

Make trouble go down the tubes

The microenvironments of a golf course dictate precision drainage practices.

Bruce Shank

One size fits all is a concept that doesn't apply to drainage on golf courses. A superintendent's approach to drainage should be divided into separate solutions for seasonal and site-specific problems. No single technology will prevent all damage from inadequate drainage, which essentially is one reason why developers and owners hire skilled superintendents in the first place. Their knowledge has considerable value.

The best golf course architects and builders can seldom guarantee they have solved all drainage problems when they turn a course over to its owner. They know that perfecting drainage takes years of fine-tuning by an observant, knowledgeable golf course manager. It requires balance between irrigation and soil moisture retention, seasonal rainfall and evapotranspiration, microclimates and traffic patterns, and competition between turf types and weeds. No architect can foresee all the mismatches as a course matures.

Surface drainage

Engineers and architects divide drainage into surface and subsurface. Surface drainage begins with shaping and smoothing the land into a watershed that directs runoff to ditches, catch basins, storm sewers or French drains. They also must try to prevent erosion by managing surface water so it will not reach damaging proportions — water becomes a powerful force as it accumulates and develops speed.

Any surface under a 2 percent (50:1 horizontal length:vertical drop) slope is considered flat. However, water will move across a slope of 0.5 percent (200:1) if the surface is perfectly smooth. This slope can be less for sandy soils. What appears flat can be sloped enough to move surface water to a collection point or ditch. Vegetation growing on the slope creates resistance for water moving across it, which is why turfgrass is an excellent means of erosion control.

Golf course architects give primary



Lines were dug over bunker mounds to a point of relief during siphon drainage installation at River Oaks Country Club in Houston, Texas.

consideration to playing conditions. While challenging, a severe uphill or downhill lie will upset the majority of golfers. A slope steeper than 5:1 will almost certainly generate complaints from players. But a slope of 50:1 will provide acceptable surface drainage and keep golfers happy. The superintendent's job is to make the turf excel somewhere between those two slopes. Obviously, that takes more than what meets the eye. It takes soil conditioning, careful irrigation, precise fertilization, correct turfgrass selection and a multitude of other cultural requirements.

Without proper surface drainage, subsurface drainage efforts are relatively futile. However, surface drainage alone is insufficient to assure soil moisture levels best suited for low-cut, high-traffic turf. This is a major reason why greens tend to be above-grade and constructed of materials with carefully specified drainage characteristics.

Taken as a whole, drainage planning should consider water retention in addition to water removal. Sand is very limited in water- and nutrient-holding abilities. It has very limited chemical buffering if a mistake is made with a fertilizer, herbicide or fungicide. Properly selected organic amendments, such as peat, provide the necessary insurance without sacrificing drainage.

Once a course is completed, correction of surface drainage deficiencies is costly and disruptive. When deficiencies are discovered, installation of vertical, subsurface drainage structures might offer a temporary, less disruptive solution than surface drains to correct problems. This goes double where catch basins would have to be located in fairways to adequately drain the watershed.

The required slope for surface drainage is greater than that of a ditch, French drain or subsurface drain. These can be trenched with a laser to provide a drop of 1 to 2 feet per 200 feet of length. Water will move at a lesser slope, but you also need to provide enough slope so the velocity of the water in the pipe will move solids mixed with the water. French drains or vertical channel drains should not be covered with soil. Sand or gravel should extend to the surface.

In areas where seasonal flooding is common, a superintendent should consider how long the turf can survive underwater and the length of time a hole or larger area will be out of play. Once you know these answers, you'll also know the required rate of drainage provided by a combination of subsurface and surface drains. You probably will need both types of drainage.

Don't reject the idea that reshaping will be necessary to deliver a long-term solution to the problem. After consulting a designer, you might find a creative excuse to locate a sand bunker (concealing a catch basin) in an appropriate spot for drainage.



A turf drain was installed prior to backfilling at River Glenn Country Club in Fishers, Ind.

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Carolina Trace CC overcomes gravity with siphon drainage system

Robert Trent Jones Sr. has aptly challenged golfers with water for decades. Sometimes that challenge is more than the legendary golf course architect intended. One such instance was the par-5 14th hole at Carolina Trace Country Club in Sanford, N.C., 40 miles southwest of Raleigh.

A 350-acre lake extends down the left side of the 529-yard hole. A creek cuts across the middle of the fairway to a small lake on the right. The elevation of the flat fairway is barely 30 inches above the lake's level. During the winter the fairway remains soggy and robs golfers of a decent roll.

"There just isn't enough drop over 250 yards to properly drain the fairways," says Mickey McCord, CGCS at Carolina Trace. "Attempts at conventional subsurface drainage had failed. Ed Marshall (now CGCS at Pine Island Country Club in Charlotte), my predecessor, had solved the problem on the tee half of the fairway with a sump pump system. My job was to correct the drainage on the green side of the fairway."

A Clemson graduate, McCord had been a superintendent and a tech representative for The Scotts Co. in Louisiana. There he met Dennis Hurley of Turf Drainage Company of America out of Marrero, La., and learned about his technique of siphoning water off fairways without mechanical pumps.

"When I got the job at Carolina Trace, I called Dennis and told him I might need his system for the 14th fairway," McCord says. "He flew up and together we worked out a drainage system that breaks up the fairway into smaller drain fields. Now, instead of having one relief point for drainage, we have six for the same area and the subsurface drain pipes have enough slope to do their jobs properly."

The six drainage basins are arranged in an "H" shape. The tops of the patented, 1-foot-diameter basins are grates to remove surface water. The walls of the basins are porous and provide subsurface drainage for the soil profile. A network of Turf Drainage "waffle drains" extends from each basin.

"We were able to cut runs of drain pipe from 200 yards to 40 yards," McCord says. "That gave us better slope and made it easier for my crew to do the work."

The six collection basins are linked together with airtight polyethylene pipe. The pipe terminates in a relief cylinder in the lake. A valve connects the irrigation system to the pipe heading toward the lake. Other than the initial priming, this valve remains closed. It can also be opened to flush the drain lines.

"The pipe from the basins doesn't have to be sloped," McCord says. "As long as the relief point is below the collection points, water will siphon from the drainage basin. Once all the water has been drained, the system is designed to stop draining so water remains in the system and keeps it primed."

The system also was installed on one of Carolina Trace's par-3 holes in late September.

"It's like a do-it-yourself system," says McCord, who is scheduled to give a talk on the technique this month (Nov. 13-15) at the Carolinas Golf Course Superintendents Association's trade show in Myrtle Beach. "More superintendents should take advantage of siphon drainage. Maybe I can spread the word."

— B.S.

Subsurface drainage

Subsurface drains depend upon infiltration and percolation of water through the soil. Those characteristics vary in individual soils, so first do a soil test to accurately determine the necessary distance between parallel drain tile or pipe and the depth of these devices. Variations between drainage products make it necessary to ask for installation guidelines.

Heavy clay soils will require closer and shallower installation than sandy or loamy soils. These details will also be influenced by the typical rainfall of the locality and worst-case scenarios. One useful public relations tool is an observation hatch where one or more of the drainage laterals empty into a sump or drainage main. Club managers or green chairmen can become believers once they see how much water is carried by the drain pipe.

Agricultural specifications will not suffice for fine golf turf. Perforated drain pipe buried 3 to 5 feet deep and 40 feet apart will probably be insufficient in areas with heavy soils and frequent rainfall. Turf applications run in the range of 2 to 3 feet deep and 15 to 20 feet apart. For golf courses where leaching salts from irrigation water is necessary, closer spacing will be needed for the drain pipe. A well-designed drainage system can remove salts from the primary root zone when used in conjunction with a flushing irrigation cycle.

Subsurface drainage can also be applied as a source of subirrigation. By closing a valve at the drain sump you can hold water in the drain pipe and create an artificial water table. You can also run a supply pipe from a reservoir into the drainage sump.

If you are seriously thinking about subirrigation, have a soils consultant evaluate the areas being considered. By taking core samples, he or she will be able to provide an accurate capillary width and depth in which water in the drain pipe will travel.

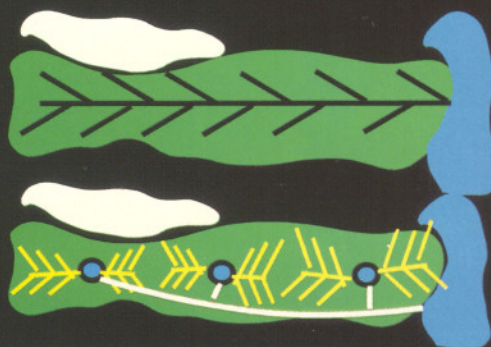
Don't guess. You can miss by 6 inches and waste your money. In the future, we will definitely take subirrigation more seriously than we do today. Some say we will establish and control a biological balance within the root zone that greatly reduces the threat of disease, black layer, thatch, nematodes and insects. Drainage is a big part of this picture.

Impressive potential

When a golf green costs \$40,000 to rebuild, a properly designed drainage system is not so unrealistic for a sport that relies on daily rounds for cash flow. Drainage is both an insurance policy and an agronomic necessity for high-use fine turfgrass. We have barely begun to tap the potential of drainage for golf course management. Combined with subirrigation and chemigation, it can solve many of the hurdles placed in the path of golf course management today.

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COLLECTION PATTERN for SIPHON VS GRAVITY SYSTEM



This drain system was installed during a green renovation.