

SOILS INVESTIGATION

A test pit is often the best method to use to determine soil conditions because the soil layers can be visually inspected and recorded easily.

Test pits must be within 3 metres (10 ft.) of the anticipated disposal site, and must extend at least 1.2 metres (4 ft.) below the anticipated bottom of the soil absorption system (see Figure 1).

For large systems (commercial buildings, dwellings with 5+ bedrooms) more than one test pit and percolation test hole may be required.

Once the test pit has been dug, information on the types of soil (see Table 1) are to be recorded on your application form available from the Environmental Health Office.

PERCOLATION TEST

The percolation test provides the data necessary to properly design your soil absorption system. The percolation rate is expressed as the time in minutes that it takes for water to drop 25 mm (1 in.) in the test hole.

Following is an approved procedure for carrying out the percolation test (see Figure 1):

- (1) To determine the depth for your test hole, it is best to excavate a hole with a backhoe to a depth of 3 m (10 ft.) or more, obtain soils information and select the soil layer that you think is suitable for the absorption of the sewage effluent. Then excavate a bench or step on the sidewall of the test pit. When the test is made from a step or bench of a test pit, the percolation test hole therein should not be closer than 0.5 m (1.6 ft.) to the sidewall of the pit.
- (2) The test hole is to be augured or dug with a diameter of 150 mm (6 in.) maintaining a vertical attitude into the soil layer intended to accept the sewage effluent (liquid from the septic tank). The bottom of the percolation test hole must be at least 1.2 m (4 ft.) above the groundwater level and bedrock/impervious soil layer.
- (3) The auger is likely to smear the soil along the sidewalls of the test hole. Therefore, it is necessary to scratch or scarify the bottom 0.5 m (1.6 ft.) sidewall as well as the bottom of the hole. This can easily be carried out with a pointed instrument/nails driven into a board.

- (4) Remove all loose soil material from the bottom of the test hole, then add 50 mm (2 in.) of 6 to 20 mm (1/4 to 3/4 in.) diameter drainrock to protect the bottom from scouring when water is added. The gravel can be contained in a nylon mesh bag to be removed after the test is performed for use in additional percolation tests.
- (5) Carefully fill the test hole with clean water to at least 300 mm (12 in.) in depth, and continue to do so until the soil is saturated. Saturation means that the void spaces between the soil particles are full of water. Keep soaking the hole until the rate at which the water seeping away becomes constant.

In the event that the soil layer consists mainly of:

- (a) heavy silts or clays, then water must be kept in the hole to allow for saturation and swelling. Keep water in the hole for at least 4 hours, preferably overnight. Refill, if necessary, or supply a surplus reservoir of water, maintaining the 300 mm (12 in.) depth with an automatic siphon. Use a hose or similar device to add water to the hole and to prevent washing down the sides of the hole. Measure the percolation rate after at least 16 hours, but no more than 30 hours after water was first added to the hole. This ensures that the soil has an ample opportunity to swell and to approach the natural condition during the wettest season.
 - (b) sand and gravel, and you are unable retain water in the hole after attempting to saturate the soil, then you may assume that your rate of percolation is less than 5 min./25 mm (1 in.). Should this be the case, then 2 ft. of filtered sand may be required. Information on the sand filter may be obtained from the Environmental Health Office.
- (6) Measuring the Percolation Rate:
- (a) After the soaking period, bail out or fill up the water so that 150 mm (6 in.) of water remains above the gravel and is 200 mm (8 in.) from the hole bottom. Measure the drop in water level to the nearest 3 mm (1/8 in.) every 30 minutes. After each measurement, refill the water in the hole so that the liquid depth is once again 150 mm (6 in.) above the gravel.
 - (b) In sandy soils, or in soils where the water seeps away in less than 30 minutes, after the soaking period, allow 10 minutes between measurements. If the soils are very sandy, use a stop watch, and measure the time taken to drop 25 mm (1 in.). Refill the test hole after each measurement to bring the water level to 150 mm (6 in.) above the gravel.

Continue taking readings until 3 consecutive percolation rates vary by no more than 10 %.

(7) Calculating the Percolation Rate:

When using the method of measurement as described in 8(a) divide the time interval by the drop in water level and multiply by 25 to determine the percolation rate in minutes per 25 mm (1 in.).

Example:

If water falls 19 mm in 30 minutes,
then water falls 1 mm in $(30 \text{ min.} \div 19 \text{ mm}) = 1.6 \text{ min./mm}$,
then water falls 25 mm in $(25 \text{ mm} \times 1.6 \text{ min./mm}) = 40 \text{ min.}$

or

If water falls 3/4 or 0.75 inch in 30 minutes,
then water falls 1 inch in $(30 \text{ min.} \div 0.75 \text{ in.}) = 40 \text{ min.}$

The percolation rate is 40 min per 25 mm (1 in.)

Calculate the percolation rate for each reading. When 3 consecutive readings vary by no more than 10 %, use the average of these 3 readings to determine the percolation rate for that test hole. Percolation rates in each test hole for a proposed soil absorption system should be averaged in order to determine the design percolation rate.

Once the percolation tests have been completed, record this information on your application form.

After the average percolation rate has been determined, the minimum soil absorption surface area required for your sewage disposal system can be obtained by using Table 2. This area is based on the number of bedrooms in a standard household, assuming a water usage of 570 litres per bedroom (125 gallons per bedroom).

For a 1 bedroom dwelling with a 10 min./ 25 mm percolation rate, the minimum area required for an absorption bed system would be 23 m₂ or 248 ft₂.

For a 3 bedroom dwelling with a 10 min./ 25 mm percolation rate, the minimum area required for an absorption bed system would be 23 m₂ (248 ft₂) / bedroom x 3 bedrooms for a total area of 69 m₂ or 744 ft₂.

Further information on the design and sizing of your sewage system is available from:

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