



11-2005

# SP651-Costs of Managing a Bermudagrass Football Field in Tennessee

The University of Tennessee Agricultural Extension Service

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## Recommended Citation

"SP651-Costs of Managing a Bermudagrass Football Field in Tennessee," The University of Tennessee Agricultural Extension Service, SP651-1M-11/05 E12-4115-00-002-06 06-0009, [http://trace.tennessee.edu/utk\\_agexcomhort/20](http://trace.tennessee.edu/utk_agexcomhort/20)

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# Costs of Managing a Bermudagrass Football Field in Tennessee

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**T**his publication is intended to provide sports turf managers and coaches an estimate of the costs of managing an existing bermudagrass football field in Tennessee. Managing a healthy, wear-resistant football field requires routine **mowing** and **fertilization**. Bermudagrass football fields are most often maintained with a reel mower set at cutting heights from  $\frac{3}{4}$  to 2 inches. Sports turfs often require more nitrogen (N), phosphorus (P) and potassium (K) than the soil can supply. Magnesium and iron applications can improve plant color. Applying calcium, a component of plant cell walls, may result in added plant strength. Sulfur, found in several proteins, may also be limiting. Fertilizing usually increases the amount of acids in soil and lowers the soil pH. **Liming** neutralizes these acids and increases the soil pH. **Irrigation** is necessary to supplement rainfall and prevent the soil from becoming too dry. **Core aerifying** several times during the bermudagrass growing season helps combat soil compaction. **Matting** (dragging) immediately after core aerifying mixes soil from aeration cores with thatch. **Topdressing**

with sand (e.g.,  $\frac{1}{4}$ -inch layer) after core aerifying helps smooth the soil surface and fills aeration channels. Applying sand topdressing at least once each year may eventually improve the compaction resistance of a soil high in clay. In September, bermudagrass can be **overseeded** with perennial ryegrass to provide student athletes a green, actively growing turf during winter dormancy. **Insecticides** are used, as needed, to control armyworms, cutworms, white grubs and other insects that commonly injure turf. The timely application of pre-emergence and post emergence **herbicides** will control troublesome broadleaf weeds and weed grasses. Although several diseases including dollar spot (*Sclerotinia homoeocarpa*, now known as *Lanzia* and *Mollerodiscus* spp.), leaf spot (e.g., *Helminthosporium* spp., now known as *Bipolaris*, *Drechslera* and *Exserohilum* spp.) and brown patch (*Rhizoctonia* spp.) can injure turf, **fungicides** are seldom applied to football fields. When necessary, treatments are most often made on a curative, rather than preventative basis.

**The Field** – The football field used as an example to develop this budget is five years old and has a 12-inch crown side-to-side. The texture of the original soil base is silt loam. ‘Tifway’ (Tifton 419) bermudagrass was established by sprigging immediately after the automatic sprinkler irrigation system was installed. Although the turf has been core aerified and topdressed with  $\frac{1}{4}$ -inch of sand once each year since establishment, the soil is very compacted due to extra heavy play. Bermudagrass has thinned from hashmark to hashmark. Although the thatch layer is nearly  $\frac{1}{2}$ -inch thick along the sidelines there is very little thatch in the center of the field. Soil test results indicate a pH of 6.0, a phosphorus level of 45 pounds per acre (medium) and a potassium level of 190 pounds per acre (high). Crabgrass, goosegrass and dallisgrass are commonly observed weed grasses. Chickweed, clover, henbit and wild garlic are also becoming a problem. Last year, green June beetle larvae (white grubs) caused severe damage from the 30-yard line to the goal line on the north end of the field. Bermudagrass has been overseeded with perennial ryegrass for the past two years.

## Management practices

### ***Mowing.***

In March, April, October, November and December, the field is mowed at a cutting height of 1¾ inches when turfgrasses reach an average height of 2½ inches. In June, July, August and September, the field is mowed at a cutting height of 1¼ inches when the average height of plants is 1¾ inches. The field is mowed 62 times each year.

### ***Irrigation.***

The field is irrigated 42 times each year from May through November. One-half inch of water is applied per irrigation event. About 756,000 gallons of water are applied to the field annually. Water is sold in 750-gallon increments at an average cost of \$1.60 per 750 gallons. Seven-hundred-fifty-six-thousand gallons of water costs an estimated \$1,612.80.

### ***Fertilization.***

Each year, the field receives a total of 370 pounds of N, 134 pounds of phosphate (P<sub>2</sub>O<sub>5</sub>), or 59 pounds of P, 307 pounds of potash (K<sub>2</sub>O), or 255 pounds of K, 65 pounds of calcium (Ca), 92 pounds of sulfur (S) and 9.8 pounds of iron (Fe) from granular fertilizers.

### ***Liming.***

Pelletized dolomitic limestone (21 percent Ca + 10 percent magnesium, Mg) is applied at the rate of 300 pounds per acre (400 pounds per field) in late November or early December each year. In addition to neutralizing soil acids, the dolomitic lime supplies 84 pounds of Ca and 40 pounds of Mg per 1⅓ acre field.

### ***Core Aerifying.***

The field is aerated using a rotary-motion core aerifier with ¾-inch-diameter coring tines in early June, mid-July and mid-August. A total of three passes (one parallel to the sidelines, one from the northeast to the southwest and one from the northwest to the southeast) are made each time the field is aerated.

### ***Matting.***

After aeration cores have dried on the turf surface, a drag-mat is used to mix soil from the aeration cores with thatch. The drag-mat is also used to work sand into aeration channels immediately after the field is topdressed.

### ***Topdressing.***

Each year, after core aeration in early June, the field is topdressed with 65 tons of medium-coarse textured silica sand weighing 3,000 pounds per cubic yard.

### ***Insect Control.***

An insecticide is applied when green June beetle grubs feeding near the soil surface number six to eight per square foot, or armyworms and cutworms number one per 4 square feet.

### ***Perennial Ryegrass Removal.***

A herbicide is applied in early June to remove perennial ryegrass from bermudagrass and control annual bluegrass.

### ***Weed Control, Pre-emergence.***

Pre-emergence herbicides are applied in combination with a granular fertilizer. An herbicide + fertilizer combination is applied in late March, before the soil surface temperature reaches 55 F. In an effort to gain season-long control of crabgrass and goosegrass, a second herbicide + fertilizer combination is applied in mid-May.

### ***Weed Control, Post-Emergence.***

**Weed grasses.** An herbicide is applied twice in July to control emerged summer annual (e.g., crabgrass, goosegrass and foxtails) and perennial (dallisgrass) weed grasses.

**Broadleaf weeds.** A post-emergence herbicide is applied in late February and again in late November or early December, after the playing season is over. These herbicide applications control wild garlic and many broadleaf weeds such as chickweed, white clover and henbit.

### ***Field Painting.***

The field is laid out, marked, and painted 6 times (number of home games during a typical football season) according to regulations specifying hash marks, yard markers, end lines, and side lines. A total of 10 manhours is required for painting a field that is already marked correctly and 13 manhours for painting and laying out a field from scratch. An extra 7-8 hours may be required depending on the number and complexity of team logos. It is assumed here that a premium quality paint is used at a cost of \$20 per gallon.

### Timing of Operations

Late Feb.	Post-emergence Herbicide (Chickweed/Henbit/White Clover) Application		
	Three-Way™ Herbicide <sup>a</sup> 2,4-D (30.56 %) + MCPP (8.17 %) + Dicamba (2.77 %) \$44.78 per gallon <sup>b</sup>	32 ounces product / acre	42 ounces product per 1⅓-acre football field
Late Mar.	Application of Fertilizer + Pre-emergence Herbicide (Crabgrass/Goosegrass) Combination		
	15-3-15 with Ronstar (0.63 % oxadiazon) + 50 % sulfur coated urea and 1.16 % ammoniacal nitrogen + 13.84% urea nitrogen Standard particle size \$36.52 per 50-pound bag	300 lbs. product / acre	400 lbs. product per 1⅓-acre football field
Mid-May	Application of Fertilizer + Pre-emergence Herbicide (Crabgrass/Goosegrass) Combination		
	19-3-7 with 0.86 % PRE-M + 30% polymer-coated, sulfur-coated urea Standard particle size \$33.05 per 50-pound bag	150 lbs. product / acre	200 lbs. product per 1⅓-acre football field
Early June	Perennial Ryegrass Removal		
	Revolver™ Herbicide <sup>c</sup> (2.34% foramsulfuron) \$191.17 per quart	13 oz. product / acre	17 oz. product per 1⅓-acre football field
	<b>Core Aerification</b> a total of three passes		
	<b>Topdressing</b>		
	Apply medium-coarse textured sand topdressing \$18.50 per ton delivered	50 tons / acre	65 tons of sand per 1⅓-acre football field
	<b>Matting (drag mat)</b> a total of two passes		
	<b>Fertilization</b>		
	21-0-0 Ammonium Sulfate with 21% ammoniacal nitrogen + 20% combined sulfur \$13.60 per 50-pound bag	150 lbs. product / acre	200 lbs. product per 1⅓-acre football field
Late June	Fertilization		
	5-10-31 with 10% iron and 3.9 % ammoniacal nitrogen + 1.1 % urea nitrogen \$23.55 per 50-pound bag	200 lbs. product / acre	260 lbs. product per 1⅓-acre football field

<b>Mid-July</b>	<b>Core Aerification</b>	<b>a total of three passes</b>	
	<b>Matting (drag mat)</b>	<b>a total of two passes</b>	
	<b>Fertilization</b>		
	46-0-0 Urea with 46% urea nitrogen \$27.40 per 50-pound bag	100 lbs. product / acre	130 lbs. product per 1 $\frac{1}{3}$ -acre football field
	Gypsum - Pelletized 20% calcium + 16% combined sulfur Standard particle size \$15.40 per 50-pound bag	250 lbs. product / acre	325 pounds product per 1 $\frac{1}{3}$ -acre football field
	<b>Post-emergence Herbicide (Crabgrass/Goosegrass) Application</b>		
MSMA 6.6 Target <sup>d</sup> 51% monosodium acid methanearsonate \$82.65 per 2 $\frac{1}{2}$ gallons	44 oz. product / acre	57 oz. product per 1 $\frac{1}{3}$ -acre football field	
<b>Late July</b>	<b>Post-emergence Herbicide (Crabgrass/Goosegrass) Application</b>		
MSMA 6.6 Target <sup>d</sup> 51% monosodium acid methanearsonate \$82.65 per 2 $\frac{1}{2}$ gallons	44 oz. product / acre	57 oz. product per 1 $\frac{1}{3}$ -acre football field	
	<b>Insecticide Application (Green June Beetle Larvae, Cutworms and Armyworms)</b>		
Sevin® Brand SL 43 % carbaryl \$136.70 per 2 $\frac{1}{2}$ gallons	1 gallon product / acre	1 $\frac{1}{3}$ gallons product per 1 $\frac{1}{3}$ acre football field	
<b>Early August</b>	<b>Fertilization (ammonium nitrate)</b>		
34-0-0 \$7.80 per 50-pound bag	115 pounds product / acre	150 pounds product per 1 $\frac{1}{3}$ -acre football field	
<b>Mid-Aug.</b>	<b>Core Aerification</b>	<b>a total of three passes</b>	
	<b>Matting (drag mat)</b>	<b>a total of two passes</b>	
	<b>Fertilization</b>		
	32-3-8 with 30% polymer-coated, sulfur-coated urea + 2% iron Standard particle size \$28.75 per 50-pound bag	150 lbs. product / acre	200 lbs. product per 1 $\frac{1}{3}$ -acre football field
<b>Early Sept.</b>	<b>Overseeding</b>		
Overseed with perennial ryegrass Eagle Overseeding Blend \$1.84 per pound	275 pounds of seed / acre	350 pounds of seed per 1 $\frac{1}{3}$ -acre football field	
	<b>Matting (drag mat)</b>		
	<b>Fertilization</b>		
18-24-12 with 25% polymer-coated sulfur-coated urea Standard particle size \$24.70 per 50-pound bag	150 lbs. product / acre	200 lbs. product per 1 $\frac{1}{3}$ -acre football field	

<b>Mid-Oct</b>	<b>Fertilization</b>		
	5-10-31 with 10% iron and 3.9 % ammoniacal nitrogen + 1.1 % urea nitrogen \$23.55 per 50-pound bag	200 lbs. product / acre	260 lbs. product per 1⅓-acre football field
<b>Late Nov. Early Dec</b>	<b>Post-emergence Herbicide (Chickweed/Henbit/White Clover) Application</b>		
	Three-Way™ Herbicide 2,4-D (30.56 %) + MCP (8.17 %) + Dicamba (2.77 %) \$44.78 per gallon	32 ounces product per acre	42 ounces product per 1⅓-acre football field
	<b>Liming</b>		
	Pelletized dolomitic lime 21 % calcium + 10 % magnesium \$9.70 per 50-pound bag	300 pounds material / acre	400 pounds material per 1⅓-acre football field
<p><sup>a</sup> Three-Way™ Herbicide may be applied to the entire field or only those weedy zones of turf with emerged broadleaf weeds such as chickweed, henbit and white clover.</p> <p><sup>b</sup> Prices represent the suggested retail price.</p> <p><sup>c</sup> Revolver™ Herbicide is sprayed to remove perennial ryegrass and help control annual bluegrass.</p> <p><sup>d</sup> Apply MSMA only if crabgrass and goosegrass appear. A second application of MSMA should be applied no later than 10 days after the first. Adding a surfactant along with MSMA may improve herbicide activity.</p>			

## Maintenance Equipment Inventory

\$730.00	Tennessee Farmers Co-operative tractor-mount sprayer; 55-gallon polyethylene tank; PTO-driven diaphragm pump; three-point hitch; and a boom spray width of 14 feet.
\$15,225.00	John Deere® 5103 utility tractor; 50 horsepower; PowerTech™ diesel engine; 2-wheel drive; hydrostatic power steering; and flotation/turf tread tires.
\$4,123.00	John Deere® front-end loader attachment for 5103 utility tractor.
\$395.00	Cosmo three-point hitch, spin-type broadcast spreader, 500-pound capacity; 5.8 cubic feet volume capacity; and spreading width of 15 feet.
\$6,300.00	Ryan® Renovaire® tractor-drawn, rotary-motion aerator; 96 inches wide x 60 inches long by 36 inches high; manual hydraulic lift; weight of 1,158 pounds; 6 feet aeration width; 12 aerating wheels w/ 8 coring tines per wheel; ¾-inch coring tine diameter; up to 9 aeration holes per square foot; coring depth of 2 to 4 inches; and operating speed of 4 mph.
\$270.00	Drag mat; flexible, rolled expanded steel; and 8 feet wide x 4 feet long w/ 10 feet towing harness.
\$7,275.00	Millcreek Turftiger™ Cub Model 3200 PTO-powered Topdresser; weight of 1,300 pounds w/ wheels; 2.3 cubic yard heaped volume capacity; 3,750-pound load capacity; 70-inch overall width; 114-inch length; and 51-inch height; and with gearbox and chain-driven beater.
\$21,975.00	Toro® ReelMaster® 2000D Triplex Sports Turf Mower; 19 hp 3-cylinder diesel Briggs & Stratton / Daihatsu engine; 3-wheel drive; 72-inch cut; and 8-blade cutting units.
\$8,400.00	Field painting equipment includes Graco Airless Sprayer, LineLazer™ 3400 (\$4,000); 6' number stencils (\$400); aluminum yard marker (\$1,000); logo stencils (\$2,500); miscellaneous items such as string, winders, nails, drill mixer (\$500)

**High-intensity maintenance on a 1.33 acre bermudagrass football field in Tennessee, 2005.**

Maintenance activity performed	Labor			Equipment			Materials			
	Number of hours <sup>a</sup>	Cost per hour <sup>b</sup>	Cost per entire field	Number of hours <sup>c</sup>	Cost per hour <sup>d</sup>	Cost per entire field	Cost per unit	Rate per field	Cost per entire area	
<b>Late February</b>										
a. Apply post-emergent herbicide (to control chickweed, henbit & white clover) - three-way herbicide - 2,4-D (30.56%) + MCPP (8.17%) + Dicamba (2.77%)	1.98	\$12.50	\$24.78	0.99	19.73	\$19.56	\$44.78 gallon	0.33	\$14.69	
<b>Late March</b>										
a. Apply fertilizer and pre-emergent herbicide (to control crabgrass & goosegrass) - 15-3-15 with Ronstar (0.63% oxadiazon) + 50% sulfur-coated urea and 1.16% ammoniacal nitrogen + 13.84% urea nitrogen	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$36.52 50-lb. bag	8.00	\$292.16	
<b>Mid-May</b>										
a. Apply fertilizer and pre-emergent herbicide (to control crabgrass & goosegrass) - 19-3-7 with PRE-M + 30% polymer-coated, sulfur-coated urea	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$33.05 50-lb. bag	4.00	\$132.20	
<b>Early June</b>										
a. Remove perennial ryegrass with Revolver herbicide (2.34% foramsuluron)	1.98	\$12.50	\$24.78	0.99	19.73	\$19.56	\$191.17 quart	0.53	\$101.56	
b. Core aerify using rotary-motion aerifier with ¾-inch diameter coring tines - 3 passes	3.43	\$10.00	\$34.32	1.72	19.37	\$33.24				
c. Topdress with medium-coarse textured sand	7.58	\$10.00	\$75.79	3.79	19.61	\$74.31	\$18.50 ton	65.00	\$1,202.50	
d. Drag-mat to mix soil from aeration cores with thatch and to work sand into aeration channels - 2 passes	2.51	\$10.00	\$25.08	1.25	19.37	\$24.29				
e. Apply fertilizer - 21-0-0 ammonium sulfate with 21% ammoniacal nitrogen + 20% combined sulfur	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$13.60 50-lb. bag	4.00	\$54.40	
<b>Late June</b>										
a. Apply fertilizer - 5-10-31 with 10% iron and 3.9% ammoniacal nitrogen + 1.1% urea nitrogen	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$23.55 50-lb. bag	5.20	\$122.46	
<b>Mid-July</b>										
a. Core aerify using rotary-motion aerifier with ¾-inch diameter coring tines - 3 passes	3.43	\$10.00	\$34.32	1.72	19.37	\$33.24		---	---	
b. Drag-mat to mix soil from aeration cores with thatch and to work sand into aeration channels - 2 passes	2.51	\$10.00	\$25.08	1.25	19.37	\$24.29		---	---	
c. Apply fertilizer - 46-0-0 urea with 46% urea nitrogen	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$27.40 50-lb. bag	2.60	\$71.24	
d. Apply gypsum - pelletized 20% calcium + 16% combined sulfur	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$15.40 50-lb. bag	6.50	\$100.10	
e. Apply post-emergent herbicide (to control crabgrass & goosegrass) - MSMA 6.6 Target - 51% monosodium acid methanearsonate	1.98	\$12.50	\$24.78	0.99	19.73	\$19.56	\$82.65 2.5 gallon	0.18	\$14.72	
<b>Late July</b>										
a. Apply post-emergent herbicide (to control crabgrass & goosegrass) - MSMA 6.6 Target - 51% monosodium acid methanearsonate	1.98	\$12.50	\$24.78	0.99	19.73	\$19.56	\$82.65 2.5 gallon	0.18	\$14.72	
b. Apply insecticide (to control green June beetle larvae, cutworms, and armyworms) - Seven Brand SL (43% carbaryl)/cutworms, and armyworms) - Sevin Brand SL (43% carbaryl)	1.98	\$12.50	\$24.78	0.99	19.73	\$19.56	\$136.70 2.5 gallon	0.53	\$72.72	



Maintenance activity performed	Labor			Equipment			Materials		
	Number of hours <sup>a</sup>	Cost per hour <sup>b</sup>	Cost per entire field	Number of hours <sup>c</sup>	Cost per hour <sup>d</sup>	Cost per entire field	Cost per unit	Rate per field	Cost per entire area
<b>Mid-August</b>									
a. Core aerify using rotary-motion aerifier with ¾-inch diameter coring tines - 3 passes	3.43	\$10.00	\$34.32	1.72	19.37	\$33.24	---	---	---
b. Drag-mat to mix soil from aeration cores with thatch and to work sand into aeration channels - 2 passes	2.51	\$10.00	\$25.08	1.25	19.37	\$24.29	---	---	---
c. Apply fertilizer - 32-3-8 with 30% polymer-coated, sulfur-coated urea + 2% iron	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$28.75 50-lb. bag	4.00	\$115.00
<b>Early-September</b>									
a. Overseed with perennial ryegrass - Eagle Overseeing Blend	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$1.84 pound	350.00	\$644.00
b. Drag mat - 2 passes	2.51	\$10.00	\$25.08	1.25	19.37	\$24.29	---	---	---
c. Apply fertilizer - 18-24-12 with 25% polymer-coated, sulfur-coated urea	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$24.70 50-lb. bag	4.00	\$98.80
<b>Mid-October</b>									
a. Apply fertilizer - 5-10-31 with 10% iron and 3.9% ammoniacal nitrogen + 1.1% urea nitrogen	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$23.55 50-lb. bag	5.20	\$122.46
<b>Late November-Early December</b>									
a. Apply post-emergent herbicide (to control chickweed, henbit & white clover) - three-way herbicide - 2,4-D (30.56%) + MCPP (8.17%) + Dicamba (2.77%)	1.98	\$12.50	\$24.78	0.99	19.73	\$19.56	\$44.78 gallon	0.33	\$14.69
b. Apply lime - pelletized dolomitic lime - 21% calcium + 10% magnesium	1.38	\$12.50	\$17.21	0.69	19.76	\$13.60	\$9.70 50-lb. bag	8.00	\$77.60
<b>Mowing (62 times per year)</b>									
Toro Reelmaster 2000D triplex Sports Turf Mower - 72» cut, 4 mph groundspeed e	36.08	\$10.00	\$360.76	28.86	8.00	\$230.89	---	---	---
<b>Field Painting (6 times per season)</b>									
Graco Airless Sprayer LineLazer 3400, 6' number stencils, aluminum yard marker, logo stencils, and miscellaneous tools	78.75	\$10.00	\$787.50	60.00	7.80	\$468.00	\$20.00 gallon	90.00	\$1,800.00
<b>Irrigation</b>									
756,000 gallons of water applied annually	---	---	---	---	---	---	\$1.60 750 gal.	756,000	\$1,612.80
Subtotal <sup>f</sup>			\$1,782.46			\$1250.59			\$6,702.23
Grand Total									\$9,735.29

<sup>a</sup>A two-person crew is assumed for all tasks except mowing.

<sup>b</sup>Labor and equipment hours of usage and costs are obtained from the 2004 RSMeans Site Work & Landscape Cost Data, the PGMS Grounds Maintenance Estimating Guide lines, 8th Edition, and the NLA Landscape Designer & Estimator's Guide, 3rd Edition. Labor rates include an estimated charge for labor burden (e.g., \$8.00 + 25% burden = \$10.00 per hour; \$10.00 + 25% burden = \$12.50).

<sup>c</sup>Hours of equipment use include extra time for equipment setup, calibration and cleanup (0.75 hours for spraying; 0.50 hours for fertilizing; 0.33 hours for aerifying and dragging).

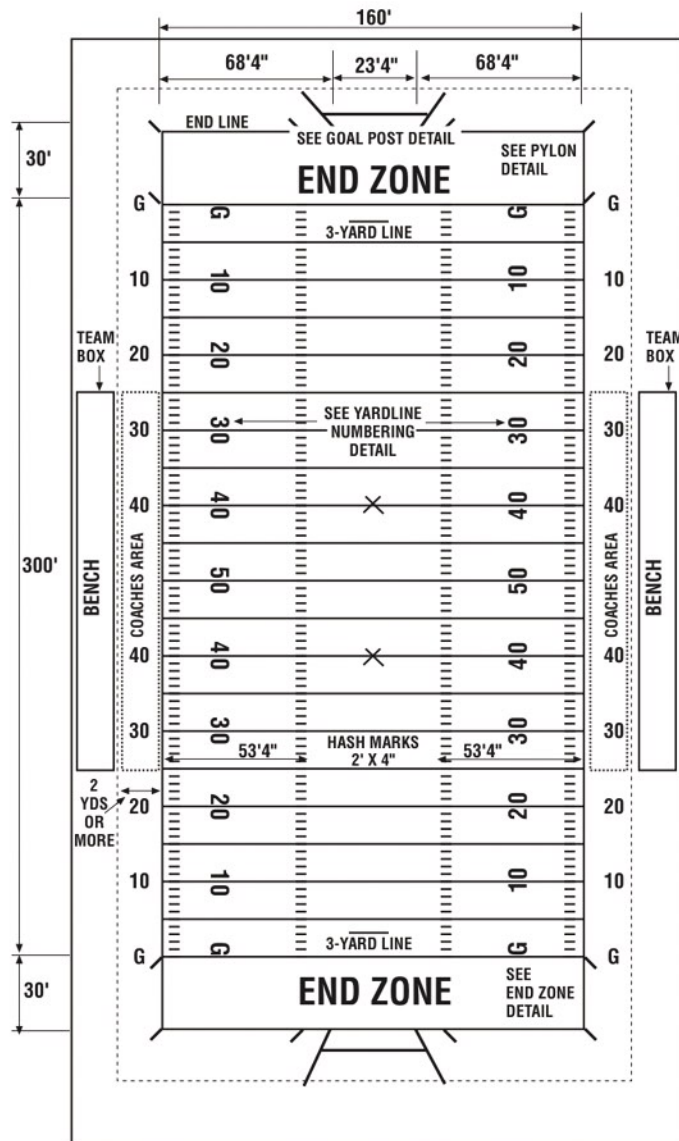
<sup>d</sup>Equipment hourly-use rates are based on machinery specifications and 4 mph travel speed. The tractor and mower are assumed to be used for other school operations and/or sites.

<sup>e</sup>The number of mowing and field painting labor hours include an additional 25% for fueling and cleanup.

<sup>f</sup>The computer internally calculates totals to the seventh decimal place. Totals for a column may not equal the total of rounded numbers.



# High School Football Field Dimensions



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SP651-1M-11/05 E12-4115-00-002-06 06-0009

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