# Water Systems-Engineering and Installation

## A Panel Discussion

At USGA Green Section's 1966 Conference on Golf Course Management, New York. Marvin H. Ferguson, Moderator; Graham Daniel, Austin Miller, J. B. Moncrief, Panelists.

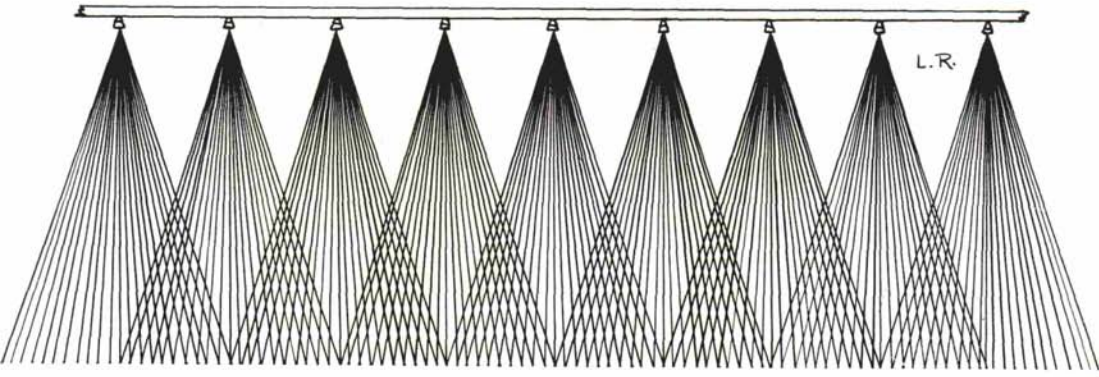
Users of irrigation systems indicate repeatedly that many faults in their systems can be attributed to poor engineering or poor installation. Complaints about types of pipe can often be traced to methods of handling or installation rather than to faults in the pipe itself. Similarly, poor coverage is not always attributable to improper sprinkler design or improper spacing; it may be caused by mismatching the supply pump and the distribution system. This panel has answered questions on a variety of subjects relating to the proper engineering and installation of irrigation systems. The following account purports to summarize the answers provided by panel members.

*Q. In arranging for the installation of an irrigation system, who represents the interests of the club?*

A. Very frequently the chairman of the green committee or some other individual chosen as chairman of a special committee will act as the club's representative. Usually this person will not have any special knowledge that would equip him to deal professionally with the problem. He goes to the local dealer in golf course irrigation supplies and tells of his club's interest in an irrigation system. The dealer may then suggest that he or the sprinkler manufacturer he represents can provide a plan for an irrigation system without cost to the club, provided the club purchases the necessary supplies through the dealer.

The dealer may make such an offer in good faith and the customer may find that the deal represents a bargain. On the other hand, the club may not be satisfied with the performance of the completed irrigation system. When club members go back to the

*A good spray pattern—a turf management must.*



dealer, he may point a finger at the installer; the installer may blame the materials, or vague language in the specifications, or the wrong type of sprinklers. The point is that the club may never learn where the fault lies. The members simply have on their hands an irrigation system that does not meet their expectations and they don't know how to solve the problem.

The consensus appears to be that a club's first step should be to hire an independent design engineer. This person serves the same function as an architect in the building trades. He has nothing to sell except a good design and supervision of the installation. This man draws the plan, writes the specifications, helps the club with bid procedures, and inspects the job as it progresses. If there is any malfunction, he can determine whether it is caused by materials, design or installation and he can have the fault corrected.

Golf club committees can then deal with one person and this person can see that they get the type of system they need. Most dealers in irrigation supplies agree with this approach. Their business is to sell supplies. Happy customers are good for business. Conversely, if a system is unsatisfactory, the name that usually sticks in the minds of observers is the one which appears on the cover plate of the sprinkler head.

*Q. Are moisture sensing devices such as gypsum blocks and tensiometers useful in turfgrass irrigation?*

A. It seems likely that refinements and improvements of such devices may in the future make them useful in practical installations. At the present time, they are useful as research tools and in some limited ways lend themselves to practical application. There appears to be no place for them on any broad scale at the present.

*Q. Discuss the merits of the various kinds of pipe available for use in golf course irrigation systems.*

A. This is a big and controversial question.

Let us start with cast iron pipe. It has been a standard for comparison for many years. It has a long history of trouble-free use and for that reason it is specified for many municipal water supplies. Despite its many outstanding qualities, it has a few drawbacks. Cast iron is heavy and relatively expensive with respect to original cost. Rubber ring seal joints have served to simplify installation. There is some problem of scaling with certain types of water. Some cast iron pipe is cement-lined and this solves the problem of scaling or rust.

Galvanized pipe in smaller sizes has been usd a great deal, but it is more frequently subject to corrosion than other types. On the other hand, it is strong and relatively easy to work.

Asbestos-cement pipe for use in the larger lines on golf courses has become more popular. This pipe requires considerable care in handling. It must be bedded in stone-free soil or sand and where turns are made, blocking is required so that surge and vibration do not cause shifting. Provided adequate attention is paid to these details, asbestos-cement pipe performs very well. Because of the inert nature of the material, excellent flow characteristics are maintained over a long period of time.

Plastic pipe is being used rather widely in conjunction with asbestos-

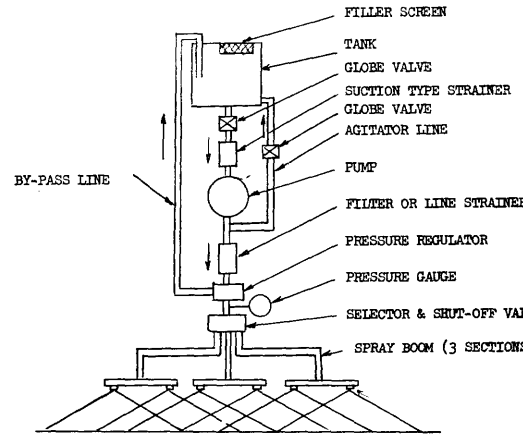
cement. The most popular of the plastics is polyvinyl chloride (PVC). Plastic, like asbestos-cement, is inert and very smooth inside so that friction loss is relatively low and flow characteristics will remain good for many years.

Criticism of plastic pipe has resulted from splitting and from the fact that it sometimes pulls apart at joints. It seems likely that careless handling is responsible for most of these troubles. Joints are made by solvent welding. The pipe must be clean and dry and it must be allowed to "set" before being subjected to movement or twisting. The time required for hardening or setting of the weld is influenced by temperature, and of course dampness or light rain can make the job extremely difficult.

In summary, it appears that plastics and asbestos-cement pipe both require careful handling and definite procedures, but when this care is accorded the installation process, these kinds of pipe perform very well indeed.

*Q. When a water system is installed over the golf course, is it important to be able to cut off parts of the course so that when repairs are made one doesn't have to drain the whole system?*

A. Yes. A well-planned golf course irrigation system will permit the isolation of certain portions of the course. Ideally, these cut-off valves should be spaced very close together so that only a small portion of the system would require draining. Practically, however, such valves are quite expensive, and they contribute somewhat to friction losses in the line. It is usually satisfactory to place valves in such a way that the system supplying two or three holes can be isolated.




*Schematic diagram indicating the essential parts of a sprayer*

*Q. When specifications are written for water system installation, is it not important to specify the scheduling and timing of various operations? To illustrate the point I'm trying to make, let me cite the experience of my club. We contracted the installation of the system to a contractor who enjoys a good reputation. However, he had other jobs in progress and he subcontracted much of the work at our course. One subcontractor dug the ditch. His contract apparently called for a specific number of feet of ditch. He came to the course, dug as much ditch as he could in a day and left. He was also responsible for backfilling the ditches, and when the pipe was laid for one section of the course, we expected that he would do the backfilling. The ditching contractor, however, contended that there was no time specified and he would do the backfilling when he came to dig more ditch.*

*In the meantime, rains washed out the ditches, mud was scattered over our low fairways and the golf course was just about unplayable. This isn't the end of our sad story, but this much will serve to make my point.*

*We eventually got a good water system and we are happy with it. The club would gladly have paid a few more dollars, though, to have had the job done in an orderly fashion so that the golf course would not have been torn up all summer.*

A. The gentleman's question just about answers itself. It is important to have your design engineer specify any scheduling requirements that may be pertinent in your case.

*Q. We've talked a great deal about sprinklers, spacing, design, pipes, and matters of that sort. What can the panel tell us about pumps? What about location, sizes, and types?*

A. Let's start with location. Hopefully, the water supply will be located somewhere near the center of the area to be irrigated. Because of friction loss considerations, the shorter the distance water must be pumped, the more efficient the equipment.

The most popular type of pump is the centrifugal type. Such a pump has a good water "pushing" capacity but a poor "pulling" ability. Therefore water should be pushed uphill and through the pipes. It should not be located in such a way that a great deal of suction is required to lift water from the supply to the pump.

Pump sizes can be calculated by any competent irrigation engineer. Because neither pumps nor power sources operate at the peak efficiency at which they are generally rated, it may be necessary for your designer to make generous allowances when calculating the sizes you need.

At many golf courses, one large pump is used for most of the irrigation and there is one small auxiliary pump for standby duty. We feel that it is better to have two medium sized pumps. These can be used together for peak loads, but either probably can provide sufficient water to keep the golf course alive in the event one must be shut down for repairs.

*Q. This isn't really a question but an observation. Drawings showing the plan of an irrigation system ought to be accurate. The drawings our contractor left with the club show that all the hydraulic control tubes of our automatic system are at least eighteen inches underground. Last summer, our superintendent started scarifying an area where we intend to build a practice putting green. The tractor drawn chisel was being operated at a depth of 8 or 10 inches when it caught a bundle of these hydraulic control tubes. Here were sixteen broken tubes. They are not color coded. There was no way of telling which ends fitted together. One of our statisticians figured out that there were 255 possible combinations. There weren't supposed to be any tubes in that area.*

A. It is rare when a system is installed exactly as the plan indicates. Therefore, the club should insist that it be provided with a plan showing the system "as installed." An "as planned" drawing can be not only misleading but dangerous if the installation varies from it.