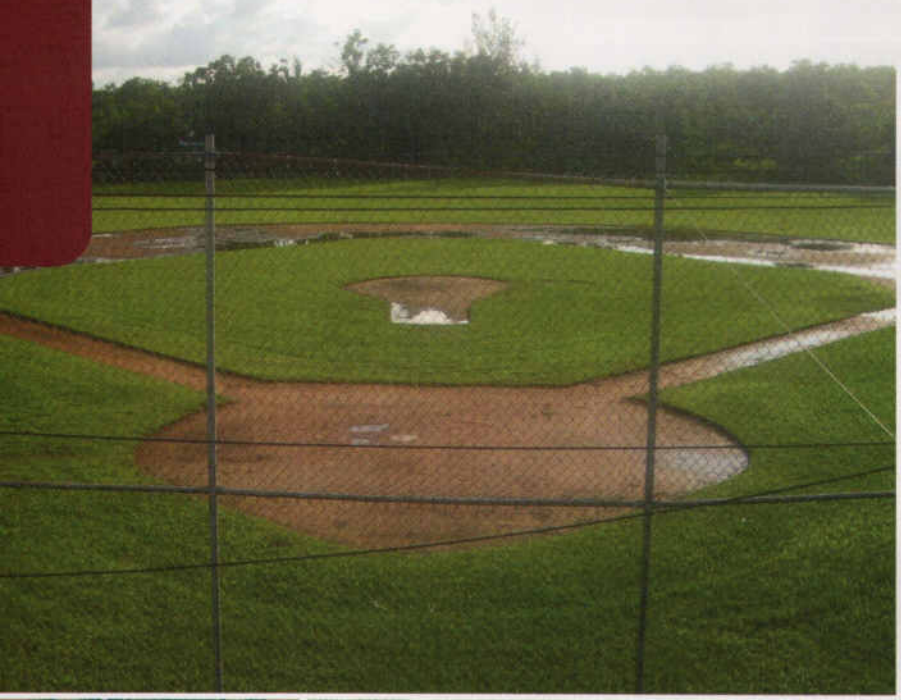
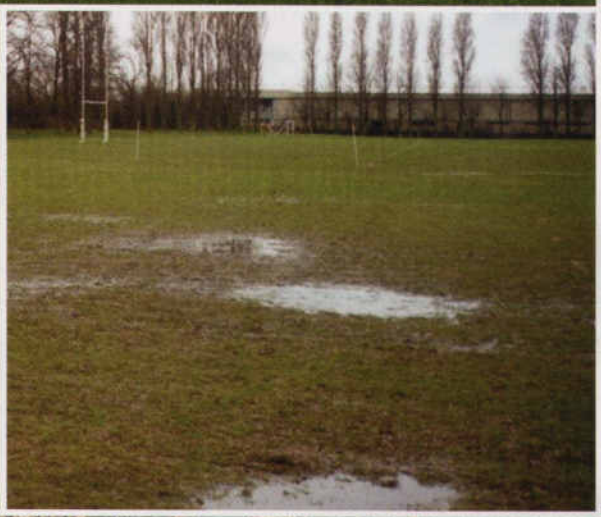




Why drainage is important

By Jim Surrell

Recently, I received a phone call from a City Parks Director. The conversation went something like this; "We installed new sod with an irrigation system on three of our existing soccer fields last spring. Now we are looking for a solution to get our fields back in shape." I asked, "Did you install any drainage on the fields?" After a brief pause, the answer was, "They were originally going to have drainage installed but it was cut from the budget. Now the fields are in rough shape because of the play during rain events."

Just like this call, there are numerous headlines from all over the U.S. that have the same message: Improper drainage, or no drainage, costs money!

"Repairs to stadium's drainage system may cost Cedar Hill ISD $850,000" was a headline in the Dallas Morning News last May. "Standing water on the field has plagued the district's $6.2 million Longhorn Stadium since it opened in fall 1999. In 2006, the district spent $480,000 to replace the drainage system and artificial turf."

"Drainage problems at Grayslake North field" from the Daily Herald outside Chicago:

"Grayslake Central High School doesn't have the same drainage problems because it has an artificial turf field. An inability to use Grayslake North's field for five days after heavy rain… officials said."

"For field crew, when it rains, it's poor" from Albany, NY: "Rain, at once a blessing and bane for football fields, fell again this week. With water, water everywhere, the fields at the University at Albany turned lush green—and also just about flooded."

Most professional turf installers understand the importance of proper drainage. Professional field turf installers agree that proper drainage is essential to field performance. If you have been in the industry for 3 months or 30 years, you understand that drainage is crucial to the quality and playability of athletic fields.

Goal is simple: remove the water

Whether you have an existing natural turf field or you are building a new one, the goal of any drainage system is to remove standing water and promote good growth of the turf. All fields have one thing in common; gravity! The old adage is true; "Water does not flow uphill." Taking advantage of gravity is the key to proper drainage design. A drainage system is nothing more than an "underground" stream that takes the water to a desired lower outlet.

Soil saturation is a common problem. For example, a field receives one inch of rainfall on one day and there is no standing water. The next day, the field receives a quarter inch of rainfall and there is standing water. The field has reached the saturation point. The ground can not accept any more water and the water will begin to stand or pond. This is why we commonly ask about the soil type when designing a drainage system. Sandy and loamy soils can accept and release water at a faster rate than clay soils. The soil type will have an affect on the drain design.

We recently assisted in the corrected design of the New Orleans Zephyrs baseball field. It had 16,000 feet of an existing 4-inch pipe system that failed in just a few years. It would take days for the water to leave the field. The field had very little or no fall and an impervious liner was placed 9 inches below the playing surface.

The liner was installed to keep water from entering the field from the bottom as the field was only eight feet above sea level. The correction required the system to be designed for a 4-inch rainfall event.

Flow ratings are only a measure of how quickly water flows *from* the pipe. A more important question to ask is, "what is the *in-flow* rate?"

We used the Hydraway 2000, a 1 x 12-inch flat drain, installing 10,000 feet on 13-foot centers in a horizontal position 7 inches below the surface. The field now drains a 4-6-inch rainfall event in just a few short hours versus days. There were no cancellations of any games due to rain this past season. This includes hurricane rain events!

Flow rate vs. In-flow

Talk to any manufacturer of drainage systems and you will find that in general drainage products have similarities and differences. The products are tested to a minimum standard "flow rate" (ASTM 4716). However, these flow ratings are only a measure of how quickly water flows *from* the pipe. A more important question to ask is, "what is the *in-flow* rate?" How quickly can water enter into the pipe? That is what needs to be considered in every design.

In-flow rates relate to how fast the water can get into the pipe as compared to how much water it can discharge at a given slope. For example, a 4-inch round perforated pipe has a flow rate of approximately 26 gallons per min at a 0.10% slope. However, you must also consider that all of the "openings or perforations" on the surface of the pipe, only add up to approx 3% of the entire surface! This is why you need a wide trench to act as a reservoir to "hold" the water until the pipe can catch up.

Our design is a "flat" pipe design that has over 70% open inflow space vs. 3% for round pipe. This relates directly to how fast the water can get into the pipe and drain the field. No reservoir is needed to hold the water and feed the pipe.

When considering a drainage pipe you need to consider the following:

• How much of the pipe surface is open for water in-flow? You will find great differences among pipe designs. Some pipes only allow 3-10% in-flow due to the small openings.

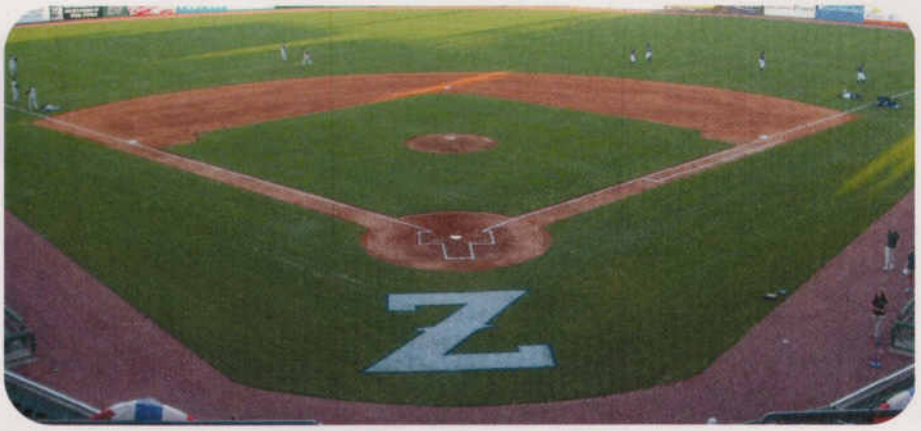
• Are all four sides of the flat pipe available for water intake? This is an extremely important question as some products only allow water to enter on the top and bottom of their flat pipe. These products have a solid side that prevents water from entering. If you are laying the pipe in a horizontal position, can the water enter the sides or does it have to try and go under or build up volume to go over the top to enter?

• What are the compressive strengths? If you are building a synthetic turf field, you most likely will be driving your heavy tracked equipment over the drain lines with as little as 2 inches of cover. Can the flat pipe sustain the weight? Or is it damaged during installation before the field is opened?

Most designers across the United States do a very good job at designing drainage systems. Often we receive site plans and are asked to assist in the design of the drainage system. We are happy to provide this assistance, and we do it at no charge.

While assisting with the design, we find several things that need to be corrected. One of the most overlooked is the amount of drainage to be installed, or improper spacing of the drain lines. For any properly designed system to work, water must be able to enter the system. The closer the drain lines, the faster the field will drain.

Another common error is the position of the lines. Typically, drainage lines should be placed at 45 degree angles of the slope and directed to a collector pipe. As surface water follows the slope of the field, the water needs to cross several drain lines to get the water into the system.



Importance of backfill for natural turf

Another commonly overlooked issue is the granular size of the backfill. We recommend coarse clean sand in a size of 0.2 mm to 0.5 mm as the backfill. This will serve two important functions; 1) it will keep the water flowing freely to the drainage system, and 2) it will act as a pre-filter for ground particulates before entering the system.

An average football field totaling between 90,000 and 100,000 sq. ft. will receive more than 55,000 gallons of water for every 1 inch of rainfall. That does not include the water that is flowing from the track or the stands onto the field.

Synthetic field drainage

Synthetic fields use a stone base that allows the free flow of water from the field down into the drainage system. The purpose is to rapidly remove the water from the sub-grade. Standing water on the sub-grade will create dips that are noticeable on the turf surface. Selecting a drainage system that will allow for rapid "in-flow" on the side of the pipe is critically important for synthetic fields. Without rapid "in-flow" the water must accumulate before it can enter the system.

Proper design requires some basic information:

- How soon do you want to play after a rain event?
- What is the average rain event in the area being considered?
- How much rain does a given area receive annually?
- What is the rain event frequency and intensity?
- What are the budget considerations?
- What is the proposed life of the field?
- Is a sprinkler system to be installed?
- Are there sufficient outlet locations?
- Is the collector system adequate?
- Does the collector need to be improved or upgraded?

There is no "cookie cutter" approach to drainage as all fields have unique characteristics and issues that must be considered. If your field is natural or synthetic, getting the water off the playing surface is the one common goal for the safety of the players and the longevity of your field. ■

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