

**LINCOLN COUNTY ON-SITE
SEWAGE DISPOSAL SYSTEM
ORDINANCE 1995-12
Revised Version April 1999**

**Lincoln County Health Department
Office of Environmental Sanitation
251 West Collier
Troy, Missouri 63379
636-528-6130**

LINCOLN COUNTY ON-SITE SEWAGE DISPOSAL ORDINANCE 1995-12 Revised April 1999

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ORDINANCE NUMBER 1995-12
Revised Version April, 1999*
Lincoln County, Missouri
On-Site Sewage Disposal Systems Ordinance

* Denotes revised section or paragraph

An ordinance establishing the requirement for permits to be issued to construct, install, repair, or modify on-site sewage disposal systems, the certification of installers, the certification of haulers, qualifications of persons performing percolation tests and soils morphology examinations, and the penalties regarding violations of said ordinance in Lincoln County, Missouri (Systems which are functioning properly and not in violation of sections 701.025 through 701.059, RSMo., or sections 644.006 through 644.141, RSMo., when this ordinance becomes effective, shall not be required to obtain a permit for operation. However, all systems shall be maintained free of nuisances and imminent health hazards regardless of when the system was originally installed.).

Section 1. Authority.

Section 192.300, RSMo. The county commissions and county health boards of the several counties may make and promulgate orders, ordinances, rules or regulations, respectively as will tend to enhance the public health and prevent the entrance of infectious, contagious, communicable or dangerous diseases into such county, but any orders, ordinances, rules or regulations shall not be in conflict with any rules or regulations authorized and made by the Department of Health in accordance with this chapter or by the Department of Social Services under chapter 198, RSMo.

The administrative authority shall be the Lincoln County Office of Environmental Sanitation.

Section 2. Applicability.

This ordinance shall apply to any on-site sewage disposal system, as defined in Section 3.9 of this ordinance, located on a lot or parcel of less than forty (40) acres within Lincoln County, which is not regulated pursuant to chapter 644, RSMo. *The owner of a single-family residence lot consisting of 40 acres or more, except lots adjacent to lakes operated by the Corps of Engineers or by a public utility, shall be excluded from the provisions of Lincoln County Ordinance 1995-12 and the rules promulgated thereunder, including provisions relating to the construction, operation, major modification and major repair of on-site disposal systems, when all points of the system are located in excess of ten feet from any adjoining property line and no effluent enters an adjoining property, contaminates surface waters or groundwater or creates a nuisance as determined by a readily available scientific method. Except as provided in this section, any construction, operation, major modification or major repair of an on-site sewage system shall be in accordance with rules promulgated under Lincoln County Ordinance 1995-12 regardless of when the system was originally constructed. The provisions of the Lincoln County Ordinance shall not apply to lots located in subdivisions under the jurisdiction of the Missouri Department of Natural Resources which are required by a consent decree, in effect on or before May 15, 1984 to have class one (1),*

National Sewage Federation (NSF) aerated sewage disposal systems. (Portion in italics was added on May 16, 1996 to comply with the language of Section 701.031 of the Missouri Law for On-Site Disposal Systems.)

Section 3. Definitions.

As used in this ordinance, unless the context otherwise requires, the following terms shall mean:

3.1 “Agent”, any person authorized, in a written and signed statement by the property owner, to execute the interests of the property owner in matters related to this ordinance.

3.2 “Emergency repair”, the modification, extension, or replacement of an on-site sewage system requiring more than a minor repair due to a sudden structural or mechanical failure which prevents the disposal of sewage from plumbing fixtures.

3.3 “Hauler”, see Section 3.10, On-site sewage disposal system hauler.

3.4 “Existing system”, an on-site sewage disposal system in operation before January 1, 1996.

3.5 “Imminent health hazard”, a condition which is likely to cause an immediate threat to life or a serious risk to the health, safety, and welfare of the public if immediate action is not taken.

3.6 “Installer”, see Section 3.11, On-site sewage disposal system installer.

3.7 “Minor repair”, any repair which does not involve the modification, extension, or replacement of a sewage tank, subsurface soil absorption system, or any other part of an on-site sewage disposal system which provides for the treatment of organic wastes except for the repair or replacement of aeration unit motors.

3.8 “Nuisance”, sewage, human excreta or other human organic waste discharged or exposed on the owner’s land or any other land from an on-site sewage disposal system in a manner that makes it a potential instrument or medium for the breeding of flies and mosquitoes, the production of odors, or the transmission of disease to or between a person or persons, or which contaminates surface waters, or groundwater.

3.9 “On-site sewage disposal system”, any sewage system, disposal system or treatment system, discharging a maximum of three thousand gallons per day into a subsurface soil absorption system, which is intended to render harmless or remove potentially hazardous organic wastes.

3.10 “On-site sewage disposal system hauler” or “hauler”, any person who pumps, cleans, transports, and disposes of sewage

removed from an on-site sewage disposal system on behalf of, or under contract with the owner or agent of such system.

***3.11** “*On-site sewage disposal system installer*” or “*installer*”, any person who performs construction, alteration, repair, extension, of an on-site sewage disposal system on behalf of, or under contract with, the owner or agent of such system.

***3.11A** The Lincoln County Office of Environmental Sanitation defines a Professional On-Site Sewage Disposal System Installer as an individual who:

A. Has passed both the Lincoln County Installers Closed-Book and Open-Book Tests. (A score of 90% is required to pass the open book test and a score of 85% is required to pass the closed book test.)

B. Has paid the annual Twenty-Five Dollar (\$25) Lincoln County On-Site Sewage Disposal System Installer License fee.

C. Has provided a copy of certification from the State Health Department for On-Site Sewage Disposal System Training (attended the State training class for on-site sewage disposal systems and passed the exam).

D. Has shown to be covered by a License & Permit Bond or Contractor’s Bond in the amount of Ten Thousand Dollars (\$10,000).

E. Has shown to be covered by General Liability Insurance in the minimum amount of Five Hundred Thousand Dollars (\$500,000).

F. Has demonstrated knowledge of Lincoln County’s septic system permit procedure.

G. Has been in good standing with all State & County Regulatory Agencies.

***3.11B** The Lincoln County Office of Environmental Sanitation defines a Homeowner On-Site Sewage Disposal System Installer as an individual who has

A. Passed both the Lincoln County Installers Closed-Book and Open-Book Tests. (A score of 90% is required to pass the open book test and a score of 85% is required to pass the closed book test.)

B. Paid a Twenty-Five Dollar (\$25) Lincoln County On-Site Sewage Disposal System Installer License fee.

A Homeowner On-Site Sewage Disposal System Installer License shall be valid for six (6) months and six (6) months only from date of issuance and applies only toward a septic system installation on the property of the homeowner’s primary residence. No extensions shall be granted for this license.

3.12 “*Person*”, any individual, group of individuals, association, trust, partnership, corporation, person doing business under an assumed name, the state of Missouri or any department thereof, any other government body or any department thereof, or any political subdivision of this state.

3.13 “*Permit*”, the written authorization from the Lincoln County Office of Environmental Sanitation, allowing the property owner or the agent of the property owner to construct, install or modify an on-site sewage disposal system according to the standards adopted by the Lincoln County Commission.

3.14 “*Property owner*”, the person in whose name legal title to the real estate is recorded.

3.15 “*Sewage*”, all wastewater originating from the sanitary conveniences of residences, commercial buildings, factories, institutions, or other buildings to include, but not restricted to wastewater from toilets, baths, kitchens and laundry facilities. Sewage is further defined as blackwater, which consists of wastes carried off by toilets, urinals, and kitchen drains, and gray water, which consists of all other domestic wastes including bath tubs, showers, lavatories, and laundry machines.

3.16 “*Subdivision*”, land divided or proposed to be divided for primarily residential purposes into parcels as required by local ordinances, or in the absence of local ordinances, “subdivision” means land which is divided by a common owner or owners into three or more lots or parcels, any of which contains less than three acres, or into platted or unplatted units, any of which contains less than three acres, as a part of a uniform plan of development.

3.17 “*Subsurface soil absorption system*”, a system for the final renovation of the sewage tank effluent and return of the renovated wastewater to the hydrologic cycle, including the lateral lines, the perforated pipes, the rock material, and the absorption trenches. Included within the scope of this definition are: soil treatment systems, privies, chemical toilets, single-family wastewater stabilization ponds and similar systems; except that a subsurface soil absorption system does not include a sewage system regulated pursuant to chapter 644, RSMo.

Section 4. Permits

Subsequent to the passage of this ordinance, any construction, installation, modification, or repair of an on-site sewage disposal system shall require the property owner or agent to obtain a permit from the Lincoln County Office of Environmental Sanitation, 251 West Collier, Troy, Missouri 63379, (314) 528-6130.

4.1 A permit shall only be issued to the property owner or agent.

4.2 The issuance of a permit to construct, install, modify, or repair an on-site sewage disposal system does not relieve the property owner or agent of the responsibility to properly plan, design, construct or maintain the system described in the permit application in accordance with currently adopted standards.

4.3 Emergency repairs shall meet or exceed the adopted minimum design standards. The property owner or agent shall obtain a permit within five (5) working days after beginning emergency repairs. No part of the emergency repairs shall be backfilled until the compliance section of the permit is signed by the Lincoln County Office of Environmental Sanitation.

Section 5. Prohibitions.

No person, except when authorized by a permit issued by the Lincoln County Office of Environmental Sanitation, pursuant to this ordinance, shall:

5.1 construct, install, modify, or repair any on-site sewage disposal system in a manner inconsistent with the terms and conditions of a permit issued for that system; or,

5.2 construct, install, modify, or repair an on-site sewage disposal system with a permit that has expired or has been suspended or revoked.

***Section 6. Responsibilities; Installers and Haulers to be certified; Suspension or Revocation of Certification.**

At least one certified on-site sewage system installer shall be on site at all times during the construction, installation, modification, or repair of an on-site sewage disposal system. The certified on-site sewage disposal system installer is responsible for assuring that the adopted standards of this ordinance are followed. Certification shall be issued to an installer upon compliance with Sections 6.1 and 6.2 of this ordinance.

*6.1 Each person desiring to become a Professional On-Site Sewage Disposal System Installer or a Homeowner On-Site Sewage Disposal System Installer shall take and pass both an open-book and closed-book examination under the criteria described in 3.11A. Arrangements to take these examinations shall be made by the applicant at least one day in advance by contacting the Lincoln County Office of Environmental Sanitation.

*6.2 Examination dates and locations shall be established by the Lincoln County Office of Environmental Sanitation. A fee of \$25.00 shall be filed with the Lincoln County Office of Environmental Sanitation prior to taking the examination.

*6.3 The examinations for the Professional On-Site Sewage Disposal System Installer License or a Homeowner On-Site Sewage Disposal System Installer License shall test the applicant's knowledge of the design, construction, installation, modification, repair and servicing of on-site sewage disposal systems. In addition, the examinations shall test the applicant's knowledge and understanding of the permit procedure and its requirements.

*6.4 The open book examination shall consist of 100 questions with a combined grade value of 100 points. In order to successfully pass the examination, a grade of not less than 90% must be obtained. The closed book examination shall consist of 30 questions consisting of multiple choice and true or false questions. Each question shall have a grade value of three and one-third points. In order to successfully pass the examination, a grade of not less than 85% must be obtained.

*6.5 Any person who fails to pass the examination shall be admitted to a subsequent regularly scheduled examination with the Lincoln County Office of Environmental Sanitation in accordance with Section 6.1, 6.2 and 6.3.

6.6 The Lincoln County Office of Environmental Sanitation shall issue certificates and maintain a roster of on-site sewage disposal system installers and haulers currently certified in Lincoln County. The roster will be considered public information and available for review and publication.

6.7 Each *certified* installer or hauler shall furnish proof of valid certification if requested by the Lincoln County Office of Environmental Sanitation. *(Words in italics added May 16, 1996 to update language of Ordinance as a result of open hearings.)*

6.8 The certificate may be suspended or revoked by the Lincoln County Office of Environmental Sanitation if the *certified* installer or hauler violates any section of this ordinance or sections 701.025 through 701.059, RSMo., or any rule or regulation adopted under this ordinance or other statute. *(Words in italics added May 16, 1996 to update language of Ordinance as a result of open hearings.)*

6.8.1 The installer or hauler may request a hearing pursuant to Section 19. of this ordinance. Until the final decision of the hearing is issued, the installer or the hauler shall be required to suspend all operations related to the construction, installation, modification, repair, or servicing of on-site sewage disposal systems.

6.8.2 If the decision to deny, suspend or revoke the certification of an installer or hauler is upheld and not appealed, the installer may reapply for certification one (1) year after the date of the final decision.

Section 7. Adopted Standards.

Persons performing percolation tests and soils morphology examinations must meet or exceed the minimum qualifications of 19 CSR 20-3.080. All plans, specifications, and installations shall meet or exceed the minimum design standards filed with the Missouri Secretary of State on April 17, 1995 titled, 19 CSR 20-3.060 Minimum Construction Standards for On-Site Sewage Disposal Systems, promulgated by the Missouri Department of Health, except:

7.1 All new or modified systems using a wastewater stabilization pond shall be preceded by an appropriately sized septic or aeration tank. Wastewater surface area shall not be reduced when preceded by a septic or aeration unit.

7.2 Metal sewage tanks shall not be used in the construction, installation, modification, or repair of any on-site sewage disposal system.

***7.3 Soil Evaluations**

Before any new on-site sewage disposal system is installed, or any existing absorption field is repaired, a soil evaluation shall be performed on the site by a qualified soil scientist. In certain instances where the sewage disposal system is not dependent upon soil characteristics, and at the discretion of the Office of Environmental Sanitation, the soil evaluation may be waived. Percolation tests are allowed at the discretion of the homeowner, however, the Office of Environmental Sanitation is not required to honor the results.

***7.32 Conventional Systems**

Inspection Ports

Inspection ports, consisting of 4" PVC pipe shall be placed at the end of each absorption line for the purpose of determining the true water depth in each trench.

***7.35 Gravelless Pipe Systems**

The following criteria shall be observed when installing Gravelless Pipe Systems:

***7.35A Top Location Indicator Stripe**

When installing gravelless pipe in the trench, the visible top location indicator marking stripe, running the length of the pipe, shall be placed top dead center.

***7.35B Inspection Ports**

Inspection ports, consisting of 4" PVC pipe shall be placed at the end of each absorption line. The inspection port shall be connected to the end cap of the gravelless pipe and oriented such that the connection is at the lowest part of the gravelless pipe.

***7.40 Chamber Systems**

The following criteria shall be observed when installing Chamber Systems:

***7.40A Inspection Ports**

Inspection ports, consisting of 4" PVC pipe shall be placed at the end of each absorption line. The inspection port shall be connected to the end cap of the chamber.

***7.50 Low Pressure Pipe Systems**

The following criteria shall be observed when installing Low Pressure Pipe Systems:

***7.50A Trenches**

When backfilled, all absorption field trenches, manifold trenches and supply line trenches should remain mounded with six (6) to eight (8) inches of backfill soil until complete settling of the soil has occurred.

***7.50B Distribution Laterals**

All absorption field pipes shall be constructed with ninety-degree-elbowed, threaded, removable end caps at the distal end of each line to facilitate periodic cleaning.

***7.50B1** A valve box or cover shall be placed over the end of each removable end cap to protect it from accidental breakage. A valve box or cover shall be placed over each ball valve leading into each distribution lateral. The tops of all valve boxes or covers shall be at or slightly above finished grade. Valve box lids shall be tight fitting and free of holes or openings.

***7.50B2** All distribution laterals shall be Schedule 40 PVC pipe or equivalent and shall be installed clear and clean of all soil, debris and drill cuttings.

***7.50B3** Distribution laterals shall be no more than eighty (80) feet in length.

***7.50C Landblocks**

A twenty-four (24) inch wide, hand dug landblock shall be situated between the supply manifold and each distribution lateral. A twenty-four (24) inch wide, hand dug or tamped landblock shall be situated at twenty (20) foot intervals along the length of each distribution trench.

***7.50D Pump Tanks**

The volume of the pump tank shall be at least twice the daily flow rate of the residence it serves. Pump tanks for Low Pressure Pipe Systems shall be single compartment tanks.

***7.50D1** The pump tank shall be fitted with a high water alarm. The high water alarm indicator shall be placed in a visible location and be wired on a circuit separate from the circuit that serves the sewage pump.

***7.50D2** All Low Pressure Pipe Systems should be designed to time dose the absorption field two to four times each day.

***7.55 Recirculating Sand Filter Systems**

The following criteria shall be observed when installing Recirculating Sand Filter Systems:

***7.55A Septic Tank Requirements**

All recirculating sand filter systems shall be preceded by a Class I septic tank.

***7.55B Filter Media**

Filter media shall consist of one-eighth (1/8) to three-eighths (3/8) inch diameter pea gravel and shall be wet or damp at time of installation.

***7.55C Distribution Laterals**

Distribution laterals shall have one, one-eighth (1/8) inch diameter orifice per each six (6) square feet of sand surface area. The distal end of each distribution lateral shall be elbowed and capped with threaded end caps so as to facilitate periodic flushing of the distribution laterals.

***7.55D Sand Basin Fences**

Recirculating sand filter boxes should be fenced by a four-foot high chain link fence or equivalent and have an access gate to allow for entry to the basin area.

***7.55E Pump Tanks**

The pump tank for a Recirculating Sand Filter System shall be fitted with a high water alarm. The high water alarm indicator shall be placed in a visible location and be wired on a circuit separate from the circuit that serves the sewage pump. To prevent freezing in cold weather, the supply line coming from the pump should not be fitted with a check valve.

***7.55F Recirculation Rate**

All Recirculating Sand Filter Systems shall be designed to recirculate 80% of the sewage effluent back to the pump tank/sand basin and to discharge 20% of the sewage effluent to the discharge system.

***7.55G Drain Piping**

The recirculating sand filter basin shall discharge through a drainpipe consisting of four (4) inch Schedule 40 PVC pipe. The drainpipe shall have one-quarter (1/4) inch grooves cut every 4" to a depth of one-half (1/2) the pipe diameter. Perforated 4" PVC pipe may also be used as drain piping. Six (6) inches of one and one-half (1 1/2) to two (2) inch washed river rock shall be on the bottom of the sand filter basin and shall cover the drainpipe. As an alternative to coarse gravel, the drain piping may be covered with a nondecaying, nonmetallic mesh with a grid opening of between one-sixteenth inch

(1/16") and one-eighth (1/8"). At least one breather pipe shall extend up to the surface from the drain piping and be elbowed 180 degrees at the top and fitted with an insect screen. The insect screen and the elbow shall be left unglued so as to facilitate maintenance.

***7.60 Drip Soil Irrigation Systems**

The following criteria shall be observed when installing Drip Soil Irrigation Systems:

***7.60A Emitter Lines**

Drip soil irrigation emitter lines should be laid out and installed roughly on contour.

***7.60A1** Drip soil irrigation emitter line shall be stored out of direct sunlight.

***7.60A2** Drip soil irrigation emitter line shall be installed at a depth of no less than six (6) inches and no more than ten (10) inches.

***7.60A3** Emitter lines should be installed during the coolest part of the day to minimize shrinkage, stretching and separating of the emitter lines from the manifold.

***7.60B Vacuum Breakers**

At least one vacuum breaker shall be installed at the high point of the absorption field.

***7.60B1** If emitter lines are installed on rolling hills such that there are highs and lows along the length of the emitter lines, all high points of the emitter lines shall be connected by a common line and lead to a vacuum breaker.

***7.60C Pressure Regulators**

If a pressure regulator is used to control emitter line pressure, a bypass line and ball valve shall be installed in order to bypass the pressure regulator and facilitate periodic flushing of the emitter lines.

***7.60C1** The pressure regulator and bypass valve shall be housed in a yard box with a tight-fitting removable cover. The pressure regulator shall be located in close proximity to the absorption field so that pressure loss does not prevent effluent from circulating throughout the entire absorption system.

***7.60D Manifold Lines**

The trench bottoms of the manifold lines shall be moistened and compacted to help prevent separation of the manifold line from the emitter line due to settling of the manifold trench bottom.

***7.60D1** All main and manifold lines shall be installed below the frost line.

***7.60D2** Main lines and manifold lines shall be flushed to remove all debris prior to final installation of the emitter lines.

***7.60E Pump Tanks and Dosing**

Pump tanks shall be single compartment and have a volume equivalent to a minimum of one times the daily flow rate of the residence it serves.

***7.60E1** Pump tanks shall be watertight. The manhole riser shall be a minimum of two (2) inches above finished grade to prevent ground water infiltration.

***7.60E2** Drip Soil Irrigation systems should time-dose the absorption field at a rate of six to eight times each day.

***7.60E3** The pump tank shall be fitted with a high water alarm. The high water alarm indicator shall be placed in a visible location and be wired on a circuit separate from the circuit that serves the sewage pump.

***7.60F Filters**

An approved filter shall be installed in the supply line of the Drip Soil Irrigation System.

***7.65 Constructed Wetlands Systems**

The following criteria shall be observed when installing Constructed Wetlands Systems:

***7.65A Plants**

Before approval of a permit application for a Constructed Wetlands is given, the homeowner or their agent shall provide a signed contract for the purchase of the appropriate types and numbers of aquatic plants to be planted in the Constructed Wetlands. The contract must stipulate the type of plants to be used, the number of plants to be used and the approximate date planting is to take place. Planting of the Wetlands cell must be completed prior to occupancy of the dwelling.

***7.65B Inspection Ports**

An inspection port consisting of perforated PVC pipe shall be placed vertically in the Wetlands bed so as to allow the monitoring of the water level in the Wetlands cell.

***7.70 Maintenance Schedule**

Installers shall provide the homeowner with a written schedule of periodic maintenance pertaining to the installed system.

***7.80 Septic Tanks**

***7.80A** All newly installed septic tanks shall be fitted with an approved effluent filter except those preceding a sewage treatment lagoon. Filters should be fitted with a rigid handle to facilitate removal, cleaning and replacement.

[Modification of Adopted Standards 19 CSR 20-3.060 Section 4B.13.B]

***7.80B** A six-inch (6") inspection port shall be provided over the inlet and outlet baffles of all septic tanks and terminate at or above grade. An inspection port shall not be used as pumpout access. A manhole cover at or above grade may *not* serve in place of inspection ports.

***7.80C No Reduction in Field Size For Aerated Septic Tanks**

There shall be no reduction in absorption field size due to the installation of an aerated septic tank.

***7.80D Bedding of Septic Tanks**

All septic tanks, other than concrete tanks, shall be bedded and backfilled with sand or concrete screenings two thirds of the way up the sides of the tank.

***7.80E Water in All New Septic Tank Installations**

All newly installed septic tanks should be filled with water as soon as possible after installation.

***7.80F Abandonment of Septic Tanks**

All septic tanks, pump tanks or cisterns, when disconnected from the building and/or abandoned, shall be properly demolished. All septic or pump tanks which are being abandoned shall have all sewage removed by a certified Lincoln County sewage disposal system hauler before demolition or removal. All demolition or removal shall be done by a licensed Lincoln County installer.

***7.80F1** The demolition of the septic tank, pump tank or cistern shall be by one of the following methods:

1.) The top of the septic tank, pump tank or cistern collapsed and the void filled with a fine grained material such as soil, sand or gravel.

2.) The septic tank, pump tank or cistern unearthed and removed. A septic or pump tank is considered hazardous waste and must be hauled by a certified sewage disposal system hauler.

***7.80F2** All related electrical wiring, such as wiring to an aeration device, warning device or pump motor, shall be permanently disconnected from the power source.

***7.84 Connection of Building Sewers to Community or Public Sewage Collection Systems**

7.84A Sewer line connections shall be done by a licensed Lincoln County Septic System Installer. Installer shall submit a completed Septic Tank Abandonment/Sewer Line Hook-Up Information Form to the Lincoln County Health Department at time of completion of sewer line connection.

Both gray water and black water building sewer pipes shall be connected to the community or public sewage collection system. All new sewer piping shall consist of Sch 35 PVC pipe or better.

***7.84B** Foundation and roof drainpipes shall not be connected to the community or public sewage collection system.

***7.85 Distribution Boxes**

Location of distribution boxes should be marked with either a stand pipe or ground stake unless the top of the box is visible. This includes distribution boxes used in recirculating sand filters.

***7.90 Pump Tanks**

***7.90A** All electrical wiring for pump tanks shall have their connections at a waterproof location outside of the pump tank.

***7.90B** All pump tanks shall be fitted with a high water alarm. The high water alarm indicator shall be placed in a visible location and be wired on a circuit separate from the circuit that serves the sewage pump.

Section 8. Application Procedure.

The following procedure shall be adhered to when making application to the Lincoln County Office of Environmental Sanitation for an on-site sewage disposal system permit:

8.1 Any person who proposes to construct, install, modify, or repair an on-site sewage disposal system shall submit a written application on forms provided. A permit fee is due upon submission of the application.

8.2 The application for a permit to construct, install, modify, or repair an on-site sewage disposal system shall:

8.2.1 provide identifying information;

***8.2.2** be accompanied by plans, specifications, design data and other pertinent information covering the project or additional information as required by the Lincoln County Office of Environmental Sanitation.

Section 9. Exceptions for Existing Systems and Lots.

9.1 Exceptions to the minimum setbacks of 19 CSR 20-3.060 may be allowed by the Lincoln County Office of Environmental Sanitation for existing systems or for lots or parcels platted and recorded before January 1, 1996 due to size and shape limitations. Plans for the modification, repair, or replacement of existing systems or installation on lots or parcels platted before January 1, 1996 may vary, except as to:

9.1.1 the protection of public and private water wells, systems and lines, (19 CSR 20-3.060 (1) (D) Table 1);

9.1.2 the protection of surface and groundwaters;

9.1.3 the provisions of primary sewage treatment; and,

9.1.4 the requirement to contain the sewage upon the property from which it is generated.

9.2 Any exception which may impact an adjoining property owner shall require a written, signed and notarized statement from the adjoining property owner which expresses no objection to any and all exceptions. Any on-site sewage disposal system, which is granted an exception, shall be designed and stamped by a licensed engineer.

***Section 10. Application Processing Procedure.**

***Summary of Permit Procedure**

The Lincoln County Office of Environmental Sanitation shall process all permits in accordance with the following:

***10.0A Soil Evaluation** Before any new on-site sewage disposal system is installed, or any existing absorption field is repaired, a soil evaluation shall be performed on the site by a qualified soil scientist. A list of qualified soil scientists shall be available from the Lincoln County Health Department or the State Health Department. In certain instances where the sewage disposal system's operation is not dependent upon soil quality characteristics, and at the discretion of the Office of Environmental Sanitation, the soil test may be waived. In

addition to the required soil evaluation, the property owner may also obtain a percolation test from a qualified percolation tester however, the Office of Environmental Sanitation is not required to honor the results.

***10.0B Receive Options and Permit Application** The property owner or their agent shall make arrangements with the Lincoln County Health Department to discuss the soil evaluation with an Environmental Specialist. The property owner or their agent may receive suggested septic system options, which meet the requirements of the Adopted Standards 19 CSR 20-3.060, from a Lincoln County Environmental Specialist. The Environmental Specialist may consider other options presented by the homeowner or their agent. The property owner or their agent receives at this time a blank On-Site Sewage Disposal System Permit Application Form for construction or repair.

***10.0C Choose a Septic System**

Based on the suggested septic system options discussed in 10.0B, the property owner and their installer shall determine which type of on-site sewage disposal system meets the needs of the property owner. A Lincoln County Environmental Specialist may provide technical assistance and be consulted to ensure conformance with the Adopted Standards 19 CSR 20-3.060.

***10.0D Submit Proposal/Pay Permit Fee**

The property owner or their agent submits to the Lincoln County Health Department a completed **Permit Application Form** for the proposed septic system, including a detailed plat of the property showing slopes, relevant structures and features such as wells, ponds and water lines and the approximate distances between them. Incomplete permit application forms will not be processed. A permit fee, in the form of a check or money order payable to "Lincoln County Health Department," shall be paid at this time. The Lincoln County Health Department reserves the right to alter the fee schedule under certain circumstances of hardship.

***10.0E [Replaces 10.1] Review of Proposal** The Lincoln County Health Department will review the proposal and either accept or reject the proposal within 15 days, giving reasons and points that are in conflict with this ordinance. After the proposal is accepted, a preliminary site inspection is scheduled. Incomplete applications will not be processed.

***10.0F Site Evaluation/Permit Issued** When the Sanitarian meets the property owner or their agent on the site and determines that the proposed system is appropriate for the lot, a permit to begin construction is issued at that time by the Sanitarian.

***10.0G No work** may begin until a permit has been issued to the property owner or their agent, and the permit fee has been paid.

***10.0H Final Inspection [Replaces Section 11.4] Notify** the Lincoln County Office of Environmental Sanitation prior to 10:00 a.m. on the day preceding completion of construction, installation, modification, or repair of an on-site sewage disposal system. The system shall be maintained in a condition which allows for a complete inspection until 3:00 p.m. on the

day of completion, pursuant to this ordinance, unless the Lincoln County Office of Environmental Sanitation provides confirmation that the system has been inspected and approved prior to that time. The on-site sewage system shall not be closed or completed if the Lincoln County Office of Environmental Sanitation determines upon inspection that the system does not meet the adopted standard. On-site sewage disposal systems closed prior to 3:00 p.m. without the approval of the Lincoln County Office of Environmental Sanitation will result in one of the following actions being instituted by the Lincoln County Office of Environmental Sanitation:

***10.0H.1** excavation of the on-site sewage disposal system at the expense of the installer to demonstrate compliance with the conditions of the permit;

***10.0H.2** revocation/suspension of the permit, pursuant to Section 15;

***10.0H.3** the prescribed legal action described in Section 19 of this ordinance.

Registered installers may forego a final inspection, only after receiving specific permission from the local Sanitarian.

10.2 Each application shall be submitted with all the supporting data necessary for review. Processing of the application with respect to recommendations or required changes shall be accomplished in accordance with the provisions of the design standards, 19 CSR 20-3.060 and the provisions of this ordinance.

10.3 The property owner or agent shall be notified of the status of the application within 15 calendar days from the date the application is received. If the conditions for the permit are different from the proposed specifications submitted, the permit notification shall include reasons for the specification changes.

10.4 If, upon review of an application, it is determined that a permit is not required, the property owner or agent shall be notified of this determination. Such notification shall constitute final action of the application.

10.5 If, upon review of an application, it is determined that a permit shall not be granted, the property owner or agent shall be notified of the permit denial and the reasons for the denial.

10.6 If the property owner or agent is dissatisfied with the conditions or denial of a permit, the applicant may request a hearing pursuant to Section 19. of this ordinance.

10.7 A permit shall be issued by the Lincoln County Office of Environmental Sanitation upon approval of the submitted application.

10.8 In the event a permit is not required, unexpended permit fees may be refunded to the applicant.

Section 11. Construction, Installation, Modification, Repair, or Maintenance in Compliance with Issued Permit.

In order to receive a written final approval of the on-site sewage disposal system by the Lincoln County Office of

Environmental Sanitation the property owner or agent shall assure that the installer:

11.1 constructs, installs, modifies, repairs and maintains the permitted on-site sewage disposal system in accordance with the terms and conditions of the permit issued by the Lincoln County Office of Environmental Sanitation. Unauthorized changes, deviations or modifications are a violation of the permit conditions. A new or amended application shall be filed to obtain a review of the requested changes to the proposed system. No change of the original specifications shall be implemented by the property owner or agent until a new or revised permit is issued. However, a waiver may be granted pursuant to Section 11.2 of this ordinance.

11.2 request a waiver for authorization to utilize materials and/or procedures differing from the specifications of the issued permit. A waiver may be granted if the materials cannot be obtained or the procedures cannot be accomplished as specified in the issued permit. However alternative materials must meet or exceed minimum standards. The Lincoln County Office of Environmental Sanitation may grant a waiver upon receipt of a written request for such, provided that the content of the request is immediately incorporated in writing into the permit.

11.3 conduct the maintenance of the permitted on-site sewage disposal system in accordance with this ordinance, statements, representations and procedures presented in the complete application and supporting documents, and in a manner free of nuisances and imminent health hazards. Compliance with this subsection is required of the property owner or any subsequent owner of the permitted on-site sewage disposal system as long as the on-site sewage disposal system remains in operation.

11.4 notify the Lincoln County Office of Environmental Sanitation prior to 10:00 a.m. on the day preceding completion of construction, installation, modification, or repair of an on-site sewage disposal system. The system shall be maintained in a condition which allows for a complete inspection until 3:00 p.m. on the day of completion, pursuant to this ordinance, unless the Lincoln County Office of Environmental Sanitation provides confirmation that the system has been inspected and approved prior to that time. The on-site sewage system shall not be closed or completed if the Lincoln County Office of Environmental Sanitation determines upon inspection that the system does not meet the adopted standard. The compliance section of the permit shall be signed by the Lincoln County Office of Environmental Sanitation if the conditions and specifications of the permit are accomplished or confirmation that the on-site sewage disposal system was not inspected prior to closing. On-site sewage disposal systems closed prior to 3:00 p.m. without the approval of the Lincoln County Office of Environmental Sanitation will result in one of the following actions being instituted by the Lincoln County Office of Environmental Sanitation:

11.4.1 excavation of the on-site sewage disposal system at the expense of the installer to demonstrate compliance with the conditions of the permit;

11.4.2 revocation/suspension of the permit, pursuant to Section 15;

11.4.3 the prescribed legal action described in Section 19 of this ordinance.

Section 12. Duration, Termination, Renewal, Extension, or Transfer of Permits.

As permitted by the Lincoln County Office of Environmental Sanitation:

12.1 An on-site sewage disposal system shall be constructed, installed, modified, or repaired within one hundred eighty (180) calendar days from the date of issuance of the permit.

12.2 A permit may be transferred to a new owner upon the written request of the official applicant if the construction, installation, modification, or repair project is not completed at the time of the sale of the property. The letter requesting the transfer shall also be signed by the new owner. The request for the transfer of an existing permit shall be acted upon by the Lincoln County Office of Environmental Sanitation within thirty (30) calendar days after receipt.

12.3 Any conditions established in the permit shall remain in effect when a permit transfer is granted to a new owner.

12.4 A permit may be renewed, or the expiration date extended for up to thirty (30) calendar days, upon written request from the property owner or agent. The request shall state that the conditions of the original permit shall be met. The request shall be received at least thirty (30) calendar days prior to the original expiration date of the permit.

12.5 Upon legal transfer of the property, the new owner of the property becomes the legal owner of the permitted on-site sewage disposal system, which remains subject to any conditions of such permit.

Section 13. Denial of a Permit.

The Lincoln County Office of Environmental Sanitation shall deny an on-site sewage disposal system permit for any of the following reasons:

13.1 The application does not meet the applicable minimum design and construction standards as specified in the current revision of the design standards, 19 CSR 20-3.060, except as noted in Section 9.1 of this ordinance;

13.2 The project, if constructed, may be in violation of state surface or groundwater standards;

13.3 A public sanitary sewer is available within three hundred (300) feet of the building to be served by the proposed on-site sewage disposal system. The sewer connection shall be practical, economically feasible and approved by the public sewer authority;

13.4 Any other justifiable reason which shall be provided in writing by the Lincoln County Office of Environmental Sanitation.

13.5 Any person denied a permit may request a hearing within ten (10) calendar days of such denial pursuant to Section 19. of this ordinance.

Section 14. Change of a permit.

14.1 Before completion of an on-site sewage disposal system, the Lincoln County Office of Environmental Sanitation may change the specifications of a permit due to one or more of the following reasons:

14.1.1 unforeseen or changing site conditions which could prevent construction, and resultant operation, from complying with state or local regulations pertaining to the operation and maintenance of an on-site sewage disposal system;

14.1.2 receipt of additional information affecting the specifications of the proposed on-site sewage disposal system permit;

14.1.3 any other reason necessary to implement applicable state or local statutes or regulations.

14.2 The Lincoln County Office of Environmental Sanitation shall notify the property owner or agent, in writing, of the intent to change the permit.

14.3 Notification shall include the proposed changes, the reasons for the changes, and the time period in which to accomplish the changes.

14.4 The change of the permit shall become final ten (10) calendar days from the date of the notice to the property owner or agent unless within that ten (10) day period the property owner or agent requests a hearing pursuant to Section 19. of this ordinance.

14.5 A copy of the changed permit shall be mailed to the property owner or agent the date the change is approved. All changes shall be incorporated into the construction, installation, modification, or repair of the on-site sewage disposal system before the final inspection.

Section 15. Suspension or Revocation of a Permit.

The Lincoln County Office of Environmental Sanitation shall suspend or revoke a permit before construction, installation, modification, or repair of an on-site sewage disposal system is completed for the reasons set forth in Section 15.1 of this ordinance.

15.1 The property owner or agent shall be mailed written notification within ten (10) calendar days of the intent to suspend or revoke the permit due to one or more of the following:

15.1.1 noncompliance with the terms of the permit;

15.1.2 unapproved alterations, by the property owner or agent, in design or construction;

15.1.3 determination of false information submitted in the application;

15.1.4 changing site conditions which could result in violations of applicable state or local regulations;

15.1.5 noncompliance with the current design standards, 19 CSR 20-3.060;

15.1.6 any other reason necessary to implement applicable state or local statutes and regulations.

15.2 The notification to the property owner or agent shall include the reasons for the suspension or revocation.

15.3 The suspension or revocation of a permit shall become final ten (10) calendar days from the date of such notice unless, within that ten (10) day period, the property owner or agent requests a hearing pursuant to Section 19. of this ordinance.

Section 16. Compliance with State and Local Water Quality Management Plans.

No permit shall be issued for any on-site sewage disposal system which is in conflict with any approved water management plan prepared under Section 301, 208 and/or 201 of the Federal Clean Water Act, as amended.

Section 17. Immunity.

The Lincoln County Office of Environmental Sanitation shall not be liable for damages resulting from approval by the Lincoln County Office of Environmental Sanitation for the construction, installation, modification, repair, maintenance, or operation of an on-site sewage disposal system.

Section 18. Violation Notices.

Violation notices shall be issued in accordance with the following:

*18.1 Whenever the Lincoln County Office of Environmental Sanitation has reasonable grounds for believing that there has been a violation of this ordinance, or any rule or regulation adopted pursuant thereto, the Lincoln County Office of Environmental Sanitation shall give written notice to the person alleged to be in violation. Reasonable grounds includes the receipt by the Lincoln County Office of Environmental Sanitation:

- 1) any signed written complaint from an aggrieved party,
- 2) any unsigned, anonymous, written complaint from an aggrieved party, or
- 3) any complaint received over the telephone provided that the date and time the call was received is recorded on the complaint form and in the Lincoln County Office of Environmental Sanitation telephone log book.

Such notice shall identify the provision of this ordinance, or regulation adopted thereby, alleged to be violated and the facts alleged to constitute such violation.

***18.15 Fees Charged For Complaint-Related Inspections**

A maximum fee of One Hundred and Fifty Dollars (\$150) may be charged by the Lincoln County Office of Environmental Sanitation to the homeowner of any septic system found to be in violation of this Ordinance as a result of a complaint

investigation. When allotted time for abatement has expired, and a reinspection is performed to check for compliance, another fee of no more than One Hundred and Fifty Dollars (\$150) may be charged by the Lincoln County Office of Environmental Sanitation. This fee applies to any and every subsequent inspection trip to the site of the violation. This fee will not apply when the Lincoln County Office of Environmental Sanitation is contacted for a final inspection to demonstrate abatement.

18.2 Such notice shall be served in the manner required by law and may be accompanied by an order of the Lincoln County Office of Environmental Sanitation requiring remedial action, which if taken within the time specified in such order, shall effect compliance with the requirements of this ordinance. Such order shall become final unless a request for a hearing is made pursuant to Section 19. of this ordinance. In lieu of such order, the Lincoln County Office of Environmental Sanitation may require the person named in such notice to appear at a hearing at a time and place specified in the notice. A hearing shall be conducted pursuant to Section 19. of this ordinance.

18.3 Such notice shall be deemed to have been properly served upon the owner, operator, or installer when a copy thereof has been sent by registered or certified mail to the last know address furnished to the Lincoln County Office of Environmental Sanitation.

Section 19. Hearings

This ordinance includes the opportunity for any person affected by the decision(s) of the Lincoln County Office of Environmental Sanitation to request an Administrative hearing to review issues regarding the administration of this ordinance (See Sections 6.8.1, 9.6, 12.5, 13.4, 14.3, 18.2, and 22). The specifications contained within the adopted standards of Sections 701.025 through 701.059 RSMo and Sections 644.006 through 644.141 RSMo are minimum regulations mandated by the State of Missouri and are not subject to challenge through the Hearing process herein established.

19.1 Request for hearing. A person may request a hearing after having the certificate to operate as an installer and/or hauler suspended or revoked (Section 6.8), after being denied a permit (Section 12), after being denied a change of permit (Section 13), after having a permit suspended or revoked (Section 14), and after being assessed a notice of violation (Section 18). The form to request a hearing can be obtained by contacting the Lincoln County Office of Environmental Sanitation, 251 West Collier, Troy, Missouri 63379, (314) 528-6130. Such request for a hearing shall be in writing and be received by the Lincoln County Office of Environmental Sanitation within ten (10) calendar days of the administrative decision in question. As stated above, the specifications contained in the minimum regulations mandated by the State of Missouri cannot be challenged within the context of the Lincoln County Hearing Board. Requests for hearings based on a challenge of the minimum regulations mandated by the State of Missouri will be denied and the hearing request returned to the person filing the complaint within ten (10) calendar days. If the request for the hearing is granted, an administrative hearing shall be held within thirty (30) calendar days from the receipt of the written request to the Lincoln County Office of Environmental Sanitation.

19.2 Hearing Board. The Hearing Board shall consist of three members. Members of the Hearing Board shall be residents of Lincoln County. Qualifications shall include: (1) Working knowledge and/or experience with on-site sewage disposal systems and regulations, (2) not currently employed as a politically-elected official, and (3) available to attend hearings at their own expense for their one (1) year appointment. Professional backgrounds: (a) On-site Sewage Disposal System Installer and/or Hauler, (b) Environmental Health Sanitarian, (c) Real Estate Inspector/Evaluator, (d) Design Engineer or Soil Scientist, (e) Building Code Inspector, (f) Lending Agent, (g) Real Estate Broker or Appraiser. A majority vote of the Commissioners is required for appointment to the Hearing Board. If a seated member of the hearing board is party to a request for a hearing, that person shall be replaced by a temporary board member by the Lincoln County Commission until a final decision has been rendered.

19.3 Hearing Procedure. If a request for a hearing is received and meets the criteria in Section 19 and 19.1, the complainant will be notified by the Lincoln County Office of Environmental Sanitation within ten (10) calendar days for the time and date of the hearing. Failure of the complainant to appear for the scheduled hearing will result in default in favor of the Lincoln County Office of Environmental Sanitation. The Hearing Board will hear the complainant's reasons for reversal then hear the rebuttal by the Lincoln County Office of Environmental Sanitation. The Hearing Board will be allowed to question each party then discuss the issue in private and vote by secret ballot with simple majority rule. The complainant and Lincoln County Office of Environmental Sanitation will be notified in writing within ten (10) calendar days of the Hearing Board's decision. If the decision is in favor of the complainant, the Lincoln County Office of Environmental Sanitation will be required to re-issue the appropriate permit and/or certificate.

Section 20. Penalties.

The following penalties shall be imposed:

20.1 Any person who fails to comply with any provision of this ordinance or order pursuant hereto, shall be guilty of a misdemeanor, punishable by a one hundred dollar (\$100) to one thousand dollar (\$1,000) fine and/or up to one year imprisonment. Each day or any part thereof in, which such violation occurs, shall constitute a separate offense.

20.2 Operation as an installer or hauler without a valid certification is specifically a violation of this ordinance and subject to the aforementioned penalties.

20.3 The Lincoln County Office of Environmental Sanitation, upon receipt of a valid written and signed complaint from an aggrieved person, is authorized to require the property owner to correct an on-site sewage disposal system within a specified time period not to exceed one hundred twenty (120) calendar days *if the complaint is determined to be valid*. After which time, the property owner shall be guilty of a misdemeanor, punishable by a fifty dollar (\$50) to five hundred dollar (\$500) fine and/or up to six months imprisonment. Each day or any part thereof in, which such violation occurs, shall constitute a

separate offense. (*Words in italics added May 16, 1996 to update language of Ordinance as a result of open hearings.*)

20.4 The prosecuting attorney of the County of Lincoln shall act on behalf of the Lincoln County Office of Environmental Sanitation and shall, upon request of the Lincoln County Office of Environmental Sanitation, institute appropriate abatement proceedings.

Section 21. Schedule of Fees.

The Lincoln County Commission shall adopt a schedule of fees associated with the administration of this ordinance or accept the schedule of fees proposed by its representative. The schedule shall be recorded as a court order effective the 1st day of January of each year.

Section 22. Inconsistent Codes Repealed.

Ordinance number 1995-2 of Lincoln County and all other codes or portions of codes in conflict herewith are hereby repealed.

Section 23. Conflict With Other Laws.

The provisions of any law or regulation of any municipality, the state of Missouri, or federal agency establishing standards affording greater protection to the public health and/or safety

shall prevail within the respective jurisdictions over the provisions of this ordinance adopted hereunder.

Section 24. Severability.

If any portion of this ordinance is for any reason held invalid or unconstitutional by any court of competent jurisdiction, that portion shall be deemed a separate, distinct and independent provision and that holding shall not effect the validity of the remaining portion of this ordinance.

Section 25. Revisions; Amendments.

The Lincoln County Commission may convene a hearing and enter into this ordinance any necessary revisions or amendments for the administration of this ordinance. Such revisions or amendments shall represent a separate, distinct and independent entity of the ordinance and may be accomplished by court order or any other method allowed by law.

Section 26. Effective Date.

This ordinance shall become effective on the date that this ordinance is acted upon and ordered by the Lincoln County Commission.

ADOPTED STANDARDS

**LINCOLN COUNTY'S
ON-SITE SEWAGE
DISPOSAL SYSTEMS:**

**MINIMUM
CONSTRUCTION
STANDARDS BASED ON
MISSOURI DEPARTMENT
OF HEALTH
REGULATIONS
19 CSR 20-3.060**

Title 19—DEPARTMENT OF HEALTH
Division 20—Environmental Health & Epidemiology
Chapter 3—General Sanitation

19 CSR 20-3.060 Minimum Construction Standards for On-Site Sewage Disposal Systems

PURPOSE: This rule establishes minimum construction standards for on-site sewage disposal systems. In accordance with the authority granted in section 701.040, RSMo., this rule establishes the minimum standards and criteria for the design, location, installation and repair of individual on-site sewage disposal systems to promote the public health and general welfare and to protect the surface and ground waters of the state.

Editor's Note: The secretary of state has determined that the publication of this rule in its entirety would be unduly cumbersome or expensive. The entire text of the material referenced has been filed with the secretary of state. This material may be found at the Office of the Secretary of State or at the headquarters of the agency and is available to any interested person at a cost established by state law.

(1) General.

(A) Definitions. Definitions as set forth in Chapter 701, RSMo On-Site Sewage Disposal Law shall apply to those terms when used in this rule unless the context clearly requires otherwise or as noted in this subsection. For the purposes of these standards, certain terms or words used here shall be interpreted as follows. The word shall is mandatory and the words should and may are permissive. All distances, unless otherwise specified, shall be measured horizontally:

1. Administrative authority—The governing body which may include, but is not limited to, county health departments, planning and zoning commissions, county building departments, county public works department, sewer districts, municipalities and the Missouri Department of Health which has, as authorized by statute, charter or other form of enabling authority, adopted these standards for individual on-site sewage disposal systems;

2. Aeration unit—Any sewage tank which utilizes the principle of oxidation in the decomposition of sewage by the introduction of air into the sewage;

3. Alluvium—Soil parent material which was transported and deposited in a running water setting;

4. Alternative—An individual sewage disposal system employing methods and devices as presented in section (6) of this rule;

5. Approved—Considered acceptable by the administrative authority;

6. Baffle—A device installed in a septic tank for proper operation of the tank and to provide maximum retention of solids. This includes vented sanitary tees and submerged pipes in addition to those devices normally called baffles;

7. Bedrock—That layer of geologic material which is consolidated;

8. Bedroom—Any room within a dwelling that might reasonably be used as a sleeping room. The number of bedrooms in a residence as given by an appraiser will be used in determining volumes in the sizing of on-site sewage disposal systems;

9. Black water—Liquid-carried waste from a dwelling or other establishment, which contains organic wastes, including excreta or other body wastes, blood or other body fluids, and garbage;

10. Building sewer—That part of the drainage system which extends from the end of the building drain and conveys its discharge to an on-site sewage disposal system;

11. Capacity—The liquid volume of a sewage tank using inside dimensions below the outlet;

12. Color—The moist color of the soil based on the Munsell soil color system;

13. Distribution pipes—Perforated rigid pipes that are used to distribute sewage tank effluent in a soil treatment system;

14. Dosing chamber (or pump pit or wet well)—A tank or separate compartment following the sewage tank which serves as a reservoir for the dosing device;

15. Dosing device—A pump, siphon or other device that discharges sewage tank effluent from the dosing chamber to the soil treatment system;

16. Dwelling—Any building or place used or intended to be used by human occupants as a residential unit(s);

17. Effluent—The liquid discharge of a septic tank or other sewage treatment device;

18. Gravelless system—An absorption system recognized by the administrative authority as an acceptable method of subsurface disposal of sewage without the required use of gravel. The following are examples:

A. Large diameter, eight (8)- and ten (10)-inch corrugated, perforated plastic pipe, wrapped in a sheath of spun-bonded filter wrap;

B. Chamber system; and

C. Drip irrigation;

19. Gray water—Liquid waste, specifically excluding toilet, hazardous, culinary and oily wastes, from a dwelling or other establishment which is produced by bathing, laundry, or discharges from floor drains;

20. Grease trap—A device designed and installed so as to separate and retain oils and fats from normal wastes while permitting normal sewage or wastes to discharge into the drainage system by gravity;

21. Ground absorption sewage treatment and disposal system—A system that utilizes the soil for the subsurface disposal of partially treated or treated sewage effluent. The following are examples:

A. Chamber system—A system that uses an open bottom structure which forms an underground chamber over the soil's infiltrative surface. The wastewater is discharged into the chamber through a central weir, trough or splash plate and is allowed to flow over the infiltrative surface in any direction;

B. Conventional soil absorption system—A system that distributes effluent by gravity flow from the septic or other treatment tank and applies effluent to the soil through the use of a seepage trench or bed;

C. Dosing soil absorption system—A system that distributes effluent by a pump or automatic siphon to elevate or distribute effluent to the soil through the use of a seepage trench or bed.

D. Drip soil absorption system—An experimental system that distributes effluent through drip lines in a grid pattern (also known as trickle irrigation); and

E. Pressure distribution system—A soil absorption system that distributes effluent by a pump and smaller diameter distribution piping with small diameter perforations to distribute effluent;

22. Hazardous waste—Any waste or combination of wastes, as determined by the Hazardous Waste Commission by rules, which, because of its quantity, concentration, or physical, chemical or infectious characteristics, may cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness, or pose a present or potential threat to the health of humans or the environment;

23. High ground water—Zones of soil saturation which include: perched water tables, shallow regional ground water tables or aquifers, or zones that are seasonally, periodically or permanently saturated;

24. High-water level—The highest known flood water elevation of any lake, stream, pond or flowage or the regional flood elevation established by a state or federal agency;

25. Holding tank—A watertight tank for temporary storage of sewage until it can be transported to a point of approved treatment and disposal;

26. Horizon—A layer of soil, approximately parallel to the surface, that has distinct characteristics relative to adjacent layers;

27. Individual sewage disposal system—A sewage disposal system, or part of a system, serving a dwelling(s) or other establishment(s), which utilizes subsurface soil treatment and disposal;

28. Intermittent sand filters—Intermittent sand filters are beds of granular materials twenty-four to thirty-six inches (24-36") thick underlain by graded gravel and collecting pipe. Waste water is applied intermittently to the surface of the bed through distribution pipes or troughs and the bed is underdrained to collect and discharge the final effluent. Uniform distribution is normally obtained by dosing so as to flood the entire surface of the bed. Filters may be designed to provide free access (open filters) or may be buried in the ground (buried filters or subsurface sand filters);

29. Matrix color—The dominant color of a soil material;

30. Mottling—Spots or splotches of color interspersed in the dominant (or matrix color) of a soil material. Mottles may be of a wide variety of colors;

31. Mound system—A system where the soil treatment area is built above the ground to overcome limits imposed by proximity to water table or bedrock or by rapidly or slowly permeable soils;

32. Non-ground absorption sewage disposal system—A facility for waste treatment designed not to discharge to the soil, land surface, or surface waters, including, but not limited to, incinerating toilets, mechanical toilets, composting toilets and recycling systems;

33. Other establishment—Any public or private structure other than a dwelling which generates sewage;

34. Pan—A soil horizon compacted, hard or very high in clay content. These horizons are usually very slowly permeable. Common pans in Missouri are claypans and fragipans;

35. Perched water table—A saturated zone above and separated from the water table by a horizon which is unsaturated;

36. Percolation rate—The time rate of drop of a water surface in a test hole as specified in subsection (2)(C) of this rule and expressed in minutes per inch;

37. Permeability—The ease with which liquids and gases move within the soil or rock;

38. Plastic limit—A soil moisture content below which the soil may be manipulated for purposes of installing a soil treatment system and above which manipulation will cause compaction, puddling and smearing, as determined by the administrative authority. This is not to be confused with plastic limit as used or defined in the Unified Soil Classification System;

39. Privy—An outhouse or structure used for receiving human excrement in a container or vault beneath the structure;

40. Registered geologist—A person who meets the requirements of Chapter 256, RSMo;

41. Restrictive horizon—A soil horizon that is capable of perching ground water or sewage effluent and that is brittle and strongly compacted or strongly cemented with iron, aluminum, silica, organic matter or other compounds. Restrictive horizons may occur as fragipans, iron pans or organic pans and are recognized by their resistance in excavation or in use of a soil auger;

42. Rock fragments—The percentage by volume of rock fragments in a soil that are greater than two millimeters (2 mm) in diameter or retained on a No. 10 sieve which may include, but is not restricted to, chert, sandstone, shale, limestone or dolomite;

43. Sanitarian—A person registered either as a sanitarian or environmental health professional by the National Environmental Health Association or the Missouri Board of Certification for Environmental Health Professionals or employed as a sanitarian or environmental health professional by the administrative authority;

44. Seepage bed—An excavated area larger than three feet (3') in width which contains a bedding of aggregate and has more than one (1) distribution line;

45. Seepage trench—An area excavated one to three feet (1-3') in width which contains a bedding of aggregate and a single distribution line;

46. Septage—Those solids and liquids removed during periodic maintenance of a septic or aeration unit tank or those solids and liquids removed from a holding tank;

47. Septic tank—Any watertight, covered receptacle designed and constructed to receive the discharge of sewage from a building sewer, separate solids from liquid, digest organic matter, store liquids through a period of detention and allow the clarified liquids to discharge to a soil treatment system;

48. Setback—A separation distance measured horizontally;

49. Severe geological limitations—Site-specific geologic conditions which are indicative of rapid recharge of an aquifer and likely groundwater contamination. Locations with significant groundwater contamination potential should be investigated by a registered geologist to determine if the site has severe geological limitations. Standardized criteria for determination of severe geological limitations are available in

the form *Assessment of Individual On-Site Waste Disposal Geological Limitations* from the Department of Natural Resources, Division of Geology and Land Survey;

50. Sewage—Any water-carried domestic waste, exclusive of footings and roof drainage. Domestic waste includes, but is not limited to, liquid waste produced by bathing, laundry, culinary operations, liquid wastes from toilets and floor drains and specifically excludes animal waste and commercial process water. Also known as wastewater;

51. Sewage flow—Flow as determined by measurement of actual water use or, if actual measurements are unavailable, as estimated by the best available data provided by Table 2A in subsection (1)(E) of this rule;

52. Sewage tank—A watertight tank used in the treatment of sewage which includes, but is not limited to, septic tanks and aeration units;

53. Sewage tank effluent—That liquid which flows from a septic tank or aeration unit under normal operation;

54. Significant groundwater contamination potential—Any condition which would cause or indicate rapid recharge of an aquifer. This includes, but is not limited to, the following conditions or parameters: a water sample from an on-site well which exceeds drinking water standards with respect to fecal coliform; a hydrologic connection is established between the on-site waste disposal system and any well; a disposal field to be placed in Class V soils or soils with a percolation rate less than ten minutes per inch (10 min./in.); a disposal field within one hundred feet (100') of the topographic drainage of a sinkhole; or a sewage tank with fifty feet (50') of the topographic drainage of a sinkhole;

55. Sinkhole—A land surface depression that is hydraulically connected with a subterranean passage developed by a solution or collapse into the underlying bedrock, or both;

56. Site—The area bounded by the dimensions required for the proper location of the soil treatment system;

57. Slope—The ratio of vertical rise or fall to horizontal distance;

58. Soil—The naturally occurring, unconsolidated mineral or organic material of the land surface developed from rock or other parent material and consisting of sand, silt and clay-sized particles and variable amount of organic materials;

59. Soil characteristics, limiting—Those soil characteristics which preclude the installation of a standard system, including, but not limited to, evidence of water table or bedrock closer than three feet (3') to the ground surface and percolation rates slower than one hundred twenty (120) minutes per inch;

60. Soil saturation—The condition that occurs when all the pores in a soil are filled with water;

61. Soil scientist—An individual who has a minimum of fifteen (15) semester credit hours of soils course work including a minimum of three (3) hours in the area of soil morphology and interpretations, and has a minimum of two (2) years of field experience;

62. Soil textural classification—Soil particle sizes or textures specified in this rule refer to the soil textural classification in the "Soil Survey Manual Handbook No. 18," U.S. Department of Agriculture, 1993;

63. Soil treatment area—That area of trench or bed bottom which is in direct contact with the trench rock of the soil treatment system;

64. Soil treatment system—A system where sewage tank effluent is treated and disposed of below ground surface by filtration and percolation through the soil. It includes those

systems commonly known as seepage bed, trench, drainfield, disposal field and includes mound and low pressure pipe systems;

65. Standard system—An individual sewage disposal system employing a building sewer, sewage tank and the soil treatment system commonly known as seepage bed or trenches, drainfield or leachfield;

66. Toilet waste—Fecal matter, urine, toilet paper and any water used for flushing;

67. Trench rock—Clean rock, washed creek gravel or similar insoluble, durable and decay-resistant material free from dust, sand, silt or clay. The size shall range from one inch to two and one-half inches (1"-2 1/2"). If limestone, dolomite or other crushed white rock is used, it shall be washed and be a minimum size of one and one-half inches (1 1/2");

68. Valve box—Any device which can stop sewage tank effluent from flowing to a portion of the soil treatment area. This includes, but is not limited to, caps or plugs on distribution or drop box outlets, divider boards, butterfly valves, gate valves or other mechanisms;

69. Very slowly permeable—Soils, bedrock and soil horizon or layer having a vertical permeability less than one inch (1") in twenty-four (24) hours;

70. Wastewater—same as sewage as defined in paragraph (1)(A)50. of this rule;

71. Wastewater stabilization pond—A sealed earthen basin which uses the natural unaided biological processes to stabilize wastewater (also known as a sewage lagoon);

72. Water table—The highest elevation in the soil or rock where all voids are filled with water, as evidenced by presence of water or soil mottling or other information. This includes perched water tables or perched zones of saturation; and

73. Watertight—Constructed so that no water can get in or out below the level of the outlet.

(B) Applicability. For this rule, on-site wastewater treatment and disposal system means all equipment and devices necessary for proper conduction, collection, storage, treatment and disposal of wastewater from a dwelling or other facility producing sewage of three thousand gallons (3000 gals.) or less per day. Included within the scope of this rule are building sewers, septic tanks, subsurface absorption systems, mound systems, intermittent sand filters, gravelless systems, aeration unit wastewater treatment systems and single family wastewater stabilization ponds. Commercial or industrial facilities and developers of subdivisions must first contact the Department of Natural Resources concerning compliance with the Missouri Clean Water Law and Regulations before applying for any approvals or permits under this rule.

(C) Responsibilities.

1. The design, construction, operation and maintenance of sewage treatment and disposal systems, whether septic tank systems, privies or alternative systems, shall be the responsibility of the designer, owner, developer, installer or user of the system.

2. Actions of representatives of the administrative authority engaged in the evaluation and determination of measures required to effect compliance with the provisions of this rule shall in no way be taken as a guarantee or warranty that sewage treatment and disposal systems approved and permitted will function in a satisfactory manner for any given period of time. Due to the development of clogging mats, which adversely impact the life expectancy of normally functioning ground absorption sewage treatment and disposal

systems and variables influencing system function which are beyond the scope of this rule, no guarantee or warranty is implied or given that a sewage treatment and disposal system will function in a satisfactory manner for any specific period of time.

3. Prior to the issuance of a permit to install or effect major repair of an on-site sewage disposal system as regulated by Chapter 701, RSMo, plans and specifications shall be required for review. Approval by the administrative authority shall be required for—

A. Plans for absorption field showing the following:

(I) Field locations with slope(s) indicated or with contour lines based on field measurement. If field areas are essentially flat or of uniform grade, spot elevations will be required for alternate systems.

(II) Field layout, length, spacing, connection, pipe sizes and cleanout details, invert elevations of flow distribution devices and laterals, valves and appurtenances;

(III) Trench plan and profile drawings and flow distribution device details;

(IV) Location and design of associated surface and groundwater drainage systems;

(V) Name, address and telephone number of the person(s) drafting the plans; and

(VI) Any other information required by the administrative- authority; and

B. Alternative systems whether or not specifically described in this rule.

4. The entire sanitary sewage system shall be on property owned or controlled by the person owning or controlling the system. Necessary easements shall be obtained permitting the use and unlimited access for inspection and maintenance of all portions of the system to which the owner and operator do not hold undisputed title. Easements shall remain valid as long as the system is required and shall be recorded with the county recorder of deeds.

(D) **Minimum Set-Back Distances.** All on-site wastewater treatment and disposal systems shall be located in accordance with the distances shown in Table 1.

(E) **Sewage Flow Rates.** Table 2A or 2B shall be used to determine the minimum design daily flow of sewage required in calculating the design volume of sanitary sewage systems to serve selected types of establishments. The minimum design volume of sewage from any establishment shall be one hundred gallons (100 gals.) per day. Design of sewage treatment and disposal systems for establishments not identified in this rule shall be determined using available flow data, water-using fixtures, occupancy or operation patterns and other measured data.

1. **Volume determination.** In determining the volume of sewage from single family dwellings, the minimum flow rate shall be one hundred twenty gallons (120 gals.) per day per bedroom. The minimum volume of sewage from each single family dwelling shall be two hundred forty gallons (240 gals.) per day. When the occupancy of a single family dwelling exceeds two (2) persons per bedroom, the volume of sewage shall be determined by the maximum occupancy at a rate of sixty gallons (60 gals.) per person per day.

2. **Other establishments.** For establishments or housing developments other than a single family residence, either Table 2A shall be used to estimate the sewage flow rate or actual measured flow rate for existing systems may be used. Values for estimated sewage flow for establishments having food

service operations shall be increased by a factor of one and one-half (1.5) to compensate for the high organic strength. Grease traps shall be required at food service facilities, meat markets and other places of business where the accumulation of grease or oils can cause premature failure of a soil absorption system. The following design criteria shall be met:

A. The grease trap shall conform to Plumbing & Drainage Institute Standard PDI-G101 or equivalent;

B. The grease trap shall be plumbed to receive all wastes associated with food handling and no toilet wastes;

C. The grease trap liquid capacity shall be sufficient to provide for at least five gallons (5 gals.) of storage per meal served per day, at least two-thirds (2/3) of the required septic tank liquid capacity, or a capacity as determined in accordance with the following:

$$LC = D \times GL \times ST \times HR/2 \times LF$$

where LC = grease trap liquid capacity (gallons)

D = number of seats in dining area

GL = gallons of wastewater per meal (1.5 single-service; 2.5 full-service)

ST = storage capacity factor = 2.5

HR = number of hours open

LF = loading factor = (1.25 interstate highway = 1.0 other highways and recreational areas = 0.8 secondary roads);

D. Two (2) or more chambers must be provided, with total length-to-width ratio at least two to one (2:1). Chamber opening and outlet sanitary tee must extend down at least fifty percent (50%) of the liquid depth;

E. Access manholes, with a minimum diameter of twenty-four inches (24"), shall be provided over each chamber and sanitary tee. The access manholes shall extend at least to finished grade and be designed and maintained to prevent surface water infiltration. The manholes shall also have readily removable covers to facilitate inspection and grease removal; and

F. Where it has been demonstrated that specially designed grease interceptors will provide improved performance, the grease trap liquid capacity may be reduced by up to fifty percent (50%).

3. **Population to be served.** Unless satisfactory justification can be given for using lower per-unit occupancies, the figures in Table 2B shall be used in determining the population for which to design the sewage works:

4. **Reduction in sewage flow.** Reductions in design sewage flow rates may be allowed by the administrative authority on a case-by-case basis depending upon water conservation plans. Sewage flow rates may be reduced up to forty percent (40%) for gray water systems where the toilet wastes are discharged to a holding tank and disposed of off site or where waterless toilets are utilized.

(2) Site Evaluation.

(A) **All proposed sites for on-site sewage treatment and disposal systems shall be evaluated for the following:**

1. Either percolation tests or soil conditions, properties and permeability as determined by a soil morphology examination; a profile pit shall be required for all new installations in order to conduct soil morphology examination;

2. Slope;

3. The existence of lowlands, local surface depressions, rock outcrops and sinkholes;
4. All required setback distances as required in subsection (1)(D) of this rule;
5. Surface water flooding probability and depth to water table;
6. Location of easements and underground utilities;
7. Amount of available area for the installation of the system and an area for replacement;
8. Location of homesite or dwelling as well as management of surface runoff water from those buildings;
9. Any other cultural feature, such as roads, streets and the like in the surrounding areas which influences surface and subterranean flow of water on or near the proposed site; and
10. Any significant groundwater contamination potential.

(B) Preliminary Soils Information. During a site evaluation reference may be made of county soil survey reports which are available from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) for a majority of the counties in Missouri. NRCS soil survey reports should not be used as sole final determination for a specific site, but only as a guide to which soils are expected in a given area.

(C) Soil Permeability and Soil Percolation. Soil permeability and soil percolation are two (2) different soil features with no direct correlation.

1. Soil permeability is that quality that enables soil to transmit water or air. It can be measured quantitatively in terms of rate of flow of water through a unit cross section of saturated soil in unit time under specified temperature and hydraulic conditions.

2. Soil percolation rate is based on a standard method which includes a twenty-four (24)-hour presoak in a six to eight inch (6–8") diameter hole to the depth of the proposed absorption field. After the presoak, water is poured into the hole to a level of eight inches (8") above the bottom. The drop in water level is then measured at thirty (30)-minute intervals until a stabilized rate is obtained. Results are recorded as minutes per inch (min./in.) for the water level to drop.

(D) Procedures for Percolation Tests and Profile Holes. Two (2) types of site evaluations are acceptable. Each type depends upon the technical expertise of the individual conducting the evaluations. When percolation tests are slower than sixty minutes per inch (60 min./in.), the design must be drafted and signed by a registered engineer. This would apply to all systems except for lagoons or other systems that do not use the soil for treatment. When percolation tests are slower than one hundred and twenty minutes per inch (120 min./in.), on-site sewage disposal systems shall not be permitted, except for lagoons or other systems designed in accordance with sections (6) and (7) of this rule. The administrative authority will determine which method(s) is to be used. The types of site evaluations are described as follows:

1. Percolation tests only. This type of site evaluation is where site suitability and sizing of the soil absorption system is made by percolation tests and there is no other evaluation of soil characteristics. This type of site evaluation can be used only for siting and sizing standard systems in areas which are not classified as having significant groundwater contamination potential. When using this type of evaluation, only percolation rates between ten minutes and sixty minutes per inch (10–60 min./in.) will be acceptable. Percolation tests shall be conducted by an engineer, sanitarian, registered geologist, soil

scientist or a person who has been trained and certified by the Department of Health in accordance with section 701.040(2), RSMo. These tests shall be performed in accordance with the following procedure:

A. A minimum of four (4) percolation test holes are required with three (3) of the holes around the periphery within the proposed soil absorption site and one (1) in the middle of the proposed soil absorption site;

B. Each test hole shall be six to eight inches (6–8") in diameter, have vertical side walls and be bored or dug to a depth of the bottom of the proposed soil absorption system;

C. The bottom and sides of the hole shall be carefully scratched to remove any smearing and to provide a natural soil surface into which water may penetrate. All loose material shall be removed from the bottom of the test hole and two inches (2") of one-fourth to three-fourths inch (1/4–3/4") washed gravel shall be added to protect the bottom from scouring;

D. The hole shall be carefully filled with clear water to a minimum of twelve inches (12") over the soil bottom of the test hole and maintained for no less than four (4) hours. The hole shall then be allowed to swell for at least twenty-four (24) hours. In sandy soils, the saturation and swelling procedure shall not be required and the test may proceed if one (1) filling of the hole has seeped away in less than ten (10) minutes;

E. In sandy soils, the water depth shall be adjusted to eight inches (8") over the soil bottom of the test hole. From a fixed reference point, the drop in water level shall be measured in inches to the nearest one-eighth inch (1/8") at approximately ten (10)-minute intervals. A measurement can also be made by determining the time it takes for the water level to drop one inch (1") from an eight-inch (8") reference point. If eight inches (8") of water seeps away in less than ten (10) minutes, a shorter interval between measurements shall be used but in no case shall the water depth exceed eight inches (8"). The test shall continue until three (3) consecutive percolation rate measurements vary by a range of no more than ten percent (10%);

F. In other soils, the water depth shall be adjusted to eight inches (8") over the soil at the bottom of the test hole. From a fixed reference point, the drop in water level shall be measured in inches to the nearest one-eighth inch (1/8") at approximately thirty (30)-minute intervals, refilling between measurements to maintain an eight-inch (8") starting head. The test shall continue until three (3) consecutive percolation rate measurements vary by a range of no more than ten percent (10%). The percolation rate can also be made by observing the time it takes the water level to drop one inch (1") from an eight-inch (8") reference point if a constant water depth of at least eight inches (8") has been maintained for at least four (4) hours prior to the measurement;

G. Percolation rate shall be calculated as follows:

(I) The time interval shall be divided by the drop in water level to obtain the percolation rate in minutes per inch;

(II) The slowest percolation rate of the four (4) tests shall be used to determine the final soil treatment system design. Where the slowest percolation rate varies by more than twenty minutes per inch (20 min./in.) from the other tests, a detailed soils morphology evaluation must be conducted to justify a design based upon the average percolation rate; and

(III) For reporting the percolation rate, worksheets showing all calculations and measurements shall be submitted; and

H. Depth to bedrock or other restrictive layer shall be determined in areas where it is known that bedrock may exist at depths less than ten feet (10'); and

2. Soil Morphology. This evaluation shall be conducted by a soil scientist unless an engineer, registered geologist or sanitarian has had special training and field experience to determine the required soil characteristics. This type of evaluation is recommended for sites that are classified as having significant groundwater contamination potential, severe geological limitations or severe limitations relating to restrictive layers. Section (7) of this rule contains criteria for this type of site evaluation. Since this type of soil analysis pertains to the factors that relate directly to permeability, no percolation test is required, however the administrative authority may retain the option of requiring percolation tests for additional information in determining site suitability.

(3) Building Sewers. Building sewers used to conduct wastewater from a building to an on-site wastewater treatment and disposal system shall be constructed of material meeting the minimum requirements of American Society for Testing and Materials (ASTM) Standards and listed by that agency for such use. Suitable materials meeting ASTM standards include: Acrylonitrile, butadiene styrene (ABS), cast iron pipe, concrete pipe, copper or copper-alloy tubing, polyvinyl chloride (PVC) or vitrified clay pipe. Although listed by ASTM, asbestos cement pipe will not be accepted due to potential health hazards to installers. Building sewer specifications are as follows:

(A) Size. Building sewers shall not be less than four inches (4") in diameter;

(B) Slope. Building sewers shall be laid to the following minimum slope:

1. Four-inch (4") sewer—twelve inches (12") per one hundred feet (100'); and

2. Six-inch (6") sewer—eight inches (8") per one hundred feet (100');

(C) Cleanouts. A cleanout shall be provided at least every one hundred feet (100') and at every change in direction or slope if the change exceeds forty-five degrees (45°). A cleanout should be provided between house and tank; and

(D) Connection to sewage tank. The pipe going into and out of the sewage tank shall be schedule 40 PVC or cast iron and shall extend a minimum of two feet (2') beyond the hole of excavation for the sewage tank.

(4) Sewage Tanks.

(A) General. All liquid waste and washwater with the following exceptions shall discharge into the sewage tank. Roof, garage, footing, surface water, drainage, cooling water discharges and hazardous wastes shall be excluded from the sewage tank. Backwash from water softeners and swimming pool filtration systems may be excluded from the sewage tank. In such event of excluding swimming pool filter backwash, the Department of Natural Resources shall be contacted for applicability of a discharge permit. All sewage tank effluent shall be discharged to a soil absorption system that is designed to retain the effluent upon the property from which it originated. All tanks regardless of material or method of construction shall—

1. Be watertight and designed and constructed to withstand all lateral earth pressures under saturated soil conditions with the tank empty;

2. Be designed and constructed to withstand a minimum of two feet (2') of saturated earth cover above the tank top; and

3. Not be subject to excessive corrosion or decay. Metal sewage tanks shall not be used.

(B) Septic Tanks. Septic tanks, regardless of material or method of construction, shall conform to the following criteria:

1. The liquid depth of any septic tank or its compartment shall be not less than thirty-six inches (36"). A liquid depth greater than six and one-half feet (6 1/2') shall not be considered in determining tank capacity;

2. No tank or compartment shall have an inside horizontal dimension less than twenty-four inches (24");

3. Inlet and outlet connections of the tank shall be protected by baffles or sanitary tees as defined in paragraph (4)(B)6. of this rule;

4. The space in the tank between the liquid surface and the top of the inlet and outlet baffles shall not be less than twenty percent (20%) of the total required capacity, except that in horizontal cylindrical tanks, this space shall be not less than fifteen percent (15%) of the total required liquid capacity;

5. Inlet and outlet baffles shall be constructed of acid-resistant concrete, acid-resistant fiberglass or plastic;

6. Sanitary tees shall be affixed to the inlet or outlet pipes with a permanent waterproof adhesive. Baffles shall be integrally cast with the tank, affixed with a permanent waterproof adhesive or with stainless steel connectors top and bottom;

7. The inlet baffle shall extend at least six inches (6") but no more than twenty percent (20%) of the total liquid depth below the liquid surface and at least one inch (1") above the crown of the inlet sewer;

8. The outlet baffle and the baffles between compartments shall extend below the liquid surface a distance equal to forty percent (40%) of the liquid depth, except that the penetration of the indicated baffles or sanitary tees for horizontal cylindrical tanks shall be thirty-five percent (35%) of the total liquid depth. They also shall extend above the liquid surface as required in paragraph (4)(B)4. of this rule. In no case shall they extend less than six inches (6") above the liquid surface;

9. There shall be at least one inch (1") between the underside of the top of the tank and the highest point of the inlet and outlet devices;

10. The inlet shall be not less than three inches (3") above the outlet;

11. The inlet and outlet shall be located opposite each other along the axis of maximum dimension. The horizontal distance between the nearest points of the inlet and outlet devices shall be at least four feet (4');

12. Sanitary tees shall be at least four inches (4") in diameter. Inlet baffles shall be no less than six inches (6") or no more than twelve inches (12") measured from the end of the inlet pipe to the nearest point on the baffle. Outlet baffles shall be six inches (6") measured from beginning of the outlet pipe to the nearest point on the baffle;

13. Access to the septic tank shall be as follows:

A. Manholes. Access shall be provided over both the inlet and outlet devices and to each tank compartment by means of either a removable cover or a manhole. Where the top of the tank is located more than eighteen inches (18") below the finished grade, manholes and inspection holes shall extend to approximately eight inches (8") below the finished grade. The extension can be made using riser of approved material and fitted with tight covers of heavy metal or concrete. Proper

attention must be given to the accident hazard involved when manholes are extended close to the ground surface. Manhole risers are not required when the top of the tank is within eighteen inches (18") of final grade. All manhole openings must be provided with a substantial, fitted, water-tight cover of concrete, cast iron or other approved material. All manhole covers which terminate below grade shall be covered with at least six inches (6") of earth. Manhole covers which terminate above grade shall have either an effective locking device or otherwise be adequately sealed in a manner to prevent accidental access; and

B. A six-inch (6") inspection port shall be provided over the inlet and outlet baffles of each tank and terminate at or above grade. An inspection port shall not be used as a pumpout access. A manhole cover at or above grade may also serve in place of inspection ports;

14. Compartmentation of single tanks shall be in accordance with the following:

A. Septic tanks larger than fifteen hundred gallons (1500 gals.) and fabricated as a single unit shall be divided into two (2) or more compartments;

B. When a septic tank is divided into two (2) compartments, not less than one-half (1/2), nor more than two-thirds (2/3), of the total volume shall be in the first compartment;

C. When a septic tank is divided into three (3) or more compartments, one-half (1/2) of the total volume shall be in the first compartment and the other half equally divided in the other compartments;

D. Connections between compartments shall be baffled so as to obtain effective retention of scum and sludge. The submergence of the inlet and outlet baffles of each compartment shall be as specified in paragraphs (4)(B)7. and 8. of this rule;

E. Adequate venting shall be provided between compartments by baffles or by an opening of at least fifty (50) square inches near the top of the compartment wall; and

F. Adequate access to each compartment shall be provided by one (1) or more manholes with a minimum opening twenty inches (20") square or in diameter and located within six feet (6') of all walls of the tank;

15. The use of multiple tanks shall conform with the following:

A. Where more than one (1) tank is used to obtain the required liquid volume, the tanks shall be connected in series;

B. Each tank shall comply with all other provisions of this section;

C. No more than three (3) tanks in series can be used to obtain the required liquid volume; and

D. The first tank shall be no smaller than any subsequent tanks in series;

16. The liquid capacity of a septic tank serving a dwelling shall be based upon the number of bedrooms contemplated in the dwelling served and shall be at least as large as the capacities given in Table 4.

A. For six (6) or more bedrooms, the septic tank shall be sized on the basis similar to an establishment. See paragraph (4)(B)17. of this rule.

B. No tank shall be designed to retain less than two (2) days', forty-eight (48) hours' flow; and

17. Individual residences with more than five (5) bedrooms, multiple-family residences, individual septic tank systems serving two (2) or more residences or any place of

business or public assembly where the design sewage flow is greater than one thousand gallons per day (1000 gpd), the liquid capacity of the septic tank shall be designed in accordance with the following:

$$V = 1.5Q + 500$$

where V = the liquid capacity of the septic tank and

Q = the design daily sewage flow.

The minimum liquid capacity of a septic tank serving two (2) or more residences shall be fifteen hundred gallons (1500 gals.).

(C) Location. Location of the sewage tank shall include the following:

1. The sewage tank shall be placed so that it is accessible for the removal of liquids and accumulated solids;

2. The sewage tank shall be placed on firm and settled soil capable of bearing the weight of the tank and its contents; and

3. The sewage tanks shall be set back as specified in subsection (1)(D) of this rule.

(D) Solids Removal. The owner of any septic tank or his/her agent shall regularly inspect and arrange for the removal and sanitary disposal of septage from the tank whenever the top of the sludge layer is less than twelve inches (12") below the bottom of the outlet baffle or whenever the bottom of the scum layer is less than three inches (3") above the bottom of the outlet baffle. Yearly inspections of septic tanks are recommended and tanks shall be pumped whenever the bottom of the scum layer is within three inches (3") of the bottom of the outlet device or the sludge level is within eight inches (8") of the bottom of the outlet device.

(E) Aeration Units. An aeration unit wastewater treatment plant utilizes the principle of oxidation in the decomposition of sewage by the introduction of air into the sewage. An aeration unit may be used as the primary treatment unit instead of a septic tank except where special local conditions may limit their use. All aeration unit type treatment systems shall comply with the general requirements for sewage tanks set forth in subsection (4)(A) of this rule and with the following:

1. Limitations. Special conditions where aeration units should not be used may include, but not be limited to, the following:

A. Where intermittent use (interruptions allowing more than five (5) days without continuous flow) will adversely affect the functioning of the plant; and

B. Where local ordinances restrict their use;

2. General. The aeration unit shall be located where it is readily accessible for inspection and maintenance. Set-back distances for aeration units shall be in accordance with subsection (1)(D) of this rule;

3. Design. All aeration units shall comply with National Sanitation Foundation Standard No. 40 or as required by the administrative authority. In addition, all aeration unit treatment plants shall comply with the requirements stipulated in this section. The aeration unit shall have a minimum treatment capacity of one hundred twenty gallons per bedroom per day (120 gals./pbd) or five hundred gallons (500 gals.), whichever is greater;

4. Effluent disposal. Effluent from an aeration unit shall be discharged into a soil absorption system or other final treatment system in accordance with section (6) of this rule. No reductions in the area of soil absorption systems or other final

treatment systems shall be permitted because of the use of an aeration unit instead of a septic tank; and

5. Operation and maintenance. Where aeration units are used in institutional or administrative arrangements to control their use, operation and maintenance are recommended. Aeration units should be inspected at least one (1) time each year and pumped when mixed liquor solids concentrations result in excessive clarifier loading.

(5) Absorption Systems. The common design of absorption systems is the use of absorption trenches, each separate from the other and each containing a distribution pipe. This type system should be used whenever practical. Other types of absorption systems may be used as alternatives where the site conditions meet the specific design requirements of the alternative systems. Installation shall not be made while the soil is wet or moist. This is to prevent smearing and destroying the structure of the soil. All absorption systems should have curtain drains, terraces or use of other flow diversion methods to minimize surface or ground water from loading the absorption field.

(A) Absorption Trenches. The absorption trench gives additional treatment to the sewage from the treatment tank. Regardless of its appearance of clarity or transparency, the outflow or effluent from a sewage tank is a dangerous source of contamination. The satisfactory operation of the sewage disposal system is largely dependent upon the proper site selection, design and construction of the absorption trench.

1. Absorption trenches should not be constructed in soils having a percolation rate slower than sixty minutes per inch (60 min./in.) and in no case shall absorption trenches be constructed in soils with percolation rates slower than one hundred twenty minutes per inch (120 min./in.) or where rapid percolation may result in contamination of water-bearing formations or surface waters.

2. The absorption trench shall be located on the property to maximize the vertical separation distance from the bottom of the absorption trench to the seasonal high groundwater level, as determined by the presence of mottling, bedrock or other limiting layer. The vertical separation between the bottom of the absorption trench and limiting layer or seasonal high water table shall be no less than one foot (1') for standard systems. Greater vertical separation may be required where water-bearing formations are in danger of contamination.

3. Absorption trenches shall not be constructed in unstabilized fill or ground which has become severely compacted due to construction equipment.

4. The minimum area in any absorption trench system shall be in accordance with Table 5. Absorption trenches in these highly permeable soils shall have a minimum vertical separation of four feet (4') between the absorption trench bottom and seasonal high groundwater table or bedrock. Cherty clays may have percolation rates between zero (0) and sixty (60) minutes per inch. Cherty clay soils located in areas of severe geological limitations shall have less than fifty percent (50%) rock fragments and a vertical separation distance of four feet (4') or more between the absorption trench bottom and bedrock. Unlined absorption trenches shall not be installed in cherty clays when the field evaluation indicated the presence of large voids. Regardless of the percolation rate, absorption trenches installed in areas of severe geological limitations with cherty clays should be designed for a maximum loading rate of forty-five hundredths gallons per square foot (0.45 gals./sq. ft.)

or a minimum of two hundred sixty-five square feet per bedroom (265 sq. ft./bedroom).

5. Each absorption trench system shall have a minimum of two (2) trenches with no one (1) trench longer than one hundred feet (100') unless approved by the administrative authority on a case-by-case basis. The absorption trenches shall be located not less than three (3) times the trench width on centers with a minimum spacing of five feet (5') on centers.

6. Absorption trenches shall be at least eighteen inches (18") wide and no more than thirty-six inches (36") wide. Thirty-six inch (36") wide trenches should not be utilized in soils with percolation rates slower than forty-five minutes per inch (45 min./in.). The bottom of standard absorption trenches shall be at least eighteen inches (18") and no more than thirty inches (30") below the finished grade except as approved by the administrative authority.

7. The pipe used between the sewage tank and the absorption system shall be a minimum of four-inch (4") inside diameter equivalent to the pipe used for the building sewer as set forth in section (3) of this rule. The pipe shall have a minimum fall of not less than one-eighth inch (1/8") per foot. All joints shall be of watertight construction.

8. Gravity-fed absorption field distribution lines should be at least four inches (4") in diameter. Perforated distribution line shall have holes at least one-half inch (1/2") and no more than three-fourths inch (3/4") in diameter.

A. Pipe used for distribution lines shall meet the appropriate ASTM standard or those of an equivalent testing laboratory. Fittings used in the absorption field shall be compatible with the materials used in the distribution lines.

B. When four inch (4")- or six inch (6")-diameter corrugated plastic tubing is used for distribution lines, it shall be certified as complying with applicable ASTM standards. The corrugated tubing shall have either two (2) or three (3) rows of holes, each hole between one-half inch (1/2") and three-fourths inch (3/4") in diameter and spaced longitudinally approximately four inches (4") on centers. ***Coiled tubing shall not be used.***

9. The absorption trenches shall be constructed as level as possible, but in no case shall the fall in a single trench bottom exceed one-fourth inch (1/4") in ten feet (10'). The ends of distribution lines should be capped or plugged, or when they are at equal elevations, they shall be connected.

10. Rock used in soil absorption systems shall be clean gravel or crushed stone, and graded or sized between one and one-half and three inches (1 1/2–3") with no more than ten percent (10%) material to pass through a one-half inch (1/2") screen. The rock shall be placed a minimum of twelve inches (12") deep with at least six inches (6") below the pipe and two inches (2") over the pipe and distributed uniformly across the trench bottom and over the pipe. Limestone and dolomite shall be avoided when possible. Before placing soil backfill over the trenches, the gravel shall be covered with one (1) of the following:

A. Unfaced, rolled, three and one-half inch (3-1/2") thick fiberglass insulation;

B. Untreated building paper;

C. Synthetic drainage fabric; or

D. Other material approved by the administrative authority laid as to separate the gravel from the backfill.

11. Complex slope patterns and slopes dissected by gullies shall not be considered for installation of absorption trenches. Uniform slopes under fifteen percent (15%) shall be considered

suitable slope for installation of absorption trenches. When slopes are less than two percent (2%), provisions shall be made to insure adequate surface drainage. When slopes are greater than four percent (4%), the absorption trenches shall follow the contour of the ground. Uniform slopes between fifteen percent (15%) and thirty percent (30%) should not be used for installation of absorption trenches unless the soils are three feet (3') or more below the trench bottom. Slopes within this range may require installation of interceptor drains upslope from the soil absorption system to remove all excess water that might be moving laterally through the soil during wet periods. Usable areas larger than minimum are ordinarily required in this slope range. Slopes greater than thirty percent (30%) shall not be utilized for installation of absorption trenches unless the following requirements can be met and approval is obtained from the administrative authority:

A. The slope can be terraced or otherwise graded or the absorption trenches can be located in naturally occurring soil so as to maintain a minimum ten foot (10') horizontal distance from the absorption trench and the top edge of the fill embankment;

B. The soil is permeable and no restrictive layers or water tables occur at a depth within two feet (2') of the trench bottom;

C. Surface water runoff is diverted around the absorption trench field so that there will be no scouring or erosion of the soil over the field or to allow surface runoff onto the field;

D. If necessary, groundwater flow from heavy rainfall is intercepted and diverted to prevent that water from running into or saturating the soil absorption system; and

E. There is sufficient ground area available to install the absorption trench system with these modifications.

12. Effluent distribution devices, including distribution boxes, flow dividers and flow diversion devices, shall be of sound construction, watertight, not subject to excessive corrosion and of adequate design as approved by the administrative authority. Effluent distribution devices shall be separated from the sewage tank by a minimum of two feet (2') of undisturbed or compacted soil and shall be placed level on a solid foundation of soil, gravel or concrete to prevent differential settlement of the device. Distribution boxes provided with flow equalizers are recommended.

A. Each distribution line shall connect individually to the distribution box and shall be watertight.

B. The pipe connecting the distribution box to the distribution line shall be of a watertight construction laid on undisturbed earth.

C. No more than four (4) distribution lines should be connected to a distribution box receiving gravity flow unless the ground surface elevation of the lowest trench is above the flow line elevation of the distribution box.

13. Stepdowns or drop boxes may be used where topography prohibits the placement of absorption trenches on level grade. Serial distribution systems should be limited to a separation of at least three feet (3') between the bottom of the absorption trenches and the limiting condition such as slow permeability or zone of seasonal saturation as evidenced by mottling. Whenever the design sewage flow rate requires more than seven hundred and fifty lineal feet (750 lin. ft.) of distribution line in a stepdown or drop-box type system, the absorption field shall be divided into two (2) or more equal portions. Stepdowns shall be constructed of two feet (2') of

undisturbed soil and constructed to a height level with the top of the upper distribution line. The inlet to a trench should be placed either in the center or as far as practical from the outlet (overflow) from the same trench. Drop boxes shall be constructed so that the inlet supply pipe is one inch (1") above the invert of the outlet supply pipe which is connected to the next lower drop box. The top of the trench outlet laterals, which allow effluent to move to the distribution lines, shall be two inches (2") below the invert of the outlet supply line. It is recommended that drop boxes be designed to close off the trench outlets to provide for periods of resting when the absorption trench becomes saturated.

14. Dosing is recommended for all systems except serial distribution systems and shall be provided when the design sewage flow requires more than five hundred lineal feet (500 lin. ft.) of distribution line. When the design sewage flow requires more than one thousand lineal feet (1000 lin. ft.) of distribution line, the absorption field shall be divided into two (2) equal portions and each half dosed alternatively, not more than four (4) times per day. Dosing may be accomplished by the use of a pump. Each side of the system shall be dosed not more than four (4) times per day. The volume of each dose shall be the greater of the daily sewage volume divided by the daily dosing frequency, or an amount equal to approximately three-fourths (3/4) of the internal volume of the distribution lines being dosed (approximately one-half gallon per lineal foot (1/2 gal./lin. ft.) of four-inch (4") pipe). Whenever dosed distribution box systems are utilized, the separation distance between the absorption trench bottom and limiting condition should be at least two feet (2').

15. Gravelless subsurface absorption systems may be used as an alternative to conventional four-inch (4") pipe placed in gravel filled trenches, however they cannot be used in areas where conventional systems would not be allowed due to poor permeability, high groundwater or insufficient depth to bedrock. Design approval for these systems may be required from the administrative authority prior to installation and all manufacturing specifications and installation procedures shall be closely adhered to. Gravelless trench systems using fabric wrapped tubing shall not be used, however, where wastes contain high amounts of grease and oil, such as in restaurants.

A. The eight (8)-, ten (10)-, and twelve (12)-inch (inner diameter) corrugated polyethylene tubing used in gravelless systems shall meet the requirements of ASTM F667, Standard Specification for Large Diameter Corrugated Polyethylene Tubing. For purpose of calculation, the eight-inch (8") pipe may be considered equal to eighteen inches (18") in width of a standard absorption trench. The ten-inch (10") pipe may be considered equal to twenty-five inches (25") in width of a standard absorption trench.

B. Two (2) rows of perforations shall be provided located one hundred twenty degrees (120°) apart along the bottom half of the tubing, each sixty degrees (60°) from the bottom centerline. The tubing shall be marked with a visible top location indicator one hundred twenty degrees (120°) away from each row of holes. Perforations shall be cleanly cut and uniformly spaced along the length of the tubing and should be staggered so that there is only one (1) hole in each corrugation. The tubing shall be marked with a visible top location indicator. All gravelless drainfield pipe shall be encased at the point of manufacture with a filter wrap of spun-bonded nylon, spun-bonded polypropylene or other substantially equivalent material approved by the administrative authority.

C. Rigid corrugated tubing shall be covered with filter wrap at the factory and each joint shall be immediately encased in a protective wrap that will prevent ultraviolet light penetration which shall continue to encase the large diameter pipe and wrap until just prior to installation in the trench. Filter wrap encasing the tubing shall not be exposed to sunlight (ultraviolet radiation) for extended periods. Rocks and large soil clumps shall be removed from backfill material prior to being used. Clayey soils (soil group IV) shall not be used for backfill. The near end of the large diameter pipe shall have an offset adapter (small end opening at top) suitable for receiving the pipe from the septic tank or distribution device and making a mechanical joint in the trench.

D. The trench for the gravelless system shall be dug with a level bottom. On sloping ground, the trench should follow the contour of the ground to maintain a level trench bottom and to ensure a minimum backfill of six inches (6"). It is recommended that the minimum trench width for the gravelless system be eighteen inches (18") in friable soils to ensure proper backfill around the bottom half of the pipe. In cohesive soils, the minimum width of excavation should be twenty-four inches (24"). In clay soils, it is recommended that the trench be backfilled with sandy material, sandy loam, loam, clay loam, silt loam or silty clay loam. The gravelless system may be installed at a trench bottom depth of eighteen inches (18") minimum to thirty inches (30") maximum, but a more shallow trench bottom depth of eighteen to twenty-four inches (18-24") is recommended. To promote equal effluent and suspended solids distribution, the slope of the drain pipe should be from zero to one-half inch per one hundred feet (0-1/2 in./100 ft.).

E. A gravelless chamber may be installed based on bottom absorption area utilizing a reduction of up to twenty-five percent (25%) in the size of a standard gravel absorption area based upon a soil morphology evaluation indicating the feasibility of a reduction. However, as described in Table 6, the maximum loading rate provided for any particular soil group must not be exceeded when sizing for the thirty-four inch (34") chamber. For this purpose, the fifteen inch (15") chamber may be considered equal to twenty-four inches (24") in width of a standard absorption trench. The twenty-two inch (22") chamber may be considered equal to twenty-eight inches (28") in width of a standard absorption trench. The thirty-four inch (34") chamber may be considered equal to forty-two inches (42") in width of a standard absorption trench.

F. Installation of the chamber system shall be in accordance with this rule except:

(I) The installation shall be made in accordance with the manufacturer's specifications;

(II) The side walls of trenches placed in Group IVa soils shall be raked to open pores which were damaged or sealed during excavation; and

(III) Chambers utilizing maximum sidewall absorption features shall be installed per the manufacturer's recommendations to maximize the use of upper soil horizons; and

G. A reduction of up to twenty-five percent (25%) in the size of the absorption field may be allowed based upon a soil morphology evaluation indicating the feasibility of a reduction. However, as described in Table 6, the maximum loading rate provided for any particular soil group must not be exceeded.

16. Dosing/alternating systems are encouraged, especially in slowly permeable soil conditions.

17. The administrative authority may permit the use of a bed system on sites where the minimum soil permeability is a percolation rate of forty-five minutes per inch (45 min./in.) and essentially meeting the other requirements of this section, and only on lots which are limited by topography, space or other site planning considerations. In such cases the number of square feet of bottom area needed shall be increased by fifty percent (50%) over what would be required for a trench system. Distribution lines shall be at least eighteen inches (18") from the side of the bed and shall have lines on three-foot (3') centers and care must be taken to divert surface water away from the bed. When the design volume of sewage exceeds six hundred gallons (600 gals.) per day, adequate space shall be provided to accommodate a trench system for the absorption field. There shall be no less than a two-foot (2') separation between the bed bottom and the limiting layer or seasonal high water table.

(B) Possible modifications to standard absorption systems which may be utilized to overcome selected soil and site limitations and must be approved by the administrative authority include the following:

1. Shallow placement of absorption trenches shall be utilized where insufficient depth to seasonally high or perched water table or where insufficient soil thickness prevents the placement of conventional distribution lines in accordance with this section. Shallow trenches shall be designed and constructed to provide a minimum of two feet (2') of natural soil separation between the trench bottom and the uppermost elevation of the seasonally high or perched water table and rock. Shallow trenches may be constructed by placing the top of the gravel at original ground level and covering the absorption field with loamy soil, (sandy loam, loam, clay loam, silt loam or silty clay loam) to a depth of eight to twelve inches (8-12") at the center. The cover over the absorption field shall extend at least five feet (5') beyond the edge of any trench and have a turf grass cover established immediately after construction. If an area is to be filled and the trenches constructed in the fill with the bottom of the trenches in at least six inches (6") of natural soil, the following procedures must be followed:

A. The fill material should be of a sandy texture with a maximum clay content of twenty percent (20%). The fill material should not be hauled or worked wet. The area to be filled must be protected from traffic and small brush and trees removed prior to placement;

B. The soil surface must be loosened with a cultivator or garden plow. This work must be done when the soil is dry;

C. The fill is moved onto the site without driving on the loosened soil. The fill material is then tilled into the natural soil to create a gradual boundary between the two (2). The remaining fill is then added in layers until the desired height is obtained with each layer being tilled into the preceding layer; and

D. The site is then shaped to shed water and fill all low spots before the absorption system is installed. After installation of the absorption system, the site must have a turf grass cover established as soon as possible;

2. Alternating dual field absorption systems may be utilized where soils are limited by high clogging potentials, percolation rates slower than sixty minutes per inch (60 min./in.) or high shrink/swell potential soils and where the

potential for malfunction and need for immediate repair is required. Alternating dual field absorption systems shall be designed with two (2) complete absorption fields, each sized a minimum of seventy-five percent (75%) of the total area required for a single field and separated by an effluent flow diversion valve. The diversion valve shall be constructed to resist five hundred pounds (500 lbs.) crushing strength, structurally sound and shall be resistant to corrosion. A valve placed below ground level shall be constructed so that it may be operated from the ground surface; and

3. Sand-lined trenches may be used in areas where the soil has greater than fifty percent (50%) rock fragments and there are severe geological limitations. For a maximum loading rate of forty-five hundredths gallons per day per square foot (.45 gpd/sq. ft.) or a minimum of two hundred sixty-five square feet per bedroom (265 sq. ft./bedroom), the sand is not required to meet the requirements for intermittent sand filters. The material must be natural or manufactured sand and have no more than fifteen percent (15%) clay content. Manufactured sand shall be chat, fines manufactured from igneous rocks or chert gravel or manufactured from crushed glass. **Crushed limestone is not acceptable.** For higher loading rates, the sand must meet the requirements for an intermittent sand filter.

A. In standard four-inch (4") pipe and gravel trenches, the depth of liner material must be twelve inches (12") below the gravel and at least six inches (6") on the sides of the gravel up to the top of the gravel. To place sand on the sides of the trenches, the trench walls must be excavated on a slope instead of vertically. The side slopes should be two horizontal to one vertical (2:1) and in no case steeper than one horizontal to one vertical (1:1).

B. In gravelless pipe systems the minimum thickness of liner material is six inches (6") around the pipe.

C. The effluent to sand-lined systems in areas of potential groundwater contamination should be equally distributed as much as practically possible. Serial and drop-box systems shall not be used. As a minimum, a distribution box shall be used to evenly distribute the effluent to the trenches. Dosing is recommended in order to more positively assure even distribution.

D. The sand-lined trenches may be used, with the approval of the administrative authority, where the percentage of rock fragments is less than seventy percent (70%) for at least four feet (4') below the trench bottom. For sand-lined trenches to function properly, the permeability of the natural material should be similar to the permeability of the liner material. Sand-lined trenches must not be used over fragipans or other restrictive layers which have potential to perch water tables and could cause saturation of the liner material.

(6) Alternative Systems.

(A) **General.** The intent of this section is to provide minimum standards for the design, location, installation, use and maintenance of alternative sewage disposal systems in areas of limiting soil characteristics, where a standard system cannot be installed or a standard system is not the most suitable treatment. Where these systems are employed, they shall comply with all local codes and ordinances and should be subject to timely inspections to assure adherence to specifications. These systems, except for wastewater stabilization ponds, shall be designed and stamped by a licensed engineer. All absorption systems should have curtain drains, terraces or use of other flow diversion methods to

minimize surface or ground water from loading the absorption field.

(B) **Adoption and Use.** Where this rule is administered by an administrative authority, those administrative authorities may adopt this section in whole or in part as part of a local code or ordinance. Further, nothing in this rule or section shall require any administrative authority to allow the installation of any system in this section.

(C) **Low Pressure Pipe (LPP) System.** A low pressure, two-to four-foot (2–4') pressure head, pipe system may be utilized where soil and site conditions prohibit the installation of a conventional or modified septic tank system due to the presence of shallow soil conditions, seasonally high water table conditions and slow soil permeability. The administrative authority may permit the use of a LPP system where there are cherty clay soils, severe geological limitations or both. The separation distance in these areas of concern for groundwater between the trench bottoms and bedrock shall be at least four feet (4') or more. The administrative authority may require that the hydraulic design of LPP systems be designed by an engineer. The administrative authority may also require the LPP trenches to be sand-lined if the soils have severely diminished treatment capability due to excessive rock content. The amount of rock fragments shall be less than fifty percent (50%) and in no case more than seventy percent (70%), unless the trenches are lined with sand.

1. The LPP shall consist of the following basic components:

A. A network of one- to two-inch (1–2") diameter perforated PVC, one hundred sixty pounds per square inch (160 lbs./sq. in.) pipe or equivalent placed in natural soil at shallow depths, generally no more than twelve inches (12"), in narrow trenches not less than six inches (6") in width and spaced not less than five feet (5') on center. Trenches shall include at least five inches (5") of pea gravel, if available; or if necessary, no less than three-quarter inch (3/4") crushed stone below the pipe and two inches (2") above the pipe; and four inches (4") of soil cover. The holes in the perforated pipe should be spaced from two feet (2') to no more than eight feet (8'). The minimum hole size is five thirty-seconds inch (5/32");

B. A properly designed, two (2)-compartment septic tank or other approved pretreatment system and a pumping or dosing tank. The pumping or dosing tank shall be a minimum of five hundred gallons (500 gals.) or have the capacity to store one (1) day's flow above the pump on level, whichever is greater. The tank shall be provided with a filter or screen capable of preventing the passage of suspended solids to the soil absorption system;

C. A submersible sewage effluent pump (*not* a sump pump) with appropriate on/off controls for controlled dosing and a high water alarm or other approved pressure dosing and distribution system; and

D. A watertight supply manifold pipe for conveying effluent from the pump to the low pressure network.

2. The soil and site criteria for low pressure pipe systems shall meet the following minimum requirements:

A. LPP absorption fields shall not be installed on slopes in excess of ten percent (10%). LPP absorption fields may be installed on slopes greater than ten percent (10%), but require special design procedures to assure proper distribution of effluent over the absorption field;

B. There shall be at least twenty-four inches (24") of separation between the naturally occurring soil surface and

bedrock, water-impeding formation, seasonally high water table or evidence of chroma 2 mottles. This twenty-four-inch (24") depth shall consist of permeable soils with percolation rates less than or equal to sixty minutes per inch (60 min./in.) or be classified as SUITABLE or PROVISIONALLY SUITABLE in accordance with section (7) of this rule. The bottom of percolation test holes must be dug or bored to the bottom of the proposed trenches. The bottom of the proposed trenches must be located a minimum of one foot (1') above rock, water-impeding formation, seasonally high water table or where there is evidence of chroma 2 mottles. In areas where there are severe geological limitations and the soils have a high chert content, the bottom of the proposed trenches shall be at least four feet (4') above bedrock unless an evaluation by a registered geologist determines that the separation distance may be reduced;

C. Components of the LPP shall not be located in depressions or areas subject to frequent flooding. Surface water, perched ground water and other subsurface lateral water movement shall be intercepted or diverted away from all components of the LPP. Final shape of the LPP distribution field shall be such that rainwater or runoff is shed;

D. Location of the septic tank, pumping or dosing chamber and LPP absorption field is subject to the same horizontal setbacks specified in subsection (1)(D) of this rule. Horizontal setback distances in Table 1 shall be measured in the LPP absorption field from a margin of two and one-half feet (2 1/2') beyond the lateral and manifold pipes;

E. An area that is at least equal in size to the LPP distribution field area plus a two and one-half foot (2 1/2') margin beyond the lateral and manifold pipes and which meets all other site and soil criteria shall be set aside for a replacement field; and

F. There shall be no soil disturbance to an approved site for an LPP system except the minimum required for installation.

3. The following application rates shall be used in determining the maximum application rate for low pressure pipe systems:

A. In calculating the number of square feet for the absorption field (not square footage of trench bottom), the design sewage flow shall be divided by the application rate from Table 7. The lateral lines shall have a minimum spacing of five feet (5') on centers within the areas calculated for the absorption field area; and

B. The systems shall be designed so that the discharge from any one (1) lateral line does not vary more than ten percent (10%) from the other laterals. All laterals shall have an envelope of trench rock surrounding the pipe. The trench rock shall be placed to a minimum depth of four inches (4") below the pipe and two inches (2") above the pipe.

4. Design of the LPP shall comply with accepted practices and be specifically approved by the administrative authority. The system shall be designed and bear the seal of a Missouri registered engineer.

(D) Wastewater Stabilization Ponds (Lagoon). A waste stabilization pond can provide satisfactory sewage disposal in rural areas where soils are not suited for absorption systems. Single residence wastewater stabilization ponds are not generally suitable in subdivisions with lots less than three (3) acres in size. No more than one (1) single family residence will be allowed on one (1) stabilization pond.

1. The following minimum separation distances may be modified as necessary to accommodate site requirements or local codes:

A. The pond shall be located a minimum of seventy-five feet (75') from property lines as measured from the adjoining pond shoreline. However, this distance must be increased where necessary to be sure that all effluent is disposed upon the property from which it originated;

B. The pond shall be located a minimum of two hundred feet (200') from the nearest existing residence and a minimum of one hundred feet (100') from the residence that it serves;

C. The pond shall be located at least one hundred feet (100') from a potable water supply or pump suction line; and

D. The pond shall be located at least fifty feet (50') from a stream, water course, lake or impoundment.

2. Ponds may be utilized when there are no significant limitations related to groundwater from their use and the soils have been demonstrated to be very slowly permeable such as percolation rates slower than one hundred twenty minutes per inch (120 min./in.). There shall be either a minimum separation distance between the pond bottom and creviced bedrock of three feet (3') or installation of a clay liner with a minimum thickness of one foot (1') or a synthetic liner, either of which must be acceptable to the administrative authority. Percolation losses from the pond shall not exceed one-eighth inch (1/8") per day to prevent groundwater contamination or nuisance conditions. Site modifications may be accomplished to provide these soil requirements. In areas of severe geological limitations, restrictive layers such as fragipans shall be a minimum of twelve inches (12") thick and shall not be breached during construction.

3. Steeply sloping areas should be avoided.

4. Selection of the pond site should consider a clear sweep of the surrounding area by prevailing winds. Heavy timber should be removed for a distance of fifty feet (50') from the water's edge to enhance wind action and prevent shading.

5. The administrative authority may require that a properly sized and constructed septic tank or aeration unit precede the pond. If irrigation of the effluent is required to maintain the wastewater on the property from which it originated, a septic tank or aeration unit should precede the pond. The use of a septic tank or aeration unit should not be used as a basis for reduction of the set-back distances as set forth in subparagraphs (6)(D)1.A.-D. of this rule.

6. The pond shall be designed on the basis of four hundred forty square feet (440 sq. ft.) of water surface area per bedroom at the three-foot (3') operating level. This square footage may be reduced by a maximum of twenty percent (20%) if a septic tank, aeration unit or other pretreatment device precedes the pond. The minimum water surface area at the three-foot (3') level shall be nine hundred square feet (900 sq. ft.).

7. A single cell is generally acceptable for single residence pond systems. If multiple cells are used for further polishing or storing of the effluent, the secondary cell should be one-half (1/2) the size of the primary cell.

8. The minimum embankment top width shall be four feet (4'). The embankment slopes shall not be steeper than three to one (3:1) on the inner and outer slopes. Inner embankment slopes shall not be flatter than four to one (4:1). Outer embankment slopes shall be sufficient to prevent the entrance of surface water into the pond. Freeboard shall be at least

eighteen inches (18") and preferably twenty-four inches (24"). Additional freeboard may be provided.

9. To minimize erosion and facilitate weed control, embankments shall be seeded with a locally hardy grass from the outside toe to one foot (1') above the water line. Alfalfa or similar long-rooted crops which might interfere with the structure of the embankment shall not be used. Rip rap may be necessary under unusual conditions to provide protection of embankments from erosion.

10. The influent line shall be of a sound, durable material of watertight construction of SDR 35 or greater. The line shall have a minimum diameter of four inches (4") and be laid on a firm foundation at a minimum grade of one-eighth inch (1/8") per foot from the point of entry into the pond. The influent line shall discharge as far as practical from the possible outlet side of the pond. A cleanout or manhole should be provided in the influent line near the pond embankment. From this point the line shall either be laid to the inner toe of the embankment and then on the bottom of the pond to the terminus point or the line shall be supported and secured every five feet (5'). A concrete splash pad three feet (3') square should be placed under the terminus of the pipe. The elevation of the cleanout or manhole bottom should be a minimum of six inches (6") above the high water level in the pond.

11. The pond shall be shaped so there are no narrow or elongated portions. Round, square or rectangular cells are considered most desirable. Rectangular cells shall have a length not exceeding three (3) times the width. No islands, peninsulas or coves shall be permitted. Embankments should be rounded at corners to minimize accumulation of floating materials.

12. The floor of the pond shall be stripped of vegetation and leveled to the proper elevation. Organic material removed from the pond area shall not be used in embankment construction. The wetted area of the pond must be sealed to prevent excessive exfiltration. Seals consisting of soils must be adequately compacted by the construction equipment.

13. Embankments shall be constructed of impervious materials and compacted sufficiently to form a stable structure with very little settlement.

14. Any effluent should be withdrawn from six inches (6") below the water surface. This can be accomplished by placing a tee on the inlet end of the pipe or by placing the outlet pipe eight to ten inches (8-10") lower on the inlet end than the outlet end of the pipe.

15. The pond area shall be enclosed with a fence conforming to the following conditions:

A. The fence shall be at least four feet (4') in height;

B. The fence shall be welded, woven or chain link material with no smaller than fourteen gauge (14 ga.) wire. Cattle or hog panels can be substituted with a tee post being used for a line post;

C. Fence posts shall be pressure-treated wood, galvanized and/or painted steel. Fence posts shall be driven, tamped or set in concrete. Line posts should be at least eighteen inches (18") deep and shall be spaced no more than ten feet (10') apart. Corner posts should be at least twenty-four inches (24") deep and shall be properly braced;

D. The fence shall be of sound construction with no gaps or openings along the bottom;

E. The fence shall be no closer than the center of the berm to the water's edge at the three-foot (3') deep operating level. Fence set-backs should not exceed thirty feet (30') from the water's edge;

F. A properly hinged four foot (4') high gate or comparable materials shall be installed and provided with an effective latching device. The gate should be thirty-six to forty-eight inches (36-48") in width to accommodate maintenance and mowing equipment; and

G. The fence must be completed prior to occupancy of the dwelling.

16. Effluent from a pond must be disposed of on the property from which it originated. This may be accomplished by locating the outlet as far as practical from the property line and out of any natural drainage ditches or swales. The minimum distance from the outlet to a property line shall be one hundred feet (100'). Another method is to construct a terraced swale with a minimum length of one hundred fifty feet (150'). If these methods are unsuccessful, or whenever there is less than twelve inches (12") of permeable soil over a restrictive layer, controlled surface irrigation must be used. To utilize controlled surface irrigation, the pond must be capable of operating up to five feet (5') deep with one foot (1') of freeboard or have a second cell for storage. The administrative authority shall approve the method of effluent disposal.

17. It may be necessary to introduce water into the pond to facilitate start-up of the biological processes, however, there shall be no permanent connection of any roof drain, footing drain or any source of rainwater to the wastewater stabilization pond.

18. Odor problems caused by spring turnover of water, temporary overloading, ice cover, atmospheric conditions or anaerobic conditions may be controlled by broadcasting sodium or ammonium nitrate over the surface of the pond. In general, the amount of sodium or ammonium nitrate should not exceed two pounds (2 lbs.) per day until the odor dissipates.

(E) Elevated Sand Mounds. Elevated sand mounds may be considered whenever site conditions preclude the use of absorption trenches. The construction of a mound shall be initiated only after a site evaluation has been made and landscaping, dwelling placement, effect on surface drainage and general topography have been considered. Due to the nature of this alternative system, actual selection of mound location, size of mound and construction techniques must be carefully considered and the criteria established in this rule implicitly followed. A set-back distance of fifty feet (50') from the downslope property line is recommended.

1. Elevated sand mounds shall not be utilized on soils where the high ground water level as evidenced by mottling, bedrock or other strata having a percolation rate slower than one hundred twenty minutes per inch (120 min./in.) occurs within twenty-four inches (24") of natural grade. Up to four feet (4') of soil thickness over bedrock may be required in areas where there is a significant potential for groundwater contamination. Mounds shall be constructed only upon undisturbed naturally occurring soils.

2. Elevated sand mounds are subject to the setback distances required in subsection (1)(D) of this rule.

3. The fill material from the natural soil plowed surface to the top of the rock-filled bed shall be sand, loamy sand or sandy loam. Loading rates on the sand fill shall not exceed the values in Table 8.

4. There shall be a minimum of one foot (1') of fill material and two feet (2') of naturally occurring soils between the bottom of the trench rock and the highest elevation of the limiting conditions as defined in paragraph (6)(E)1. of this rule.

5. Whenever possible, mounds should be located on flat areas or crests of slopes. Mounds should not be located on natural slopes of more than six percent (6%) if the percolation rate is slower than sixty minutes per inch (60 min./in.) to a depth of at least twenty-four inches (24") below the sand layer. Mounds may be located on slopes up to a maximum of twelve percent (12%) if the soil percolation rate is faster than sixty minutes per inch (60 min./in.) to a depth of twenty-four inches (24") below the sand layer.

6. In no case shall the width of the trench rock in a single bed exceed ten feet (10').

7. The required bottom area of the trenches or bed and the effective basal area of the mound shall be based on one hundred twenty gallons per bedroom per day (120 gals./pbd). The basal area of the mound shall have the minimum area as shown in Table 9.

8. The area of sand fill shall extend beyond the basal area and the sides shaped to a three to one (3:1) or four to one (4:1) slope. The sand fill shall be covered with six inches (6") of fine textured soil and a final cap of six inches (6") of good topsoil applied. Also the mound shall be seeded with a hardy grass to establish a turf grass cover as soon as possible. No shrubs shall be planted on the top of the mound. Shrubs may be placed at the foot and side slopes of the mound.

9. The land area fifty feet (50') down slope of the elevated sand mound is the effluent dispersal area and the soil in this area may not be removed or disturbed.

10. Dosing shall be required for all elevated sand mounds. The mound shall be dosed not more than two (2) times per day. The size of the dosing pump shall be selected to maintain a minimum pressure of one pound per square inch (1 psi), two and three-tenths feet (2.3') of head, at the end of each distribution line.

A. Perforation holes and hole spacing shall be determined to insure equal distribution of the effluent throughout the bed or trenches.

B. The perforated pipe laterals shall be connected to a two-inch (2") diameter manifold pipe with the ends capped. The laterals shall be spaced no farther than forty inches (40") on center and no farther than twenty inches (20") from the edge of the trench rock. The perforated pipe laterals shall be installed level with the perforations downward. There shall be a minimum of nine inches (9") of trench rock below the laterals and two inches (2") above the laterals. The material used to cover the trench rock shall be untreated building paper, six inches (6") of compacted straw and three and one-half inch (3 1/2") unbacked fiberglass insulation or a geotextile.

C. The manifold pipe shall be connected to the supply pipe from the pump. The manifold shall be sloped toward the supply pipe from the pump. Antireflux valves are prohibited in the pump discharge line. The pump discharge line shall be graded to permit gravity flow to the absorption area or back to the dosing tank. Proper air relief and anti-siphon devices shall be installed in the piping to prevent siphoning of effluent from the dosing tank or from the mound.

11. Prior to preparing the area selected for the mound, above ground vegetation must be closely cut and removed from the ground surface. Prior to plowing, the dosing pump discharge line shall be installed from the pump chamber to the point of connection with the distribution manifold. The area shall then be plowed to a depth of seven to eight inches (7-8") parallel to the land contour with the plow throwing the soil upslope to provide a proper interface between the fill and

natural soils. A rubber-tired tractor may be used for plowing but in no case shall a rubber-tired tractor be used after the surface preparation is completed. Tree stumps should be cut flush with the surface and the roots should not be pulled. The soil shall be plowed only when the moisture content of a fragment eight inches (8") below the surface is below the plastic limit.

12. Mound construction shall proceed immediately after surface preparation is completed.

A. A minimum of twelve inches (12") of sand fill shall be placed where the trench rock is to be located. A crawler tractor with a blade shall be used to move the sand into place. At least six inches (6") of sand shall be kept beneath equipment to minimize compaction of the plowed layer. The sand layer upon which the trench rock is to be placed shall be level.

B. After hand leveling of the trench rock, the distribution system shall be placed and the pipes covered with two inches (2") of rock. After installation of the distribution system, the entire mound is to be covered with topsoil native to the area. The entire mound shall be crowned by providing twelve inches (12") of topsoil on the side slopes with a minimum of eighteen inches (18") over the center of the mound. The entire mound shall then have a turf grass cover established to assure stability of the installation.

C. The area surrounding the elevated sand mound shall be graded to provide diversion of surface runoff waters.

(F) **Holding Tanks.** The use of holding tanks is generally discouraged and their interim use should be limited to situations where construction of satisfactory sewage treatment and disposal systems will occur within one (1) year. Use of a holding tank must be specifically approved by the administrative authority on a case-by-case basis which may require stipulations in a signed agreement regarding the use and the length of time for use of the holding tank.

1. A holding tank shall be constructed of the materials and by the same procedures as those specified for watertight septic tanks.

2. A cleanout pipe of at least six inches (6") diameter shall extend to the ground surface and be provided with seals to prevent odor and exclude insects and vermin. A manhole of at least twenty inches (20") least dimension shall extend through the cover to a point within twelve inches (12") but no closer than six inches (6") below finished grade. The manhole cover shall be covered with at least six inches (6") of earth.

3. The tank shall be protected against flotation under high water table conditions. This shall be achieved by weight of the tank, earth anchors or shallow bury depths.

4. For a residence, the size shall be one thousand gallons (1000 gals.) or four hundred gallons (400 gals.) times the number of bedrooms, whichever is greater. For permanent structures, other than residences, the capacity shall be based on measured flow rates or estimated flow rates. The tank capacity shall be at least five (5) times the daily flow rate.

5. Holding tanks shall be located as follows:

A. In an area readily accessible to the pump truck under all weather conditions;

B. As specified for septic tanks in Table 1 set forth in subsection (1)(D) of this rule; and

C. Where accidental spillage during pumpage will not create a nuisance.

6. A contract for disposal and treatment of the sewage wastes shall be maintained by the owner with a pumper, municipality, agency or firm which possesses a current and

valid permit issued by the Department of Natural Resources for such activity.

7. Holding tanks shall be monitored to minimize the chance of accidental sewage overflows. Techniques such as visual observation, warning lights or bells, or regularly scheduled pumping shall be used. For commercial establishments, a positive warning system shall be installed which allows twenty-five percent (25%) reserve capacity after actuation.

8. Holding tanks used in conjunction with permanent black water/gray water systems must conform to the requirements of this section except that the minimum size tank is one thousand gallons (1000 gals.). In these situations, the holding tank is to receive toilet wastes only.

(G) Sand Filters. Septic tanks or aeration units and sand filters may be used along with soil absorption systems in soils with percolation rates between sixty and one hundred twenty minutes per inch (60–120 min./in.). These systems must be specifically approved by the administrative authority.

1. The septic tank and aeration units must be in accordance with section (4) of this rule. Setback distances as shown in Table 1 and as specified in subsection (1)(D) of this rule shall apply except that the minimum distance to the downslope property line should be fifty feet (50').

2. The following shall apply to gravity flow sand filter systems:

A. All piping in a sand filter shall be four inch (4") polyvinyl chloride (PVC). Perforated pipe should be used for distribution and collection lines;

B. All sand filters shall be dosed at two (2) times per day. Dosing shall provide uniform distribution of wastewater throughout the filter cross-section and allow time for reaeration of the pore spaces to occur. Dosing may be accomplished by either pumps or siphons;

C. Effluent from filter underdrains must be collected and disposed of properly. Effluent shall not discharge off the owner's property;

D. Buried sand filters shall be in conformance with Table 10 of this rule. One (1) collector line shall be provided for every six feet (6') of bed width, with a minimum of two (2) collector lines per bed. The collector lines shall have a minimum grade of one percent (1%); and

(I) Distribution lines shall be level and spaced a maximum of three feet (3') apart. Each distribution line must be vented (downstream end) or connected to a common vent. Vents should extend at least twelve inches (12") above the ground surface with the outlet screened or capped (perforated).

(II) Septic tank effluent shall be applied to the filter through a distribution box. Buried filters shall be dosed with a pump or siphon. The dosing volume shall be sufficient to fill the pore spaces in the gravel to a depth of four inches (4"). For single bed filters receiving septic tank effluent, the hydraulic loading rate shall not exceed one gallon per day per square foot (1 gpd/sq. ft.) with a maximum organic loading of one and three-fourths pounds (1 3/4 lbs.) of biological oxygen demand (BOD) per day per one thousand square feet (1000 sq. ft.) of surface area. Total surface area shall not be less than two hundred square feet (200 sq. ft.).

E. Open sand filters are similar to buried filters with the exception that no soil backfill or gravel is used on the top of the sand and the filter must be enclosed within concrete walls or other substantially equivalent material. Open sand filters shall be in conformance with Table 10.

(I) Distribution of wastewater shall be applied by pipes directly over the sand surface at the center of the bed or at the four corners. Splash plates beneath points of discharge must be used to prevent erosion of the sand. Curbs around the splash plates or large stones placed around the periphery of the plate will help prevent scouring. All exposed pipes shall slope to drain.

(II) Filter walls shall be concrete, masonry, compacted clay, high density polyethylene plastic with a minimum thickness of thirty (30) mil, or other material acceptable to the administrative authority; and extend six inches (6") above the sand and six inches (6") above the adjacent ground level.

(III) Dosing shall flood the bed to a depth of two inches (2") with a hydraulic loading of two to five gallons per day per square foot (2–5 gpd/sq. ft.) (septic tank effluent). Maximum organic loading is five and thirteen-hundredths pounds (5.13 lbs.) of BOD per day per one thousand square feet (1000 sq. ft.) of surface area.

(IV) The filter may be covered to provide protection against severe weather, prevent growth of weeds and to keep children and animals out of the filter. Such cover may include six inches (6") of clean one to two inch (1-2") gravel, if so designed by an engineer as part of the system. In such event, a vent for the system would not be required if so determined by the engineer.

3. The following shall apply to pressure dosed sand filter systems:

A. Conventional pressure dosed sand filters use an intermittent filter with two feet (2') or more of medium sand designed to filter and biologically treat sewage tank effluent from a pressure distribution system at an application rate not to exceed one and twenty-five hundredths gallons per square foot (1.25 gals./sq. ft.) sand surface area per day, applied at a dose not to exceed one-half gallon (1/2 gal.) per orifice per dose. These sand filters may be buried or open.

B. Recirculating pressure dosed sand filters use a recirculating filter with two feet (2') or more of medium filter media designed to filter and biologically treat sewage tank effluent from a pressure distribution system at an application rate not to exceed five gallons per square foot (5 gals./sq. ft.) filter surface per day, applied at a dose not to exceed two gallons (2 gals.) per orifice per dose. These sand filters shall be uncovered and open to the surface.

C. Minimum filter area for these filters shall be as follows:

(I) Conventional pressure dosed sand filters for single family residences shall be a minimum of three hundred and sixty square feet (360 sq. ft.) in surface area with a design sewage flow not to exceed six hundred gallons (600 gals.). If sand filter design flows exceed an average of four hundred and fifty gallons per day (450 gpd), the minimum sand surface will be based on one and twenty-five hundredths gallons per day per square foot (1.25 gpd/sq. ft.); and

(II) Pressure dosed sand filters for commercial facilities shall be sized on the basis of projected daily sewage flow. If the waste strength is proposed to be greater than residential strength waste, pretreatment shall be required which will reduce the biological oxygen demand to levels not to exceed three hundred (300), total suspended solids to levels not to exceed one hundred-fifty (150), and oil and grease to levels not to exceed twenty-five (25). The minimum sand surface will

be based on two to five gallons per day per square foot (2–5 gpd/sq. ft.).

D. Design criteria shall include the following:

(I) Sewage tanks shall be in accordance with section (4) of this rule. Set-back distances as shown in Table 1 of subsection (1)(D) and as specified in subsection (1)(E) of this rule shall apply, unless a variance has been allowed by the administrative authority. Tanks shall be watertight and tested in the field. The test shall be performed by filling the tank two inches (2") above the riser inlet. At the end of the first twenty-four (24) hour period, the tank water level should be refilled. After another twenty-four (24) hour period, no more than one inch (1") of water should have dropped from the original reading. All sewage and pump tanks will be supplied with vandal-proof access risers to grade over the pump units. Risers should have a waterproof epoxy seal between the tank and riser;

(II) Pumping systems for a pressure dosed sand filter system should provide pumping apparatus that is capable of filtering gross solids larger than one-eighth inch (1/8") and draw from the clear zone near the outlet side of the sewage tank. This zone is described as the layer of effluent between the sludge and scum layers of the sewage tank. Pumps should be able to deliver adequate head pressure to control orifice plugging. Pumps should be made of a corrosive resistant material such as Type 316 stainless steel, suitable plastic, or 85-5-5-5 bronze. Screens should have at least ten square feet (10 sq. ft.) of surface area, with one-eighth inch (1/8") openings;

(III) Operation controls should be on a timer dose that distributes the average daily flow over an eighteen (18) hour period. Recirculating filters will be set to recirculate five (5) times the average daily flow over a twenty-four (24) hour period. Systems should be designed with a high water alarm and light signal. Control panels should be located on an exterior location. Control operations should be located in an area available for maintenance;

(IV) Intermittent filter media shall be a mixture of sand or durable inert particles with one hundred percent (100%) passing the three-eighths inch (3/8") sieve; ninety to one hundred percent (90-100%) passing the No. 4 sieve; sixty-two to one hundred percent (62-100%) passing the No. 10 sieve; forty-five to eighty-two percent (45-82%) passing the No. 16 sieve; twenty-five to fifty-five percent (25-55%) passing the No. 30 sieve; ten percent (10%) or less passing the No. 60 sieve; four percent (4%) or less passing the No. 100 sieve; or sand meeting the ASTM-C 33 concrete sand specification minus four percent (4%) or less passing the No. 100 sieve. All drainage rock should be a river washed, hardened and weathered rock. The treatment media will be two inches (2") deep and of a coarse media with an effective size of one and one-half to three millimeters (1 1/2–3 mm) and a uniformity coefficient of less than two (2). Limestone or dolomite is not acceptable for drainage rock;

(V) Recirculating filter media shall be a mixture of sand or durable inert particles with one hundred percent (100%) passing the three-eighths inch (3/8") sieve; seventy-nine to one hundred percent (79-100%) passing the No. 4 sieve; eight to ninety-two percent (8-92%) passing the No. 8 sieve; zero to fifteen percent (0-15%) passing the No. 30 sieve; zero to one percent (0-1%) passing the No. 50 sieve. All drainage rock should be a river washed, hardened and weathered rock. The treatment media will be two inches (2")

deep and of a coarse media with an effective size of one and one-half to three millimeters (1 1/2–3 mm) and a uniformity coefficient of less than two (2). Limestone or dolomite is not acceptable for drainage rock; and

(VI) Container designs may be concrete containers consisting of watertight walls and floors to prevent groundwater from infiltrating or effluent from exfiltrating from the filter. All penetrations through the walls shall be watertight. Containers may also consist of a thirty (30) mil polyvinyl chloride liner covering the sand filter bottom and side wall areas. Polyvinyl chloride liners should be supplied with repair kits and boots for passage through the liner wall. The bottom area of the liner should be bedded in two inches (2") of leveling sand. The liner should be constructed to form a waterproof membrane between the trench bottom and trench walls. The polyvinyl liner should incorporate all seams to be a chemically or heat bonded waterproof seam.

E. The filter design criteria shall include the following:

(I) The interior base of the filter container shall be level or constructed at a grade of one percent (1%) or less to the underdrain pipe elevation;

(II) The underdrain piping shall consist of a pipe with one-fourth inch (1/4") grooves cut every four inches (4") along the pipe length to a depth of one-half (1/2) of the pipe diameter. The bottom of the filter container shall be covered with a minimum of six inches (6") of drain media. The underdrain pipe shall be enveloped in an amount and depth of drainage rock to prevent migration of the underdrain media into the pipe perforations;

(III) A minimum of twenty-four inches (24") of approved filter media shall be installed over the underdrain media. The media shall be damp at the time of installation to insure compaction of the media. The top surface of the media shall be level;

(IV) There shall be a minimum of three inches (3") of clean drain media below the distribution laterals, and sufficient media above the laterals equal to or covering the orifice shields and/or pipe;

(V) Distribution laterals shall be evenly spaced on minimum, thirty inch (30") centers. Orifices shall be placed such that there is one orifice or more on average per six square feet (6 sq. ft.) of sand surface. Orifice holes shall be one-eighth inch (1/8") in diameter. The diameter of the piping manifold and lateral shall be no less than one-half inch (1/2"). The ends of the distribution laterals should be constructed with a means to perform flushing of the piping, collectively or individually, through the operation of a flushing valve. The flushed effluent may be discharged to the sand filter;

(VI) The top of the intermittent media in which the pressure distribution system is installed shall be covered with a breathable nylon or polypropylene spun filter fabric rated at eighty-five hundredths ounce per square yard (0.85 oz./sq. yd.) to eliminate soil intrusion into the filter media. Recirculating filters shall be open-topped.

(VII) The top of the intermittent sand filter area shall be backfilled with a soil cover, free of rocks, vegetation, wood waste, etc. The soil cover shall have a textural class of loamy sand. The soil cover shall have a minimum depth of six inches (6") and a maximum depth of twelve inches (12"). Intermittent sand filters designs may delete soil cover and incorporate three to six inches (3-6") of a quality cypress or cedar mulch over the entire filter area.

(VIII) Where the effluent from a sand filter is to be discharged via a pump, the pump and related apparatus shall be housed in a vandal resistant vault designed to withstand the stresses placed upon it and not allow the migration of drain media, sand or underdrain media to its interior. The vault shall have a durable, affixed floor. The vault shall provide watertight access to the finished grade with a diameter equal to that of a gravity discharge sand filter. The depth of the underdrain and the operational level of the pump cycle and alarm shall not allow effluent to come within two inches (2") of the bottom of the sand filter media. The pump off level shall be no lower than the invert of the perforations of the underdrain piping. The internal sand filter pump shall be electrically linked to the sand filter dosing apparatus in such a manner as to prevent effluent from entering the sand filter in event the internal sand filter pump fails; and

(IX) Other sand filters which vary in design from those described in this rule may be authorized by the administrative authority if they can be demonstrated to produce a comparable effluent quality.

F. Effluent from these sand filters may discharge to the ground surface, provided the effluent is maintained on the owner's property and the following separation distances are maintained:

(I) The discharge shall be a minimum of one hundred feet (100') from private water supply wells; one hundred-fifty feet (150') from unplugged abandoned wells or wells with less than eighty feet (80') of casing; and three hundred feet (300') from public water supply wells;

(II) The discharge shall be a minimum of one hundred feet (100') from springs; five hundred feet (500') from the edge of surficial sink holes; fifty feet (50') from a classified stream; and twenty-five feet (25') from a stream or open ditch; and

(III) The discharge shall be a minimum of seventy-five feet (75') from property lines.

G. If effluent can not meet the minimum separation distances as described in subparagraph (6)(G)2.F., then the effluent must be disposed of into a soil absorption system. The required footage of the soil absorption system may be reduced by up to one-third (1/3) of that required for a conventional soil absorption system. Shallow bury designs should be utilized whenever possible to achieve the best absorption rates.

(H) **Drip Soil Absorption.** Drip soil absorption also known as trickle irrigation may be approved by the administrative authority in accordance with section (6) of this rule. Due to the various pretreatment methods and appurtenances and lack of extensive experience, drip soil absorption systems must be viewed as experimental, and back-up design for another system shall be approved in case of failure of the drip soil absorption system.

1. Drip lines shall be placed two feet (2') apart in a parallel arrangement. Emitters shall be placed in the drip lines every two feet (2') so there will be a two-foot by two-foot (2'x2') grid pattern. Other configurations and spacings of the drip line and emitters may be used; however, each emitter will be considered to cover four square feet (4 sq. ft.) of absorption area.

2. The application rate shall not exceed the values as shown in Table 7 for low pressure pipe systems in subparagraph (6)(C)3.A of this rule.

3. Drip soil absorption systems may be allowed at sites where the soil is classified as being in group IVb. A minimum separation distance of twelve inches (12") shall be maintained

between the drip lines and emitters and a high ground water table or other limiting condition. The maximum application rate for IVb soils shall be from five-hundredths to one-tenth gallons per day per square foot (0.05–0.10 gpd/sq. ft.) of absorption field.

(I) **Wetlands.** Constructed wetlands provide secondary levels of treatment, which means that some form of pretreatment (septic tank, aeration tank, lagoon, etc.) must be used prior to the wetland, as wetlands cannot withstand large influxes of suspended solids. The pretreatment used must be capable of removing a large portion of these solids. Effluent from wetlands must be contained on the owner's property with the same set-back distances as required for lagoons in Table 1, located in subsection (1)(D) of this rule.

1. Free water surface wetlands are shallow beds or channels with a depth less than twenty-four inches (24") and filled with emergent aquatic plants. This type of wetland shall not be allowed.

2. Submerged flow wetlands are similar to free water surface wetlands except that the channels are filled with shallow depths of rock, gravel or sand. The depth of the porous media is usually less than eighteen inches (18"). The porous media supports the root systems of the emergent aquatic vegetation. The water level is to be maintained below the top of the porous media so that there is no open water surface.

3. The surface area of wetlands shall be determined by using the following equation:

$$A_s = [Q(\ln C_o - \ln C_e)] / (k_T \times f \times d)$$

where: A_s = wetland surface area, sq. ft.

Q = daily flow rate to wetland, cu. ft./day
([gallons/day] ÷ 7.5);

C_o = influent BOD₅ concentration, mg/L;

C_e = effluent BOD₅ concentration, mg/L;

k_T = temperature dependent rate constant,
per day;

d = water depth in wetland, ft; and

f = void fraction of rock media, decimal.

4. After a surface area has been determined, a cross-sectional area shall be calculated against hydraulic loading by using the following equation:

$$A_h = Q / (K_h \times S)$$

where: A_h = cross-sectional area (hydraulic loading),
sq. ft.;

K_h = hydraulic conductivity of rock media,
ft./day*; and

S = slope of wetland bottom, decimal.**

*A value of eight hundred feet per day (800 ft./day) may be used for the hydraulic conductivity for rock of one inch (1") diameter.

**Values for slope should range between twenty-five hundredth and one percent (0.25-1.0%).

5. After the hydraulic loading has been determined, an organic loading shall be calculated using the following equation:

$$A_o = OGL / 0.05$$

where: A_o = cross-sectional area (organic loading),
sq. ft.; and

OGL = organic loading, lbs BOD₅/day.

6. The larger of the two (2) calculations, the hydraulic loading or the organic loading, shall be used to determine the wetland dimensions. Wetlands should not be long and narrow.

7. The width of the wetland shall be calculated by dividing the larger cross-sectional area by the water depth. The calculated width should not be less than one-third (1/3) of the length (a length:width ratio of three to one (3:1)). Should it be necessary to construct a wetland with a ratio greater than three to one (3:1), step-loading along the length of the wetland shall be considered.

8. The configuration of a wetland for an individual home can be a one (1) cell or two (2) cells in series, depending upon the soil properties at the site. Larger systems may consist of multiple cells in parallel or series in order to provide more management options.

A. Single cells may be used where there will be no percolation of water through the bottom of the wetland. Water movement properties of the soil at the wetland construction site must be determined either by use of properly performed percolation tests or a thorough soil profile analysis performed by a qualified person meeting the criteria of 19 CSR 20.3.080.

B. For soils with percolation rates of sixty minutes per inch (60 min./in.) or less and where geological limitations are not severe, a two (2)-cell wetland may be used. The first cell shall be lined, allowing no percolation. The second cell may be unlined and filled with sand (not rock) to promote some percolation from the bottom of the wetland. The second cell shall not be larger than the first cell.

9. Crushed limestone or other rock with sharp edges shall not be used for a porous media as this type of rock will compact with time. Rock with rounded edges, such as creek gravel, shall be used. Rock must be thoroughly washed to remove fines which may cause plugging. Rock substrate size should be one inch (1") diameter, while rock to be used around inlet and outlet pipes may be two to four inches (2-4") diameter to reduce potential clogging. A three to four inch (3-4") layer of washed pea gravel may be used on top of the one inch (1") substrate for decorative purposes.

10. All piping shall be SDR 35 Sewer pipe, Schedule 40 polyvinyl chloride (PVC) DWV pipe, or material of equivalent or stronger construction. Piping shall be a four inch (4") diameter.

11. Influent shall be distributed and effluent collected by header pipes running the width of the wetland. Perforated sewer pipe can be used for the headers. For unperforated pipe, a one and one-half inch (1 1/2") hole shall be drilled every twelve inches (12") along the header. Headers shall be placed at the bottom of the wetland on a bed of rock and covered with two to four inch (2-4") rock. A cleanout shall be placed before the influent header.

A. If effluent from the septic tank flows to the wetland by gravity and there are parallel cells in the wetland, a distribution box shall be placed ahead of the wetland so that flow can be controlled to individual cells.

B. If effluent is pumped, the pumping rate shall not exceed twenty-five gallons per minute (25 gpm) and no more than one-third (1/3) of the daily design flow shall be pumped at one (1) time.

12. Water level in a wetland shall be controllable. The range of control shall be from two inches (2") above the surface of the rock to complete draining of the wetland. Maximum

water level in the wetland shall be a minimum of twelve inches (12") below the outlet of the septic tank so that water does not back up into the septic tank.

A. To conveniently check the water level relative to the gravel surface, a four inch (4") diameter perforated pipe may be placed in the bottom of the wetland, through the channel embankment, and then elbowed up to the elevation of the top of the channel.

B. Water level control may be obtained by use of swivel standpipes or collapsible tubing.

13. Surface water shall be kept out of the wetland. This may be accomplished by diverting runoff away from the wetland or constructing an earthen berm around the wetland. Berms shall be a minimum of six inches (6") above the surface of the porous media.

14. Emergent plants shall be selected by the ability of the plants to: root and grow in the wastewater-rock environment, treat wastewater to acceptable levels, produce biomass in amounts that can be controlled and aesthetics. Reference may be made to Tables 11 and 12 in selecting desired plants.

(J) Privy. A privy will be allowed only under limited conditions and will not be recognized as a method of sewage disposal for a continuously occupied dwelling, business or other structure. A privy will only be considered for remote areas not served by a piped water source. Examples of these areas may be a rural cemetery, a rural church with a small congregation and where hand-washing facilities are available, or a river access point provided by the Department of Conservation. Plans and construction of a privy will need to meet the approval of the administrative authority.

1. The privy shall be used to receive only human excreta and toilet paper. The privy shall not be used as a depository for other wastes.

2. A pit shall be provided for the privy. The sides of the pit shall be curbed to prevent cave-in. If the pit has an earth bottom, the bottom shall be at least three feet (3') above saturated soil conditions. If this separation distance cannot be achieved in the location of the privy, then the pit shall be liquid tight.

3. The pit shall be periodically pumped out by someone who services septic tank systems. At no time shall the pit contents be allowed to accumulate to within one foot (1') of the pit top. The pit contents shall then be transported and disposed into a community sewer system that is in compliance with Chapter 644, RSMo.

4. Both the pit and the privy shall be vented. Insect-proof openings shall be placed in the walls, below the seat. A vent shall extend from the underside of the seat board through the roof or up to a horizontal vent open to the sides of the toilet. This vent must be flush with the underside of the seat board and shall not extend down into the pit. All vent openings to the outside shall be properly screened to keep out insects. The top of the privy shall have a screened opening on each side. It is preferable the opening be all the way around the top of the privy in order to allow air to pass through and to carry away any odors which may seep into the upper part of the structure. If a crescent-shaped opening is cut into the door or wall of the privy, it shall also be screened.

5. The inside of the privy shall be of durable, smooth, non-absorbent material. If wood is used, the inside of the structure shall be coated with a polyurethane-type coating so as to minimize the penetration of liquids and odors into the wood.

6. A tight-fitting door, preferably with a self-closing feature, such as a door spring, shall be used.

7. A privy shall be set back from surface waters, buildings, property lines and water supply wells the same distance as required for soil treatment areas. This information may be found in subsection (1)(D), Table 1 of this rule.

8. The privy shall be of sufficient capacity for the facility it serves, but shall have at least fifty cubic feet (50 cu. ft.) of capacity.

9. Abandoned pits shall have the contents removed, transported and disposed into a community sewer system that is in compliance with Chapter 644, RSMo. This activity shall be performed by someone who services septic tank systems. The pit shall then be filled with clean earth and slightly mounded to allow for settling.

(K) Other Systems. Where unusual conditions exist, special systems of treatment and disposal, other than those specifically mentioned in this rule, may be employed provided—

1. Reasonable assurance of performance of the system is presented to the administrative authority;

2. The engineering design of the system is first approved by the administrative authority;

3. Adequate substantiating data indicate that the effluent will not contaminate any drinking water supply, groundwater used for drinking water or any surface water;

4. Treatment and disposal of the wastes will not deteriorate the public health and general welfare;

5. Discharge of effluent, if any, shall be within set-back distances as described in Table 1, located in subsection (1)(D) of this rule; and

6. These systems comply with all applicable requirements of this rule, with all local codes and ordinances, and all applicable requirements of sections 701.025–701.055 and Chapter 644, RSMo (1994).

(L) Variances. Variances may be considered and granted by the administrative authority concerning repair to on-site sewage disposal systems existing prior to January 1, 1996 with site limitations or for property platted prior to January 1, 1996 with site limitations. Where variances have been allowed from the standards, the administrative authority may require that a higher level of pretreatment than that of a septic tank be provided. At the discretion of the administrative authority and with relative assurance for protection of the public health and preservation of the quality of surface and ground waters, variances may be allowed for the following:

1. Setbacks as specified in Table 1, located in subsection (1)(D) of this rule.

2. Minimum distance between the infiltrative surface and restrictive feature or bedrock.

3. Minimum areas for infiltrative surfaces as shown in Table 5, Table 6, Table 7, Table 8, Table 9 and Tables 13 and 14.

4. A written application for a variance shall be provided to the administrative authority and shall provide the following:

A. An explicit description explaining why the requirements of this rule cannot be complied with, including a description of specific sections of this rule for which a variance is being requested;

B. A design of the proposed system. The design shall show that as much soil absorption as is practically possible will be installed;

C. The existing and maximum occupancy pattern and the existing water usage records, if any;

D. Potential impact, if any, on neighboring property owners and the names and mailing addresses of these property owners; and

E. Adequate substantiating data to indicate that the effluent will not contaminate any drinking water supply, groundwater used for drinking water or any surface water.

5. These systems shall comply with all applicable requirements of these standards except where variances have been granted.

6. No variance will be granted for any system that would result in noncompliance with Chapter 644, RSMo (1994), Missouri Clean Water law and subsequent rules. On-site sewage disposal systems with a discharge, other than a system serving a single family residence lot, must be referred to the Department of Natural Resources and comply with Chapter 644, RSMo (1994), Missouri Clean Water law and subsequent rules.

7. If effluent can not meet the minimum separation distances as described in Table 1 of subsection (1)(D), then the effluent must be disposed of into a soil absorption system. Set-back distances for lagoons will be considered applicable to alternative systems. The required footage of the soil absorption system following alternative systems may be reduced by up to one-third (1/3) of that required for a conventional soil absorption system. Shallow bury designs should be utilized whenever possible to achieve the best absorption rates.

8. All adjacent and/or affected property owners shall be notified in writing by the administrative authority whenever consideration for granting a variance is likely to result in effluent crossing property lines. The party requesting the variance shall be responsible for supplying the names and addresses of all adjacent and/or affected property owners to the administrative authority. Adjacent and/or affected property owners shall be allowed thirty (30) days from the date of the written notification to contact the administrative authority to express comments concerning the consideration of granting a variance.

9. In cases of complaint abatement, where effluent cannot be maintained on the owner's property, within the required set-back distances and presents a nuisance or threat to public health or surface or ground water quality, the administrative authority may require a holding tank be placed at the optimum location within the sewage system, in order to abate the complaint. The owner shall be responsible for assuring the holding tank is pumped as needed, with the contents being disposed of in a Department of Natural Resources permitted facility.

(7) Detailed Soils Evaluation.

(A) General. The intent of this section is to provide minimum standards for site evaluations based upon evaluation of the soil characteristics, namely texture, color, structure, drainage and depth. Criteria are also given for sizing standard systems and some alternative systems.

(B) Adoption and Use. Where this rule is administered by an administrative authority, those administrative authorities may adopt this section, in whole or in part, as part of a local code or ordinance. Nothing in this rule or section shall require any administrative authority to allow an installation based upon the criteria contained in this section. The administrative authority may require percolation tests in addition to evaluation of soil characteristics. Whenever percolation tests and these criteria are used, the size of the proposed system or suitability

of a site should be based upon which criteria produce the most conservative system. This type evaluation should be conducted by a professional soil scientist, engineer, sanitarian or registered geologist with special training in determining soil morphological characteristics in the field.

(C) Site Evaluation. An investigation of a proposed soil absorption site shall consider the following factors:

1. Topography and landscape position;
2. Soil characteristics (morphology) which includes texture, structure, porosity, consistence, color and other physical, mineral and biological properties of various horizons, and the thickness and arrangement of the horizons in the soil profile;
3. Soil drainage, which includes both external (surface) and internal (soil);
4. Soil depth;
5. Restrictive horizons; and
6. Available space.

(D) Site evaluations shall be made in accordance with subsections (7)(E)–(M) of this rule. Based on this evaluation, each of the factors listed in subsection (7)(C) of this rule shall be classified as Suitable, Provisionally Suitable or Unsuitable.

(E) Topography and Landscape Position. Uniform slopes under fifteen percent (15%) shall be considered suitable with respect to topography. When slopes are less than two percent (2%), provisions shall be made to insure adequate surface drainage. When slopes are greater than four percent (4%), the absorption lines shall follow the contour of the ground.

1. Uniform slopes between fifteen percent (15%) and thirty percent (30%) shall be considered provisionally suitable with respect to topography, if the soils are thirty-six inches (36") or more thick. Slopes within this range may require installation of interceptor drains upslope from the soil absorption system to remove all excess water that might be moving laterally through the soil during wet period. Usable areas larger than minimum are ordinarily required in this slope range.

2. Slopes greater than thirty percent (30%) shall be considered unsuitable except when a thorough study of the soil characteristics indicates that a soil absorption system will function satisfactorily and sufficient ground area is available to properly install such a system. Slopes greater than thirty percent (30%) may be classified as provisionally suitable when all of the following conditions are met:

A. The slope can be terraced or otherwise graded or the absorption lines located in naturally occurring soil to maintain a minimum ten-foot (10') horizontal distance from the absorption trench and the top edge of the fill embankment;

B. The soil characteristics can be classified as suitable or provisionally suitable to a depth of at least one foot (1') below the bottom of the absorption trench;

C. Surface water runoff is diverted around the absorption field so that there will be no scouring or erosion of the soil over the field;

D. If necessary, groundwater flow is intercepted and diverted to prevent the water from running into or saturating the soil absorption system; and

E. There is sufficient ground area available to install the septic tank system with these modifications.

3. Complex slope patterns and slopes dissected by gullies and ravines shall be considered unsuitable to topography.

4. Areas subject to frequent flooding shall be considered unsuitable to landscape positions.

5. Depressions shall be considered unsuitable with respect to landscape positions except when the site complies essentially with the requirements of this section and is specifically approved by the administrative authority.

6. If directed by the administrative authority, the surface area on or around a ground absorption system sewage treatment and disposal system shall be landscaped to provide adequate drainage. The interception of perched or lateral groundwater movement shall be provided where necessary to prevent soil saturation on or around the ground absorption sewage treatment and disposal system.

(F) Soil Characteristics (Morphology). Soil borings or pits shall be taken at the site to be used for soil absorption systems. These borings shall be taken to a depth of forty-eight inches (48") or as required to determine the soil characteristics. Soil borings or pits and core samples shall be evaluated and a determination made on the suitability of the soil to treat and absorb septic tank effluent. The important soil characteristics which shall be reviewed by the administrative authority are as follows:

1. The relative amounts of the different sizes of mineral particles in a soil are referred to as soil texture. All mineral soils are composed of sand, two to five hundredths millimeters (2–.05 mm) in size; silt, which includes intermediate-sized particles that cannot be seen with the naked eye but feel like flour when pressed between the fingers, five hundredths to two thousandths millimeter (0.05-0.002 mm) in size; or clay, which is extremely small in size and is the mineral particle that gives cohesion to a soil, less than two thousandths millimeters (0.002 mm) in size or a combination of these. The texture of the different horizons of soils may be classified into five (5) general groups and shall be used for determining the application rates shown in Tables 6 and 7 of this rule.

A. Soil Group I. Sandy texture soils contain more than seventy percent (70%) sand-sized particles in the soil mass. These soils do not have enough clay to be cohesive. Sandy soils have favorable sewage application rates, but may have a low filtering capacity leading to malfunction due to contamination of groundwater. The sandy group includes the sand and loamy sand soil textural classes and shall generally be considered suitable in texture.

(I) Sand. Sand has a gritty feel, does not stain the fingers and does not form a ribbon or ball when wet or moist.

(II) Loamy sand. Loamy sand has a gritty feel, stains the fingers (silt and clay), forms a weak ball and cannot be handled without breaking.

B. Soil group II. Coarse loamy texture soils contain more than thirty percent (30%) sand-sized particles and fewer than twenty percent (20%) clay-sized particles in the soil mass. They exhibit slight or no stickiness. The coarse loamy group includes sandy loam and loam soil textural classes and shall generally be considered suitable in texture.

(I) Sandy loam. Sandy loam feels gritty and forms a ball that can be picked up with the fingers and handled with care without breaking.

(II) Loam. Loam may feel slightly gritty but does not show a fingerprint and forms only short ribbons ranging from twenty-five hundredths to fifty hundredths inch (.25-.50") in length. Loam will form a ball that can be handled without breaking.

C. Soil group III. These fine loamy texture soils contain fewer than forty percent (40%) clay-sized particles and not more than thirty percent (30%) sand-sized particles in a soil

mass. Also this group is limited to less than thirty-five percent (35%) clay when the clay minerals exhibit high shrink/swell characteristic and exhibit slight to moderate stickiness. The fine loamy group includes sandy clay loam, silt loam, clay loam and silty clay loam textural classes and shall generally be considered provisionally suitable in texture.

(I) Silt loam. Silt loam feels floury when moist and will show a fingerprint but will not ribbon and forms only a weak ball.

(II) Silt. Silt has a floury feel when moist and sticky when wet but will not ribbon and forms a ball that will tolerate some handling.

(III) Sandy clay loam. Sandy clay loam feels gritty but contains enough clay to form a firm ball and may ribbon to form seventy-five hundredths to one-inch (.75-1") pieces.

(IV) Silty clay loam. Silty clay loam is sticky when moist and will ribbon from one to two inches (1-2"). Rubbing silty clay loam with the thumbnail produces a moderate sheen. Silty clay loam produces a distinct fingerprint.

(V) Clay loam. Clay loam is sticky when moist. Clay loam forms a thin ribbon of one to two inches (1-2") in length and produces a slight sheen when rubbed with the thumbnail. Clay loam produces a non-distinct fingerprint.

D. Soil group IV. These clayey texture soils contain forty percent (40%) or more clay-sized particles and include sandy clay, silty clay and clay. This group may also include clay loam and silty clay loam when the clay fraction is greater than thirty-five percent (35%) and of a high shrink/swell nature. There are two (2) major types of clays—non-expandable and expandable. The non-expandable clays, when wet, are slightly sticky to sticky; when moist, are friable to firm; and when dry, they are slightly hard to hard. The non-expandable clays (Group IVa) shall generally be considered provisionally suitable in texture. The expandable clays, when wet, are very sticky and very plastic and when moist, these clays are very firm to extremely firm and when dry, are very hard to extremely hard. The expandable clays (Group IVb) shall be considered unsuitable in texture.

(I) Sandy clay. Sandy clay is plastic, gritty and sticky when moist and forms a firm ball and produces a thin ribbon to over two inches (2") in length.

(II) Silty clay. Silty clay is both plastic and sticky when moist and lacks any gritty feeling. Silty clay forms a firm ball and readily ribbons to over two inches (2") in length.

(III) Clay. Clay is both sticky and plastic when moist, produces a thin ribbon over two inches (2") in length, produces a high sheen when rubbed with the thumbnail and forms a strong ball resistant to breaking.

E. Soil group V. This soil group may be of any texture, however, the most predominant are cherty and very cherty clays, silt loams and silty clay loams. The amount of rock fragments in these soils is of a concern in areas of residual soils overlying highly permeable bedrock where ground water could become contaminated. In general, soils with less than fifty percent (50%) rock fragments will be considered suitable. In general, soils with greater than fifty percent (50%) rock fragments over highly permeable bedrock will be considered unsuitable. Soils with greater than fifty percent (50%) rock fragments will be considered provisionally suitable if geological limitations are not severe.

F. The soil texture shall be estimated by field testing.

2. Soil consistency. Soil consistency is comprised of the attributes of soil material, typically clay, that are expressed by

the degree and kind of cohesion and adhesion or by the resistance to deformation or rupture.

A. Soil consistency when wet shall be considered as follows:

(I) Stickiness. Stickiness is the quality of adhesion to other objects. For field evaluation of stickiness, wet soil material is pressed between thumb and finger and its adherence noted. Degrees of stickiness are described as follows:

(a) Slightly sticky. After pressure, soil material adheres to both thumb and finger but comes off one or the other cleanly. It is not appreciably stretched when the digits are separated;

(b) Sticky. After pressure, soil material adheres to both thumb and finger and tends to stretch somewhat and pull apart rather than pulling free from either digit; and

(c) Very sticky. After pressure, soil material adheres to both thumb and finger and is decidedly stretched when they are separated; and

(II) Plasticity. Plasticity is the ability to change shape continuously under the influence of an applied stress and to retain the impressed shape on removal of the stress. For field determination of plasticity, the soil material shall be rolled between the thumb and finger to observe whether or not a wire or thin rod of soil can be formed. Degree of resistance to deformation at or slightly above field capacity is as follows:

(a) Slightly plastic. Wire formable but soil mass easily deformable;

(b) Plastic. Wire formable and moderate pressure required for deformation of the soil mass; and

(c) Very plastic. Wire formable and much pressure required for deformation of the soil mass.

B. Soil consistency when moist. Consistency when moist is determined at a moisture content approximately midway between air dry and field capacity. At this moisture content, most soil materials exhibit a form of consistency characterized by— tendency to break into smaller masses rather than into powder; some deformation prior to rupture; absence of brittleness; and ability of the material after disturbance to cohere again when pressed together. To evaluate this consistency, a mass that appears slightly moist shall be selected and attempt made to crush in the hand.

(I) Friable. Soil material crushes easily under gentle to moderate pressure between thumb and finger, and coheres when pressed together.

(II) Firm. Soil material crushes under moderate pressure between thumb and finger but resistance is distinctly noticeable.

(III) Very firm. Soil material crushes under strong pressure; barely crushable between thumb and finger.

(IV) Extremely firm. Soil material crushes only under very strong pressure; cannot be crushed between thumb and finger and must be broken apart bit by bit.

C. Soil consistency when dry. The consistency of soil materials when dry is characterized by rigidity, brittleness, maximum resistance to pressure, more or less tendency to crush to a powder or to fragments with rather sharp edges, and inability of crushed material to cohere again when pressed together. For evaluation, the air-dry mass shall be selected and broken in the hand.

(I) Slightly hard. Weakly resistant to pressure, easily broken between thumb and finger.

(II) Hard. Moderately resistant to pressure; can be broken in the hands without difficulty but is barely breakable between thumb and finger.

(III) Very hard. Very resistant to pressure; can be broken in the hands only with difficulty; not breakable between thumb and finger.

(IV) Extremely hard. Extremely resistant to pressure; cannot be broken in the hands.

3. Soil structure. In many soils, the sand, silt and clay particles tend to cling or stick to one another to form a ped or a clump of soil. This is known as soil structure. Soil structure may have a significant effect on the movement of effluent through a soil. Structure is usually not important in soil groups I and II, and these types of soils shall generally be considered suitable as to structure. The three (3) kinds of soil structure that are most significant in movement of sewage effluent through groups III and IV soils are block-like, platy and the absence of soil structure or massive conditions. These kinds of soil structure are described as follows:

A. Block-like soil structure. In groups III and IV soils, if the soil exhibits many peds of angular and subangular peds, then the soils have block-like structure. The sewage effluent may move between the cracks of these types of peds. Block-like structure in groups III and IV soils is frequently destroyed by mechanical excavating equipment manipulating the soil when it is too wet. Trenches for absorption lines being placed in groups III and IV soils with block-like structure should only be dug when the soils are moist or dry. Block-like soil structure in groups III and IV soils shall be considered provisionally suitable;

B. Platy soil structure. If groups III and IV soils fall out into plate-like sheets, then the soil would have platy structure. Water or effluent movement through these soils would be extremely slow, and the structure shall be considered unsuitable; and

C. Absence of soil structure. Some groups II, III and IV soils are massive and exhibit no structural aggregates. In these kinds of soils, water or effluent movement would be negligible. This structure shall be considered unsuitable.

(G) Soil Drainage. Soils with seasonally high water tables are of major concern in evaluating sites for sewage effluent disposal. These are the soil areas that give good sewage absorption rates during dry seasons of the year but force sewage effluent to the surface during the wetter seasons.

1. The depth of the seasonal high water table can commonly be recognized by those examining soil profiles. The criterion for recognition of high water tables is that of soil color. Subsurface horizons that are in colors of reds, yellows and browns generally indicate good soil aeration and drainage throughout the year. Subsurface horizons that are in colors of gray, olive or bluish colors indicate poor aeration and poor soil drainage. These dull or grayish colors may occur as a solid mass of soil or may be in mottles of localized spots. The volume of grayish color is indicative of the length of time that free water stands in that soil profile. There are soils that have light-colored mottles which are relic from the light-colored rock from which the soils have weathered. These soils would not have high water tables, so one must distinguish between a true soil composed of sand, silts and clays, or the rock material that may still exist in the soil profile. Similarly, there are also some soils with surface or subsurface eluvial horizons with light colors which can be unrelated to drainage conditions.

2. Any soil profile that has the grayish colors of chroma 2 or less (Munsell color chart) indicative of high water tables, or is either subject to periodic high water, within twenty-four inches (24") of the surface, or is less than twelve inches (12") between the proposed trench bottom and the high water table, shall be considered unsuitable as to drainage. Soils where the seasonally high water table is less than forty-eight inches (48") and more than twenty-four inches (24") below the naturally occurring surface shall be considered provisionally suitable for soil drainage, provided there remains at least twelve inches (12") of soil between the proposed trench bottom and the seasonally high water table. Soils where the seasonally high water table is greater than forty-eight inches (48") below the naturally occurring surface shall be considered suitable for soil drainage. Drainage systems installed for groundwater lowering shall be maintained so that a minimum separation of one foot (1') occurs between the absorption trench bottom and the seasonally high water table. For extensive drainage systems, such as groundwater lowering in subdivisions, easements shall be recorded and shall have adequate width for reasonable egress and ingress for maintenance.

(H) Soil Thickness. The thickness of soils to rock which are classified as suitable or provisionally suitable in texture and structure shall be at least forty-eight inches (48") when conventional soil absorption systems at conventional depths are to be utilized. Soil thickness greater than forty-eight inches (48") shall be considered as suitable as to soil thickness. Soil thickness less than forty-eight inches (48") and greater than thirty-six inches (36") shall be considered provisionally suitable. Where special design and installation modifications can be made to provide at least two feet (2') of naturally occurring soil below the bottom of the absorption trench, these soils may be reclassified as provisionally suitable in thickness.

(I) Restrictive Horizons. Restrictive horizons in soils are recognized by their apparent resistance in excavation or in the use of a soil auger. Restrictive horizons may occur as fragipans or claypans. The fragipan is a layer that owes its hardness mainly to extreme density or compactness as opposed to high clay content or cementation. The layer is typically dense and brittle. Although fragments are friable when removed, when in place the material is so dense that water moves through it very slowly. Unlike fragipans, the claypan is a compact, slowly permeable layer in the subsoil having a much higher clay content than the overlying material. A sharply defined boundary exists between the claypan and the overlying material. Claypans are typically hard when dry and plastic and sticky when wet.

1. Restrictive horizons that are greater than six inches (6") thick severely restrict the movement of water and sewage effluent and do not adequately respond to groundwater lowering drainage systems. Where these horizons are less than six inches (6") thick, they do not severely restrict the movement of water and sewage effluent, but rather indicate the presence of a seasonally high water table and may be modified after special investigation.

2. Soils in which restrictive horizons are six inches (6") or more in thickness and at depths greater than forty-eight inches (48") below the ground surface shall be considered suitable as to depth to restrictive horizons. Restrictive horizons six inches (6") or more in thickness and at depths between forty-eight inches and twenty-four inches (48-24") shall be considered provisionally suitable as to depth to restrictive horizons. Restrictive horizons six inches (6") or more in

thickness encountered at depths less than twenty-four inches (24") below the ground surface shall be considered unsuitable as to depth to restrictive horizons.

(J) Other Applicable Factors. The site evaluation should include consideration of any other applicable factors involving environmental principles including:

1. The potential environmental hazard of possible failures of soil absorption systems involving large quantities of sewage, which would dictate larger separation distances than the minimums specified in subsection (1)(D) of this rule; and

2. The potential environmental and health hazard of possible massive failures of soil absorption systems proposed to serve large numbers of residences, as in residential subdivisions or mobile home parks.

(K) Determination of Overall Site Suitability. All of the criteria in subsections (7)(E)-(J) of this rule shall be determined to be suitable, provisionally suitable or unsuitable as indicated. If all criteria are classified the same, that classification shall prevail. Where there is a variation in classification of the several criteria, the following shall be used in making the overall site classification. The lowest of the uncorrectable characteristics will determine the overall site classification. The administrative authority shall make this determination—

1. If the topography is classified as unsuitable, it may be reclassified provisionally suitable under the conditions outlined in subsection (7)(E) of this rule;

2. If the soil texture is classified as unsuitable, the overall classification will be unsuitable regardless of the other criteria unless the provisions of subsection (6)(K) of this rule are met;

3. If the soil structure is classified as unsuitable, the overall classification will be unsuitable regardless of the other criteria unless the provisions of subsection (6)(K) of this rule are met;

4. When soil thickness is classified as unsuitable, it may be reclassified as provisionally suitable under the conditions outlined in subsection (7)(H) of this rule;

5. When the restrictive horizon is classified unsuitable, it may be reclassified as provisionally suitable under the conditions outlined in subsection (6)(K) of this rule; and

6. When drainage (groundwater level) is unsuitable, it may be reclassified as provisionally suitable under the conditions outlined in subsection (7)(G) of this rule.

(L) Site Classification. Sites classified as suitable may be utilized for a ground absorption sewage treatment and disposal system consistent with this rule. A suitable classification generally indicates soil and site conditions favorable for the operation of a ground absorption sewage treatment and disposal system or have slight limitations that are readily overcome by proper design and installation.

1. Sites classified as provisionally suitable may be utilized for a ground absorption sewage treatment and disposal system consistent with this rule but with moderate limitations. Sites classified provisionally suitable require some modifications and careful planning, design and installation for a ground absorption sewage treatment and disposal system to function satisfactorily.

2. Sites originally classified as unsuitable may be used for soil absorption disposal systems, provided engineering, hydrogeologic and soil studies indicate to the administrative authority that a suitable septic tank system or a suitable alternate system can reasonably be expected to function satisfactorily. These sites may be reclassified as provisionally suitable upon submission to the administrative authority and

meeting the department's requirements in subsection (6)(K) of this rule.

(M) Design Criteria. Tables 13 and 14 shall be used when determining application rates for the appropriate sewage disposal system design.

1. Table 13 shall be used when determining the application rate for septic tank systems of conventional design when using the site evaluation criteria in this rule.

2. The construction of any conventional or LPP system must meet the other applicable requirements as set forth in section (6) of this rule. Soils for LPP systems must be classified as suitable or provisionally suitable to a depth of two feet (2') from the original ground surface. Table 14 shall be used when determining the application rate when using the site evaluation criteria in this rule.

(8) This rule shall expire June 30, 2006.

*Auth: sections 701.040(1) and 701.043.1, RSMo (1994).
Emergency rule filed April 17, 1995, effective April 27, 1995, expires August 25, 1995. Original rule filed April 17, 1995.*

Division 20– Title 19–DEPARTMENT OF HEALTH
Environmental Health & Epidemiology
Chapter 3–General Sanitation

19 CSR 20-3.080 Description of Persons Qualified to Perform Percolation Tests or Soils Morphology Examinations in Determining Soil Properties for On-Site Sewage Disposal Systems

PURPOSE: This rule establishes a list describing those persons qualified to perform percolation tests or soils morphology examinations in determining soil properties for on-site sewage disposal systems. This listing is authorized and mandated by section 701.040(2), RSMo.

(1) The following definitions shall apply in the interpretation and enforcement of this rule:

(A) Certified Agent of the Department of Health—A person or entity that has received authority from the Department of Health to act on behalf of the Department of Health regarding certification of individuals to conduct percolation or soil morphology examinations;

(B) Department—the Missouri Department of Health;

(C) Licensed Engineer—A person authorized under the provisions of Chapter 327, RSMo to practice as a professional engineer in Missouri and who may legally render or offer to render or hold himself or herself out as willing or able to render any service or creative work, the adequate performance of which requires engineering education, training and experience in the application of special knowledge of the mathematical, physical and engineering sciences to such services or creative work as consultation, investigation, evaluation, planning and design of engineering works and systems, engineering teaching of advanced engineering subjects or related courses, and the inspection of construction for the purpose of assuring compliance with drawings and specifications, any of which embraces such service or work either public or private, in connection with any utilities, structures, buildings, machines, equipment, processes, work systems, or projects and including such architectural work as is incidental to the practice of engineering; or who uses the title professional engineer or consulting engineer or the word engineer alone or preceded by any word indicating or implying that such person is or holds himself out to be a professional engineer, or who shall use any word or words, letters, figures, degrees, titles or other description indicating or implying that the person is a professional engineer or is willing or able to practice engineering;

(D) Percolation Test—The method of testing absorption qualities of the soil by prescribed means of digging and soaking holes with water, and measuring the rate of absorption into the soil;

(E) Registered geologist—A geologist who has met the qualifications established by the Missouri Board of Geologist Registration and has been issued a certificate of registration by the board;

(F) Sanitarian—A person registered either as a sanitarian or environmental health professional by the National Environmental Health Association, certified as a sanitarian or environmental health professional by the Missouri Board of Certification for Environmental Health Professionals or employed as a sanitarian or environmental health professional by the administrative authority;

(G) Soil Morphology Examination—The method of testing absorption qualities of the soil by physical examination

of the soils' color, mottling, texture, structure, topography and hillslope position; and

(H) Soil scientist—A person who has successfully completed at least fifteen (15) semester hours of soils science course work including at least three (3) hours of course work in soil morphology and interpretations, and has a minimum of two (2) years of field experience.

(2) A person meeting the definitions of soil scientist as defined in subsection (1)(H) of this rule may conduct a percolation test, soil morphology examination, or both, to determine suitability for on-site sewage disposal systems.

(3) After successful completion of a training course acceptable to or administered by the department, a person meeting the definitions of registered geologist, licensed engineer or sanitarian as defined in subsections (1)(B), (C) or (E) of this rule may conduct a percolation test to determine suitability for on-site sewage disposal systems. This person may also conduct a soil morphology examination if s/he has completed a minimum of ten (10) semester hours of soils course work, at least three (3) hours of which shall have included studies in soil morphology.

(4) Prior to conducting percolation tests, a person not meeting the definitions of licensed engineer, registered geologist, sanitarian or soil scientist as defined in subsections (1) (B), (C), (E) or (H) of this rule must become certified by the department or a certified agent of the department. Certification may be obtained by successful completion of a training course conducted by or approved by the department. This training course shall include, at a minimum, course work, field work, a written examination and a practical examination.

(5) The department may audit the work of a licensed engineer, registered geologist, sanitarian, soil scientist or certified person at any time to determine whether a proper and competent percolation test, soil morphology examination inspection or evaluation, or a combination, was made. Failure to adhere to department standards may be cause for suspension or revocation of the certification or authorization, or for mandatory successful completion of a training course as described in section (4). The audit may be an unannounced visit to the property on which the percolation test or soil morphology examination was conducted, which may include an independent soil percolation test or soil morphology examination, or a visit within the period of a soil percolation test or soil morphology examination with or without prior appointment with the certified or authorized person.

(6) No person without certification or authorization may conduct any part of a percolation test or soil morphology examination in which results are intended for use in design of an on-site sewage disposal system, whether on his/her own or under supervision of a certified or authorized person. Any certified or authorized person allowing or directing an uncertified or unauthorized person to conduct a percolation test or soil morphology examination will be subject to suspension or revocation of his/her certification or authorization.

(7) The suspension or revocation of certification or authorization shall be served in writing by certified mail or personal service to the affected person or his/her representative. Within ten (10) days the person may request a hearing or written review to show cause why the certification or authorization should not be suspended or revoked. The department may set a date not fewer than ten (10) nor more than thirty (30) days after receipt of the request. The decision of the department following the hearing or written review may be appealed to the Administrative Hearing Commission as provided in Chapters 536 and 621, RSMo.

(8) Any person whose certification or authorization has been revoked may not reapply for certification or authorization for at least one (1) year after the revocation.

(9) A person may be permanently barred from reapplying for certification or authorization if—

(A) The person has been found guilty of an infraction, misdemeanor or felony involving misrepresentation, fraud or other crime relating to activities associated with on-site sewage disposal systems; or

(B) The person has his/her certification or authorization revoked a second time within five (5) years.

(10) This rule will expire June 30, 2006.

Auth: section 701.040(2), RSMo (1994). Emergency rule filed April 17, 1995, effective April 27, 1995, expires August 25, 1995. Original rule filed April 17, 1995.

APPENDIX

Table 1–Minimum Set-Back Distances

Minimum Distance From	Sewage Tank¹	Disposal Area ²	Lagoons
	(Feet)	(Feet)	(Feet)
Private water supply well ³	50	100	100
Public water supply well	300	300	300
Cistern	25	25	25
Spring	50	100	100
Classified stream, lake or impoundment*	50	50	50
Stream or open ditch ⁴	25	25	25
Property lines	10	10**	75
Building foundation	5	15	100
Basement	15	25	100
Swimming pool	15	15	100
Water line under pressure	10	10	10
Suction water line	50	100	100
Upslope interceptor drains	-	10	10
Downslope interceptor drains	-	25	25
Top of slope of embankments or cuts of two feet (2') or more vertical height	-	20	20
Edge of surficial sink holes	50	100	500
Other soil absorption system except repair area	-	20	20

*A classified stream is any stream that maintains permanent flow or permanent pools during drought periods and supports aquatic life.

**Recommend twenty-five feet (25') of downslope property line initially, but repair may be allowed to ten feet (10') of downslope property line.

¹Includes sewage tanks, intermittent sand filters and dosing chambers.

²Includes all systems (sand filter, wetland and the like) except wastewater stabilization ponds.

³Unplugged abandoned wells or wells with less than eighty feet (< 80') of casing depth shall have one-hundred-fifty feet (150') minimum distance from all above.

⁴Sewage tanks and soil absorption systems should never be located in the drainage area of a sinkhole.

APPENDIX

TABLE 2A—Quantities of Domestic Sewage Flows

Type of Establishment ¹	Flow
Residential Units	(gallons per day per unit unless otherwise indicated)
Single Family Dwelling	120/bedroom
Multiple Family Dwelling (with laundry capabilities)	120/bedroom
Multiple Family Dwelling (without laundry capabilities cottages)	95/bedroom 50/person (in excess of 2 persons/bedroom)
Mobile Home Parks	300/home*
Commercial Facilities	
Transportation terminals (airports, bus stops, railroad stations and the like)	5/passengers
Laundromats	580/machine
Beauty Shops (Style Shops)	125/chair
Bowling Lanes	50/lane
Business (other than those listed elsewhere in this table)	25/employee
Factories (exclusive of industrial waste) add for showers	25/person/shift 10/person/shift
Marinas	10/boat slip
with bathhouse	30/boat slip
Motels/Hotels	120/room
with cooking facilities	175/person
Offices (per shift)	25/person
Service Stations	250/water closet or urinal
24-hour Service Stations	325/water closet
Theaters: Movies Drive-in	5/seat 15/vehicle space
Warehouses	30/employee
Public parks (toilets only)	5/user
Public parks with bath house	15–25/user
Camps	
Construction or Work Camps	60/person 40/person (with chemical toilets)
Summer Camps	60/person
Campgrounds—with Comfort Station (without water and sewer hookups)	100/campsites
Travel Trailer/Recreational Vehicle Park (with water and sewer hookups)	120/space
Assembly & Mercantile	
Retail Stores	120/ 1000 sq. ft. of retail sales area
Stadium, Auditorium, Theater, Drive-in	5/seat or space
Swimming Pools, Spas, and Bathhouses	10/person
Churches (Not including a Kitchen, Food Service Facility, Day Care or Camp)	3/seat
Churches (With a Kitchen but not including a Food Service Facility, Day Care or Camp)	5/seat
Country Club	20/member

APPENDIX

TABLE 2A—Quantities of Domestic Sewage Flows (continued)

Type of Establishment ¹	Flow
Food or Drink Establishment**	
Bar (not serving food)	20/seat
Restaurants	40/seat or 40/15 sq. ft. of dining area, whichever is greater
24-hour Restaurant	75/seat
Food Stands	
1) per 100 square feet of food stand floor space	50 gal.
2) add per food employee	25 gal.
Other food service facilities	5/meal
Meat Markets	
1) per 100 square feet of market floor space	50 gal.
2) add per market employee	25 gal.
Institutional**	
Hospitals	300/bed
Day Care Facilities	15/person
Residential Care Facilities	60/person
Rest Homes and Nursing Homes	
with laundry	120/bed
without laundry	60/bed
Day Schools	
with cafeteria, gym, and showers	15/student
with cafeteria only	12/student
with neither cafeteria nor showers	10/student
Boarding Schools	60/person

¹Establishments with flows greater than three thousand gallons per day (3,000 gpd) shall be regulated under Chapter 644, RSMo, administered by the Department of Natural Resources.

*Must consider flow into the soil absorption system from mobile homes where taps are allowed to run to prevent freezing.

**Establishments processing food may be required to provide grease interceptors in an accessible location prior to the sewage treatment system.

Note: Gallons per person per unit includes normal infiltration for residential systems.

APPENDIX

Table 2B–Sewage Works Population/Design Table

Unit	Persons/unit
Apartments or Condominiums	
(1 bedroom)	2.0
(2 bedroom)	3.0
(3 bedroom)	3.7
Camper trailers with sewer hookup	3.0
Camper trailers without sewer hookup	2.5
Mobile Homes	3.0–3.7
Motels	3.0
Residences	3.7

Table 4–Dwelling Septic Tank Capacity*

Number of Bedrooms	Minimum Liquid Capacity
	(gallons)
1–3	1000
4	1250
5	1500

*These figures provide for use of garbage grinders, automatic clothes washers and other household appliances. Garbage grinders are not recommended due to the introduction of fats and other high organic loads.

APPENDIX

Table 5–Minimum Absorption Area

Percolation Rate	Absorption Loading Area	Loading Rate
(min./in.)	(sq.ft./Bedroom)	(gal./sq. ft.)*
≤10**	150	1.0
11–30	200	0.8
31–45	265	0.45
46–60***	300	0.4
61–120***?	600	0.2

- * Gallons of sewage tank effluent per day per square foot of trench bottom.
- ** Soils with percolation rates of one to ten minutes per inch (1–10 min./in.) or less shall either be evaluated for severe geological limitations by a registered geologist or a soil morphology examination shall be required.
- *** Note: When percolation rate is greater than forty-five minutes per inch (45 min./in.), backfill above infiltration barrier shall be sand, loamy sand or sandy loam, when available. Two to four inches (2–4") of loamy soil shall be used to cap the sandy backfill. This is to keep rainwater from entering the system.
- ? Must be designed and approved by a Missouri registered engineer.

Table 6–Loading Rate for Chamber Systems*

Soil Group	Range for Chambers
	(gpd/sq. ft.)
I	1.0–1.2
II	0.7–0.8
III	0.5–0.6
IVa	0.3–0.4
IVb	Unsuitable
V**	0.4–0.6

- * Note: All application rates are for area of trench bottoms only.
- ** Note: No reduction is allowed for chamber systems in Group V soils.

APPENDIX

Table 7–Loading Rates

Percolation Rate	Loading Rates Absorption Area	Loading Rate*
(min.in.) ≤10**	(sq. ft./bedroom) 200	(gal./sq. ft.) 0.6
11-30	300	0.4
31-45	400	0.3
46-60	600	0.2

* Gallons of sewage tank effluent per day per square foot of total area.

** In areas where there are severe geological limitations and the soils consist of very gravelly soils of thirty-five or greater percent (≥ 35%) gravels by volume, the loading rate of two-tenths gallons per day per square foot (0.2 gpd/sq. ft.) should be used even when the percolation rate would indicate a higher loading.

Table 8–Recommended Loading Rates for Soil Textures Suited to Use as Fill in a Mound System

Texture	Loading Rate
	(gal./sq. ft./day)
Medium to coarse sand	1.2
Fine sand	1.0
Loamy sand	0.8
Sandy loam	0.6

Note: Rock fragments larger than one-sixteenth inch (1/16") shall not exceed fifteen percent (15%) by volume of the material used for sandy fill.

APPENDIX

Table 9–Loading Rate

Percolation Rate	Loading Rate of Basal Area
(min./in.) 1–30	(gpd/sq. ft.) 1.2
31–45	0.75
46–60	0.5
61–120	0.25

Table 10 - Design Guidelines for Intermittent Sand Filters

Parameter	Buried Filters	Open Filters
Pretreatment	Septic Tank	Septic Tank
Setback Distance Residences Water Supplies	50 ft. 100 ft.	200 ft. 100 ft.
Backfill Depths	12-inch minimum	
Distribution Gravel Pipe Venting Dosing Frequency Hydraulic Loading Barrier Material	6" (3/4"–2–1/2") 4" PVC Perforated Down stream end ≥2 per day 1.0 gpd/sq. ft. 3–1/2 fiberglass; untreated building paper (4060 lb.); synthetic fabric; 8" straw	None PVC or equivalent ≥2 per day 2–5 gpd/sq. ft. None
Sand Effective size Uniformity coefficient Fines (<0.13 mm) Depth	0.3-1.22 mm <3.5 ≤1% (by wt.) 24–36"	0.3-1.22 mm <3.5 <1% (by wt.) 24–36"
Collector Lines Minimum Number Slope Gravel Pea Gravel Pipe	2/bed, 1 line per 6' width 1% minimum 4" overpipe; 3/4–2 1/2") 3" (1/83/8") 4" PVC Perforated	2/bed; 1 line per 6' width 1% minimum 4" overpipe (3/4–2 1/2") 3" (1/83/8") 4" PVC Perforated

APPENDIX

Table 11 - Plant Growth Data after one growing season

Plant Species	Wet Weight	Dry Weight		Top/Root	Root Depth	
	(lbs./sq. ft.)	Top Dry	Root Dry			(inches)
Softstem Bulrush (<i>Scirpus validus</i>)	9.74	4.20	3.20	1.00	3.20	7.0
Horsetail (<i>Equisetum hyemale</i>)	1.90	0.55	0.20	0.35	0.57	11.0
Water Iris (<i>Iris pseudacorus</i>)	3.28	0.66	0.31	0.35	0.90	8.0
Pickerel Rush (<i>Pontederia cordata</i>)	6.24	1.30	0.50	0.80	0.63	15.0
Arrowhead (<i>Sagittaria latifolia</i>)	2.25	0.35	0.17	0.18	0.94	10.0
Cattails (<i>Typha latifolia</i>)	7.89	3.00	1.90	1.10	1.73	8.0
Soft Rush (<i>Juncus effusus</i>)	3.00	1.05	0.65	0.40	1.62	18.0
Flowering Rush (<i>Butomus umbellatus</i>)	0.30	0.07	0.01	0.06	0.18	12.0

APPENDIX

Table 12 -Characteristics of Emergent Aquatic Plants

Plant Species	Bloom Date	Type of Bloom	Bloom Color	Plant Height (inches)	Growth Pattern	Initial Spacing (feet)
Softstem Bulrush (<i>Scirpus validus</i>)	June–July	Oblong Spikelets	Gray	40–60	Spreading	3
Horsetail (<i>Equisetum hyemale</i>)	July–Aug.	Oblong Spikelets	Brown	30–40	Spreading	3
Water Iris (<i>Iris pseudacorus</i>)	May–Aug.	Flower	White- Lt. Blue	10–18	Bunches	2–3
Pickerel Rush (<i>Pontederia cordata</i>)	July–Sept.	Flower	Purple	10–18	Bunches	2
Arrowhead (<i>Sagittaria latifolia</i>)	June–July	Hanging Bulbs	Green- White	6–10	Spreading	2–3
Cattails (<i>Typha latifolia</i>)	May–June	Oblong Spike	Brown	48–72	Spreading	3
Soft Rush (<i>Juncus effusus</i>)	June–July	Flower	Brown	18–30	Bunches	2

APPENDIX

Table 13 - Application Rates by Soil Groups for Conventional Systems

Soil Group	Soil Texture	Soil Structure/ Color	Application Rate
I	Sand, Loamy sand	Any striation/Brown (No gray)	(gpd./sq.ft.) (conventional) 1.2 - 0.8
II	Sandy loam, Loam Sandy loam, Loam	Granular, fine and medium subangular blocky Prismatic; coarse, subangular, and angular blocky	0.9 - 0.7 0.7 - 0.5
III	Silt loam, Clay loam, Sandy clay loam, Silty clay loam Silt loam, Clay loam, Sandy clay loam, Silty clay loam	Granular, fine, and medium subangular blocky Prismatic, coarse subangular and angular blocky	0.6 - 0.4 0.4 - 0.3
IVa	Sandy clay, Silty clay, Clay (low to moderate shrink/swell) Sandy clay, Clay, Silty clay (low-moderate shrink/swell)	Granular, fine, and medium subangular blocky Prismatic; coarse subangular or angular blocky	0.4 - 0.2 0.3 - 0.1
IVb	Sandy clay, Clay, Silty clay loam, Silty clay (high shrink/swell potential)	Subangular, Angular blocky, or Prismatic	Not suitable
V	Skeletal (less than 50% coarse fragments), Silt loam, Silty clay loam, Clay, Silty clay	Anything but platy or massive	0.4 - 0.2

APPENDIX

Table 14 - Application Rates by Soil Group

Soil Group	Soil Texture	Classes	Application Rate (Low Pressure Pipe) (gpd/sq. ft.)
I	Sand, Loamy Sand	No structure (Brown colors)	0.5–0.4
II	Sandy loam, Loam	Granular; fine and medium subangular blocky	0.4–0.35
	Sandy loam, Loam	Prismatic; coarse subangular and angular blocky	0.3–0.2
III	Silt loam, Clay loam Sandy clay loam, Silty clay loam	Granular; fine and medium subangular blocky	0.3–0.2
	Silt loam, Clay loam, Sandy clay loam, Silty clay loam	Prismatic; coarse subangular and angular blocky	0.20–0.15
IVa	Sandy clay, Silty clay, Clay (low to moderate shrink/swell)	Granular; fine and medium subangular blocky	0.2–0.1
	Sandy clay, Clay, Silty clay	Prismatic; coarse subangular or angular blocky	0.1–0.05
IVb	Clay, Sandy clay, Silty clay loam, Clay loam, Silty clay (high shrink/swell potential)	Subangular, Angular blocky, or Prismatic	Not suitable
V	Skeletal (less than 50%), Silt loam, Silty clay loam, Clay, Silty clay	Anything but platy or massive	0.3–0.15