The Best Bet for Turf Racetracks and Equestrian Venues

Jockeys report that horses can feel the stability in a consistent track and go full out. Photos courtesy: Netlon Limited.

This turf track at Happy Valley in Hong Kong is subject to tropical monsoon and typhoon rainfall, as well as the normal wear of the turf.

By Stephen Guise

Sports turf management is all about providing a safe surface that allows athletes to perform to the best of their abilities. Ideally, the site conditions should give each competitor an equal opportunity.

These goals are no different when the athlete is a horse. Though these thousand-pound competitors may look sturdy, they have vulnerable stress points, particularly in the legs. The weight of a horse is borne by four slender legs each ending in a three-inch hoof. A competitive surface should not be so hard that the hooves leave no impact when they strike it. The horse requires some degree of give in the surface both to help absorb some of the stress and to provide a stable base from which to push off with the movement of the fetlock (the ankle of a horse) that leads into the next stride.

A turf track can be soft and still be safe if it is not overly soft and the degree of softness is consistent everywhere. However, when conditions vary from soft to hard within the competitive area, injuries can occur.

Award-winning jockeys report that horses "feel" the stability in a consistent track and go full out. When stability is erratic, the horses sense the danger and react accordingly.

The track or arena must retain uniformity and consistency throughout any weather conditions. That does not mean that a track must be maintained at one, pre-set degree of moisture content and firmness, but that whatever the conditions, they must be the same throughout the competitive area. Revenues depend on the number of races that can be run on a track each day, the wearability factor, and on the track being safe and usable, even during rainy weather.

Soil Requirements

The soil profile plays a major role in firmness, stability and uniformity. Because rapid percolation is essential for turf track usability during rainy weather, sand-based tracks and arenas have great appeal.

Sands, however, can vary. Particle size analysis divides sands and soils into seven soil types: very coarse sand (2.0 to 1.0 mm), coarse sand (1.0 to 0.5 mm), medium sand (0.5 to 0.25 mm), fine sand (0.25 to 0.10 mm), very fine sand (0.10 to 0.05 mm), silt (0.05 to 0.002 mm) and clay (less than 0.002 mm). Sieving determines the category of the five sand types.

Particle designations also may be referred to by the size of the specific sieve or screen used in the analysis process. For example, a very fine sand that would pass through a sieve opening of .088 mm but not through a sieve opening of .074 mm could be defined by a 170 mesh Tyler Screen Scale designation, an 88 micron Standard US Series designation or an alternate (ASTM) US Series designation of No. 170.

In addition to being defined as the size between two sieves, the particle size may be defined as that passing through a specific size sieve or as that being retained by a specific size sieve. The soil scientist, turf manager and construction engineer must clarify specifications precisely according to a single method of analysis and designation.

The effectiveness of a sand profile is dependent upon the particle size and uniformity. Particles touch, bridge and leave voids — spaces through which oxygen, gas and water can easily pass. With too much variation between particle sizes, even different sand sizes, the voids between coarse particles may be filled by fine or very fine particles.

If the sands used are too coarse, they move more freely and may be too soft for equestrian events. If the sands are too fine, movement is diminished, resulting in greater hardness. Bulk density, a measure of dry soil volume, rates the particle distribution. A higher bulk density equals finer particles; a lower bulk density equals coarser particles.

The material of which the sand is formed also must be considered. This determines the angularity or sharpness of the sand, its durability and its chemical components. Natural or crushed rock quartz sands generally are favored for turf areas because of their chemical inertness and resistance to physical weathering.

Impurities within the specified components may require hydraulic screening for removal. If the sand will be combined with some type of organic material, the precise size and make-up of this material also must be determined. Loamy sand can tighten a coarse sand profile and add agronomic benefits for better rooting. However, when adding soils to sand, the sand should be medium to coarse. Soils added to medium to

Jump placement can be coordinated to vary the takeoff and landing points at different events held at the same venue.

fine sands may result in the equivalent of concrete. A high degree of silt or clay components may infiltrate enough of the sand-created voids to severely reduce infiltration and percolation rates. Organic or man-made fibrous materials also act in this manner, impeding the voids and channels that are necessary for turf survival. The key is to achieve stability without using anything that will hamper percolation or infiltration.

Race tracks require a softer surface than athletic fields. Jumping areas have to be firmer than race tracks. The Clegg Impact Soil Tester (Clegg Hammer) is used to measure the surface absorption of impact energy (hardness). Studies by Dr. Sam Sifers and Dr. James Beard at Texas A&M have established the rating in gravities suitable for various sports venues. (See chart below for turf race track characteristics.)

These findings have later been studied and accepted by many leading sports turf institutions. A new standard test method developed by the American Society of Testing and Materials also has confirmed the use of the Clegg Hammer for measuring shock-attenuation characteristics of natural playing surface systems. The grounds manager can assess conditions during and after construction with Clegg Hammer readings.

Moisture Characteristics

Moisture characteristics of the final material will affect turf growing conditions and site usability. Density, porosity, hydraulic conductivity and plant-available water retention must be analyzed. In other words, how quickly does water move through the soil profile and how much water will be available to turf roots before it passes beyond their reach?

In addition, general climatic conditions of the site must be known. What effect will heat, humidity and winds have on the evapotranspiration rate of the desired turf? What is the anticipated rainfall or snowfall for the season, and when would it normally occur? What are the temperature variations during each portion of the turf-growing season? How will these factors affect the turf growth and the competitive surface during periods of minimal or extremely heavy use?

Irrigation must be closely monitored. Moisture content impacts relative softness or hardness. Inconsistent moisture can produce problems.

A sand-based track or arena — even a turfed one — that is kept too dry will be overly soft. The horses' hooves will sink in, throwing sand behind the horses. Watering and rolling the area will increase the relative hardness and reduce flying sand at least temporarily.

Initial construction must be keyed not only to providing a safe, uniform, stable site, but also to providing an area that can be maintained at that high standard over the long term in an efficient and cost-effective manner. Higher initial costs can be justified if the benefits will pay off in cost savings and improved conditions over the following years.

Turf Selection

Proper selection of the turf type and cultivars is essential for success. In horse events on turf, top green growth might not be as important as the roots. When roots are not deep and well-developed, and the soil lacks stability, a thousand-pound animal driving in with three-inch hooves can produce divots up to 12 inches across and ten inches deep. The root system should extend four to six inches or more for sufficient holding power.

The turfgrass selection must be suited for the climate during the period in which the facility will be used — the prime racing or performance months. Also the lay of the track, the slope, and any shadows or shade that might create different conditions for the turf must be considered.

Once the best grass type or types have been selected and established, height of cut becomes a factor. Trainers and jockeys have the perception that tall grass softens the track, but if grass is so long that it lays down, and turf density is reduced, it becomes hard.

Bermudagrass maintained at a height of two to three inches forms a good running base but requires an intense maintenance program because it starts to thin at heights over 1 1/2 inches. A four-inch height is too tall to maintain vigor in bermudagrass. Roots and top growth both decline.

Cool-season grasses, such as perennial ryegrass, bluegrass and turf-type fescue, can be maintained at heights between

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Surface absorption of impact energy* (hardness) in gravities	Turf race track character
Less than 30	Too soft, slow, more injury potential
30 - 50	Acceptable
50 - 70	Good, fast, low injury potential
70 - 90	Good, most speed, low injury
90 - 110	Acceptable
More than 110	Firm, more injury potential

* Measured by a Clegg Impact Soil Tester with a 0.5 kg hammer weight

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four and six inches and remain dense and vigorous. Increased top growth will encourage deeper rooting up to a point. Owners, trainers and facility personnel often specify that these grasses reach a height of ten inches or greater for certain races. Though the weight of the grass does help hold down the sand and cuts back on some divoting, lengths over six inches become difficult to mow, and thinning is inevitable.

Turf maintenance practices, including aeration and fertilization, must be precisely manipulated to reach the prescribed height at the proper time without sacrificing root development and plant vigor. After a sustained period of four or five weeks at extremely long heights, turf thins and root development slows.

Areas of wear can be managed to a limited degree by adjusting heavy use locations. For example, jump placement can be coordinated to vary the takeoff and landing points at different events held within the same arena. Some race tracks are wide enough to allow moving the position of the inner rail.

As with any high-maintenance turf field, problems with the grass often signal problems in underlying conditions. Because *Poa annua* thrives in wet areas, invasions of this weed generally warrant inspection of the subsurface moisture for inconsistencies in the irrigation pattern or problems with compaction, percolation and drainage. Thinning turf or discoloration may indicate dry conditions but have similar underlying problem sources.

The grounds supervisor is often placed in a difficult position. Different people connected with a track or other equestrian facility will want different things. Track stewards may want a firm surface with little or no divoting. Trainers say that those conditions lead to "hot foot" for the horses caused by the friction between the hoof and the firm track. A "hard" track has injury-causing potential that trainers want to avoid but may be favored by racing promoters and fans who want to see "fast" horses. Because 1/16 of an inch can determine whether the track is soft or hard, last-minute preparations may include running a grooming harrow over the surface with the depth adjusted to cut into the turf base.

Ultimately, a track will be appreciated by all if it is free of characteristics that favor one type of horse over another. Certain surfaces and conditions may favor the horses that lead wire to wire or the horses that come from deep in the field for a fast finish. If both types of horses win races on the same day, there is no track bias.

One sign of a good turf course is the number of photo finishes. Horses that traditionally lead wire to wire and the closers end up all together at the home stretch. If a track is determined to be fair to all types of horses, the field (number of competing horses) is larger, and the betting handle (the dollar total of all bets placed) is greater.

Hong Kong Turf Tracks

In Hong Kong turf racing rules. Racing generally takes place two days a week, but up to ten races are run each day. Racing is big business; the average family bets $6,000 a year.

Tracks are subject to tropical monsoon and typhoon rainfall, as well as the normal wear of the natural turf. In 1983, 17 race meetings were transferred from the Royal Hong Kong Jockey Club turf tracks to alternative all-weather tracks, resulting in less exciting racing and lower revenue from the tote. Following that season, track stewards embarked on a research and development program to find a natural turf track with all-weather characteristics.

The existing silt and clay components were removed, and a combina-

From the Jockey's Mouth: What Makes a Good Turf Track

A great jockey forms a team with his or her horse, sensing the animal's current disposition, gauging its abilities and reading its reaction to the field, the action of the race and the track. Jockey Chris McCarren says he can feel differences in track conditions "telegraphed" from the racing surface through the horse's legs. He once alerted a grounds crew to a drainage system clog by telling them about a soft area in one small section of the course.

Superior track conditions allow the jockey to concentrate on the horse and the field. Jockey Gary Stevens spent the spring and early summer commuting from Hong Kong to the U.S. to lead the field in such high profile races as the Kentucky Derby and Belmont Stakes, two legs of the Triple Crown. Stevens had contracted to ride for trainer Steve Leung in Hong Kong at the turf tracks of Sha Tin and Happy Valley in multiple races every Wednesday and Sunday.

Stevens says, "A good turf course is one that has a good root system, has some cushioning and doesn't get torn up easily from traffic. As far as turf height, I think a good course needs three to four inches to give it some protection. It also helps if the course is wide enough so they can put the inside rail in different settings to save the turf from wear."

Just how good did Stevens consider the Sha Tin turf conditions? Just look at his results. Stevens placed first on 23 percent of his rides and finished in the money (first, second or third) 85 percent of the time.

"Sha Tin is one of the best courses I've ridden on," says Stevens. "Ninety percent of the races in Hong Kong are run on turf. The drainage is excellent, and despite getting lots of rain, the turf still held up great."

Jockey Julie Krone has not had the dream season of Gary Stevens. A hairline fracture of her pinkie kept her off the horses for nearly 30 days, but she returned with a vengeance, giving Stevens a run for the money in the Belmont, where she placed second. Like Stevens, Krone has multiple-track experience on soil and turf both in the U.S. and overseas. She, too, praises the turf tracks of Hong Kong. "The Happy Valley Course is the best I've ever ridden on," she admits.

Jockeys quickly learn that track conditions affect the outcome of the race. Jockey Dodie Duys says, "The biggest complaint from jockeys comes when tracks are used beyond their capability to recover and become soft and filled with divots. If conditions are erratic, your horse will be tentative, unsure of his footing, and you'll be unsure of your horse."

tion of sand and Netlon mesh elements were installed at the Sha Tin and Happy Valley race courses beginning in 1986. Total installations on both courses were completed in 1990.

Rainfall now moves quickly through the profile, and the track remains in good condition, virtually eliminating the transfer of races to the non-turfed track. In addition, the tracks have shown a marked reduction in divoting, with maximum divot size of four inches across and three inches deep. Grass roots grow down through the mesh, and this combination supplies the cohesion normally provided by silt and clay.

USGA Green Profile Used on Track

Initial reports have been very good from the E.P. Taylor grass track which opened in the early fall of 1994 as part of a three-track Woodbine Racetrack complex of the Ontario Jockey Club. The inner oval, a limestone track, accommodates standard-bred racing, the next oval is a dirt track for thoroughbred racing, and the outer oval is the turf track. This track is constructed on a modified USGA greens profile with underlying drainage in a four-inch layer of coarse stone covered by a layer of finer stone in lieu of a choker layer. The stone sizes were designed to prevent infiltration of the rootzone material yet allow easy passage of air and water. This was topped with a 12-inch rootzone layer consisting of a three-to-one blend of a precisely graded sand and a high sand content, loamy topsoil.

As the Kentucky bluegrass sod matures, some roots are anticipated to extend the full 12 inches of the sand-soil profile, with the majority of active roots concentrated in the upper six inches.

Equestrian Requirements

The Grand Ring Equestrian Arena of England's Stoneleigh Royal Agricultural Showground is a showcase for premium jumpers. Following the installation of a sand and mesh profile there, Harvey Smith, noted show jumping champion, said, "The surface was so good, John McEnroe could have played tennis on it last week, and he wouldn't have complained!"

Not all equestrian area constructions have been as successful. In the 1994 English hurdle racing season on all-weather, sand-based tracks, some horses suffered injuries and death. The construction and maintenance of the particular tracks provided surfaces that tended to be less forgiving, stamina-sapping to run on and unyielding to fall on. Hurdles on such tracks increase the stress factor and the injury potential.

All racing and jumping events put tremendous stress on horses. Equestrian site grounds managers have no less responsibility for the safety of their athletes than any other sports turf managers. ❑

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