The author measures turf hardness with a Clegg Impact Hammer at Hollywood Park Race Track.

Trends in Fitting Fields to Stadiums

By Steve Guise and Dave Hanson

Stadiums and sports fields should fit together like hand and glove. While the aesthetic appeal and crowd-pleasing features of a stadium make it popular with fans and the seating and "sky box" capacity make it appealing to owners, ultimately it's field usability that gives the facility longevity and financial success.

"Usability" means the field must be able to host appropriate athletic events by providing a safe, highly playable surface that allows participants to play to the best of their ability. In addition, the field and stadium must be able to accommodate other revenue-raising events to justify the financial commitment necessary to build and maintain the facility.

To ensure all this, certain design elements of older sports stadiums are altered in today's stadium constructions due, in part, to the multi-use, high tech nature of the fields. Consider a few of the design elements due for change:

•Often, limited provisions were made for on-site storage of field maintenance materials or equipment.

•Frequently, stadium entry points, adequate initially, now are too small for today's large equipment and the materials needed for special events. In some cases, a single entry point serves the entire facility, acting as a bottleneck when multiple machines and materials must be moved onto or off the field. Constant heavy traffic through limited entry points causes compaction problems and excessive wear to certain areas of the field.

•Added seating often reduced the size of the field sidelines and increased traffic pressures. Stadium design, or redesign for additional seating, channeled rain from the stands down to the field. Drainage systems became obsolete or inadequate at best.

•Closed oval stadiums designed to reduce wind for better sports play and increased seating created an environment that encouraged turfgrass diseases. Shadows created by the stadium design hindered turf growth.

•Increased revenue demands created new opportunities for field use that further stressed the turf.

New Relationships

The art and science of turfgrass maintenance has advanced rapidly over the last century, creating new relationships for those involved.

With the complexities of today's high tech fields, architects of sports turf facilities are diversifying into this specialty or forming subcontracting arrangements with those who do specialize in field design and construction; landscape design; sound and/or lighting systems; seating and concessions; and the complex engineering elements necessary to accommodate the field's requirements for irrigation, fertigation, drainage, heating or cooling, and oxygenation.

Owners today frequently relate high tech field systems with performance guarantees, post construction maintenance, and long-term technical support. The failure of many field designs has increased the demand for product and system performance guarantees.

Sponsorships from key suppliers — such as the irrigation, mowing and maintenance, or fertilizer companies — may "synergize" field maintenance and the marketing of products. This relationship can become a major contributor to the facility's bottom line and, in some instances, can determine the maintenance equipment and fertility programs available to the sports turf manager.

New Systems

In recent years, laboratory technologies have advanced rapidly. A number of soil laboratories, led by the

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architect's demand for better field systems, have developed new parameters for all-weather field design. Research moguls from major companies and from such research-based institutes as the International Sports Turf Research Institute located here in the States and the Sports Turf Research Institute (STRI) in England continue to develop and qualify new products for field construction to enhance the soil profile, providing such benefits as compaction relief, increased infiltration, and stabilization.

Sports field drainage and sub-surface moisture control systems give sports turf managers the ability to clear excess water from the playing surface and the ability to maintain optimum moisture levels in the root-zone. Some systems combine these features with the ability to control macro- and micro-porosity of the soil, allowing for compaction resistance, aeration and the escape of sub-surface gases released by root systems.

Other systems provide subsurface heating to allow sports turf managers to extend the active growth period of their turf.

Soil profiles can be specified with precise components of sand particle size distributions and organic or synthetic matter to create the base deemed most suitable for turf establishment and growth in specific field settings. The term "engineered turf" will have greater meaning now that fields have to be designed to withstand multiple events in all weather.

Plant scientists from turf seed companies, universities, and research laboratories have developed improved turfgrass cultivars keyed to withstanding the stress and wear inherent with athletic fields.

Natural turf in self-contained, removable trays or as reinforced squares of turf offer a method of providing a natural turf playing surface in stadium conditions that might not naturally support long-term turf growth. It also offers the option of replacing

In older facilities like Foxboro Stadium, steep, narrow accesses have contributed to compaction and erosion problems. Photos courtesy: Steve Guise.

selected modular units with "fresh" ones in response to heavy wear or other turf-damaging factors.

Stadiums designed with movable roof systems can combine turf access to natural sunlight, while the roof system is open, with the spectator and player comfort of a covered dome when the roof system is closed. Refinements of the technical aspects of such systems are combined with turfgrass research and testing of suitable cultivars to improve efficiency and overall field conditions.

These advances allow stadiums greater multi-use flexibility and the ability to hold more frequent events.

New Instruments

Keeping pace with turf systems have been advancements in instruments for measuring field conditions.

Laboratory testing of the various field media components can ensure consistency of the media materials during the construction process.

Soil and tissue test analysis can pinpoint nutrient uptake and levels within turfgrasses to allow development of fertility programs tailored to specific, quantified turf needs.

On-site readings of specific turf and soil profile conditions are available through such instruments as fertility and pH meters, light meters, stimpmeters, flowmeters, and infiltrometers.

The Clegg Impact Hammer has been selected by the American Society of Testing Materials (ASTM) as a lightweight apparatus for measuring a field's hardness. This gives sports turf managers a system to quantify hardness and to measure degrees of improvement from field renovations and various field maintenance procedures. It additionally aids the sports turf manager in identifying when a synthetic field has lost its cushioning ability and needs to be replaced.

The Sports Turf Research Institute in Bingley, England, continues to develop beneficial products, such as this wear machine.

Turf strength can be measured with Penn State's PennFoot, University of California at Riverside's Brinkman Traffic Simulator or STRI's wear

On-site readings of specific soil conditions are available through instruments such as Texas A & M's infiltrometer.

machine, or with simple traction veins and torque wrenches.

Weather stations collect local condition readings to supply ET (evapotranspiration) information. Satellite systems monitor weather patterns and allow precise tracking of local storm systems. All this information now can be tied directly to an in-office computer system for event preparations.

Realities of Maintenance

A key element of the high tech systems integrated into today's field designs is using them properly. Why build a multi-million-dollar facility for multi-million-dollar athletes and skimp on the investment in long-term maintenance?

The architect, field designer and facility owner have developed a set of stadium and field components with a specific intent. The installation contractor concentrated on that vision during field preparations. So, it makes sense that sports turf managers are often being hired at the start of construction, and sometimes at the start of the design process, to assist in the identification of maintenance issues and needs assessment.

Part of today's field installation contracts is a grow-in and initial maintenance period. This may be 90 to 180 days, or even longer, depending on the circumstances of construction and the primary, or initial high-visibility, use of the facility. During this period, the contractor and/or the appointed maintenance company check out all the operational elements of the systems. The field is only accepted by the owner when all systems are functioning properly.

Owners may hire sports turf managers already familiar with the facility's high tech systems, or they may provide the appropriate instruction or educational opportunities for the sports turf manager to gain a thorough understanding of the systems. Or, they may opt to go outside the traditional in-house maintenance crew in search of maintenance companies that offer better equipment, reduced costs and overhead, volume purchase discounts,

or other advantages.

Whatever the decision, the person in control of maintaining a field must be familiar with all aspects of the high tech systems to utilize them properly. Ideally, that person is involved at least during the construction phase of the project so he or she has the opportunity to see where each component is installed, to observe how certain elements fit together, and to participate in the initial stages of set-up and adjustment. This person then can develop an accurate "as built" blueprint of the facility complete with notations that will assist crews in long-term maintenance.

At the very least, the person who will be in charge of long-term maintenance should be involved during the grow-in and post-construction maintenance period. Working with the systems and the construction personnel during this time of testing, adjustment and fine-tuning provides the sports turf manager the opportunity not only to gain in-depth knowledge of the systems and their capabilities, but also to gain an awareness of the "vision" which the systems are to carry out.

In reality, over the multiple years during which the facility will be in operation, more dollars will be spent on long-term maintenance than were invested in the development and construction phases. It's just common sense to make sure that maintenance takes full advantage of the high tech systems that were installed.

With all the technology now available and the new advances being introduced, field design is *becoming* a science we can rely on to produce a successful stadium, field system and maintenance program that fit together and work together from the time of design to the time the final mowing patterns are completed.

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