

locale. These can be obtained from your local Weather Bureau. New York City, for example, in its 75 years history, reports that the average rainfall for the 22-week period from April 1 through September 30 was 18.53 inches. Based on the "rule of thumb" assumption that grasses normally require one inch of water per week, theoretically, to span this critical 22-week period, we need only to supplement with 3.47 inches of artificial water to satisfy our requirement. Actually, because of the usual erratic distribution of rainfall, we should allow for at least double this amount, according to most irrigation specialists, in order to be on the safe side.

What does this mean in gallons? The average golf course has approximately 45 acres in fairways. It takes approximately 1¼ million gallons to provide one acre inch of water to 45 acres. To satisfy our requirement of applying 3.47 inches it would take approximately 4½ million gal-

lons of water. To be on the safe side, therefore, it would be necessary to have approximately 8¾ million gallons of water for irrigation purposes for an average golf course in or around the New York Metropolitan Area. This is the average situation; actually, there are courses in this area that use less water yearly, and there are courses that use more. From Weather Bureau records available each of us could work out the requirement for any specific area in the nation.

Water is one of our most precious natural resources. With the increase in population and growing industrial uses, there is growing concern that as a nation we are running out of water, and many states are closely re-examining their water policies with an eye toward new and adequate legislation on this problem. There is no room for water waste as a nation, nor is there room for waste on the golf course.

Water Distribution Systems

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Fundamentals and standards have been developed for water distribution systems. However, the application of these standards will vary with the use made of the systems. For turf development and maintenance this variation is obvious. Differences in soil, terrain, type of grasses grown, degree of maintenance, all affect the system used. The watering practice for any course must be adapted to meet local conditions, otherwise the watering system can become a liability instead of an asset.

Several items will be covered by my remarks on our experience with water systems at Pine Valley.

Many of you know that our course is built on very sandy soil. Without an adequate supply of water it would be impossible to produce good golfing turf. Fortunately, we are blessed with an abundant supply of good water at all times. This water comes from several spring-fed lakes on the course.

In 1912 when our first holes were built, a temporary water system was installed. The water was supplied from three lakes at different locations on the course. The

power for the chain-driven pumps came from huge water wheels. The water wheels in turn got their power from the overflow of the dams. Two of the old water wheels are still on the course—just for rustic effect.

In 1920 when the course was completed, a permanent watering system for fairways and greens was installed. (As a matter of fact, this layout was the most up-to-date system at that time.) In this system all the mains ran parallel to the fairways with hose outlets, spaced every 80 feet, located in sunken wooden boxes flush with the ground. There were over 300 outlets of this type, and 25,000 feet of hose was needed to water the course. This system held up well for nearly 40 years. Although it offered much flexibility in that you could put the water where it was needed and in the quantities needed, it did have many limitations. The pressure loss was great. A system of this type requires 150 to 200 feet of hose from outlet to edge of fairway, and it is interesting to note that a sprinkler producing 10 gallons per minute, traveling through ¾ inch water hose will lose 14 pounds of pressure for each 100 feet traveled.

Maintenance and replacement cost for hose and sprinklers, and rising cost and availability of labor to operate the hose system, caused us to consider a change. Daytime watering interfered with golfers' play, while nighttime watering was not possible due to the unavailability of labor.

Since 1957 we have been in the process of modernizing our system by installing underground, quick coupling valves through the center of the fairways. We completed five or six fairways each winter, and hope to finish the installation by this spring.

In the 1920 system very good planning was used in that large mains (9 inches) were installed. These mains have proven to be adequate for all changes which we have made. All the laterals for our quick coupling system are connected to the old mains.

It is of interest to note that after 40 years of use the galvanized mains show little or no corrosion from the water. Because of this we have used galvanized pipe throughout our present program.

We pump our water from a four acre lake. A 9 inch suction pipe carries the water from the filter to the pumphouse. The pumphouse is located below the dam and the water level of the lake. This filter is boxlike, made of logs and stone. The outside wall or fence is 12 by 12 feet and the inside wall is 6 by 6 feet. The area between these walls is filled with crushed stone. This type filter has proven to be very effective in screening out all kinds of debris such as weeds from the lake, leaves, fish and fishing gear, and turtles.

We have two electrically driven centrifugal pumps—A 500 gallon-per-minute and a 1,000 gallon-per-minute pump. The small pump furnishes enough water for five or six fairways and greens. When more water is needed or the pressure drops to a certain point the large pump starts automatically.

The water is pumped directly into a 9 inch main which is reduced to smaller mains. Four inch mains are the smallest size used on the course. Galvanized pipe (2½ or 3 inch) is used for laterals in the fairways for the quick coupling valve system. Wherever possible the laterals are looped back into the mains in order to give more pressure and volume to the sprinkler. Facilities for drainage and

shut-offs have been included in all fairway installations.

The sprinkler valves have been so located that all turfed areas can be reached. The nozzle size varies according to area to be covered, and pressure and volume of water at the location. If for some reason some areas in the fairways—high hard-spots—need additional water, this can be supplied with a length of hose and sprinkler attached to a quick coupling valve and swivel system.

Our new system provides a better distribution of outlets with a higher pressure at the outlet.

The snap-on valves are placed slightly below the surface of the turf. A 5 inch steel sleeve approximately 16 inches long is placed around the valves and risers to keep the grass (Bermudagrass) from growing over.

We feel that our change to the more modern system has shown the following advantages:

1. One man can water half of the course in one night. Prior to this, up to five men were sometimes used.
2. The yearly maintenance cost has been reduced as there is no more hose to buy.
3. Unsightly hose and valve boxes along the fairways have been eliminated. Equipment can be operated with much greater ease, and there is no interference with golf play from these obstacles.

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