

**COLE COUNTY HEALTH
DEPARTMENT**

RULES FOR

ON-SITE WASTEWATER SYSTEMS

CHAPTER 1

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SMALL ON-SITE WASTEWATER SYSTEMS

An ordinance governing the construction, modification, installation, and operation of on-site wastewater treatment systems within the county requiring certain permits for installation and operation, and qualifications of persons providing services, and providing penalties for violations thereof.

On-site wastewater treatment systems which are properly functioning and not in violation of sections 701.025 through 701.059, RSMo., shall not be required to obtain a permit for operation. However all systems shall be maintained free of nuisances, potential health hazards, or violations of Missouri law regardless of when the system was originally installed.

It is hereby ordered by the Cole County Commission as follows:

1.1 Purpose

These regulations are enacted for the purpose of regulating the design, construction and modification of small on-site wastewater systems as the term is defined in these regulations in order to protect and promote the public health and to prevent the entrance of infectious, contagious, communicable or dangerous diseases into Cole County, Missouri. No person or property owner may operate an on-site sewage disposal system or transport and dispose of waste removed therefore in such a manner that may result in the contamination of surface waters or groundwater or present a nuisance or imminent health hazard to any other person or property owner and that does not comply with the requirements of this ordinance and the on-site sewage disposal rules promulgated under sections 701.025 to 701.059 by the Missouri Department of Health.

1.2 Authority

These regulations are enacted under authority vested in the County Commission of Cole County, Missouri by Section 192.300 RSMo. (Supp. 1989) as enacted by Senate Bill 68 of the 85th General Assembly.

1.3 Applicability

This ordinance shall apply to all wastewater treatment systems, as defined in Section 1.4.17 of this ordinance, except for systems connected to the wastewater treatment system operated by or on behalf of an incorporated municipality, systems run by private, PSC regulated, companies or systems designed to treat 3000 gallons of wastewater per day or more within the county. The intent of this ordinance is that there shall be no surface discharge. 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.

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1.4 Definitions

As used in this chapter, unless the context clearly indicates otherwise or the definition of the term is found in a regulation adopted by reference in this regulation, the following words and terms shall have the following meanings:

1.4.1 Administrative Authority - The administrative agency or agencies appointed by the Cole County Commission to administer these regulations or portions thereof.

1.4.2 Board of Review - A committee of five persons as further described in these regulations charged with determining requests for variances and appeals authorized by these regulations.

1.4.3 Permit - Written authorization issued by the Administrative Authority which authorizes the permittee to construct or modify the small on-site wastewater systems regulated under this chapter. This permit is not intended to be construed to be a permit regulating the operation of a small on-site wastewater system after completion of construction or modification.

1.4.4 Person - Any natural person, business entity of any type, corporation, trust, association of any type, or any agent, officer or employee of any of the foregoing.

1.4.5 Small On-site Wastewater System - Any subsurface sewage treatment system, lagoon disposal system or other waterborne waste disposal method employing basic biologic or engineering principles which receives 3000 gallons or less of waterborne waste per day.

1.4.7 Construction - Any act of building and/or installing a new small on-site waste system in order to make it operational and functional or any act of repairing or replacing a small on-site wastewater system other than routine maintenance.

1.4.8 Modification - Any act or work upon an existing small on-site wastewater system which changes the design or function of system other than routine maintenance.

1.4.9 Agent - any person authorized in writing by the property owner to execute the interests of the property owner in matters related to this ordinance.

1.4.10 Emergency Condition - a condition of such extreme nature which presents an immediate danger to public health requiring immediate corrective action without the necessary time to apply for the required permit as set forth herein.

1.4.11 Lagoon - part of an on-site wastewater treatment system consisting of a shallow pond, constructed and located in accordance with this ordinance. (Must be on a minimum of two (2) acres)

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1.4.12 Potable Water - water free from impurities that could cause disease or harmful physiological effects, and with chemical and bacteriological quality conforming to applicable public health standards.

1.4.13 Registered Contractors, and Installers - a contractor or installer who registers his/her business with the Administrative Authority and meets the requirements as set in this ordinance for that registration.

1.4.14 (State Registered/Professional) Engineer - a registered professional engineer authorized and empowered to operated in that capacity in the State of Missouri, registered as such with the Missouri Board of Architects, Professional Engineers, and Land Surveyors.

1.4.15 Surface Discharge - any wastewater leaving the property by surface runoff, even if it has been processed through a septic tank and drain field.

1.4.16 Wastewater - is defined as including but not limited to any liquid or solid that goes down a drain--excreta, wash water, ground garbage, or other type of liquid or solid.

1.4.17 Wastewater Treatment System - for the purpose of this ordinance is the on-site wastewater disposal system as defined in Chapter 701 RSMo., designed or being utilized to handle, treat or dispose of wastewater generated as a result of the human inhabitant or use of a house, building, or other structure on the property of that house, building, or other structure.

1.4.18 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 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.

1.4.19 Imminent Health Hazard - a condition which is likely to cause an immediate threat to life or serious risk to the health, safety, and welfare of the public if immediate action is not taken.

1.5 Small On-site Wastewater System Design and Construction Standards

All small on-site wastewater systems shall be designed, constructed or modified in accordance with the standards set forth in 19 CSR 20-3.060 Individual Sewage Treatment System Standards, effective November 20, 1995, the same being incorporated by reference as if fully set out in this regulation verbatim and maintained on file in the office of the Cole County Health Department, Cole County Planning & Building Inspection Department and Cole County Clerk's office except to the extent the same is modified by these regulations.

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1.6 Permit Required for Construction or Modification of Small On-site Wastewater Systems

From and after the effective date of these regulations no small on-site wastewater system shall be constructed or modified except in accordance with the terms and conditions of a valid permit issued pursuant to these regulations. The issuance of a permit in accordance with these regulations does not relieve the permittee of the responsibility to properly plan, design, construct, install, modify, operate or maintain the system as may be otherwise regulated by law, rule or regulation, nor does issuance of such permit guarantee that the system will function in compliance with these regulations or other applicable laws, rules or regulations.

1.6.1 Permit Applications - Any person seeking a permit to construct or modify a small on-site wastewater system shall submit to the Administrative Authority a written application for same on forms provided by the Administrative Authority; such application shall be accompanied by plans, including site plans indicating the location of percolation test holes or soil profile holes, test results, lot lines, proposed location of treatment systems in relation to buildings and lot lines, specifications, design data and other pertinent information required by the Administrative Authority and set forth in 19 CSR 20-3.060 1(C)3A. All plans and specifications shall conform to the design standards required under these regulations. All permit applications including site plans shall demonstrate in writing and graphically that the proposed small on-site wastewater system to be constructed or modified will be in compliance with the requirements of these regulations.

Emergency conditions must be reported immediately, or on the next working day, in writing, to the Administrative Authority, and a corresponding application for a permit(s) for such emergency condition must be submitted within 2 working days after reporting of said emergency condition.

1.6.2 Permit Application Processing Procedures - The Administrative Authority shall review all permit applications initially for completeness; incomplete applications shall be returned to the applicant for completion. The Administrative Authority shall take final action on all completed permit applications within five (5) work days of submission by either approving the application and issuing the permit, issuing the permit with modifications necessary for compliance with these regulations or denying the permit. Any permit issued with modifications or denied shall be accompanied by written reasons for such modification or denial and in the case of denial, the Administrative Authority at its discretion may recommend corrective action. Any applicant aggrieved by the issuance of a permit with modifications or denial of a permit may appeal such issuance or denial to the Board of Review within 30 days of such issuance or denial in accordance with the provisions of these regulations.

1.6.3 Compliance with Permit - No small on-site waste water system shall be constructed or modified except in compliance with the terms and conditions of the permit issued for same and approved application therefore; unauthorized changes, deviations or modifications shall constitute a violation of the permit and subject the permittee to permit suspension, revocation and/or prosecution as set forth in RSMo. 701.

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1.6.4 Permit Modification - No small on-site wastewater system shall be constructed or modified in deviation from the terms and conditions of the permit and approved application therefore unless a new application or amended application for such permit has been first filed with the Administrative Authority and approved by such authority or a waiver of permit modification has been granted pursuant to section 1.6.5.

1.6.5 Permit General Conditions - The following general conditions shall be applicable to all small on-site wastewater system permits:

1.6.5.1 Expiration of Permit - All small on-site waste water system permits shall be valid for six months after date of issuance and the Administrative Authority shall record the expiration date on each such permit. Permits may be renewed for additional ninety (90) day periods after the initial period of validity for good cause provided there have been no changes in the plans for construction or modification of the system under the initial permit and application for renewal is made prior to the expiration date of the permit. No small on-site wastewater system permit shall be renewed except by the Administrative Authority making a written endorsement of renewal upon the existing permit prior to the expiration date of such permit. Failure to request or obtain renewal prior to the expiration date shall require the permittee to submit an application for new permit.

1.6.6 Permit Denial - The Administrative Authority may deny an on-site wastewater system permit for any of the reasons enumerated in sections 1.6.7.1 through 1.6.7.2. In the event the Administrative Authority denies issuance of a permit the applicant shall be notified in writing of the reason or reasons for denial. An applicant denied a permit may request in writing a hearing before the Board of Review stating the grounds in support of the request within thirty (30) days of the notification of denial. The ruling of the Board of Review shall be final; any further appeal or review of the decision shall be as provided by Chapter 536 RSMo.

1.6.6.1 Denial Due to Violation of Minimum Design Standards - A small on-site wastewater system permit may be denied because application for such permit is incomplete or does not meet applicable minimum design and/or construction standards established by these regulations.

1.6.6.2 Denial Due to Location Within 300 Feet of Sanitary Sewer - A small on-site wastewater system permit may be denied because the building which it is to serve is located within 300 feet of a sanitary sewer to which connection is practical and is permitted by the governmental agency or utility responsible for the sanitary sewer, or in the case of a nonconforming on-site wastewater system under section 1.10, no such permit shall be issued where such a system constitutes a nuisance as otherwise prohibited in these regulations and the building which such system serves is located within 300 feet of a sanitary sewer to which connection is practical.

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1.6.7 Permit Suspension and Revocation - The Administrative Authority may suspend or revoke a permit before construction or modification of a small on-site waste water system is completed due to noncompliance with the terms of the permit or these regulations, unapproved modifications in design or construction, false information submitted in the application for permit, changing site conditions which would result in a violation of one or more of the provisions of these regulations, submission of false percolation test data or false soil morphology/landscape data, permittee misrepresentation concerning compliance with these regulations or any other reasons necessary for protection of the public health or safety. The permittee shall be given written notice of the Administrative Authority's intent and it shall contain a written statement of the reasons for the suspension or revocation, duration of suspension (if applicable) together with notice of corrective actions (if applicable) necessary to authorize the permittee to retain the permit. The permittee may appeal a notice of suspension or revocation to the Board of Review by submitting a written notice of appeal to the Administrative Authority within thirty (30) days from the date of suspension or revocation. The Board of Review shall determine the appeal of any suspension or revocation as soon as reasonably practicable; the decision of the Board of Review shall be final and any further appeal or review shall be as prescribed by Chapter 536 RSMo.

1.6.8 Operation of Small On-site Wastewater System - No small on-site wastewater system shall be operated unless and until a final inspection of same is conducted by the Administrative Authority and the system is approved and found to be in compliance with these regulations. No final inspection shall be conducted or approval granted unless the system is exposed for inspection without backfilling so that the system can be examined for compliance with these regulations. Any small on-site wastewater system which has been backfilled in whole or part or otherwise covered such that a complete inspection for compliance cannot be conducted shall upon request of any representative of Administrative Authority be uncovered, re-excavated or otherwise exposed at the sole expense of the permittee such that a complete inspection can be conducted for purposes of determining compliance with these regulations. Any permittee who shall fail to expose a small on-site wastewater system for inspection under the provisions of these regulations shall be subject to permit suspension, revocation and/or prosecution. Any permittee who shall fail to expose a small on-site sewage system to inspection after construction or modification within thirty (30) days after request of a representative of the Administrative Authority shall be subject to permit suspension, revocation and/or prosecution.

1.7 Board of Review

The County Commission shall appoint a review committee consisting of five members to be known as the Small On-Site Wastewater System Board of Review which shall review and determine applications for variances as authorized by these regulations, hear and determine appeals from Administrative Authority decisions as are authorized and prescribed by these regulations and have over site powers to maintain this

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ordinance in a current status as state laws change and as may be deemed otherwise necessary. The voting members of the Board of Review shall consist of a person actively involved in the design or inspection of alternative small on-site wastewater systems, and two citizens at large owning or possessing real estate containing a small on-site wastewater system. A member of the Cole County Health Department and a member of the Cole County Department of Public Works shall provide administrative support to the Board of Review and serve as a non-voting ex-officio members of the board. Persons occupying seats on the Board of Review shall be subject to removal from the Board by the Cole County Commission for misconduct or neglect of office (missing three consecutive meetings). The nongovernmental members on the Board of Review shall be appointed for staggered terms by the Cole County Commission with initial terms to cover one, two and three years as deemed appropriate by the County Commission and thereafter each successive term shall be for a period of three years. The Board of Review shall be entitled to establish rules of procedure and bylaws for the conduct of its business subject to review, modification and approval by the Cole County Commission.

1.7.1 General Variances - The Board of Review may grant variances from the strict application of these regulations in cases where a property owner or occupant would not be able to effectively or properly use a small on-site wastewater system and the grant of a variance would not result in conflict in or violation of any state or federal law or regulation. No variance shall be granted on the condition of reduced water usage or maximum specified water usage. The Board may impose such conditions on a variance as it deems appropriate for purposes of preventing contamination of surface waters or ground water or preventing a nuisance or health hazard condition to other persons or preventing discharge of treated or untreated domestic sewage or human waste off the property subject to the permit.

1.8 Certification of Small On-site Wastewater System Installers, Percolation Test Technicians

No person shall construct or modify a small on-site wastewater system after March 31, 1996 unless certified by the Administrative Authority as an installer for such system by the Administrative Authority or unless otherwise exempt from such certification under these regulations. No person shall administer a soil percolation test for purposes of complying with these regulations unless certified by the Administrative Authority as a percolation test technician. No person shall perform or administer a soil morphology/landscape analysis for purposes of complying with these regulations unless qualified as a soil scientist as defined herein.

1.8.1 Certification Requirements for Installers - An individual may be certified as a small on-site wastewater system installer if such person has attended and passed a training course as required by the Administrative Authority consisting of instruction on the application of these regulations. The Administrative Authority is authorized to

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establish such courses of instruction and/or testing as it may deem appropriate from time to time to insure installer compliance with these regulations. The Cole County Commission shall retain the right to enter into agreement of reciprocity with other counties (states) in lieu of certification.

1.8.2 Requirements for Percolation Test Technician Certification - An individual may be certified as a percolation test technician if such person has attended and passed a training course as required by the Administrative Authority consisting of instruction on the application of these regulations. The Administrative Authority is authorized to establish such courses of instruction and/or testing as it may deem appropriate from time to time to insure technician compliance with these regulations. The Administrative Authority may exempt any person from training and testing requirements it finds already qualified as a percolation test technician by education and experience; it shall be the responsibility of the party requesting exemption to prove to the Administrative Authority's reasonable satisfaction their entitlement to exemption.

1.8.3 Revocation of Certification - The Administrative Authority may revoke the certification of any small on-site wastewater system installer or soil percolation test technician who is found to intentionally violate any provision of these regulations or who after written warning of violation of a particular regulation is found to violate the same regulation on one or more subsequent occasions regardless of whether or not such person intended violation. Any certification revoked by the Administrative Authority may be appealed in writing to the Board of Review within ten (10) days after notice of revocation has been served upon the person whose certification is to be revoked. The decision of the Board of Review shall be final and any appeal thereafter shall be as prescribed by Chapter 536 RSMo.

1.9 Inspections

Designated representatives of the Administrative Authority shall have full power and authority at any time during normal working hours to enter onto any property to cause or conduct an inspection of any wastewater treatment system under construction, installation, modification, or the operation of any wastewater treatment system located within the County that there is reason to suspect is in violation of Chapter 701 RSMo or this ordinance.

1.9.1 Inspections will be made before a wastewater disposal system may be put into operation. The installer must contact the Administrative Authority two (2) working days prior to installation to allow inspections to be scheduled.

1.9.2. Inspections of existing systems may be made at the request of a person for his/her own system, a seller, lending institution, or their respective agents for the purpose of evaluating the system to determine its operation is not in violation of this

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ordinance or RSMo 701. A fee may be charged in accordance with section 1.16 of this ordinance.

1.9.3 The Administrative Authority retains the right to reevaluate the system up to six (6) months after closure with twenty four (24) hours prior notice.

1.10 Nonconforming Small On-site Wastewater Systems

Except as provided below, all small on-site wastewater systems existing as of the effective date of this chapter shall be presumed to be in compliance with these regulations unless such system is found to be public health nuisance or hazard or is in violation of state law pertaining to wastewater systems. When any such condition exists the owner of the real estate upon which such system exists shall then be subject to the provisions of these regulations and shall be required to apply for a small on-site wastewater permit in order to modify the existing system or construct a new system within a reasonable time as prescribed by the Administrative Authority. No small on-site wastewater system shall be presumed to be in compliance with these regulations which has not been operable or used for a period of one hundred eighty (180) or more consecutive days or for which a construction permit has been issued pursuant to these regulations. No on-site sewage treatment lagoon otherwise subject to these regulations which existed on or before the date these regulations were first enacted that has a minimum surface area of nine hundred square (900') feet and is surrounded by a forty-eight (48") inch or taller fence with two stands of barbed wire or other fence designed to prevent animals and children from entering the enclosed area and that is without observable functional deficiencies shall be considered to be in violation of the foregoing sections or other applicable law, rules or regulations based solely upon size or location or general condition. No subsurface sewage treatment system otherwise subject to these regulations which existed on or before the date these regulations were first enacted that does not exhibit any chronic surface discharge shall be considered to be in violation of the foregoing sections or other applicable law, rule or regulation based solely upon known or unknown design, components or configuration unless there is other evidence demonstrating one or more violations of said sections or other applicable law, rules or regulations.

1.11 Notification

When the Administrative Authority or its representative have reasonable grounds to believe there is a violation of this ordinance or any adopted rule, regulation, or applicable law the Administrative Authority or its representative shall give written notice to the person(s) alleged to be in violation. The notice shall include a description of the violation, location, remedial action and time allowed for correction.

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1.11.1 Such notices shall be delivered in person or by certified mail. The notification shall be considered valid and final unless a request for hearing is made pursuant to section 1.7 of this ordinance.

1.12 Enforcement

When the Administrative Authority has found an on site sewer system was installed in non-compliance with any part of this ordinance, and the owner or installer has refused to bring the system into total compliance within ninety days of formal notification the Administrative Authority will record with the Cole County Recorder a notice stating the system in question was installed in non-compliance with this ordinance. This notice shall include the permit number and the address of the property in question.

Upon the system being brought into compliance the Administrative Authority will record with the Cole County Recorder a notice stating the system has been brought into compliance with this ordinance.

1.13 Interpretation and Severability

The regulations enacted under this chapter are intended to be supplementary to other provisions or remedies authorized or prescribed by law or rule or regulation enacted there under. The invalidity of any particular regulation enacted herein shall not affect the validity of any other provision and all regulations hereunder shall be construed as consistently and harmoniously as possible with each other and other applicable provisions of the law. In the event these regulations irreconcilably conflict with another law, rule or regulation, the law, rule or regulation which affords the greater protection to the public health or safety shall prevail except in the case of conflict with any rules or regulations made by the Missouri Department of Health or the Missouri Department of Social Services pursuant to chapter 198 RSMo, in which case the regulations of the state there under shall prevail. These regulations also shall be liberally construed to the fullest extent permitted by law to effectuate the broad remedial purposes for which they are intended.

1.14 Immunity

The approval of any permit or wastewater treatment system shall not be taken as a guarantee that system will operate and function as intended. The Cole County Commission, Administrative Authority or their representatives shall not be liable for damages resulting from the approval by the Administrative Authority or its representatives for the construction, installation or modification, maintenance or operation of an individual wastewater treatment system.

1.15 Jurisdiction

The regulations contained in this chapter shall be applicable to all unincorporated areas within Cole County, Missouri and by order of the Cole County Commission in incorporated municipalities which petition the Cole County Commission to be included

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and the Cole County Commission agrees to order their inclusion after public hearing thereon.

1.16 Penalties and Remedies

Any person who violates any requirement or provision of these regulations shall be deemed guilty of a misdemeanor and shall be punished as provided by law; each day's violation of any such regulation shall constitute a separate and distinct offense. The penalty provided in this section shall not be construed to be exclusive but is intended to be supplementary and in addition to any other remedy provided by law or at equity.

1.17 Fees

The County Commission may from time to time impose such user fees such as permit fees or inspection fees as it may deem appropriate so long as such fees comply with the provisions of Section 192.300 RSMo. and RSMo. 64.800 through 64.840 and are otherwise authorized by law.

1.18 Amendments

This ordinance may be amended at any time pursuant to RSMo. 192.300, and RSMo. 64.800 through 64.840.

1.19 Effective

The original regulations were first effective on and after the 1st day of January, 1996. The first revision shall be effective on and after the 1st day of January, 1997.

CHAPTER 2 SEPTIC TANK AND DRAIN FIELD

2.1 Minimum Set Back Distances. All on-site wastewater treatment and disposal systems shall be located in accordance with the distances shown in Table I. Minimum lot size for a septic tank and drain field shall be one acre, lots less than one acre may have a septic tank and drain field system when designed by a registered professional engineer.

TABLE I

Minimum Distance in Feet From	Sewage Tanks (1)	Disposal Area (2)
Private Water Supply Well(4)	50	100
Public Water Supply Well	300	300
Classified Stream, Lake or Impoundment	50	50
Stream or Open Ditch (3)	25	25
Property Line	10	10
Building Foundation	5	100
Basement	15	100
Water Line Under Pressure	10	10
Suction Water Line	50	100
Upslope Interceptor Drains	--	10
Downslope Interceptor Drains	--	25
Top of Slope of Embankments or Cuts of 2 Feet or More Vertical Height	--	20
Other Soil Absorption System Except Repair Area	--	20
Cistern	25	25
Spring	50	100

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

(2) Includes subsurface absorption systems. Does not include wastewater stabilization ponds.

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

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

Corrected 3/26/96

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2.2 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.

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

2.2.2 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 ground water 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 ground water table should be three feet (3'), and in no case shall the separation distance be less than two feet (2') for standard systems. Greater vertical separation may be required where water-bearing formations are in danger of contamination.

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

2.2.4 The minimum area in any absorption trench system shall be in accordance with Table II, with the minimum size system shall be four hundred (400) square feet.

TABLE II

Percolation Rate**	Absorption Area Sq Ft/Bedroom*	Loading Rate Gal/Sq. Ft*	Probable Soil Texture
1-10	150	1.0	Sand, Loamy Sand
10-30	200	0.8	Sandy Loam, Loam
30-45	265	0.45	Silt Loam, Clay Loam, Silty Clay Loam***
45-60	300	0.4	Silt Loam, Clay Loam, Silty Clay Loam***
60-120AE	600	0.2	Silty Clay, Sandy Clay, Silty Clay, Sandy Clay, Clay****

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AE Must be designed by a licensed professional engineer

*Gallons of sewage tank effluent per day per square foot of trench bottom.

**Sands with percolation rates from one to ten (1-10) minutes per inch shall be evaluated for potential groundwater contamination.

Absorption trenches in these highly permeable sands 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 potential groundwater contamination 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 zones of large voids. Regardless of the percolation rate, absorption trenches installed in areas of potential groundwater contamination with cherty clays should be designed for a maximum loading rate of forty-five hundredths (.45) gallons per square foot or a minimum of two hundred sixty-five (265) square feet per bedroom.

***Fine loams with low to moderate shrink/swell potential and less than thirty-five percent (35%) clay.

****Clays with low to moderate shrink/swell potential above any perched water table or zone of seasonal saturation. These soils are easily damaged during construction due to compacting from equipment. Absorption trenches should be installed only when the soil moisture content is less than the plastic limit. Extreme care should be taken to determine if a perched water table or zone of seasonal saturation as evidenced by mottling is within two feet (2') of the trench bottom of these soils. Soils with percolation rates slower than one hundred twenty (120) minutes per inch shall not be used for soil absorption of sewage tank effluent.

2.2.5 Each absorption trench system shall have a minimum of two (2) trenches with no one (1) trench longer than one hundred feet (100'). Trenches longer than one hundred feet (100') may be used with approval of the administrative authority when the total absorption system requires more than five hundred (500) linear feet of trenches. 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.

2.2.6 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 (45) minutes per inch. 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.

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2.2.7 The pipe used between the sewage tank and the absorption system shall be a minimum of four inch (4") inside diameter Schedule 40 pipe. 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.

2.2.8 Gravity-fed absorption field distribution lines should be at least four inches (4") in diameter. If foot long tiles are laid, they shall each be separated by one-fourth inch (1/4") space and the joint covered by a strip of untreated building paper. If perforated distribution lines are used, the perforation shall be at least one-half inch (1/2") and no more than three-fourths inch (3/4") in diameter and spaced to provide at least the equivalent total opening of comparable diameter foot long tile laid with one-fourth inch (1/4") open joints.

2.2.8.1 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.

2.2.8.2 When four (4) or six (6) inch diameter corrugated plastic tubing is used for distribution lines, it shall be certified as complying with applicable ASTM standards. The corrugated tubing shall have 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. The rows of holes may be equally spaced one hundred twenty degrees (120) on centers around the periphery, or three (3) rows may be located in the lower portion of the tubing, the outside rows being approximately on one hundred twenty degree (120) centers. Coiled tubing shall not be used.

2.2.9 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') as determined by an engineer's level. The ends of distribution lines should be capped or plugged, or when they are at equal elevations, they should be connected.

2.2.10 Rock used in soil absorption systems shall be clean gravel or crushed stone and graded or sized between seven eighths inch to two and one half inches (**7/8" - 2 1/2"**). The rock shall be placed a minimum of one and one half feet (1.5') deep with at least twelve inches (12") below the pipe and two inches (2") over the pipe and distributed uniformly across the trench bottom and over the pipe. Before placing soil backfill over the trenches, the gravel shall be covered with:

2.2.10.1 Unbacked, rolled, three and one half inch (3 1/2") thick fiberglass insulation;

2.2.10.2 Untreated building paper;

2.2.10.3 Synthetic drainage fabric **recommended**;

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2.2.10.4 A minimum of eight inches (8") of straw for a compacted thickness of two inches (2"); or

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

2.2.11 Complex slope patterns and slopes dissected by gullies shall not be considered 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. 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.

2.2.11.1 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;

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

2.2.11.3 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;

2.2.11.4 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;

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

2.2.12 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 and absorption trenches by a minimum of two feet (2') of undisturbed or compacted soil and shall be placed level on a solid foundation of soil or concrete to prevent differential settlement of the device.

CHAPTER 2

2.2.12.1 Each distribution line shall connect individually to the distribution box.

2.2.12.2 The pipe connecting the distribution box to the distribution line shall be of a tight joint construction laid on undisturbed earth or property bedded throughout its length.

2.2.12.3 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 below the flow line elevation of the distribution box.

2.2.13 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 where there is at least three feet (3') separation between the bottom of the absorption trenches and the limiting condition such as slow permeability of zone of seasonal saturation as evidenced by mottling. Whenever the design sewage flow rate requires seven hundred fifty feet (750') 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. 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.

2.2.14 Dosing is recommended for all systems except serial distribution systems and shall be provided when the design sewage flow requires more than five hundred (500) lineal feet of distribution line. When the design sewage flow requires more than one thousand (1,000) lineal feet 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 box systems are utilized, the separation distance between absorption trench bottom and limiting condition should be at least two feet (2').

2.2.15 Gravelless subsurface absorption systems may be used as an alternative to conventional four inch (4") pipe placed in a 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

CHAPTER 2

these systems may be required from the administrative authority prior to installation and all manufacturing specifications and installation procedures shall be closely adhered to.

2.2.15.1 The eight (8) and ten (10) 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. The eight inch (8") pipe may be considered equal to a two foot (2') wide standard absorption trench. The ten inch (10") pipe may be considered equal to a three foot (3') wide absorption trench.

2.2.15.2 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. 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 visibly marked to indicate the top of the pipe. All gravelless drain field pipe shall be encased at the point of manufacture with a spun bonded nylon filter wrap.

2.2.15.3 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 or good topsoil. 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 (0-1/2") per one hundred feet (100').

2.2.16 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 (45) minutes per inch 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 have lines on three-foot (3') centers. When the design volume of sewage exceeds six hundred (600) gallons per day, adequate SCE shall be provided to accommodate a trench system for the absorption field.

2.3 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:

CHAPTER 2

2.3.1 Shallow placement of the 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. In areas of thin soils and potential for groundwater contamination, the vertical separation between the trench bottom and bedrock shall be four feet (4') or more. Shallow trenches may be constructed by placing the top of the gravel at original ground level and covering the absorption field with loamy soil or good top soil to a depth of twelve to eighteen inches (12-18") 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 trenches in at least six inches (6") of natural soil, the following procedures must be followed:

2.3.1.1 The fill material should be of a sandy texture with a maximum clay content of fifteen percent (15%). The fill material should not be hauled or worked with. The area to be filled must be protected from traffic, and small brush and trees removed prior to placement;

CHAPTER 3

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

2.3.1.3 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. The remaining fill is then added in layers until the desired height is obtained with each layer being tilled into the preceding layer; and

2.3.1.4 The site is then shaped to shed water and all low spots filled 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.

2.3.2 Alternating dual field absorption systems may be utilized where soils are limited by high clogging potentials, percolation rates slower than sixty (60) minutes per inch, 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. Valves placed below ground level shall be that it may be operated from the ground surface.

2.3.3 Sand-lined trenches may be used in areas where the soil has greater than fifty percent (50%) rock fragments and there is a potential for groundwater contamination due to bedrock conditions. For a maximum loading rate of forty-five-hundredths gallons (.45 gallons) per day per 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 sand produced from flint chat in the Joplin area or fined manufactured from igneous rocks, or chert gravel may be used. The sand used for the liner shall contain less than twenty-five percent (25%) material retained on a No. 10 Sieve. Finely crushed limestone is not acceptable. For higher loading rates, the sand must meet the requirements for an intermittent sand filter.

2.3.3.1 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 to one (2:1) and in no case steeper than one to one (1:1).

CHAPTER 3

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

2.3.3.3 The effluent 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.

2.3.3.4 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 perched water tables and could cause saturation of the liner material.

CHAPTER 3

GUIDELINES FOR INDIVIDUAL WASTE STABILIZATION LAGOON FOR A RESIDENCE

3 Wastewater stabilization ponds. A waste stabilization pond can provide satisfactory sewage treatment 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. Single residence wastewater stabilization ponds will not be allowed on lots less than two (2) acres in size.

3.1 Ponds may be utilized when there are no significant limitations related to groundwater from their use and the soils have been demonstrated to be impermeable such as percolation rates slower than one hundred twenty (120) minutes per inch. There shall be a minimum separation distance between the pond bottom and creviced bedrock of three feet (3'). 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 highly permeable bedrock, restrictive layers such as fragipans shall be a minimum of twelve inches (12") thick and shall not be breached during construction.

3.2 Steeply sloping areas should be avoided.

3.3 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.

3.4 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.

3.5 The pond shall be designed on the basis of four hundred forty (440) square feet of water surface area per bedroom at the three foot (3') operating level. Whenever the pond is preceded by a septic tank or aeration unit, the water surface area may be reduced up to a maximum of twenty percent (20%); however, the minimum water surface area at the three foot (3') level shall be nine hundred (900) square feet. This reduction in size shall not be allowed where irrigation of the pond effluent is required by the administrative authority in order to keep the wastewater on the property from which it originated.

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

CHAPTER 3

3.7 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.

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

3.9 The influent line shall be of sound, durable material of water-tight construction. The line shall have a minimum diameter of four inches (4") and be laid on a firm foundation at a minimum grade of one-fourth inch (1/4") per foot. 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 should be laid to the inner toe of the embankment and then on the bottom of the pond to the terminus point. 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.

3.10 The shape of the pond should be such that there are no narrow 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 covers shall be permitted. Embankments should be rounded at corners to minimize accumulation of floating materials.

3.11 The floor of the pond shall be stripped of vegetation and levels to the proper elevation. Organic material removed from the pond area shall not be used in embankment construction. The wetted areas of the pond must be sealed to prevent excessive exfiltration. Seals consisting soils must be adequately compacted by the construction equipment or a sheep-foot type roller may be used.

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

3.13 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 a 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.

CHAPTER 3

3.14 The pond area shall be enclosed with a four-foot (4') high woven or chain link fence to preclude livestock and discourage trespassing. The fence shall be so located to permit mowing of the embankment top and slopes. A gate of sufficient width to accommodate mowing equipment shall be provided. Appropriate warning signs shall be provided to designate the nature of the facility.

3.15 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.

3.16 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.

3.17 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.

3.18 FENCE REQUIREMENTS

3.18.1 The lagoon shall be no closer than the center of the berm to the water's edge at the three foot (3') deep operating level. Fence setbacks should not exceed thirty feet (30') from the water's edge.

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

3.18.3 The fence shall be welded, woven or chain link material with no smaller than 14 gauge wire.

CHAPTER 4

3.18.4 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.

Cattle or hog panels can be substituted for Section C. If cattle or hog panels are used, tee post can be used for line post.

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

3.18.6 Fence must be completed prior to occupancy of dwelling.

COLE COUNTY DISTANCE TABLES (corrected 2/29/96)

<u>Minimum Distance in feet from</u>	<u>Septic Tanks (1)</u>	<u>Drain Fields (2)</u>	<u>Lagoons</u>
Private water supply(5)	50	100	100
Public water supply	300	300	300
Classified stream, lake or impoundment	50	50	50
Stream or ditch(3)	25	25	25 - 100(4)
Property line	10	10	75
Building foundation	5	15	100
Basement	15	25	100
Waterline under pressure	10	10	10
Suction waterline	50	100	100
Up slope interceptor drain	-	10	10
Down slope interceptor drain	-	25	25
Top of slope of embankments or cuts of 2 feet or more vertical height	-	20	20
Other soil absorption system except repair area	-	-	20
Vertical depth to solid rock	3	3	3
Cistern	50	50	50
Spring	100	100	100
Swimming pool	15	15	100
Nearest neighboring residence	-	-	200
Other soil absorption system	-	20	20

CHAPTER 4

- (1) Includes sewage tanks, intermittent sand filters, and dosing chambers
- (2) Includes subsurface absorption systems. Does not include wastewater stabilization ponds.
- (3) Sewage tanks and soil absorption systems may never be located in the drainage area of a sinkhole.
- (4) Outfall pipe.
- (5) Unplugged abandoned wells or wells with less than eighty feet of casing depth shall have one hundred fifty feet minimum distance from all above

Land Application (No Discharge)

300 feet from water supply well, sinkhole, lake, pond, water supply reservoir, or water supply intake in a stream.

300 feet from a losing stream, no-discharge stream, stream stretches designated for whole body contact recreation.

150 feet from dwellings.

100 feet from wetlands or permanent flowing streams.

50 feet from property lines or other waters of the state, including intermittent flowing streams.

Septic Tank (Minimum Size)

1 to 3 bedroom - 1000 gallons

4 bedrooms - 1250 gallons

5 bedrooms - 1500 gallons

Lagoon (Minimum Size)

1 bedroom - 900 square feet

2 bedrooms - 900 square feet

3 bedrooms - 1320 square feet

4 bedrooms - 1760 square feet

Notes

- 1. All pipes carrying sewage to a drain field shall have a minimum slope of 1/4 inch per foot (2%)
- 2. Absorption field lines must be level, this includes the pipe, floor of trench and rock.
- 3. Heavy timber should be removed for a distance of 50 feet from the waters edge of lagoons to enhance wind action and prevent shading.
- 4. Lagoons shall be enclosed by a four foot high fence with two strands of barbed wire above the fence
- 5. No storm water runoff shall enter the lagoon.

CHAPTER 4

Alternative Systems.

General. The intent of the next two sections are to provide minimum standards for the design, location, installation, use and maintenance of alternative sewage treatment systems in areas of limiting soil characteristics or where a standard system cannot be installed or is not the most suitable treatment. Where systems are employed, they shall comply with all local codes and ordinances and should be subject to timely inspections to assure adherence to specifications.

The Administrative Authority shall have the authority to modify, delete or add technical alterations to these rules based on new technology and local experiences with required public notice and changes required to comply with appropriate state regulations.

The following systems are not the only Alternative Systems that will be allowed and are intended to serve only as expamples. Refer to 19 CSR 20-3.060 for more detail in design requirements and additional alternative systems.

All Alternative Systems that are submitted must be designed by a registered Professional Engineer.

Low Pressure Pipe (LPP) System.

4 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 overlying highly permeable bedrock. 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 will require that the hydraulic design of LPP systems be designed by an engineer. The administrative authority may also require the LPP trenches to be sandlined if the soils have severely diminished treatment capability due to excessive rock content. The amount of rock fragments should be less than fifty percent (50%) and in no case more than seventy percent (70%) unless the trenches are lined with sand.

CHAPTER 4

4.1 The LPP shall consist of the following basic components:

4.1.1 A network of small diameter one- to two-inch (1-2") diameter perforated PVC one hundred sixty pounds (160 lbs.) per square inch pipe or equivalent placed in natural soil at shallow depths, generally six to twelve inches (6-12"), in narrow trenches not less than six inches (6") in width. 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");

4.1.2 A properly designed, two (2)-compartment septic tank or other approved pretreatment system and a pumping or dosing tank. The pumping or dosing tank should be a minimum of five hundred gallons (500 gals.) or have the capacity to store one (1) day's flow above the pump level, whichever is greater;

4.1.3 An approved submersible effluent pump with appropriate on/off controls for controlled dosing and a high water alarm or other approved pressure dosing and distribution system; and

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

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

4.2.1 LPP absorption fields should 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;

4.2.2 There shall be at least twenty-four inches (24") of separation between the naturally occurring soil surface and rock, 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 the percolation rates less than or equal to sixty (60) minutes per inch or be classified as SUITABLE or PROVISIONALLY SUITABLE in accordance with section (7) of 10 CSR 20-8.021 or its successor. . 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 is concern for groundwater contamination and the soils have a high chert content, the bottom of the proposed trenches may be required to be as much as four feet (4') above the bedrock;

CHAPTER 4

4.2.3 Components of the LPP shall not be located in depressions or areas subject to frequent flooding. Surface water, perched groundwater 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 the rainwater or runoff is shed;

4.2.4 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 10 CSR 20-8.021 or its successor. Horizontal distances from the LPP absorption field shall be measured from a margin of two and one-half feet (2 ½') beyond the lateral and manifold pipes;

4.2.5 An area that is at least equal in size to the LPP distribution field area plus a two and one-half foot (2 ½') margin beyond the lateral and manifold pipes and meeting all other site and soil criteria shall be set aside for a replacement field;

4.2.6 There shall be no soil disturbance to an approved site for an LPP system except the minimum required for installation; and

4.2.7 Additional design considerations that should be followed may be found in the publication *Design and Installation of Low-Pressure Pipe Waste Treatment Systems*, May 1982, written by Craig Crogger, Bobby I. Carlile and Dennis Osborne, North Carolina State University. Copies of this publication may be obtained from the Triangle J Council of Governments, 100 Park Drive, Research Triangle Park, North Carolina 27709. Also the publication *Pressurized Distribution for On-Site Domestic Wastewater-Renovation Systems*, April 1984, Bulletin 870, Agricultural Experiment Station, University of Arkansas, Fayetteville, Arkansas, may be obtained.

CHAPTER 5

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

Table III

Percolation Rate	Absorption Area Sq.Ft./Bedroom	Loading Rate* Gal./Sq.Ft.	Probable Soil Texture
1-10	200	0.6	Sand, Loamy sand
10-30	300	0.4	Sandy loam, loam
30-45	400	0.3	Loam, Silt Loam, clay loam
45-60	600	0.2	Silt loam, clay loam silty clay loam cherty clays**

* Gallons of sewage tank effluent per day per square foot of total area.

** In areas where there is concern for groundwater contamination and the soils consist of cherty clays, the loading rate of two-tenths gallons (.2 gals.) per day per square foot should be used even when the percolation rate would indicate a higher loading.

4.4 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 III. The lateral lines shall have a minimum spacing of five feet (5') on centers within the area calculated for the absorption field. 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.

4.5 Design of the LPP shall comply with accepted practices and be specifically approved by the administrative authority.

CHAPTER 5

ON-SITE WETLAND SYSTEM

The following compilation of information is intended to give an idea of what is required for an On-Site Wetland System. The references shown need to be reviewed prior to design of the system.

Septic tank size - in accordance with state regulation 10 CSR 20-8.021 or its successor. .

Wetland rock bed size:

-Using EPA design equations (EPA 1988), loading should be at 2 cubic feet per gallon

(2 cu. ft./gal.)

-Rock depth @ 24", water depth @ 18" = 1.5 ft.

- Sewage flow rates per 10 CSR 20-8.021 or its successor. , page 6:

2 bedroom @ 240 gal./day

for each additional bedroom, add 120 gal./day

for each additional person above 2 people per bedroom, add 60 gal./day

Example calculations:

2 bedrooms: 2 bedrooms x 120 gal./day = 240 gal./day

240 gal./day x 2 cu. ft./gal = 480 cu. ft.

480 cu. ft. Divided by 1.5 ft. = 320 sq. ft.

w/5:1 length to width ratio, use 8' x 40'

3 bedrooms: 3 bedrooms x 120 gal./day = 360 gal./day

360 gal./day x 2 cu. ft./gal. = 720 cu. ft.

720 cu. ft. divided by 1.5 ft. = 480 sq. ft.

w/5:1 length to width ratio, use 10' x 50'

4 bedrooms: 4 bedrooms x 120 gal./day = 480 gal./day

480 gal./day x 2 cu. ft./gal = 960 cu. ft.

960 cu. ft. divided by 1.5 ft. = 640 sq. ft.

w/5:1 length to width ratio, use 11'6" x 57'

2 bedrooms with 5 people:

(2 bedrooms x 120 gal./day) + (1 person x 60 gal./day) = 300

gal./day

300 gal./day x 2 cu. ft./gal = 600 cu. ft.

600 cu. ft. divided by 1.5 ft. = 400 sq. ft.

w/5:1 length to width ratio, use 9' x 45'

Subsurface Effluent Distribution Pipe

CHAPTER 5

This design is one that has successfully been used in eastern Missouri. A 4-inch diameter perforated pipe is laid in a trench with the pipe invert being 16" below the surface. The trench (and perforated pipe) are run on a contour (constant elevation). Slope of the trench bottom is 2% minimum and 4% maximum. The trench is backfilled with in-situ soils, lightly compacted. Trench is 12" wide with a length of 75 feet per bedroom. Grass is grown on the backfilled earth. This is called an evapotranspiration trench.

GRAVEL BED MAY BE A SINGLE RUN, OR SIDE BY SIDE. THE SIDE BY SIDE ARRANGEMENT IS SHOWN ON THE DRAWING.

SIDES AND BOTTOM OF GRAVEL BED SHALL BE LINED WITH MINIMUM 10 MIL. PLASTIC SHEET.

SUBBASE FOR PLASTIC SHEET SHALL BE SMOOTH SOIL WITH NO ROCKS ON SURFACE.

BASE FOR PLASTIC SHEET SHALL BE 6 INCHES OF SAND.

PLASTIC SHEET SEAL SHALL BE CONTINUOUS OVER ENTIRE WALLS AND FLOOR OF GRAVEL BED.

GLUE ALL JOINTS AND SEAMS IN PLASTIC SHEET TO MAKE A WATERTIGHT SEAL.

CUT AND GLUE ALL FOLDS IN PLASTIC SHEET IN TRANSITION AREA, TO MAKE A SMOOTH, WATERTIGHT SEAL.

GRAVEL BED AND SUBSURFACE EFFLUENT DISTRIBUTOR TO BE ARRANGED ON LOTS TO HAVE MAXIMUM DISTANCE DOWNHILL TO ADJACENT PROPERTY.

SETBACK DISTANCES SHALL BE PER STATE REGULATION 10CSR20.8-021

PLANTS IN ROCK BED SHALL BE CATTAILS, REEDS, RUSHES, OR OTHER LOCALLY AVAILABLE AQUATIC PLANTS, ORNAMENTAL AQUATIC PLANTS MAY BE USED.

AQUATIC PLANTS TO BE PLANTED 2 FEET ON CENTER.

WIDTH OF TRANSITION AREA SHALL BE THE SAME WIDTH AS THE MAIN BED.

OUTSIDE BERM SHALL BE SLOPED TO PREVENT SURFACE WATER FROM

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ENTERING WETLAND.

SIDE SLOPES SHALL BE 2 HORIZONTAL TO 1 VERTICAL (2:1)

WIDTH OF TOP OF BERMS SHALL ALLOW FOR GRASS MOWING.

ROCK SHALL BE MINIMUM 2 FEET DEEP, MINIMUM WATER DEPTH SHALL BE 18 INCHES.

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PIPING SHALL BE MINIMUM 4 INCH DIAMETER.

SUBSURFACE DISTRIBUTION PIPE INSTALLATION SHALL BE CONSTRUCTED ON A CONTOUR WITH A SLOPE AT 2% MINIMUM & 4% MAXIMUM.

TRENCH FOR SUBSURFACE DISTRIBUTION PIPE SHALL BE BACKFILLED WITH LOCAL SOIL, LIGHTLY COMPACTED, SEED SURFACE OF BACKFILL WITH GRASS.

IF CATTAILS ARE USED, DECREASE OPERATING DEPTH TO 12 INCHES AND INCREASE SURFACE AREA BY 50 PERCENT.

Procedures for Percolation Tests and Soil Borings

6 Two (2) types of site evaluations are acceptable. Each type depends upon the technical expertise of the individual conducting the evaluations. The types of site evaluations are described as follows:

6.1 Percolation tests only. This type of site evaluation is where site suitability and sizing of the soil absorption system is by percolation tests and no evaluation of soil characteristics is made. This type of site evaluation can be used only for siting and sizing standard systems in areas with no significant geological limitations related to contamination of groundwater. The slowest acceptable percolation rate is sixty (60) minutes per inch when using this type of evaluation. Percolation tests shall be conducted by a registered engineer.

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

6.1.2 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 twenty-four inches (24") or to the bottom of the proposed soil absorption system, whichever is greater;

6.1.3 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") gravel shall be added to protect the bottom from scouring.

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6.1.4 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 twenty-four (24) hours. In sandy soils, the saturation and swelling procedure shall not be required and the test may proceed if one filling of the hole has seeped away in less than ten (10) minutes;

6.1.5 In sandy soils, adjust the water depth to eight inches (8") over 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 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 the 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%);

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6.1.6 In other soils, adjust the water depth 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;

6.1.7 Percolation rate shall be calculated as follows:

6.1.7.1 Divide the time interval by the drop in water level to obtain the percolation rate in minutes per inch;

6.1.7.2 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 (20) minutes per inch from the other tests, a detailed soils evaluation must be conducted to justify a design based upon the faster percolation rates; and

6.1.7.3 For reporting the percolation rate, worksheets showing all calculations and measurements shall be submitted.

6.1.8 Depth to bedrock shall be determined in areas where it is known that bedrock may exist at depths less than ten feet (10').

6.2 Soil Factors. This type of evaluation for determining site suitability and design is by determining the soil morphological characteristics. This evaluation should be conducted by a profession soil scientist. This type of evaluation is recommended for subdivisions where an engineer's report is required and for sites that have severe limitations related to restrictive layers and potential groundwater contamination. 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 for comparison. With this type of site evaluation, determination of suitability of a site and sizing may be done for standard or alternative soil absorption systems. The following criteria must be followed:

6.2.1 Each boring or excavation shall be made to a depth at least three feet (3') deeper than the bottom of the proposed system or until bedrock or a water table is encountered, whichever is less. A soil texture description shall be recorded by depth and notations made where texture changes occur. Particular effort shall be made to determine restrictive horizons;

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6.2.2 Extreme care should be taken to determine the highest known water table by recording the first occurrence of mottling observed in the hole or, if mottling is encountered, the open holes in clay or loam soils shall be observed after standing undisturbed a minimum of sixteen (16) hours and depth of standing water, if present, shall be measured;

6.2.3 Other prominent features such as a structure, stoniness, or roots should be noted by horizon. In areas where there is a significant potential for groundwater contamination, the administrative authority may require that the percentage of rock fragments be determined on each soil layer or horizon; and

6.2.4 General color and color variation (mottling) should be indicated by horizon. Color should be indicated in accordance with Munsell color notations.