

# **GUIDELINES FOR SEPTIC SYSTEM DESIGN**

**Single Family Residential  
For multi-family or commercial buildings,**

**Or**

**If in the Oakdale area, contact the  
Department of Environmental Resources  
Regarding septic system design.**

NOTE: A building permit is required for all new homes septic system installations.

BUILDING PERMITS: Stanislaus County Department of Building Inspection, 1010 10<sup>TH</sup> Street, 3<sup>rd</sup> Floor - Suite 3400, Modesto, CA (209) 525-6330

REPAIR PERMITS: Stanislaus County Division of Environmental Health, 3800 Cornucopia Way, Suite C, Modesto, CA 7:30 a.m. to 5:00 p.m.

INSPECTION: Stanislaus County Division of Environmental Health, 3800 Cornucopia Way, Suite C, Modesto, CA 7:30 - 8:30 a.m. or 4:00 - 5:00 p.m.

SPECIAL NOTE: For aerobic treatment tank users, the installation guidelines are basically the same as for septic tank systems. Contact the Division of Environmental Health regarding sizing and operational requirements specific to aerobic treatment systems. A list of approved aerobic treatment units is available from our office.

## **INSTALLATION REQUIREMENTS**

All household sewage or other liquid waste shall be disposed of through an approved sewage disposal system. Sewage disposal systems designed for individual dwellings shall consist of a sewer line from the house to the treatment tank, the tank, distribution boxes, leach lines and/or seepage pits.

## A. HOUSE TO TREATMENT TANK CONNECTION

1. Purpose: Carry sewage from the building to the treatment tank.
2. Clean-out: To be provided if more than one 45 degree angle is made.
3. Material: Approved pipe, per Uniform Plumbing Code.
4. Stub-out: Should be installed so as to prevent the initial portion of the leach line rock surface from being greater than 24 inches below grade. Multiple story dwellings require special foundation passages. (Figure 1)
5. Building sewer: Should not be less than ¼" fall per linear foot.

## B. SEPTIC TANK (AEROBIC TANKS ALSO)

1. Purpose: The septic tank retains raw sewage and separates the solid from the liquids by sedimentation and liquification through bacterial action, which permits a relatively clear liquid effluent to flow into leach lines and/or seepage pits. (Figure 2)
2. Materials:
  - a. Approved, pre-cast concrete.
  - b. Approved, poured in place concrete.
  - c. Approved, fiberglass, polyethylene, etc. (IAPMO cert.)
3. Location: The septic tank must be a minimum of five feet (**5'**) from any foundation, structure, patio, etc.; fifty feet (**50'**) from any private well and one hundred feet (**100'**) from any public well.

## C. DISTRIBUTION BOX

1. Purpose: The distribution box distributes the liquid from the septic tank equally among two or more leach lines and/or seepage pits. The distribution box also provides an inspection point and may be used when necessary drain field additions are made. When a seepage pit is installed at the end of a leach line, a 5 foot section of non-perforated pipe can be used without the use of a distribution box, to make this connection.
2. Specifications:
  - a. Minimum size - **12"** square OR **12"** in diameter.
  - b. Constructed of concrete in a monolithic pour or other materials approved by the Director or Environmental Health.
  - c. Minimum depth - **12"**.
  - d. Inlet pipe to be a minimum of **2"** higher than outlets.
  - e. Footing - all "D" boxes must be set on a natural or compacted soil.
  - f. A **5'** non-perforated pipe to be installed between septic tank and distribution box.
  - g. The pipes to be sealed with mortar or plastic seals to prevent leakage

from around the pipe.

#### D. **LEACH LINES**

1. Purpose: Leach lines dispose of liquid waste from the septic tank through percolation into the soil and evapotranspiration into the air or up take by vegetation through the root system.
2. Materials: Approved 3" or 4" perforated pipe, washed drain rock ( $\frac{3}{4}$ " - 2  $\frac{1}{2}$ " ), untreated building paper or straw. \*Graveless leach field chambers maybe substituted for gravel and perforated pipe. Sizing of required surface area based upon a 0.70 multiplier.
3. Location\*: Leach lines must be a minimum of fifty feet (**50'**) from a private well, one hundred feet (**100'**) from any public well, five feet (**5'**) from any property line, eight feet (**8'**) from any building, structure, patio, etc., **12** feet from leach line or seepage pit (center to center), and five feet (**5'**) from any domestic water lines.
4. Design: The trench shall be **18 - 36** inches wide and must be a minimum of **30"** deep. The perforated pipe must be laid level on top of a minimum of **12"** of gravel, to within **1'** of the end of the trench unless an end cap is used. Rock is added around and **2** inches over the pipe to standard depth, then covered with untreated building paper or straw. The standard depth of rock is **18"** total, credit for greater depths must have prior approval from this department. (Figure 3 & Figure 3a)

NOTE: Leaching area is determined from area, in square feet of trench bottom. Therefore, a trench 3 feet wide by 10 feet long would yield 30 square feet of leaching area. (Figure 3-a)

- A. The maximum credited width of a leach line is three (3) feet
- B. Leach lines will not be credited for any gravel deeper than three (3) feet under the perforated drain line. Maximum drain line credit will be seven (7) square feet per running foot.
- C. Leach line trench layout in sloping ground. (Figure 3b)

**\* All measurements are from the edge of the trench unless otherwise noted.**

#### E. **SEEPAGE PIT**

1. Purpose: Seepage pits are used to dispose of liquid waste effluent from the septic tank through percolation and evapotranspiration. Pits are generally

used when soil conditions limit the exclusive use of leach lines. There must be a minimum of 10' of unsaturated soil between the bottom of the pit and groundwater. SEEPAGE PITS MUST NOT EXCEED 50% OF THE ORIGINAL SYSTEM WITHOUT PRIOR APPROVAL.

2. Materials: Approved perforated pipe, washed drain rock (2/4" to 2½") untreated building paper or straw. (Figure 4)
3. Location: Seepage pits must be a minimum of one hundred (**100'**) from a private well, eight (**8'**) from any property line or building, structure, etc., and five (**5'**) from domestic water lines.
4. Design: Seepage pits are three (**3'**) wide with varying lengths and depths. The perforated pipe is laid level over the gravel and extends to within one foot (**1'**) of the end of the excavation. Rock is added on top of the pipe to a minimum of two (**2"**) in depth, then covered with untreated building paper or straw. (Figure 4)

**Need trench depth for definition (8' trench depth).**

NOTE: Leaching area of a pit is determined from the amount of rock that is used in yards. Therefore, a pit 3' wide, 20' long with 9' of gravel under the pipe would contain 20 cubic yards of rock, equaling 200 square feet of leaching area. This is a credit of 10 square feet per cubic yard of gravel.

**IMPORTANT!** The designated replacement or future drain field expansion area shall be adequate to install at least 100% replacement should the original system fail. No division of the lot or erection of structures shall be made if such action impairs the usefulness of the designated expansion area.

**F. PIPE SPECIFICATIONS**

1. Solid Pipe - For sewage disposal systems, pipes shall conform to the standards of the most recent edition of the Uniform Plumbing Code published by IAPMO. Materials approved are acrylonitrile-butadiene-styrene (ABS) and polyvinyl chloride (PVC) plastic pipe. Pipe diameter shall be three or four inches.
2. Distribution Pipe - Perforated pipe for distribution system shall conform to the most recent edition of the Uniform Plumbing Code published by IAPMO. Pipe diameter shall be three or four inches.

**LOCATION OF SEWAGE DISPOSAL SYSTEMS**

<u>Minimum Distance To</u>	<u>Septic Tank</u>	<u>Leach Line</u>	<u>Seepage Pit</u>
Building or Structure	5'	8'	8'
Property Line	5'	5'	8'

Private Well	50'	50'	100'
Public Well	100'	100'	150'
Streams / River	100'	100'	200'
Lake or Reservoir	50'	200'	200'
Seepage Pit	5'	12'(CENTER)	12'(CENTER)
Leach Line	5'	12'(CENTER)	12'(CENTER)
Water Line	5'	5'	5'
Distribution Box	5'	5'	5'
Dry Well (Storm Drain)	8'	50'	50'
French Drain	8'	12'	12'
Drainage Course/Unlined Irrigation Ditch	25'	50'	50'
Storm Drainage Ponds	25'	50'	50'
Cut, Bank, or Fill	10'	4h*	4h*

\*h = vertical height of cut/bank, measured from top of the bank with 100' maximum unless greater distance is deemed necessary by the Department.

**MINIMUM SIZE OF SEPTIC SYSTEMS**  
for Single Family Residences  
(Calculations are based on 3 feet wide trenches)

Number of Bedrooms In Home	Minimum Septic Tank Capacity (gallons)	Required Leaching Area Square feet ** (190sq' per bedroom)	Linear Feet Depth (190sq' Per Bedroom)			Required Leach Square Feet (330sq' Per Bedroom)	Linear Feet Depth (330sq'per bedroom)		
			single	double	triple		single	double	triple
1	1200	250	84'	50'	36'	600	200'	120'	86'
2	1200	380	127'	76'	55'	660	220'	132'	95'
3	1500	570	190'	114'	82'	990	330'	198'	142'
4	1800	760	254'	152'	109'	1320	440'	264'	189'
5	2400	950	317'	190'	136'	1650	550'	330'	236'
6	2400	1140	380'	228'	163'	1980	660'	396'	283'

7 or more, consult the Department of Environmental Resources

**\*\*NOTE** - Additional leaching area square footage is often necessary in the Oakdale and County foothill areas because of poor soil percolation conditions. Contact the Division of Environmental Health for specific requirements.

**COMMERCIAL SYSTEMS**

Sizing of commercial On-Site sewage disposal systems is based upon fixture units or

estimated waste discharge volume as per the Uniform Plumbing Code, Table 7-3 and K-2. In most situations, commercial systems must use AEROBIC TREATMENT UNITS instead of septic tanks.

**EXAMPLE OF ON-SITE SEWAGE DISPOSAL CALCULATIONS FOR A COMMERCIAL PROJECT.**

*Office and warehouse proposed, approximately 10 employees present.*

<b>Plumbing fixtures</b>	<b>No.</b>	<b>Fixture unit*</b>	<b>Total Units</b>
water closets	3X	6	18
hand sinks	3X	1	3
janitor's sinks	1X	3	3
*UPC, Table 4-1			24

**A. Sizing the tank**

From the projected liquid waste to be generated, a 1200 gallon septic tank or a 500 gpd aerobic treatment unit required. Measure X compliant.

**B. Expected wastewater generation**

From UPC, Table K-3 (See Exhibit A): Office and warehouse = 20 gallon/day/employee.

Total square footage = 4200 square feet  
 office space = 100 x 1/100\*\* = 10 employees  
 warehouse space = 3200 x 1/500\*\* = 6 employees  
 Total = 16 employees

16 employees x 20 g/d = 320 gpd

\*\*Uniform Building Code (UBC), Table 33-A (occupant load/sq. ft.)

**C. Sizing disposal field options**

*Based on Soil Description:* Sandy Loam

Application rate from UPC, Table K-4:

Maximum absorption capacity = 2.5 gal/sq.ft./day

Disposal field size -  $\frac{320 \text{ gpd}}{2.5} = 128 \text{ sq.ft.}$  Use 45' of 3' wide trench.

Note: A soils specialist or civil engineer has to verify the area's soil type and sign the design specification sheet.

*Based upon Percolation rate* = at 1 inch in 10 minutes

Application rate from the Manual of Septic Tank Practice:

rate = 1.6 gal./sq.ft./day

Field size -  $\frac{320 \text{ gpd}}{1.6} = 225 \text{ sq.ft.}$  Use 75' of 3' wide trench

Note: The percolation test must be performed by soils specialists or civil engineers.

**EXHIBIT A**

**Estimated Waste/Sewage Flow Rates**

**TABLE K-3**

Because of the many variables encountered, it is not possible to set absolute values for waste/sewage flow rate for all situations. The designer should evaluate each situation and, if figures in this table need modification, they should be made with the concurrence of the Administrative Authority.

**TYPE OF OCCUPANCY**

**GALLONS (LITERS) PER DAY**

1.	Airports	15	(56.8)	Per employee
		5	(18.9)	Per passenger
2.	Auto washers			Check with equipment manufacturer
3.	Bowling alleys (snack bar only)	75	(283.9)	Per lane
4.	Camps:			
	Camp ground with central comfort station	35	(132.5)	Per person
	Campground with flush toilets, no showers	25	(94.6)	Per person
	Day camps (no meals served)	15	(56.8)	Per person
	Summer and seasonal	50	(189.3)	Per person
5.	Churches (Sanctuary)	5	(18.9)	Per seat
	With kitchen waste	7	(26.5)	Per seat
6.	Dance halls	5	(18.9)	Per person
7.	Factories			
	No showers	25	(94.6)	Per employee
	With showers	35	(132.5)	Per employee
	Cafeteria, add	5	(18.9)	Per employee
8.	Hospitals	250	(946.3)	Per bed
	Kitchen waste only	25	(94.6)	Per bed
	Laundry waste only	40	(151.4)	Per bed
9.	Hotels (no kitchen waste)	60	(227.1)	Per bed (2 person)
10.	Institutions (Resident)	75	(283.9)	Per person
	Nursing home	125	(473.1)	Per person
	Rest home	125	(473.1)	Per person
11.	Laundries, self-service			
	(minimum 10 hours per day)	50	(189.3)	Per wash cycle
	Commercial			Per manufacturer's specifications
12.	Motel	50	(189.3)	Per bed space
	With kitchen	60	(227.1)	Per bed space
13.	Offices	20	(75.7)	Per employee
14.	Parks, mobile homes	250	(946.3)	Per space
	Picnic parks (toilets only)	20	(75.7)	Per parking space
	Recreational vehicles—			
	Without water hook-up	75	(183.9)	Per space
	With water and sewer hook-up	100	(378.5)	Per space
15.	Restaurants – Cafeterias	20	(75.7)	Per employee
	Toilet	7	(26.5)	Per customer
	Kitchen waste	6	(22.7)	Per meal
	Add for garbage disposal	1	(3.8)	Per meal
	Add for cocktail lounge	2	(7.6)	Per customer
	Kitchen waste –			
	Disposable service	2	(7.6)	Per meal
16.	Schools – Staff and office	20	(75.7)	Per person
	Elementary students	15	(56.8)	Per person
	Intermediate and high	20	(75.7)	Per student
	With gym and showers, add	5	(18.9)	Per student
	With cafeteria, add	3	(11.4)	Per student
	Boarding, total waste	100	(378.5)	Per person
17.	Service station, toilets	1000	(3785)	For 1st bay
		500	(1892.5)	For each additional bay
		20		
18.	Stores	1per 10	(75.7)	Per employee
	Public restrooms, add	sq ft	(4.1m <sup>2</sup> )	Of floor space
19.	Swimming pools, public	10	(37.9)	Per person
20.	Theaters, auditoriums	5	(18.6)	Per seat
	Drive-in	10	(37.9)	Per space

(a) Recommended Design Criteria. Sewage disposal systems sized using the estimated waste/sewage flow rates should be calculated as follows:

- (1) Waste/sewage flow, up to 1500 gallons/day (5677.5 L/day)  
Flow x 1.5 + septic tank size
- (2) Waste/sewage flow, over 1500 gallons/day (5677.5 L/day)
- (3) Secondary system shall be sized for total flow per 24 hours.

(b) Also see Section K-2 of this appendix.

**FIGURE 1**

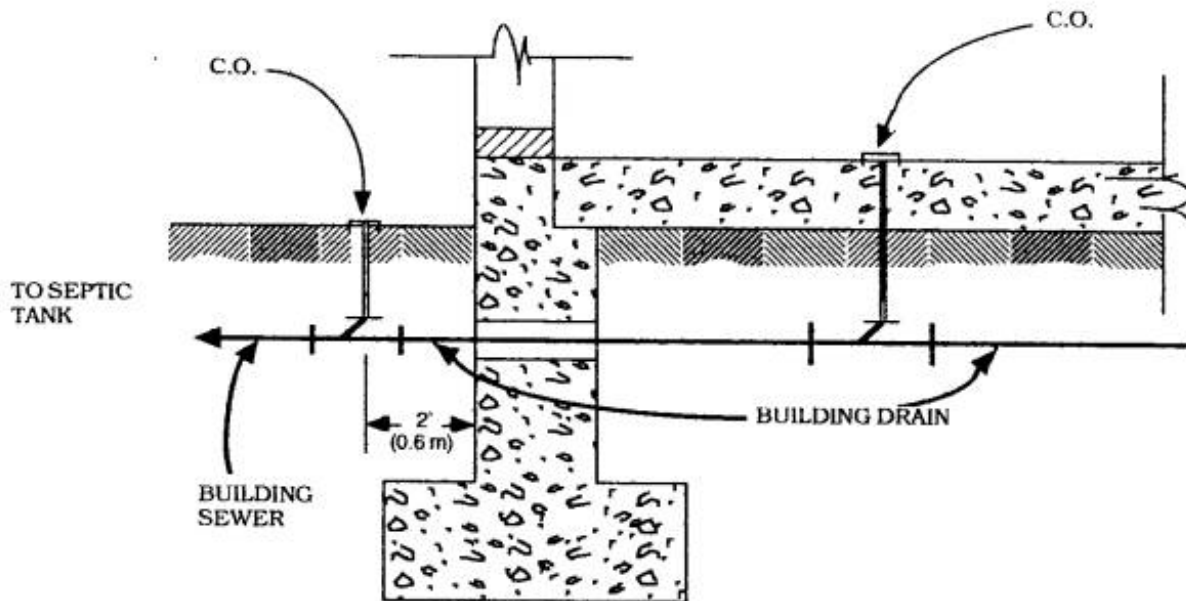


Figure 1

Building drain passage through multiple story foundation.



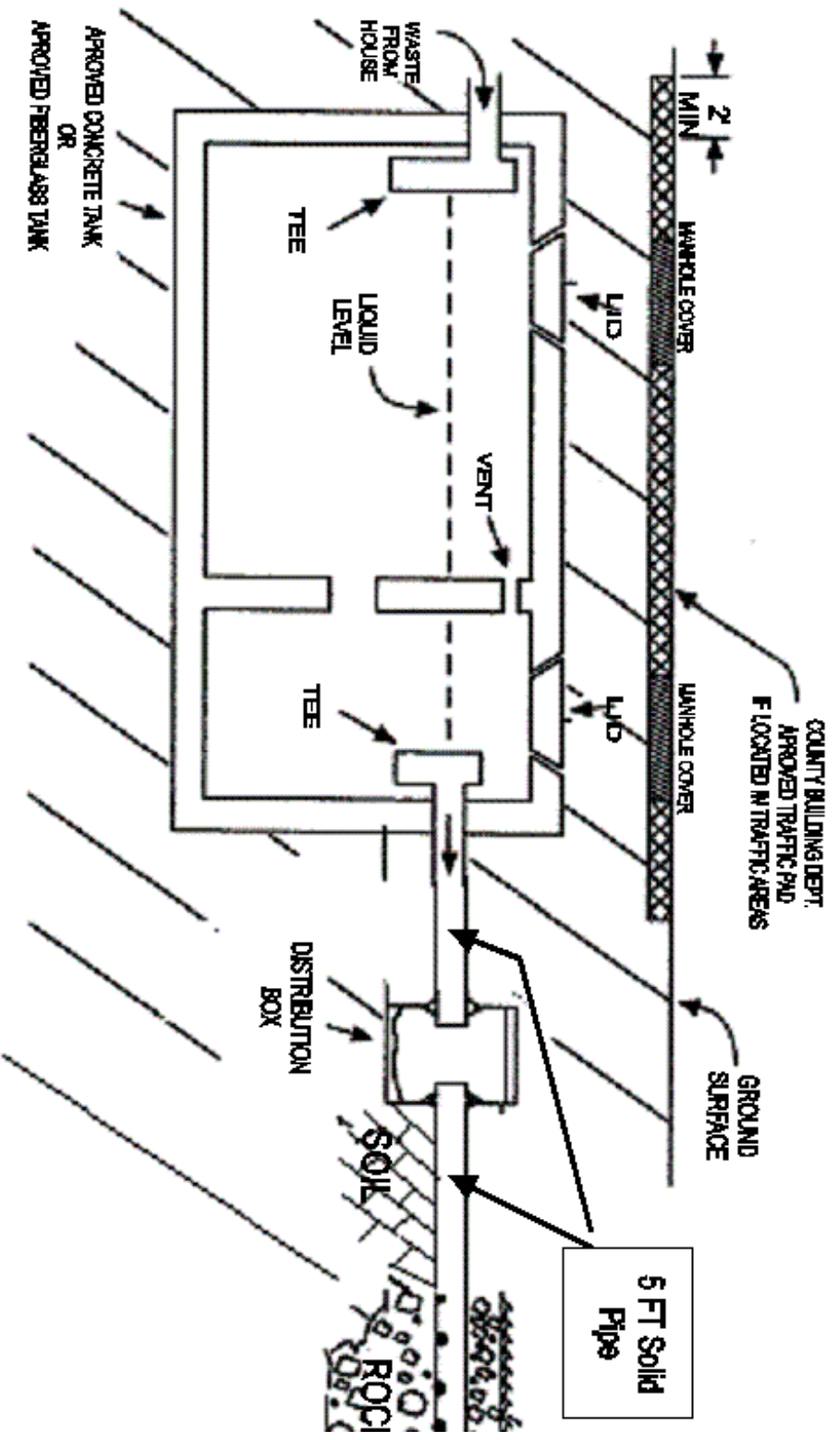
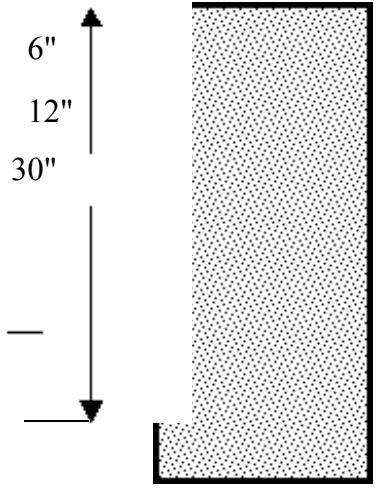
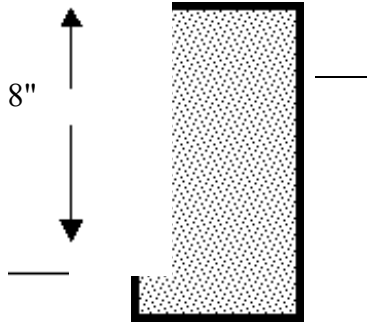


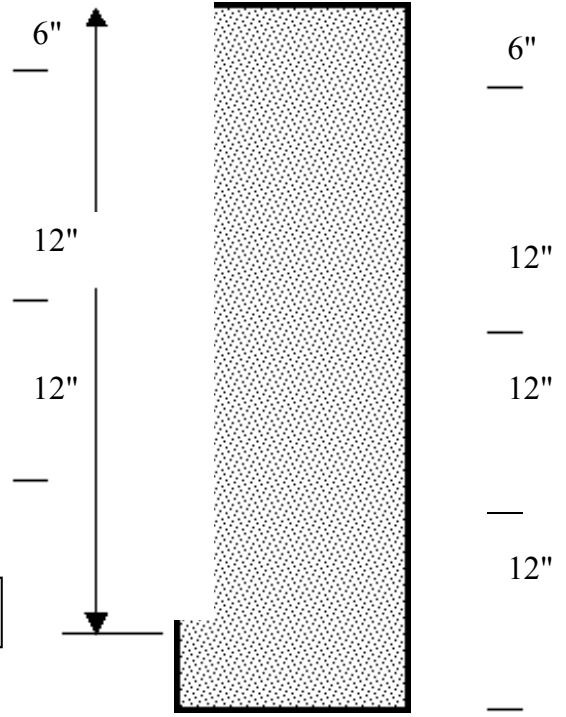
FIGURE 2

**FIGURE 3**





5 sq ft PER LINEAR FOOT



TYPICAL LEACH LINE

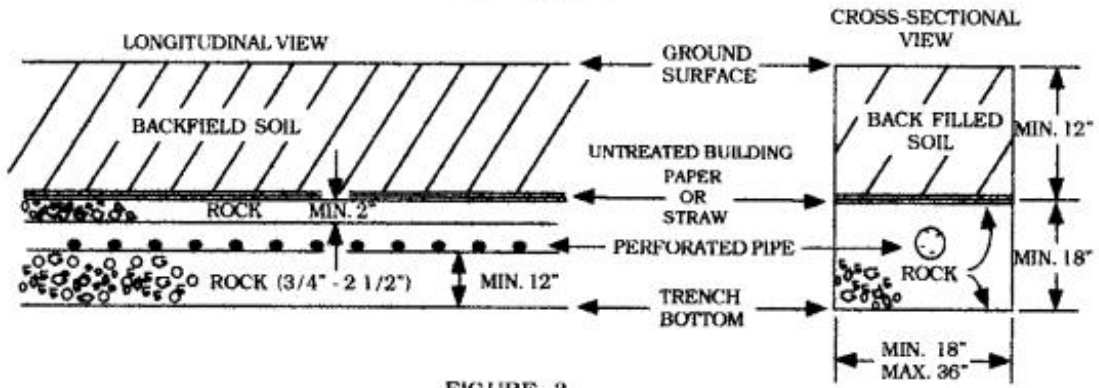


FIGURE 3



36"

3 sq ft  
PER  
LINEAR  
FOOT



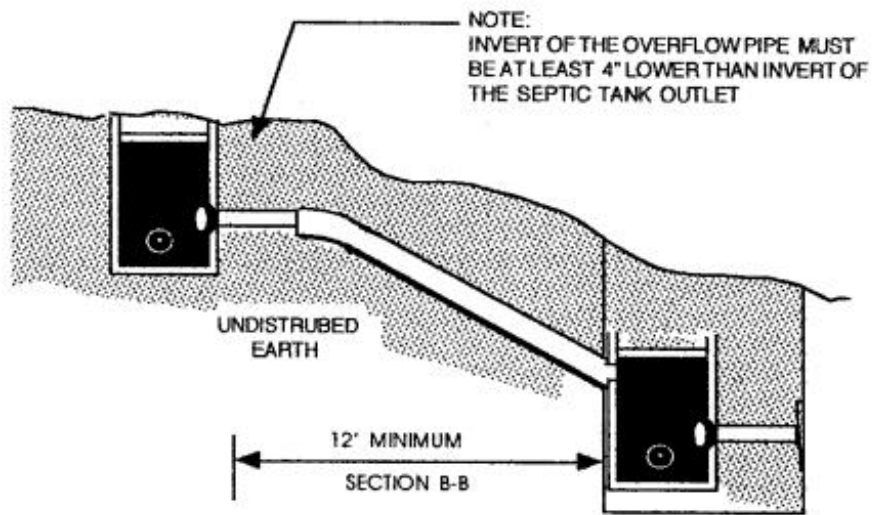
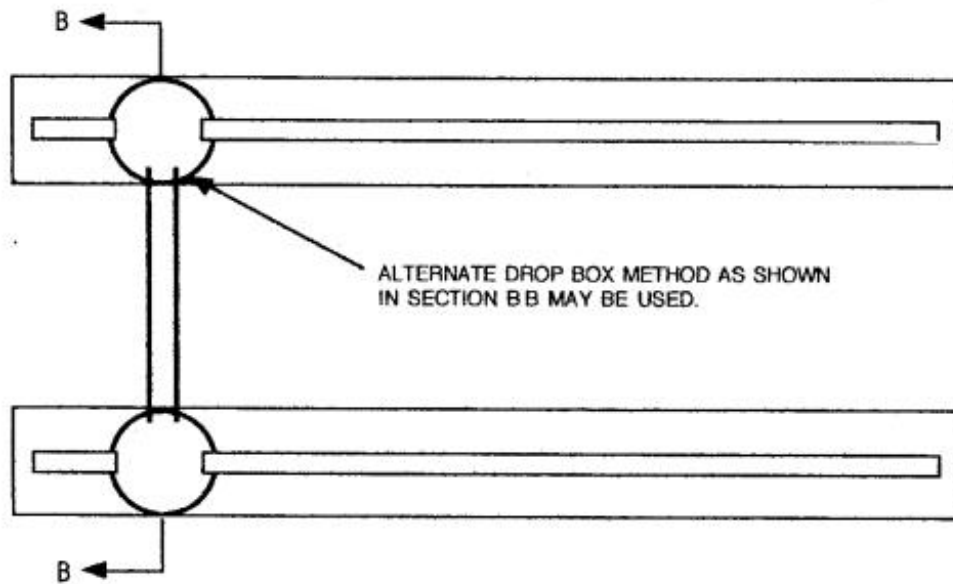
36"



36"

7 sq ft  
PER  
LINEAR  
FOOT

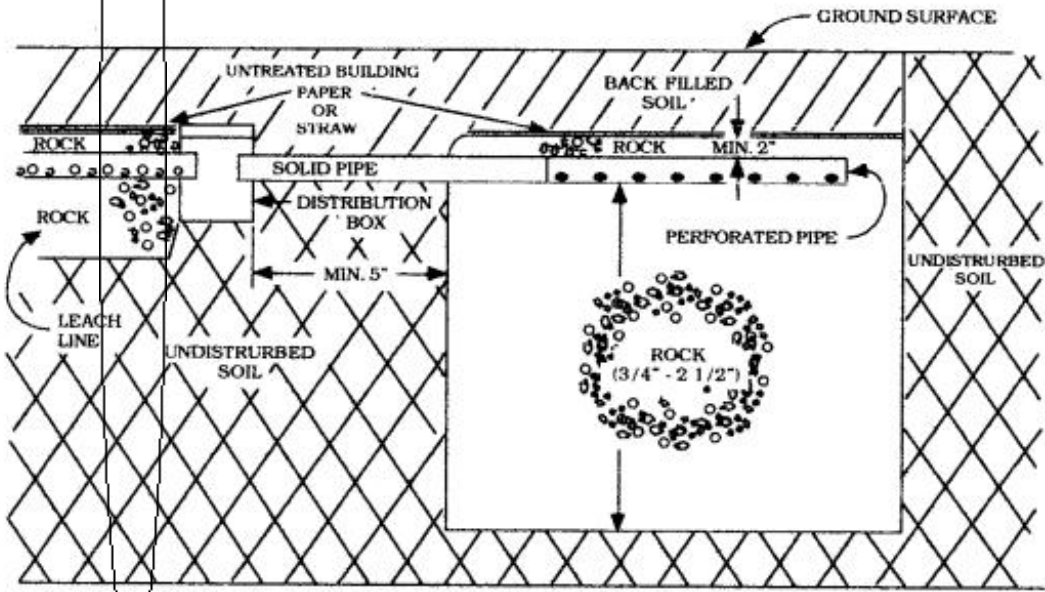
FIGURE 3-A  
FIGURE 3-B  
TYPICAL  
LEACH  
LINE



Leach line trench layout in sloping ground may require special installation using serial distribution. Trenches shall follow contours.

**FIGURE 4**

# TYPICAL SEEPAGE PIT





# TYPICAL SEPTIC SYSTEM LAYOUT

