
APPENDIX C

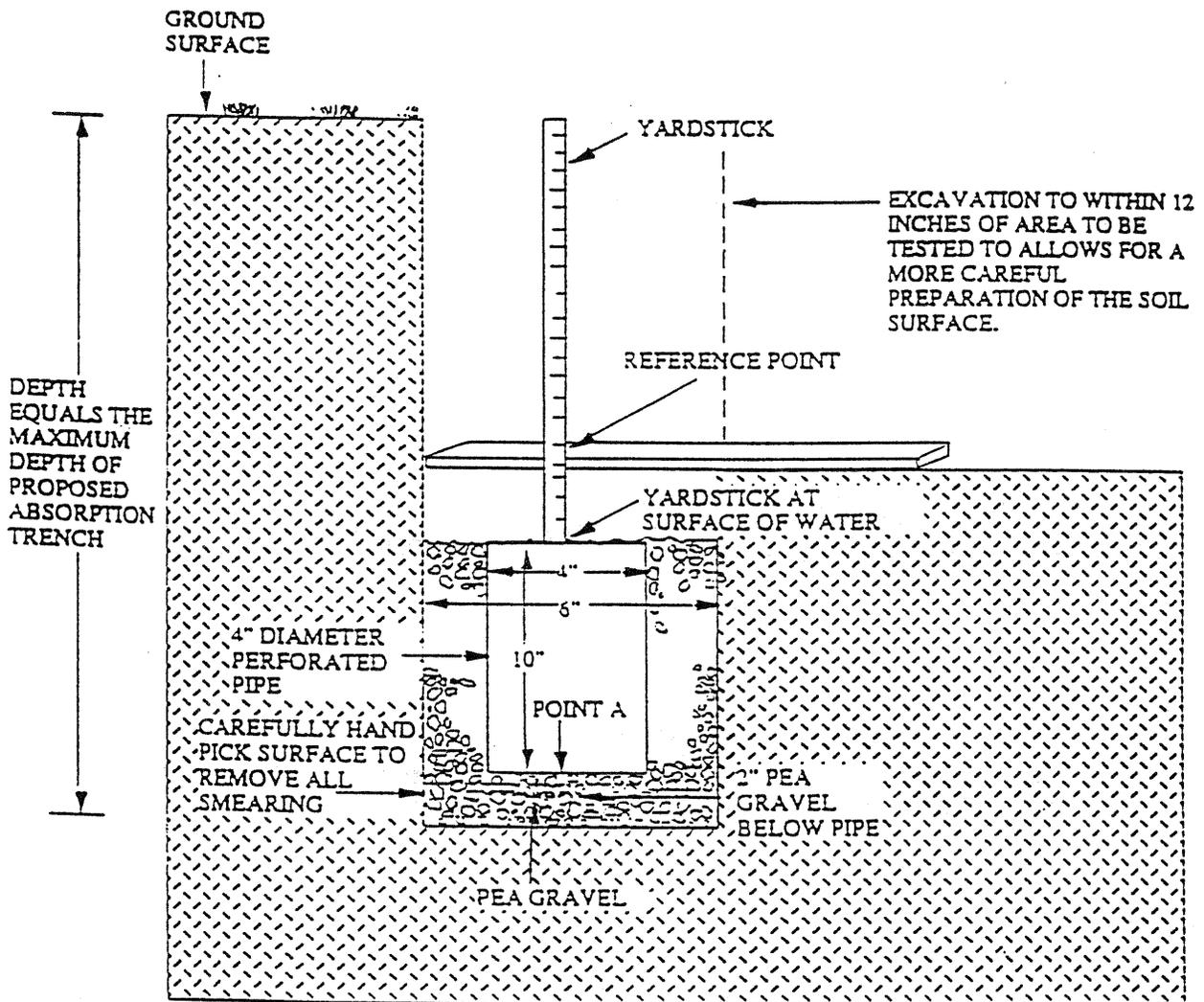
HYDRAULIC TESTING OF SOIL

The Onsite Sanitary Official may require hydraulic testing of disposal area soils as part of the site evaluation process. The hydraulic tests shall either be a percolation test, infiltration test, or absorption test, as described below.

A. Percolation Test

1. Test Procedure

- a. Construct three holes, six-inch diameter, spaced over the area to be considered for the absorption field and repair area.
- b. The depth of the hole should be the maximum depth of the proposed disposal trenches.
- c. Carefully pick the surface of the hole to remove all smeared surfaces.
- d. Place two inches of pea gravel in the bottom of the hole.
- e. Place a four-inch perforated pipe in the center of the hole.
- f. Place pea gravel around the pipe.
- g. Fill hole to the top of four-inch pipe with water the night before the test.
- h. The next morning, fill water to top of the four-inch pipe. Allow water to drain.
- i. Fill to a four-inch mark above Point A shown on Figure C.1.
- j. Measure the time it takes for the water level to drop four inches.
- k. Repeat Steps i and j five times.
- l. Report rate of drop in min/in. Adjust rates to compensate for the volume of gravel in the hole. An example is shown below.
- m. If test cannot be repeated five times, conclude test after five hours.



A CORRECTION FACTOR NEEDS TO BE APPLIED WHEN USING THIS TECHNIQUE. THE GRAVEL TAKES UP SPACE WHICH WILL CAUSE THE WATER TO DROP FASTER THAN A NON-LINED HOLE.

FIGURE C.1
TYPICAL CROSS SECTION OF A GRAVEL LINED PERCOLATION TEST

2. Example of Gravel Volume Compensation Calculations

- a. Calculate the volume of the hole without gravel or pipe.

$$Y = \pi r^2 h$$

where: y = volume of hole without gravel (ft³)
 π = 3.14
 r = hole radius (0.25 ft)
 h = depth of infiltration zone (1 ft)

$$y = 0.196 \text{ ft}^3 \text{ for gravel filled percolation test}$$

- b. Calculate the volume of the 4 in. pipe

$$V_p = \pi r_p^2 h_p$$

where: V_p = volume of pipe (ft³)
 r_p = radius of pipe (0.17 ft)
 h_p = depth of pipe in infiltration zone (0.83 ft)

$$V_p = 0.075 \text{ ft}^3 \text{ for gravel filled percolation test}$$

- c. Calculate the volume of the void space in the gravel

$$V_g = (Y - V_p)n$$

where: V_g = volume of gravel (ft³)
 n = gravel porosity (0.40)

$$V_g = 0.048 \text{ ft}^3 \text{ for gravel filled percolation test}$$

- d. Calculate the volume of the void space with the pipe and gravel in place.

$$x = V_p + V_g$$

$$x = 0.123 \text{ ft}^3 \text{ for gravel filled percolation test}$$

- e. Calculate the adjustment factor to compensate for the gravel.

$$\text{A.F.} = \frac{Y}{X}$$

where: A.F. = adjustment factor

$$\text{A.F.} = 1.6$$

- f. Multiply the test results (min/in.) by the adjustment factor to compensate for the gravel in the hole.

B. Infiltration Test

1. General Test Procedure

- a. Carefully drive ten-twenty-four inch diameter steel ring three-quarter inches into the soil surface as shown in Figure C.2.
- b. Place a small board or rock to act as a splash plate.
- c. Add water to ring keeping water level one inch or so above surface for thirty minutes.
- d. After thirty minutes of soaking, measure the time required for water to drop one inch. If rates are very rapid, add a known quantity of water and determine the amount of time required for the soil to absorb the water.
- e. Measure the rate of drop over a two-hour period.
- f. Report results in gal/ft²·hr.

2. Test Procedure for Weathered Bedrock

Follow the same steps as listed above, except dig a basin one-half inch into the bedrock instead of using the infiltration rings. Carefully pick the surface and remove all loose soil.

C. Absorption Test

An Absorption test is a method of determining the capacity of a site to accept the daily wastewater flow. It consists of constructing a short segment of a disposal trench, maintaining water in the trench for several days, and then excavating the soil to determine where the water has traveled and how much area was required to absorb the water. A typical absorption test is illustrated in Figure C.3. A shallow trench of adequate length (six to ten feet) is excavated in the location where the actual disposal field trenches are to be placed. The bottom and sidewalls of the trench are picked to remove any smeared soil. A wooden box is placed in the trench and clean gravel is placed around the box. A float is installed in the box to maintain a constant head of water. Water applied to the trench is metered so that an accurate accounting can be maintained. The trench is then filled with water to a given height and the water level is maintained at that height throughout the test period (typically two to six days). As water is applied to the trench, a portion of the water flows vertically. Another portion water moves laterally. To determine the acceptance rate of the underlying soil strata, the horizontal extent to which the water spreads under saturated flow conditions is defined. The extent of the spread (or plume) is cross section area through which flow takes place, the total water applied, the water remaining in

the trench, in the soil column above the area defined by the plume, and in the capillary fringe, the soil acceptance rate and the saturated coefficient of permeability can be determined.

Absorption tests shall be conducted by a qualified designer. A thorough knowledge of soils and soil hydraulics is required to accurately interpret the results.

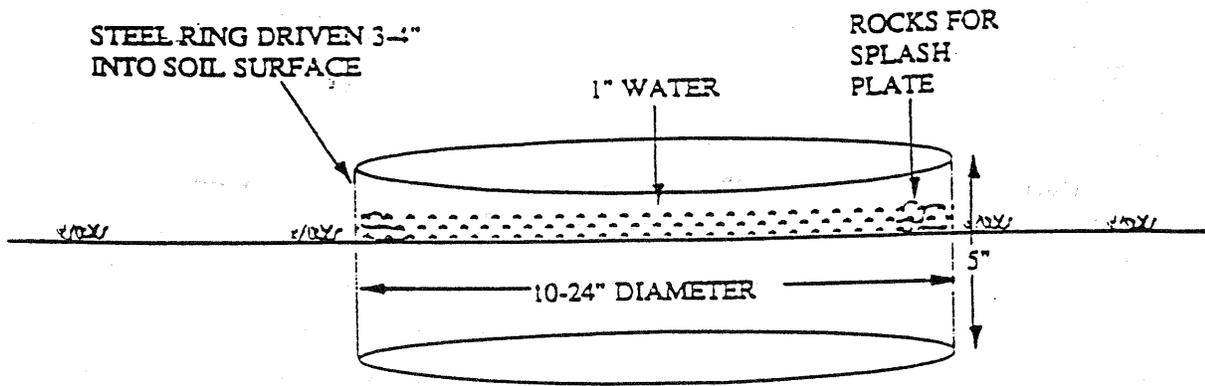


FIGURE C.2
INFILTRATION RING INSTALLED AT SOIL SURFACE

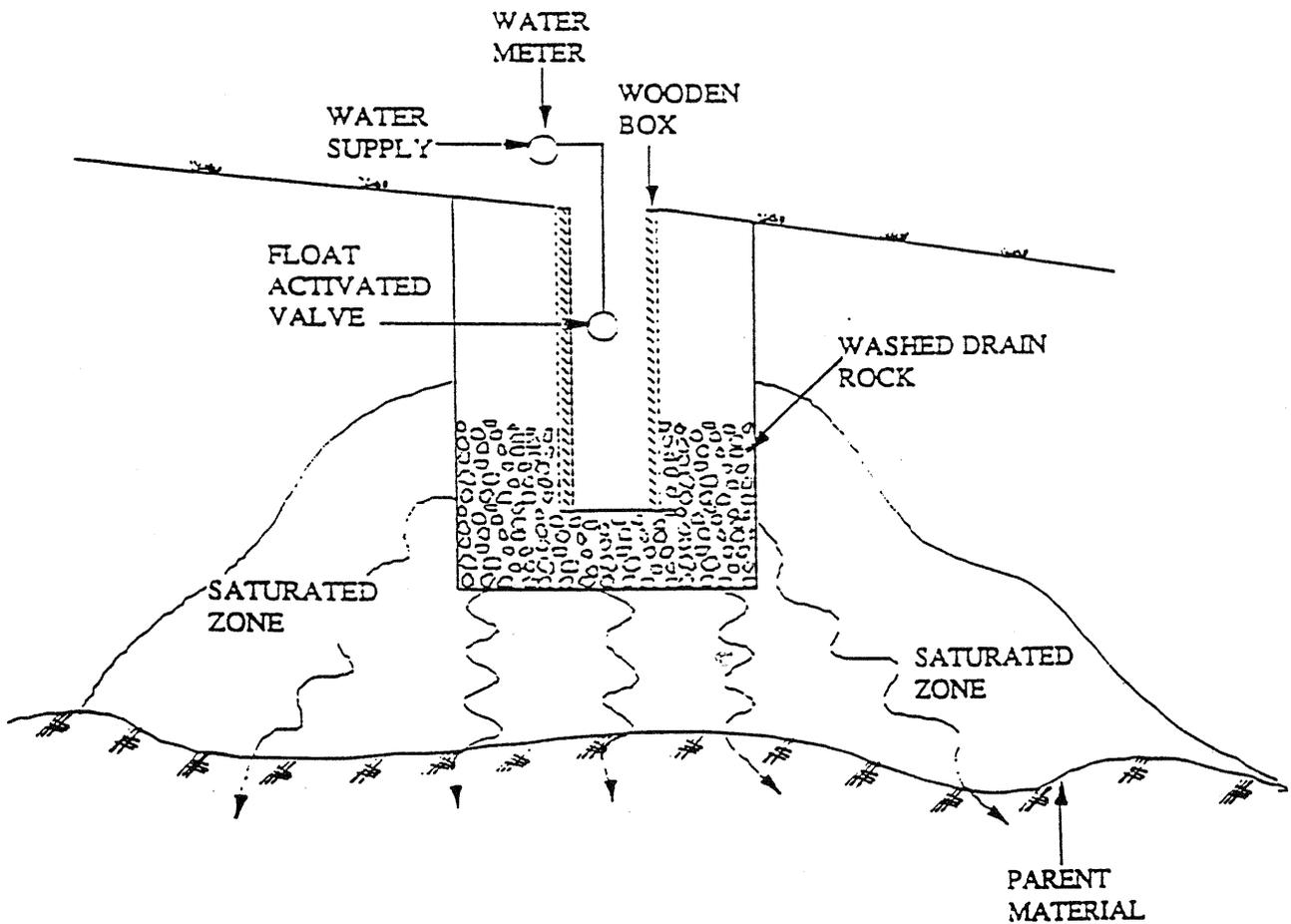


FIGURE C.3
ABSORPTION TEST