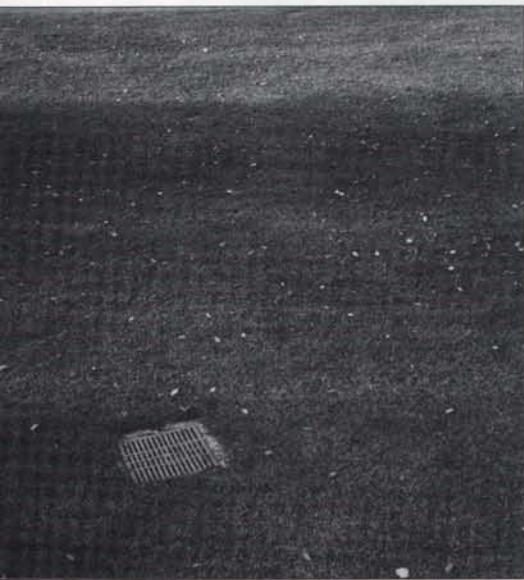


# Renovating Drainage Systems: Matching Plans With Reality

By Bruce Shank



Catch basins collect water faster than subsurface drains.

One thing in almost guaranteed in construction of golf courses and athletic fields, some adjustments in the drainage system will be necessary after the project is completed.

Even the most skillful architect can't anticipate every possible variable during construction. No soil is absolutely uniform. Erosion and localized settling is as unpredictable as the weather. Finally, there is concentrated foot or vehicular traffic and the havoc it creates with which to contend.

A great number of calculations are involved in designing a drainage system for a recreational turf area. They approach irrigation formulas in their complexity and are based on expected maximum amounts of rainfall. Many broad-based assumptions must be made which leave a wide margin for refinement.

One of the first determinations to make is what portion of the drainage sys-

tem should be dedicated to runoff as opposed to infiltration and percolation. Catch basins remove water faster than subsurface devices, but they are undesirable on playing surfaces. They are critical, however, in intercepting water from adjacent areas, such as tracks, cart paths, berms and other sloped areas.

The trend in construction of critical, high-use areas is to devote a high percentage of the drainage system to subsurface collection. Percolation rates of ten inches or more per hour are common in sand-based greens, tees and fields *when they are new*. The purpose of such high rates is to prevent saturated soil conditions which make the surface unplayable and/or easily damaged. As turf becomes established and develops an extensive root system, percolation rates decrease. The final infiltration rate of a mature sand-based green may be more along the lines of two to three inches per hour. This rate would be sufficient for more than two thirds of the country based on maximum rainfall history for the past 100 years.

As turf becomes established and increases in density it traps more surface water and reduces runoff. Therefore, as a turf area matures, drainage becomes more critical. Cultural practices to keep the soil profile open such as aeration, slicing, and topdressing with materials compatible to the original root zone mixture, grow in importance.

Over a period of years, the drainage characteristics of a soil, a designated slope, and the performance of subsurface drainage structures may change significantly. Additional drainage may be required to maintain enough capacity for maximum rainfall.



Cart paths present serious drainage challenges and often require renovation.



To extend the useful life of drain pipe manufacturers offer perforated pipe wrapped in geotextile fabrics. A number of companies today also produce what they term "prefabricated" drainage structures, which are essentially narrow plastic cores enveloped in geotextile.

"The advantage of prefab is ease of installation and less spoil to handle," explains Robert Embrey of Pro Drain Systems in Highland, MI. "Since they are narrower than conventional four-inch pipe, a smaller trench is required to install the product. Because the entire surface of the product is a porous fabric, the prefab is more efficient than perforated pipe in collecting water. Pipe is more efficient in moving water. By letting the prefab collect drainage and connecting it to pipe to carry it away, you derive the maximum benefit out of both products. Prefab was designed for areas of heavy collection, not to eliminate conventional pipe, but to work in conjunction with it."

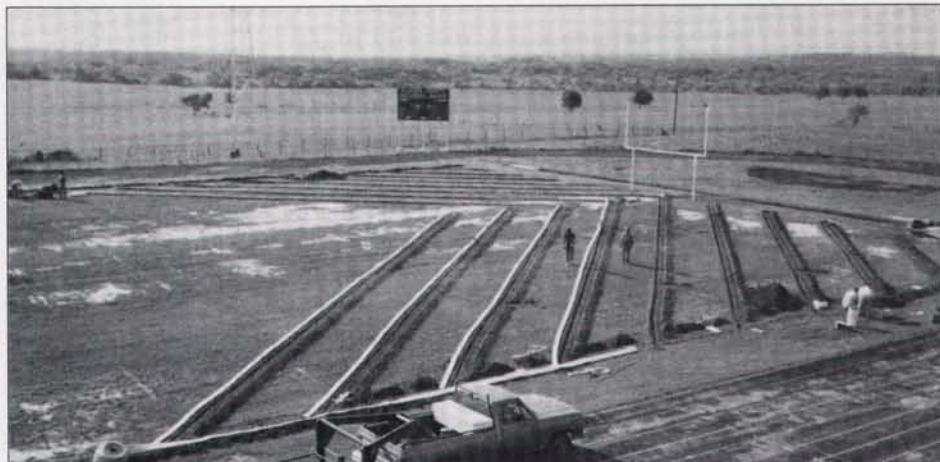
Prefabricated drain structures and drain pipe can move water faster than French drains, says Embrey. "There is an open track from the point of entry to the outlet. There is no pea gravel for the water to flow around."

A common question Embrey faces about prefabricated drainage structures is clogging. It was a question his company had to deal with in the highway drainage market. "Geotextiles have improved over the past five years," he responds. "They are less prone to clogging. A one-square-foot section of our geotextile has a flow capacity of 100 gallons per minute. If 90 percent of the geotextile was blocked, ten gallons per minute would still flow into the structure for each square foot of surface area. There are hundreds of miles of prefab drains along this country's highways working satisfactorily."

A third of the rain falling on turf becomes runoff, according to Mike Fallon of NDS in Camarillo, CA. "A drainage system is incomplete without appropriate surface drainage," he states.

"An area should have enough catch basins to intercept runoff before it reaches turbulent or damaging levels. The key to surface drains is the size and numbers of the grates, not so much the size of the pipe."

NDS created a drainage calculator to help turf managers get an idea of the volume of runoff during rainstorms. The slide-rule type device shows runoff based



**Prefabricated drainage structures are a practical tool for drainage renovation.**  
Photo courtesy: Warrens Specialty Products.

on inches per hour of rainfall. It also indicates the amount of open surface area of grates to handle this runoff.

For example, one inch of rain falling in one hour on a 5,000 square foot green produces more than 15 gallons of runoff per minute. Twelve square inches of open grate area are required to receive this amount of water. A two-inch rainstorm falling in one hour would require 24 inches of open grate area.

Rather than installing one large grate for the entire area, Fallon recommends a number of smaller grates distributed throughout the base of the watershed. "Smaller catch basins are just as durable as old cast iron grates and fit into a sports facility better," he adds. A series of small grates also collects water in stages before it can cause erosion.

Any spot where water collects and remains wet for long periods after rain or irrigation are candidates for catch basins, he suggests. One of the most important is along cart paths and parking lots. "Water flows off of concrete or asphalt in sheets," he warns. "The soil along the path becomes saturated and carts compact it to the point that no grass will grow. Channel drains along the low edge of cart paths remove this water before it reaches the soil."

Both surface and subsurface drainage devices are becoming easier to install. An inadequate drainage system is simpler to renovate than before. In an ever changing facility, some attention to drainage can provide returns in improved maintenance and better day-to-day turf performance. □

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