

New Trench Drainage Method Solves California Greens Problem

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The city of Walnut Creek, Calif. has successfully applied a technique called the "trench drain method" to improve the drainage of its municipal golf course greens resulting in an estimated savings of \$75,000.

The city had been experiencing increasing difficulties with its greens for the past three years caused by water not percolating adequately through the green to the bottom drain lines. This resulted in "saturated" greens with unsatisfactory playing surfaces and promoted the invasion of *Poa annua* in the greens themselves. The greens' playing surface not only had "soft spots" because of the development of a thick layer of thatch, but "hard spots" caused by poor water drainage. Thus, a golf ball landing on the green might stay in the same place it hit or bounce a considerable distance.

In order to ascertain the nature and cause of the greens' drainage problem, the city made arrangements with the University of California cooperating extension service to conduct a series of greens tests. A representative of the Extension Service, with assistance from the golf course maintenance staff made the following four tests of the greens: water infiltration test, soil profile test, examination drainage

outflow test, and precipitation rate test.

The results of the greens tests indicated that the golf course had a severe drainage problem in most of its greens. The infiltration test indicated that the average water percolation rate was .39 inches per hour without turf in place, compared to a standard average of one to one and one-half inches per hour. The greens profile tests indicated the presence of saturated layers of soil in the soil mix, again indicating inadequate drainage. The precipitation test proved that the greens were receiving adequate irrigation coverage.

Following the greens test, representatives of the city's public service department, extension service, and the golf course architect met to review the test results and discuss alternative improvement measures. It was concluded that the primary cause of the greens' drainage problem was the inability of the existing greens' soil mix to pass water successfully. Since the greens' soil mix was a combination of native soil, sand and organic matter, it was concluded that the fine clay soil particles in the native soil mix were building up at various levels in the soil strata, causing a barrier to water drainage.

The traditional method of correcting a severe greens' drainage



Ed Watson, golf course supervisor for the city of Walnut Creek, prepares one of the trench drains for a green (left), and after work has been completed (right).



problem such as this is to rebuild the green. Since it costs approximately \$6,000 to rebuild a green, the total cost of this alternative was economically unfeasible.

Public service department staff, working with representatives of the extension service and golf course architect developed a new experimental method for improving the greens at considerably less cost. This method, termed the "trench drain method", involved the digging of four-inch trenches at two to five foot intervals (following the surface contour) throughout the green surface and filling these trenches with sand to create a series of "dry wells" or vertical drains allowing the irrigation water to percolate through the green to its base drain tile into the greens' drainage system. Small grooves, one-half inch in width and about two inches in depth, were also made in a diagonal pattern to the trenches to provide additional channels for surface irrigation water to move into the trenches and drain down to the drain tile. We estimated the cost of the method to be approximately \$1,000 per green.

In October, 1974, golf course maintenance staff performed the method on the eighth green. By making only a few trenches each

day, filling with sand and resodding immediately, the green was never taken out of play. A series of 13 trenches, five feet apart and 12 inches deep, were made throughout the green. A verticutter was used to make four-inch grooves one foot apart in a diagonal pattern to the trenches. This process took about three weeks.

This work was followed by the topdressing program of adding $\frac{1}{8}$ inch of sand to the surface of the green twice a month. This was necessary to build up the surface of the green to smooth any unevenness caused by the trenches and grooves and facilitate surface drainage to the sand trenches. The green was topdressed twice a month for nine months, after which it is currently being done once a month. The cost of using the method on this green was \$475 for materials (sand and equipment rental) and 160 workhours for the installation and filling of the trenches.

The eighth green was observed closely during the winter months to determine how well it drained the excess water caused by rain. The drainage of this green during this time was determined to be improved significantly well beyond our original expectations. Golf course

maintenance staff also reported that during the spring and early summer, this green drained the irrigation water much better. The topdressing program developed for the greens has resulted in an improved playing surface.

Last May a representative of the cooperating extension service made a series of infiltration tests on the eighth green to measure the change in water percolation through the green. The results of those tests indicated that the overall drainage of the green has improved significantly. Not only is the drainage in those portions of the green above the trenches improved as expected, but most importantly, there was a lateral movement of water to the trenches through the grooves and sand layer developed through the topdressing program.

The city is now using the method on an annual basis to improve the remaining golf course greens. Three of the greens, however, had to be rebuilt because of extensive problems with their drains and soil mix. Since inadequate drainage of greens is a common problem for many golf courses, we believe that the method provides an economical technique for making drainage improvements to golf course greens. □