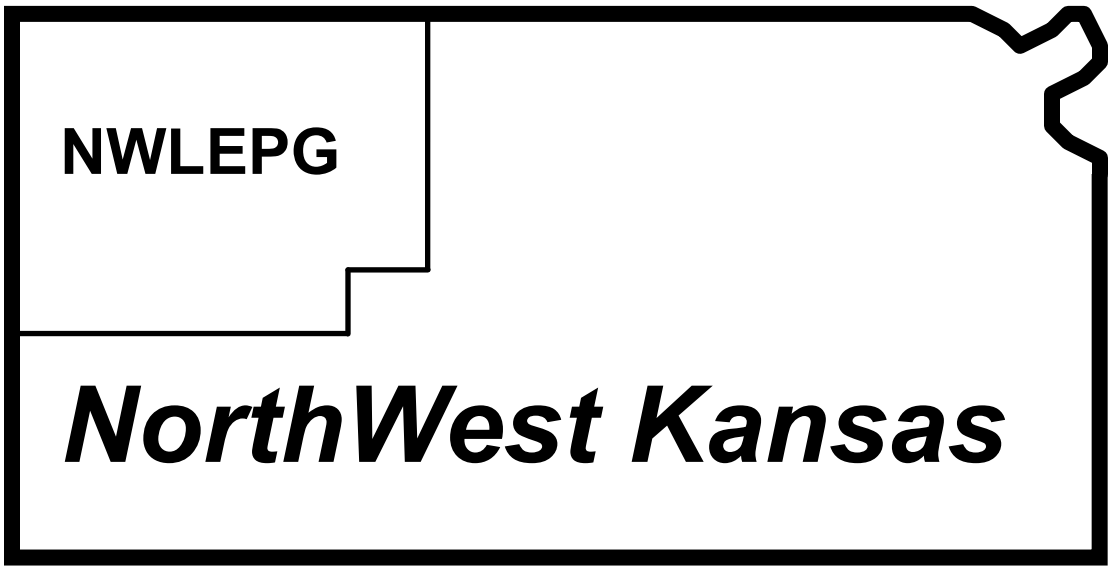
Onsite Wastewater System Installer Handbook

Design, Layout & Construction



NORTHWEST LOCAL ENVIRONMENTAL PROTECTION GROUP

350 S. Range, Suite #4
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Serving: Cheyenne, Gove, Greeley, Lane, Logan, Rawlins, Scott, Sheridan, Sherman, Thomas, Trego, and Wallace Counties

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Onsite Wastewater System Installer Handbook

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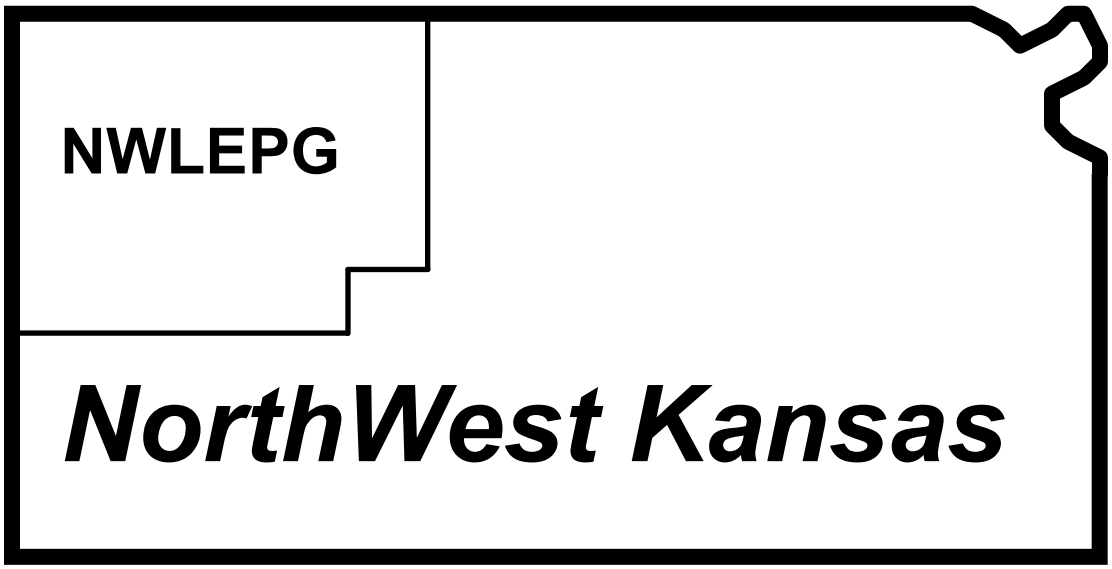
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ADMINISTRATIVE PROCEDURES

for
ONSITE WASTEWATER SYSTEMS



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ADMINISTRATIVE PROCEDURES
FOR
ONSITE WASTEWATER SYSTEMS

Introduction

These are the Administrative Procedures as referenced by the County Environmental/Sanitary Codes for Chapter 2 for the installation or modification of onsite wastewater systems in the Northwest Local Environmental Protection Group (NWLEPG) area. These Administrative Procedures provide the guidelines to be followed concerning the general construction requirements, appropriate forms to be submitted, system sizing options, licensing requirements for owner-builders, contractors and cleaners, Code related fee schedule, and appropriate contact agencies.

Construction or Modification of Onsite Wastewater Systems

Any person constructing or modifying an onsite wastewater system shall comply with the following procedures:

System Notification Requirements:

1. The NWLEPG shall be notified prior to construction or modification of a private wastewater system by submittal of an **Onsite Wastewater System Permit Application**.
2. The NWLEPG shall be contacted and arrangements made for the inspection of the system.
3. If an inspection is not performed. The owner or contractor, whomever is responsible for performing work upon the system, shall submit within 5 days a completed and signed **Construction Drawing form** of the construction or modification, complete with all required information.
4. When an emergency situation exists that requires immediate construction or modification of a private wastewater system, prior notification (by letter of intent or permits and notification for site inspections) is not required. However, the NWLEPG shall be notified by phone the first working day after construction or modification and the **Onsite Wastewater System Permit Application** and **Construction Drawing form** shall be submitted within 5 days.

System Construction or Modification Requirements:

1. The installation or modification of an onsite wastewater system shall comply with all applicable sections of the Construction Guidelines for Onsite Wastewater Systems.
2. All septic tanks shall be constructed to permit retention of incoming sewage for a minimum of 48 hours. The capacity for residential tanks shall be based upon the number of bedrooms according to the following table:

Number of Bedrooms	Minimum Effective Liquid Tank Capacity (gallons)
3 or less	1,000
4	1,250
5	1,500
Each Additional Bedroom (add)	250

Note: For sizing systems other than residential dwellings, use Table 3 Quantities of Wastewater in the Construction Guidelines for Onsite Wastewater Systems.

3. The owner-builder, installing their own system or the licensed contractor may use one of the following options for sizing the absorption field:
   a. Perform a percolation test in the area of the absorption field and size the absorption field using all appropriate information in the Construction Guidelines for Onsite Wastewater Systems.
   b. Size the absorption field using the Soil Conservation Service County Soil Survey and the specific information for the particular soil classification for the site and Table 6 Design Criteria by Soil Type for Absorption Fields in the Construction Guidelines for Onsite Wastewater Systems.
   c. Size the absorption field using 232 square foot per bedroom which is based on a 60-minute percolation rate.

SPECIAL CONSTRUCTION NOTES:

   a. Relocation of the absorption field may be required if excessive amounts of clay are found in the area of the absorption field during construction.
   b. All wastewater systems shall be sized using the Construction Guidelines and shall be approved by the NWLEPG to operate for system flows less than 2500 g/d (gallons per day) and only discharges domestic wastewater.
   c. All residential systems larger than 2500 g/d, including domestic wastewater systems for industrial or commercial facilities-shall be approved by the Kansas Department of Health and Environment (KDHE) unless directed otherwise by the KDHE.
4. When percolation tests are performed, the results shall be submitted to the NWLEPG prior to system construction.

All necessary forms, general information or other requirements pertaining to the County Codes may be obtained from the NWLEPG. Copies of the Codes, these Administrative Procedures or the Construction Guidelines may be obtained from your local County Clerk's Office or the NWLEPG. The NWLEPG will maintain a list of all licensed system contractors and cleaners.

Sanitary Disposal Service Operator License Requirements

The NWLEPG has established guidelines and procedures for the licensing of system cleaners.

The guidelines and procedures are as follows:

1. Application for the initial license and license renewals shall be made upon forms supplied by the NWLEPG. All fees shall be paid prior to processing the applications.
2. a) All licenses shall expire on March 31 of each year.
   b) Any initial license issued before January 1 shall pay the full yearly fees.
   c) Any initial license applications occurring between January 1 and March 31 will be exempt from the yearly fees for this 3-month period. Any initial licenses issued during this 3-month period will expire the following year on March 31.
   d) All license renewals shall be submitted prior to March 15 of each year.
3. Employees of a licensed Sanitary Disposal Service Operator shall not be required to be licensed however, they must be able to display a copy of the valid license, the approved NWLEPG license application form for the licensed owner, or otherwise prove they are operating under a valid Sanitary Disposal Service Operator License.
4. A Sanitary Disposal Service Operator license which expires because of failure to renew or is cancelled or revoked shall upon reapplication comply with all the requirements for the initial license.

5. An inspection of the equipment used in the cleaning of a septic tank is required prior to issuance of the initial license. All subsequent inspections resulting from random checks by the Authorized Representative or resulting from any complaints shall not be charged additional inspection fees for these inspections.
6. There shall be liquid in the truck tank at the time of inspection. A certification letter stating the tank is watertight from a person or company who is qualified to pressure test tanks may be submitted at the time of inspection in place of having liquid in the tank.
7. All equipment used in the cleaning of a septic tank shall be of watertight construction and maintained in good working condition to ensure that no spillage of sewage will occur during transportation.
8. A license holder when cleaning a septic tank shall remove the liquid, sludge and scum leaving approximately 6-8 inches of liquid (not sludge) in the tank. All light weight commercial tanks made of poly-plastic materials or lightweight fiberglass or similar materials shall be filled with water immediately after removal of the septage to prevent damage to the tank.
9. The septic tank shall be inspected during the cleaning. The baffles shall be present and functional, and the owner notified of any tank operational deficiency.
10. All persons removing septage from tanks, any inground excavations such as seepage pits or cesspools, privies, or port-a-potties shall dispose of these materials as stated in the Construction Guidelines for Proper Septage Disposal (Table 8).
11. Any person who is licensed as a system cleaner by the NWLEPG shall be approved to operate throughout the NWLEPG area.
12. All license holders shall submit to the NWLEPG upon license renewal, a signed affidavit form supplied by the NWLEPG, verifying all septage disposal during the past year was done in accordance with Table 8 of the Construction Guidelines.
13. Any system cleaner not complying with the County Environmental/Sanitary Code and these administrative requirements will be subject to license revocation by the NWLEPG and/or both revocation and the penalties stated in the Code.

Onsite Wastewater System Installer License Requirements

The NWLEPG has established guidelines and procedures for the licensing of system contractors. The guidelines and procedures are as follows:

1. Application for the initial license and renewals shall be made upon forms supplied by the NWLEPG. All fees shall be paid prior to processing the applications.
2. a) All licenses shall expire on March 31 of each year.
   b) Any initial license issued before January 1 shall pay the full yearly fees.
   c) Any initial license applications occurring between January 1 and March 31, will be exempt from the yearly fees for this 3-month period. Any initial licenses issued during this 3-month period will expire the following year on March 31.
   d) All license renewals shall be submitted prior to March 15 of each year.
3. Prior to issuance of the initial license the contractor may attend an offered class or take a written examination on the Environmental/Sanitary Code, Administrative Procedures and Construction Guidelines for Onsite Wastewater Systems.
4. At intervals of three (3) years, a written examination or attending a continuing education workshop shall be required for license renewal. If the license holder has attended an NWLEPG approved training workshop during the 3-year period, the written test will be waived. If the license holder has not attended any NWLEPG approved continuing education during the 3-year period, a written test is required for license renewal.

5. Employees of a licensed system contractor shall not be required to be licensed but shall not work without direct supervision by a licensed contractor with a valid license.
6. A contractor's license which expires because of failure to renew or is cancelled or revoked shall upon reapplication comply with all the requirements for the initial license.
7. Installation or modification of any private wastewater disposal system shall be in compliance with the County Environmental/Sanitary Code, Administrative Procedures and the Construction Guidelines for Onsite Wastewater Systems.
8. Any person who is licensed as a system contractor by the NWLEPG, shall be approved to operate throughout the NWLEPG area.
9. Any system contractor not complying with the County Environmental/Sanitary Code and these requirements will be subject to license revocation by the NWLEPG and/or both revocation and the penalties stated in the Code.

Owner-Builder Onsite Wastewater System Installer License Requirements

The NWLEPG has established guidelines and procedures for the licensing of homeowner or property owner installers. The guidelines and procedures are as follows:

1. Application for the initial license and renewals shall be made upon forms supplied by the NWLEPG. All fees shall be paid prior to processing the applications.
2. All licenses shall expire one year from the date of issue.
3. Prior to issuance of the license the Owner-Builder shall take a written examination on the Environmental/Sanitary Code, Administrative Procedures and Construction Guidelines for Onsite Wastewater Systems.
4. A licensed Owner-Builder shall be present for all modification or construction of onsite wastewater systems.
5. Installation or modification of any private wastewater disposal system shall be in compliance with the County Environmental/Sanitary Code, Administrative Procedures and the Construction Guidelines for Onsite Wastewater Systems.
6. Any homeowner installer not complying with the County Environmental/Sanitary Code and these requirements will be subject to license revocation by the NWLEPG and/or both revocation and the penalties stated in the Code.

NWLEPG License Revocation Procedures

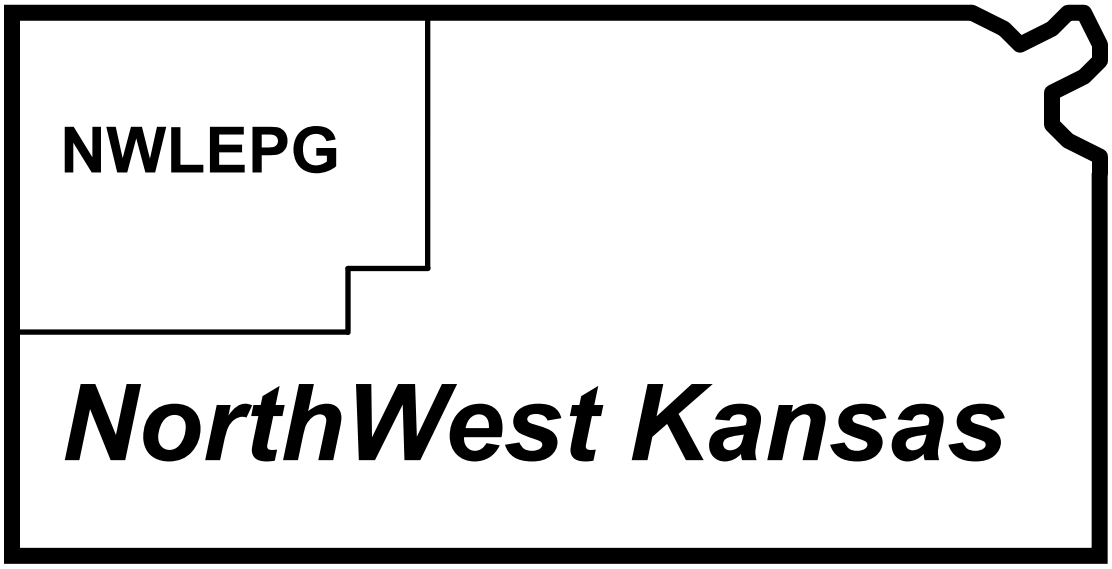
The NWLEPG has established written procedures for license revocation and probationary actions to ensure the provisions of the NWLEPG member Environmental/Sanitary Codes are followed.

The NWLEPG may cancel, revoke, suspend, or place on probation any license issued to any person required to hold a license from the NWLEPG (Authorized Representative) if the license was obtained by fraud, or the licensee has shown lack of knowledge (incompetency) in matters relevant to the license, or the licensee violates the provisions of the Environmental/Sanitary Codes of any member county of the NWLEPG.

The procedures assign time periods for the revocation process, schedule for appeal hearings, hearing officers, and provide procedures for final decisions by the NWLEPG Board. All proceedings shall maintain written records of the proceedings and all correspondence required for any and all actions taken. Copies of these procedures may be obtained from the NWLEPG and are provide to each licensee at initial licensing or upon request.

Revised: 3/8/94; 9/24/96, 11/14/01.

CONSTRUCTION GUIDELINES
for
ONSITE WASTEWATER SYSTEMS



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CONSTRUCTION GUIDELINES
FOR
ONSITE WASTEWATER SYSTEMS

Introduction

These guidelines provide the details on designing, sizing, planning and constructing a onsite wastewater system. It also contains forms, permit applications, tables for designing, distance requirements and other tables. This information can be found under the various headings and subheadings in the following pages of this guideline.

REQUIREMENTS FOR SEPTIC TANKS

Introduction

Septic tanks are the first step in the treatment of wastewater in a private wastewater system. The importance of the septic tank is often underestimated by home owners and contractors alike. The following sections will give the users and contractors a better understanding of what, why, and how the septic tank performs its function. It also includes design sizing and operational requirements.

Functions of the Septic Tank

Untreated liquid household wastes (sewage) will quickly clog all but the most porous gravel formations. The septic tank conditions the sewage so that it may be more readily absorbed into the subsoil. To do this, the septic tank must accomplish the following functions:

1. Remove the suspended solids: Clogging of the soil with tank effluent varies directly with the amount of suspended solids in the liquid. As sewage from a building enters a septic tank, its rate of flow is reduced so that larger suspended solids sink to the bottom or rise to the surface. The solids are retained in the tank and the clarified sewage is discharged to the absorption field.

2. Decompose the solids: The solids in the tank are subjected to continuous decomposition by bacteria and other living organisms normally present in sewage and natural processes. The bacteria thrive in the absence of free oxygen and the decomposition of the solids occur under anaerobic or septic conditions; hence the name of the tank.

3. Provide storage for sludge and scum: Sludge is the accumulation of the settled solids at the bottom of the tank. Sludge, and scum to a lesser degree, will be digested and reduced to a small residue of inert material. Space must be provided in the tank for accumulation of this residue during the interval between cleanings; otherwise, sludge and scum will eventually be carried out of the tank into the disposal field where it will clog the soil.

If adequately designed, constructed, and operated, septic tanks are very effective in accomplishing these functions.

Size

A septic tank should be constructed to permit retention of incoming sewage for a minimum of 48 hours, the capacity shall be based upon the number of bedrooms according to the following table:

Number of Bedrooms	Minimum Effective Liquid Tank Capacity (gallons)
3 or less	1,000
4	1,250
5	1,500
Each Additional Bedroom (add)	250

Note: For sizing systems other than residential dwellings, use Table 3 Quantities of Wastewater in the Construction Guidelines Appendix.

Design Criteria

1. Septic tanks shall meet the design and construction specifications as set forth in the State of Kansas Department of Health and Environment Bulletin 4-2 and amendments thereto. All tanks associated with the treatment, collection and/or disposal of onsite domestic wastewater (including but not limited to septic tanks, holding tanks, pump tanks, treatment unit tanks) shall be constructed of sound, durable materials, not subject to excessive corrosion or decay and shall be watertight, such as concrete, fiberglass or thermoplastics. Each such tank shall be structurally designed to withstand all anticipated earth or other loads and shall be installed level and on a solid bed. **Steel septic tanks shall not be permitted.**
2. All tanks shall be water tight with special attention given to job-built tanks to insure water tightness.
3. Job-built tank geometry should provide sufficient surface area to reduce surge flows. The larger the surface area the smaller the discharge rate (velocity). Large surges will cause more solids to be discharged to the absorption field. Generally, tanks built with a 2:3 ratio of width to length are desirable. For example, a tank 4 ft. wide will be 6 ft. long.
4. Heavy-weight concrete blocks shall be laid on a solid foundation and the mortar joints shall be well filled. The interior of the tanks shall be surfaced with two 1/4 inch thick coats of cement sand plaster.
5. Precast and cast-in-place tanks shall have a minimum wall thickness of 2 1/2 inches and be adequately reinforced.
6. When precast slabs are used as covers, they shall have a thickness of at least 3 inches and be adequately reinforced.
7. The inlet pipe flow line shall be at least 3 inches higher than the outlet pipe flow line. The inlet invert shall be rounded to prevent dripping. Dripping causes oscillations which prevent good separation of solids.
8. All tanks shall provide adequate baffling which will disburse the flow as evenly as possible. This will slow the velocity of the liquids through the tank and produce a cleaner effluent.
9. A vented inlet tee or baffle shall extend at least 6 inches below the liquid level, but in no case should the penetration extend deeper than the outlet tee or baffle.
10. Outlet tee or baffle shall extend above the surface of the liquid to within 1 inch of the underside of the tank top and should extend at least 14 inches below the outlet flow line.
11. Liquid depth should be a minimum of 30 inches and a maximum not to exceed the tank length or 60 inches, whichever is less.

12. A single or multi-compartment tank may be used. A two-compartment tank will produce a cleaner effluent than a single compartment tank of equal size. No more than (4) compartments are allowed.
13. A septic tank having two or more compartments or if more than one tank is used in series the first compartment or tank should hold 1/2 to 2/3 of the required capacity.
14. The transfer of liquid from the first compartment to the second or successive compartment should be made at a liquid depth of at least 14 inches below the outlet invert but not in the sludge zone.
15. At least one access no less than 20 inches across shall be provided in each compartment or tank.
16. In multi-compartment tanks there must be at least a 1 inch air gap for venting between the underside of the top of the tank and the top of the dividing wall.
17. The plans and specifications shall be submitted and approved by KDHE for any tank fabricated on site prior to construction.

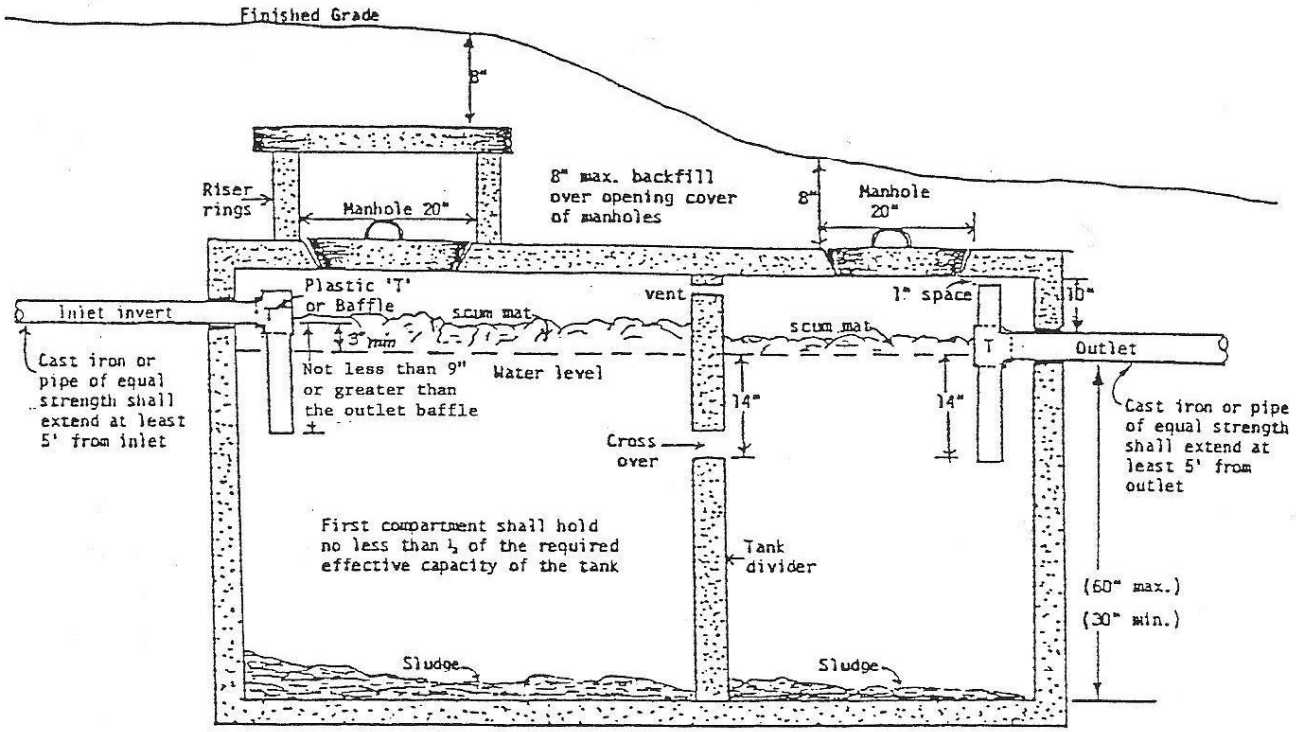
GENERAL: When designing job-built tanks, the contractor/builder should remember key factors affecting the tank design. Tank geometry, inlet and outlet arrangements, the number of compartments, and the operation and maintenance of the tank directly affect the ability of the tank to perform its function.

Installation

1. Cast iron pipe or pipe meeting ASTM standard 3034, properly supported to prevent failure by settling, shall extend from the septic tank for a distance of at least 5 feet from the inlet and outlet ends. (PVC SDR 35 and Schedule 40 PVC Pipe both meet this standard.)
2. Septic tanks shall be installed level and on a solid base or undisturbed soil.
3. Roof drains, foundation drains, area drains, cistern overflows or any other storm drainage shall not enter the tank or any part of the treatment system.
4. The building sewer should be laid with a minimum fall of 1/8 inch per foot and should not exceed 1/4 inch per foot.
5. Bends in the building sewer should be limited to 45 degrees ells or longsweep quarter bends to prevent plugging.
6. Cast iron pipe or its equivalent is required whenever the building sewer is located under a driveway.
7. The inlet and outlet pipes shall be grouted and sealed with a water proof material.
8. The opening cover of a septic tank manhole, inspection port, or sampling access port should be no deeper than 8 inches below the finished grade. Manhole extensions may be added to meet this recommendation.

DIAGRAM 1

TYPICAL SEPTIC TANK INSTALLATION



Abandonment of Tank

Septic tanks are sometimes abandoned for a variety of reasons. Whenever a tank is abandoned for whatever reason, the tank **shall** be filled to prevent danger of collapse. If the tank contains liquids, the tank must be pumped prior to filling. The tank must be filled with some type of inert material such as gravel, sand, sandy loam, or clay in compliance with K.S.A. 19-2504.

Proper Septage Disposal

Any licensed septic tank cleaner or individual disposing of septage shall dispose of the septage in a manner which does not pollute the waters of the state, endanger human health, or constitute a public nuisance.

Methods for disposal of septage has been developed by KDHE and the EPA. The proper methods of disposal are in the appendix Table 8.

SOIL REQUIREMENTS

Suitability of Soils

The first step in the design of subsurface wastewater system is to determine whether the soil is suitable for the absorption of septic tank effluent and, if so, how much area is required.

The soil must have an acceptable percolation rate, without interference from ground water or impervious strata below the level of the absorption system. The following conditions shall be met:

1. There shall be at least 4 feet of suitable soil between the bottom of the absorption field and bedrock or the maximum seasonal groundwater table.

2. There shall be a ground slope of no more than 25 percent.

3. The soil percolation rate shall be between 5 and 60 minutes per inch. If the rate is slower than 60 min. per inch innovative or alternative systems or a wastewater pond should be considered. If the soil is of a sandy texture and the percolation rate is faster than 5 mins. per inch, the percolation rate may be slowed by soil treatment.

Profile

A soil profile is recommended to a depth of at least four feet below the bottom of the absorption field or to a minimum of 8 feet. (See Figure 1 Soil Profile Record). A soil profile maybe obtained during the excavation of the system by using the backhoe to dig to the required depth. Another alternative is to use a coring tool to determine the types of soil for the profile. (See Table 1. Textural Properties Of Soils for general information on soils).

Falling Head Percolation Test Procedures

1. Number and Location of Tests: Commonly a minimum of three percolation tests are performed within the area proposed for an absorption system. They are spaced uniformly throughout the area. If soil conditions are highly variable, more tests may be required.

2. Preparation of Test Hole: Each test hole should be the same size whether it is 4, 6, or 8 inch in diameter bored or rectangular hand dug to the proposed depths of the absorption systems or to the most limiting soil horizon. To expose a natural soil surface, the sides of the hole are scratched with a sharp pointed instrument and the loose material is removed from the bottom of the test hole. Two inches of 1/2 to 3/4 in. gravel are placed in the hole to protect the bottom from scouring action when the water is added.

3. Soaking Period: The hole is carefully filled with at least 12 inches of clear water. This depth of water should be maintained for at least 4 hours and preferably overnight if clay soils are present. A funnel with an attached hose or similar device may be used to prevent water from washing down the sides of the hole. Automatic siphons or float valves may be employed to automatically maintain the water level during the soaking period. It is extremely important that the soil be allowed to soak for a sufficiently long period of time to allow the soil to swell if accurate results are to be obtained.

In sandy soils with little or no clay, soaking is not necessary. If, after filling the hole twice with 12 inches of water, the water seeps completely away in less than ten minutes, the test can proceed immediately.

4. Measurement of the Percolation Rate: Except for sandy soils, percolation rate measurements are made 15 hours but no more than 30 hours after the soaking period began. Any soil that sloughed into the hole during the soaking period is removed and the water level is adjusted to 6 inches above the gravel (or 8 inches above the bottom of the hole). At no time during the test is the water level allowed to rise more than 6 inches above the gravel.

   Immediately after adjustment, the water level is measured from a fixed reference point to the nearest 1/16 in. at 30 min. intervals. At least three measurements are made.

   After each measurement, the water level is readjusted to the 6 in. level. The test is continued until two successive water level drops do not vary by more than 1/16 in. The last water level drop is used to calculate the percolation rate.

   In sandy soils or soils in which the first 6 in. of water added after the soaking period seeps away in less than 30 min., water level measurements are made at 10 min. intervals for a 1 hr. period. The last water level drop is used to calculate the percolation rate.

5. Calculation of the Percolation Rate: The percolation rate is calculated for each test hole by dividing the time interval used between measurements by the magnitude of the last water level drop. This calculation results in a percolation rate in terms of min. per in. To determine the percolation rate for the area, the rates obtained from each hole are averaged.

Note: If tests in the proposed area vary by more than 20 min. per in., it indicates variations in soil type and percolation rates should not be averaged. Under these circumstances, relocation of the proposed site should be considered and additional percolation tests done until a more uniform soil type can be located. If relocation is not an option, then size the absorption field using the highest percolation rate.

Example: If the last measured drop in water level after 30 min. is $1\ ^{3}/_{16}$ in. then;

A. Convert fractions to decimals $1\ ^{3}/_{16}$ (3 divided by 16 = 0.19) = 1.19 inches.

B. Divide the number of minutes by the number of inches.
   30 min. divided by 1.19 inches = 25 min. per inch

C. Determine the average percolation rate by adding the results of the last reading from each hole and dividing by the number of holes.

   Example: $\frac{26 + 30 + 28 + 32}{4}$ = 29 min. per in. (average)

SAMPLE-PERCOLATION TEST DATA FORM

Percolation test number: 2 Date: Jan. 1, 1900

Location Lot 105, High Point Heights Subdivision, Mung City, Ks. 23456

Test hole number 2 of 3

Depth to bottom of hole 28 inches. Diameter of hole 6 inches.

Depth, inches	Soil texture
0-4	Black-Top Soil (Loam)
4-12	Brown-Sandy Clay
12-28	Yellow-Brown-Loamy Clay

Time	Time Interval, minutes	Measurement, inches	Drop in water level, inches	Percolation rate, minutes per inch	Remarks
9:30	-	44			
10:00	30	43	1		
10:20	20	43	1		
10:50	30	43 1/4	3/4		
11:20	30	43 1/16	15/16		
12:00	40	43 1/4	3/4		
12:30	30	43 3/16	13/16		
1:00	30	43 5/16	11/16		$30 \div \frac{11}{16} = 43.6$
1:30	30	43 5/16	11/16		

Percolation rate = 44 minutes per inch.

This percolation test was performed in accordance with the requirements and procedures established by the County and the NWLEPG.

Signature: John Doe Date: Jan. 1, 1900

DESIGN CRITERIA FOR SOIL ABSORPTION SYSTEM

Introduction

Septic tanks change the composition of raw sewage but the effluent still contains many pollutants and harmful organisms and is not suitable for direct discharge to the environment. Final treatment of the septic tank effluent occurs in the soil absorption system which is designed to filter and oxidize most suspended solids and bacteria. Nitrifying bacteria found in the top few feet of the soil facilitate the use of nitrogen compounds as plant nutrients. If the absorption system is kept shallow, the root system of the vegetative cover can penetrate the system and take up much of the phosphates and nitrogen compounds. This will minimize the potential for phosphate or nitrate contamination of the groundwater. This vegetative cover will also aid in ridding the system of some of the water load by transpiration. **Note:** All soil absorption systems shall be proceeded by an adequately sized septic tank.

Location of The Absorption Field

The absorption field should be located in areas where good grass cover is possible. Areas of seasonal flooding and slopes of greater than 25 per cent (25 feet per 100 feet) should be avoided. The bottom of the field shall be at least four feet above the seasonal high water table or bedrock and surface waters should be diverted from the vicinity of the subsurface disposal system. Absorption systems should never be built under driveways, walkways, parts of buildings, etc. and such structures should never be constructed over any portion of an existing or planned on-site wastewater treatment system. MINIMUM DISTANCES FROM WATER SOURCES, STRUCTURES AND PROPERTY LINES SHALL BE OBSERVED (See Table 2 Minimum Horizontal Distance Requirements).

Calculation of Sewage Flow

1. Where gallons per day can be obtained by measurement of existing conditions, such data should be used.
2. For new facilities Table 3 Quantities of Wastewater should be used as a guide to represent design flow.
3. To calculate the sewage flow for dwellings and mobile homes, use two persons per bedroom.
4. In no event may the system be designed for a lesser capacity than the anticipated maximum daily sewage flow or treatment requirements of the sewage or wastewater in the system.

Sizing

1. For a system treating and disposing of effluent through a soil absorption system, the method for calculating minimum absorption area shall be based upon the amount of suitable soil and the capacity of the soil to absorb liquids as established by the percolation test or minimum requirement per bedroom and upon design criteria and construction standards for such type of absorption system as set forth in the Administrative Procedures for Private Wastewater Systems.
2. Absorption Area: The minimum absorption area in square feet (A) for a private sewage disposal system shall be determined as a function of the design flow of sewage in gallons per day (Q), and the percolation rate in minutes per inch (t), according to the formula:

$$A = \frac{Q \times t}{5}$$

Note: Where the percolation rate is found to be faster than five minutes per inch in soils of sandy texture, the minimum value of the "t" for use in this formula shall not be less than "5".

3. If an excessive amount clay is found during construction additional percolation tests should be performed and the field sized using the percolation test results. With clay being present relocation of the absorption field may be required.

Typical Absorption Trench and Absorption Bed System

An absorption trench or absorption bed should be of sufficient width and length or dimension to provide the required absorption area. The bottom of the trench or bed should be level.

Note: Refer to Innovative/Alternative Section for other trench or bed systems.

Trenches:

1. A minimum of 2 trenches of near equal length is required and neither trench should be longer than 100 feet in length.
2. The trench should be 24 or 36 inches wide and no deeper than 36 inches.
3. A perforated distribution pipe should be placed the entire length of the trench with the holes down and should be surrounded by clean, graded gravel, rock or material of equal efficiency.
4. The rock may range in size from 1/2 inch to 2 1/2 inches in diameter.
5. The rock should be placed at least 6 inches below the pipe and at least 2 inches above the pipe making a minimum of 12 inches. (See Diagram 3 Absorption Trench and Bed Cross-Section).
6. There should be at least 6 feet of undisturbed soil between trenches.
7. The perforated pipe for gravity distribution should be no less than 4 inches in diameter and be rigid enough to maintain the level through out the trench.
8. The perforated pipe should be as level as possible or with a drop of not more than 4 inches in a 100 foot.
9. The terminal ends of the lines should be capped unless looped or air vented.
10. If tile or other open joint pipe is used, the upper half of each joint should be covered to prevent the entrance of outside graded material.

Beds:

1. The bed should be wider than 36 inches and no deeper than 36 inches.
2. The perforated pipe should be surrounded by clean, graded gravel, rock or material of equal efficiency.
3. The rock may range in size from 1/2 inch to 2 1/2 inches.
4. The rock should be placed at least 6 inches below the pipe and at least 2 inches above the pipe making a minimum of 12 inches (See Diagram 3 Absorption Trench and Bed Cross Section).
5. The distance between parallel perforated lines should not exceed 6 feet and a perforated line should be located within 3 feet of each sidewall of the bed.
6. The perforated pipe for gravity distribution should be no less than 4 inches in diameter and rigid enough to maintain the level throughout the bed.
7. The perforated pipe should be looped at the ends.

General:

1. The top of the gravel should be covered with a layer of hay, straw, untreated building paper, or similar pervious biodegradable material. An impervious or non-biodegradable covering shall not be used.
2. A final cover of soil suitable for vegetation at least 10 inches deep should be placed from the top of the pervious covering to the finished surface grade of an absorption trench or absorption bed.

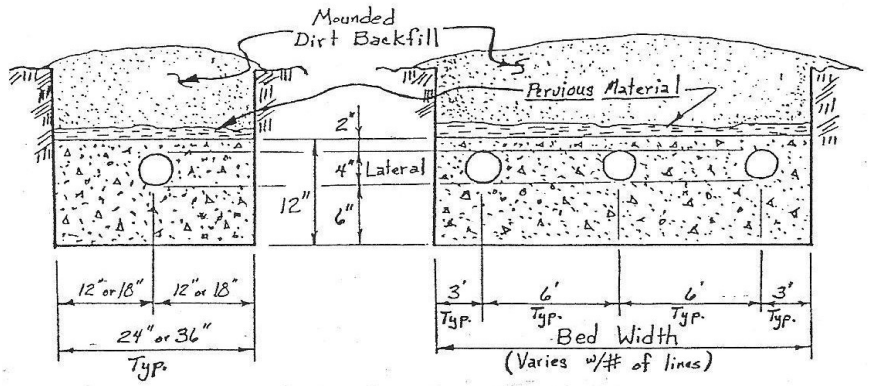
3. The final cover should be graded to deflect runoff water away from the disposal area. Machine tamping, rolling or hydraulic compaction of final cover should not be permitted, however, hand tamping may be allowed where necessary to stabilize the soil to prevent erosion or the intrusion of extraneous water.
4. The length of an absorption trench or seepage bed may be calculated by allowance for the sidewall area of additional depth of gravel in excess of 6 inches below the bottom of the distribution pipe according to the following formula:

$$L = \text{Length required prior to adjustment} \times \frac{(W+2)}{(W+1+2d)}$$

Where: W = width of trench in feet
d = depth of gravel below distribution pipe in feet
(See Table 5 Chart for Increased Gravel Depth Under Lateral Pipes).

DIAGRAM 3
ABSORPTION TRENCH AND BED CROSS SECTION

Trench Bed



Mini-System

A mini-system may be considered for disposal of wastewater from sinks, lavatories, showers or other gray water disposal. Mini-systems shall be used in conjunction with approved conventional disposal systems for human excreta. The standard design requirements for conventional septic systems prescribed by these construction standards shall apply, except that:

1. Design shall be based on a minimum volume of wastes **not** containing human excreta, or 25 gallons per day per person. Three days retention time shall be provided for each mini-system tank.

2. Construction materials shall be such that the tank will remain water tight.
3. Percolation tests should be conducted and the minimum size of the absorption area shall be calculated in accordance with these construction standards.
4. The building drain and sewer leading to the septic tank shall be a **maximum** of two inches in diameter to preclude a later tap for a water closet (toilet).

Gravelless Lateral Field

Gravelless Lateral Fields shall use corrugated polyethylene tubing encased in a soil filter protective wrap. The inside diameter should be either 8 inches or 10 inches. One foot of 8 inch tubing will equal one foot of 24 inch trench and one foot of 10 inch tubing will equal one foot of 36 inch trench. The Gravelless system shall be installed per the manufacturer's installation guide.

Inspection ports extending 12 inches above ground level are required for monitoring purposes. The end plates of each tube shall be constructed of plastic, made by the manufacturer of the tubing.

Chamber Systems

A chamber system shall be of sufficient width and length or dimension to provide the required absorption area and be installed to meet manufacturers specifications utilizing end caps designed for the chamber. The bottom of the trench shall be level.

1. Chamber trenches shall be separated by six (6) feet of undisturbed soil.
2. Fill the sidewall area to the top of the louvers by pulling soil from trench sides with a shovel. Be sure the fill covers the louvers. Pack down the fill by walking along the edges of the trench. This is an important step that assures correct structural support.
3. Risers shall be installed at the end of each lateral run extending 12 inches above ground level.
4. The soil covering the wastewater system shall be mounded upon completion of the system for a period of approximately two years.
5. Systems requiring more than one distribution line shall utilize distribution boxes with speed levelers or the equivalent.

Privy

A privy shall be built to include: fly-tight construction, a superstructure affording complete privacy, an earth mound around the top of the vault and below floor level, which slopes downward away from the super-structure base, a floor and riser of concrete or other impervious material, and with seats and covers of easily cleanable materials, venting shall be fly-proofed with No. 16 or tighter mesh screening. If a vault is used it shall be no less than 1000 gallons.

Innovative/Alternative Systems

Where no sewer is available or where conventional onsite wastewater disposal is not possible, innovative/alternative systems and systems not included in these construction guidelines may be submitted to the NWLEPG. The NWLEPG may require the system to be designed by a Kansas licensed professional engineer and ask for review by the Kansas Department of Health and Environment. Examples of alternative systems are: Mound, Evapotranspiration, Aerobic, etc.

Trench and bed systems utilizing new techniques other than the typical systems described in the Typical Absorption Trench and Bed System section may be used but sized the same as the typical systems. Variance in sizing shall be approved by the NWLEPG. Examples of such systems are the corrugated, fiberglass system, half round clay tiles, or half round concrete systems.

REQUIREMENTS FOR WASTEWATER STABILIZATION PONDS

Introduction

Due to limited absorption capacity of the soil in many areas of Kansas, the septic tank-lateral field systems described in these guidelines will not absorb the quantities of wastewater produced in our modern homes. Properly located, designed, constructed, and operated waste stabilization ponds may provide a possible solution where public sewers are not available. Ponds should not be considered unless percolation tests indicate rates slower than 1 inch of fall per hour (60 min per inch).

There are some drawbacks to a waste stabilization pond that should be considered before choosing this alternative. One is that ponds require more area than many people realize. Another is that they require considerably more maintenance. The pond area needs as much or more care than a lawn. Occasionally there can be operational problems and for some people, an aesthetic drawback to waste stabilization ponds. Since ponds contain raw sewage it is necessary to fence the pond for health and safety reasons. When estimating costs remember to consider the fencing and the seeding of the dikes. Sometimes it is necessary to control erosion of the compacted clay soil. In addition, if rock or sandy soil is encountered during construction, the costs can be much more than expected.

Plans

1. All applicable county or city/county requirements shall be met prior to construction.
2. The designs shown in these guidelines are not suitable for use at schools, institutions, or commercial businesses such as motels, restaurants, camps or trailer parks. Facilities for such establishments shall be designed by a Kansas Registered Professional Engineer. All waste stabilization ponds for the following described situations require a permit from Kansas Department of Health and Environment (KDHE):
   a) receive over 1000 gallons per day,
   b) serve more than one property,
   c) receive industrial waste, or
   d) discharge effluent.
3. A single-family pond should not be considered if septic tank/lateral field systems are feasible. If public sewer connection or a septic tank/lateral field is not feasible then a waste stabilization pond may be considered.
4. Before considering the installation of a pond, one should consider the following factors:
   a) The area required by a pond ranges from 5,500 to 10,000 square feet depending on the pond type.
   b) Ponds require routine maintenance of dikes, fencing and vegetation.
   c) Older ponds will fill with solids and may require the removal of those solids to prolong the ponds life. This is done by dewatering and removing the sludge, both require proper disposal. (See section on Disposal of Septage.)
   d) Some ponds require abandonment which requires dewatering and sludge removal as well as filling in the excavation.

Site

1. Conduct a preliminary site evaluation to determine the probable location for the facility. Note any conditions which could adversely affect construction, such as wells, public water supply, sandy soil, etc. A high water table or saturated zone near the surface of the ground would be an example of a prohibitive condition. Use all available site specific information, such as site history soil profiles, Soil Conservation Service Soil Survey and so forth.

2. Determine the percolation rate of the soil using the procedure described in the falling head percolation test. It is the percolation rate near the bottom of the test holes that is important.
3. Compare the results with your county Soil Conservation Service Soil Survey to see if the percolation test results are in general agreement. Large differences should be reconciled by further testing and examination of soil characteristics by someone knowledgeable in soil texture and structure and any factors which affect hydraulic conductivity.
4. Each county in Northwest Kansas has two recommended pond sizes (M-40 & M-45) for household wastewater disposal. The smaller pond should be used if the house has three bedrooms or less or if it serves five persons or less. The larger pond is for houses having four or five bedrooms and serves six or more persons. If there is any question about size, use the larger size. Other pond sizes are listed in Table 7 but are reserved for high water use households or multiple households and require KDHE approval.

WASTEWATER STABILIZATION POND SIZES

Pond Dimensions				Storage Capacity			
"A"	"B"	"X"		(cu. ft.)		(gallons)	
Pond Type			(Depth)	1.5'	5'	1.5'	5'
M-40	10'	52'	3.0	295	2,375	2,210	17,770
M-45	10'	59'	3.5	321	2,760	2,400	20,650

Note: See the Construction section for general specifications of dike construction. Diagram 5 shows the general layout of a wastewater stabilization pond in plan and section views.

5. Ponds shall be separated from other areas by distances equal to or greater than those shown below.

WASTEWATER STABILIZATION POND MINIMUM DISTANCES

Area	Minimum Separation
House it serves	100 ft.
Other residential structures	250 ft.
Applicant's private water supply well	100 ft.
* Property lines, including right-of-way	100 ft.
Public water supply well	100 ft.
Public water transmission lines	25 ft.

*** Note:** Placing the pond too close to a property line might limit the options of where an adjoining owner could locate a well. The neighboring property owner may sign a waiver which would allow the placement of the facility as close as 50 feet to the property line. Public roadways (total right-of-way) may be considered part of the separation if necessary. However, neither the pond or the dikes may be placed on any public access or utility easement.

Construction

1. The bottom level of the pond shall be at least 4 feet above the minimum groundwater level.
2. All outside dike slopes are to be three and one half (3 1/2) feet horizontal to one 1 foot vertical. Inside slopes are determined by the pond type used. (See Diagram 5 or Table of Waste Stabilization Pond Sizes.)
3. Minimum dike berm (top) width is to be four (4) feet.
4. Minimum dike freeboard (distance between water level and top of the dike) is to be two (2) feet. This makes the total dike berm height (7) feet above pond bottom.
5. Pond retention dikes should be above the 100-year flood plain.

6. The inlet pipe is to be of rigid, freeze-breakage resistant material such as steel, P.V.C., or A.B.S., and provide a capped cleanout at the nearest upsewer point where the flowline will be above the maximum pond water level. The minimum slope of the inlet pipe is to be 1/8 inch per foot with the piping outlet opening one (1) foot from the pond bottom. A 2 ft. sq. concrete splash pad or equivalent shall be placed under the outlet end of sewer pipe to prevent washout of the clay barrier.
7. When the pond excavation penetrates or terminates in either a rock strata or a porous (sand or gravel) strata, the excavation shall be extended a distance of one foot on both the bottom and side slopes. The area of supplemental excavation shall be filled with a non-permeable earthen material to limit seepage from the pond to a maximum value of 1/4 inch per day. This may be accomplished by using a clay soil which is free of rocks. If a clay soil is not available, the fill soil should be mixed with bentonite clay at the manufacturer's recommended rate and then compacted.
8. Surface drainage shall be diverted around the pond. (See Diagram 5 for example of diversion drainage.)
9. The builder shall smooth the dikes so that no clods, rocks, or ruts will interfere with a mower.
10. For erosion control, a groundcover shall be established on the dike. This groundcover should be a short-rooted perennial such as bluegrass, fescue, brome or crown vetch and must a maintained regularly during the growing season.
11. The entire pond area shall be fenced with a minimum 4 ft. high woven or welded wire fencing with 2-inch x 4 inch maximum openings. The fence may be installed no closer than three feet from the inside edge of the top of the dike. In addition, a double strand of barbed wire or electric fence is recommended if the facility will be accessible to livestock. The pond must be adequately fenced to prevent entrance of unauthorized personnel and livestock. All of the area within the pond enclosure should be regularly mowed.
12. A gate of sufficient size (minimum 4 ft. width) and located to accommodate the entrance of a mower shall be provided. This gate shall provide the same degree of resistance to entry as the fence and kept locked.
13. Roof drains may be discharged to the sewer system to aid in maintaining minimum water levels provided there is a control arrangement which can divert this water from the pond during times of high water.
14. If public sewers become available to the property, connection shall be made to the public sewer. The pond shall be abandoned by dewatering and pushing in the dikes and returning the area to the contours it had before construction of the waste stabilization pond. To dewater, the irrigation procedures for Emergency Overflow Procedures in these construction guidelines may be used.
15. Single-family ponds that are not constructed, operated and maintained according to county or city/county requirements are subject to being declared public health nuisances by the local boards of health (KSA 65-159) and prosecuted by the county attorneys (KSA 65-160).
16. Ponds are subject to all addendum of the Kansas Department of Health and Environment water quality regulations.
17. Specifications for pond sizes are listed in Diagram 5 or may be picked up at the Northwest Local Environmental Planning Group (NWLEPG).

Operation and Maintenance

1. All of the area bounded by the outside bottom edge of the dikes (or the fence where there is no dike) shall have a good stand of groundcover established and maintained on it. This grass should be a short-rooted perennial such as blue, fescue, or brome. Once this vegetation is established it shall be regularly maintained during the growing season and

under no circumstances shall trees or tall weeds be allowed to develop in the dike area. Vegetation shall not be allowed to grow higher than six inches.

2. Water vegetation shall be controlled. All trees and weeds, such as cattails and duckweed, should be removed as soon as the first ones develop in the water. Mosquito production is directly proportional to the amount of such vegetation. Essential air circulation is reduced, the pond's seal can be destroyed, and organic overloading can occur and evaporation can be reduced when such vegetation is allowed to get out of control. Pulling weeds out by hand is generally the best method. They should be removed from the water so that they do not contribute to the organic loading and filling of the pond. Herbicide use should be avoided when possible, as improper use can cause temporary system failure. If herbicides must be used, call your county extension agent for the latest advice on what product to use. Follow the manufacture's recommendations and avoid spillage or drift that would kill the grass on dikes.
3. The water depth shall be maintained between 1 1/2 and 5 feet. The pond should not be allowed to go dry during continuous use as this will stop the digestion of the wastewater. To help maintain the minimum depth in dry weather, roof drains may be directed into the sewer line. However, this should be considered a temporary condition and the drain water redirected during times of high water in the pond. Areas of little rainfall or times of low household water usage may require that additional water be pumped into the pond to maintain a minimum water level.
4. Any damage to the dikes shall be repaired by reshaping the area to the original plan and then establishing a good stand of groundcover on the worked areas. Among the most common causes of dike damage are settling, erosion and rodent burrowing. Surface water shall be diverted around the pond so it will not contribute to the hydraulic loading of the pond or create an erosion problem.
5. Essential features of the pond, such as the fence, gate and pipe shall be maintained in the condition called for in the original plans and specifications.

Emergency Overflow Procedure

One method often suitable for preventing overflow is to use some of the pond water for irrigation. This irrigation water must be distributed so all water is absorbed into the ground without runoff. The preferred irrigation area is plowed cropland. Care should be taken to minimize the taking of fresh or untreated sewage and sewage solids within the irrigation water; the intake should be suspended about midway in the water's depth. One alternative is to have the excess sewage hauled away by licensed system cleaner.

Note: For dewatering and irrigation requirements, see section on Proper Septage Disposal.

Irrigation is not to be considered a normal operating procedure but rather an emergency procedure to be used on rare occasions. If the threat of overflow persists, other measures must be taken such as enlargement of the existing pond or construction of an additional cell.

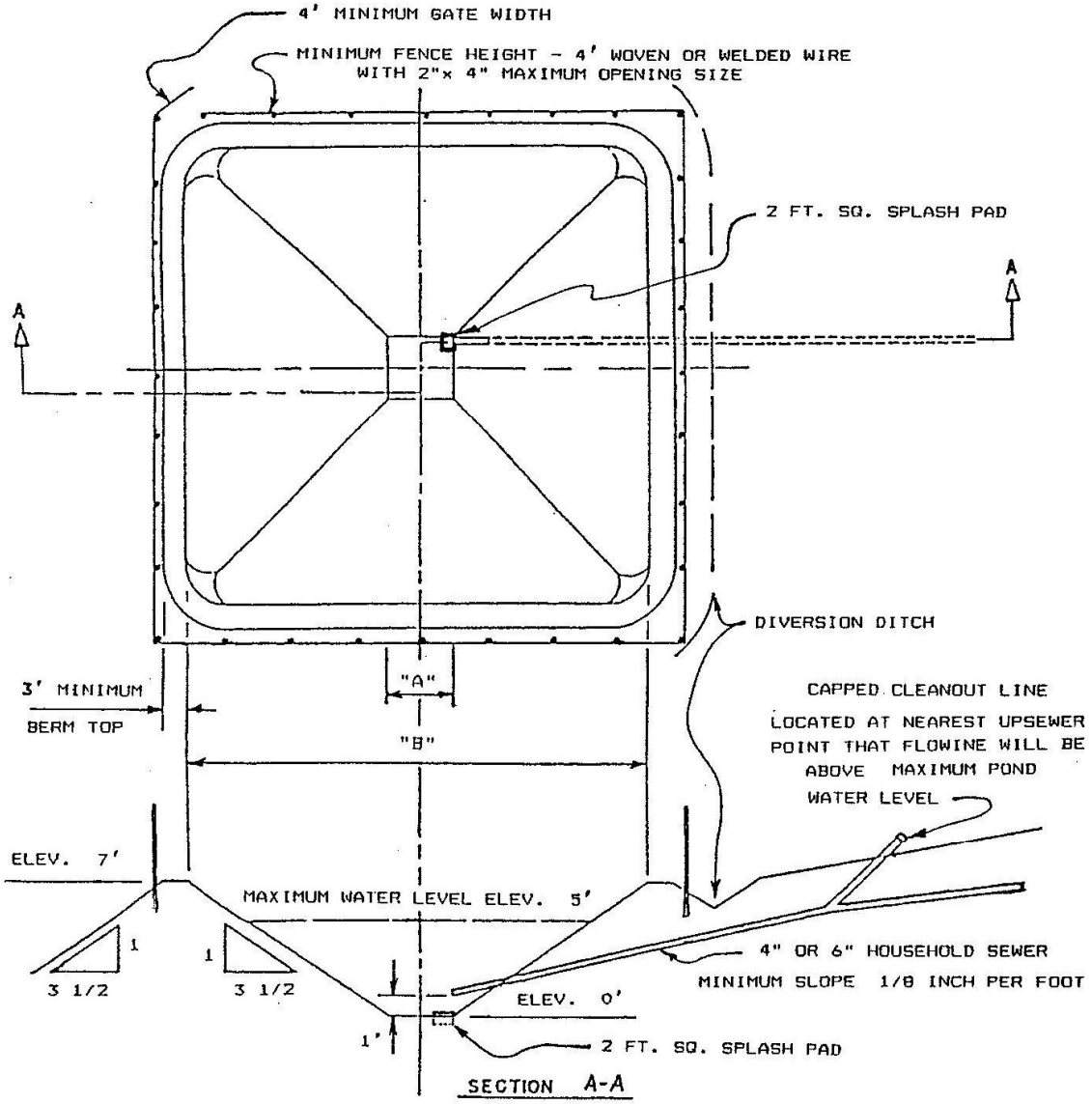
DIAGRAM 5

WASTEWATER STABILIZATION POND LAYOUT (PLAN & SECTION)

WASTEWATER STABILIZATION POND SIZES

	Pond Dimensions			Storage Capacity			
	"A"	"B"	"X"	(cu. ft.)		(gallons)	
Pond Type			(Depth)	1.5'	5'	1.5'	5'
M-40	10'	52'	3.0	295	2,375	2,210	17,770
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Note: See the Construction section for general specifications of dike construction. Diagram 5 shows the general layout of a wastewater stabilization pond in plan and section views.



APPENDIX OF TABLES AND FORMS

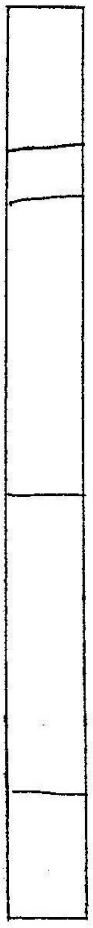
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FIGURE 1
SAMPLE SOIL PROFILE RECORD

NORTHWEST LOCAL ENVIRONMNENTAL PROTECTION GROUP
350 S. Range, Colby, KS. 67701, PH: 785-462-8636, FAX: 785-460-8637

SOIL PROFILE RECORD

Inches	Feet	Description of Soil
0	0	Silty Loam
12	1	13" Silty Clay
		20"
24	2	
36	3	Sandy Clay
48	4	52"
60	5	
		Sand
72	6	
84	7	84"
		Bedrock or Water Table
96	8	



COMMENTS:

_____

_____

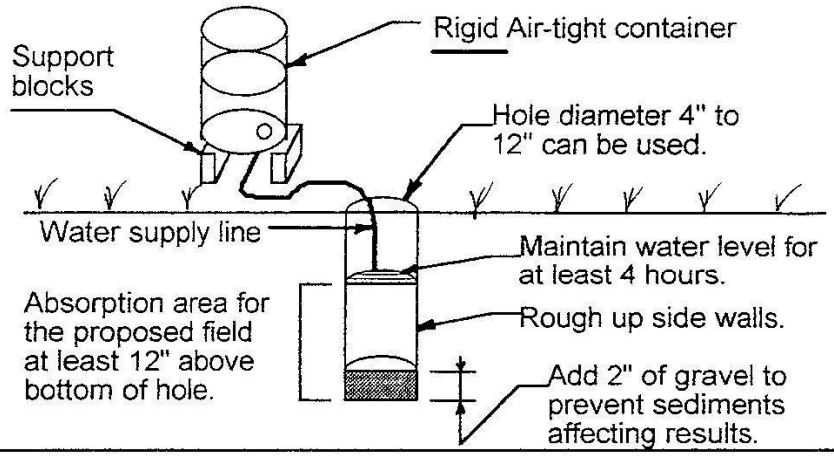
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_____

Soil Profile completed by:_____ Date:_____
(Signature)

Percolation Test Soaking Device Diagram-#2



PERCOLATION TEST REPORT

Perc Test #:_____ **Date:**_____ **Location:**_____

Hole Depth: _____ **Hole #** ____ **of** ____

Soil Profile: **Depth** **Soil Texture Description**

0 to _____

_____

_____

Time	Interval	Water Level	Drop	drop/time	Notes

To calculate perc rate: divide Time by Drop: Time (min.)/drop (in.) = ???? min/in

Perc. rate:_____ **min/in**

Signature:_____ **Date:**_____

SC-WKSP-01/99-EDV(WW-HDBK3.WPS)

TABLE 1
TEXTURAL PROPERTIES OF SOILS
Feeling and Appearance

Soil Class	Dry Soil	Moist Soil
Sand	Loose, single grains which feel gritty. Squeezed in the hand, the soil mass falls apart when the pressure is released.	Squeezed in the hand, it forms a cast which crumbles when touched. Does not form a ribbon between thumb and forefinger.
Sand Loam	Aggregates easily crushed; very faint velvety feeling initially but with continued rubbing the gritty feeling of sand soon dominates.	Forms a cast which bears careful handling without breaking. Does not form a ribbon between thumb and forefinger.
Loam	Aggregates are crushed under moderate pressure; clods can be quite firm. When pulverized, loam has velvety feel that becomes gritty with continued rubbing. Casts bear careful handling.	Cast can be handled quite freely without breaking. Very slight tendency to ribbon between thumb and forefinger. Rubbed surface is rough.
Silt Loam	Aggregates are firm but may be crushed under moderate pressure. Clods are firm to hard. Smooth, flour-like feel dominates when soil is pulverized.	Cast can freely handled without breaking. Slight tendency to ribbon between thumb and forefinger. Rubbed surface has a broken or rippled appearance.
Clay Loam	Very firm aggregates and hard clods that strongly resist crushing by hand. When pulverized, the soil takes on a somewhat gritty feeling due to the harshness of the very small aggregates which persists.	Cast can bear much handling without breaking. Pinched between the thumb and forefinger, it forms a ribbon whose surface tends to feel slightly gritty when dampened and rubbed. Soil is plastic, sticky and puddles easily.
Clay	Aggregates are hard; clods are extremely hard and strongly resist crushing by hand. When pulverized, it has a grit-like texture due to the harshness of numerous very small aggregates which persist.	Casts can bear considerable handling without breaking. Forms a flexible ribbon between thumb and forefinger and retains its plasticity when elongated. Rubbed surface has a very smooth, satin feeling. Sticky when wet and easily puddled.

Table 2
MINIMUM HORIZONTAL DISTANCE REQUIREMENTS IN FEET

	Springs, Private Wells, Private Well Suction Lines	Potable Water Supply Lines	Potable Water Supply Cistern	Dwelling, Occupied Building	Property Lines	Subsoil Drains	Lakes, Water Courses, Irrigation Ditches, or Streams	Dry Gulch	Septic Tanks
Utilizing Aerosol Methods	100	10	50	125	10	-	25	10	10
Seepage Pit	100	50	25	20	25	10	50	25	10
Absorption Trench, Seepage Bed, Sand Filter, or Sub-Surface Dispersal System	100	25	25	20	25	10	50	25	10
Unlined Sand Filter in Soil with a Percolation Rate Slower than 60 Minute Per Inch	100	25	25	15	10	10	25	15	10
Unlined or Partially Lined Evapotranspiration System, or Surface Disposal System other than Aerosol	100	25	25	15	10	10	25	15	10
Lined Sand Filter	100	10	25	15	10	10	25	10	10
Lined Evapotranspiration Field	100	10	25	15	10	10	25	10	10
Vault Privy or Vault	50	10	25	15	10	10	25	10	-
Sanitary Privy	100	25	25	20	10	10	50	25	10
Septic Tanks, Treatment Plants, Dosing Tanks or Effluent Lines	50	10	25	10	25	10	50	10	-
Building Sewer	50	10	25	-	-	10	50	10	-
Wastewater Lagoon	100	25	25	100	100	10	25	25	10

For the repair of an existing system where the size of the lot precludes adherence to these distances, the repaired facility shall not be closer to the physical features than the existing facilities, but must comply with K.A.R. Article 5 as authorized by K.S.A. 65-171D.

TABLE 3

QUANTITIES OF WASTEWATER

TYPE OF ESTABLISHMENT	GALLONS/PERSON/DAY (Average) (Unless Otherwise Stated)
Residential	
Hotels & Motels without private baths	50
& Motels with private baths	60
Multiple family dwellings or apartments	75
Rooming houses	50
Single family dwellings	75
Commercial & Miscellaneous	
Airline Catering	3 gal/meal served
Airports (not incl. food)	5 gal/passenger
Airports	10 gal/employee/day
Bus service areas (not incl. food)	5
Country clubs (not incl. food)	30
Day workers at offices	15
Drive-in theaters (not incl. food)	10 gal/space/day
Factories and plants (excl. of industrial waste)	35
Laundries, self-service	400 gal/washer/day
Food service establishments(toilet and kitchen wastes)	10 gal/patron/day
Food service establishments (kitchen wastes)	3 gal/meal/served
Food service establishments (with paper service)	.5 gal/meal served
Additional for bars & cocktail lounges	2
Movie theaters, churches (not incl. food)	5 gal/seat/day
Stores	400 gal/public/toilet/day
Work or construction camps (semipermanent) with flush toilets	50
Work or construction camps (semipermanent) without flush toilets	35
Travel trailer parks with individual water & sewage hook-up	100 gal/unit/day
Travel trailer parks without individual water & sewage hook-up	50 gal/unit/day
Institutional	
Hospitals	250 gal/bed area/day
Institutions other than hospitals	125 gal/bed area/day
Mobile home parks	75
Schools, boarding	100
Schools, day (without cafeteria, gym or showers)	15
Schools, day (with cafeteria, but not gym or showers)	20
Schools, day (with cafeteria, gym and showers)	25

Recreational & Seasonal

Camps, day (no meals served)	15
Camps, luxury resort	125
Camps, resort (night & day) with limited plumbing	50
Camps, tourist, trailer, campground	100 gal/unit/day
Cottages and small dwellings (seasonal occupancy)	50

Country club

Shower	500 gal/fixture/day
Bath	300 gal/fixture/day
Lavatory	100 gal/fixture/day
Toilet	150 gal/fixture/day
Urinal	100 gal/fixture/day
Sink	50 gal/fixture/day

Public park (during hours when park is open)

Flush toilet	36 gal/fixture/hr.
Urinal	10 gal/fixture/hr.
Shower	100 gal/fixture/hr.
Faucet	15 gal/fixture/hr.
Swimming pools and bathhouses	10

Separate Flow-Residential Use

Bath/shower	14.7
Dishwasher	1.8
Kitchen sink	4.4
Additional for garbage grinder	1.4
Laundry washer	19.5
Lavatory	8.4
Water closet	24.8
TOTAL	**75.0**

TABLE 4
ABSORPTION AREA REQUIREMENTS

TABLE 5

CHART FOR INCREASED GRAVEL DEPTH UNDER LATERAL PIPES

Depth of Gravel (below lateral)	For 24" Trench		For 36" Trench	
	Decreased Length	Increased Area	Decreased Length	Increased Area
12	0.80	1.20	0.83	1.17
18	0.66	1.33	0.71	1.29
24	0.57	1.43	0.62	1.38
30	0.50	1.50	0.55	1.45
36	0.44	1.56	0.50	1.50
42	0.40	1.60	0.45	1.55

Note: 1) Standard trenches require 6" of gravel under the lateral pipe.
2) This table is derived from the following formula:

$$L = \frac{(W + 2)}{(W + 1 + 2d)}$$

Where: W is the width (in feet)
d is the depth (in feet)

Using this Table: Whenever increased gravel depths are used, this table can be used to calculate the decrease in length of the trench or the increase in absorption area. To use the Table, simply find the depth of the gravel below the lateral and multiply the value under trench length by that number to find the decrease in required trench length or use the area increase column to find the increase as a result of increasing the depth below the lateral.

Examples:

Absorption Area Design:

(A) = 570 square feet using a standard trench.
24" wide trench requires 285 feet of lateral lines.
36" wide trench requires 190 feet of lateral lines.

Decreasing the length:

24" Trench -- Increased to 18" of gravel below the lateral will decrease the length of trench to 66% of original design length. To find the decreased length, simply multiply **285 x 0.66 = 188 ft.**

Increasing the Absorption Area:

36" Trench -- Increased to 18" of gravel below the lateral will increase the absorption area of trench by 29% of original design area. To find the increased absorption area, simply multiply **570 x 1.29 = 735 sq. ft.**

TABLE 6
DESIGN CRITERIA BY SOIL TYPE FOR ABSORPTION FIELDS

Soil Types	Design & Notes	Counties
Clay----------Perc Test Req'd.----------		
Badland (Bd,Bl)	>120 a	LG,TR,SC
Bogue (Bg)	>100 a	TR
Lismas Clay (Lm)	>100 a	LG
Midway (Mh,Rm)	45->100 a,b	CN,WA
Ness (Nc,Ne)	45->100 a	LE,NS
Promise (Pr,Ps,Pt)	>100 a	LG
Randall (Ra)	>120 a,d	LG,SC
Razor (Rm,Rc)	35->100 a,b,c	CN,WA
Clay Loam----------Design 45 min/in----------		
Mansic (Ma,Mb,Me,Mg)		WH
Manvel (Ma,Mb)	b,d	GO,TR
Penden (Pd,Pe,Pf, Ph,Pk,Pm,Po,Px) DC,GO,GH,LE,NS,NT,SD,TR	b	
Sweetwater (Se)	d	WA
Fine Sandy Loam----------Design 20 min/in----------		
Bayard (Bl)		WH,SC
Glenberg (Gb)	d	CN,WA
Linclon (Lf)	b	LG,WH
Manter (Mc,Mh,Mn,Ms)		CN,GL,LG,WA
Otero (Ot,Of,Oh)	e	CN,GO,GL,LE,LG,SC,WA
Gravel----------Design 5 min/in----------		
Gravel (Gr)	e	LE,LG,SH
Gravelly Loam----------Design 5 min/in----------		
Brownell (Br)	b,e	TR
Heizer (Hw,Hg)	b,e	NS,TR
Gravelly Sand Loam----------Design 30 min/in----------		
Schamber (Sc)		TH
Potter (Po)	b,c,e	GL,LG,SC
Loam----------Design 35 min/in----------		
Alluvial (Ab,Ad,An)	d	LE,LG,SC,SH,WH
Armo (As,Ap,Ar,)		GH,TR
Campus (Cc,Cd)	b,c	GO,GH,LE,NS,NT,RA,TR
Canlon (Cc,Ph) GO,GH,LE,NS,NT,RA,SD,TR	b	
Canyon (Ca,Cd)	c	CN,LG,WA,WH
Dalhart (Dr)		SC
Humbarger(Hu,Hw)	d	GH,TR,WH
Kim (Km,Kr,Ko,Kp)		CN,GO,LE,WA
Las (Lb)		LG
Mansker (Px)	b	GL,LG
Satanta (Sb,Sc)		CN,WA
Wet Alluvial (Mw,Wa)	d	CN,SC

Loamy Fine Sand----------Design 10 min/in----------		
Bankard (Bc,Bb)	d,e	CN,WA
Dwyer (Dw)	e	CN,LGLikes (Lk)
a,e	LG	
Loamy Sand----------Design 5 min/in----------		
Simeon (Sm)	e	SD
Valentine (Va)	e	GH
Tivoli (Ts)	e	LE,SC
Sand----------Design 5 min/in----------		
Active Dunes (Ad)	No Design	LG
Dix (Dx)	e	GO
Inavale (If,Ih,In,Im)	d,e	GO,GH,SD,TR
Sandy Loam----------Design 25 min/in----------		
Anselmo (An,Ad)		GH,LG,SH,WH
Dorrance (Do)	b	TR
Las Animas (Lh,Ld)	d	CN,LG
Munjor (Md,Mu)	d	DC,GO,GH,NT,SD,TR
Silt Loam----------Design 40 min/in----------		
Angelus (An)		GO
Bridgeport (Ba,Bd,Be,Bf, Bg,Bh,Bo,Br,Bs,Bw)	d	All except GL,NT,TR,WH
Carlson (Cd,Cf)		GO,TR
Colby (Cc,Cd,Co*,Cp, DC,GO,GH,LE, Cs*,Cu,Cy*)	c*	All except: NS,NT,TR
Coly (Cu,Cd,Cn,Co)		GH,DC,NS,NT,TR,WH
Cozad (Cs*,Cu,Cz)	d*	NT
Elkader (Ea,Eb,Ec,Ed,Ek)	b,c	GO,LE,LG,WA
Eltree (Et)	e	GH
Goshen (Gn,Go) CN,GL,TH,SC,SH,WA,WH	d	
Grigston (Gs)	d	LE
Harney (Ha,Hb, Hc,He,Hr,Hu,Hv)	a	GO,LE,NS,TR
Hobbs (Hb)	d	NT
Holdrege (Ha,He,Hf, Hg,Hm,Ho,Hp,Hr,Hs,Ht)		DC,GH,NT,TR
Hord (Ha,Ho,Hz)	d	GH,NS,NT,SD,TH,TR
Keith (Ke,Ka,Kb,Kh,Ku)		All except DC,GH,GL,NT,TR
Kuma (Ku)		CN,RA,SD,WA
Lubbock (Lu)		LG,SC
Mansker (Mm)	b	SC,WH
McCook (Mc)	d	DC,TR
Mento (He)		TR
Minnequa (Mb,Mn,Mp)	b	LE,LG
Nibson (Nw)	b	GH,NS,NT,TR
Penrose (Mp)	b	LG
Richfield(Rc,Rf,Rm,Rn,Ro,Rp)		GL,LE,LG,SC,SH,TH,WH

Roxbury (Ra,Rb, Rf,Ro,Rs,Rx) GO,LE,NS,NT,SD,SH,TH,TR	d	
Uly (Ua,Ub,Uc*, Ud,Ue*,Up*,Ux,Uy)	c*	DC,GH,NS,NT,TR
Ulysses (Ua,Ub,Uc,Ud, Ue,Uk,Ul,Um,Un,Us)		All except TR
Volin (Vi,Vs)	c	LG
Wakeen (Wa,Wb,Wc, Wn,Wp,Ws)	b	GH,LG,NS,NT,TR
Silty Clay Loam----------Perc Test Req'd.----------		
Arvada (Ba)	35->100 a	WA
Caruso (Ca,Cd, Cf,Ch,Cr) CN,DC,GO,RA,SD,SH,WA	20-35 d	
Church (Ch)	>100 b	LE,SC
Detroit (De,Dt)	35->100 a,d	NS,NT
Drummond (Dc)	35->100 a,d	LE
Limon (Lm)	>100 a	WA
Lofton (Lo)	>100 a	LG,WH
Pleasant (Ps,Pt,Po) CN,DC,GO,RA,SD,SH,TH,WA	20->100 a,d	
Volin-Slickspots (Vs)	20-35 d	SH
Voda (Vo)	20-35 d	TR

NOTES: Asterisks(*) denote the soil symbol to which it is applicable.

a) Variable; watch for clay.
b) Shallow bedrock or water table; watch depth requirements.
c) Steep slopes possible.
d) Subject to Flooding.
e) Sand; may require the addition of loam, silt, or clay soils to slow to Design Percolation Rate.

This table was complied from the Soil Surveys from the following Northwest Kansas counties; Cheyenne, Decatur, Gove, Greeley, Lane, Logan, Ness, Norton, Rawlins, Scott, Sheridan, Sherman, Thomas, Trego, Wallace, and Wichita. It is designed to be a general guide for sizing soil absorption fields for On-Site Wastewater Disposal Systems.

HOW TO USE THIS TABLE

Any person designing the soil absorption field using this table should follow this procedure:

1. Locate the absorption field on the maps in the County Soil Survey.
2. Determine the soil type from the map.
3. Using Table 6 find your soil type e.g. (Hm).
4. Determine the Design Percolation Rate on the general soil classification line (all in Bold) find the **Design 40 min/in**.
5. Check the county column to make sure you are in the right county.
6. Use the Design Percolation Rate to size the field using Table 4.
7. If the soil classification line has Perc Test Req'd. in the design column, this indicates the soil is too variable to set a design percolation rate.
8. If an asterisk is located behind a soil type, then it is the only soil type applicable to the note in the Design column.

The Design Percolation Rates in this table are not necessarily applicable or adequate in every case. It is a general maximum design which does not include all conditions which may be encountered in these soils. **THIS TABLE IS ONLY AN ESTIMATE, SOIL CONDITIONS WILL VARY GREATLY.** Soil Percolation Tests will give a closer indication of the soils ability to absorb wastewater from a private system.

TABLE 7
WASTE STABILIZATION POND REQUIREMENTS

WASTEWATER STABILIZATION POND SIZES & CAPACITIES

Pond	Dimensions "A" "B" "X"			Storage Capacity (cu. ft.)		Storage Capacity (gallons)	
Type			(Depth)	1.5'	5.0'	1.5'	5.0'
M-40	10'	52'	3.0	295	2,375	2,210	17,770
M-45	10'	59'	3.5	321	2,760	2,400	20,650
M-50	15'	64'	3.5	588	3,577	4,400	31,870
M-55	20'	69'	3.5	929	4,577	6,950	44,970
M-60	25'	74'	3.5	1,345	8,010	10,060	59,930

Note: See the Construction section for general specifications of dike construction. Diagram 5 shows the general layout of a wastewater stabilization pond in plan and section views.

WASTEWATER STABILIZATION POND MINIMUM DISTANCES

Area	**Minimum Separation**
House it serves	100 ft.
Other residential structures	250 ft.
Any private water supply well	100 ft.
* Property lines, including right-of-way	100 ft.
Public water supply well	100 ft.
Public water transmission lines	25 ft.

*** Note:** Placing the pond too close to a property line might limit the options of where an adjoining owner could locate a well. The neighboring property owner may sign a waiver which would allow the placement of the facility as close a 50 feet to the property line. Public roadways (total right-of-way) may be considered part of the separation if necessary. However, neither the pond nor the dikes may be placed on any public access or utility easement.

DEWATERING & IRRIGATION DISTANCE REQUIREMENTS

(See section on Proper Septage Disposal)

Private dwellings, municipal boundaries, public and private water supplies, any surface water or streams	1000 ft.
Public roads and ditches, intermittent streams, water ways, or property lines	250 ft.

Note: These distances apply to dewatering and irrigation practices for lagoons as well as septage from septic tanks, cesspools, or any other sewage disposal systems. For application procedures and conditions that must be followed, see the section on Proper Septage Disposal.

TABLE 8
SEPTAGE DISPOSAL REQUIREMENTS

A. GOAL - To adequately treat and dispose of Domestic Septage in a manner which reduces the potential for contamination of water systems and prevents the spread of human diseases caused by contaminants in the septage.

B. DEFINITION - Domestic Septage is the liquid or solid material removed from a septic tank, cesspool, portable toilet, type III marine sanitation device or a similar system that receives only household, non-commercial, non-industrial sewage.

C. SEPTAGE DISPOSAL METHODS

1. Disposal at a municipal wastewater plant
2. Land disposal - by any of the following (3) options.
   - **a.** Applied without treatment by injection into soil OR
   - **b.** Applied to land surface and incorporated within six (6) hours OR
   - **c.** Applied to land surface by raising the pH above 12 for 30 minutes using the following procedure.

Raising pH with Hydrated Lime

1. Agitate septic tank contents with tank vacuum hose or stirring device.
2. Withdraw approximately 1/3 of the septic tank (300 of a 1,000 gallon tank).
3. Add 50 pounds of hydrated lime to the septage through the vacuum hose. The dry lime (available at hardware stores and lumber yards) can be emptied into five gallon buckets or can be vacuumed directly from the original paper bag.
4. Vacuum the balance of the septage into the vacuum tank.
5. Agitate septage and lime mixture for 15 minutes by frequent opening and closing vacuum hose valve. The air bubbling through the tank and sloshing during transport to disposal site should adequately mix the lime and septage.
6. Thirty (30) minute contact time is required to raise the pH to 12 or higher before you land apply to the soil. Do not allow septage to pond!

NOTES: This procedure illustrates a 1,000 gallon mix. If you have a 500 gallon vacuum tank use 25 pounds of lime per load. Similarly, a 1,500 gallon septic tank will require 75 pounds of dry lime. Follow all labeled safety instructions printed on the lime package i.e. wear rubber boots, gloves and eye protection. Lime is caustic!

D. EPA RULE 503 REQUIREMENTS

1. Disposal in accordance with one of the above listed METHODS.
2. Rule 503 requires records to be kept for all septage disposal. The NWLEPG requires all licensed NWLEPG Tank Cleaners maintain records to stay in compliance with Rule 503. You may develop your own forms or use the forms in the Land Application handbook from KDHE (available from the NWLEPG).

E. NWLEPG REQUIREMENTS

1. All persons engaged in the pumping and disposal of septage within the NWLEPG coded counties must hold a valid license issued by the NWLEPG.
2. All licenses are renewed each year by annual inspection for leaks of the vacuum tank.
3. All licensed tank cleaners shall report which options were used for septage disposal.
4. The NWLEPG also reserves the option to inspect any records held for EPA Rule 503.
5. Each licensed Tank Cleaner must report the number of systems pumped for septage disposal to the NWLEPG for general informational purposes.

1. Kansas Department of Health and Environment, March 1984, Bulletin 4-2, "A Manual of Recommended Standards for Locating, Constructing and Operating Septic Tank Systems for Rural Homes"

2. Kansas Department of Health and Environment, November 22, 1989 Draft "Recommended Standards for Construction, Operation of Single Family Waste Stabilization Ponds"

3. Environmental Protection Agency Design Manual, October 1980, "Onsite Wastewater Treatment and Disposal Systems", EPA 625/1-80-012.

4. USPHS No.526, 1972, "Manual of Septic-Tank Practice"

5. Colorado Environmental Health Association, 1985, "Sanitarians Field Handbook", second edition

6. Kansas Association of Sanitarians, 1990 draft, "The Kansas Sanitarians Handbook"

7. Environmental Protection Agency Handbook, October 1984, "Septage Treatment and Disposal"

8. United States Dept. of Agriculture, Soil Conservation Service, Soil Surveys of all counties in NWLEPG area