



Midlothian C. C. (Chicago district) has a water system that combines deep wells, a stream and this reservoir site. The pumphouse shown has automatic pressure control apparatus as a feature

Watering System for 9-Hole Course Must Look to the Future

By WENDELL P. MILLER

THE nature and extent of the nine-hole watering system is determined by the amount of funds available. Usually the problem is not how efficient in results and how economical in operating costs, but how cheaply can water be carried to the tees and greens. Golf course sites are rarely selected with any consideration for the irrigation and water supply problems and both drainage and irrigation are budgeted *after* the surface work, the constructor, and the architect are taken care of. This situation is a concomitant of golf club organization and there is no preventative, during the early club stages, for inadequate drainage and irrigation construction. We can point out the errors that are commonly made and indicate the materials and construction that are proving satisfactory in the hope that the designers of the initial water systems will make the most of funds available through improved design and construction, and perhaps be better equipped to argue for larger appropriations for the water system, to the end that the engineer who in later years is called upon to improve and extend the water system is able

to utilize all of the original construction in the complete irrigation project.

It is indeed unfortunate that club officers, organizers, and course owners cannot foresee the ultimate consequences of this "penny wise pound foolish" policy in lavishing money on clubhouses, furnishings, and all sorts of accessories, while starving the water and drainage systems, the facilities which more than any others can contribute most to the final success of the club.

In the absence of the owners' or clubs' foresight and understanding of their irrigation and drainage requirements, the designer is forced to eke out the meagre appropriations by designs and construction they would not otherwise even consider, and by establishing water supplies which are inadequate at the outset.

We hope that our propaganda for better golf courses and better course facilities will eventually bring our golf course owners to an understanding of the fundamentals of irrigation and drainage requirements, and that the following outline of irrigation requirements and construction will be of particular assistance, not only



Concealed tee sprinklers in "mow-over" tees at University of Michigan's new golf course

to the nine-hole courses, but also to new courses of all sizes.

Water Supply for Nine Tees and Greens

A water system is nothing without water, hence first of importance is a dependable water supply of not less than 10,000 gallons per day, if the soil is tight, or 15,000 per day for medium soils, and 20,000 gallons for loose, sandy soil. If, in addition, the climate be arid, then another 5,000 to 10,000 gallons are necessary. Further, the entire daily water supply should be available for withdrawal within an eight-hour shift. The above figures do not include lawns, stables, swimming pools, and other accessories nor do they include fairways.

Pressure and Pumping

The working pressure should be above 50 pounds at the extremities of the system. This pressure usually cannot be obtained from an aerial tank unless the tank be located on a hill or rise. For rough figuring allow one foot of pressure to two and one-half feet of elevation. If city water is used, the pressure is apt to be low as golf courses are usually located at the extremities of the city water system. By sprinkling after 10 o'clock at night the peak load on city water systems can be avoided and maximum city pressures secured. If possible, a pressure pumping plant (booster) should be installed for either city water or aerial tower supply. Boosting the pressure to 80 or 100 pounds greatly simplifies the work of sprinkling. For a nine-hole tee and green system the pump can be installed with ordinary manual control. A centrifugal pump with a capacity of 150 to 200 gallons per minute will

operate nine green sprinklers very effectively. The cost of pump, motor, switch, fittings, and shelter box should not exceed \$1,200 installed (does not include bringing electric wires to pump). This same equipment will serve if the water is to be taken from reservoir, lake, or river. If a well is the source of supply, the well pump can be arranged to supply the tees and greens direct without booster pumping, but if an aerial tower or standpipe is used, without automatic control of the well pump, it will be necessary to pass the water through the aerial tank and use it at whatever pressure is thus provided—or with the addition of the booster pumping plant mentioned. Bear in mind that when booster pumping is employed the pressure under which the water enters the pump is not lost or duplicated—it is merely increased.

Wells, Towers, Clubhouse and Course

It is this combination which furnishes the complications. The simplest arrangement, as above mentioned, is to pass the water through the aerial tank, and use a booster pump to provide proper pressure for the golf course. Direct pressure pumping by well pumps to the golf course is not satisfactory, particularly with deep lifts; and if the well also supplies the clubhouse through a tower, or otherwise, the complications arise from the simple fact that adequate pressure for the golf course is ruinous in the clubhouse, the plumbing will not stand it. Of course, pressure reducing valves can be used to protect the clubhouse plumbing but there are objections to reducing valves, and so it goes. The combination of deep well,

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aerial tank, clubhouse and golf course provides plenty of problems for the designer, and is usually solved by giving the golf course the short end. There is no set answer or formula for these problems, each is a study in itself. The only common basis is the need for separating the house supply from the course supply, and having each independent, if this can be arranged.

Importance of Water Supply

The importance of an adequate water supply cannot be overstated. Suitable pressure ordinarily cannot be supplied by either city water, aerial towers or stand-pipes. When golf course architects learn that the 20, 30, or 40 pounds pressure provided by municipal water systems or aerial tanks is woefully inadequate either for forcing the water to the extremities of the small pipes usually found in tee and green systems or for efficiently distributing water through up-to-date equipment, proper attention will be given to the water supply. But until then the greenkeepers of the nine-hole courses must struggle along with inadequate water supplies.

Again, if it be known in advance that the water pressure is inadequate, why should the designer of the water system compound an untoward condition by specifying pipe sizes which would be small even with pressure pumping? Yet this double inadequacy is common practice. You can go into any golfing district and find greenkeepers making from five to ten sprinkler settings to each green even on courses designed by prominent architects!

The adequacy of the initial water pressure is paramount to successful irrigation practice, and is equally as important as the pipe sizing or the layout.

Layout

The layout of the piping system for tees and greens for nine holes should, of course, follow a design suitable for combined fairway, tee and green irrigation for a future 18-hole course (if extra land is available) and should be constructed of permanent piping.

Rarely, however, will any new nine-hole course have funds for this and in nearly every case the problem is to provide water for tees and greens at the absolute minimum capital outlay, which means galvanized or even black, or second-hand, steel pipe laid in straight lines connecting the tees and greens with the least amount of piping and without any regard for future construction.

(To be continued.)