

NOTE

A Method for Sealing Soil Moisture Access Tubes. An inexpensive and effective method for sealing the lower end of neutron access tubes used for soil moisture measurements has been developed and tested by personnel of a U. S. Forest Service watershed management project at Charleston, South Carolina. Tubes sealed by this technique—locally referred to as the “stopper method”—will withstand water pressures up to at least 6 pounds per square inch without leaking. Pressures of this magnitude are not uncommon in the lower coastal plain where, over the course of an average year, ground-water levels fluctuate from above ground surface to many feet below.

There are several reasons for keeping water out of access tubes. First, neutron moisture probes can be damaged by immersion. Second, even if the probe is waterproofed, soil moisture measurements taken in or at free water in a tube are in error when used with calibration curves based on a dry tube. Third, with a dry tube it is possible to take measurements below the water table in order to investigate various hydrologic phenomena, that is, maximum water storage capacity of soils *in situ*, alternating saturated and unsaturated layers in a profile, etc.

The stopper method consists of plugging the end of a 2-inch access tube with a rubber stopper coated with a non-hardening gasket sealer and holding the stopper in place against water pressure with two nails running through the tube and stopper. Bentonite clay is placed around the stopper to absorb moisture, swell and further seal the tube, and provide an extra margin of safety against leakage (fig. 1). Materials used are readily available and include the following: size No. 10 solid rubber stopper, non-hardening gasket sealer,¹ a $\frac{3}{8}$ -inch high-speed drill, six penny finishing nails, and bentonite clay. A step by step description of the stopper method is given below:

1. Apply a generous film of sealer around sides of the stopper.

¹No. 2 Permatex gasket sealer has been used successfully in the stopper method. Other non-hardening gasket sealers may work equally well, but they have not been tested by us.

2. Push stopper into bottom end of tube until the big end is recessed about $\frac{1}{8}$ inch.

3. Apply additional sealer around the recessed tube-stopper interface.

4. Drill two $\frac{3}{8}$ -inch holes 90 degrees apart, one slightly lower than the other, through the access tube and center of the stopper with a high-speed drill. The drill bit is a fraction smaller than the nail and insures a tight fit.

5. Insert a 6-penny finishing nail into each hole; apply the gasket sealer liberally around the head and protruding end.

6. Cut off the pointed end of the nails approximately $\frac{1}{8}$ inch from side of tubing.

7. Brad both ends of the nails against side of the tube.

8. Install the access tube to the desired depth in the ground.

9. Drop a 3-inch plug of bentonite clay down the tube in a facial tissue.

A field test of the stopper method was made in a wet location on the Santee Experimental Forest, located 30 miles north of Charleston. Four tubes were installed to a depth of 14 feet, and, over a 3-month period, checked periodically for seepage. Even though the bottoms of

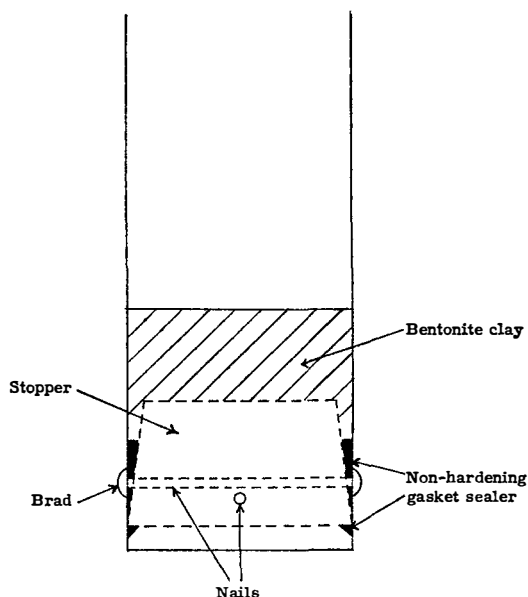


FIG. 1. Access tube sealed by the stopper method

the access tubes were subjected to a hydrostatic pressure of about 19 pounds when the water was at ground surface, no significant amount of seepage took place. Later large-scale field installations on the forest have further verified the results of this early test.

As a rule, access tubes should be sufficiently long to prevent moisture measurements from being taken within 1 foot of the sealing materials, thus reducing possible adverse effects of the materials on the accuracy of soil moisture measurements.

Although the stopper method of sealing was only tested on 2-inch aluminum tubing, it should work equally well on pipe of a smaller diameter if rubber stoppers of the proper size are used.

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