Golf Course Irrigation

By C. E. (SCOTTY) STEWART
Registered Engineer, Homewood, Ill.

(Second of Three Articles)

Properties of Pipe, Trenching and Backfilling and Water Supply Sources Are Discussed in Second of Three Articles

THE major cost in almost every irrigation system is the pipe, which for an 18 hole golf course, approximates 23,000 ft. in sizes ranging from 8 in. to 1¼ in. Pipe is, as you know, available in cast-iron, steel, copper, cement-asbestos and plastic. All require special care in installation.

Since an irrigation system in the midwest is not used during the winter, it is rarely necessary to bury the pipe below the frost line. A 24 in. soil cover over the top of the pipe is sufficient. Shallow bury, however, sets up certain problems, the chief of which is temperature range the pipe becomes subjected to during winter and summer. It may vary from zero to 70 deg. F.

Expansion Properties

This range sets up considerable expansion and contraction in pipe materials; much more in some than in others. The lineal co-efficient of thermal expansion in cast-iron, steel, copper and cement-asbestos pipe is about the same but is much higher in plastic pipe. To cite one example: If we run a pipe down the middle of a 400 yard fairway and if it goes through a 70 deg. F. temperature change it will be approximately six ins. shorter in the winter time if it is made of cast-iron, steel, copper or cement-asbestos. But it will be 57 inches shorter if it is made of plastic material. To overcome this large contraction effect and keep the pipe from pulling apart, plastic pipe manufacturers suggest that the pipe, when installed, should be "snaked" in the trench, I personally feel that the best precaution is to bury it below the frost line where the temperature is fairly constant.

Cement-asbestos pipe has been used on a few golf courses in the middle-west and as far as I can determine is suitable. However it might be well for you to bear in mind that the walls of cement-asbestos pipe absorb some water. According to the circular C450 issued by the U. S. Dept. of Commerce, water absorption of asbestos-cement pipe, after 14 days immersion in water, went up as high as 10 per cent expressed as a gain in weight. This indicates that although in draining this pipe, we might be able to get all of the free water out of it there still might be a percentage of water retained in the wall of the pipe which could form into ice during freezing weather. Water, as you know, when in the form of ice is approximately 8 per cent greater in volume. This condition could in time cause flaking and weakening of the pipe wall.

So if you plan on using this pipe it might be well to bury it deeper so it will not be subjected to freezing temperatures.

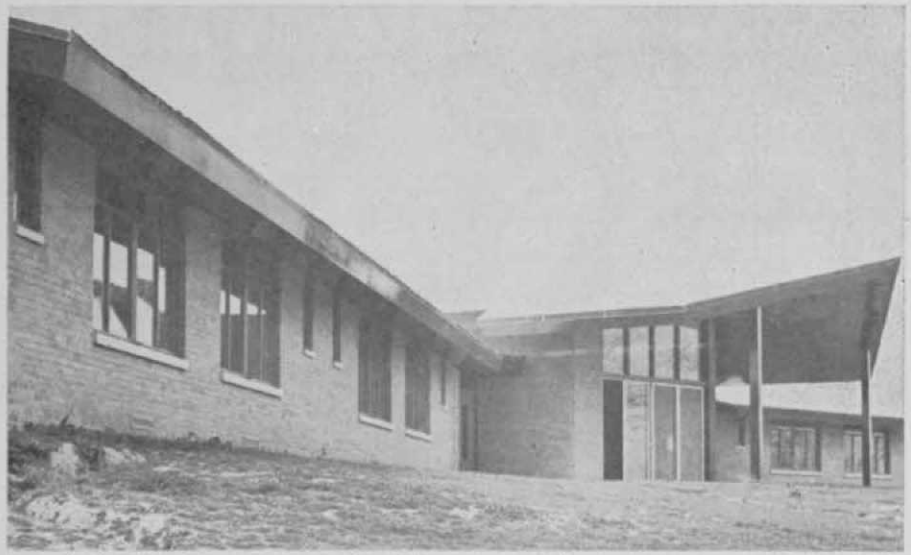
Temperature changes seem to have little effect on cast iron pipe because bell and spigot joints permit a slight movement at each joint.

In steel pipe, which is usually threaded and coupled together, movement set up by temperature changes is usually taken care of by inserting expansion joints at approximately 250 ft. intervals.

Some of you whose courses border electric railroads or street car lines may encounter some trouble with electrolysis where stray electric currents leak from the rails along the pipe and then back to the rails. This condition pits the pipe and eventually a hole appears. There are several ways to overcome this problem but probably the best is to use a non-metallic pipe at critical points.

Trenching and Backfilling

If damage to turf, either by the settling of the backfill or scalping by mowers is to continue over the years owing to a poor backfilling and turf relaying job, it greatly detracts from the value obtained



Mr. and Mrs. Waco Turner of Burneyville, Okla., are completing an elaborate recreation center in that community that includes an 18-hole course, the lodge, shown above, and six other buildings. The course winds around five lakes, one of which covers 3½ acres and is located on the 10th hole. The Opie Turner Open for women was recently played in Burneyville.

from a new irrigation system.

One method of trenching which works out quite well is to first remove the turf to a width 4 ins. wider than the trench width. This permits a 2 in. shoulder on either side of the trench which eliminates much damage to the turf during pipe-laying operations and later provides a grade for relaying of turf. The trenching machine which seems best suited for the work is the type which deposits all excavated material on one side of the trench, thereby leaving the other side clear for pipe laying operations.

When the pipe has been properly layed a 6-in. layer of backfill should be thoroughly tamped under, around and over the pipe. When the turf is layed and rolled or tramped it should go back to original grade.

Disadvantage of Crowning

Years ago we used to crown the backfill and the turf on the trench lines with the thought that it would eventually settle. Unfortunately, although some of it did settle, a lot of it did not, the result being that for a number of years after the irrigation system was installed the crowned turf on the trench lines got scalped each time the fairway was mowed.

The method employed by Don Strand at Westmoreland CC, Skokie, Ill., in backfilling trenches in his greens after he had installed the center system of green watering is, in my opinion, most effective and certainly bears description. After removing turf on the green and excavating the trench Don layed in a 4-in. line through which he pushed the 1½ in. water line to the center of the green. A few cubic feet of crushed stone was then deposited at each end of the outer pipe. This made an ideal drain for the removal of any excess water that might accumulate around the green sprinkler. In backfilling he had a man walk in the trench and shovel in the back fill in 3 or 4 inch layers. This enabled him to get correct soil compaction. Roy Nelson employed the same method a year or so ago at the Golden Valley C.C. in Minneapolis and obtained equally satisfactory results.

Water Supply Sources

One of the chief problems encountered when a new irrigation system is considered is an adequate water supply. Courses which can obtain adequate water from nearby rivers or lakes are certainly much more fortunate than those which have to depend on a city water supply, wells, or man-made lakes.

Courses which obtain water from the city main and then boost pressure by means of a pump often find that the rapid growth of a city forces the city water

dept. to curtail supply. In many cases the supt. is ordered to water at designated times which are either of insufficient duration or don't fit in with his schedule of work operation. This problem has been overcome by excavating a lake for water storage on the course. The water for filling the lake may be taken from the main at greatly reduced volume and over a long period, thereby relieving the load on the main. A pressure pump then takes the water directly from the lake and supplies it to the irrigation system.

Lake excavations in the Chicago area average 50 cents per cu. yd. Thus construction of a lake can be a costly job and its size, depth, inlet and overflow structures should all be carefully considered. Where a lake used for water storage serves as a waterhole, it becomes an important part of the landscape. Its size should be such that during any pumping period the water level is not lowered more than 12 ins. If it is lowered considerably more, an unattractive, non-vegetated area will be revealed and will detract from the landscape.

In cases where it hasn't been possible to obtain sufficient surface area for a lake, and the desired amount of water has been obtained only by making it quite deep, it has been found that when such lakes are lowered 5 or more ft. a night by pumping, it's only a matter of a few years before a drag-line had to be brought in to re-excavate part of the lake. Repeated lowering of water causes the banks to cave in.

Area vs. Gallonage

If, in using a lake, we only plan on using the top 12 ins. of water, the lake does not have to be too deep. Since 12 inches of water over an area of one acre equals 325,850 gals. it is evident that one acre of lake area is the minimum size that should be considered for water storage.

An average depth of five feet has proved to be suitable at many courses. Some lakes have helped to provide additional club revenue from winter sports. From the safety angle in such cases it is not advisable to have them too deep.

The type of pump commonly used for boosting water pressure from lakes, well discharge or city main is the horizontal centrifugal type. It is directly connected through a flexible coupling to a suitable size of electric motor and mounted on a steel or cast-iron bed plate. In purchasing such a pump, I can't stress too strongly that you should get as high efficiency as possible.

75 Per Cent Efficiency

It is not unusual to obtain 75 per cent efficiency from a well designed pump. Further, you should bear in mind that the pump will have to operate under varying water load conditions. There will be times when you will be operating all sprinklers and times when you might be only using one half or less of them.

The curve of the pump you select should be such that when you are only using a few sprinklers the pressure will not be increased too much. This is commonly known as a flat pressure head curve. I am sure many of you have had experience with pumps that upon only supplying a few sprinklers, pressure shot up to dangerous heights. This condition can be avoided by specifying correct performance when purchasing the pump.

Stewart's series on Irrigation will be concluded in October GOLFDOM.

Leads Bermuda Amateurs

George Wardman is the playing captain of the Bermuda entry in the first World Amateur team championship which will be held at St. Andrews, Scotland, Oct. 8-11. Other Bermuda team members are Ronnie Dwyer, Ford Hutchings and Richard Pearman. At least 35 countries are expected to take part in the event.

Texas A & M Holds Annual Turfgrass Field Day

Texas A & M College's annual field day, held in July, was attended by about 100 turfmen who made a tour of test plots and the campus and heard reports on various experiments conducted by the College's agronomy dept. Of particular interest were the St. Augustine and Bermudagrass experimental plots and height of mowing tests that the agronomists conducted. Agronomy dept. experts who spoke were E. C. Holt, John Long and Bill Bennett. Ted H. Filer and Leon Hart, graduate students, also gave reports. The height of mowing demonstration was conducted by Marvin H. Ferguson of the USGA green section.