PART II

Analyzing Drainage Problems and Applying Proper Drainage Techniques

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(Editor's Note: This article was originally published on January 6, 2004. This is the second of two parts of the article. Part I was published in the July 2009 issue of Hole Notes. Related photos can be found at www.mgcsa.org. Dennis Hurley is president of Turf Drainage Co. of America. Dennis was the first person to introduce what is now generically called "waffle drainage" to the golf course industry at the GCSAA show in San Francisco in 1985. Since that time he has received four patents in the field of seepage drainage, and is the inventor of the Turf Drain Siphon System. In 2001 alone, his company was involved in drainage projects at four of the top 12 ranked golf courses in the country.)

III: Designing the System

Lastly, the drainage system must be designed prior to the initiation of any work. The motto is, "plan when it is wet, and install when it is dry." Typically, it is best to plan all potential work before beginning installation phases. The alternative of planning a hole, installing that plan, then coming back and planning the next area, can produce a final product that has more overall transportation footage, and therefore higher overall costs. The reason for this is that a relief choice may be chosen to serve both areas, if all areas are planned from the beginning.

The planning process begins with the identification of each area to be drained, and recording its location. Next is the location of the optimal areas to collect surface water, as well as the tools to be used. No plan is complete at this point; any surface system will have areas that have missed water that now must be collected as seepage water, either from lack of velocity, or another type of seepage water as described above.

The seepage drainage design will be driven by the club's objectives. Objectives may vary in each area from removing unsightly puddles in an out of play area, to the desire to have the area in "tournament condition" as soon as possible once the rain has ceased. In light of these objectives, the design will have to answer the following questions:

How much? is another way to ask, "What spacing should the lines be on?" There are no absolutes. Unfortunately, no magical spacing exists that can apply to variations of objectives, soil types, shade and budgets. However, suffice it to say that most installation occurs between 10- and 25-foot spacings.

How deep? Depth will be determined by soil type, water type and the relief that is chosen. However, minimum standards would use 24" deep reliefs, and no part of any line will ever be less than 18." The most effective systems are typically between 22," with reliefs up to six feet deep. The most common question from the average green committee member is, "If our soil is only wet at the top, why do I need to go deep?" The lower the permeability of the soil, the deeper the column must be to create the hydraulic head to release water.

What direction? The lines should always be as perpendicular as possible to the flow of water. After that, the exact patterns will be dictated by the irrigation system, and the direction spoils will be moved. Typically, patterns that work perpendicular and parallel to irrigation systems will facilitate the least man hours to hand dig across irrigation lines.

What does it consist of? The best way to build technically correct seepage lines in native soils will almost always require the use of sands and geotextiles. Waffle type systems lend themselves to these construction methods and have a solid 20-year history in the golf course industry, not to mention other construction fields, such as highways. Trenches are typically five to seven inches wide with the spoils cleaned and hauled away. Finally, backfills will normally utilize sands with infiltration rates of 30 to 80 inches per hour. These lines often are topped off with a mix that would have a higher percentage of moisture retention. Sodding of the trench line is recommended in most, but not all, cases.

The next step in the planning process is choosing the transportation system or combination of systems to be used. Once this is determined, along with the relief points, the length and size of the transportation line that will be required can be determined. At this time, the points the piping will intersect and the fittings needed can be determined.

Lastly, all of these figures will be used to estimate the cubic yards of material that will need to be moved. This figure will be the basis for estimating total labor hours, the number of workers that will be needed, length of rental equipment and the days the area will be out of play. Normally, in-house projects using plywood and shovels to move spoils will be between 1/10th and 3/10ths of a ton per man hour. Methods using overpacked trenches to facilitate spoils removal with loaders or skid steer equipment can move 8/10 to 1 ton per man hour. Experienced crews using tarp systems or conveyor trenches will typically move between 1 to 1.5 tons per man hour.