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An American National Standard

Standard Guide for Maintaining Warm Season Turfgrasses on Athletic Fields[1]

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1. Scope

1.1 This guide covers the minimum requirements for maintaining warm-season turfgrasses used for natural surface athletic fields. Practices covered include mowing, fertilization, irrigation, core cultivation, winter overseeding, pest management, and requirements for management of dormant turf winter overseeded with cool-season turf (see also Guide F2060).

1.2 The decisions involved in maintaining a quality natural playing surface should consider soil types, local climate and other factors. Therefore, it is recommended that you contact your local cooperative extension service for more specific information on soils, and grass species and cultivars adapted to your area.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F2060 Guide for Maintaining Cool Season Turfgrasses on Athletic Fields

F2651 Terminology Relating to Soil and Turfgrass Characteristics of Natural Playing Surfaces

3. Terminology

3.1 *Definitions:*

3.1.1 Except as noted, soil-related and turfgrass-related definitions are in accordance with Terminology F2651.

4. Significance and Use

4.1 A dense, uniform stand of turfgrass on a playing surface improves the playing quality and safety of the field by providing firm footing for the athletes and by cushioning their impact from falls, tackles or slides. These standards are the minimum inputs required to provide such a surface. Various published guides have been used in the development of this standard **(1-8)**.[3]

4.2 Field conditions may directly influence the frequency and type of athletic injuries occurring as a result of using the fields. While these standards do not guarantee that such injuries will be prevented, a well maintained turf on a natural playing surface should minimize field-related injuries.

5. Apparatus

5.1 *General*—Experience and good judgment are important to match the proper type of equipment to the nature of the task to be performed.

5.1.1 *Mowing Equipment*—Mower types include reel, rotary, and flail; although the latter type is not recommended for fine playing surfaces. A reel mower should be used for playing surfaces requiring mowing at less than 2.5 cm (1.0 in.). Mower blades should always be kept sharp and properly adjusted in accordance to manufacturer's recommendations. Mowing equipment should be operated in a speed range (ground and engine speed) consistent with the manufacturer's recommendation.

5.1.2 *Spreaders*—Spreaders are necessary if dry fertilizer or pest control materials are to be applied. Spreader types may include drop, rotary (centrifugal, spinner), or oscillating. Spreaders should be calibrated to deliver the desired, labeled, or recommended rate of fertilizer or pest control product being applied.

5.1.3 *Sprayers*—Sprayers are necessary if liquid fertilizers or pest control materials are to be applied. Low pressure systems are recommended. Sprayers should be calibrated to deliver the desired, labeled, or recommended rate of fertilizer or pest control product being applied.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The boldface numbers in parentheses refer to the list of references at the end of this standard.

5.1.4 *Core Cultivators*—Core cultivation (aerification, coring) equipment relieves soil surface compaction. Core cultivators should be of the type that physically removes soil, such as a hollow tine or spoon. Cultivators with 1.3 to 1.9 cm (½ to ¾ in.) tines on spacing not more than 15 cm (6 in.) should be used on all playing surfaces. Spikers, slicers, or similar types of equipment are not as effective for relieving surface compaction. In addition to soil compaction found immediately at surface, the mechanical aeration practices may be performed such that the aeration tines penetrate to a depth sufficient to disrupt compacted layers. The effectiveness of such practices will depend upon equipment capabilities and adjustment.

5.1.5 *Seeders*—Broadcast or slit seeders should be used for any overseeding or renovation operations. Slit seeders cut a groove into the soil and deposit the seed in the groove at a predetermined depth. To achieve the same results, broadcast seeders will require a higher rate of seed application due to less effective seed-to-soil contact. Additionally, a broadcast seeded field will generally require more irrigation to effectively germinate seed compared to slit seeded fields. Seeding of bare soils can be accomplished by broadcast seeders, drop seeders, or slit seeders but each method will require a mulch for effective germination. Hydroseeding methods can be used effectively to apply seed and mulch in a hydroslurry to a bare soil surface but is not effective as a winter overseeding practice on existing turf.

5.1.6 *Irrigation System or Equipment*—Ideally some source of water should be available for irrigation. Systems can range from portable or permanently installed types.

5.1.7 *Soil Sampling Tube*—Used to sample soils for testing purposes.

6. Mowing

6.1 *Mowing (General)*—The periodic removal of excess shoot growth is necessary on natural surface playing fields.

6.2 *Mowing Height*—The mowing height of a natural surface athletic field will vary with the sport, turfgrass species, and time of the year. Adjust mowing heights accordingly, using the chart below:

Sports Field Use	Grass Species	Mowing Height
Baseball/Cricket Infields, Field Hockey Fields	hybrid bermudagrass, zoysiagrass, or seashore paspalum	6.4 to 19 mm (0.25 to 0.75 in.)
Baseball/Cricket/Softball Outfields; Soccer, Football, Lacrosse, Polo, and Rugby Fields; Intramural and Multiple-use Fields	hybrid bermudagrass, zoysiagrass, or seashore paspalum;	19 to 38 mm (0.75 to 1.5 in.)
	common bermudagrass, kikuyagrass;	38 to 64 mm (1.5 to 2.5 in.)
	bahiagrass	64 to 102 mm (2.5 to 4 in.)

NOTE 1—Adjustments in mowing height should be made to accommodate the sport using the field. Mowing heights should be increased by 25 % when the fields are not being used, or when the mowing height does not influence the game. A modest increase in mowing height adds photosynthetic leaf area to the turf canopy and may increase turf health and assist recovery rates of worn fields.

6.3 *Mowing Frequency*—Fields should be mowed as often as necessary. No more than ⅓ of the leaf surface should be cut off at any one mowing. Under normal growing conditions, this usually means every 5 to 7 days for fields maintained at 3.8 cm (1.5 in.) or higher, and two or three times a week for baseball infields and other closely mowed fields.

6.4 *Clipping Removal*—Fields maintained at a mowing height of 2.5 cm (1 in.) or higher do not require that the clippings be removed at mowing if mowed at the proper frequency interval. Only remove clippings if the grass is allowed to grow excessively high so that clippings would accumulate on the playing field surface. Playing surfaces maintained at one inch or shorter should have the clippings removed with each mowing.

6.5 *Mowing Pattern*—Mowing direction should be varied with each successive mowing. Striping of fields due to mowing direction can be accomplished with one or two mowings prior to an event.

NOTE 2—Seashore paspalum is the only warm-season turf that will produce a significant striping effect. Overseeded cool-season turfs may also produce a striping effect.

7. Fertilization

7.1 *Fertilization (General)*—Fertilization is essential for maintaining dense, vigorously growing natural turfgrass fields. Fertilizer rate, timing, source, and ratio will influence a natural turf's density, color, uniformity, and recuperative ability, as well as its ability to tolerate wear, biological and environmental stresses.

7.2 *Soil Testing*—Soil testing should be performed on established fields every three to four years. More frequent testing (once or more per year) may be required on sand-based fields or those having nutritional imbalances. Soil testing will identify nutrient deficiencies that may be corrected by supplemental fertilizer applications or by fertilizer selection. Soil testing will also identify changes needed in soil reaction (pH).

7.2.1 *Sampling*—A representative sample should be taken from each field. Using a soil sampling tube, pull out about 50 random samples per acre of turf, and combine them to obtain a representative sample. Samples should be taken from the soil surface to a depth of 51 to 102 mm (2 to 4 in.).

7.2.2 Remove the thatch and any stones or debris.

7.2.3 Thoroughly mix the cores and pull a one pint 0.5 L (1 pt) sample from the composite to submit to the testing lab.

7.2.4 Provide as much information to the lab as possible, including the use of the area, grass species, past fertilization history, irrigation or not, clipping removal or not, age of the field, and other information the lab may request.

7.2.5 Submit the samples to a state or commercial soil testing lab. Maintain records of samples submitted, to include sampling date, soil testing lab, and results.

7.3 *Soil Reaction (pH)*—Ideally, soil pH should be maintained in a range of 6.0 to 7.0, although acceptable turf can be maintained outside this range with careful management of plant nutrients.

7.3.1 Lime should be applied as per soil test recommendations to increase soil pH. Lime materials may include pulverized or granular limestone, pelletized limestone, and hydrated lime. Use dolomitic liming materials if there is a need for

additional magnesium in the soil. Apply lime in spring and/or fall until the desired pH is attained.

7.3.2 Apply no more than 4900 kg per hectare of limestone (100 lbs/1000 ft^2) application. Apply no more than 3675 kg per hectare of hydrated lime (75 lbs/1000 ft^2) per application.

7.3.3 Elemental sulfur or ammonium based fertilizers can be used to decrease soil pH. Apply elemental sulfur at a rate not to exceed 245 kg per hectare (5 lbs/1000 ft^2) in the spring and fall until the desired soil pH is reached.

7.4 *Fertilizer Rate and Nitrogen Sources*—Warm-season playing surfaces (except Seashore paspalum) should receive fertilizer at a rate to deliver no less than 25 kg N per hectare (about ½ lb of actual nitrogen per 1000 ft^2) per growing month. Potassium is generally required at about ⅓ to ½ of the nitrogen fertility rate or about 100 to 150 kg per hectare (about 2 to 3 lbs of potassium per 1000 ft^2) per year. Seashore paspalum will require only 100 to 150 kg per hectare (about 2 to 3 lbs of nitrogen per 1000 ft^2) per year but an approximately equal amount of potassium. The need for higher rates will be dependent on climatic and soil conditions, irrigation practices, and intensity of use. Many warm-season soils contain or retain, or both, adequate amounts of phosphorus. Phosphorus applications should be made based upon recommendations from soil testing.

7.4.1 Quick-release nitrogen sources such as ammonium phosphates, ammonium nitrate, urea, or ammonium sulfate should be applied at rates not to exceed 50 kg actual N per hectare (about 1 lb of actual nitrogen per 1000 ft^2) per application. Slow-release forms of nitrogen such as sulfur-coated urea, IBDU, ureaform, polymer coated urea, polymer/sulfur coated urea, and natural organics may be applied at higher rates less frequently through the year, and are preferred for use on sandy soils or sand-based rootzone constructions. Many turfgrass fertilizers contain a combination of both quick- and slow-release nitrogen sources, and are usually applied at a rate of 50 kg actual N per hectare (about 1 lb of actual nitrogen per 1000 ft^2). A fertilizer containing quick and slow release nitrogen sources should be used on Bahiagrass.

7.4.2 Starter fertilizers (see 7.6.1) applied at the time of overseeding should be applied at a rate necessary to deliver 25 kg actual N per hectare (about ½ lb of actual nitrogen per 1000 ft^2).

7.5 *Fertilization Timing*—The dates of a fertilizer application should be adjusted to suit schedules and environmental conditions. Nitrogen is the main plant nutrient affecting timing. In general, apply moderate amounts of fertilizer when warm-season grasses are coming out of dormancy in late winter and early spring. Applications in mid-spring through mid summer will enhance growth, density, and green color; this corresponds with the season of maximum growth potential. Moderate rates of fertilizer should be applied in late summer to mid-fall; this being the period when grasses are hardening off prior to winter dormancy. If areas are overseeded with cool-season grasses, fertilize with a starter fertilizer at the time of overseeding and then periodically fertilize to favor the cool-season grass growth. Bahiagrass should only be fertilized once or twice per year (in the fall or spring and fall) with a 4-1-2 (N, P_2O_5, K_2O) ratio fertilizer at a rate of 50 kg actual N per hectare (about 1 lb of actual nitrogen per 1000 ft^2) in the spring and the fall. Light applications of nitrogen at 25 kg N per hectare (about ½ lb of nitrogen per 1000 ft^2) may be applied to bahiagrass during the summer if adequate rainfall is anticipated.

7.5.1 Fertilizer should not be applied to dormant turf (unless overseeded) or turf that is under environmental stress (heat or dryness) during the growing season.

7.6 *Fertilizer Ratio*—The ratio of nitrogen to phosphorus to potassium should be based on a soil test. In lieu of a soil test report, use a fertilizer with a 4-1-2 or similar ratio. For seashore paspalum, use a fertilizer that contains nitrogen and potassium in equal proportions (1:1, N to K_2O) or with a higher ratio of K_2O than N.

7.6.1 Fertilizers applied at the time of overseeding should have a 3-4-1, 1-2-1 or similar ratio indicating a higher percentage of P_2O_5 than N or K_2O.

8. Core Cultivation

8.1 *Core Cultivation (General)*—Core cultivation is an effective means to alleviate surface compaction and is necessary to obtain an acceptable playing surface.

8.2 Core cultivate natural fields monthly when the turf is actively growing.

8.2.1 Do not core cultivate a natural turf surface when the turf is under heat or drought stress.

8.3 Cultivate in a minimum of three directions.

8.3.1 Severely compacted areas such as goal mouths may require more passes to alleviate compaction.

8.4 Allow cores to dry.

8.5 Break up the cores by dragging with a drag mat or piece of chain link fence, or by pulverizing with a rotary or vertical mower.

8.6 Irrigate if possible to alleviate stress caused by coring.

9. Irrigation

9.1 Irrigate natural turf sports fields to replenish moisture lost from the root zone as determined by soil moisture monitoring of local evapotranspiration rates; generally about 2.5 to 5 cm (about 1 to 2 in.) per week during growing months for bermudagrass and zoysiagrass enduring periods without natural precipitation. Seashore paspalum will require only 1.3 to 3.8 cm (0.5 to 1.5 in.) per week during the same dry periods. Due to the low maintenance nature of bahiagrass fields, they are seldom irrigated.

9.1.1 On sandy soils, apply 1.3 to 1.9 cm (½ to ¾ in.) of water every 2 to 4 days during periods without natural precipitation.

9.2 Water early in the morning, when evaporative losses are minimal.

10. Overseeding

10.1 *Overseeding (General)*—Natural surface athletic fields are often worn to the extent that they will not recover through normal cultural practices. Such surfaces should be overseeded a minimum of once a year. Depending upon the size of the worn areas and the nature of the turf species (for example,

some species do not produce viable seed or are slow to establish from seed), alternative methodologies may be used such as sprigging of viable vegetative plant parts, sodding, or plugging. In some cases overseeding may be done during a winter playing season; for example, overseeding a previously winter overseeded athletic field with additional cool-season turf seed for the purposes of renovation of worn areas.

10.2 *Overseeding for Winter Dormancy:*

10.2.1 Winter overseeding with cool-season grasses is best done in the early fall, and consideration should also be given to times of the year when the fields are minimally used to allow for the establishment of the seeded areas. Winter overseeding is a practice utilized in order to provide a green playing surface during the winter dormancy period.

10.2.2 Mow the field as short as possible without causing turf injury, and remove any debris from the field surface.

10.2.3 Core aerify the field in a minimum of two directions, leaving the cores.

10.2.4 Apply a high phosphorus starter fertilizer as described in 7.4.2 and 7.6.1.

10.2.5 Overseed using a broadcast or drop spreader. Set the machine to deliver a total of 450 to 900 kg per hectare (about 10 to 20 lbs/1000 ft^2) of annual or perennial ryegrass and seed in two directions; lengthwise and diagonally across the field. Total annual overseed should not exceed 1400 kg per hectare (about 30 lbs/1000 ft^2). The overseeding rate may need to be adjusted if a species other than ryegrass is used for overseeding.

10.2.6 Drag the field with a drag mat or piece of chain link fence.

10.2.7 Maintain the area at the shorter mowing height until germination is visible.

10.2.8 Water the field as necessary to keep the soil surface moist.

10.2.9 Spring transition occurs in the spring when the warm-season grass resumes growth. During this period, management practices should be such to favor the warm-season grass over the cool-season grass. Or, alternatively, selective chemical herbicides may be used to supress or kill the cool-season grass in order to facilitate spring transition to the warm-season grass.

10.3 *Interseeding During the Winter Playing Season:*

10.3.1 Broadcast or slit seed on the field at a rate of 100 to 150 kg per hectare (about 2 to 3 lbs/1000 ft^2), if needed. Seed in heavily worn areas at a rate of 200 to 300 kg per hectare (4 to 6 lbs/1000 ft^2) of annual or perennial ryegrass.

10.3.2 Divots from play should be filled with a mixture of ten parts soil or sand to one part seed (by volume) shortly after each athletic event.

11. Pest Management

11.1 Pest problems such as weeds are common on natural sports fields. Diseases and insects are less common, but still occur. Properly identify the pest before selecting a control strategy. Least toxic pest control measures proven to be efficacious should be given precedence over synthetic chemical methods. Contact your cooperative extension service for assistance in pest identification and selection of the most appropriate pest control strategy in your region or state. Users of pesticides are responsible for making sure that the intended use complies with current local, state, or federal regulations and conforms with the product label.

12. Keywords

12.1 athletic field; core cultivation; fertilization; irrigation; mowing; overseeding; pest control; warm-season turfgrass

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