Diamond Drainage

by Tom Burns

This article is the second of three articles on soil compaction and drainage issues. In the first part, Mike DePew discussed and defined terms to provide a better understanding of soil science principles relating to soil mechanics and soil strength principles. In this second part, Tom Burns discusses the multiple issues involved in drainage of baseball and softball fields.

An understanding of the soil science principles relating to issues of compaction and drainage is essential in athletic field construction and maintenance. On baseball and softball fields, the relationship between the physical properties of the various soil profiles during the wide range of climatic conditions and field-use situations affecting that field must be considered to properly manage field playability.

Drainage issues on athletic fields involve surface drainage—the movement of water across and away from the soil surface—and internal drainage, the movement of water into and through the soil. Infiltration describes water movement into the soil. Percolation describes water movement through the soil profile.

Field construction should provide for adequate surface drainage of the entire field and adequate internal drainage for the non-skinned portions of the field. The clay content of the skinned area combined with the degree of compaction required to provide firmness for play create a percolation rate too slow to move water into standard internal drainage systems.

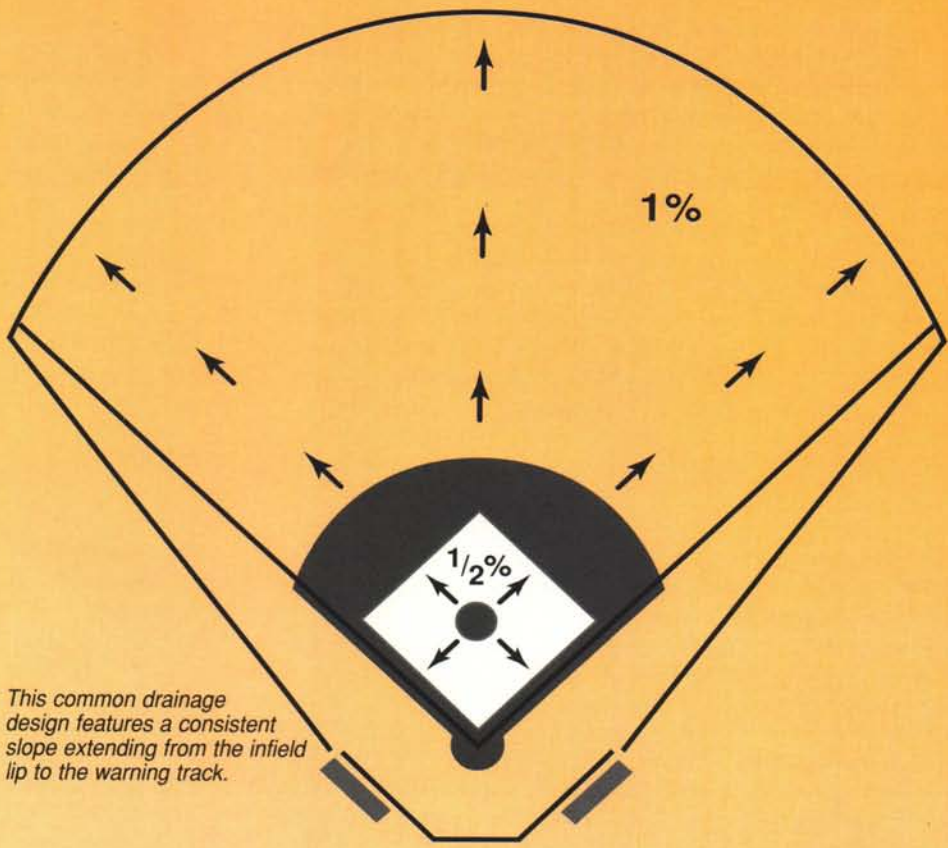
Surface Drainage

The main drainage issue on a baseball

or softball field is the movement of water away from the primary areas of play, the skinned and infield surfaces, and then away from the entire field surface. This is achieved through creating a degree of slope sufficient to move the water without producing a negative impact on field playability.

The general rule of thumb for this slope is one-half percent throughout the infield, one percent throughout the outfield, and one-quarter to one-half percent across the "dirt." This degree of slope could be increased or decreased slightly based on the average amount of rainfall the untarped field would receive. The higher the rainfall received, the greater the degree of slope.

The mound should be the high spot on the field with all water flowing away from it. Water hitting the center of the mound should flow in a cone away from the mound, moving equally in all directions. The infield slope should begin at the mound and continue equally and consistently in all directions past the basepath.

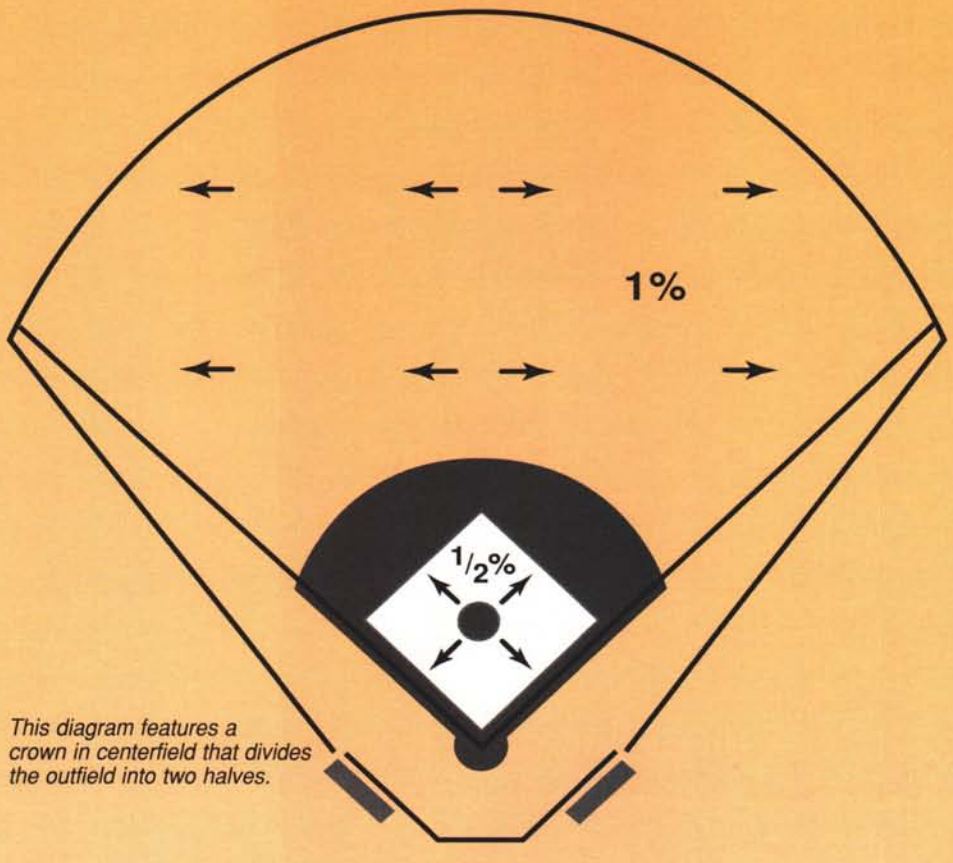


This common drainage design features a consistent slope extending from the infield lip to the warning track.

There are two common options for outfield drainage. The first continues the principle above, with an equal and consistent degree of slope extending outward in all directions to the warning track. The second option calls for a crown in center field, with the slope extending from the crown outward to the warning track. This option drains the outfield as two halves.

Field design and construction also must provide a method of removing the water accumulated at the perimeter of the field through surface drainage. This usually is handled through a channel drain at the edge of the field that connects to a central outside drain line that leads to a catch basin or sewer system.

If adequate surface drainage is not achieved, no internal drainage system can function well enough to compensate for the deficiencies and provide optimum field playability.



This diagram features a crown in centerfield that divides the outfield into two halves.

Design and Construction

Typically new construction will include an internal drainage system incorporating a network of drainage tiles leading to the external

drainage site. With higher-level sand-based fields, the drainage tiles are at the base, generally enclosed in filter fabric, and are covered with a layer of pea gravel. This layer is topped with the sand profile material. A layer of filter fabric will be placed between the pea gravel and the skinned area mix to prevent infiltration by the clay. The depth of each layer varies with construction design.

The drain lines often are placed on 15-foot centers throughout the field, though some field designs use 15-foot centers for the infield and sidelines and 30-foot centers in the outfield. If the budget allows, it's better to include the additional drains. It's far easier to add water to a field than to take water away. Typically the drains run under the skinned area, though little if any internal drainage will occur there, simply to tie drainage of the infield turf area into another pipeline. The drain lines do need to be sloped properly with some degree of downward fall leading to the collection point.

Warning Track

Surface and internal drainage of the warning track depend on the types of natural or synthetic materials used and the construction design. Natural material warning tracks typically have a slight slope though traffic and frequent maintenance make it difficult to maintain the integrity of the slope. Artificial warning tracks generally have an internal drainage line installed. Many field designs include drainage lines in the turf bordering the warning track or incorporate a slit or sand drain around the field.

A channel drain around the perimeter of the field also helps collect water run-off from the stands. If possible, drains and a drainage system within the stands can be used to reduce run-off onto the field. Rubber skirting at the bottom of the gates used for field access from the stands also help hold back the water and reduce washout areas. Some older fields featured a catch basin system with grates that could be covered with an artificial turf mat that could be removed to allow water to funnel through.

An effective surface drainage system helps remove water from the tarp when the field is covered. Some fields are designed with internal drainage on tighter centers in the

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area where the tarp water is dumped. This may include vertical drainpipes with caps that can be removed prior to dumping the tarp.

Problem Solving

Use imagination in solving drainage problems. Installation of a drainpipe, French drain or slit drain may eliminate a wet area, but will have limited holding capacity, so do tie it to an outside outlet.

Upright, capped drain tiles leading to the subsurface drainage tiles can improve water removal on a native soil field. The caps can be removed during heavy rains and additional excess water swept or squeezed into the openings. Swales placed off the playing surface can channel and direct run-off water. Swales should not be used on the playing surface. Even a slight dip and rise system has the potential to cause player injury.

Prevent lip buildup along the skinned area and turf transition points. The lip serves as a dam trapping water on the skin. Pay special attention to the back arc of the infield, sweeping or hosing it daily to remove excess material.

Be aware that a side effect of the field slope is the washing of skin material into the outfield. The contamination increases following aerification as the infield material washes into the holes created by the process. The clay particles from the skin are so fine they tend to seal off the natural drainage of the soil profile and damage the integrity of the root zone. Over time on high profile fields it will be necessary to solve this problem by removing and replacing a layer of sod approximately four or five feet into the outfield.

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On fields where the entire infield is a skinned area, monitor maintenance to eliminate the depressions that will be formed by player traffic. The areas around home plate and first base, the spots of choice for the second baseman and shortstop, and to a lesser degree, second and third base, will receive a higher level of wear and require close attention to maintain the integrity of the slope as originally constructed. Whatever the design of the field or the level of play, the groundskeeper must maintain and manipulate drainage to achieve top playability.

Tom Burns is director of grounds for the Texas Rangers and STMA board member representing Category I, those in charge of professional sports facilities. He is a frequent contributor to sports turf-related publications and a frequent speaker at turf-related conferences.