

Simple and accurate device for Sprinkler Irrigation

flow measurements

An easily made device—a square-edged orifice—for measuring the rate of water flow in sprinkler irrigation pipe was the most accurate of several such devices evaluated at Davis.

The square-edged orifice can be made with ordinary shop tools, is sturdy enough to withstand field abuse, and produces a reasonable degree of accuracy with relatively low loss of velocity head. The device and pressure taps can be installed in 1-1½ hours with common shop tools.

All the devices included in the evalua-

tion study were adapted to 4" diameter aluminum tubing.

The square-edge eccentric orifice was made of 3/16" aluminium plate with an effective area—area open for water flow—at the orifice of 76% of the cross sectional area of a steel press-on coupler. The device was tested with a 20' straight approach of pipe and with a 4' straight approach.

When water is forced through the device, the reduced area of the orifice forms a jet of high velocity and low static pressure downstream from the orifice plate.

In a level pipe the differences in pressure upstream and downstream from the orifice can be measured—on a differential pressure gauge or by a U tube air-water manometer—through taps in the side of the pipe in line with the deepest section of the orifice plate. The taps should be flush with the inside surface of the pipe, and all burrs removed to avoid unnecessary errors in pressure measurement.

On the basis of accuracy, ease of construction and adaptability to field conditions, the square-edged orifice is practical for measurement of flow in sprinkler systems. It is simple to construct, and to install, and the use of an air-water manometer is an advantage in field use.

The square-edged orifice method of measurement is accurate over the desired range of water flow in sprinkler irrigation systems.

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Pressure panel for

Soil Moisture Removal

measurements

Soil moisture desorption information can be measured accurately in the laboratory with a relatively simple research tool—porous membrane apparatus—and used to determine the energy status of water in the soil.

The forces with which moisture is held in the soil are adsorption, the attraction of water to the surface of soil particles, and capillarity, the surface tension of water in the soil pore spaces. The composite of these forces is termed soil moisture suction and is commonly expressed in terms of bars or atmospheres, 1.0 bar equals 0.9869 atmosphere. Moisture is removed from soil by plant roots, evaporation and gravity.

A suction of one third bar approximates the amount of water a soil will hold against the downward force of gravity and 15 bars of suction approximates the

level of soil moisture at which plants show signs of severe stress or wilt. The amount of moisture between the one third bar and 15 bars of suction is an estimate of the total amount of water which is stored in the soil and available for plant use. Plants use water more readily when the soil moisture-suction is low.

Soil moisture desorption information can be used to estimate the amount of remaining available water when the soil moisture content is known; in studying the phenomenon of soil moisture movement; and for the study of other soil-moisture problems.

The apparatus for determining soil-moisture desorption information consists of a pressure panel, pressure-membrane units and porous-plate units. The pressure-membrane unit is used to obtain the

high suction range from 1.0 bar to 15 or more bars. The bottom of the chamber has a screen soldered to a sheet metal disc with an outflow tube at the center. A cellulose membrane is fitted over the screen and soil samples placed on the membrane. The chamber is made airtight by bolting the top and bottom plates together.

The porous-plate unit has a ceramic membrane instead of a cellulose membrane and is used to obtain low suction values from 0-1.0 bar. Four to six porous ceramic plates, holding soil samples, are put into a pressure cooker, which facilitates a large number of determinations.

The pressure cookers used with the ceramic plates are individually controlled by extremely sensitive manual loading, pneumatically balanced regulators. The

Concluded on next page

use, and the most efficient spacing of the artificial burrows under various field and gopher-population conditions in California.

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Additional field trials with mechanical bait applicators are planned by many California County Farm Advisors.

Detailed construction plans for a mechanical gopher-bait applicator and operating instructions may be obtained without cost from the Department of Agricultural Engineering, University of California, Davis.

The mechanical baiting experiments in Colorado are reported in Special Scientific Report: Wildlife No. 47, 1960, by A. L. Ward and R. M. Hansen, U. S. Department of Interior, Fish and Wildlife Service, Washington 25, D. C.

FALLOUT DEBRIS

Continued from page 6

duced to about one fifth the amount of strontium90 taken up by plants from acidic soils. Added calcium did not significantly reduce strontium90 uptake from neutral soils of high calcium status or from alkaline-calcareous soils. Crop grown on soils of high calcium status take up only about one tenth the amounts of strontium90 taken up from soils of low calcium status.

The addition of stable strontium amendments to soils at levels compatible for normal plant growth did not effectively reduce strontium90 uptake. There was reduced crop uptake of strontium%, ruthenium106, and cerium137 when high concentrations of bicarbonate were present, as is usual in alkaline and calcareous soils.

The extent to which strontium90 accumulates in the human body through the soil-plant-animal-human food chain apparently depends on the dietary calcium accumulation, because calcium tends to dilute the strontium90 concentrations.

Cesium137

Cesium and potassium also showed complementary ion relationships. Crop uptake of cesium137 increased as the potassium level in the soil was reduced by cropping. The addition of potassium amendments reduced plant uptake of cesium137 from soils low in exchange-