What Makes Your Infield, Your Infield?

*by Jim Hermann, CSFM

It could be that wet area mid way down the third base line. Or, it could be the sandy infield mix you have wanted to replace but haven't had the resources for. It could be the playing schedule your field is forced to endure. Your baseball or softball infield is different from every other. For this reason, the particulars of your maintenance plan and the products you use have to be site specific to your individual field. The key to being an effective sports field manager is having the ability to evaluate your individual field and apply the principles of proper athletic field management. This must be accomplished in a way that coincides with your resources, the needs of your field and the needs of the teams and leagues that use it.

Consider the following assumption: This product is used on nine out of ten professional infields and is therefore the answer to the problems on your infield. Consider the actual differences in your infield and a professional infield.

Along with being covered, primped and pampered, a professional infield typically starts with a perfectly graded sub base below the actual playing surface. This sub base usually maintains a grade contour, which mirrors that of the final surface-grading plan. A popular and effective surface grading plan for a professional field is one, which maintains a precise slope of ½% away from a point directly behind pitchers mound in all directions and maintains a smooth transition into the turf perimeter.

Your infield or my infield may have a slope of 1.5% on one side and 1% on the other. It may have no slope at all. It may be the high point of the complex or the low point of the complex.

The sub base of a professional infield is typically excavated below finish grade to a depth which accommodates both the infield mix or root zone along with a subsurface drainage plan which may include a full gravel blanket. Lateral drains may be installed within or below the gravel blanket at a depth and spacing engineered to be adequate for the existing conditions to evacuate potential water.

A gravel blanket or layer is installed at a minimum thickness of 4" or so. The actual thickness is determined by the particle size and physical properties of both the gravel being used and the material above it. As with everything else in athletic field construction and maintenance there are differences in opinion in regard to what material is best for an effective gravel blanket. Some say clean ¾ stone covered with a geotextile fabric, which acts as a filter. Others prefer a smaller particle size more compatible with that of infield mix that does not call for the use of geotextile fabric to prevent inwashing of infield mix into the gravel below. I know from experience that a geotextile fabric installed below any material with a significant amount of clay such as infield mix will ultimately clog.

A misconception in reference to the use and potential benefit of a gravel blanket is the belief that the sole purpose of a gravel blanket is to provide an avenue of drainage for the infield mix or root zone above it. A properly maintained infield mix infiltrates water at rates as low as .03 inches per hour or lower. For this reason, the gravel blanket or other material below the infield mix is not usually a limiting factor in maintaining proper surface drainage. Adequate and effective surface drainage is typically the product of proper surface grading and as such the ability of the water to move laterally off the infield into the turf area where it can effectively be intercepted and removed by means of surface perimeter drainage.

The main benefit derived from the installation of a gravel blanket or other subsurface drainage system that far exceeds any benefit in surface drainage is the decrease in the potential for saturation of the infield mix caused by ground water or a rise in the water table from below. When used in conjunction with a surface drain surrounding the infield, a gravel blanket helps to isolate the infield from the effects of site-specific conditions surrounding the infield.

Infields that I have had the opportunity to maintain and I am sure many of yours are very dependent on site-specific conditions such as a high water table or poor surface drainage of surrounding areas. If the soil surrounding your infield is saturated, chances are the infield mix is also saturated. **In order for drainage to be effective there has to be a place for the water to go**. A high water table does not provide for this. A gravel blanket provides an escape for ground water only if it is connected to an outlet.

Now that drainage has been addressed, lets look at the infield mix. What is your main concern when selecting an infield mix? Typically, the main concern is cost. As the demand for quality and playability increases, managers like you and me are becoming more concerned with the composition of infield mix and how infield mix acts given our site-specific conditions.

When it comes to the footing provided to the players, most professional infields are made up of two very specific layers. First, there is the base mix. More often than not, the base mix used in professional infields is higher in silt and clay content than an infield mix that might be acceptable to you or me. The moisture content of the base mix is managed at a precise level to insure proper stability and resilience. It is rolled to a point of firmness that is sometimes referred to as being cork like. A thumbprint or depression can be established with some difficulty. A cleat can penetrate the base and be removed without loosening material and bringing that material with it. The integrity of the base is protected at great length to insure consistency and minimize contamination from outside sources.

I don't believe there is such a thing as a "typical" base mix in professional ball. Most professional managers will try to accommodate the desires of the players when developing the infield footing and as such adjust the composition of the base mix to attain that goal. One mix that I am aware of is a base mix that starts with 60% sand and 40% clayey material. To this, 20% calcined clay is blended. I will be honest with you. I don't know if that is by weight or volume.

If you look at an acceptable mix for you or me as being a mix with 80% sand and 20% clayey material, it is within the realm of understanding that they have replaced 20% of the sand with calcined clay. This allows the 60% sand, 20% calcined clay mix (60 + 20 = 80), to maintain much of the physical characteristics of the 80% sand blend along with the added benefit of moisture retention and therefore increased stability brought about by the use of calcined clay). This concept does not support the fallacy that you can continually use infield-drying agents by just mixing them in without destroying the integrity of your infield mix.

Covering the base mix, there is a ¼" or so of topdressing. Topdressing is used to help provide the desired footing for the players. This topdressing is not merely derived by scarifying the upper half-inch or so of base material as is the case with most municipal infields. It is a specific blend of materials chosen by that particular manager to achieve the footing his players desire. There are a few considerations when selecting topdressing.

Topdressing not only provides the desired footing for the players but also provides a "capillary break" in the infield system. This capillary break minimizes evaporation or moisture loss from the base layer below by acting as a protective coating similar to mulch used to maintain moisture in a new seeding. A capillary break is a break or interruption in the capillary movement of moisture caused by a difference in particle size and distribution between adjoining layers and as such a difference in hydraulic conductivity (*the ability of a soil to transmit water*). Hydraulic conductivity will persist uninterrupted when moving from a coarser material to a finer material as from the topdressing into the base, but is interrupted when moving from a finer material to a coarser material as from the base into the topdressing. Gravity has little or no influence on this process.

The topdressing must retain moisture to provide an acceptable degree of stability and dust resistance and also be hydrophobic (repel water) to the degree that it allows for effective wetting of the base below, when needed. With the lack of infiltration provided by the base, the topdressing must also allow for optimum lateral (sideways) movement of excess moisture as an effective means of surface drainage in the event of rain.

Again, the word "typical" doesn't apply. One topdressing I am aware of consists of 80% vitrified clay and 20% calcined clay. The layering of dissimilar materials between the base mix and the topdressing forms the capillary break. Water does not readily travel from the base into the topdressing where it would be more influenced by evaporation.

You or I on the other hand, would scarify a wet infield in an attempt to provide optimum drying conditions. This is because there is no capillary break. In our situation, water is capable of rising to the surface, as it would rise through a sponge where it is more susceptible to evaporation at the surface. Scarification exposes more surface area to promote increased surface drying and moisture evaporation

The calcined clay in topdressing retains moisture but has the potential to become sticky when overly moist. Vitrified clay; although it does have the ability to absorb moisture, does not have the moisture holding capacity of calcined clay and therefore provides for the increased vertical movement of moisture when required by the base mix and lateral movement of moisture to the perimeters when necessary for surface drainage.

Add to this formula, sub surface irrigation designed to provide each individual player the footing he desires and you have a system totally foreign to many of us. So when someone says, "use this, its used by nine out of ten professional sports field managers", make your decision is based on the needs of your field and not the needs of nine out of ten others.

What makes your field, your field? "You" are the one making the decisions.

The ability of an effective sports field manager is slowing gaining justified recognition as an art form. In view of this, it should be understood that although the principles of proper sports field management are imbedded in science, the application and utilization of those principles remains an art form acquired through experience. Science provides the explanations for why infield mixes and soils react the way they do. Experience allows for discretion and the ability to utilize this resource given your site-specific circumstances. Science provides the ASTM Standard Guide for Construction and Maintenance of Skinned Areas in Sports Fields (Publication F-2107-01). Experience gives the Sports field manager the discretion to utilize and relate this information to his or her individual site-specific conditions to optimize durability, playability and safety of the infields under his or her control.

Education is key. Whether it is a short course provided by Rutgers or a field day provided by SFMANJ, education is key in both acquiring and utilizing information and resources at your disposal.

Proper sports field maintenance is a balancing act dictated by both the positive and negative influences exerted on your field.

Effective utilization of resources, minimizing negative impact, maximizing positive influence, optimizing time allocation, these are all responsibilities of the sports field manager.

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Answer for Last Issue's Puzzle

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Field Design & Usage

***by Pam Sherratt & John Street**

The topic of **field usage** is something that comes up regularly. Dr. Dave Minner from Iowa State has been conducting national field surveys for the last few years with the aim of correlating the condition of a field with the amount of events it hosts. The data collected from field managers across the USA has ranged anywhere from 10-650 events per year.

Research carried out by STRI (Baker 1992) also identified different levels of use that fields could withstand and suggested the following:

1. The more sophisticated the construction of a natural turf drainage system, the more artificial the field, and the less able it is to buffer against mis-management. Technical management in turn must be improved in conjunction with a total commitment by ground staff as drainage becomes more specialized.

2. If the natural soil drainage is poor, then installation of pipe drains only is not worthwhile except as a first step for schemes to be superimposed upon it.

3. Slit drained fields are the most cost-effective form of field provision examined, provided their installation is accompanied by correct management and a life span of at least seven years is achieved without major reinvestment.

4. If slit drained fields need to be re-slit at intervals of less than approximately seven years, the cost per hour of use is comparable with or even greater than that for a sand carpet field.

5. Suspended water table fields are the most expensive forms of field provision. In addition, the potential cost of floodlighting and irrigating these pitches is considerable and should not be ignored in the cost-effectiveness evaluation. At intensities of use expected of other designs they provide an excellent but expensive playing surface. They cannot maintain grass cover at intensities of use which would make them cost-effective and over-use creates major maintenance problems.

6. In the short-term, sand carpet and suspended water table fields can only really be justified from a financial point of view if play has to be guaranteed irrespective of the weather (except snow and frost).

In January 2004, the STRI published another article on this subject. The summary is as follows:

* **Undrained or basic drained fields** that rely upon the nature of the local soil for drainage could support 1-2 hours per week of adult play (50-80 games per season). Any more might compromise field quality. Amount of rainfall will also heavily influence this number (i.e. a sandy soil field will accommodate more play than a clay loam field before grass cover is lost and surface drainage rates fall).

* **Slit-drained fields** are designed whereby the water bypasses the native soil, so that the local soil has less of an influence on drainage rates. The slits are usually 3ft apart, running perpendicular to installed drain pipe, and backfilled with clean sand. These fields can accommodate 6 hours adult play per week (95-125 events per season). A slit-drained field will cost more to install and requires a certain level of management - in particular, an annual sand topdressing program has to be initiated to make sure that the slits are not *capped off* over time.

* For even higher levels of use, **sand cap or suspended water table** constructions are required. These can accommodate 8-9 hours of adult use per week. These fields cost more money (100-160K) and require a higher level of maintenance, which is sometimes not feasible for high school or parks & rec areas.

* All of these figures are based upon a high standard of field maintenance appropriate to the type of construction. Annual coring/deep tining, sand topdressing, appropriate slit tining, regular mowing, and occasional fertilizer applications are the minimum that need to be budgeted for, alongside any drainage improvement. A key requirement on any field that drains well is an irrigation system.

Note: they considered junior usage to cause far less field damage, so hours of play could be increased by 50% for junior use.

RESOURCES:

An informative publication, explaining each of these field designs, including diagrams, has been put together by **SPORT ENGLAND** . The PDF document can be viewed &/or printed off at http://www.sportengland.org/downloads/Naturalturf.pdf.

References: 2004-03-22 *Gibbs, R. J.; Adams, W. A.; Baker, S. W. Case studies of the performance of different designs of winter games pitches. II. Cost-effectiveness. Journal of the Sports Turf Research Institute. Vol. 68, June 1992, p. 33-49. Beggs, E. Winter Games Pitches - How Many Games? STRI Bulletin, January 2004.* ◆