

HUMBOLDT COUNTY BUILDING DEPARTMENT
INDIVIDUAL SEWAGE DISPOSAL SYSTEM INSTALLATION HANDOUT
Nevada Administrative Chapter 444

Note: This handout is for sewage disposal systems installed for single family dwellings. Commercial sewage disposal systems shall be submitted to NDEP.

Well must be drilled prior to issuance of sewage disposal permit.

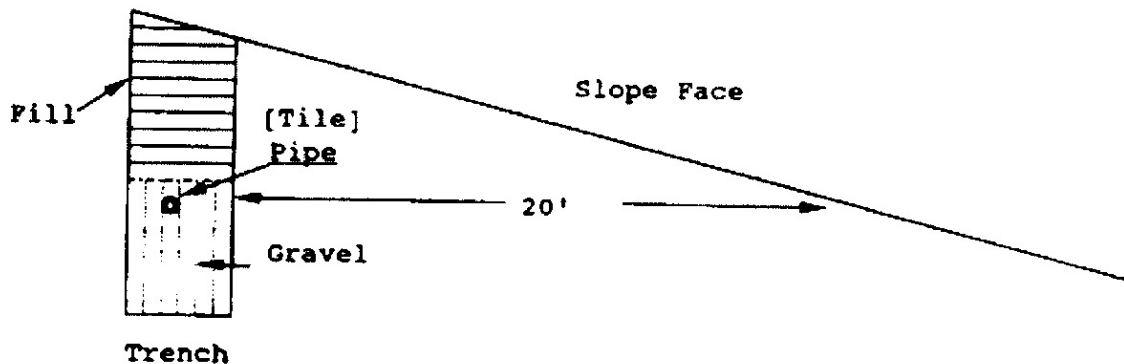
1. Provide a plot plan. The plot plan shall contain the following:
 - a. The title and date of the plan and the signature of the owner or his representative.
 - b. A map of the area in which the individual sewage disposal system will be located that shows the location of the roads and streets.
 - c. The location and distance to well and sewage disposal systems on surrounding lots. If the lots are vacant, the plot plan must so indicate.
 - d. The direction of north clearly indicated.
 - e. The distance within 500 feet of any watercourse indicated, including, without limits, any pond, lagoon or stream. If there are no watercourses, the plot plan must so indicate.
 - f. The location of each percolation test hole and boring test hole.
 - g. The location and depth of each proposed or actual well, including the depth of casing or surface grout seal.
 - h. The distance of each well and soil absorption system to the property line.
 - i. The maximum slope across the absorption system area.
 - j. The dimensions of the lot
 - k. The depth, length, width and spacing of any absorption trenches
 - l. The location of the water supply lines, building sewer lines, other underground utilities and electrical meter
 - m. The location of the structures, paved areas, driveways, trees, and patios
 - n. The location of the source of water to be used by the individual sewage disposal system, including without limitation, a well or other source approved by the administrative authority
 - o. The area of the reserve absorption area, which must be of a size not less than the size of the primary absorption area
2. Inspections
 - a. Inspection of the system materials and the trench before the trench is filled with aggregate or rock.
 - b. Inspection of the leachfield, septic tank and sewer line before they are covered.
3. Lot Size
 - a. A minimum area of 1 acre (43,560 square feet) including public streets and alleys or other public rights-of-way lands or any portion thereof abutting on, running through or within a building site, is required for the installation of an individual sewage disposal system on a lot served by a well.
 - b. For a lot that is part of a tentative map that was approved before January 1, 2000 a minimum area of $\frac{1}{4}$ acre (10,890 square feet) including public streets and alleys or other public rights-of-way lands or any portion thereof abutting on, running through or within a building site, is required for the installation of an individual sewage disposal system on a lot served by a community water supply.
 - c. For a lot that is part of a tentative map that was approved after January 1, 2000 a minimum area of $\frac{1}{2}$ acre (21,780 square feet) including public streets and alleys or other public rights-of-way lands or any portion thereof abutting on, running through or within a building site, is required for the installation of an individual sewage disposal system on a lot served by a community water supply.
4. Location
 - a. An individual sewage disposal system must be located on the same lot as the building or structure that the system serves.

- b. The minimum horizontal separations that must be maintained between the perimeter of the components of a individual sewage disposal system and the following features are:

Min. horizontal distance, in clear, required from:	Septic Tank	Disposal Field (Shallow)
Building or structure	8'	8'
Property Lines	10'	10'
Water supply wells(sealed to 50 feet)	100'	100'
Water supply wells (not sealed to 50 feet)	100'	150'
Public water supply wells	150'	150'
Streams or water courses	100'	100'
Drainage channels	25'	25'
Large trees or shrubs	10'	10'
Disposal fields	5'	
Community water main line	10'	25'
Individual water service line	10'	10'

5. Slope Requirements

- a. For lots with slopes in excess of 20 percent, soil absorption trenches must, at the level of the distribution pipe, be minimum of 20 feet horizontally from the face of the slope or ground surface as shown in subsection c.
- b. Additional restrictions may be imposed where conditions relating to percolation and slope so indicate.
- c. A stepped network of trenches utilizing relief lines which follows the contours of the slope may be used upon the approval of the health authority.



6. Performance of percolation test by property owner; verification of certain data by engineer.

- a. Data from percolation tests from a minimum of two test holes in the area of the proposed soil absorption system is required.
- b. The hole must be dug or bored to the proposed depth of the absorption trench. The hole must have vertical sides and have a horizontal dimension of 4 to 12 inches. The bottom and sides of the hole must be carefully scratched with a sharp pointed instrument to expose the natural soil interface. All loose material must be removed from the bottom of the hole which must then be covered with 2 inches of coarse sand or gravel when necessary to prevent scouring. Any soil which has sloughed into the hole before or during the percolation test must be removed.
- c. The Building Department may require an engineer to verify data relating to the depth of the high groundwater and bedrock, or areas subject or susceptible to flooding, the ground slope and the results of percolation tests. Verification of maximum high groundwater includes, without limitation, a morphological study of soil conditions with particular reference to soil color and sequence of horizons.

- d. If the natural soil condition has been altered by filling or other attempts to improve wet areas, the Building Department, may require the verification by the engineer to include a determination of whether the fill material is suitable for an individual sewage disposal system.
- e. A minimum of two test pits must be excavated and the date of those tests must be logged. The soil profile from the test pits and the percolation results must be included as part of the plans submitted for review. A soil profile to depth that is at least 5 feet below the bottom of the absorption trench must be provided in the appropriate space in the log for the profile of the soil.

7. Determination of appropriate percolation test procedures.

- a. In conducting percolation test, the following flow chart must be used to determine which test procedure to follow:

1)

Fill the percolation hole with water to a depth of at least 12 inches over the aggregate. Determine the time needed for the water to seep away completely.

2)

Fill the percolation hole with water again to a depth of at least 12 inches over the aggregate. Determine if the water seeps away in 10 minutes or less.

3a)

If water is left in the percolation hole after 10 minutes, proceed with the **PRESOAKING PROCEDURE**, followed by the **SLOW PERCOLATION TEST PROCEDURE**

3b)

If water has completely seeped away after 10 minutes proceed with the **FAST PERCOLATION TEST PROCEDURE**.

- b. Fast percolation test procedure – The minimum time in which a fast percolation test may be completed is 1 hour. The level of water must never exceed 6 inches over the aggregate during a fast percolation test.

- 1. The following flow chart illustrates the fast percolation procedure:

a)

Fill the percolation hole with water to a level that is no more than 6 inches over the aggregate

b)

From a fixed referenced point, determine, at 10-minute intervals, how much the water drops over the next 60 minutes. If 6 inches of water seeps away in less than 10 minutes, a short interval between measurements must be used

c)

Refill the hole as necessary to prevent all water from seeping away. The level of the water must never exceed 6 inches in depth over the aggregate.

- d) The amount of the drop in the level of the water recorded for the final 10-minute period must be used to determine the percolation rate.

c. Slow percolation procedures

1. Presoaking

- a) The following flow chart illustrates the presoaking procedure for a slow percolation test.

- 1) Fill the percolation hole with clear water to a minimum depth of 12 inches over the aggregate

- 2) Maintain at least 12 inches of water over the aggregate in the hole for 4 hours

- 3) Any water remaining in the hole at the end of the 4-hour period must be allowed to seep away. Do not remove the water

- 4) Let the hole sit for not less than 16 hours or more than 30 hours. Swelling of the soil will occur during this period. The SLOW PERCOLATION TEST PROCEDURE must begin no sooner than 16 hours after the end of the 4-hour soaking period.

2. Test Procedures

- a) The following flow chart illustrates the slow percolation test procedure

- 1) Fill the percolation hole with water to a maximum depth of 6 inches over the aggregate

- 2) From a fixed reference point, measure the drop in the level of the water at 30-minute intervals for a total of 4 hours. If the first 6 inches of water seeps away in less than 30 minutes, the interval between measurements must be reduced to 10 minutes and the length of the test be reduced to 1 hour

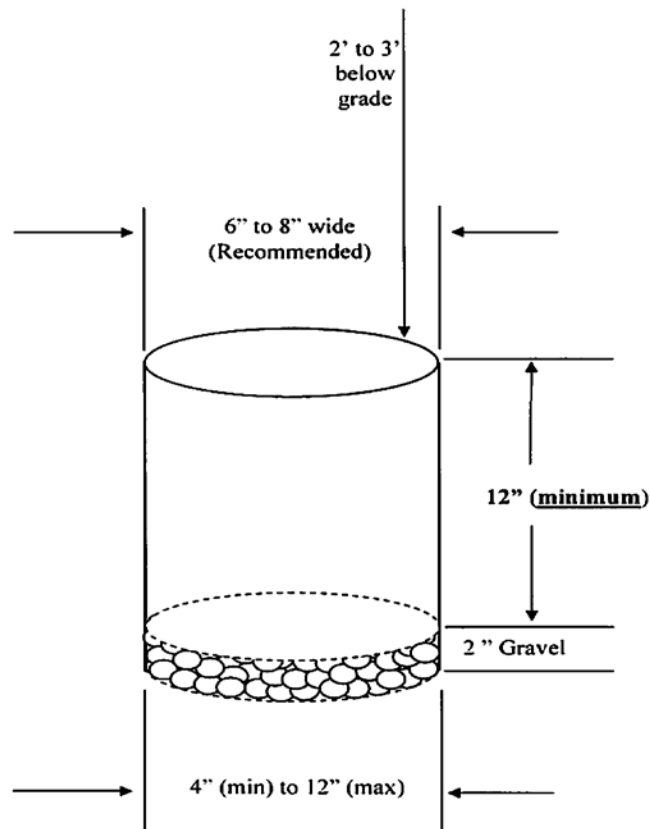
3) Fill the hole to a maximum depth of 6 inches over the aggregate as often as necessary to prevent the hole from becoming empty

4) The amount of the drop in the level of the water during the last interval must be used to determine the percolation rate, except that if two successive measurements do not vary more than 1/16 inch, the test may be stopped and the percolation rate may be determined.

Percolation Tests

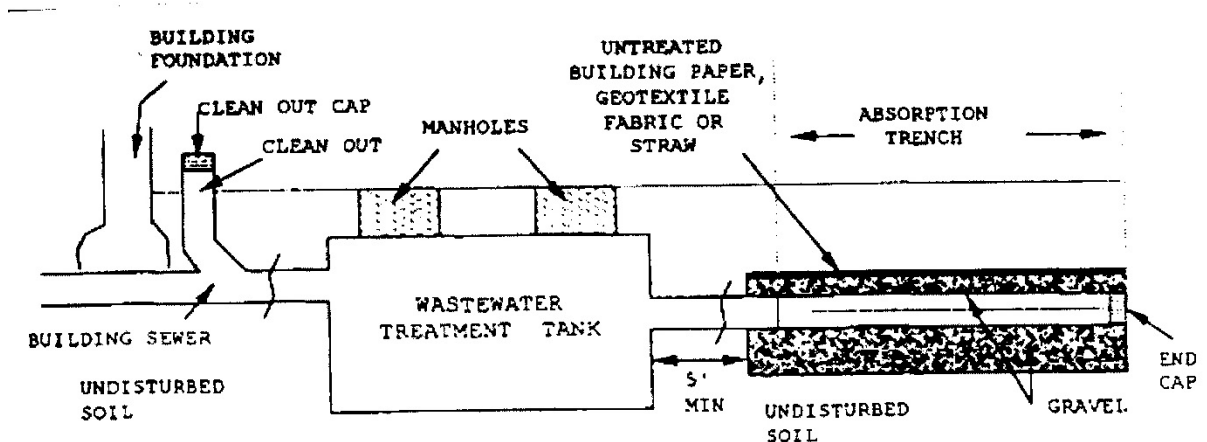
A minimum of two holes for the percolation tests is required, at the depth of the proposed trenches.

Water used for percolation tests is clear, clean water.



8. Building Sewer

- a. An approved cleanout must be installed on the building sewer line. The cleanout must be located within 3 feet of the structure or, if the cleanout cannot be placed with 3 feet of the structure, as close as practicable to the structure. At least one additional cleanout must be placed for each 100-foot increment of sewer line and for each aggregate change in the direction of the sewer line in excess of 90 degrees.
- b. The building sewer between the house and the individual sewage disposal system must be approved pipe made of cast-iron, concrete, cement-asbestos or polyvinylchloride, with watertight joints.
- c. The run of the building sewer, when practical, must be at a uniform slope of not less than $\frac{1}{4}$ inch per foot from the building toward the point of disposal.
 1. A building sewer not less than 4 inches or more than 6 inches in diameter may have a slope of not less than $\frac{1}{8}$ inch per foot.
 2. A building sewer eight inches or more in diameter may have a slope of not less than $\frac{1}{16}$ inch per foot.
- d. A building sewer must be laid on undisturbed earth or well compacted material. The top of the building sewer must be 12 inches or more below the final grade.
- e. The following is a diagram of an individual sewage disposal system
- f. Provide manhole access to grade on first chamber.



9. Accessory structures

- a. A accessory structure may be allowed to plumb into an individual sewage disposal system that serves a single family dwelling if:
 1. The accessory structure is used in conjunction with the single-family dwelling and;
 2. The septic tank has sufficient capacity to accommodate the total number of fixtures in the accessory structure and the single-family dwelling, as determined by the following table.

Type of Fixture	Fixture Units
Bathtub	2
Bidet	2
Drinking fountain	1
Floor Drain	2
Interceptor:	
For items such as grease, oil or solids	3
Laundry tub	2
Machine for washing clothes	2
Sewer connection for recreational vehicle	6

Shower, single stall	2
Sink	
Bar, private (1 ½ inch or 38.1-millimeter minimum waste	1
Bathroom(single)	1
Bathroom(double)	2
Toilet	6
Urinal	2

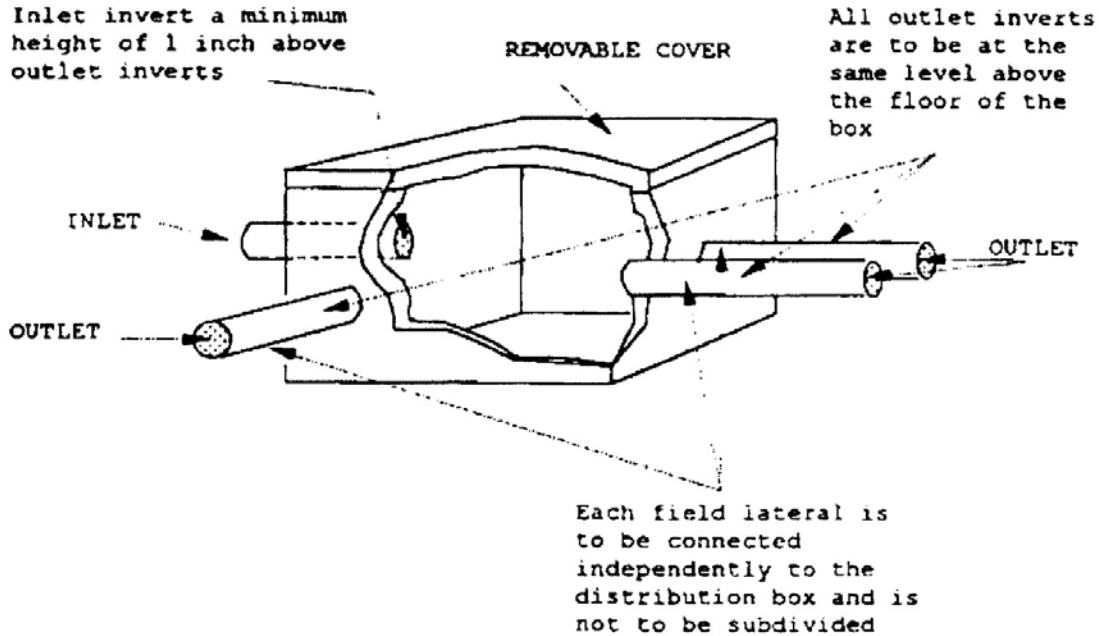
10. Limitations and site requirements
- a. Cesspools are prohibited
 - b. The discharge of surface, rain and other clear water into an individual sewage disposal system is prohibited.
 - c. An individual sewage disposal system must be operated and maintained so as not to create a public hazard or nuisance, or cause water pollution.
 - d. A septic tank that is no longer in use may be pumped, removed and disposed of. A septic tank that is not longer in use and is to be abandoned in place must be backfilled with suitable material that is compatible to the intended use of the site.
 - e. To facilitate cleaning and maintenance operations, the installer shall provide to the owner a diagram of the system. The diagram must include the location of the house, the septic tank, the cleanouts and the absorption system. The information must be kept on the premises regardless of changes in occupancy.
 - f. Any necessary bends in the individual sewage disposal system before the system enters the septic tank must be accomplished by the use of pipe fittings that are 45 degrees or less.
 - g. Every dwelling or habitation, including occupied trailers, must have an approved method of sewage disposal. The health authority may issue a permit for the temporary use of a holding tank at locations, including labor camps for construction or drilling projects, where an approved method of sewage disposal is not available. A permit for the temporary use of a holding tank issued pursuant to this subsection is valid for 30 days and may be renewed as necessary. An application for permit for temporary use of a holding tank must include a copy of:
 1. A contract between the applicant and a licensed septic tank pumping contractor that provides for the removal and disposal of wastes from the temporary tank; and
 2. A letter from an approved sewage disposal treatment facility stating that the facility agrees to accept the waste from the holding tank collected by the septic tank pumping contractor.
 - h. The disposal of sewage must be through a approved individual sewage disposal system.

11. Capacity of septic tank serving single-family dwelling

Number of Bedrooms	Minimum Liquid Capacity of Tank(in Gallons)
3 or less	1,000
4	1,200
5 or 6	1,500
If the SFD has more than six bedrooms, 150 gallons for each additional bedroom must be added to 1,500 gallons.	

12. Distribution box
- a. A distribution box must be used in an absorption system if more than one distribution line is used.
 - b. Distribution box must be watertight and constructed of durable material that is resistant to corrosion, including without limitation, concrete, polyethylene, fiberglass or any other material approved by the health authority. The distribution box must have a cover that is made of the same material as the distribution box.
 - c. Each distribution line must be separately connected to the distribution box. The inverts of the outlet lines must be set at the same level above the bottom of the box. The inverts of the inlet must be at least 1 inch higher than the inverts of the outlet. A distribution box must be designed to ensure equal flow and must be installed on:
 1. Aggregate;

2. A level concrete slab which is at least 6 inches in depth and which extends 6 inches or more beyond the perimeter of the distribution box; or
3. Undisturbed soil
- d. The number of outlets of a distribution box must be equal to or greater than the number of distribution lines to be used.
- e. The following is a diagram of a distribution box:



13. Soil absorption system

a. General Requirements

1. The effluent from a septic tank or other primary treatment unit must be disposed of through a soil absorption trench or through an absorption system approved by the administrative authority.
2. The size and type of the absorption area required for the disposal of the effluent must be determined according to the results of the percolation testing and the requirements for the sizing of the appropriate septic tank, except that if the percolation testing yields a percolation rate of less than 10 minutes per inch, the percolation rate shall be deemed to be 10 minutes per inch.
3. Soils to be used in a soil absorption trench must have a percolation rate that is 120 minutes per inch or less without interference from groundwater or impervious strata below the level of the absorption system. A test pit must be excavated and the profile of the soil to a minimum depth of 5 feet below the bottom of the proposed absorption system must be recorded in a log for the profile of the soil. Impervious barriers, bedrock, fractures, areas of open solution, clay, caliche or other limiting factors which may affect the effluent disposal area must be indicated in the log.
4. A soil absorption system intended for use on soils with percolation rates greater than 60 minutes per inch, or intended for commercial use, must be designed by an engineer.
5. The depth to the seasonal high groundwater, as observed as the surface of free water or as indicated by mottling or historical documentation, must be indicated in the log for the profile of the soil.
6. Unless otherwise approved by the administrative authority, the owner of the absorption system shall maintain at least 4 feet between the bottom of the disposal trench or absorption area and the level of seasonal high groundwater, impervious barriers or other limiting soil characteristics.

7. If the absorption trench will be placed in any soil which has a percolation rate of less than 2 minutes per inch, the administrative authority may, depending on the characteristics of the soil and site, require that:
 - (1) The trench be specially designed by an engineer; and
 - (2) The required setbacks from any well or watercourses be increased.
 8. Effluent from a tank for the treatment of wastewater must be disposed of through a solid watertight pipe that is at least 5 feet in length and placed immediately before the absorption system.
 9. The tank for the treatment of wastewater and the soil absorption system must be separated by at least 5 feet, and the solid watertight pipe that connects the tank and the absorption system must be placed on undisturbed soil.
 10. Distribution lines must be of equivalent length unless otherwise authorized by the administrative authority.
 11. The slowest percolation rate generated by the percolation tests must be used to determine the required size of an absorption system.
 12. An individual sewage disposal system must be designed to include a reserve absorption area which is equal in size to at least 100 percent of the primary required absorption area. The reserve absorption area must not be paved and is subject to the setback requirements for the primary absorption area. No vehicles may travel on the reserve absorption area.
- b. Design calculations
1. An individual sewage disposal system utilizing absorption trenches may be used wherever practical except if limiting conditions such as high groundwater, sloping terrain, impervious soil or bedrock exist at the site where the individual sewage disposal system is to be located.
 2. The design for an individual sewage disposal system utilizing absorption trenches must comply with the design criteria set forth in this section and NAC 444.8354 and 444.8356.
 3. A homeowner or a licensed contractor may design a residential system that uses absorption trenches for the residence of the homeowner if the percolation rate of the soils in which the residential system will be placed is 60 minutes per inch or less and the site is free of the limiting conditions described in subsection 1.
 4. The following is an example of the calculations required to design an individual sewage disposal system utilizing absorption trenches:

A homeowner plans to build a 4-bedroom house. Percolation testing yields percolation rates of 15 minutes per inch in test hole number one and 23 minutes per inch in test hole number two. To determine the required capacity of the wastewater treatment tank, the required number of square feet of disposal area, and the required number of lineal feet of absorption trench:

Step 1 – Pursuant to the table in subsection 1 of NAC 444.8306, a septic or wastewater treatment tank that has a capacity of 1,200 gallons is required for a 4-bedroom house.

Step 2 – The slowest percolation rate, which is 23 minutes per inch, must be used to determine the design application rate. Pursuant to the table in subsection 9 of NAC 444.8354, the design application rate is 1.0 gallon per square foot.

Step 3 – The required absorption area is calculated by dividing the capacity of the septic or wastewater treatment tank by the design application rate as follows:

$$1,200 \text{ gallons} \div 1.0 \text{ gallon/square foot} = 1,200 \text{ square feet}$$

Step 4 – The effective sidewall area must be calculated by multiplying the number of feet of aggregate beneath the distribution line by 2, to utilize the absorption area on each side of the trench. For the purposes of this example, assume that a maximum of 4 square feet of the area of the sidewall will be utilized on each trench wall per each lineal foot as follows:

$$2 \times 4 \text{ square feet} = 8 \text{ square feet per each lineal foot of trench}$$

Step 5 – The required trench length is now determined by dividing the required absorption area by the effective sidewall area as follows:

$$1,200 \text{ square feet} \div 8 \text{ square feet/lineal foot} = 150 \text{ lineal feet}$$

Since the maximum length of a distribution line may not exceed 110 feet, a minimum of two trenches of equivalent lengths are required. Therefore, the use of two distribution lines that are 75 feet long with 4 feet of aggregate beneath the distribution lines would be acceptable

c. Design criteria

1. The bottom of an absorption trench that is used in an individual sewage disposal system must be level and not less than 1 foot or more than 3 feet in width.
2. Excavations for absorption trenches must be spaced apart at a distance that is equal to or greater than 4 feet plus 2 feet for each foot of depth which the trench is below the bottom of the distribution piping, as measured from the centerline of the trenches.
3. An individual lateral may not be more than 110 feet long.
4. An absorption trench must not be excavated if the soil is extremely wet. Surfaces in an absorption trench which are smeared or compacted must be scarified to the depth to which the soils are smeared or compacted, and all loose material must be removed.
5. Distribution lines must be perforated drain pipe made of polyvinylchloride, unless otherwise approved by the administrative authority. The bottom of the distribution lines must be laid not less than 12 inches or more than 48 inches below the ground surface in continuous straight or curved lines with a slope of not less than 2 inches or more than 4 inches per 100 feet of pipe. Distribution lines must be equipped with end caps or vented to the surface at the end of the lines.
6. At least 12 inches of clean, graded aggregate ranging in size from 3/4 to 2 1/2 inches must be placed in the trench below the distribution line, and the aggregate must extend at least 2 inches over the top of the distribution line.
7. If an absorption trench is more than 6 feet in depth below the finished grade, the aggregate must extend to not less than 12 inches below the ground surface to avoid an anaerobic condition in the trench.
8. The aggregate in an absorption trench must be covered with untreated building paper, straw, geotextile fabric, or a similar covering approved by the administrative authority, and the top of the trench must be overfilled with not less than 4 inches or more than 6 inches of soil.
9. The percolation rate of the soil must be used to determine the design application rate in accordance with the following table:

Percolation Rate (minutes/inch)	Design Application Rate (gallons/square foot)
0-10	1.6
11-15	1.3
16-20	1.1
21-25	1.0
26-30	0.9
31-40	0.8
41-50	0.7
51-60	0.6

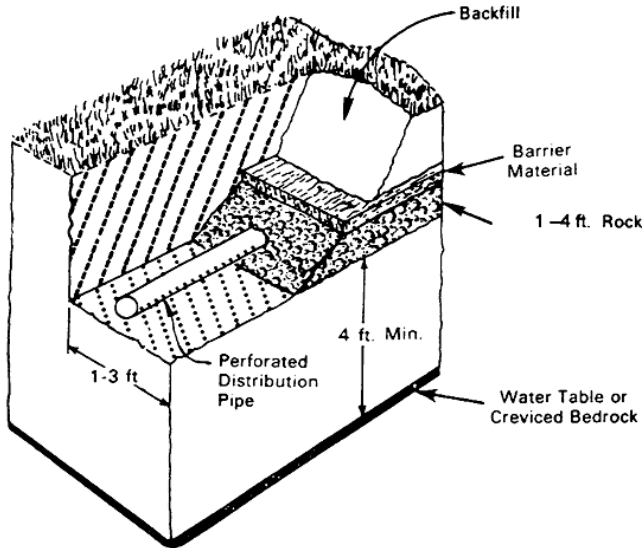
If the percolation rate of the soil is greater than 60 minutes per inch, the system must be designed by an engineer.

10. The required capacity of the septic tank must be divided by the design application rate to calculate the minimum absorption area required.
11. The area of the absorption trench must be determined by calculating the size of the effective area of the sidewall needed beneath the distribution line. Not more than 4 feet of aggregate below the distribution line may be used to calculate the

effective area of the sidewall, except that aggregate which is in excess of 4 feet below the distribution line may be used to calculate the effective area of the sidewall with the approval of the administrative authority. The required length of distribution line must be determined as follows:

The minimum size required for the absorption area (in square feet) divided by [2 times the depth of the aggregate below the distribution line (in feet)] = required length of distribution line (in feet)

12. The following is a diagram of an absorption trench:



PERC RATE (MIN/IN)	FEET OF GRAVEL UNDER LEACH LINE			
	1 FT	2FT	3 FT	4 FT (IF ALLOWED)
10	316'	158'	100'	80'
15	387'	194'	129'	100'
20	447'	224'	149'	-
25	500'	250'	167'	-
30	(547')	273'	182'	-
35	(591')	296'	197'	-
40	(632')	316'	210'	-
45	(670')	335'	224'	-
50	(707')	353'	235'	-
55	(741')	370'	247'	-
60	(775')	387'	258'	-

No one perforated line may exceed 100' in length, lines must be equal and distribution boxes are required when more than 100' of line is needed

d. Inspections

1. Inspection shall be called for prior to covering the system.

14. Chamber System

a. General requirements

1. A chamber system may be used in lieu of a standard absorption trench if the installation of an absorption trench is not practical. The bottom area of the chamber system, rather than the area of the sidewall, serves as the primary absorption medium.
2. The manufacturer of a chamber system must apply to the health authority for approval of the chamber system. A chamber system must not be used as a

component of an individual sewage disposal system unless the health authority has reviewed and approved the use of the chamber system.

3. A homeowner may design a residential system for use at his residence that includes a chamber system.

b. Design criteria

1. The health authority shall provide a sizing chart for each chamber system which it approves. The sizing chart must list the number of chamber units required for a specific size of septic tank and percolation rate.
2. The percolation rate of the soil on which a chamber system is placed must not be slower than 60 minutes per inch.
3. The invert of the drain piping entering the first chamber of the system must not be more than 48 inches below the finished grade. The trench depth for a chamber system must not be more than 5 feet below the finished grade. The top of the chamber system must be at least 6 inches below the natural soil surface, and a capping fill must be placed over the top of the chamber system to allow for settling.
4. The absorption trenches for a chamber system must not be longer than 110 feet.
5. Excavations for absorption trenches for a chamber system must be spaced so that there is at least 6 feet between the trenches, as measured from the centerline of the trenches.
6. The bottom of the excavation for an absorption trench to be used in a chamber system must be level. The owner must take such precautions as are necessary to avoid compacting the bottom of the trench. Loose or smeared soil must be raked and removed. No vehicles may travel on the area of an absorption trench after the excavation of the trench.
7. Dosing is required if more than 500 linear feet of absorption trench are required.
8. If a chamber system is used in conjunction with an absorption bed rather than an absorption trench, the chamber system and the absorption bed must comply with the requirements relating to the sizing for absorption beds set forth in NAC 444.8358 and 444.8361. The sizing chart provided by the health authority pursuant to this section must not be used to size an absorption bed in which a chamber system will be placed.

c. Inspections

1. The construction of an individual sewage disposal system that uses a chamber system must be inspected and verified by an engineer or, if the unit is designed by a homeowner as part of a residential system for his home, the homeowner. The inspections must be conducted as follows:
 - (a) Following excavation, the bottom of each absorption trench or the bottom of the absorption bed, as appropriate, must be inspected to ensure that there is no loose soil and that no smearing conditions exist; and
 - (b) Upon completion of the installation of the chambers in the absorption trenches or absorption bed, the individual sewage disposal system must be inspected to ensure that the chamber system and the trenches or bed, as appropriate, have been constructed and installed in accordance with the design plans.
2. If a residential system that includes a chamber system is designed by a homeowner:
 - (a) The homeowner shall contact the administrative authority for an inspection; and
 - (b) The administrative authority shall inspect the construction of the residential system by conducting an on-site inspection before the covering is placed on the system, to ensure that the system complies with the approved plans.
3. If an individual sewage disposal system is designed by an engineer, the engineer shall, within 30 days after the date on which the construction of the individual sewage disposal system is completed, submit a letter to the administrative authority stating the system was constructed in accordance with the approved plans.