NEBRASKA
DEPT. OF ENVIRONMENT AND ENERGY



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# Soil Percolation

Percolation test is defined in Title 124 - Onsite Wastewater Treatment Systems as the determination of the suitability of an area for subsurface wastewater effluent disposal by a standardized test of the rate at which the undisturbed soil in an excavated pit or hole of standard size will absorb liquid per unit of surface area. Soil percolation tests are conducted to help determine the amount of soil absorption area required for a soil absorption system. The percolation rate is usually expressed in minutes per inch or mpi.

Soil percolation tests must be conducted in the area where the soil absorption system will be located and cannot be made on disturbed or frozen ground. Where fissured or creviced formations are encountered below the ground surface, the Nebraska Department of Environment and Energy (NDEE) must be consulted for assistance. Soil percolation tests must be conducted by a professional engineer, registered environmental health specialist, or a certified professional holding a certificate in the category of Inspector, Soil Evaluator, Master Installer or Journeyman Installer.

Soil is unsuitable for a soil absorption system if the percolation rate is faster than five minutes per inch or is slower than 60 minutes per inch. Soils with a percolation rate faster than five minutes per inch are acceptable if a 12-inch thick loamy sand soil liner with a percolation rate of 15 to 20 minutes per inch is installed in the trench or bed. The trench or bed is then sized based on this soil liner percolation rate.

A soil absorption system must not be installed if the percolation rate is slower than 60 minutes per inch unless designed by a professional engineer and a construction permit is issued in accordance Title 124. Installation of an alternative onsite wastewater treatment system to accommodate unsuitable soil conditions also requires a construction permit approved by the Department.

The following procedures must be followed when conducting soil percolation tests:

- At least three test holes must be dug and spaced uniformly over the proposed absorption field site. If the difference between the fastest and the slowest measured percolation rate is greater than 20 minutes per inch, or there are other indications that soil conditions are highly variable, a minimum of four test holes and two test holes per lateral is required.
- The holes must be dug or bored with horizontal dimensions from four to twelve inches and vertical sides to the depth of the bottom of the proposed distribution trench. Holes can be bored with a posthole type auger.

- The bottom and sides of the holes must be roughened or scratched to provide a natural surface. All loose material must be removed from the hole. About two inches of ¼ to ¾inch gravel should be placed in the hole to prevent bottom scouring.
- The hole must be filled with clear water to a minimum depth of 12 inches over the gravel. Water must be kept in the hole for at least four hours, and preferably overnight, by refilling as necessary or by supplying a surplus reservoir of water (automatic siphon).
    - Soils with moderately slow permeability or that contain greater than 30 percent clay will require several days soaking to reach saturation, especially when the soil is dry, order to obtain the required saturation prior to making measurements.
    - Soaking is not necessary in sandy soils containing little or no clay. If after filling the hole twice with 12 inches of water and the water seeps completely away each time in less than 10 minutes, the test measurements can proceed immediately.
- Percolation rate measurements should be taken the day following the saturation process, except in highly permeable sandy soils with fast percolation rates or in less permeable soils with high clay content and slow percolation rates. For all soils, the percolation rate of the planned last test measurement for any one test hole should approach a uniform rate and not vary more than 10 percent from the previous measurement for that test hole.
    - If water remains in the test hole after overnight saturation, the water depth must be adjusted to a minimum of six inches over the gravel. From a fixed reference point, the drop in the water level is then measured during an approximate 30-minute period.
    - If no water remains in the hole after overnight saturation, clear water must be added to a depth of six inches over the gravel. From a fixed referenced point, the drop in the water level is then measured at approximate 30-minute intervals over a four-hour period. The hole must be refilled to a depth of six inches as necessary after each 30-minute period. The drop which occurs during the final 30-minute period is then used to calculate the percolation rate.
    - A shorter measurement time interval of 10 minutes may be used for sandy or course grained soils with fast permeability where the first six inches of water seeps away in less than 30 minutes even after the overnight saturation or swelling period. Six test measurements must be taken, one at the end of each 10-minute interval. The hole must be refilled to a depth of six inches as necessary after each interval. The drop that occurs during the final 10 minutes is then used to calculate the percolation rate.
- The mpi, or percolation rate of a test hole (the time in minutes for the water level in the test hole to drop one inch), is determined by dividing the number of minutes elapsed by the water level drop in inches during the final measurement period. The design percolation rate for the soil absorption system is then determined by averaging the percolation rate of all of the test holes unless the difference between the fastest and slowest measured rates is more than 20 minutes per inch, in which case the slowest percolation rate must be used.

The percolation test data must be recorded and maintained on the premises. The Soil Absorption Test Data Report may be used to document and record measurements obtained during soil percolation testing. Other methods of determining the percolation rate may be approved by the Department if the method is recognized as providing accurate and consistent results. The Department may require verification of percolation rates when submitted results are inconsistent with other known data.