Rutgers Corner - Differences Exist Among Infield Mixes

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Introduction and Rationale

Management and potentially selection of an infield mix are an integral part of a sport turf manager's responsibilities if he or she is required to oversee the maintenance of a baseball or softball field. In many cases, a field manager will only be familiar with his or her infield mix and be unaware of the variety of mixes that are available on the market. In Summer 2003 we created plots at the Rutgers Snyder Research and Extension Farm for the purpose of demonstrating different infield mixes.

Our goals in selecting mixes were to choose various mixes that fell within American Society for Testing and Materials (ASTM) standards as well as choose materials that did not meet ASTM specifications.

According to ASTM specifications utilizing sieve designations, no more than approximately 7% of an infield mix may contain gravel (particle sizes greater that 2.0 mm) and 80-94% of the mix should be comprised of sand. The remaining portion of a mix should be silt and clay.

However, the ASTM standards contain a passage, which states, "In the absence of particle size data to assess materials, a reasonable approach would be to prepare a mixture using 15 to 30% clayey soil and 70-85% sand ...". Using these criteria, we designed the Summer 2003 demonstration that included a total of 5 mixes; two falling within ASTM standards, and three falling outside ASTM standards.

Materials and Methods

A uniform, non-sloped, well-drained site was chosen and three pits (approximately 30 ft x 10 ft) were excavated by rototilling to a depth of 3.0 inches and removing the loosened soil with a front-end loader. Large stones were removed from the pits and the base of each pit was scarified to a depth of 1.0 inch and rolled.

Two pits were individually filled with two mixes that generally fell within ASTM specifications at the high and low end of percent sand composition. Approximately 0.5 inch of mix was added to a pit, rolled to create a firm surface, and additional mix was added and rolled at 0.5 inch increments.

Mix 1: 88% sand, 12% silt/clay

Mix 2: 70% sand, 21% silt/clay, 9% gravel

We divided the third pit into three equal 10 ft x 10 ft sections and filled each section with a mix that clearly fell outside the range of acceptability as defined by the ASTM standards.

Mix 3: 95% sand, 5% silt/clay

Mix 4: 66% sand, 17% silt/clay, 17% gravel

Mix 5: 50% sand, 44% silt/clay, 6% gravel

Mix 3 (excessive sand) was prepared by modifying Mix 1 with additional sand. The volume of a 10 ft x 10 ft pit was determined and a calculated volume of sand was added to a known volume of Mix 1 to completely fill the 10 ft x 10 ft pit. Using similar methods, additional gravel was added to Mix 2 to create Mix 4 (excessive gravel).

Excavated pits were filled with infield mixes using a front-end loader.

While Mix 5 falls outside of ASTM standards due to excessive silt/clay, it must be noted that this mix is acceptable for use in the construction of pitchers' mounds and batters' boxes.

Maintenance Regime & Discussion

Following installation, the infield mixes were left uncovered and therefore exposed to weather conditions ranging from heavy rainfall to prolonged dryness.

In order to maintain a "game-ready" infield surface under dry conditions, it was necessary to supply moisture to Mixes 1,2,3, and 4 several times daily followed by hand raking.

We define a "game- ready" infield surface as surface that is firm yet cork-like (using one's thumb to create an imprint in the mix) and can be worked with a rake or other scarification tool to create a loosened "cap layer" of mix.

Rob Shortell, Rutgers University, adds additional sand to Mix 1 (88% sand) to create Mix 3 (95% sand)

While the addition of moisture to Mix 3 (excessive sand) added some stability to the mix, because of the excessive sand content and subsequent inability to retain moisture, we deemed Mix 3 to be commercially unacceptable.

Mix 5 (excessive silt/clay) was extremely difficult to manage and was rarely game-ready. During dry weather, this mix became rock-hard and cracked. Following rainfall, Mix 5 was soft, slick, unplayable, and an illustration of another commercially unacceptable mix.

Mixes 1 and 2 (both conforming to ASTM specifications) showed differing moisture requirements and drying times following exposure to dry and wet conditions, respectively. Under dry conditions, Mix 1 (88% sand) required the addition of more moisture compared to Mix 2 (70% sand) to bring to game-ready conditions. Following heavy rains and subsequent dry weather, Mix 1 required less drying time to become "workable" with hand rakes and thus easier to prepare for a game-ready surface.

Under all conditions Mix 4 (excessive gravel), displayed identical characteristics (wetting and drying) to Mix 2, indicating the additional gravel had minimal impact on the behavior of the mix. The 17% gravel content comprising Mix 4 (ASTM standards suggest 7% maximum) presents a significant safety hazard and, in our opinion, mixes similar in composition to Mix 4 should not be used as infield playing surfaces.

After several weeks of allowing the mixes to be exposed to variable weather conditions, we made the decision to cover the mixes with tarps. We made this decision, in part, by noting that the ASTM specifications say, "When budget allows ... areas should be covered with an appropriate impervious cover when not in use. Such covers prevent evaporation in dry weather and protect the area from excess water during rainfall or general irrigation of an infield."

Considering Mixes 1 and 2 (both conforming to ASTM standards), following rainfall, the covers kept the mixes dryer and reduced the amount of time necessary to prepare the mixes for game day conditions. Despite covering the mixes, Mix 1 (88% sand) continued to require less time to prepare compared to Mix 2 (70% sand) following rainfall.

Conversely, Mix 2 retained moisture longer compared to Mix 1 following prolonged dry weather and removal of covers. As part of this demonstration, we estimated that infield mix maintenance inputs were reduced by as much as half as a result of covering the mixes.

As part of the Sports Turf Workshop held on October 2, 2003 at the Rutgers Snyder Farm, we allowed 1/3rd of each mix to remain uncovered for approximately 2 weeks, and the other portion of the mixes to remain covered until the morning prior to the Workshop. We prepared the covered portions of all the mixes to game-ready conditions on the morning of the Workshop. The advantages of covering were evident on October 2 as the covered areas were game-ready whereas the uncovered sections were rock hard.

Additional Considerations

The infield mix plots at the Rutgers Snyder Farm demonstrated concepts described by the ASTM specifications, most notably the fact that management of an infield mix is affected by relative percentages of sand and silt/clay in the mix. According to the ASTM standards, "... top mixes with 6 to 10% silt/clay [90-94% sand] are better suited in rainy climates due to greater internal drainage. In dry periods, they will

require frequent irrigation to minimize dust and to provide a firm surface." Whereas, "... the presence of clay is desirable from the standpoint of providing both a firm and stable surface for good footing ... top mixes 11 to 20% silt/clay [80-89% sand] will drain more slowly but will retain more water. Frequency of irrigation will be less. These mixes will be more cohesive and will be more difficult to loosen when they compact."

Sports field managers should consider their budgets, availability of labor, and typical environmental conditions (dry climate vs. moist climate) when choosing an infield mix.

Infield mix maintenance has often been considered as much an "art" as it a "science." While the ASTM standards provide a starting point from which to choose a particular mix, and we effectively demonstrated three mixes that are not acceptable (Mix 3, 4, and 5), the quality of an infield playing surface is most significantly affected by the actions and decisions made by the sports field manager.

"It has often been observed that the skills of the grounds manager are a greater contributing factor to high quality skinned areas than the materials used to construct these areas. Successful grounds managers must select management practices that are appropriate for the field at hand, or modify field conditions to match a given maintenance program." – ASTM Standards F 2107-01 ◆

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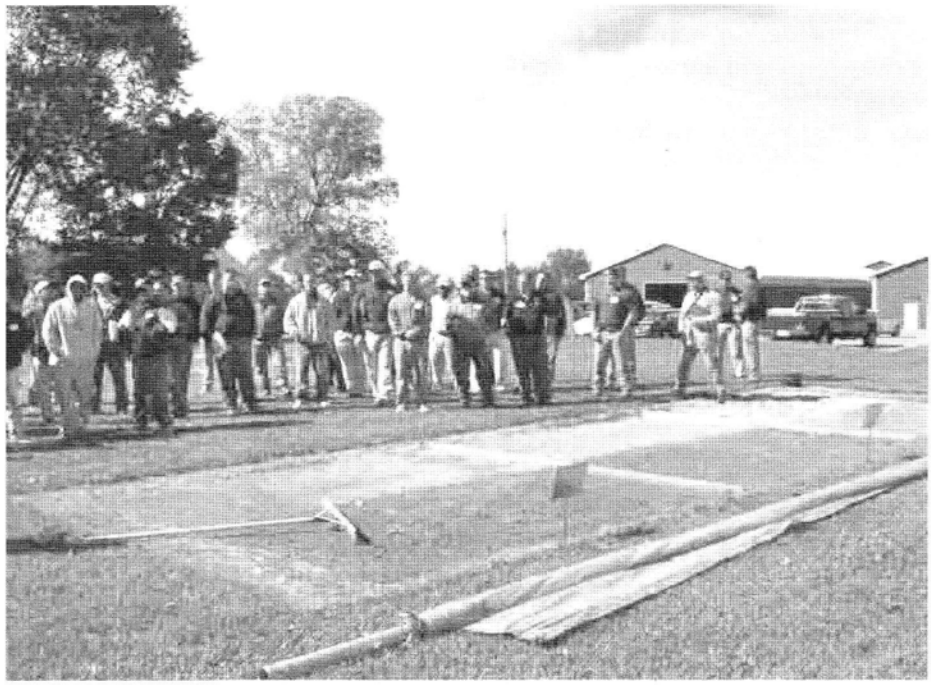
Literature Cited

ASTM. 2002. Standard Guide for Construction and Maintenance of Skinned Areas on Sports Fields. Volume 15.05: Designation F 2107-01.



A 30 minute presentation on the installed infield mixes was part of the October 2, 2003 Sports Turf Workshop at the Rutgers Snyder Research and Extension Farm located in Pittstown, NJ.

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responsible for the outcome? Did the engineer oversee and enforce the contract properly? Did the contractor follow the specifications to the T? Did the administration cut corners to save money and meet their time-line?

How many of you have asked yourselves these questions? How many of you have had great projects or ones that were not so great? Tell me about them. I would like to hear from directors, contractors, engineers, administrators and the sports field manager. I do not need names or company's just successes or failures we can all learn from. You do not have to give your name if you do not want it revealed. E-mail or write to the SFMANJ address in this newsletter. ◆

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