No evidence was found in these tests of real differences in performance between clay, concrete, or bituminous-fiber tiles. Differences in tile outflow were due primarily to soil variation and not to tile performance. Little actual change in salinity resulted from the leaching operation in the body of soil between the tiles. In most cases as much, and often more, water was lost through seepage as was removed by the tile. Much of the water which moved through the soil followed the disturbed trench above the tile, as evidenced by the much lower salinity in that trench. Electrical conductivity of the tile effluent was inversely related to both rate and duration of tile flow. Each tile showed a unique relationship between electrical conductivity, rate, and duration of flow—probably a reflection of a unique combination of hydraulic conductivities along each tile line.

In January 1964, pairs of clay, concrete, and bituminous-fiber tiles were installed in a 40-acre field at the Imperial Valley Field Station. The tiles were laid at 6-ft depths, with 120-ft intervals between lines. The bituminous-fiber tiles with fiberglass filters were installed with perforations up. The clay and concrete systems were surrounded with a washed-gravel filter. The lines were 1250 ft long. These three tiles were installed as part of a long-term experiment to determine the longevity and effectiveness of these materials over an extended period of time (it is expected that observations will continue over a period of 20 to 25 years).

The first observations, in 1966, represent initial tests of the three materials. The effectiveness of these lines will be recorded periodically to show how the flow changes with time. In addition, segments of the lines will be examined to see how they stand up under a long period of use. This report gives the initial comparison of operations of these three different types of material.

A description of the soils of this area (made before tiling) was based on three subareas: (1) silty clay loam, fine sandy clay loam, and sandy clay loam in the first 4 ft, giving way to a dense clay which continued to 10 ft; (2) clay loam and dense clay throughout the entire 10 ft, with one area of sandy loam at 5 to 6 ft; and (3) holes dug in subarea 3 indicated that further subdivision should be made to describe the soils adequately: part contained clay loam throughout the 10 ft, while nearby, silty clay loam in the first 3 ft gave way to fine sandy loam down to 10 ft. Average permeability values, obtained for the different subareas of the experimental plots, varied according to the materials present, and were generally low except for small isolated areas.

During April 1966, levees were constructed in the field which isolated the pairs of tile and segmented each pair into a south third, a center third, and a north third, as shown in the test plot diagram. The south third was flooded first by allowing water to spill from one segment to the next. A steady flow was maintained across the pond to keep the ponds full. Each third was then allowed to drain before the next was filled.

Soil moisture and conductivity records of saturated soil pastes were obtained to 5 ft of depth prior to and following the ponding operation in each third. Tile outflows were recorded twice daily with 4-inch, V-notch weir inserts placed in the ends of the tile. Electrical conductivity of the tile effluent was recorded twice daily. Twenty-four samples of 700 cc tile effluent were evaporated to define total salt content as a function of electrical conductivity. Total salt removal was then calculated.
The graph shows flow and electrical conductivity data for the tile effluent from a single tile line in the center third of the area. The other tiles showed the same general inverse relationship between electrical conductivity and both rate and period of flow. The relationship of electrical conductivity to rate and duration of flow was unique for each tile line and no general relationship could be established. This undoubtedly was the result of a unique combination of hydraulic conductivities along each tile line. Areas of high hydraulic conductivity tended to dilute the salinity in the areas of low hydraulic conductivity. The high initial rate of effluent reflects the method of filling the ponds. A flow of 2 cu ft per second was used for the first five days until the ponds were full. The rate was then dropped to 1/2 cu ft per second to maintain a continuous flow across the ponds to establish a constant surface level. The surface level dropped when the flow was reduced and the tile flow dropped at that time.

Table 1 shows the total water and salt removal from each of the six tiles. Differences in outflow between thirds of the same tile line were greater than differences between pairs of tile, and differences between tiles of the same pair were of the same order of magnitude as those between pairs of different types.

Table 2 shows soil salinity changes from saturation extracts taken before and after flooding. Changes in salinity were quite small in the body of soil between tiles and may have been accounted for by the initial wetting.

Table 3 presents the saturation extracts taken in the north third from directly over the tile, 15 ft from the tile, and 60 ft from the tile line. Salinity in the disturbed trench above the tile line had about one-half the value of the samples taken farther to the side of the tile line.

Table 4 shows the rate of fall of the ponds after water was turned off. This drop in level was partitioned into three quantities: The measured outflow from the tile, the loss due to evaporation, and the remainder which was lost to deep or lateral seepage. Evaporation loss was 0.7 times that from a weather bureau pan.

In a second method used to check the evaporation estimates, electrical conductivity of the pond water taken from the north third when the water was turned off was recorded at 2.02 mmho per cm. Fourteen days later the conductivity was 4 mmho per cm or twice the value, indicating one-half of the water had evaporated. The drop in pond level had been 220 mm. Of this amount 110 mm was due to evaporation at 8.0 mm per day, as compared with the pan estimate of 8.6 mm.

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