

OPEN STONE DRAINS: They May Not Be Pretty But They Work

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THE MAY, 1968, issue of the GREEN SECTION RECORD carried an article entitled, "Better Drainage Through Slit Trenches," by James L. Holmes, former Midwestern Agronomist with the USGA Green Section. In this article, Mr. Holmes discussed various new methods of installing "slit trenches" on golf courses. Basically, these drains were narrow trenches dug in wet areas and filled to surface level with gravel or crushed stone. At that time, placing stone to surface level in an open trench was novel on golf courses, though the idea was borrowed from farming. From this beginning, the idea spread and became a popular method of quickly draining trouble areas on golf courses.

Today, for all practical purposes, slit trenches have become the predominant type of golf course drain where the goal of the drainage project is to remove excess surface water quickly from low wet spots or by intercepting surface water before it can accumulate and cause problems with maintenance and playability.

In this article, we will discuss the necessity of good drainage and bring up to date the original idea of the slit trench and show that in turfgrass management, some ideas get better with age.

Why Good Drainage in the First Place?

It is fair to say that good drainage is one of the basic prerequisites for good golf turf. Without it, you will have trouble growing fine turfgrass no matter how good a turf manager you may be. Many reasons support this statement. Briefly, they include: (A) Areas of poor drainage encourage increased winter injury as a result of ice accumulation

and crown hydration through freeze/thaw cycles. (B) Areas of poor drainage cause increased summer damage. During the summer stress period, these same areas are the first to experience scald, wet wilt and disease. (C) Wet spots usually cause areas of thin turf. Because the best weed control is a healthy turf, weeds quickly dominate such areas. Crabgrass, knotweed and *Poa annua* all encroach and make these wet areas aesthetic, maintenance and playability problems. Good permanent turfgrass can only be supported on soils that have good drainage. Poor drainage areas are difficult to maintain. Even mowing the grass becomes a chore in wet areas. Hand cutting with light equipment is usually necessary on wet areas, and this is inefficient use of manpower and equipment. With today's tight budgets, recurring expenses such as this cannot be tolerated for long.

Wet areas are also bad for play. They cause embedded or lost golf balls, soft, uneven footing, tall lush grass, and seemingly perpetual need for relief from casual water. These wet areas are always aggravated by irrigation, especially long, soaking waterings. Is it any wonder, then, that drainage projects are continually underway to correct these deficiencies on many golf courses? Some of this work is effective, but, regretfully, some of it is not. The choice of the proper drain is often the real problem. Be careful to select the correct type of drain for the specific problem.

What Type of Drainage System Is Best?

As agronomists for the Turf Advisory Service of the USGA Green Section, we regularly see all types of drainage work, ranging from small post-hole dry wells

to massive drainage projects involving the professional engineering of ponds, dikes, ditches and streams. The choice of drain involves analyzing the magnitude of the problem and determining what type of drain will do the job effectively. Where surface water is a problem, the slit trenches will usually work best for you.

This article will only discuss this one type of golf course drain . . . the slit trench with drainpipe included. For further reading, the following articles have appeared in this publication and feature other types of golf course drains. These are:

"Better Drainage Through Slit Trenches," May, 1968 — J. L. Holmes.

"Sump Pumps for Unusual Drainage Problems," January, 1977 — Dr. R. E. Engel.

"Little Things Count in Tiling Golf Courses," January, 1968 — S. Moore.

"Drainage: Why and How," May, 1975 — C. H. Schwartzkopf.

"Drainage: So Easy It's Difficult," January, 1976 — W. H. Bengeyfield.

Originally conceived, stone drains were just that, columns of crushed stone or pea gravel placed in a ditch and filled to the surface. No pipe was included. These were the classic "French drains." With the advent of continuous perforated plastic pipe, another dimension was added, evolving into what we have today, that is, a relatively quick, easy to install, and an extraordinarily effective golf course drain called, for want of any better name, a gravel or crushed stone slit trench.

How Are They Installed?

Generally, these drains are installed using a trenching machine as in Figure 1. The machine makes a neat, clean



vertical cut, generally from several inches to several feet deep. The width of the trench ranges from three to eight inches, with six inches a typical width.

The machines are easily maneuverable so that the drainage trench can literally be snaked through low spots, connecting a series of these wet areas into one neat drainage network. This is a departure from the textbook "gridiron" or "herringbone" drain patterns that were common on many golf courses. This type of network is perfect for each drainage problem area found on the golf course. After all, not all drainage problems call for a gridiron or herringbone pattern.

Once the trench has been dug, it is important to check the grade to see that water will flow downhill. If high or low spots exist, they should be brought to grade so that a smooth, gradual slope is achieved at the bottom of the trench.

In some instances, a gradual pitch can be created on flat areas by setting the trench shallow at one end and deepening it as the trencher moves along, effectively achieving adequate pitch even in areas where slope is a problem.

At least one inch of crushed stone or pea gravel is then laid in the bottom of the trench as a bed for the pipe. Pipe sizes vary from two to eight inches wide, with four-inch plastic pipe usually the most frequently used. Once the layer of stone is down, the pipe can be placed on top with the remaining stone filled to the soil surface and left uncovered (Figure 2). The drainpipe and the open stone surface are the key elements in making this type of drain long-lasting and effective!

Crushed stone and gravel comes in assorted sizes, but for drainage purposes should range from $\frac{1}{4}$ inch to a maximum of about $\frac{3}{4}$ inch. Larger stone, although effective, tends to interfere with the mowers, and sometimes damages them. Therefore, depending on stone availa-

Figure 1. While the procedure is the same for every drain line, the difference in an open stone trench is that the soil is hauled away and the pipe is completely covered with gravel or crushed stone. Ridgewood Country Club, New Jersey.



Figure 2. Pattern showing versatility of a slit trench system — two lines in gridiron fashion empty into a line that carries the excess water down natural incline. Note crushed stone in trench is filled to turf level. Wildwood Country Club, New Jersey.

bility, price, and where the stone drain is located, a range of sizes from a minimum of $\frac{1}{4}$ inch to a maximum of $\frac{3}{4}$ inch is preferred.

Keep the Stone Surface Open

If there is a key to the effectiveness of this type of drainage system, it is keeping the stone open to the surface (i.e., uncovered by sod or soil). Leaving it open permits the rapid removal of excess surface water, whether from rainfall or irrigation. It is essential to remove excess water rapidly. The water moves over the surface, reaches the

voids of the open stone, moves down through the stone and pipe below (in stone the water moves laterally and vertically) while being carried away . . . rapidly. Surface water is not allowed to accumulate. Therefore, grass is not subject to the stresses of submergence in summer or winter, and as a result the soil is much firmer for maintenance and play.

If there is a drawback to this type of drain, it is the very thing that makes it so very effective — the gravel or stone at the surface. Initially, it is unsightly, but under the Rules of Golf or a Local

Rule, relief is given if a player's stance or swing is affected. Further, given time, the grass will grow over the stone to cover these drains, yet they will still function effectively for years thereafter (Figure 3).

Sometimes, after a few years, the turf over the stone may become sod bound. This condition can be corrected by periodically removing some of the sod over the stone and, if necessary, adding more stone to bring the stone to the level of the turf. This is not a major project and should be done only on an as-needed basis.



In Summary

Rapid removal of excess water is the strength of the open stone drain. Other types of drainage systems can and will work effectively on a golf course. Indeed, perhaps the most effective drainage program on a golf course is one that makes use of all the types of drainage systems. The open stone drain with pipe included seems to effectively fill the need for rapid removal of excess surface water from in-play turf areas. After all, when surface water accumulation is not a problem, the turf is firmer after rain and will support golf carts, maintenance equipment and foot traffic better. The grass is also healthier. Keeping the course open, maintainable

and playable for a longer time is certainly the goal for any progressive turf manager. The open stone drain is one tool that helps achieve this goal.

Author's Note: In our experience, some golf course superintendents and their memberships have been pleased with this type of drainage system and others were not. The choice is always up to the club and the turf manager who maintains the facility. Most often the criticism is due to aesthetics, not function. They are effective golf course drains. Therefore, if aesthetic considerations are secondary to good drainage, give these slit trenches a try. There is little to lose and much to gain in member satisfaction and added days of pleasurable playing time.



Figure 3. Turf eventually grows over the stone, but this does not impair the effectiveness of the drainage system. Twin Hills Country Club, Massachusetts.