Designation: D 5925 – 96$^{\epsilon 1}$

Standard Practice for Preliminary Sizing and Delineation of Soil Absorption Field Areas for On-Site Septic Systems[1]

This standard is issued under the fixed designation D 5925; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

ϵ[1] NOTE—Paragraph 1.6 was added editorially October 1998.

1. Scope

1.1 This practice covers procedures for estimating the dimensions and marking the boundaries of a soil absorption area for an on-site septic system involving residential-strength wastewater. It can also be used to estimate the dimensions of commercial on-site septic systems where wastewater strengths are similar to residential wastewater.

1.2 This practice can also be used for marking the boundaries of the area for a septic system constructed filter bed.

1.3 This practice can be used at any site where a potentially suitable or recommended field area has been identified in accordance with Practices D 5879 and D 5921.

1.4 Non-metric units remain the common practice in design and installation of on-site waste disposal systems, and are used in this practice. Use of SI units given in parentheses is encouraged, if acceptable to the appropriate permitting agency.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 5879 Practice for Surface Site Characterization for On-Site Septic Systems[2]

D 5921 Practice for Subsurface Characterization of Test Pits for On-Site Septic Systems[2]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *clinometer*—an instrument for measuring inclination, as in topographic slope.

3.1.2 *constructed filter bed (CFB)*—for the purposes of this practice, material, usually of a sandy texture, placed above or in an excavated portion of the natural soil for filtration and purification of wastewater from an on-site septic system.

3.1.3 *on-site septic system*—for the purposes of this practice, any wastewater treatment and disposal system that uses a septic tank or functionally equivalent device for collecting waste solids and treats wastewater using natural soils, or constructed filter beds with disposal of the treated wastewater into the natural soil.

3.1.4 *potentially suitable field area*—the portions of a site that remain after observable limiting surface features, such as excessive slope, unsuitable landscape position, proximity to water supplies, and applicable setbacks, have been excluded.

3.1.5 *recommended field area*—the portion of the potentially suitable field area at a site that has been determined to be most suitable for an on-site septic system soil absorption field or filter bed based on surface and subsurface observations.

3.1.6 *soil absorption (SA) area*—an area of natural soil used for filtration and purification of wastewater from an on-site septic system.

3.1.7 *soil absorption field area (SAF)*—an area that includes soil absorption trenches and any soil barriers between the trenches. Also called a leachfield.

[1] This practice is under the jurisdiction of ASTM Committee D18 on Soil and Rockand is the direct responsibility of Subcommittee D18.01 on Surface and Subsurface Characterization.

Current edition approved April 10, 1996. Published November 1996.

[2] *Annual Book of ASTM Standards*, Vol 04.09.

3.1.8 *soil absorption trench*—an excavated trench, usually 1.5 to 3 ft wide that receives wastewater for treatment. Also called a lateral or leachline.

4. Significance and Use

4.1 This practice should be used in conjunction with a surface and subsurface site investigation to delineate a recommended field area that is adequate for any septic system that can reasonably be anticipated for the site. If actual design results in a smaller field area, the boundaries can be modified accordingly.

4.2 Staking and flagging procedures in the practice help prevent accidental disturbance of a recommended septic system field area by equipment traffic and other construction activities prior to installation of the system. Soil disturbance resulting in compaction from heavy equipment traffic or removal by excavation equipment usually invalidates the results of the surface and subsurface investigation that led to recommendation of a field area.

4.3 In the event of suspected disturbance or removal of natural soil in the recommended field area, soil elevation benchmarks established by this practice allow assessment of the actual extent of disturbance or soil removal.

4.4 This practice should also be used where topographic limitations create uncertainty as to whether a potentially suitable field area for a septic system will provide a large enough absorption area to treat anticipated wastewater flows. In such situations clear demarcation of the suitable areas will also provide greater assurance of proper system installation.

5. Field Equipment

5.1 A clinometer or hand level and rod that is marked in feet/metric increments and at the eye level of the investigator are used for measuring slope and delineating topographic contours. A compass may be useful for defining position of the field area. A single person can take measurements if the rod has a point that can be driven into the ground so that it stands vertically, as described in 7.1. An extendible surveyor's rod with a tripod can also be used by a single person and may facilitate the elevation benchmarking procedure described in 7.2.

5.2 A 100 ft tape or longer can be used to measure the length and width of the field area. A screwdriver or spike is also useful for anchoring one end of the tape when making measurements. Where there are no concerns about the adequacy of the available suitable area, pacing can be used as an alternative to a tape. In this case, the investigator should periodically check the accuracy of his or her pace against a known distance.

5.3 Stakes and flagging are used to mark the corners and other boundaries of the field area. Stakes can be of any material (wood, fiberglass, metal) that is durable enough to remain standing during the period from staking until installation of the system. If the area is to be mowed, the stakes should be tall enough and sturdy enough to prevent accidental damage to the stake or the mower. If there is any possibility that the stakes might be confused with other markers at the site, colored flagging coded for different purposes can be used. Generally, actual fencing is not required unless heavy equipment traffic is expected to run regularly by the area.

6. Procedure for Estimating Field Dimensions

6.1 Use this procedure for preliminary sizing of the area required for a soil absorption field or constructed filter bed for the purpose of staking a field areas as described in Section 7. This procedure should also be used whenever marginal site surface and subsurface conditions indicate doubt as to whether there is a large enough area that is suitable for an on-site septic system.

6.2 Factors that affect the soil absorption field (SAF) area requirements include wastewater quantity (typically expressed as gallons per day (gpd), loading rate (typically expressed as gpd/ft^2) that is derived from soil characteristics or percolation test results (see 6.3.3), and trench spacing, that determines the area of soil between absorption trenches.[3] Dividing Factor 1 by Factor 2 gives the total required soil absorption (SA) area.[4] The SA area plus the area represented by soil barriers between trenches yields the SAF area. In some jurisdictions the SA area may be determined by the number of bedrooms based on assumptions concerning wastewater flow and loading rates. Factors affecting the area required for constructed filter beds are the same as for soil absorption fields.

6.3 *Method for Estimating Soil Absorption Field Dimensions*—The method described here assumes residential-strength wastewater and includes tables that should be generally applicable to most parts of the United States. Alternative tables using other wastewater flow and soil loading rates can easily be developed. The method for estimating a SAF area involves the following steps: determining wastewater flow, determining soil loading rate, determining required SA area, determining the number of trenches and their length to provide the required SA area, and determining the width of the field based on the number of trenches.[5]

6.3.1 *Wastewater Flow*—Typically wastewater flow is determined by the number of bedrooms in a residence. 150 gpd per bedroom, recommended by U.S. EPA (**1**),[6] is widely used. Table 1 includes rates of 150, 300, 450, and 600 gpd that correspond to a 1-, 2-, 3-, and 4-bedroom house, respectively.

[3] Other factors that may need to be considered include: wastewater strength (suspended solids, biological/chemical oxygen demand, nitrogen, phosphorus, etc.), potential for ground-water mounding under absorption trenches or constructed filter beds, and evapotranspiration. Standard loading rates based on soil characteristics or percolation test results usually assume residential-strength wastewater. Wastewaters with parameters that differ significantly from residential wastewater require special design procedures that are not addressed in this practice. Section 6.3.5 discusses situations where ground-water mounding analysis may need to be considered. In temperate climates evapotranspiration is usually not considered when determining the required SA area because it is zero during winter months. In areas where evapotranspiration is significant throughout the year, it may be possible to reduce SA area requirements. This requires a water budget analysis for the time of year when evapotranspiration is at a minimum and adjusting the field size accordingly. For example, if 20 % of the wastewater entering the soil could be expected to be transpired, the field size could be reduced by one-fifth.

[4] This actually gives only the absorption area of the bottom of the trench. Depending on the depth of effluent in a trench additional absorption area is provided by the sidewalls. Normal practice is to ignore this area when calculating required soil absorption area. However, some jurisdictions allow credit for sidewall area.

[5] This method can also be used to estimate field dimensions for grade soil absorption fields, and trench systems where the lower portions are filled with filter bed material.

[6] The boldface numbers given in parentheses refer to a list of references at the end of the text.

TABLE 1 Soil Absorption/Filter Bed Area Requirements for Different Wastewater Flow and Soil Loading Rates

Soil Loading, *R*		Wastewater Flow							
		150 gal/day		300 gal/day		450 gal/day		600 gal/day	
		Soil Absorption Area							
gal/day ft²	ft² gal/day	ft²	Square Root	ft²	Square Root	ft²	Square Root	ft²	Square Root
0.2	5.0	750	...	1500	...	2250	...	3000	...
0.25	4.0	600	...	1200	...	1800	...	2400	...
0.3	3.3	500	...	1000	...	1500	...	2000	...
0.35	2.9	429	...	857	...	1286	...	1714	...
0.4	2.5	375	...	750	...	1125	...	1500	...
0.45	2.2	333	...	667	...	1000	...	1333	...
0.5	2.0	300	...	600	...	900	...	1200	...
0.6	1.7	250	16	500	22	750	27	1000	32
0.7	1.4	214	15	429	21	643	25	857	29
0.8	1.3	188	14	375	19	563	24	750	27
0.9	1.1	167	13	333	18	500	22	667	26
1.0	1.0	150	12	300	17	450	21	600	24
1.1	0.9	136	12	273	17	409	20	545	23
1.2	0.8	125	11	250	16	375	19	500	22

Some jurisdictions may use different loading rates (120 to 200 gpd per bedroom, 60 to 150 gpd per person). Reference **(2)** compiles design flow rates specified in state regulations in the United States.

6.3.2 *Soil Loading Rate*—Increasingly, septic system design is being based on soil loading rates based on soil texture and structure as determined by subsurface site characterization as covered in Practice D 5879. Table 1 includes loading rates from 0.2 to 1.2 gpd/ft². Loading rates may also be determined by percolation test results **(3)**. Fig. 1 can be used to convert percolation rates measured as minutes per inch (mpi) to recommended SA area loading rates as suggested by U.S. EPA **(7)** and Winneberger **(4)**. If percolation test results are reported in inches/hour, convert to minutes per inch (mpi = 60/in./h). Soil loading rates are lower than the saturated hydraulic conductivity of soil in order to take into account reduced infiltration resulting from development of a biological clogging mat on absorption trench surfaces and to allow for unsaturated flow. Some jurisdictions may require consideration of climatic factors such as precipitation and evapotranspiration when determining soil loading rates for soil. Reference **(2)** compiles application rates defined in state regulations in the United States.

6.3.3 *Soil Absorption Area*—Table 1 shows soil absorption areas required for commonly used wastewater flows and soil loading rates. If the applicable wastewater flow and soil loading rate is not included in Table 1, multiply the actual values determined in 6.3.1 and 6.3.2.

6.3.4 *Trench Width*—The width of a soil absorption trench determines how many square feet of soil absorption are available on the trench bottom per lineal foot of trench. Typical trench widths range from 1.5 to 3.0 ft **(5)**. Use the trench width that represents common installation practice in the area of the site.

6.3.5 *Number and Length of Trenches*—Use Table 2 to determine the possible combinations of number and length of trenches that will provide the soil absorption area determined in 6.3.3. For example, if the required soil absorption area is 600 ft², and the trenches are 3 ft wide, there are three possible configurations: (*1*) two trenches 100 ft long, (*2*) three trenches 70 ft long (that provide a little more than the required area), and (*3*) four trenches 50 ft long. Select the configuration that best fits the site, giving preferences for the configuration that minimizes the number of trenches.[7] This determines the length of the field for staking, as described in Section 7. Where the vertical separation between the bottom of the disposal component of the on-site septic system and a limiting layer is at or near the minimum allowed, ground-water mounding calculations may be required, especially if more than two or three trenches are required.[8]

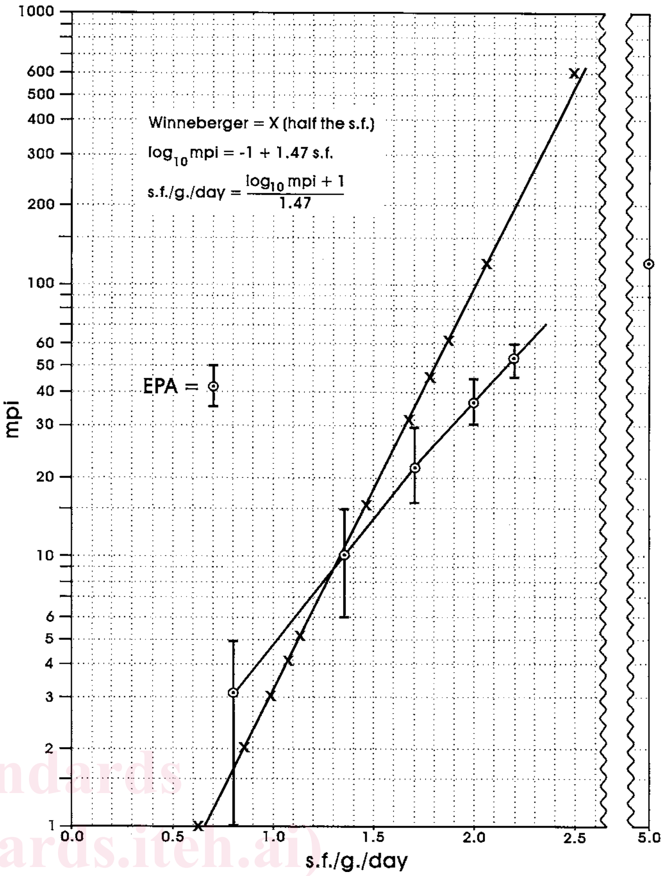

FIG. 1 EPA's and Winneberger's Recommendations for Absorptions Area (Square Feet per Gallon of Sewage per Day) Versus Measured Percolation (Minutes per Inch) (5)

6.3.6 *Width of Field*—Whenever two or more trenches are required, the width of a soil absorption field will be larger than for a single trench to account for the soil areas between

[7] Minimizing the number of trenches both simplifies installation and improves wastewater treatment by increasing soil oxygen availability and reducing ground water mounding.

[8] References that may be useful for ground-water mounding calculations in homogeneous horizontal aquifers include: ((**6**)—Chapter 4), (**7,8,9,10**) Chapter 13), ((**11**)—Section 5.7.2), ((**12**)—Section 4.3.2). The U.S. EPA ground-water mounding analysis procedures (**11,12**) are based on mound height analysis developed by Glover (**13**) and summarized by Bianchi and Muckel (**14**). Finnemore (**15**) describes procedures for ground-water mounding calculations in layered horizontal aquifers, and for four types of sloping aquifers (uniform flow/homogeneous, uniform flow/layered, nonuniform flow/homogeneous, and nonuniform flow/layered).