Update on drainage for new field construction

▲ **THIS PHOTO,** taken during construction of a sports field, shows piping at the entrance to the drainage chamber. Note the crushed rock beneath the pipe, which helps filter water vertically. All photos courtesy of Stantec, Boston, MA

WHEN LAYING THE GROUNDWORK (on paper, at least) for a new synthetic turf field, a new owner has the opportunity to create the field of his dreams. The array of options available can bump up the 'wow' factor of any facility, including upgraded seating, a press box, a high-tech scoreboard and facility-wide WiFi.

So where does drainage come in? (crickets chirping)

Unfortunately, because it's invisible (but still represents a significant investment) drainage just might fall to the bottom of the priority list if an owner isn't knowledgeable. But as field builders will be glad to point out, it doesn't matter how great the seats are, or how easy it is to stream results or how nice the scoreboard is—if the field isn't draining well enough to be playable when the time comes.

"It's important for field owners to take a long-term approach when it comes to construction," says Darby McCamy of Sporturf in Dalton, GA.

"Even at the end of the turf's useful life, when it is time to replace the field" says Ed Norton of Norton, Holcomb and Partners in Birmingham, AL, "the base and drainage system should still be functioning as they were designed to do."

MORE THAN SURFACE DEEP

Poor drainage is not just an aesthetic problem, nor is it simply a game-day issue. The usefulness of the field and its long-term performance hinge on the dependability of the drainage system. When water remains on the subgrade for too long, it may cause the subgrade to become unstable and allow the base to move. It may even allow water to back up through the base and onto the surface, washing out the infill or stretching the carpet.

WHAT FALLS ON THE SURFACE...

Synthetic fields generally drain well, but not without help. Ideally, the only water to fall on the field should be rainwater or water put on by the irrigation/cooling system. Make sure water does not drain, run or drip onto the field from a track, or from bleachers, dugouts, overhangs that cover seating or any other source. Because water that enters the field in these ways may carry silt and other particulates, it has the potential, over time, to cause problems with the drainage system, and the playability, of the field itself.

Site drainage; that is, the drainage that works around the outside of the field itself, may include interceptor drains, catch basins and retention ponds, as well as other measures used to harvest and disperse storm water. For now, though, the focus is on the subsurface drainage systems; that is, those that are installed beneath sports fields.

An experienced field builder can advise an owner on

▲ **A LAYER OF AGGREGATE** is smoothed into place as part of the field construction process.

▲ **LEFT:** This cross-section shows the flat underdrain prior to installation in a field under construction. **RIGHT:** Sports field under construction showing the gravel drainage material.

▲ **FINISHED FIELD,** showing new turf surface and game lines.

the various options available, and can give guidance on which choices best suit the site, the climate and the intended use of the field. Also on the list of considerations: the financial resources and commitment of the owner, time constraints for field construction, the annual amount of rainfall and when it is likely to come, and local codes and regulations regarding stormwater management.

"The availability and quality of the rock used is important," adds McCamy, "as it can be expensive to haul rock for hundreds of miles. Be careful of any wide fluctuations in the price of the base when turf prices remain consistent. Pricing that is too low could be a red flag pointing to skimping on quality with a lower grade stone. When that happens, your field stops draining properly and in some cases mini-sink holes can form over time."

"The stone drainage layer is typically made up of two layers of stone," notes Norton, "a base stone ranging in size from 1" down to 3/8" and a thin layer of a finer finish stone on top to achieve the desired planarity of the field. The size shape and hardness of the stone is very important. Angular stone will interlock and give the field a more stable base than a rounded stone. The hardness and soundness of both the base and finish stone should be tested prior to use."

In addition to having a builder's expertise, a design professional can provide guidance on pipe diameters or the sizes of flat drains, location and distance of laterals, collection systems and storm sewer tie-ins for the drainage system.

(Yes, there's a lot to this drainage stuff, isn't there? And we're just getting started.)

Design and construction of sports facilities is a specific, exacting discipline. It's not something that needs to be left to the low bidder; in fact, it should never be a 'cheapest option available' scenario, whether you're talking about one field or a number of them. There are many options to finding a good design professional or field builder. The Internet is everyone's favorite (quickly replacing the Yellow Pages) but another option is to check the American Sports Builders Association (ASBA). ASBA offers a voluntary builder certification program for field professionals.

DOING THE MATH

To facilitate discussions with your field builder and/or your design professional, you can estimate the amount of water your field will need to handle with the following formula:

Length of the field in feet x width of the field in feet x .623 gallons = gallons of water produced by 1" of rainfall

Drainage products are rated by gallons of flow per minute (abbreviated as gpm), or sometimes as cubic feet per second (cfs).

TYPES OF DRAINAGE SYSTEMS

To understand what works best, it's imperative to know what is on the market, since various systems are used.

"It is important to remember that most of the projects being designed today for synthetic turf consist of what is known as a drainage layer of stone (typically 6" to 8" deep) under the entire field," notes Norton. "This increases the efficiency of drainage by providing another way to move water through the drainage layer of stone and away from the field. Obviously, piping will serve to move water even more quickly to the established collection/exit points. The stone is not just for drainage, but also provides stability for the field."

Flat Drains: One type consists of flat drains, used with or without a wrapping of filter fabric, placed horizontally on the subgrade in a diagonal, herringbone pattern. Because synthetic turf fields drain quickly and have the potential to capture significant amounts of water, internal drainage lines usually can be placed farther apart than for natural grass. Of course, the closer the lines are placed, the more quickly the field will drain and be available for use after rain, but the more costly the drainage system will be.

The rate of drainage also will depend on the depth of the subgrade and the slope of the drains; this is usually .5% - 1%.

Trench Systems: An alternate system uses perforated pipes, 4" in diameter, also laid in a diagonal or herringbone pattern. (Larger pipes, around 10", will be used in the perimeter of the field). Pipes must be sized and spaced correctly by the design professional, de-

pending on the amount of water they should be expected to handle. These perforated pipes are laid in trenches, surrounded by clean stone or coarse sand. In some cases, filter fabric may also be used. The deeper the drains are placed, the slower will be the initial response time.

Whether the field uses flat drains or trenches, water flowing into the drainage system can carry with it silt or clay particles or other contaminants. Therefore, it is important to surround the drainage pipes with clean stone (in this case, clean is defined as being without silt or clay contamination) or coarse sand, both of which help to remove those particles and prevent them from entering the drainage system.

MOVEMENT OF WATER OFF THE FIELD

Whether a field uses flat or trench drains, both are sloped to the edges of a rectangular field. The drains should extend 10' – 15' beyond the sidelines themselves to an area where the water is deposited in perimeter collector pipes. Depending on the grading plan, the amount of water to be moved and other factors, intermediate collector pipes also may be included in the drainage plan; again, this is an issue where a builder and a field design professional can provide advice.

Placement of collector pipes may depend upon the sport itself. Most baseball or softball fields include intermediate collector pipes starting approximately halfway up the sideline, or foul lines, and running parallel to the centerline. Some football or soccer fields also may include intermediate collector pipes depending upon the grade of the subbase, the amount of water expected, how quickly the field must be available after rain and other factors. These intermediate collector pipes as well as the drainage pipes move the water to perimeter collector pipes, which in turn move it to a disposal site such as a storm drain or catch basin.

It is important to remember that most of the projects being designed today for synthetic turf consist of what is known as a drainage layer of stone (typically 6" to 8" deep) under the entire field. This increases the efficiency of drainage by providing another way to move water through the drainage layer of stone and away from the field. Obviously, piping will serve to move water even more quickly to the established collection/exit points.

As was mentioned previously, there are multiple systems that should be employed to move water beyond the site itself, and to deposit it into a legitimate collection area. These issues will be discussed in a future article. ■

Mary Helen Sprecher wrote this article on behalf of the American Sports Builders Association. Available at no charge is a listing of all publications offered by the ASBA, as well as their Membership Directory. For info, 866-501-2722 or www.sportsbuilders.org. ASBA also offers its book, Sports Fields: A Construction and Maintenance Manual*, which contains information on sports facilities, from concept to completion.*