



Planning a Golf Course Drainage Project

Proper planning is essential for a successful drainage project.

BY PATRICK M. O'BRIEN

Virtually every golf course has experienced some type of drainage problem on its property. Poor drainage affects a golf course's playability, appearance, economics, and reputation. As far as the golfer is concerned, nothing is worse than a golf course that turns into a mud hole during wet weather. Dirty shoes, mud balls, and cart restrictions take away some of the enjoyment of golf for most players.

Most course officials and owners are not familiar with how to plan and design drainage systems that address the needs of their facility, and they frequently succumb to several common pitfalls. The first one is a feeling that the superintendent can solve any drainage problem with \$20,000 and a trencher. Another misconception is that serious drainage problems can be solved only by closing the course from four to 12 months to excavate, reshape, and install drainage. A third pitfall is that quick fixes such as aeration or fairway topdressing will dry up wet areas. All of these efforts begin with great intentions, but without a thorough understanding of drainage principles

and proper planning, they are doomed from the start. The purpose of this article is to assist golf courses with the planning stages of a drainage project and to answer the question of how best to attack wet areas of the golf course.

HIRING A DRAINAGE CONSULTANT

A drainage master plan is the most important and often the most overlooked part of any drainage project. It can be hard for course officials to see the big picture regarding how best to address drainage problems. Few golf courses have experts on staff to devise a drainage master plan, and hiring a golf course drainage consultant who has the experience and knowledge to devise a master plan is the first step. Good consultants can visit your site and create a drainage plan with a hole-by-hole cost estimate. Most drainage plans are broken into several sections, including the estimated cost sheet, plan notes, drain sites, drain site notes, site components, and sand and labor costs.

One surprise to most people who read a drainage master plan for the first time is how the

drainage techniques and components usually change based upon the hole. For example, one hole may have elevation and rolling hills, and the emphasis is on surface collection of water in basins and 25-foot spacing of the drainage lines, as opposed to another hole with flatter terrain and lower elevations that may require the use of siphon basins and 15-foot spacing of drainage lines. Most course officials are stunned by the complexity and technology involved.

HOW THE CONSULTANT MAKES THE DRAINAGE PLANS

When a drainage consultant has been hired, the next step is the on-site visit. Ideally, the design is done when the drainage problems are readily observable for the consultant. The motto is, "Plan when it is wet, and install when it is dry." Most consultants can analyze four to five holes per day, so it may take up to three to five days to analyze an entire course, but seldom does every hole require drainage renovation work. The superintendent, assistant superintendent, and a few course officials usually accompany the drainage consultant during the site visit.

It is crucial to plan the work prior to the installation process. For a drainage expert, the analysis of golf course drainage problems is usually the easiest part of the job, but it provides new information for most clients. The consultant needs to know prior to making the drainage master plan what the membership would like to achieve by the end of the project. For example, is the goal for the course to be in tournament condition, or just to dry up wet areas enough for cart traffic, or simply to keep the course from closing? The amount of drainage needed to meet each of these goals has significantly different costs and strategies. Below are the five steps a drainage consultant will complete when developing a drainage master plan.

STEP 1 — IDENTIFICATION OF WET AREAS ON EACH HOLE

The planning process begins by identifying and naming each wet area to be drained and recording its location. Flags are used to mark wet areas and each receives a code.

STEP 2 — SURFACE COLLECTION AREAS

The consultant's next step is to locate where surface water may be entering play areas and



determine where to collect this water before it reaches the defined drainage areas. Surface water flow onto golf courses can change over time due to local developments and new roads, causing more water to drain onto the property. Curbs that channel water to open inlets at cart paths, berms that slow down surface runoff, V-shaped terraces or cart paths, or catch basins may be designated as collection devices to move surface water to underground piping systems before it reaches golf course playing areas. The most cost-effective method is to collect surface water on a cart path, using curbing and basins. Avoid collecting surface water runoff with seepage drainage unless there are no other options.

STEP 3 — SEEPAGE DRAINAGE NEEDED FOR EACH AREA AND DETERMINING RELIEF

Step three defines where seepage drainage will be installed, how deep to install these trenches, and

Trenches for seepage lines usually are a minimum relief depth of 18 inches. The lower the soil permeability, the more critical the depth.

where to take the drainage water. Seepage water is defined as water in any area that presents a problem, either after all of the surface water is removed or even when no surface water was ever present. Some surface water always escapes even the best-defined plans, especially during very wet weather, and this water will enter the soil. The ground can become saturated to the point that it interferes with either the mowing or playability of the hole. Seepage lines are connected to solid pipes leading to the end of an open and free-flowing drainage system.

The seepage design will be driven by the objectives defined initially to the consultant, including how dry the play areas should be, soil types, shade levels, and the budget. Based on the objectives, the seepage design guidelines are as follows:

- The spacing of drainage lines has no absolutes, due to variations of objectives, soil types, shade,

and budgets. Most installations are done at 10- to 25-foot spacing.

- Drainage line depths will be determined by soil conditions and the relief on the site. Standard installations are 24 inches deep with no part of any line less than 18 inches. Reliefs typically are between 2 and 6 feet deep, depending on the circumstances. Hand digging occurs around any existing irrigation installation to avoid damage to these pipes. Sometimes confusion exists as to why consultants recommend columns this deep if the soil is only wet at the top. The answer lies with the permeability of the soil. The lower the permeability of the soil, the deeper the column must be to create the hydraulic head necessary to release the water.

- Drainage lines always are installed perpendicularly to the flow of the water, but the design will take into account the existing irrigation system piping and a pattern to facilitate the most cost-



Seepage drainage design is critical for success of a drainage project. Seepage line installation runs parallel to the flow of the incoming drainage water, either parallel or perpendicular to the irrigation system, and is set up to facilitate the fastest movement of the spoils.

effective handling of spoils. Hand digging is done to avoid damage where new drainage will cross over existing irrigation systems.

- Drainage lines used in native soils require the use of sand, not gravel, and geo-textile-lined drainage materials. Trenches are five to seven inches wide to accommodate these materials. Spoils are hauled away. Sands with infiltration rates of 30 to 80 inches per hour are ideal, and they can be topped off with a moisture-holding

drains, pumps, or a combination of all may be used. The length and size of the transportation lines and fittings are determined once the transportation system has been completed.

STEP 5 — COST AND LABOR ESTIMATES

Finally, the drainage consultant will estimate the total cost of the drainage project. The quantity of material that will be moved at each drainage site



A large staging area allows storage of the new materials for a drainage project.

mix. Sand, as opposed to gravel, provides desired bridging qualities in the drainage lines that minimize the impact of the native soil on the seepage drains. The objective in seepage drainage tile is to create a stable system where the water moves to the drainage without carrying fines in the water stream. Proper backfill sand provides this stable system. Sodding of the trench lines is done in most but not all cases.

STEP 4 — SELECTION OF THE TRANSPORTATION SYSTEM, DRAINAGE PIPE, AND QUANTITIES REQUIRED

Step four is to choose the transportation system or combination of systems to be used to move the water from each area along with the relief points. Conventional connector pipes, siphon

is a critical figure, and it will be the basis for estimating the total labor hours, the number of workers needed, rental equipment time, drainage materials, sand, sod, and the days each hole will be out of play. Typically, in-house projects using plywood and shovels to move spoils will haul .10 to .30 of a ton per man-hour. Front-end loaders and skid steer equipment can increase this to .80 to 1.0 ton per man-hour. Experienced drainage contractors using tarp systems or conveyors typically will move between 1.0 and 1.5 tons per man-hour.

Labor cost calculations assume that the area of the hole the contractor is working on will be closed to the point where the workers can work safely and without waiting for groups of golfers to pass through. Usually, this does not mean closing the hole, but it may mean sometimes



Sod lines over the new fairway drainage are almost completely healed only three weeks after the installation.

playing a par-4 or par-5 hole as a par-3 for a few days.

At the end of the project, some courses include an allowance to provide a GPS map of the drainage installation. The map usually includes the location of all catch basins, connector pipes, siphons, reliefs, and perhaps some of the seepage drainage, but not all. Tracking wire is usually included in all main drainage features.

CONCLUSION

Sometimes course officials and staff are overwhelmed with the total cost of a drainage project once they see the master plan. Fortunately, it is not necessary to do the entire project at once. More importantly, though, a golf course with a drainage master plan now has a document developed by an expert that overcomes the most common pitfalls: lack of knowledge and poor planning. With the drainage plan in hand, the course can prioritize what work will be done and how much the work will cost. They will have the

peace of mind that the problem will be resolved and that cost-ineffective quick-fix attempts are avoided. The drainage plan can be used in soliciting bids from contractors or evaluating the cost of doing the job in house. In most cases, experienced contractors are more cost effective because of efficiencies in moving materials.

Poor drainage affects both the enjoyment and economics of many golf courses. Devising a sound drainage master plan with the aid of a consultant is the most important step in bringing a resolution to the problem.

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