This installed drainage system failed.

This drainage system was not working properly.

Pay now or play later

By Steve Bush, CSFM

As I sit here watching the rain outside I am reminded how challenging this spring has been for sports field managers. I don't think we have had more than 3 consecutive days without rain this entire season. I have heard countless stories of saturated field and cancelled events from frustrated coaches, athletes, owners and administrators. Canceling events is expensive; whether it is lost gate revenue and concessions, travel time and lodging, or having to reschedule or rent other facilities. If you don't pay now for drainage you can expect rainouts, cancellations and to play the games much later.

I have looked at fields this spring where the turf may look great but the field is completely unusable as a result of standing water or drainage problems. What is truly frustrating to the owners is that several of these fields have been built recently or have an installed drainage system that isn't working. Even established turf may have soils that are so severely compacted or where poor grading exists that the drainage is ineffective.

In fact the most common drainage problems I see are the result of poorly graded or uneven fields. I have walked countless fields that hold water and will not drain because of improper grading. Even with properly installed drainage, improper grading may render the installed drainage system useless. Many times, the field is designed correctly and has enough slope to move water but the unevenness of the final grade causes water to pond or not get into the installed drains. Proper grading is the critical factor for a

well-designed and installed field to drain efficiently.

Athletic fields are designed to have very minimal slope so players do not feel like they're running up and down hill. Here are common slopes for different athletic fields:

Baseball infield, 0.5%
Baseball & Softball outfield, 1% to 2%
Baseball and Softball skin areas, 0.5% to 1.75%
Football Crown, 1.0% to1.75%
Soccer side to side, 1.0% to1.75%

A .5% slope on a baseball infield means it is falling at the rate of 6 inches of fall in 100 feet of length. At this minimal slope any variance in grade will cause water to stand on the field. Any fields with 1% or less slope almost always require an installed drainage system.

Because the slopes are so minimal, it is suggested that laser guided equipment be used for any new construction or renovation project because of its accuracy. Trenchers can also be equipped with global positioning equipment that will not only install the drainage with accuracy but will also map out the system for future reference.

On existing baseball and softball fields the skinned area should be laser graded as needed to prevent low areas and lips from forming. One of the common misconceptions of infield materials and drainage is that water should pass through the skin and be removed by drain lines under the skin. Actually, the infields should be graded so that the water sheets off of the skin and into the turf where it can infiltrate or be collected in a drain system.

Ponding

Ponding water can also be the result of high wear areas becoming compacted or dissimilar soils settling at different rates. This can often be seen where players stand on a baseball field, in soccer goal mouths, and between the hash marks on football fields. Almost every baseball field I have seen has standing water on the infield as the turf becomes lower than the level of the skin.

On football fields unevenness and drainage problems often arise as areas of repeated use become compacted. Between the hash marks and along yard lines are usually the worst areas. Repeated drills and activities like band practice often contribute heavily to this compaction. Playing under wet conditions also destroys the soil structure. Aeration can help break up compaction thus improving the permeability of the soil.

Adding amendments or topdressing are also ways to increase the infiltration and percolation rate of the soil. The most commonly used amendments are sand and calcined materials. When sand is added as a soil amendment, it is important that the correct amount and proper particle size is used. If the sand is too fine, it can actually slow the internal drainage in the soil.

If the grading is not an issue and compaction has been addressed, yet drainage is still a problem, installation of some form of drainage system is in order.

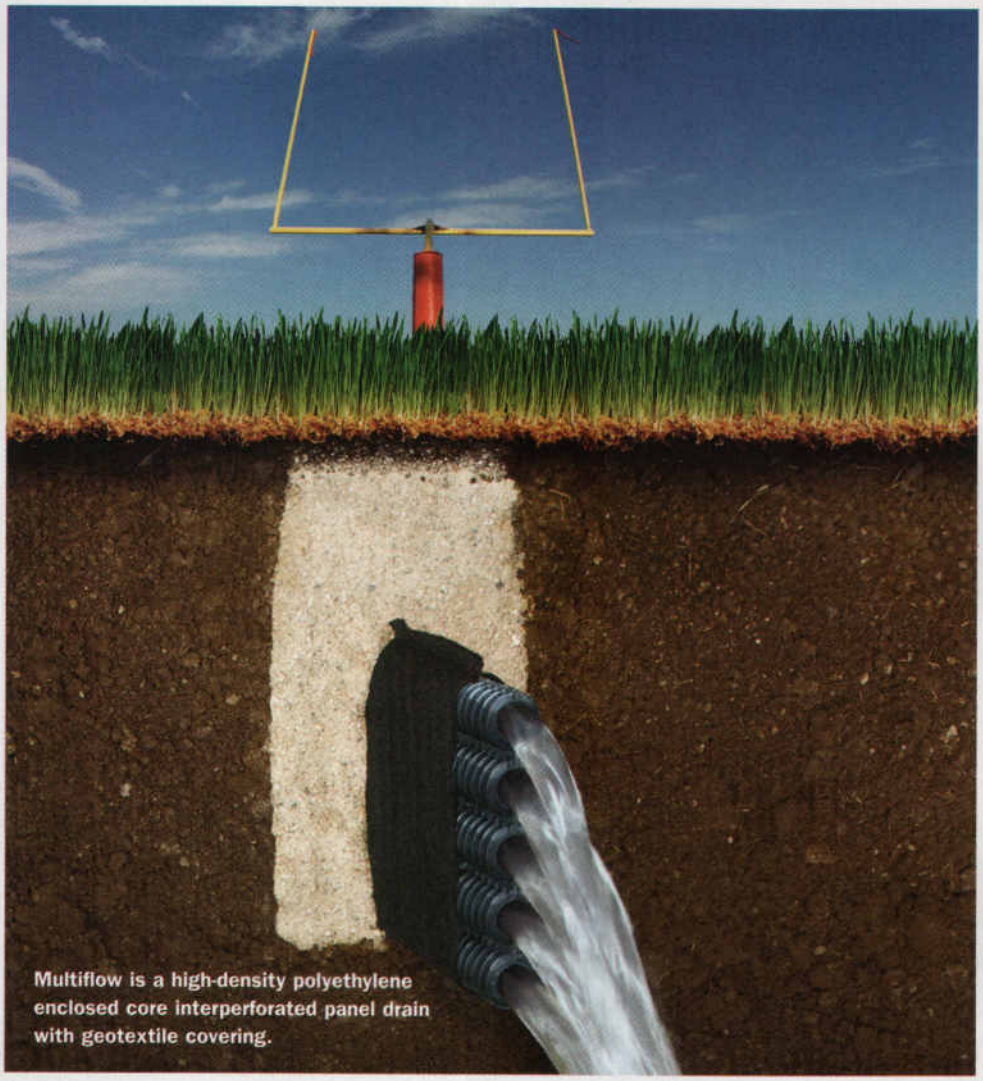
A 1-inch rain on a football field produces 42,282 gallons of water. That's a lot of water. When thinking about installing a drainage system several factors should be considered:

- How much water will need to be removed from the field?
- What is an acceptable time frame to remove this water?
- What types of soils are on the field?
- What is the budget for the drainage system on this field?
- Using these factors as a guideline, an effective installed drainage system can be designed and installed to meet your needs.

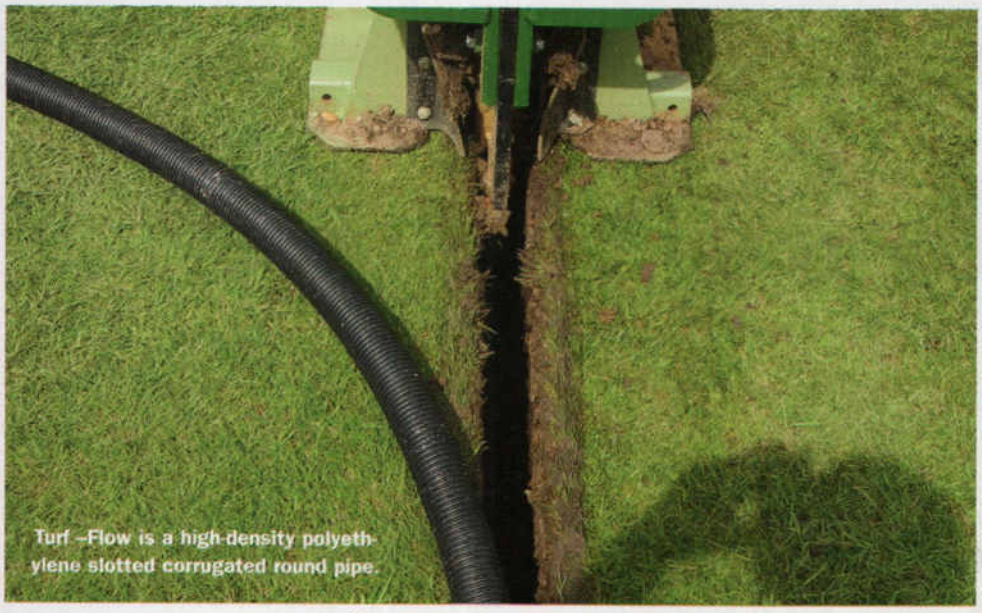
The drainage systems for native soil athletic fields are based on the principles of gravity and capillary action. There are three main types of drainage systems that are used today on native soil sports fields; pipe drains, strip drains, and sand slit drainage.

Pipe drains have been used for years in agriculture. They are primarily used for lowering the water table in an area and eventually allowing the surface to dry. Originally these systems used clay tile and more recently, corrugated plastic pipe. They range from 18 inches to 3 feet deep. The trench is filled with gravel or course sand to within 6 inches of the surface. The top of the trench is then capped off with topsoil.

From our experience, while many sports fields have this type of drain system, few of them are effective in removing water from a field at an acceptable rate. The soils will tend to get saturated above these drains before water will start to move into them. And if the soils above them are too deep or heavily compacted, they are ineffective. Fields with pipe drains installed on 15-foot centers must often wait 2 to 3 days after a signif-



Multiflow is a high-density polyethylene enclosed core interperforated panel drain with geotextile covering.



Turf -Flow is a high-density polyethylene slotted corrugated round pipe.

icant rain to be usable. Also, because of the size of these drains, they often show at the surface in drought years.

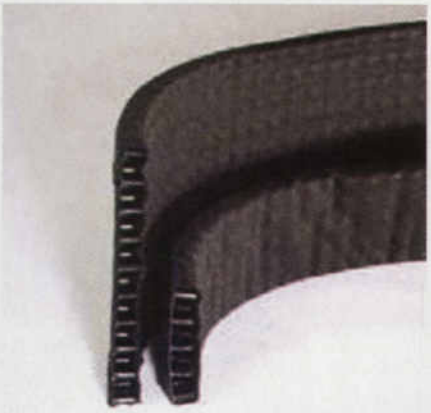
Strip drains are becoming much more common as a means of draining athletic fields. They are much more effective in quickly removing surface water from fields than pipe drains. Strip drains are narrow trenches 2 to 4 inches wide that are cut with specialized trenchers from 8 to 18 inches deep. These drains can be much shallower and can be installed in existing turf with minimal surface disturbance.

Proper grading is the critical factor for a well-designed and installed field to drain efficiently.

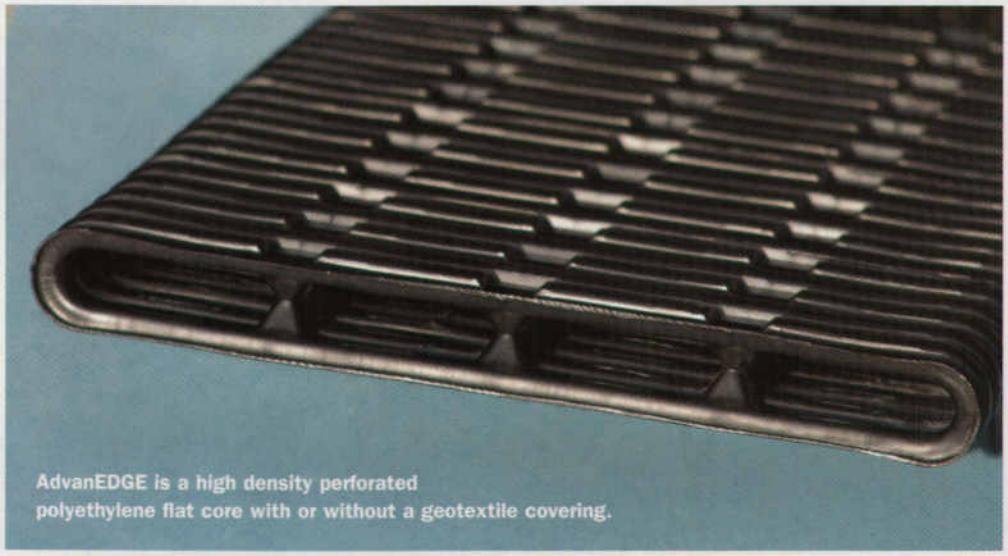
The trenchers that cut the strip drains typically remove the spoils and leave a smooth bottom trench all in one operation. There are several different companies producing round or flat drainage materials that work well in these narrow trenches.

After laying the strip drains, the trenches are typically backfilled to the surface with course sand with an approximate particle size between 1.0 and 2.0 millimeters. The sand should always be tested to make sure that it does not contain fines that can reduce the life of the system or cause it to fail. These systems are often put in after an in-ground irrigation is installed. It is important than if an existing irrigation system is installed the material used for drainage does not interfere with maintenance practices such as aeration. The big advantage to the narrower trenches is that they grow in and disappear quickly.

The strip drains are connected to a perimeter collector. The collector should be sized to handle the volume of water collected from the series of strip drains. The strip drains should be placed at a 45-degree angle to the direction of the slope. This will allow them to be installed at a consistent depth and maintain slope in the pipe. Most of the trenchers are equipped with laser equip-



Hydraway is a non-woven geotextile fabric with a high density polyethylene core.



AdvanEDGE is a high density perforated polyethylene flat core with or without a geotextile covering.

ment which adds to the flexibility of an installation. The strip drains are commonly placed on 10 to 20-foot centers.

The costs for a strip drain system are dependent on the availability of proper sands and the availability of materials and the distance of the materials from the project. In most cases this type of work would be subcontracted because of the high cost of the specialized trenching and support equipment. The cost for strip drains averages from $6 to $9 per foot for the products and installation. A typical football field would have 7,500 feet of strip drain.

The sand slit drainage system consists of a matrix of narrow 1.75-inch wide sand slits on 12 to 20-inch centers. These are cut 8 inches deep and intersect at 90-degree angles to a series of sub drains installed on 10 to 20-foot centers. This system promotes rapid surface drainage with sand trenches every 12 to 20 inches to allow water to enter the drainage system rapidly.

These sand trenches will also improve the aeration of the field and hold moisture in the soil profile when excess is not present. These systems typically cost $1.25 to $1.50 per square foot of field area. One consideration is that a sand-slit drained field will require topdressing and collection of the cores from aeration to maintain its functionality.

Plan ahead

The most important thing to do in any project is to plan. Identify the problems and their causes. With drainage there are many factors to consider and often the solution may involve more than one correction. Start with an accurate survey of the areas in question. Plan the grading and drainage based on the survey of the area and the soil types, anticipated rainfall, and the drainage rate expected for the field.

Investigate to find out what type, if any, drainage is already installed in the field and where the water from the field will go. Match the level of drainage to your budget but realize that cutting costs up front may cost dearly later. Keep in mind the expense and frustration of cancelling events because of wet fields.

And finally, hire reputable contractors with experience and a list of references on similar projects and the proper equipment designed for sports field drainage; these systems have very tight tolerances and must be installed correctly. In my opinion, it's preferable to pay for a better field now, done right the first time, than to play later every time it rains. ■

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