D. Building a Soil Quality Test Kit

Kit Inventory:

____ Two 6-inch diameter infiltration rings, 5 inches tall; cut from 1/8-inch thick aluminum irrigation pipe; beveled edge on one side **(Figure 1d)**. Mark a line around the outside of the ring, 2 inches from the top.
____ 12-inch wide roll of plastic wrap.
____ Two 500-mL plastic graduated cylinders. As a substitute, 500-mL plastic bottles or 16 oz. plastic soft drink containers can be used **(Figure 2d)**. Mark a line around the bottle at the 444 mL level.
____ 2-lb hand sledge or rubber mallet **(Figure 3d)**.
____ 7 3/4-inch long wood block, 2" by 4" **(Figure 3d)**.
____ Two 6-inch lids with septa (stoppers) for respiration chamber; 6-inch diameter stove-top caps can be used **(Figure 4d)**. As an alternative, the bottoms from a #10 can (coffee can) can be cut (1 inch lip) and used **(Figure 5d)**. The lids should be white or silver to reduce absorption of heat. Three holes fitted with red rubber stoppers, for serum or vaccine bottles, are drilled through the top of the lid to allow for gas sampling.
____ Two 6-inch long latex tubing (3/16" x 1/16").
____ Three 18- to 22-guage, 1.5-inch hypodermic needles.
____ 140-cc (mL) plastic syringe **(Figure 6d)**. A 2-mm hole can be drilled at the end of the syringe handle.
____ Pack of 10 Draeger tubes (0.1% CO_2 detection tubes) **[Figure 6d]**.
____ Soil thermometer (Celsius).
____ Two 3-inch diameter sampling tubes, 5 inches tall; cut from 1/8-inch thick aluminum irrigation pipe; beveled edge on one side **(Figure 1d)**. Mark a line around the outside of the ring, 2 inches from the top.
____ Flat-bladed knife.
____ Garden trowel (heavy duty) **[Figure 7d]**.
____ 1-qt sealable plastic storage bags.
____ 18-inch long metal rod, 1/8-inch in diameter. As a substitution, a straightened coat hanger can be used.
____ Calibrated scoop, 30.0 mL (1/8 cup) **[Figure 7d]**.
____ Squirt bottle.
____ Four 120-mL plastic containers with lids **(Figure 7d)**. As an alternative, any container with lid of similar size can be used; e.g., baby food jars.
____ Electrical conductivity meter (0.01-19.99 mS range) **[Figure 8d]**.

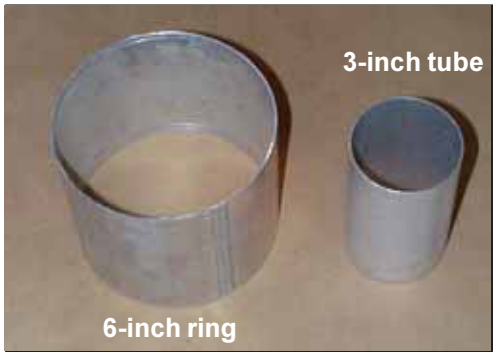

Figure 1d


Figure 2d


Figure 3d

Figure 4d

____ EC calibration standard, 1.41 dS/m (0.01 M KCl).
____ Small screw driver (for EC meter).
____ pH meter (model pHep3[1]) **[Figure 8d].**
____ Packets of 4, 7 and 10 pH buffers **(Figure 9d)**.
____ Bottle of 25 AquaChek[1] nitrate/nitrite test strips **(Figure 10d)**.
____ Box of filter paper, 12.5-cm diameter, Grade 2 - 5 can be used **(Figure 11d)**.
____Three standard plastic eyedroppers.
____Tape measure; 6-foot (metric and English units).
____ Small calculator
____ Permanent marker pen
____ 400-watt hair dryer **(Figure 12d)**.
____ 2-mm sieve, 3-inch diameter **(Figure 13d)**.
____ Two 0.25-mm sieves, 2-inch diameter **(Figure 14d)**.
____ Drying chamber, holds two 2-inch sieves **(Fig. 15d)**.
____ Two 6" x 6" sheets of terry cloth.
____ Calgon[1] (crystal form).
____ Soil stability kit (18 section tackle box with 18 1.5-mm sieve baskets) **[Figure 16d]**.
____ Stopwatch or timer.
____ Finger nail clipper.
____ Paper cups.

Other items needed:
____ Bucket or pan.
____ Mustard powder (optional).
____ Sharpshooter spade or shovel
____ Distilled water.

The kit requires the use of a scale with 0.1 g precision.

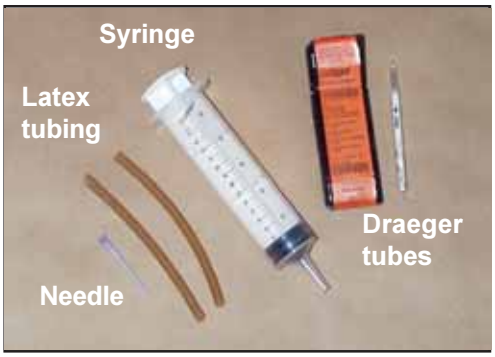

Figure 6d

Figure 7d

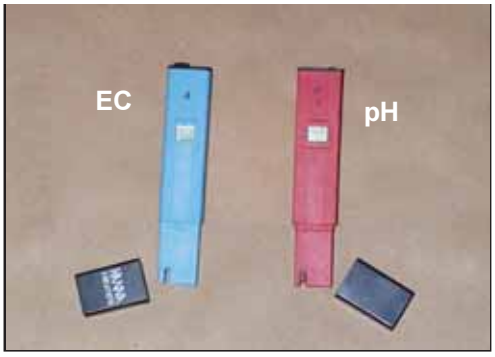

Figure 8d

Figure 5d

Figure 9d

[1]Trade names are used solely to provide specific information. Mention of a trade name does not constitute a guarantee of the product by the U.S. Department of Agriculture nor does it imply endorsement by the Department or the Natural Resources Conservation Service over comparable products that are not named.

The list on the previous pages describes all the equipment necessary for building a kit. The following are some listed items that can be easily constructed.

Construction of 2-mm sieves

1. The 2-mm-opening sieve can be made from No. 10 screens (2-mm openings) cut into discs approximately 75 mm in diameter.
2. The disc periphery is soldered with acid-core solder and mounted on the lip of 3-inch diameter PVC bushings.
3. A section of PVC (sleeve), dimensions 75 mm in diameter by 38 mm high (280 lb per inch rating), is made.
4. PVC cement is placed on the outside wall of the PVC sleeve, and on the inside wall of the PVC bushing. The PVC sleeve is pushed down firmly in to the PVC bushing, so they are cemented together (**Figure 13d)**.

Construction of 0.25-mm sieves

The 0.25-mm opening sieves can be made from No. 60 screens (hardware store) cut and mounted on the bottom of 2-inch diameter PVC joints (hardware or plumbing supply stores) using PVC cement, epoxy, or other thick glue **(Figure14d)**.

Construction of drying chamber

1. Any plastic container can be used. The container used here is a 4" x 6" plastic container with lid **(Figure 15d)**.
2. Drill two 2¼-inch holes in the bottom of the container (for insertion of 2-inch sieves).
3. Drill four ¼-inch holes in each side of the container, and a 1-inch hole on one side for insertion of the hair dryer. A 1-inch rubber grommet can be used to line the 1-inch hole to create a good seal when the hair dryer is inserted (**See Figure 15d**).

To accommodate the drying of more sieves (efficient for a large number of samples), a bigger container can be used with more 2¼-inch holes **(Figure 18d)**. The container pictured in Figure 18d is a small, trunk-style tackle box (13.5 x 8 x 6 inches). The inside tray was removed.

Figure 10d

Figure 11d

Figure 12d

Figure 13d

Construction of Soil Stability Kit

Construction of Box

1. Obtain a "parts" or "tackle" box with a lid; 18 cells, each cell at least 1¼" x 1¼" x 1½" deep **(Figure 16d)**. [sporting goods or hardware store].
2. Seal individual cells in the box with a small bead of silicone glue or caulk.

Figure 15d

Construction of Sieve Baskets (**Figure 17d**)

Materials:

- PVC, 1-inch in diameter, thin wall, about 2½ feet long.
- Aluminum window screen (1.5-mm openings), 4" x 8" piece (hardware store).
- Adhesive (epoxy or thick glue) [grocery or hardware store].

I*nstructions:*

1. Beginning at left end of the PVC pipe, make marks at 1½-inch intervals; 20 marks are needed.
2. Make a smaller mark ¼ to 3/8 inches to the *left* of all the first marks.
3. Beginning at left end, cut ¾ of the way through the tube at the first small mark using a hacksaw or bandsaw.
4. Beginning at the left end, use tin snips to make two lengthwise cuts through the tube, leaving a ¼" diameter "tab" (**See Figure 17d**).
5. Using tin snips or hacksaw, cut through the tube at the first large (1½ inch) interval mark.
6. Repeat steps 6-8 for each of the 20 sieves.
7. Cut 20 1¼" x 1¼" squares of aluminum window screen.
8. Glue a window screen square to the bottom of each sieve.
9. After allowing glue to dry, carefully trim screen to edge of sieves.

Figure 16d

Figure 17d

Figure 14d

Figure 18d

Outlet for kit items include:

Supplier[1]	Items Supplied[1]
Murray, Iowa FFA (515) 447-2517 http://www.geocities.com/murray_ffa/	Soil quality test kits (standard and deluxe kits)
Gempler's Inc. 100 Countryside Dr. P.O. Box 270 Belleville, WI 53508 (608) 424-1544 or (800) 382-8473 http://www.gemplers.com	A soil quality test kit as described in this manual. All kit items.
Fisher Scientific Pittsburgh, PA Ph. (800) 766-7000	Draeger tubes Filter paper, pH and EC meters, scales, graduated cylinders, 500-mL bottles, plastic containers, latex tubing, hypodermic needles
Scientific Industries 2207 Blue Bell Ave. Boulder, CO 80302 Ph. (303) 443-7087	Draeger tubes
Spectrum Technologies 23839 W. Andrew Rd. Plainfield, IL 60544 Ph. (800) 248-8873	AquaChek nitrate/nitrite test strips pH and EC meters scales
Markson Labsales Inc. P.O. Box 377 Wayne, New Jersey 07474 Ph. (800) 528-5114	EC standard solution (500-mL bottle, 1413 microsiemens) pH buffer capsules (pH 4, 7 and 10) Filter paper, pH and EC meters, scales graduated cylinders, 500-mL bottles, plastic containers
Walgreens	400-watt hair dryer
Forestry Suppliers, Inc. PO Box 8397 Jackson, MS 39284 Ph. (800) 647-5368	Sieves, scales
ATM Test Sieves West Allis, WI Ph. (800) 511-2096	0.25 mm screen (60 mesh) 2.0 mm screen (10 mesh)
Veterinary or medical supply	140-cc syringe
Hardware store Grocery or discount stores	2-lb hand sledges, tape measures, hand trowels, small screw drivers Plastic-wrap, 1-qt. sealable bags, 30-mL calibrated scoop

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