nearest river authority, Farmers Home Administration, Federal Emergency Management Agency, and other officials who may have information regarding the potential for flooding at the disposal site.

(5) Solid and fractured rock. Solid or fractured rock underlying a thin absorptive soil mantle which is less than four feet thick poses two different problems to the on-site sewerage system user. Solid material will reduce the absorptive capacity of a site while fractured rock may act as the mechanism for direct pollution of an aquifer that lies under the site. Percolation tests in these materials are unreliable and must not be used to size the sewerage system.

(6) Caliche. Deposits of a white-to-pale yellow mineral form of calcium carbonate and related compounds of variable thickness and hardness that should be carefully inspected by a soils scientist or qualified local authority to determine site suitability for treated sewage absorption. Caliche has several forms that may or may not allow the site to be developed as a sewage absorption area. However, if a soils scientist or qualified local authority is unavailable, an evapotranspiration system can be installed if climatic conditions are appropriate.

(7) Offsets from property lines. Minimum spacings from adjacent property owners must be adhered to. A common property line may be built upon with fencing or masonry walls. The area may serve as natural or artificial drainage for storm runoff. For these reasons, private on-site sewerage systems must not be built on these spacings, unless there is a written agreement between the adjacent property owners involved.

(8) Clearances from structures and surface improvements. Table I indicates clearance requirements relating to structures and surface improvements. Structure foundations or surface improvements, such as swimming pools, concrete curbs, landscaping, lawn sprinklers, concrete, asphalt, wood decks or other types of materials must not be placed or planned for installation in any manner that will jeopardize the suitability of subsurface sewage disposal sites, unless a study by a registered professional engineer or a registered professional sanitarian is approved by the local permitting authority.

(9) Spacing with other utilities. Utility companies may have special restrictions that can be enforced onto on-site sewerage system installations. Safety of operations has been cited as a reason to maintain distance from buried electric and gas conduits. Safety to public health requires the separation of potable water piping from sanitary sewerage systems. Table I lists commonly used criteria, but each utility company serving the parcel should be consulted prior to installing the sewerage system even if no potential problems are evident.

(10) Disposal system selection. In designing a private sewerage facility, several options concerning subsurface disposal are available. Table IV has been prepared to aid in the selection of the proper system based on site evaluation, percolation rate and lot size considerations. The table includes the systems generally recommended for subsurface disposal which are drainfields, absorption beds and evapotranspiration beds. The purpose of Table IV is to give the reader a general idea as to the most feasible type of system to construct taking into consideration lot size, soil absorptive capacity, water conservation practices and local climate.

(A) After determining the sizing of appropriate treatment tankage, the permitting agency shall confer with the applicant regarding the calculations to determine the bottom area required for trenches, an absorption bed system and an evapotranspiration system. Generally, the system having the least number of

square feet of bottom area will be the most economical. In most cases where adequate room is available, a trench system will be less costly.

(B) In areas where soils have low permeability, it is possible to design a system which combines both soil absorption and evapotranspiration. Such systems are somewhat complicated and should be designed by a person trained in sewerage system design. The United States Environmental Protection Agency has issued a publication entitled "Design Manual - On-site Wastewater Treatment and Disposal Systems" that provides guidance to those interested in selecting the most appropriate treated sewage effluent disposal method, taking site constraints into consideration. The entire manual, EPA Publication No. 625/1-80-012, may be ordered from: U.S. Environmental Protection Agency, Office of Research and Development, Municipal Environmental Research Laboratory, Cincinnati, Ohio 45268. This government publication is a 391-page document that was published in October 1980 for public use. Although it is recommended as one of several references, the department does not adopt this manual or any other technical publication.

(b) Percolation test procedures. It has been previously mentioned that the percolation test is but one of many indicators of a site's future suitability to accept sewage for safe permanent disposal. Consequently, it should not be considered as the sole basis of designing an on-site sewerage system. Experiences of local regulatory agents will have priority over the test results. Experience should be based on tests conducted during the wettest season of the year.

(1) Location and number of tests. A minimum of two test holes will be required with the holes uniformly spaced over the proposed absorption field site. Disposal systems such as evapotranspiration beds and mounds may not require percolation tests. The actual number of holes required for an individual soil evaluation should be determined experimentally in accordance with the following procedures:

(A) If the percolation rate results of both test holes fall in the same group as shown in Column One in Table VI, no additional holes will be necessary and the absorption field may be designed on the average of the results.

(B) If the percolation rate results fall in adjacent groups, the absorption field may be designed using the test results from the hole with the slowest percolation rate or one additional hole may be dug, tested and all three results averaged. To properly average the results, each test result must be converted to minutes/inch, then added together. The sum is then divided by the number of tests. If tests in an area vary by more than 20 minutes/inch, variations in soil type are indicated and percolation rates should not be averaged.

(C) If the percolation rate results fall in nonadjacent groups, the absorption field may be designed using the test results from the hole with the lowest percolation rate or two additional holes may be dug, tested and the results averaged.

(D) In lieu of the previously mentioned procedure, four holes may be dug and tested and the results averaged at the same time to reduce the amount of time required to conduct the test.

(2) Type of test hole. Dig or bore a hole with a diameter of from 6 to 12 inches with vertical sides to the depth of the proposed absorption trench. The bottom of the hole must be at the same elevation as the proposed drainfield bottom. It may be required on a case-by-case basis by the local regulatory authority, that test pits with a back hoe or other heavy excavating equipment be done prior to performing the test from a bored hole in the bottom of the test pit. The local regulatory authority may require borings to a depth greater than the depth of the proposed disposal system bottom, if a high groundwater table or impermeable layer is suspected to be present.

(3) Preparation of test holes. 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 water may percolate. Remove all loose material from the hole and carefully place approximately one inch of coarse sand or fine gravel into the bottom of the hole to protect the bottom from scouring.

(4) Saturation and swelling of the soil. It is important to distinguish between saturation and swelling. Saturation means that the void spaces between soil particles are full of water. This can be accomplished in a short period of time. Swelling is caused by intrusion of water into the individual soil particle. This is a slow process, especially in a clay-type soil, and is the reason for requiring a prolonged soaking period.

(5) Filling of test holes. In the conduct of the test, carefully fill the hole with clear water to a minimum depth of 12 inches. In most soils, it is necessary to refill the hole by supplying a surplus reservoir of water manually or by means of an automatic siphon, to keep water in the hole until saturation occurs (approximately 24 hours). Determine the percolation rate 24 hours after water is first added to the hole. This procedure is to insure that the soil is given ample opportunity to swell and to approach the condition it will be in during the wettest season of the year. Thus, the test will give comparable results in the same soil, whether made in a dry or in a wet season. In sandy soils containing little or no clay, the test may be made as described in paragraph (7) of this subsection after the 24-hour saturation period.

(6) Percolation rate measurement. Percolation rate measurements shall be made on the day following the procedure described in paragraph (5) of this subsection. After the overnight swelling period, adjust the water depth to approximately 12 inches from the bottom. From a fixed reference point, measure the drop in water level over a 30-minute period. This drop is used to calculate the percolation rate. If the rate is slower than 30 minutes per inch, continue with measuring the rate for an additional 30 minutes. The slower rate of the two consecutive one-half hour tests should be used.

(7) Percolation rate measurement (sandy soils). In sandy soils (or other soils in which the first six inches of water seeps away in less than 30 minutes, after the overnight swelling period), the hole should be filled to a depth of six inches and that depth maintained by adding water for 30 minutes. After 30 minutes, the drop in water level should be measured over an additional 10-minute period and the percolation rate calculated from this measurement.

(c) Effluent disposal systems.

(1) General Considerations. The effluent discharge from a septic tank or aerobic plant requires further handling to render it safe from a public health standpoint. A well-designed subsurface soil absorption system will allow these liquids to seep into the ground without creating a health hazard or nuisance. After the prospective builder has selected a suitable area and is assured that safe distances from wells, lakes, etc. can be maintained, the builder must determine, with the assistance of an experienced soils scientist, registered professional engineer or registered professional sanitarian whether soil formations in the selected area will allow a soil absorption system to work. When conventional soil absorption systems are used, there shall be no interference from groundwater. The groundwater table must be situated at least four feet below the bottom of the soil absorption system. In the coastal areas of Texas, fresh or salt water may occur at depths less than four feet. The design standards for conventional soil absorption systems set forth in this publication are based on the premise that impervious strata are at depths greater than four feet below the bottom of the absorption trench. Conventional soil absorption systems shall not be used if either impervious strata or groundwater exists at depths less than four feet from the trench or bed bottom, unless a detailed site evaluation is made and a design by a registered

professional engineer or registered professional sanitarian is accepted by the local regulatory authority.

(2) **Soil absorption trench.** A soil absorption trench may be used if the proposed site provides sufficient room and is of suitable soil. If the soil is not suitable, or adequate spacing is not feasible, an alternate system shall be used. An experienced soils scientist, registered professional engineer, or registered professional sanitarian should be consulted to determine if the site qualifies for trenches.

(A) Absorption trench field for level terrain. Where the topography or ground slope is not too steep, a flat or level system of gravel-filled absorption trenches is recommended. The optional use of a looped trench system will avoid dead ends and assure maximum effective utilization of all portions of the system. No individual trench shall exceed 75 feet in length. Closed loop trench designs shall incorporate headers and laterals to eliminate trenches that exceed 75 feet in length.

(i) The field bottom must be at least 12 inches lower than the flowline of the treatment tank. The capacity of any particular absorption system is determined by the total area of trench or bed bottom built into the system. The amount of this required minimum area will depend upon the expected sewage load, the average soil percolation rate, and the site's soil evaluation results. The soil percolation rate may be determined by performing a percolation test as described in subsection (b) of this title (relating to Design Standards for Effluent Disposal Systems). The trench dimensions for single family residential units may then be estimated from Table VI. For sewage flows of less than 5,000 gallons per day from commercial or institutional establishments, A, the absorption trench bottom required, is determined by the formula A = 1.25 Q/Ra, where Ra, the allowable application rate, is found in Table VI and Q is the daily flow.

(ii) All parts of the trench bottom shall be at the same elevation. Trenches should be constructed as shallow as possible with a minimum depth of 18 inches and a maximum depth of 36 inches. Deeper trenches should be used where snow may saturate the upper portion of the trench. For trench depths greater than 24 inches (except where snow exists), sand shall be used to fill the trench up to the top soil cover as shown in Figure 3. The trench width shall not exceed 36 inches, as narrow trenches (12 to 18 inches) are recommended. Although trench length is based on bottom area only, sidewall area is important since much of the wastewater is absorbed through the sidewalls and is eventually evapotranspirated. Minimum allowable spacing between adjacent edges of parallel trenches is three trench widths or five feet, whichever is smaller.

(iii) The proper installation of adequate construction materials is vitally important to the success of an absorption trench system. Materials include piping, media, media barrier, and backfill. A liquid from the sewerage unit is conducted to the absorption system via a watertight line similar to the house sewer. The liquid is distributed uniformly through the gravel-filled trenches by the use of three-inch to 10-inch perforated plastic pipe of any one size, or equivalent pipe materials. It is important that the distribution piping be laid reasonably level (4 inches per 100 feet maximum allowable grade) in the trenches, with a minimum of six inches gravel depth under the pipe. A minimum gravel depth of approximately 12 inches is required. The trench media must be clean graded gravel, broken vitrified brick, washed rock, crushed stone, crushed hardened limestone, or similar aggregate that is generally one uniform size (from 0.75 inches to 2.0 inches). Refer to the definition for uniform gravel size in Section 301.11(b)(49) of this title (relating to Definitions). Oyster shell, other types of shell, and soft limestone are not allowed for trench media because the cementitious properties of this type of

material often result in early trench failure. The perforated distribution pipe and fittings shall consist of the following materials and minimum sizes:

Polyvinyl chloride (PVC) ..... 3-inch diameter
ASTM D3034, SDR 35
ASTM D2729
ASTM F 789
Polyethylene, corrugated ..... 4-inch diameter
ASTM F 405, standard tubing
Polyethylene, smoothwall .....3-inch diameter
ASTM F 810

(iv) Piping made of different materials may be used if approved by the local licensing authority after departmental consultation prior to its installation. Jointed tile is not recommended for use because of the difficulty in maintaining joint spacing and keeping the line level. Geotextile filter fabric material or a hay layer two to four inches thick, placed over the top of the gravel is required to prevent the sandy loam or sand backfill from invading the gravel until the backfill becomes stabilized. Refer to paragraph (7)(B) of this subsection for minimum requirements for the geotextile filter fabric. Tar paper or other impervious material shall not be used under any circumstance. The pipe selected for drainfield construction shall have sufficient strength to resist crushing from external loadings such as earth fill, garden tractors, riding mowers, and similar yard equipment. Bituminous fiberboard or paper pipe shall not be used anywhere in the sewerage system. Poor construction practices will cause serious damage to the soil absorption system. Prior to issuance of a permit, notice shall be given to the regulatory authority of the types of piping proposed.

(v) It is extremely important that care be taken to avoid sealing the surface of the bottom and sides of the absorption trenches through smearing. Trenches or beds shall not be excavated when the soil is sufficiently wet so as to smear or compact easily. All smeared or compacted surfaces occurring during construction shall be raked to a depth of one inch and loose material removed just before the gravel or other media is placed. The absorptive areas should not be walked on unnecessarily. The completed surface of the disposal area must not be paved, used for parking of vehicles, or covered with impermeable materials.

(B) Absorption trench field for irregular terrain. Where the topography or ground slope is too steep for feasible construction of a level trench system but where the slope is free of ledges or breaks and is less than a 15% grade, the following alternate layout may be used. There shall be a minimum 16-inch drop from the bottom of the septic tank outlet pipe to the bottom of the first trench when trenches are installed in this configuration.

(i) A single level trench, constructed with a relief line is built along a contour. The overflow from this trench is conducted via a watertight pipe to the next lower level where a second trench can be built along a contour similar to the upper trench. The pattern can be repeated until the required minimum trench bottom area has been provided. It is required that no individual trench exceed 75 feet in length. This technique is graphically illustrated in Figure 4. Other details of trench construction described in subparagraph (A) of this paragraph, and shown in Figure 3, should be followed.

(ii) Table I should be reviewed if the irregular terrain has sharp slopes and breaks. Consideration of hydrogeological and engineering data may be required by the regulatory authority.

(3) **Soil absorption beds.** In addition to the trench-type absorption field, two or three absorption beds of reasonably equivalent areas, separated by at least five feet and using watertight flow diversion valving, (See Figure 5), may be used in areas where the combination of soil percolation and lot size precludes the use of a trench-type system with minimum spacing between trenches. While absorption beds require more bottom area than trenches, they tend to be more compact.

(A) Construction. The bed shall be constructed with its depth ranging from 18 inches to 36 inches. It shall be kept as shallow as possible to promote aerobic bacterial action in the soil. The bottom of the bed must be level to within two inches overall for uniform wastewater distribution. Fill dirt, top soil, or other material unacceptable to the regulatory authority shall not be placed on the bed bottom for any reason. Media (gravel, crushed stone, etc.) that is generally one uniform size from 0.75 to 2.0 inches shall be placed on the bed bottom followed by two or more distribution pipes spaced six to 12 feet apart and between three to four feet from the edge of the bed. The amount of gravel and spacing between the pipes is dependent on the size of the pipe used. The distribution pipe is then surrounded with additional gravel to the top of the pipe. The pipe must be one size, from two to 10 inches in diameter. The total depth of the gravel in the bed is 12 inches. The gravel shall then be covered with geotextile filter fabric, or a two-inch to four-inch layer of hay, to prevent the soil layer from invading the gravel and reducing porosity. The next soil layer shall consist of sand, sandy loam, or a mixture of the two.

(B) Wicks. In order to provide continuous capillary action in the sand, wicks shall be incorporated in the rock media. Wicks are simply sand structures which penetrate through the rock media to the bottom of the bed (See Figure 5). The total wick area shall be 10 to 15 percent of the bed surface area and shall be uniformly spaced throughout the bed. Wicks may also be constructed by simply grading furrows in the rock media in between the distribution pipe. In areas of the State where rock media is difficult to obtain, the total amount of rock media may be reduced by filling the initial 12 inches of the bed with coarse sand (2.0 mm) and placing rock media only around the top, bottom and sides of the distribution pipe to form an 18-inch enclosure.

(C) Capillary medium. If clay, rock, or other semi-impervious material is excavated from the bed site, it must be removed and under no circumstances be used as backfill in the bed. Sand or sandy loam will provide a capillary medium to help eliminate some of the wastewater through evapotranspiration, as explained in paragraph (4) of this subsection. The bed shall be filled to within six inches from the top with sand or sandy loam and mounded with sandy loam so that the center of the bed is approximately four inches above normal ground elevation. This will provide drainage away from the absorption bed. When this system is used, the total absorption bed area must be calculated using the following formulas:

For Single-Family Situations:

$$A = \frac{150\ (1 + B)}{R_a}$$

Where:

A = The total absorption bed area required for two beds.
B = The total number of bedrooms in the dwelling.
R_a = Sewage application rate for absorption trenches expressed as gallons per square foot of bed bottom, per day based on percolation rate. (See Table VI)

For non-single family residential situations:

$$A = \frac{2Q}{R_a}$$

Where
Q = The total daily wastewater discharge in gallons from that situation.

(4) Evapotranspiration beds.

(A) General. Evapotranspiration bed systems are alternate systems and may be used in locations where soil conditions are not suitable for any type of soil absorption system. For very porous soils, fill dirt, solutioned limestone, fractured bedrock, and situations that would allow excessively rapid migration of sewage toward groundwater, lined evapotranspiration beds must be designed and certified by a registered professional engineer, registered professional sanitarian, or qualified designer. The beds must be located outside the flood-prone area and not within areas subject to inundation or erosion by flood waters or rainfall runoff. An applicant for a permit to install a sewerage system shall consult with the local flood plain ordinances administrator, county engineer, State Highways and Public Transportation Department, nearest river authority, Farmers Home Administration, Federal Emergency Management Agency, and any other officials who may have information regarding the potential for flooding at the site of the evapotranspiration beds.

(B) Evapotranspiration bed construction features. The following factors must be considered in the design of evapotranspiration beds: annual mean rainfall and wettest month of the year, annual mean evaporation rate and monthly minimal rate, growing season variations, native grasses and shrubs available for cover, absorptive capacity of the soil surrounding an unlined bed, and site conditions, including varying sunlight and air movement.

(i) There is great variation in the types of plants grown in different parts of Texas, as well as differing transpiration rates in different plants. It would be hazardous to generalize in making specific suggestions on design criteria for systems dependent on evapotranspiration for successful operation. Specific recommendations on appropriate types of vegetation to use must be obtained from knowledgeable organizations such as the United States Department of Agriculture-Soil Conservation Service, Texas Agricultural Extension Service, or reputable plant nurseries.

(ii) An evapotranspiration bed system is one of the candidate disposal methods that may be constructed in impervious soil or soil with very high absorptive capacity. When the soils have a very high percolation rate, less than five minutes per inch, liners approved by the local regulatory authority must be constructed to guard against the possibility of wastewater discharging through the soil (fissured rock or gravel) and contaminating streams, lakes, or shallow groundwater. Impervious liners may consist of reinforced concrete, 20-mil minimum single layer thickness plastic, or rubber liners. All must be repairable in the field. Liners are not required in slowly permeable soils (having permeability of less than 10^{-4} centimeters per second) and should not be used since some of the wastewater may be absorbed into the soil and will help to reduce the overall evapotranspiration load. An evapotranspiration system shall be designed using the following parameters:

(I) Beds may be designed in any configuration subject to the approval of the permitting agency (square or round, for example), but the total number of square feet of bed bottom area must be determined by the formulas in subparagraph (C) of this paragraph.

(II) At least two beds must be constructed with valving arranged to allow the effluent from a sewerage unit to alternate between each bed. When one bed becomes saturated (top of bed remains moist) the

valving must be operated to allow effluent to flow into the alternate underloaded bedding. In order to determine the water level in the beds during use, an inspection port shall be installed in each bed. Inspection ports shall be designed to prohibit access to the bed bottom by insects, small animals and unauthorized persons.

(III) The beds shall be constructed as shallow as possible with a depth ranging from 18 inches to a maximum of 36 inches. This is necessary to keep the beds aerobic and prevent clogging. Treatment tankage should be installed as high as practical to permit shallow bed construction.

(IV) It is possible for a liner to be damaged after it has been covered, causing the bed to leak sewage without showing at the surface. At the discretion of the permitting agency, each bed may be required to have a separate monitor system installed in a manner that will facilitate collection and sampling of effluent leakage from a ruptured liner. The monitor system is designed to offer a means of detecting liner failure through periodic dye testing and sampling, which will help ensure the protection of the environment. The entire monitor system must be assembled and ready for approval during a single inspection. No sand shall be put in place as a cushion until the monitor system has been inspected and approved by the licensing authority.

(V) As regards leak monitor system, its design features, as illustrated in Figure 6, are as follows:

(-a-) As regards leak monitor piping material, all piping must be three to four inches in diameter. All perforated collection lines of an evapotranspiration bed monitor system must conform to the pipe material requirements set forth in paragraph (2)(A)(iii) of this subsection. The standpipe and sample sump must be of Schedule 40 polyvinyl chloride or stronger. Leak monitor collection pipe shall be wrapped with a filter cloth meeting requirements as set forth in paragraph (7)(B) of this subsection. All connections shall be glued or rubber gasketed joints with the exception of the intruder resistant standpipe cap located at finished topsoil grade. Perforations in the collection lines must face downward, with the two rows of perforations equally offset perpendicular to the ground.

(-b-) Collection line length. The end(s) of the perforated collection line(s) shall extend to within two feet of both opposite ends of the bed, measured at the bed bottom.

(-c-) Number of collection lines. An evapotranspiration bed which is 20 feet wide or less shall have a minimum of one collection line which must be located centrally, down the length of the bed. An evapotranspiration bed which is greater than 20 feet but equal to or less than 40 feet in width, shall have a minimum of two collection lines. These lines must be equally spaced (within approximately one foot) from the edge of the bed to pipe, and from pipe to pipe, installed parallel down the length of the bed. The two collection lines must be jointed by a perforated header line. As indicated in item (-b-) of this subclause, the header line shall be within two feet, and parallel, to the edge of the bed measured at the bed bottom. Monitor systems for lined evapotranspiration beds wider than 40 feet shall be designed as required by the permitting agency.

(-d-) Collection line grade. The collection line system must maintain a minimum fall of 1/16 inch per foot toward the standpipe/sump assembly.

(-e-) The collection line(s) shall tee into a two to three-inch diameter standpipe which must have a sampling sump below the bottom of the tee. This sump shall be eight to 12 inches in depth, measured from the bottom of the tee. A cap or plug must be glued to the bottom of the sump to provide a watertight connection. The top of the standpipe shall be flush with the finished grade of topsoil, and shall be covered with an intruder-resistant, removable access cap. A minimum three-inch wide by three-inch deep dry moat shall surround the standpipe cap to facilitate ease of cap removal and replacement.

(-f-) Pit bottom grade. The pit bottom on which the collection line(s) shall be placed must be an impermeable surface, graded to provide a minimum fall of 1/8 inch per foot toward the collection line from either side. This will result in an impermeable shallow vee trench for the collection line to rest in.

(-g-) Sand cushion. The collection line(s) shall be located within the sand cushion required under lined beds. The minimum four-inch sand cushion depth will increase as it follows the grade fall of the pit bottom toward the collection line. The backfill material around the standpipe should consist of sand or sandy loam.

(VI) Rock media that is generally one uniform size from 0.75 to 2.0 inches shall be placed on the bed bottom to a minimum depth of 12 inches after the liner and sand cushion are placed over the monitor system.

(VII) The top of the distribution pipe must be flush with the rock media and adequate to provide for uniform distribution of effluent. A 12-foot maximum separation between pipes and three to four feet separation between bed walls and the pipe is permissible. The bed bottom and the pipe must be level.

(VIII) A permanent water permeable sand barrier, such as geotextile filter fabric, is then placed over the rock. Sand is then added to fill the bed to within two inches from the top.

(IX) In order to provide continuous capillary action in the sand, wicks shall be incorporated in the rock media. Wicks are simply sand structures which penetrate through the rock media to the bottom of the bed (See Figure 7). The total wick area shall be 10 to 15 percent of the bed surface area and shall be uniformly spaced throughout the bed. Wicks may also be constructed by simply grading furrows in the rock media in between the distribution pipe. In areas of the State where rock media is difficult to obtain, the total amount of rock may be reduced by filling the initial 12 inches of the bed with coarse sand (2.0 millimeters) and placing rock media only around the top, bottom and sides of the distribution pipe to form an 18-inch enclosure, as indicated in Figure 7.

(X) After the sand is in place, the final two inches of bed volume are filled with sandy loam and mounded with a downward slope of two to four percent.

(XI) Final bed construction consists of covering the surface of the bed with vegetation having good transpiration properties and providing for the most stormwater diversion that is practical.

(C) Bed sizing. Evaporation and rainfall data for various areas of the state are listed in Table VII. Additional data may be found in Report 192 and Report LP192, published by the commission. After the reader considers the requirements in subparagraph (B) of this paragraph, the bed area may be approximated by using the following formulas:

For Single Family Situations:

$$A = \frac{31{,}000\ (1 + B)}{E_A - 1/2\ RFR_A}$$

Where A = Total area of both beds (To find one bed area divide A by 2)

B = Total number of bedrooms (B=2 for minimum residence. For a two bedroom house with a living area of 1500 sq. ft. or more - use B=3. For each additional 800 sq. ft. - increase B by one.)

E_A = Mean pan evaporation rate in inches per year (See Table VII)

RFR_A = Mean rainfall rate in inches per year (See Table VII)

For Non-single family residential situations:

$$A = \frac{310\ Q}{E_A - 1/2\ RFR_A}$$

Where Q = Average daily flow into the system, expressed as gallons per day (See Table III).

Evaporation and rainfall data for various areas of the State are listed in Table VII. Additional data may be found in "Report 192" and "Report LP192", published by the commission.

(D) Plants and grasses for transpiration. The bed surface shall be covered with vegetation designed to take maximum advantage of transpiration, depending on the season and site's location. Evergreen bushes having shallow root systems can be planted in the bed to assist in water uptake. If grasses are used which have dormant periods, steps shall be taken to provide appropriate vegetation on the beds during these periods. Overseeding with winter grasses is commonly used to provide year-round transpiration.

(E) Geographical location of installation considering rainfall data. Some areas of the State with high annual rainfall are not well suited for the installation of evapotranspiration systems. Counties in the eastern part of the State in which the annual rainfall exceeds the annual evapotranspiration rate, should only utilize this type of system as a last resort and with considerable design conservatism.

(5) Pressure dosing systems (a disposal alternative).

(A) Description. A basic pressure dosing system must consist of an approved sewerage system, an effluent holding tank, an easily serviced screened intake electric pump which is activated by a float or programmed start/stop switch, a solid wall force main, and perforated distribution piping which is installed within the

absorption area. The effluent pump must be capable of an operating range that will assure that effluent is delivered to the most distant point of the perforated piping network, yet not be excessive to the point that "blow-outs" occur in shallow systems. The programmed start/stop switch should allow the pump to operate at least three times during the 24-hour day. A high-water alarm, on an electric circuit separate from the pump, must be provided. After the alarm activates, the residential or institutional effluent holding tank shall have the storage capacities as stated in Section 301.12(a)(4)(F) or Section 301.12(b)(5) of this title (relating to Design Standards for Sewerage Systems). The number of perforations per length of pipe and the number of pipe lengths used per absorption area must be adequate to assure uniform liquid distribution over the entire bed area.

(B) Application. Pressure dosing is an appropriate method of conveying effluent from a treatment site that is at a lower elevation than the disposal site. It is also appropriate where seasonal high water tables exist or where the soil mantle thickness is from two to four feet to solid rock. In these situations the system must be oversized substantially to promote the effect of evapotranspiration. Commercial establishments may need to use continuously staged pressure dosing if their flow rates vary greatly during their business hours. The United States Department of Commerce (USDC) has produced North Carolina State University Sea Grant College Publication UNC-S82-03 which discusses the design of a low pressure dosing system for subsurface disposal of treated sewage. It is a 31-page document that was published for public use in May 1982. Inquiry on how to obtain a copy should be sent to the department. At the discretion of the local regulatory agent, pressure dosing systems must be designed by a registered professional engineer, registered professional sanitarian or other qualified designer. Minimum gravel size for these systems shall be 3/8 inches. The EPA Design Manual, discussed in subsection (a) of this section, also has information. Although these publications are referred to for design information, the department does not adopt them or any other technical literature.

(6) Mound systems (a disposal alternative).

(A) Physical description. A mound system is comprised of the native soil above the restricting layer (groundwater level, fissured rock, etc.), a scarified interface between the native soil and a sand fill, a sand fill, a gravel distribution bed, distribution piping, and a topsoil cover. The depth of the material between the gravel distribution bed and the restricting layer shall be at least four feet. The preferred shape is a long narrow rectangle, with the long dimension laid out along a contour. Effluent shall be pressure-dosed into the distribution piping to ensure equal distribution and to control application rates as described in Section 301.13(c)(4).

(B) Application. The purpose of this type of construction is to overcome adverse conditions at the disposal site such as a high groundwater table, shallow soil, impermeable soils, and high potential for flooding, for example. In general, the mound is constructed of a high quality soil which is brought in from another area. Since there is a potential for leakage from this type of system which could result in the surfacing of sewage around its perimeter, it is not recommended for use except as a last resort. If approved by the local permitting authority, it may be used in an effort to improve the operation of a malfunctioning disposal system. Applications of effluent to a mound system depend upon the selection of fill materials used, the absorption rate of the natural ground, and depth to the shallow groundwater table. Design information for mound construction may be obtained by ordering the Publication List of the Small Scale Waste Management Project, 1987, which is available from the University of Wisconsin, Room 240, Agricultural Hall, Madison, Wisconsin, 53706.

(7) Gravelless drainfield piping (a disposal alternative).

(A) Appropriateness. Gravelless pipe may be used in place of conventional gravel-filled trench systems. The regulatory authority and permit applicant shall carefully consider all site conditions and circumstances before arriving at decisions regarding pipe diameter selection, trench dimensions, depth of the installed pipe and suitability of on-site soil as backfill material.

(B) Physical description.

(i) Gravelless pipe generally consists of eight-inch or 10-inch diameter corrugated polyethylene pipe having two rows of perforations located approximately 120 degrees apart along the pipe's bottom half. The pipe is enclosed in a layer of unwoven spun-bonded polypropylene, polyester or nylon filter wrap. Pipe shall meet American Society for Testing and Materials, ASTM F-667 Standard Specifications for large diameter corrugated high density polyethylene (ASTM D 1248) tubing. Perforations shall be 1/2-inch diameter in 10-inch diameter pipe and 3/8-inch diameter in eight-inch diameter pipe. Perforations shall be arranged and spaced so that only one hole exists in each inner corrugation. The filter cloth must meet the following material specifications:

	Minimum Values
Weight, oz. per sq. yd. (ASTM D3776)	0.70
Grab Strength, lbs. (ASTM D4632)	11
Air Permeability, cfm per sq. ft. (ASTM D737)	500
Water Flow Rate, gpm/sq. ft. @ 3" head (ASTM D4491)	33
Trapezoidal Tear Strength, lbs. (ASTM D4533)	6

(ii) Installations must be in accordance with the pipe manufacturers' instructions. However, the system installer is cautioned against surrounding the pipe with native soils having percolation rates slower than 30 minutes per inch or laden with very fine soil particles that might plug the filter wrap.

(C) Design parameters. The design of an absorption bed, absorption trench or evapotranspiration disposal field utilizing this product shall be based upon the same parameters that are used in the design of more conventional systems.

Sec. 301.14. Disposal Alternatives/Special Applications.

(a) Surface irrigation systems. Designers and local authorities shall refer to Texas Department of Health for the most recent policy regarding the disposal of wastewater by surface irrigation. These systems must be designed by a registered professional engineer or registered professional sanitarian and submitted to the regulating authority or the department for approval.

(b) Greywater systems. Generally, blackwater and greywater are approximately 40 percent to 60 percent of the total domestic sewage flow, respectively. Subsurface greywater systems may be utilized with disposal of blackwater through a split system only under the following conditions.

(1) Designers and local authorities shall refer to the Texas Department of Health for the most recent policy regarding the disposal of greywater by subsurface absorption, evapotranspiration, or surface irrigation. A greywater disposal system utilizing anything other than conventional sewage treatment and absorption beds or trenches shall be designed and certified by a registered professional engineer, registered professional sanitarian, or qualified designer who can provide to the permitting authority evidence that the system complies with all appropriate state regulations and local governmental regulations.

(2) If flow restricting showerheads and faucet aerators are utilized throughout, a 10 percent reduction in greywater disposal trench, absorption bed, or evapotranspiration bed size will be allowed when a residential greywater system is incorporated into the disposal system design. The maximum allowable reductions in field size are determined by the type of system and the extent of watersaving fixture usage.

(c) **Composting toilets.** The composting toilet unit must be able to meet the requirements of the National Sanitation Foundation's Standard No. 41 relating to Wastewater Recycle/Reuse and Water Conservation Devices. The NSF seal on a particular unit indicates its ability to meet the requirements. Commercially manufactured units not bearing the NSF seal, or private custom designed units must be evaluated by the department. If the department finds that the system is designed in accordance with good engineering practices and has satisfactorily proven its performance in actual on-site situations, the unit may be approved by the department. The liquid waste from a composting toilet unit must be disposed of through an approved subsurface disposal system.

(d) **Sewage recycling systems.** For small on-site applications, sewage recycling systems are very limited in types and capability as follows.

(1) On-site sewage recycling as flush water for urinals and commodes in commercial and institutional projects may be possible when advanced tertiary treatment processes are engineered into designs that meet or exceed NSF Standard 41 testing and certification requirements. An approvable design will be permitted only after the supplier and user of the recycle system enter into a post-installation inspection, maintenance and repair agreement that satisfies the permitting authority.

(2) Proposals to recycle highly refined sewage for use outside project buildings such as for surface landscape irrigation will be subject to requirements indicated in Section 301.11 (f) of this title (relating to General Procedures and Information) and by the Texas Water Commission in 31 TAC Chapter 317 (Section 317.1 - 317.13), relating to "Design Criteria For Sewerage Systems."

Sec. 301.15. On-site Sewerage System Maintenance and Water Conservation.

(a) The professional installer should provide the owner of an on-site disposal system the following maintenance and water conservation information free of charge:

(1) An on-site sewerage system should not be treated as if it were a city sewer;

(2) Economy in the use of water helps prevent overloading of a sewerage system that could lessen its usefulness;

(3) Leaky faucets and faulty commode fill-up mechanisms should be carefully guarded against;

(4) Garbage grinders can cause a rapid buildup of sludge or scum resulting in a requirement for more frequent cleaning and possible system failure;

(5) The excessive use of garbage grinders and grease discarding should be avoided.

(b) Water conservation measures that will reduce the load on the on-site sewerage system include the following:

(1) Showers usually use less water than tub baths. If showers are used, install a shower head that restricts the flow from about five gallons per minute to approximately two and one-half gallons per minute. Try taking shorter showers to save water.

(2) If you take a tub bath, reduce the level of water in the tub from the level to which you customarily fill it.

(3) Do not leave the water running while brushing your teeth or washing your hands.

(4) Check commodes for leaks that may not be apparent. Add a few drops of food coloring to the tank. Do not flush. If the color appears in the bowl within a few minutes, the toilet flush mechanism needs adjustment or repair.

(5) Do not use the toilet to dispose of cleaning tissues, cigarette butts or other trash. This disposal practice will waste water and also impose an undesired solids load on the treatment system.

(6) Reduce the amount of water used for flushing the commode by installing a toilet tank dam or filling and capping two one-quart plastic bottles with water and lowering them into the tank of the commode. Do not use bricks since they may crumble and cause damage to the fixture. If a new toilet is installed, install a 1-1/2 gallon (or less) commode rather than the conventional three-to-five gallon fixture.

(7) Try to run the dishwasher with a full load, whenever possible.

(8) Avoid running the water continuously for rinsing kitchen utensils or for cleaning vegetables.

(9) Use faucet aerators that restrict flow to no more than 2.75 gallons per minute to reduce water consumption.

(10) Keep a container of drinking water in the refrigerator instead of running the faucet until the water turns cool.

(11) Insulate all hot water pipes to avoid long delays of wasted water while waiting for the heated water.

(12) Repair leaky faucets.

(13) Ask your city, county or local government about their programs to conserve water and how they can help you save water.

(c) Septic tanks shall be cleaned before sludge accumulates to a point where it approaches the bottom of the outlet device. If sludge or scum accumulates to this point, solids will leave the tank with the liquid and possibly cause clogging of the perforations in the drainfield line resulting in sewage surfacing or backing up into the house through the plumbing fixtures.

(d) Since it is not practical for the average homeowner to inspect his tank and determine the need for cleaning, a regular schedule of cleaning the tank at two-to-three year intervals should be established. Commercial cleaners are equipped to readily perform the cleaning operation. Owners of septic tank systems shall engage only persons registered with the Texas Department of Health to transport the septic tank cleanings.

(e) Do not build driveways, storage buildings or other structures over the sewerage system or its disposal field.

(f) Chemical additives or the so-called "enzymes" are not necessary for the operation of a septic tank. Some of these additives may even be harmful to the tank's operation.

(g) Soaps, detergents, bleaches, drain cleaners and other household cleaning materials will very seldom affect the operation of the system. However, moderation should be exercised in the use of such materials.

(h) It is not advisable to allow water softener back flush to enter into any portion of the on-site sewerage system.

(i) The liquid from the sewerage system is still heavily laden with bacteria. The surfacing of this material constitutes a hazard to the health of those that might come into contact with it.

(j) For residential systems, up to a 20 percent reduction in the size of the blackwater absorption beds or trenches will be allowed, or up to a 10 percent reduction in blackwater evapotranspiration beds will be allowed, if approvable watersaving blackwater fixtures are made a part of the sewerage system design.

Sec. 301.16. Unsatisfactory On-Site Disposal Systems. The construction and use of those systems not in accordance with the Health and Safety Code, Chapter 341, (Texas Civil Statutes, Article 4477-1) constitutes a violation. The department considers the following on-site disposal systems unsatisfactory because they tend to create nuisances and other conditions prejudicial to the public health:

(a) Cesspools. Cesspools were once commonly used in rural areas for disposal of domestic wastes. Cesspool designs consisted of constructing a pit into permeable soil and curbing the sides of the pit with open-jointed material to the bottom of the pit. Raw sewage was discharged directly into the cesspool and the organic material anaerobically decomposed while the partially treated wastewater was absorbed by the adjacent permeable soil. Since the threat of injury to public health is greater when raw or partially treated wastewater is in direct contact with the absorptive soil, this method can no longer be considered as an approved means of sewage disposal.

(b) Bore holes and injection wells.

(1) Bore holes and injection wells used for disposal of domestic wastes generally consist of a drilled hole greater than four feet in depth and varying in diameter from eight inches to 36 inches or larger. Usually, the holes are filled with crushed stone and are dug to a depth which intercepts a permeable soil layer. Raw sewage is discharged into these holes directly or after detention in a septic tank.

(2) The use of bore holes or injection wells for domestic sewage disposal is not an approved disposal method because it is possible to contaminate underground water. Injection wells approved and permitted by the commission are acceptable to the department. Injection wells used for private sewage disposal, as defined in Section 301.11(b)(22) of this title (relating to General Procedures and Information) are not subject to regulation by the commission, however. Their use will not be approved as stated in Section 301.11(f)(2) of this title (relating to General Procedures and Information).

(c) Seepage pits.

(1) Seepage pits are rock-filled or lined pits dug to a depth in excess of four feet and located at the end of a septic tank absorption field system. The pits are generally used to dispose of wastewater which would normally not be absorbed in the absorption field and would otherwise surface.

(2) Seepage pits are not an approved method of wastewater disposal for the same reasons that apply to bore holes and injection wells. Subsurface water contamination may occur with these systems and the anaerobic bacteria present in the wastewater may eventually cause plugging problems in the seepage pit.

Sec. 301.17. Tables and Figures

TABLE I

MINIMUM REQUIRED SEPARATION DISTANCES IN FEET FOR ON-SITE SEWERAGE UNITS

From To:	Sewage Treatment Tanks or Holding Tanks	Lined Evapo. Beds	Soil Absorption Systems or Unlined Evapo. Beds	Sewer Pipe With Watertight Joints
Private Water Wells, Underground Cisterns and Pump Suction Pipes	50	150*	150 +	20
Public Water Wells	50	150*	150	20
Water Supply Lines	10	10	10	9
Streams, Ponds, Lakes and Salt Water Bodies****	75	75*	75	20
Sharp Slopes, Breaks	5	—	50**	5
Foundations, Structures and Surface Improvements	5	5	15	—
Property Lines	10	10	10	—
Easement Lines	1	1	5***	—
Soil Absorption Systems	5	5	20	—
Swimming Pools	15	15	15	—

* When a leak detection system, as described in Sec. 301.13.(c)(3)(A)(ii)(IV)(-a-) is used, the minimum required distance is 50 feet to existing private water wells, cisterns and pump suction pipes.

** The absorption system's bottom must be a minimum of 50 feet from any break or outcropping ledges, unless it is designed by a Registered Professional Engineer or a Registered Professional Sanitarian having hydrogeological data of the strata below the system's site. Greywater disposal areas may be installed as close as 25 ft. from the slope face.

*** A drainage easement having sloped sides greater than 30% or grade breaks will require adherence to the 50 foot criteria indicated by **.

\+ This distance may be reduced to a minimum of 50 feet, for existing or proposed private water wells only, if the space between the existing private water well casing and the surrounding ground is filled with cement slurry that is pumped through a tube that extends to the required depth of sealing. This depth shall be at least two times the horizontal encroachment measurement but not more than the depth to the water producing strata. A three foot square by six inch thick concrete slab shall be poured around the casing.

**** These distances apply to high-tide water levels only.

TABLE III

INDIVIDUAL USAGE RATES IN BUSINESSES/INSTITUTIONS

This table may be used for estimating gallons of daily sewage flow per person to determine minimum tank capacity requirements, unless actual water usage data is available and has been carefully checked by the designer of the proposed system.

TYPE OF ESTABLISHMENT	GALLONS/PERSON/DAY
Airports (per passenger)	5
Apartment Houses	50
Boarding Schools	50
Churches (per member)	5
Country Clubs (per resident member)	100
Country Clubs (per non-resident member present)	25
Day Care Centers (without kitchen)	15
Day Care Centers (with kitchen)	25
Drive-In Theaters (per car space)	5
Factories (gallons per person per shift, exclusive of industrial wastes)	20
Hospitals	200
Hotels	80
Institutions other than Hospitals	100
Laundries Self-service (gallons per wash, i.e., per customer)	50
Lounges (bar & tables)	10
Mobile Homes	75
Motels	50
Movie Theaters (per auditorium seat)	5
Office Buildings*	15
Parks (without bathhouse)	5
Parks (with bathhouse)	15
Restaurants (24-hour full service)	70/seat/day
Restaurants (breakfast/lunch or lunch/dinner)	35/seat/day
Restaurants (fast food — paper plate service)	15/seat/day
Schools without cafeterias, gymnasiums or showers	15
Schools with cafeterias, but no gymnasiums or showers	20
Schools with cafeterias, gymnasiums and showers	25
Service stations (per vehicle served)	10
Stores (total per day per washroom)	400
Swimming Pools and Bathhouses	10
Townhouses (with clothes washer)	50
Travel Trailer/RV Parks	50/space/day
Vet Clinics (per animal)	10
Work or Construction Camps (semi-permanent)	50
Youth camps (no showers or meals served)	15

*Note: Offices without Food Service or Bathing Facilities, with Restrooms Equipped with Toilets Requiring 1.5 Gallon per Flush or Less, and Automatic Cutoff Faucets 6

TABLE II

SEPTIC TANK MINIMUM LIQUID CAPACITIES

NUMBER OF BEDROOMS	SEPTIC TANK CAPACITY (Gallons)
Two or less	750
Three	1,000
Four	1,250
For Each Additional	250

NOTE: The Inside Liquid Depth Of The Tank Shall Not Be Less Than 30 Inches.

See Table VI For Calculating The Number Of Bedrooms Based On Dwelling Living Area.

Consideration shall be given to increasing total tank capacity if extensive use of kitchen sink waste grinders or disposals is anticipated.

TABLE IV

FLOW SHEET FOR SELECTING PROPER SUBSURFACE DISPOSAL METHODS

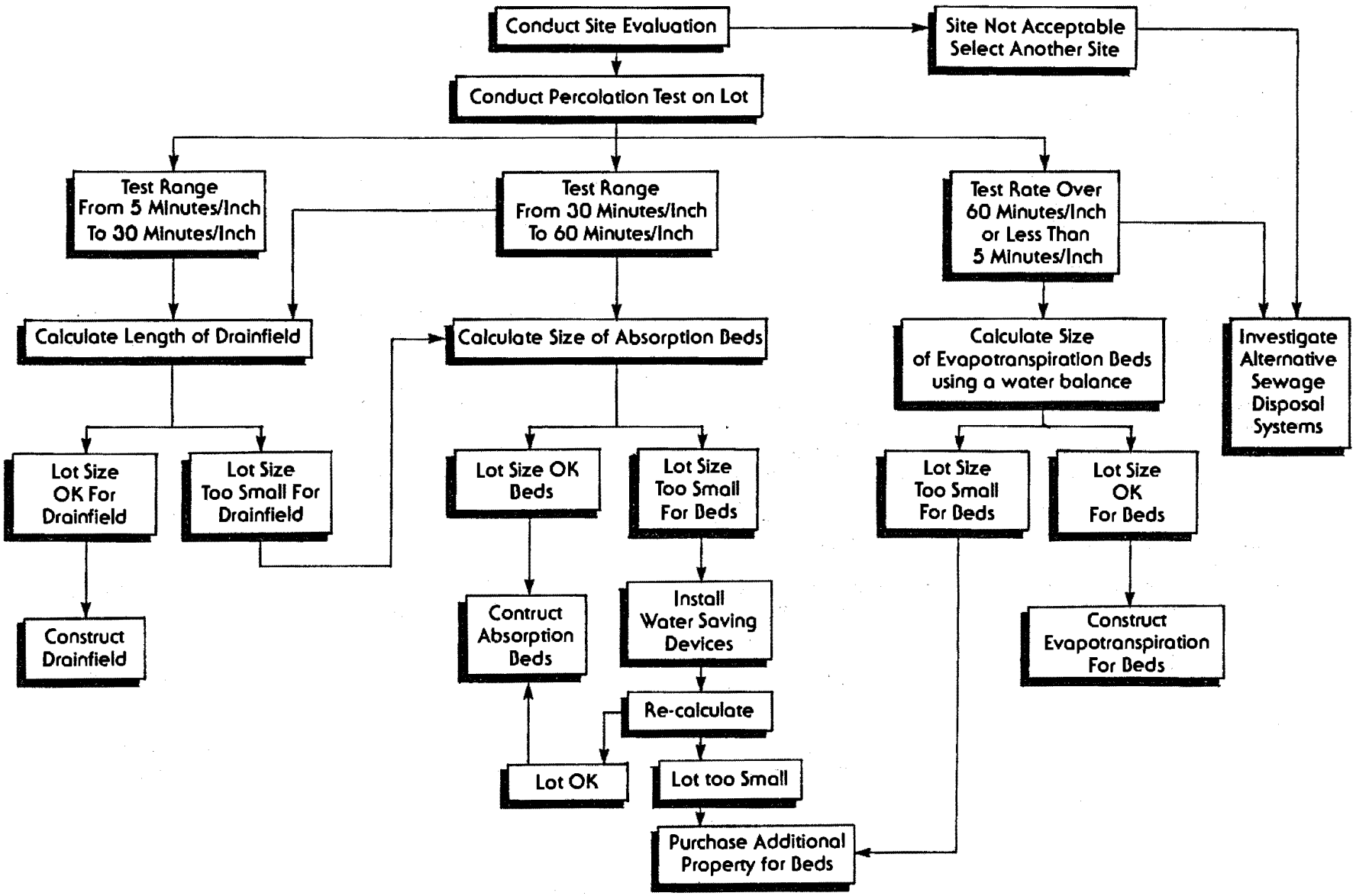


TABLE V

CRITERIA FOR SOIL ABSORPTION OF SEWAGE EFFLUENT DEVELOPED FOR SITE SPECIFIC EVALUATIONS

Site Characteristic	Classification: Suitable	Classification: Provisionally Suitable (1)	Classification: Not Suitable
Topography	Slopes 0-15%	Slopes 15-30%	Slopes greater than 30% Complex slopes.
Subsoil Texture	Sandy soils Loamy soils	Clayey soils with low shrink-swell potential.	Clayey soils with high shrink-swell potential.
Subsoil Structure		Angular or subangular blocky.	Platy structure. Weathered rock. Massive clayey soils.
Soil Depth	Weathered rock or consolidated bedrock greater than 48 inches below the bottom of disposal system.	Weatherer bedrock or consolidated rock from 36 to 48 inches below the bottom of disposal system.	Weathered rock or consolidated bedrock less than 36 inches below the the bottom of disposal system.
Restrictive Layer	None within 36 inches of the ground surface.		Restrictive horizon within 36 inches of the ground surface or below the trench bottom.
Soil Drainage	No drainage mottles within 36 inches of the bottom of disposal system.		Drainage mottles (chroma 2 or less) within 36 inches of the bottom of disposal system.
Flooding			Areas subject to a possible flood. Depressional areas without adequate drainage.
Percolation	Greater than or equal to 5 min/inch but less than or equal to 60 min/inch.		Less than or equal to 5 min/inch or greater than 60 min/inch. Unselective fill materials.

(1)Soil may be reclassified from unsuitable to provisionally suitable under certain conditions using acceptable site or system modification.

TABLE VI

CONVENTIONAL ABSORPTION TRENCH AND BED SIZING REQUIREMENTS FOR SINGLE FAMILY RESIDENTIAL DWELLINGS

Average Percolation Rate (Minutes/Inch)		Sewage Application Rate, R_a	Soil Texture (See Table VIII USDA Soil Textural Classifications)	Minimum Bottom Area (Sq. Ft.) For a One or Two Bedroom House (Living areas less than 1500 Sq. Ft.)		Minimum Bottom Area For Each Additional Bedroom* (Sq. Ft./Bedroom)	
Minutes Per Inch	Inches Per Hour	Gallons per Sq. Ft. Per Day		Trench	Bed	Trench	Bed
Less Than 5	More Than 12	Too Great For Consideration	Sand/Gravel	Conventional Systems Not Allowed See Section on Alternate Systems**			
5-15	4-12	0.6	Sandy Loam	380	750	200	250
15-30	2-4	0.5	Sandy Clay	500	900	250	300
30-45	1.3-2	0.4	Silty Clay	625	1125	300	400
45-60	1.0-1.3	0.3	Clay Loam	800	1500	400	500
More Than	Less Than	Less Than	Clay	Conventional Systems Not Allowed See Section on Alternate Systems **			

Minimum trench bottom area is calculated to include capacity for washing machine wastewater, organic material from garbage grinders, and infiltration from rainfall.

Required minimum spacing between parallel conventional absorption trenches is 3 trench widths, or five feet whichever is smaller.

*When dwellings consist of a large living area relative to the number of designated bedrooms, the following guidelines should be used to approximate the trench area:

For a two bedroom house with a living area of 1500 sq. ft. to 1900 sq. ft. — Use trench area for three bedroom house. For each additional 800 sq. ft. — Add trench area equal to one bedroom.

This criteria is valid for normal residential water consumption of approximately 75 gpd per resident by an average household occupancy and is not applicable to collective sewage system design.

**Disposal alternatives include evapotranspiration beds, low-pressure dosing systems, mound systems, gravelless drainfield piping, composting toilets, sewage recycling or items approved through department policy.

TABLE VII

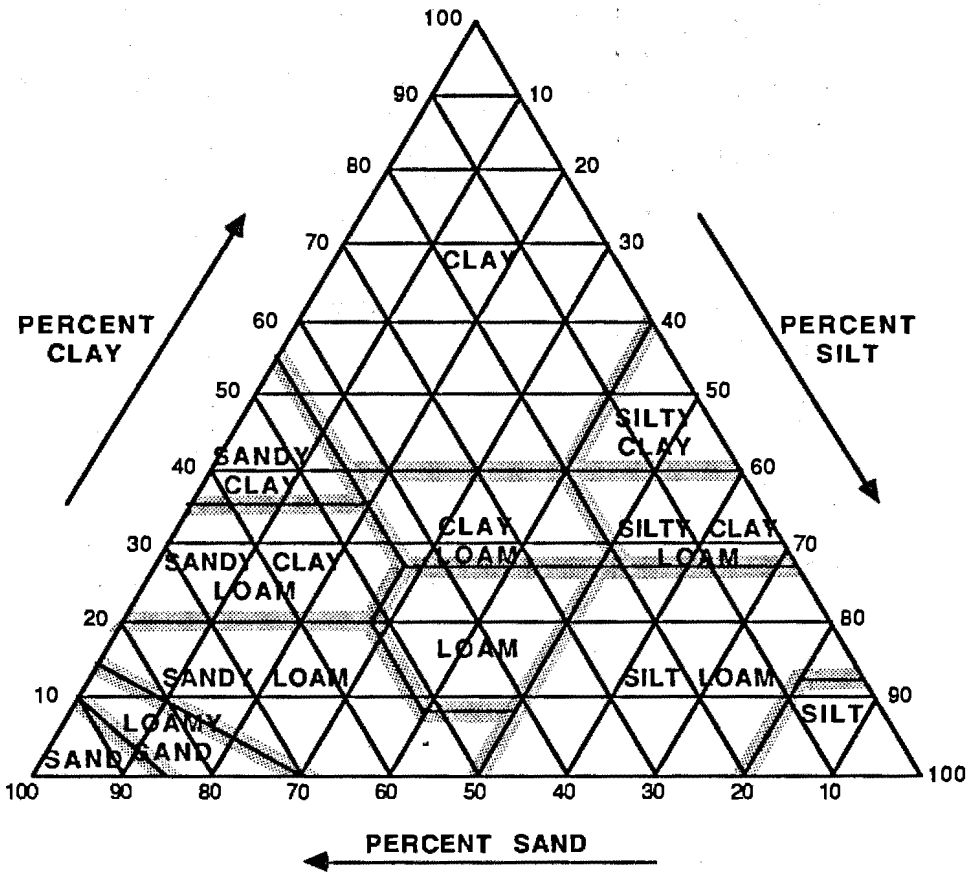
MEAN PAN EVAPORATION AND RAINFALL

Station	E_A Mean Evaporation Rate (Inches/Year)	RFR_A Mean Rainfall (Inches/Year)	1/2 RFR_A (Inches/Year)
Amarillo	87.9	18.8	9.4
Austin	70.0	32.49	16.25
Beaumont	47.8	55.07	27.54
Big Spring	81.22	17.8	8.9
Brownsville	56.0	25.13	12.57
Chilicothe	68.84	24.0	12.6
Canyon Lake	80.8	33.19	16.60
Daingerfield	74.2	44.8	22.4
Dallas	85.0	35.94	17.97
El Paso	106.5	7.77	3.89
Fort Stockton	105.6	11.85	5.93
Houston	48.7	48.19	24.09
Lake Somerville	71.7	37.45	18.73
Laredo	108.6	21.0	10.5
Lubbock	88.7	18.41	9.21
Nacogdoches	44.84	45.0	22.5
San Antonio	64.68	30.0	15.0
San Angelo	109.36	19.0	9.5
Temple	68.2	34.00	17.0
Throckmorton	80.64	25.8	12.9
Tyler	44.87	42.0	21.0

NOTE: These rainfall and evaporation rates are based on best available historical records. However, local meteorological data may yield a more conservation design. In these cases, planners are advised to utilize local data.

TABLE VIII

USDA SOIL TEXTURAL CLASSIFICATIONS



Clay— Smaller than 0.002 millimeters in diameter

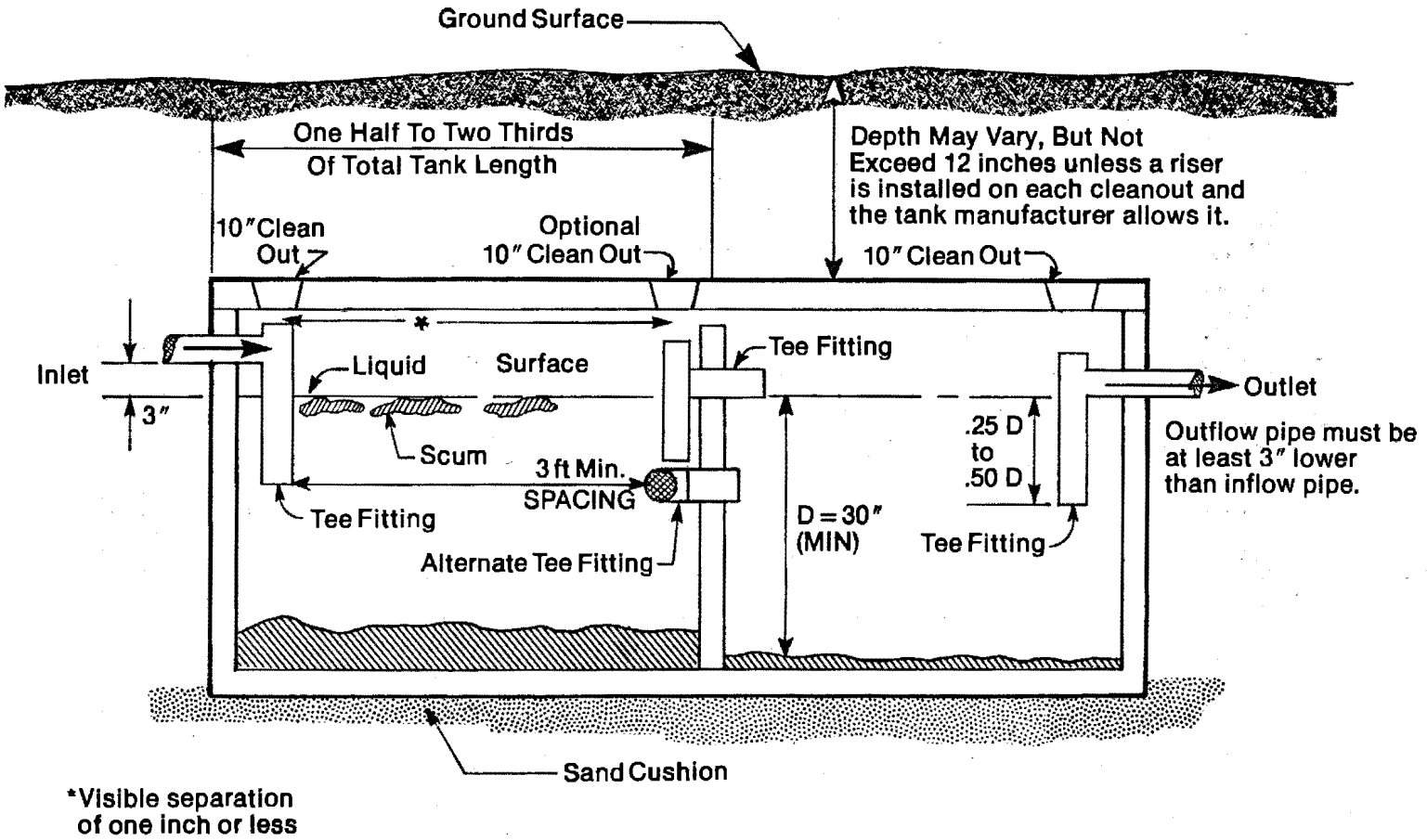
Silt — 0.05 to 0.002 millimeters in diameter

Sand — 2.0 to 0.05 millimeters in diameter

(Sand shall be free of organic matter and shall be composed of silica, quartz, mica or any other stable mineral).

FIGURE 1

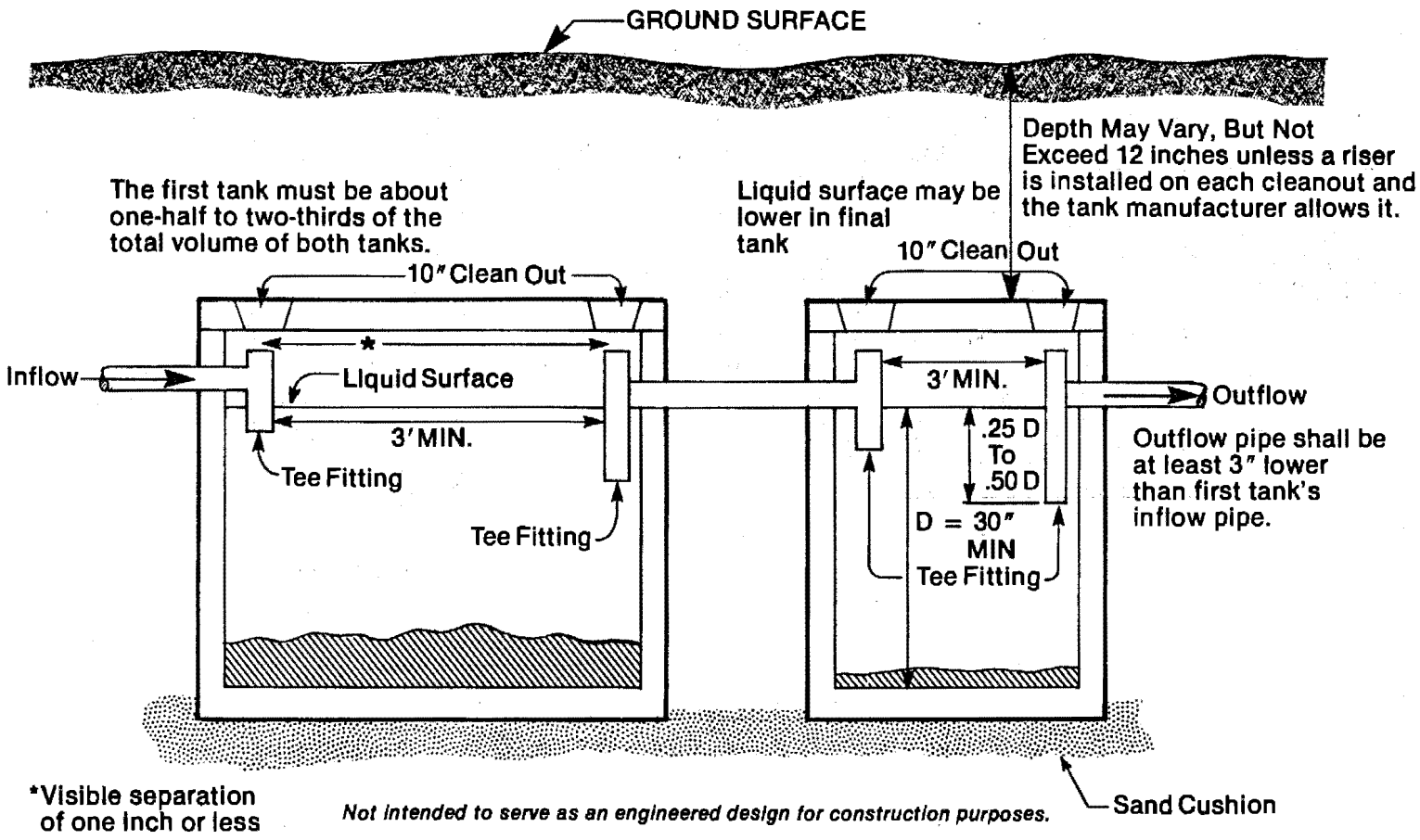
TWO COMPARTMENT SEPTIC TANK



Not intended to serve as an engineered design for construction purposes

FIGURE 2

TWO SEPTIC TANKS IN SERIES

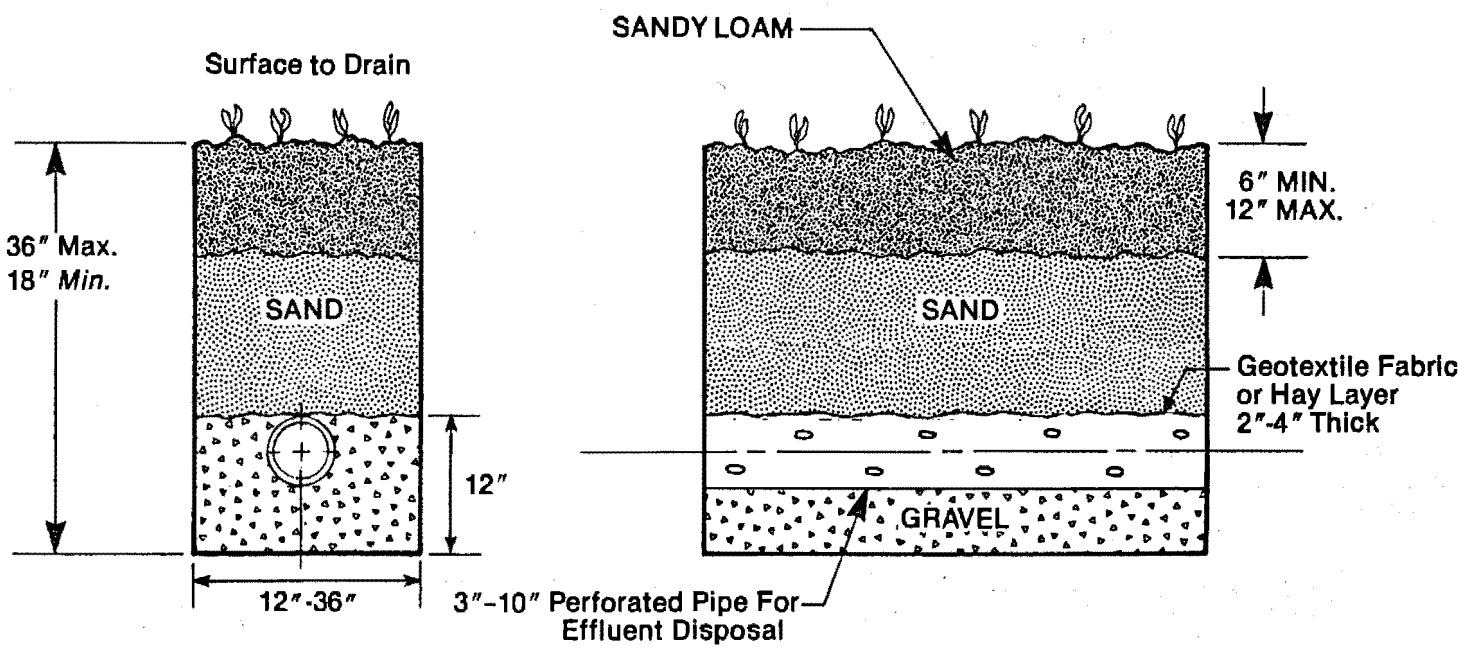


*Visible separation of one inch or less

Not intended to serve as an engineered design for construction purposes.

FIGURE 3

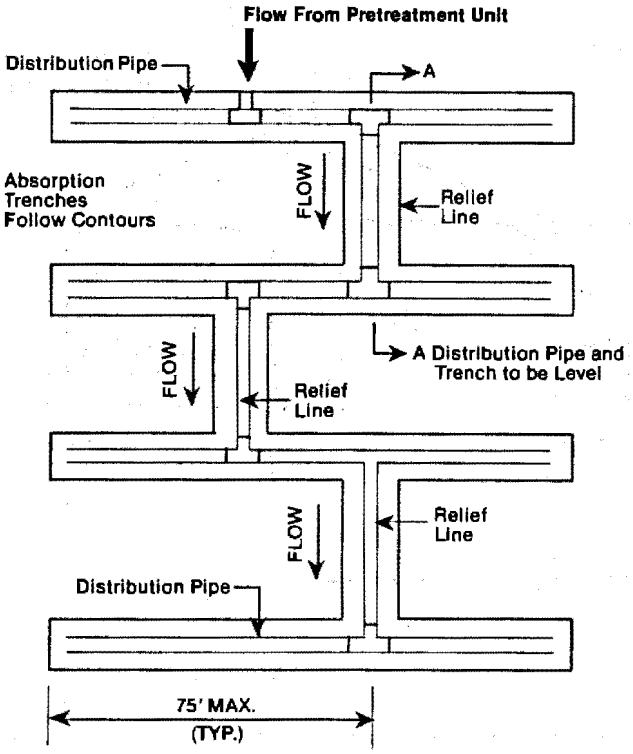
SOIL ABSORPTION TRENCH



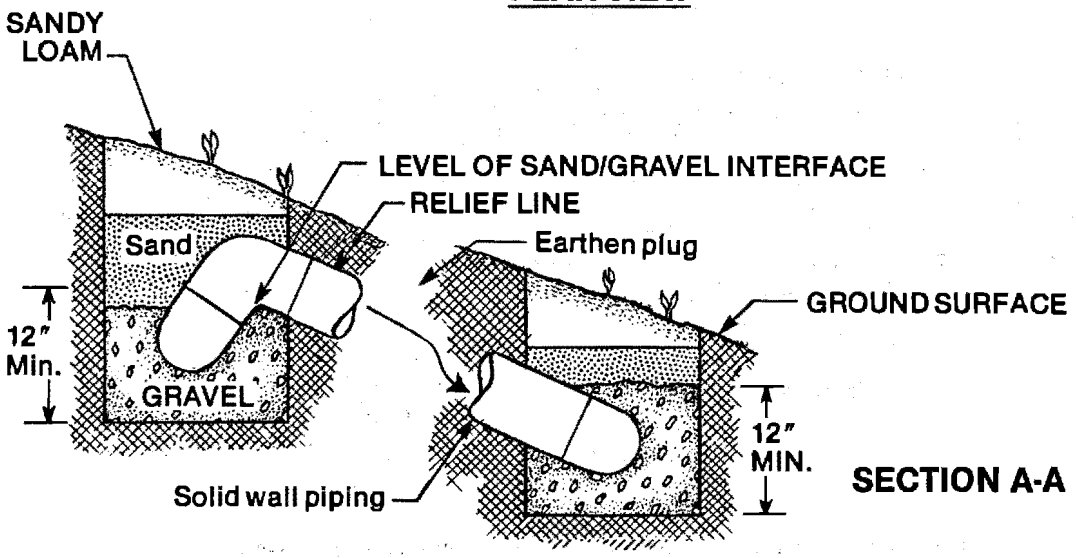
Not intended to serve as an engineered design for construction purposes.

FIGURE 4

ABSORPTION TRENCH
SYSTEM FOR SLOPING GROUND
(for slopes not greater than 15% and without sharp grade breaks)



PLAN VIEW

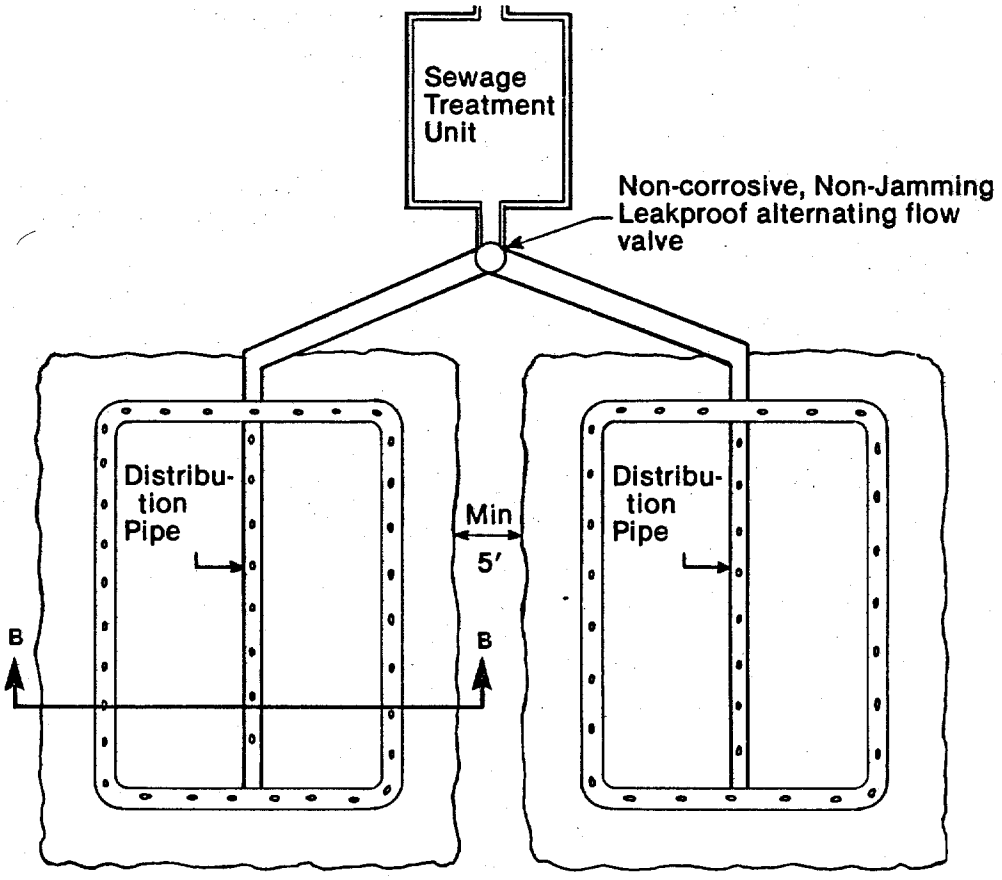


SECTION A-A

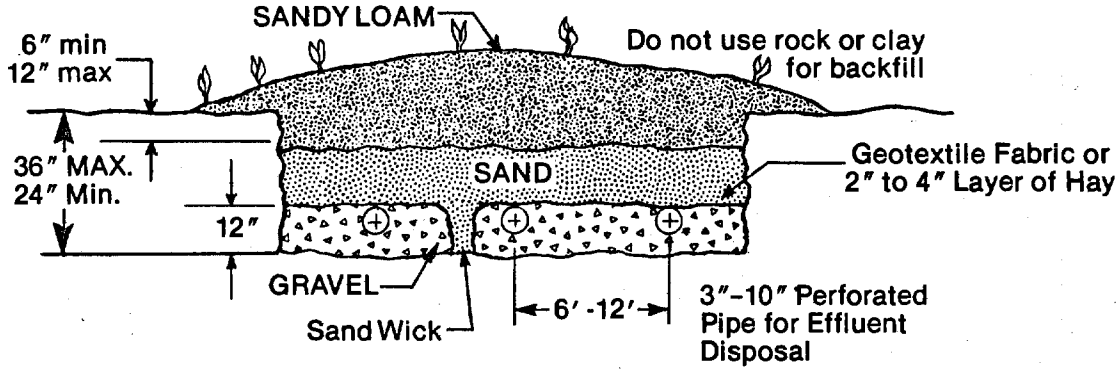
The septic tank and perforated piping shall be installed level while compacted earthen plugs shall separate the solid wall piping from the perforated piping and gravel. The interface between the sand and gravel layers shall be at the same elevation as the bottom of the 90 degree elbow.

FIGURE 5

SOIL ABSORPTION BED DETAILS



Plan View Of Dual Bed System

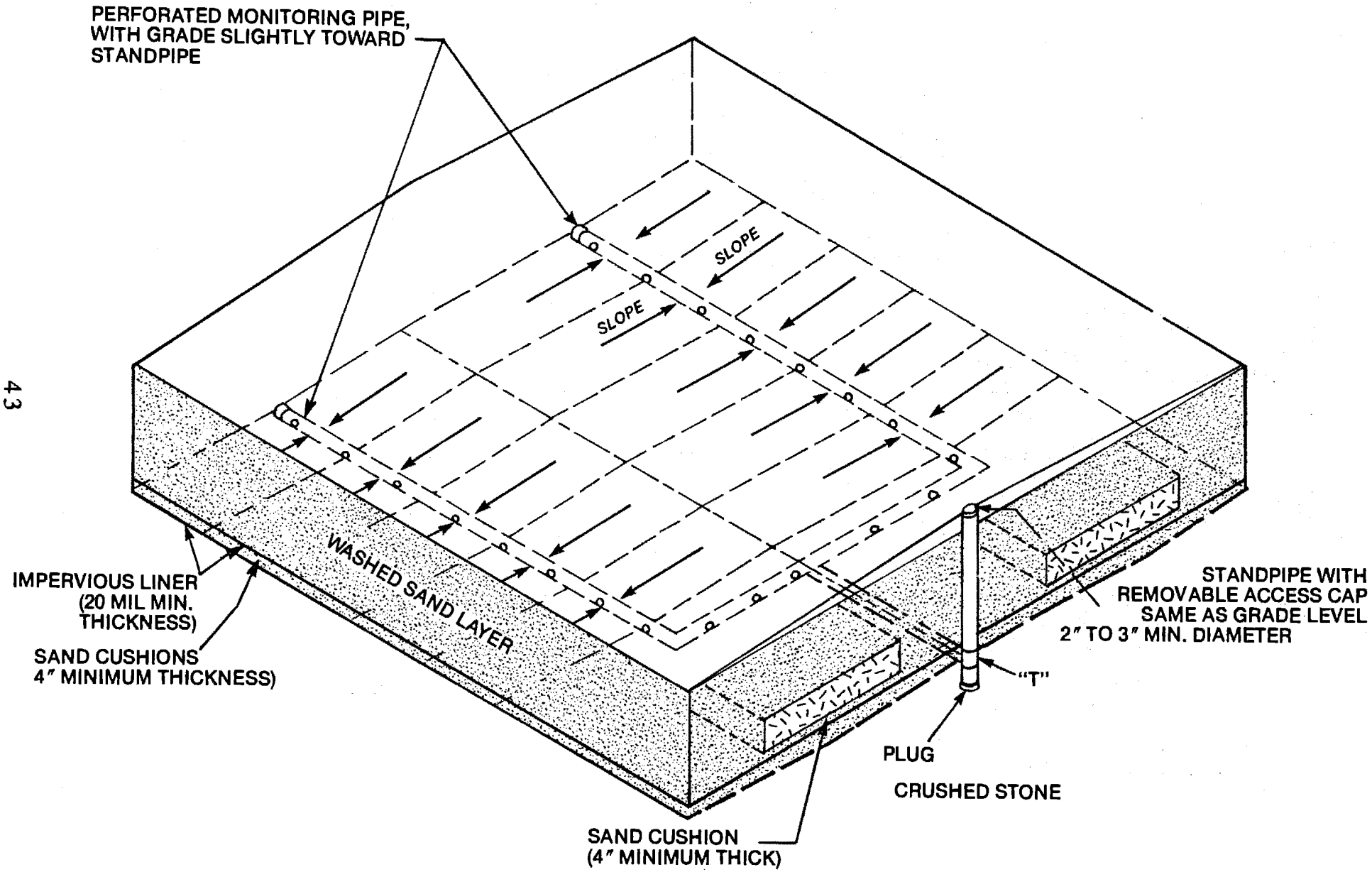


Section B-B

Not intended to serve as an engineered design for construction purposes.

FIGURE 6

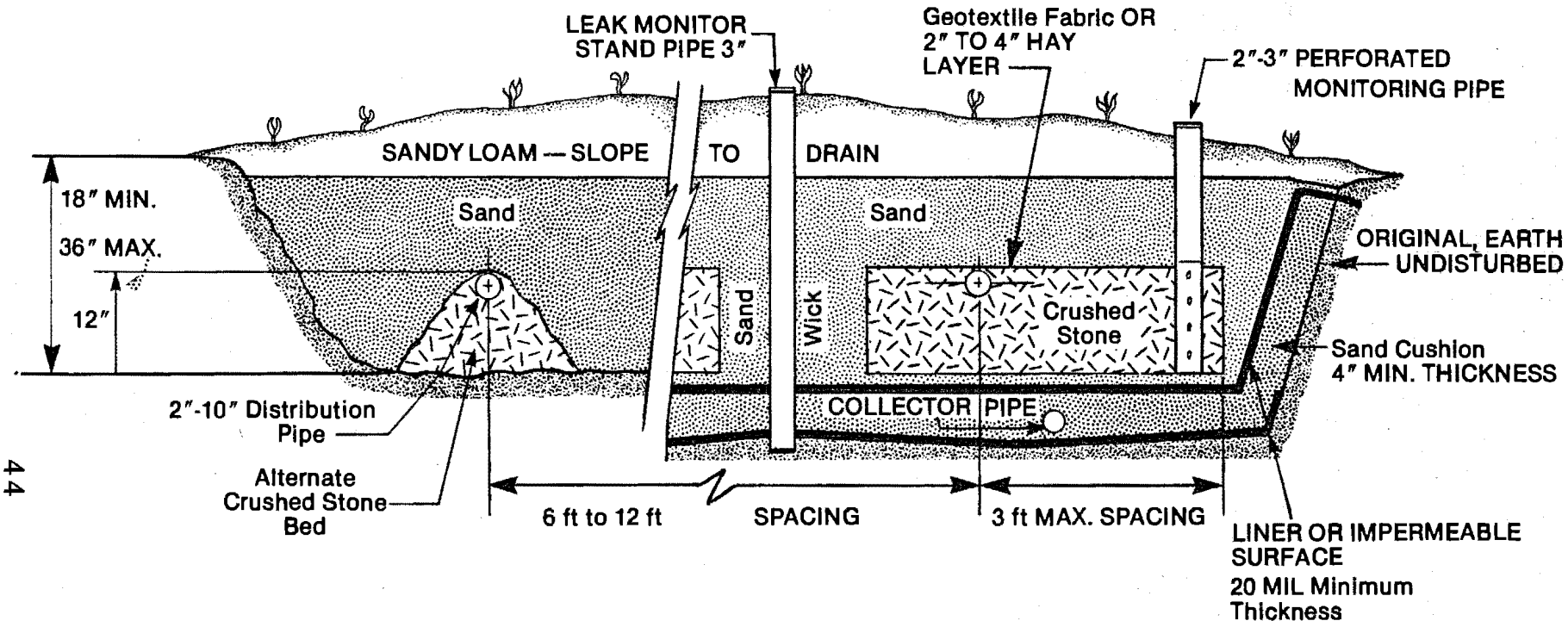
LEAK MONITOR SYSTEM
(See Figure 7 for Cross-Section)



Not intended to serve as an engineered design for construction purposes.

FIGURE 7

EVAPORATION BED
(Cross Section)



NOTES:
1. Where a liner is used over rock or other material that may damage liner, the liner shall be laid on a 4″ protective sand cushion, and covered by a similar cushion.
2. The crushed stone or gravel bed shall be made of ¾″ to 2″ size hard stone.
3. Sand columns, formed by a permeable material, shall extend completely through the crushed stone or gravel bed. Total column area shall be 10 to 15% of the bed area.
4. The surface shall be mounded or sloped to drain storm water.
5. The above drawing is for illustrative purposes; final construction design shall be site specific.
6. Refer to Table VIII for definition of sand and sandy loam.
7. Leak monitor collection pipe shall be wrapped with a filter cloth meeting the material requirements set forth in section 301.13(c)(6)(b).

Not intended to serve as an engineered design for construction purposes.

REMINDER:

Make certified copy of
Ordinance & attached rules.
Submit to Texas Dept of
Health for written approval.

4-26-90

JANUARY, 1990

THE STATE OF TEXAS
COUNTY OF LUBBOCK

R-361

Before me Frances Hernandez a Notary Public in and for Lubbock County, Texas on this day personally appeared T.J. Aufill, Account MAnager of the Southwestern Newspapers Corporation, publishers of the Lubbock Avalanche-Journal — Morning, Evening and Sunday, who being by me duly sworn did depose and say that said newspaper has been published continuously for more than fifty-two weeks prior to the first insertion of this Legal Notice No. 823698 at Lubbock County, Texas and the attached printed copy of the Legal Notice is a true copy of the original and was printed in the Lubbock Avalanche-Journal on the following dates: Feb. 17, 1990

73 words @ .46 = 33.58

TJ Aufill
Account Manager

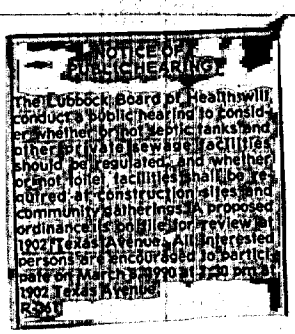
LUBBOCK AVALANCHE-JOURNAL
Southwestern Newspapers Corporation

Frances Hernandez
NOTARY PUBLIC in and for the State of Texas
My Commission Expires 7-6-91

Subscribed and sworn to before me this 6 day of May 1990

FRANCES HERNANDEZ
Notary Public, State of Texas
My Commission Expires 7-6-91

FORM 58-10


NOTICE OF PUBLIC HEARING!!
The Lubbock Board of Health will conduct a public hearing to consider whether or not septic tanks and other private sewage facilities should be regulated, and whether or not toilet facilities shall be required at construction sites and community gatherings. A proposed ordinance is available for review at 1902 Texas Avenue. All interested persons are encouraged to participate. Date of March 2, 1970 at 3:30 p.m. 1902 Texas Avenue
R-361

R-436

THE STATE OF TEXAS
COUNTY OF LUBBOCK

Before me Tonya Henry a Notary Public in and for Lubbock County, Texas on this day personally appeared T.J. Aufill, Account Manager of the Southwestern Newspapers Corporation, publishers of the Lubbock Avalanche-Journal – Morning, and Sunday, who being by me duly sworn did depose and say that said newspaper has been published continuously for more than fifty-two weeks prior to the first insertion of this legal notice No. 824074 at Lubbock County, Texas and the attached printed copy of the legal notice is a true copy of the original and was printed in the Lubbock Avalanche-Journal on the following dates: April 28, May 5, 1990

TJ Aufill
Account Manager

LUBBOCK AVALANCHE-JOURNAL
Southwestern Newspaper Corporation

Tonya Henry
NOTARY PUBLIC in and for the State of Texas
My Commission Expires 11-19-94

TONYA HENRY
Notary Public
STATE OF TEXAS
My Comm Exp Nov 19 1994

Subscribed and sworn to before me this 29 day of January 19 91

FORM 58-10

SECOND READING ORDINANCES

ORDINANCE NO. 9349

AN ORDINANCE ALTERING THE PRIMA FACIE SPEED LIMITS ON CERTAIN PORTIONS OF 74TH STREET, AS HEREINAFTER MORE PARTICULARLY DESCRIBED IN THE BODY OF THIS ORDINANCE; DIRECTING PLACEMENT OF SIGNS WITH RESPECT THERETO; REPEALING CONFLICTING ORDINANCES TO THE EXTENT OF SUCH CONFLICT; APPLICATION OF THIS ORDINANCE ONLY TO STREETS OR HIGHWAYS NAMED HEREIN; PROVIDING THIS ORDINANCE SHALL BE CUMULATIVE; PROVIDING A PENALTY; PROVIDING A SAVINGS CLAUSE; AND PROVIDING FOR PUBLICATION.

ORDINANCE NO. 9350

AN ORDINANCE AMENDING SECTION 19-2(b)(2) OF THE CODE OF ORDINANCES OF THE CITY OF LUBBOCK, TEXAS, BY DELETING THE LUBBOCK GARDEN AND ARTS CENTER FROM THOSE SELECTED PARK FACILITIES AT WHICH THE SALE AND/OR CONSUMPTION OF ALCOHOL MAY BE PERMITTED; PROVIDING A SAVINGS CLAUSE; AND PROVIDING FOR PUBLICATION.

ORDINANCE NO. 9351

AN ORDINANCE AMENDING ARTICLE XVI OF CHAPTER 2 OF THE CODE OF ORDINANCES OF THE CITY OF LUBBOCK, TEXAS, WITH REGARD TO THE BOARD OF CITY DEVELOPMENT BY AMENDING THE BOARD'S DUTIES TO COMPLY WITH CURRENT STATE LAWS AND BY REPEALING CERTAIN SECTIONS OF THE ARTICLE WHICH ARE NO LONGER NEEDED; PROVIDING A SAVINGS CLAUSE; AND PROVIDING FOR PUBLICATION.

ORDINANCE NO. 9352

AN ORDINANCE ADOPTING RULES OF THE CITY OF LUBBOCK, TEXAS, FOR PRIVATE SEWAGE FACILITIES.
R-436

R-394

THE STATE OF TEXAS
COUNTY OF LUBBOCK

Before me Frances Hernandez a Notary Public in and for Lubbock County, Texas on this day personally appeared T.J. Aufill, Account Manager of the Southwestern Newspapers Corporation, publishers of the Lubbock Avalanche-Journal — Morning, Evening and Sunday, who being by me duly sworn did depose and say that said newspaper has been published continuously for more than fifty-two weeks prior to the first insertion of this Legal Notice No. 823880 at Lubbock County, Texas and the attached printed copy of the Legal Notice is a true copy of the original and was printed in the Lubbock Avalanche-Journal on the following dates: March 21, 1990

73 words @ 46 = $33.58

T J Aufill
Account Manager

LUBBOCK AVALANCHE-JOURNAL
Southwestern Newspapers Corporation

Frances Hernandez
NOTARY PUBLIC in and for the State of Texas
My Commission Expires 7-6-91

Subscribed and sworn to before me this 11 day of May 19 90

NOTARY PUBLIC STATE OF TEXAS
FRANCES HERNANDEZ
Notary Public, State of Texas
My Commission Expires 7-6-91

FORM 58-10