On fields also used for soccer, football bench areas can become muddy problem areas. Aim to have a consistent slope through the sideline areas to prevent this problem.

Sports Field Drainage

By Jim Puhalla

If you asked turf managers what single improvement would contribute most to the quality of their fields, you'd probably get "drainage" more than any other answer. We've all had to deal with rainout headaches, but the problems go even further. Some fields hold so much water in the spring that they can't be mowed. If you try to mow, the equipment causes ruts, and then you've got two problems to deal with.

For most managers, there are only two choices for improving drainage: (1) contouring fields to encourage positive surface drainage and (2) using internal drainage systems to relieve waterlogged soil.

Surface Drainage

1. Design for New Construction. Whether you're designing a single field or a multi-field complex, each field should be treated as an individual drainage unit. No field should be expected to perform acceptably with water running across it from an adjacent field. In laying out fields, make sure to leave enough room outside (and between) the playing areas for cuts and fills, catch basins and swales.

Generally, field designs for surface drainage fall into one of two categories: a *crowned field* sloped to the sides or a *flat field* sloped to one side or to one end. The percentage of slope is one to 1.75 percent. If you are relying on surface drainage alone and will not install internal drainage, use a slope at the higher end of the range. Soccer fields are often designed using a lower percentage of slope, so internal drainage is usually needed.

Probably the most common type of football field is a *crowned field* with level sidelines. However, many facilities use one game field for both football and soccer. Unless there is consistent slope through the sideline area — which tends to get badly torn up by foot traffic at the football field bench area — the outer edges of the soccer field can become a quagmire.

On baseball and softball fields, the pitcher's mound should be the high point of the field. A good skinned area contour design is crowned behind second base, with runoff directed toward the foul lines. This design helps to avoid standing water at the outfield arc, which is a common problem when a skinned area is meant to drain into the outfield.

Under most circumstances, internal drainage is not effective for the skinned area, where water percolates through the soil slowly. Positive surface drainage is the only way to ensure a playable field in wet weather.

Flat fields tend to be built that way because of the terrain surrounding the field. If it's impractical or too costly to build a crowned facility, the flat, sloped design can work very well. There are two factors to keep in mind:

- Consider internal drainage, at least in the lower half of the field, to prevent it from becoming too wet.
- Make sure your field records show that it's a flat sloped field, or someone ten years down the road might try to "re-crown" the field, causing a real mess.

2. Reconstruction. Reconstructing

Topdressing the field, then using a level bar like this one, can even-out the contours and improve surface drainage.

a field is the ideal opportunity to improve surface drainage. First, conduct a survey to verify how water moves through and around the field. Set new grades, then remove the sod and re-grade. When making cuts, make sure not to leave two inches of topsoil in one place and ten inches in another. If you're making fills, scarify the soil first to eliminate layering, which has a detrimental effect on water movement through the soil.

3. Renovation. A good way to deal with small drainage problems, such as mud puddles, is to topdress and use a level bar across the surface of the field. This process eliminates the unevenness of the field and provides a better-draining surface.

4. Maintenance. Many field managers overlook the fact that careful maintenance practices can help prevent drainage problems. Cutting the grass shorter during wet periods allows sunlight to reach the soil and dry it faster. Aeration (especially deep-tine aeration with vibration to fracture soil) can also help open up the soil for better drainage, and will allow air into the soil profile.

There are soil amendments that can help in emergency situations — such as the diatomaceous earth products now on the market. Typical examples include Agro-Tech 2000's Axis for soggy grass areas and Play Ball! for skinned areas. Additives absorb some of the water and help firm up muddy soil.

Internal Drainage Systems

According to Don Grigsby of Lun-Drain Inc., internal drainage systems are often rated in terms of the "life of the system" — a useful measurement because some soil types will slowly infiltrate the drainage structure and eventually clog the system. Before installing any drainage system, check with your supplier to find out the life of the system you're planning to install and the things you can do to extend its life. Two common ways to extend system life are by digging wider trenches and using filter cloths.

1. Common Problems. In an internal drainage system, maybe the most common problem is drainpipe that does not slope properly toward the outlets. Standing water in poorly sloped pipe seeps into the soil and eventually creates a soggy surface through capillarity. A consistent downhill slope toward the outlet will keep the pipe clean by washing the fines out of the pipe.

Another common problem is crushing of the pipe by heavy equipment. In fact, heavy equipment also causes another drainage problem. A heavily compacted sub-base prevents water from getting to the drainage system. Many plans and specifications call for a "compacted sub-base." To the excavator, these specs call for a sheepsfoot roller or vibrating roller. This equipment makes the sub-base so compacted that it is impervious to water, which passes through the topsoil but stops at the sub-base. The un-compacted topsoil will become fully saturated during a heavy rain, because the sub-base won't allow the water to pass through.

Actually, the solution to this problem is very simple. Adding to your specs the instructions "Avoid over-compaction of the sub-base" and "scarify sub-base before installing topsoil" will alert the excavator to the drainage dynamics at work in the field system.

2. Pipe Drains. The traditional type of drainage system for a sports field is the pipe drain. Pipe drains work by slowly and consistently removing water from the soil profile, including the sub-soil as well as the topsoil.

This type of system was once constructed of clay pipe, packed with coarse sand (typically 12 to 18 inches)

Strip drains can be used to target problem areas, like this one in front of a soccer goal.

around the sides and top of the pipe, to prevent the system from filling up with silt and clay. The trenches in which the pipes are laid (usually 1 1/2 to 3 feet deep) are filled in with gravel to a level about 6 inches beneath the surface, then are filled to ground level with soil. Today's drainpipe systems use perforated pipe, and need to be back-filled with gravel around the pipe.

3. Strip Drains. Modern technology is also providing some new solutions to the challenge of properly draining fields. One of these new solutions is called strip drains, produced by companies such as Lun-Drain. These are cloth-wrapped polyethylene structures about an inch wide and 4 to 6 inches deep. Strip drains are installed in the top 12 inches of the soil and require only a 3- to 4-inch-wide trench. The strip drain is placed in the bottom of the trench and extends halfway to the surface. The trench is then filled with coarse sand to surface level. The sand should have less than 5 percent passing a 100-sieve screen. Strip drains should be laid out 45 to 90 degrees to the direction of the surface drainage and sloped one-half to one percent toward collector drains.

The advantage of a strip drain system is that the sand-filled trenches at surface level drain away some of the surface water without requiring it to flow all the way across the field. Strip drains also can be used as a targeted system to attack problem areas where water tends to collect.

Catch Basins

Catch basins are another common drainage structure used for sports fields and can be used in two ways. They can aid in surface drainage where the surrounding terrain stops the movement of water, and they can be the "junction boxes" of internal drainage systems, allowing you to monitor their effectiveness. With any sports field, place the catch basins well outside the field of play and use a small grid on top.

One common drainage system design (often used with a crowned football or soccer field with a level 400-meter running track around it) uses a number of catch basins around the field, with swales from basin-to-basin to assist surface runoff. This approach has two drawbacks: it creates an awkward appearance of hills and valleys along the field edge, and the swales tend to stay wet for extended periods during rainy conditions.

A better option is to install a trench next to the track, sloping downward toward the outlets. Lay a one-half inch bed of pea gravel in the trench, then a 4-inch perforated pipe. Next, fill pea gravel to within 6 inches of the surface, top with coarse sand, and seed. The best sand has less than 5 percent passing a 100-sieve screen. The "sand drain" will serve as an open catch basin, draining both field and track, and eliminating the annoying swales to catch basins.

Installing a "sand drain" along the inside of a track can help to drain both the track and the field area inside.

Conclusion

The secret to good field drainage is planning. Obviously, the best time to solve drainage problems is before they happen, when the field is being built. On existing fields with serious drainage problems, the wise course is to identify the most serious underlying problem and to plan ways to correct it. Stop-gap measures can provide a temporary fix, but unless a plan is developed for correcting the big problems, the "band-aid" fixes will have to be done over and over.

In the mean time, identify the steps needed to really correct the field's drainage, establish a timetable and budget, and start working with boosters or community users of the field to raise the money to do the job right.

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