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PLASTIC CASINGS FOR SOIL CORES

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Soil core samples with substantially undisturbed structure are often taken for laboratory evaluation of physical properties, particularly hydraulic conductivity. Most samplers for obtaining undisturbed samples use either a solid metal liner or a split metal liner to hold the sample. Cores taken in solid liners are trimmed, capped and left in the liner for transportation and testing. Samples taken in split liners are usually removed from the liner, trimmed and cased by painting with paraffin or plastic cement. Undisturbed soil cores require gentle handling to prevent breakage during sampling, trimming, packing, shipping and conducting laboratory tests. Core samples in solid liners can develop flow paths between the liner and the core, especially when making hydraulic conductivity measurements. Such flow paths may develop without being detected and will result in erroneous conductivity values. Samples that have been cased with paraffin or fluid plastic are not as subject to developing flow paths between the core and the casing, but the casing material fills some of the pore space, thus creating an indeterminate cross-sectional area.

Modern technology has provided a means for casing core samples which gives support to the samples for handling and testing and provides excellent conformability to the sample to prevent abnormal flow path development. This is accomplished by encasing the core with one of the heat-shrinkable insulation tubings commercially available through most electronics suppliers. Upon heating, this tubing can shrink to one-half of its original diameter. The core can be encased either in the field or in the laboratory. Shrinking requires heating to approximately 270° F. for about 10 seconds. Heat can

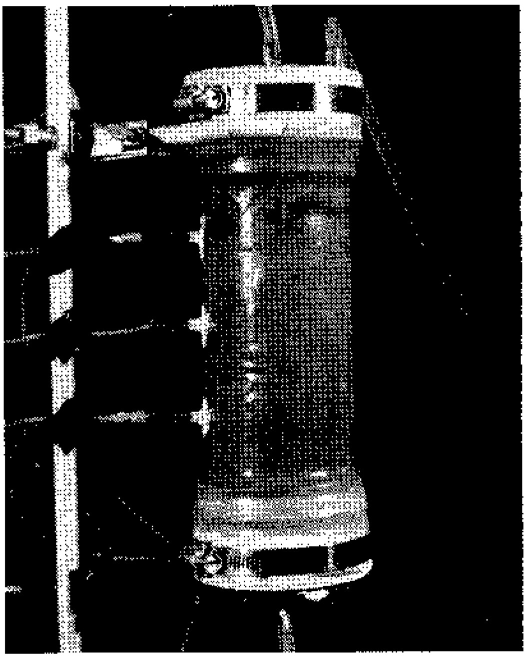

FIG. 1. Soil core sample, encased in heat-shrinkable polyolefin tubing, illustrating conformability to sample, clarity of plastic, insertion of tensiometers, and microbial growth at the upper end of the core.

be supplied in the field with an electric heat gun powered by a portable generator, or by using a gasoline camp stove and an oven. An end cap is used on each end of the core to prevent compression and breakage of the ends of the core during the shrinking process. Moist silt loam cores which were encased in the labo-

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ratory showed changes in the 10-inch length and the 3¼-inch diameter of the soil core to be less than 0.01 inch during the encasing process. The casing retains most of its flexibility after shrinking. There was no evidence of the plastic softening enough during heating for soil particles to adhere to the casing.

Heat-shrinkable insulation tubing is available in several plastic formulations including tetrafluoroethylene resin (TFE), polyolefins, and irradiated polyvinyl chloride (PVC). Bonding materials adhere well to PVC and polyolefin. This allows insertion of small diameter, ceramic tensiometers into or through the core, and sealing where the plastic was pierced as shown in figure 1. TFE plastics are more difficult to bond.

Heat-shrinkable insulation tubing is available in 4-foot lengths with diameters up to 2 inches in PVC, 4 inches in polyolefin, and 8 inches in TFE. These are available in 4-foot lengths, clear tubing can be obtained, permitting observation of the sample for abnormal flow paths and other phenomena such as the microbiological growth which is evident in fig. 1.

The ability of the plastic to intimately conform to the core wall surface was demonstrated when a core was tested for unsaturated hydraulic conductivity. A core, 82 mm. in diameter and 240 mm. long, was encased in polyolefin plastic and tested in a vertical position. The core was saturated, then water was introduced directly to the soil surface at the upper end of the core under 70 cm. of water tension. The lower end of the core was subjected to a soil moisture tension of 500 cm. of water through a porous ceramic plate. When the tensiometers indicated flow under tension, the lower part of the plastic casing was perforated to allow air to enter the core whenever the air entry value of the soil was exceeded. During several weeks of testing, air did not move up between the soil and the casing to the water cavity at the top of the core.