Drainage systems 101

"Rainout" might just be an honorary four-letter word in your vocabulary if you're a field manager. Consider the problems they cause:

- Games that need to be rescheduled
- Schedules that need to be reshuffled and of course:
- Complaints you have to hear (as though you personally ordered up the rain)

Unless your field is in a desert area, there's a good chance that you're going to have to deal with rainouts at various times throughout the year. The key to getting the schedule back on track (and the complaints minimized) is a good drainage system. In fact, good drainage is probably the most important factor in long-term performance of a field, and in making the field valuable to the owner.

Work with a design professional to help you come up with a plan for an efficient system for your field. The designer will take into consideration the specific use or uses of the field, the local climate, the availability and cost of materials, the quality and characteristics of local stone, the financial resources and commitment of the owner, time constraints for field construction, the annual amount and intensity of rainfall, local codes and regulations regarding stormwater management. The professional will be able to specify pipe diameters or the sizes of flat drains, location and distance of laterals, collection systems and storm sewer tie-ins for the drainage system.

Something that has been mentioned previously: drainage systems (in this case, the systems under the playing area) should be designed only for water that falls on the field because of precipitation, or because of irrigation. In other words, a field should not be receiving water that runs down off bleachers, drips from dugout roofs or runs off the track.

Surface drainage controls water from precipitation and water from those other areas, including water that drains off following the irrigation of planted areas adjacent to a field. There are three types of surface drainage systems: open systems, closed systems and combination systems.

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Open systems use swales (natural drainage channels covered with vegetation, usually grass) and gutters (paved swales) to divert water away from the field(s). Open systems rely on slope (gravity) alone to move water away. Lawn swales should be sloped to prevent the accumulation of standing water and to avoid erosion. An open system is fairly inexpensive to build if there is room and if the ground is easily workable. Open systems are less practical on sites where space is limited.

Closed systems, on the other hand, include pipes so water is collected and transported in a contained system.

Trench drains: There are two types of closed trench drains: gravel drains and grated drains. Gravel drains consist of an open trench with a sloping bottom filled with free-draining stone, with or without a pipe. The trench usually is lined with a non-woven geotextile filter fabric allowing water but not solids to pass through. Next, a porous or perforated pipe is laid along the bottom of the trench on a gravel bed. The remainder of the trench then is filled with gravel to the surface and left open to catch storm water while the pipe at the bottom collects it and carries it away.

Similar options include a grated trench drain (commonly called a channel drain), a gutter made of concrete or prefabricated sectional material, or a slot drain consisting of a prefabricated sectional material placed in a narrow trench. Any of these options will include a grate that prevents debris from entering.

The advantage of closed drains is their top surface can be set at a uniform grade, eliminating the need for a sloped swale or gutter. The bottom of the trench slopes instead of the surface. This is particularly useful where there is limited area around the field. In addition, it is quite common to use a gravel trench drain to act as both a surface and subsurface drain.

Catch basins: Where the presence of buildings, rocks, trees and/or other fixed obstructions, or significant changes in elevation on the site preclude moving stormwater to a storm sewer or appropriate drain field, a catch basin located at a safe distance from the field and from normal foot traffic, may be used. A catch basin is a below-grade structure, typically made of pre-cast concrete, masonry (block) or pre-molded PVC, with a plastic or metal grate on top.

Water is directed by swales, gutters or trench drains to the catch basin and from there it is dispersed. If a catch basin is provided with a sump below the invert-out, it promotes water quality improvement by allowing the settlement of silt, soils and other debris. In many cases, it allows water to safely be dispersed into storm sewers, creeks, ponds, wetlands or other environmentally sensitive areas.

In other cases, a catch basin is designed with a perforated sump in order to provide infiltration into the surrounding soils. This is done in areas where soils are highly permeable and the water table is deep enough to allow such infiltration. If constructed in this manor, a catch basin is commonly called an infiltration basin or a leaching basin. Area drains, drain inlets and in-line drains also are used to remove water from the surface and direct it into a closed drainage system.

In reality, most surface drainage systems are made up of a combination of swales, gutters, trench drains and/or catch basins, known as a combination system.

These systems treat only surface water and may be insufficient if the site is low and a large area of land drains onto it, or if there is a large amount of ground water. They are, however, useful to remove water drained off the field or off nearby buildings or pavements.

SUBSURFACE DRAINAGE

Subsurface drainage addresses the management of water below ground. Water will naturally drain from high areas to low areas both on the surface and underground. Additionally, there may be natural ground water channels within a site.

A French drain places an underground barrier between the facility and approaching subsurface water. The most common type of French drain consists of a trench separating areas of ground water accumulation or flow from the facility. The width, depth, location and number of French drains on a site depends on the soil conditions, the water table and the amount of water needing to be captured and relocated. Generally, a French drain consists of a rectangular trench filled with permeable aggregate extending to the surface, allowing the French drain to serve both surface and subsurface flows. The side walls and

bottom of the trench typically are lined with a suitable drainage filter fabric. Normally a French drain does not include a pipe; however, the inclusion of a pipe makes this type of drainage system more efficient.

A subdrain is similar to a French drain but it does not extend to the surface and always includes a perforated pipe. In the construction of a subdrain, the trench is sometimes wrapped with a suitable drainage filter fabric. In some conditions, however, the use of a prewrapped perforated pipe might be preferred by the design professional. Some design professionals prefer to keep the drainage filter fabric as a material separator to keep the natural subgrade soils from the drainage stone only. In this case, the fabric is placed on the subgrade and the drainage pipe is free floating in the clean stone drainage trench.

A relatively new variation of both the French drain and the subdrain uses a geocomposite drainage material. This material facilitates the construction of subsurface drainage with a much smaller trench or profile. Geocomposite drainage material is available in various sizes, depending on the amount of water to be handled and the rate of flow desired. The geocomposite is inserted in the trench where its unique shape allows for unobstructed water flow in a narrow trench. In some cases the design will incorporate a geocomposite or molded plastic drainage material directly under the synthetic turf or under a thin layer of drainage stone. In these two scenarios, the geocomposite is basically a substitute for a more substantial layer of drainage stone. The geocomposite is typically covered by a non-woven filter fabric to prevent soil and other small particles from clogging the drainage medium.

Another variation of the French drain, called a footing drain, is used behind a retaining wall or other structure where removal of ground water is prudent.

Any of these French drain or subdrain systems will terminate in a storm sewer connection or carry the water to an area of the site where it can be stored for reuse or dispersed in a responsible manner. These will be discussed in a subsequent 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. Call 866-501-2722 or see www.sportsbuilders.org.

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