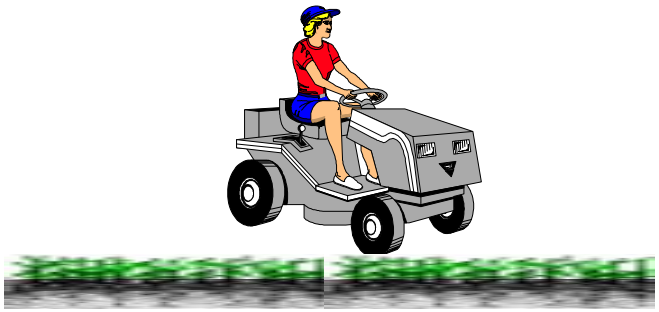
EC 699

CLEMSON UNIVERSITY

2004 Pest Control Guidelines for Professional Turfgrass Managers

This publication funded by the South Carolina Turfgrass Foundation as a benefit for its members

Calibrations & Calculations



2004 Clemson University Pest Control Guidelines for Professional Turfgrass Managers

Compiled and Edited by Dr. Bert McCarty
Clemson University Turf Specialist

This guide supplies information on pesticides used for controlling pests in turfgrasses. Use pesticides safely to protect against human injury and harm to the environment. Diagnose your pest problem; select the proper pesticide, if one is needed; follow the label directions; and obey all federal, state, and local pesticide laws and regulations. Because of environmental risks, including water quality and wildlife toxicity and similar concerns, and risks of handling, some pesticides are classified as "RESTRICTED USE PESTICIDES". Such products bear this designation on their label and can be purchased and applied only by certified applicators. All other pesticides, classified as "GENERAL USE PESTICIDES", can be purchased and applied by anyone. This guide is also available on the world wide web at: http://hubcap.clemson.edu/scafrs/hort/index.htm

Use of brand names does not imply endorsement of the products or criticism of similar ones not mentioned, but are used herein for convenience only. Mention of a proprietary product does not constitute a guarantee or warranty of the product by the authors.

CONTENTS

Poison Centers (anywhere): 1-800-222-1222

CHEMTREC: 1-800-424-9300; http://www.chemtrec.com/

Provides emergency medical assistance for acute exposure to chemical and information on how to handle spills;

National Pesticide Information Center: 1-800-858-7378

For a pesticide chemical emergency or for any pesticide information, call NPIC toll free, day or night

South Carolina Cooperative Extension Service, Clemson University
www.clemson.edu/turfornamental/

CLEMSON UNIVERSITY TURFGRASS PUBLICATION ORDER INFORMATION

Designing and Maintaining Bermudagrass Sports Fields in the United States - EC 698

Weeds of Southern Turfgrasses - EB 150

Diseases of Turfgrasses in the Southeast - EB 146

Pest Management Handbook (vol. 2), Turfgrass and Ornamentals - EC 695

Sod Production in the Southern United States - EC 702

Southern Lawns - EC 707

Make check or money order payable to the **Clemson University** or for credit card orders call 864-656-3261 during weekday office hours or order on-line at: **http://virtual.clemson.edu/groups/agcomm/pubs/pages/pubs.htm**

Send with this order form to: **Clemson University Cooperative Extension Service**
Bulletin Room, Room 82
Poole Agricultural Center
Clemson, SC 29634-0311
864-656-3261

Other Turfgrass Publications

Common Turfgrass Weeds - 84 slide set with narrative of the most common weeds in golf courses, home lawns, sports fields, & roadsides.

Sports Field Construction - 70 slide set with narrative on designing, constructing, and maintaining all levels of sports fields including baseball, football, and soccer. These slide set are available from: CSSA Headquarters Office, Attn: Book Order Dept., 677 South Segoe Road, Madison, WI 53711-1086, http://www.crops.org

BOOKS

Best Golf Course Management Practices — A complete text covering all agronomic practices which provide an environmentally friendly managed golf course with minimum fertilizer and pesticide inputs. Order from www.prenhall.com; Amazon.com; or BarnesandNoble.com. **ISBN 0-13-088359-X.**

Color Atlas of Turfgrass Weeds — A complete text covering all major weeds occurring in Turfgrass and Ornamentals. Included are detailed biology, reproductive means, distribution ranges and control recommendations. **ISBN 1-57504-142-1.**

Managing Bermudagrass Turf — A complete text concerning Bermudagrass Turf, especially golf greens .**ISBN 1-57504-163-4.** Order these two from GCSAA.com; Amazon.com; or BarnesandNoble.com.

POISON CENTERS

Robert G. Bellinger, PhD
Extension Pesticide Coordinator

Palmetto Poison Center, College of Pharmacy, University of South Carolina, Columbia, SC 29208

Emergency - anywhere:	**1-800-222-1222**	**Georgia:**	**1-800-282-5846**
Emergency - SC state-wide:	**1-800-922-1117**	**North Carolina:**	**1-800-848-6946**
Emergency - Columbia:	**803-777-1117**		
Business number:	**803-777-7909**		

If victim has collapsed or is not breathing, call 911.

National Pesticide Information Center (NPIC): 1-800-858-7378

For a pesticide chemical emergency or for any pesticide information.
E-mail: nptn@ace.orst.edu World Wide Web: http://hpc.orst.edu/

For larger pesticide spills, call CHEMTREC: 1-800-424-9300

Chemical Transportation Emergency Center (English and Spanish); http://www.chemtrec.com/

For small pesticide spills: call the manufacturer (see the product label), or the NPIC at 1-800-858-7378

Application Date: _____

PESTICIDE APPLICATION RECORD

Company Name _____ Commercial Applicator _____ License Number_____

Pesticide License Category _____ Trade Name _____ Active Ingredient & Formulation _____

% Active Concentration _____ Manufacturer _____ Lot No. _____ EPA Registration No._____

Restricted-entry Interval (REI) _____ Safety Equipment Needed/Worn _____

APPLICATION INFORMATION

Application Start Time _____ Treated Site Location _____ Type of Area Treated _____

Target Pest(s)_____ Total Treated Area _____ Application Rate (e.g., per acre or per 1000 sq. ft.) _____

Timing _____ Amount of Pesticide Product Mixed _____ Per _____ Gallons of Water: Gallon Per Acre (GPA)_____

Additives (Surfactant/Wetting Agent/Crop Oil, etc.) _____ Rate _____

WEATHER CONDITIONS

Air Temperature (°F)_____ Relative Humidity (%)_____ Dew Present (Y/N)_____ Initial Wind Velocity (MPH)_____

Wind Direction _____; First Hour_____; Second Hour_____; Third Hour_____; Soil Temperature at 4 inches (F)_____

Soil Moisture___ Cloud Cover (%)_____ Rainfall/Irrigation after application (date/time/amount) _____

APPLICATION EQUIPMENT

Method of Application _____ Speed (mph)_____ Motor Speed (RPM)_____ Nozzle Type_____Number _____

Nozzle Height_____ Spacing_____ Boom Width_____ Spray Pressure (PSI)_____

Nontarget Plant, Animal, or Human Exposure: Yes __ No____ (If yes, identify and list corrective or emergency action taken) _____

Other Comments:

Signature_____ **Date**_____

Pesticide Calibration Formulas and Information
Bert McCarty

Acres covered/hour: = MPH x Swath (ft) x 0.1212 or $\frac{\text{MPH x Swath (ft)}}{8.25}$

Gallons Per Acre (GPA):

= $\frac{\text{GPM x 495}}{\text{MPH x Swath (ft)}}$ or $\frac{\text{GPM per nozzle x 495}}{\text{MPH x nozzle spacing (ft)}}$

= $\frac{\text{GPM per nozzle x 5940}}{\text{MPH x nozzle spacing (inches)}}$ or $\frac{\text{GPM per nozzle x 5940}}{\text{MPH x width of nozzle spray (inches)}}$

= $\frac{\text{fl.oz collected per nozzle in 100 ft x 40.8375}}{\text{nozzle spacing (inches)}}$ or $\frac{\text{fl.oz. collected per nozzle x 4084}}{\text{ft. traveled x nozzle spacing (inches)}}$

= $\frac{\text{gallons collected per nozzle x no. nozzles x 43560}}{\text{ft. traveled x Swath (ft)}}$ or $\frac{\text{gallons per 1000 sq.ft.}}{0.023}$

Gallons per 1000 sq.ft. = 0.023 x GPA

Ounces per 1000 sq.ft. = 2.94 x GPA

Gallons Per Minute (GPM): = $\frac{\text{GPA x MPH x Swath (ft)}}{495}$ or $\frac{\text{fl.oz per minute}}{128}$

= $\frac{\text{GPA x MPH x nozzle spacing (inches) x no. nozzles}}{5940}$

GPM/Nozzle: = $\frac{\text{GPA x MPH x nozzle spacing (inches)}}{5940}$ or $\frac{\text{GPA x MPH x nozzle spacing (ft)}}{495}$

= $\frac{\text{Test jar fl.oz x 0.46875}}{\text{seconds to fill test jar}}$ or $\frac{7.5}{\text{seconds to fill 1 pint (16 fl.oz.)}}$

= $\frac{15}{\text{seconds to fill 1 quart (32 fl.oz.)}}$

Minutes/Acre: = $\frac{495}{\text{MPH x Swath (ft)}}$

Acres covered per tank: = $\frac{\text{Gallons per tank}}{\text{GPA}}$

Minutes/load: = $\frac{\text{gallons/load x 495}}{\text{MPH x GPA x Swath (ft)}}$

Material needed per tank = $\frac{\text{rate/A x gallons/tank}}{\text{GPA}}$

Travel Speed (Miles Per Hour, MPH) = $\frac{\text{Distance traveled (ft) x 0.68}}{\text{time (seconds) to travel distance}}$

Flow Rate (as influenced by pressure):

$$\frac{GPM_1}{GPM_2} = \frac{\sqrt{PSI_1}}{\sqrt{PSI_2}} \quad \text{or} \quad GPA_2 = GPA_1 \times \sqrt{\frac{PSI_2}{PSI_1}} \quad \text{or} \quad PSI_2 = PSI_1 \times \left(\frac{GPA_2}{GPA_1}\right)^2$$

For any change in travel speed (mph), calculate the resulting GPA_2 by:

$$GPA_2 = \frac{GPA_1 \ x \ MPH_1}{MPH_2} \quad \text{or} \quad \frac{GPA_1}{GPA_2} = \frac{MPH_2}{MPH_1} \quad \text{or} \quad MPH_2 = \frac{GPA_1 \ x \ MPH_1}{GPA_2}$$

Fluid Application

lbs/acre nutrient applied = 0.226464 x element concentration (ppm) x acre inches of solution applied

PPM = $\frac{1{,}000{,}000 \text{ x lbs ai used}}{\text{gal/tank x 8.34}}$ or $\frac{\text{wt. of material to be used (lbs) x 1,000,000}}{\text{wt. of tank mixture (lbs)}}$

= $\frac{1{,}000{,}000 \text{ x oz commercial material used x \% ai (decimal)}}{\text{gal/tank x 8.34 x 16}}$ or $\frac{1{,}000{,}000 \text{ x fl.oz. used x lb ai/gal}}{\text{gal/tank x 8.34 x 128}}$

lbs nutrients applied/acre = ppm of the element in the water x acre-inches water applied x 0.226464

lb ai to use per tank = $\frac{\text{PPM desired x gal/tank x 8.34}}{1{,}000{,}000}$ or $\frac{\text{ppm desired x gal/tank x 8.34}}{1{,}000{,}000 \text{ x \% ai}}$

lb commercial material to use per tank = $\frac{\text{PPM desired x gal/tank x 8.34}}{1{,}000{,}000 \text{ x \% ai (decimal)}}$ or $\frac{\text{\% desired x gal/tank x 8.34}}{\text{\% ai (decimal)}}$

fl. oz. to use per tank = $\frac{\text{PPM desired x gal/tank x 8.34 x 128}}{1{,}000{,}000 \text{ x ai per gal}}$

gal commercial material to use per tank = $\frac{\text{ai (decimal) x 8.34 x gal/tank}}{\text{ai per gal x 100}}$

% ai in a spray mix = $\frac{\text{lbs. commercial material used x \% ai (decimal)}}{\text{gal/tank x 8.34}}$

gal commercial material for total treated acres = $\frac{\text{PPM desired x GPA x acres x 8.34}}{1{,}000{,}000 \text{ x lb ai/gal}}$

Active Ingredients (ai)

lbs commercial material/acre = $\frac{\text{lbs ai to be applied per acre}}{\text{\% ai of material}}$

gal commercial material/tank = $\frac{\text{gallons/tank x lb ai to be applied per acre}}{\text{gallons/acre x lbs ai per gallon}}$

gal commercial material/acre = $\frac{\text{lbs ai to be applied per acre}}{\text{lbs ai per gallon}}$

Time (seconds) required to cover a specific distance to obtain a desired speed (MPH).

		Time Required (Seconds) to Travel a Distance of		
Desired MPH	**Feet per minute**	**100 ft.**	**200 ft.**	**300 ft.**
2.0	176	34	68	102
2.5	220	27	54	81
3.0	264	23	45	68
3.5	308	20	39	58
4.0	352	17	43	51
4.5	395	15	30	45
5.0	440	14	27	41
6.0	528	--	23	34
7.0	616	--	19	29
8.0	704	--	17	26
9.0	792	--	15	23

Metric Prefix Definitions (basic metric unit = 1)

tera	=	10^{12}	deci	=	10^{-1}
giga	=	10^{9}	centi	=	10^{-2}
mega	=	10^{6}	milli	=	10^{-3}
kilo	=	10^{3}	micro	=	10^{-6}
hecto	=	10^{2}	nano	=	10^{-9}
deca	=	10^{1}	pico	=	10^{-12}

Approximate Rates of Application Equivalents

Weights

1 oz/ft^2	= 2722.5 lbs/A	
1 oz/yd^2	= 302.5 lbs/A	
1 oz/100 ft^2	= 27.2 lbs/A	
1 oz/1000 ft^2	= 43.46 oz/A	= 2.72 lbs/A
1 lb/A	= 1 oz/2733 ft^2	= 8.5 g/1000 ft^2
100 lb/A	= 2.5 lb/1000 ft^2	
1 yd^3 sand	= 1.3 to 1.5 tons	
1 bushel	= 1¼ ft^3	= 0.046 yd^3

Liquid

1 oz/1000 ft^2	= 43.56 oz/A	= 1.4 qt/A
1 pt/1000 ft^2	= 5.4 gal/A	
100 gal/A	= 2.3 gal/1000 ft^2	= 1 qt/100 ft^2

Helpful Calculations and Formulas:

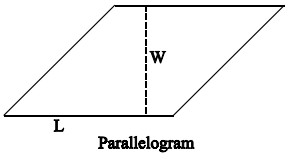
Rectangle, square or parallelogram:	**area**	=	length (L) x width (W)		
Trapezoid:	**area**	=	[a + (b x h)] ÷ 2		
Circle:	**area**	=	radius (r)^2 x 3.1416 (π)	=	diameter (d)^2 x 0.7854
	radius	=	d ÷ 2		
	diameter	0	r x 2		
	circumference	=	π x d		
Sphere:	**volume**	=	r^3 x 4.1888	=	d^3 x 0.5236
Triangle:	**area**	=	(W x H) ÷ 2		
Cylinder:	**volume**	=	r^2 x 3.1416 x L		

Finding Tank Capacity (gallons):

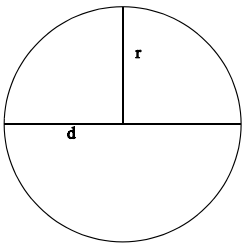
Cylindrical tanks:	**(inches)**	=	L x d^2 x 0.0034
	(feet)	=	L x d^2 x 5.875
Rectangle tanks:	**(inches)**	=	L x W x height x 0.004329
	(feet)	=	L x W x height x 7.48

Elliptical tanks: **(inches)** = L x short diameter (sd) x long diameter (ld) x 0.0034

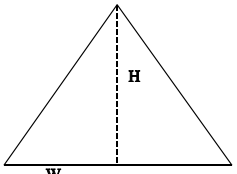
(feet) = L x sd x ld x 5.875



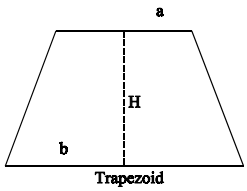
Parallelogram



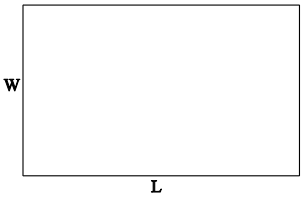
Circle



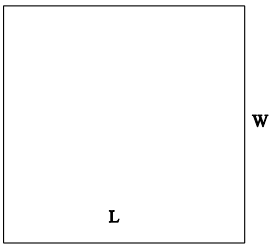
Triangle



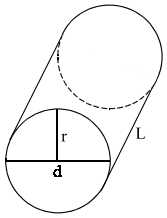
Trapezoid



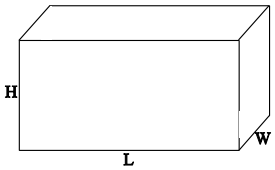
Rectangle



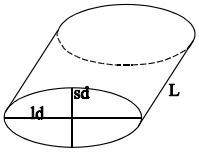
Square



Cylindrical Tank



Rectangular Tank



Elliptical Tank

Metric System Conversion Factors

Area Equivalents

1 acre = 43,560 ft^2 = 4840 yd^2 = 0.4047 hectares = 160 $rods^2$ = 4047 m^2 = 0.0016 sq. mile

1 acre-inch = 102.8 m^3 = 27,154 gal = 3630 ft^3

1 hectare (ha) = 10,000 m^2 = 100 are = 2.471 acres = 107,639 ft^2

1 cubic foot (ft^3) = 1728 in^3 = 0.037 yd^3 = 0.02832 m^3 = 28,320 cm^3

1 cubic yard (yd^3) = 27 ft^3 = 0.765 m^3

1 square foot (ft^2) = 144 in^2 = 929.03 cm^2 = 0.09290 m^2

1 square yard (yd^2) = 9 ft^2 = 0.836 m^2

Liquid Equivalents

1 ft^3 of water = 7.5 gal = 62.4 lbs. = 28.3 liters

1 acre-inch of water = 27,154 gal = 3630 ft^3

1 liter (l) = 2.113 pts. = 1000 ml = 1.057 qts. = 33.8 fl.oz. = 0.26 gal

1 US gallon=4 qt.=8 pt. = 16 cups = 128 fl.oz. = 8.337 lbs of water = 3.785 L = 3785 ml = 231 in^3 = 256 tbsp. = 0.1337 ft^3

1 quart = 0.9463 liters = 2 pt. = 32 fl. oz. = 4 cups = 64 tablespoons (tbsp.)=57.75 in^3 = 0.25 gal = 946.4 ml

1 pint = 16 fl. oz. = 2 cups = 473.2 ml = 32 level tablespoons = 0.125 gal = 0.5 qt

1 cup = 8 fl. oz. = ½ pt. = 16 tablespoons = 236.6 ml

1 tablespoon = 14.8 ml = 3 teaspoons (tsp.) = 0.5 fl.oz.

1 milliliter (ml) = 1 cm^3 = 0.34 fl.oz. = 0.002 pts

1 US fluid ounce = 29.57 ml = 2 tablespoons = 6 tsp. = 0.03125 qt

1 teaspoon = 4.93 ml = 0.1667 fl. oz. = 80 drops

Temperature Equivalents

degrees Centigrade = (°F-32)x5/9

degrees Fahrenheit = (°Cx9/5)+32

Pressure Equivalents

1 lb per square inch (PSI) = 6.9 kilopascal (kPa)

1 PSI = 2.31 feet head of water

1 atm = 760 mmHg = 1.013 x 10^5 Pa = 1.013 bar = 14.70 psi

1 mmHg = 133.32 Pa = 0.133 kPa = 133,333 mPa

Length Equivalents

centimeter (cm) = 0.3937 inch = 0.01 m = 0.03281 ft.

meter (m) = 3.28 feet = 39.4 inches = 100 cm = 1.094 yds = 1000 mm

kilometer = 0.621 statute mile = 1000 meters = 100,000 cm = 3281 ft = 39,370 in.

inch = 2.54 cm = 25.4 mm = 0.0254 m = 0.08333 ft.

foot = 0.3048 meters = 30.48 cm = 12 inches

yard = 0.9144 meters = 3 feet = 36 inches = 91.44 cm

statute mile = 1760 yards = 5280 feet = 1.61 kilometers = 1609 meters

Mixture Ratios

1 mg/g = 1000 ppm

1 fl.oz./gal = 7490 ppm

1 fl.oz./100 gal = 75 ppm

1 qt/100 gal = 2 tablespoons/1.0 gal

1 pt/100 gal = 1 teaspoons/1gal

Flow

1 gpm = 0.134 ft^3/minute

1 ft^3/min. (cfm) = 449 gal/hr. (gph) = 7.481 gal/min

Weight Equivalents

1 ton (US) = 2000 lb = 0.907 metric tons = 907.2 kg

1 metric ton = 10^6 g = 1000 kg = 2205 lb

1 lb = 16 oz = 453.6 grams (g) = 0.4536 kg

1 oz (weight) = 28.35 g = 0.0625 lb

1 gram = 1000 mg = 0.0353 oz = 0.001 kg = 0.002205 lb

milligrams (mg) = 0.001 grams

1 kilogram (kg) = 1000 grams = 35.3 oz = 2.205 lbs

microgram (μg) = 10^{-6} grams = 0.001 mg

nanogram (ng) = 10^{-9} grams = 0.001 micrograms (µg) picogram = 10^{-12} grams

1 ppm= 0.0001%= 0.013 fl oz in 100 gal =1 mg/kg=1 mg/L=1 µg/g= 0.379 g in 100 gal water= 8.34 x 10^{-6} lb/gal=1µl/l

10 ppm = 0.001% = 10 mg/L 100 ppm = 0.01% = 100 mg/L 1000 ppm = 1mg/g = 0.1% = 1000 mg/L

1 ppb = 1 µg/kg or 1 µg/L or 1 ng/g 1 ppt = 1 picogram/g

1 % = 10,000 ppm = 10g/L = 1g/100ml = 10g/kg = 1.33 oz by weight/gal water = 8.34 lbs/100 gal water

Approximate Weight of Dry Soil

Type	g/cm^3	lbs/ft^3	lbs/acre (6 inches deep)
sand	1.6	100 (or 2700 lbs/yd^3)	2,143,000
loam	1.3 to 1.55	80-95	1,714,000
clay or silt	1.0 to 1.30	65-80	1,286,000
muck	0.65	40	860,000
peat	0.325	20	430,000

Sand weights (tons): = yd^3 x 1.3

Gravel weights (tons):= ft^3 x 110

0.5 to 1 inch diameter gravel ≈ 2700 lbs/ton

0.25 to 0.375 inch diameter gravel ≈ 3000 lbs/ton

Conversions for determining turfgrass irrigation needs.

1 acre-inch	=	27,154 gal	=	43,560 cu.in.	=	3,630 cu.ft.
1 inch/1000 sq.ft.	=	620 gal	=	83 cu.ft.		
1 gallon	=	0.134 cu.ft.	=	8.34 lbs		
1 million gallon	=	3.07 acre-feet				
7½ gallons	=	1 cu.ft.	=	231 cu.in.		
1 acre-foot	=	325,851 gal	=	43,560 cu.ft.		
1 pound of water	=	0.1199 gal				
Precipitation rate (in/hr)	=	$\frac{\text{gpm x 96.3}}{\text{area (ft}^2\text{)}}$				

Energy

1 calorie (cal)	=	4.184 Joule (J)
Joule (J)	=	1 kg m^2 s^{-2}
1 kcal	=	4.184 kJ

Metric Conversion Factors

To Convert	Multiply by	To Obtain
Acres	0.4047	Hectare (ha)
Acres	43,560	Sq. feet
Acres	0.00405	Sq. kilometer
Acres	4047	Sq. meter
Acres	4840	Sq. yards
Acre-feet	325,851	Sq. feet
Acre-feet	43560	Cu. feet
Acre-feet	1233.5	m^3
Acre-inch	102.8	m^3
Bar	14.5	Lb/in^2
Bar	1019.7	g/cm^3
Bar	29.53	inches Hg @ 0ºC
Bar	75	cm Hg @ 0ºC
Bar	0.001	J/kg
Bar	100	kPa
Bushels (dry)	0.03524	m^2
Bu	1.245	ft^3
Calorie (cal)	4.184	Joules (J)
Centimeters (cm)	0.03281	Feet
Centimeters	0.3937	Inches
Centimeters	0.1094	Yards
Centimeters	0.01	Meters
Centimeters	10	Millimeters (mm)
cm/sec	1.9685	ft/min
cm/sec	0.0223694	MPH
cm^2	0.001076	ft^2
cm^2	0.1550	in^2
cm^3	0.0610237	$inch^3$
cm^3	0.0338	fl oz
Cup	8	fl oz
Cup	236.6	cm^3
Feet (ft)	30.48	Centimeters
Feet	0.3048	Meters
Feet	305	mm
ft^2	929	cm^2
ft^2	0.0929	m^2
ft^2	9.294×10^{-6}	Hectares (ha)
ft^3 (cubic feet)	0.0283	Cu. meter
ft^3	7.4805	Gallons
ft^3	1728	Cubic inches
ft^3	0.037	Cubic yards
ft^3	28.32	L
$ft^3/1000\ ft^2$	0.030463	$m^3/100\ m^2$

Metric Conversion Factors

To Convert	Multiply by	To Obtain
Feet per minute	0.01136	MPH
Feet head of water	0.433	PSI
Foot candle	10.764	Lux
Gallons (gal)	3.785	Liters
Gal	3785	Milliliters
Gal	128	Ounces (liquid)
Gal	0.13368	ft^3
Gal/acre	9.354	Liters/hectare
Gal/acre	2.938	Oz/1000 ft^2 (liquid)
Gal/1000 ft^2	4.0746	L/100 m^2
Gal/minute	2.228×10^{-3}	Cubic feet/second
Gal/min	0.06309	L/sec
Gal/min	0.227125	m^3/hr
Grams (g)	0.002205	Pounds
Gram	0.035274	oz
G/cm^3	0.036127	lb/in^3
G/cm^3	62.428	lb/ft^3
G/ha	0.000893	lbs/a
G/ha	0.014275	oz/a
G/kg	0.10	percent (%)
Grams/liter	1000	PPM
Grams/liter	10	Percent
Grams/liter	0.00834595	lbs/gal
Grams/sq.meter	0.00020481	lb/sq.feet
Hectares (ha)	2.471	Acres
Ha	107,639	ft^2
Inches	2.540	Centimeters
Inches	0.0254	Meters
Inches	25.40	Millimeters
in/ft	0.083	mm/mm
In^2	6.4516	cm^2
In^3	16.3871	cm^3
In^3	0.55411	fl oz
In^3	0.01732	qt
Kilograms (kg)	2.2046	Pounds
Kg/hectare	0.892	Pounds/acre
Kg/ha	0.02048	lb/1000 ft^2
Kg/100 m^2	2.037	lbs/1000 ft^2
Kg/L	8.3454	lb/gal
Kilometers (Km)	100,000	Centimeters
Kilometers	3281	Feet
Kilometers	1000	Meters
Kilometers	0.6214	Miles

Metric Conversion Factors

To Convert	Multiply by	To Obtain
Kilometers	1094	Yards
Km/h	0.62137	MPH
Km/h	54.6807	ft/min
Kilopascals (kPa)	0.145	Pounds/sq.in. (psi)
Liters (L)	0.2642	Gallons
L	33.814	Ounces
L	2.113	Pints
L	1.057	Quarts
L	0.035315	ft^3
L/100 m^2	0.2454	gal/1000 ft^2
L/100 m^2	1.9634	pt/1000 ft^2
Liters/hectare	0.107	Gallons/acre
L/ha	0.314	oz/1000 ft^2
L/ha	0.855	pt/A
L/min	15.85	gal/hr
Meters (m)	3.281	Feet
Meters	39.37	Inches
Meters	1.094	yards
Meters	100	Centimeters
Meters	0.001	Kilometers
Meters	1000	Millimeters
Meters/sec	2.2369	MPH
M^2	10.764	ft^2
M^2	1,550	in^2
M^2	1.196	yd^2
M^3	35.3147	ft^3
M^3	1.30795	yd^3
Miles (nautical)	1.1508	Miles (statute)
Miles (statute)	160,900	Centimeters
Miles	5280	Feet
Miles	1.609	Kilometers
Miles	1760	Yards
Miles/hour (mph)	1.467	Feet/second
Miles/hour	88	Feet/minute
Miles/hour	1.61	Kilometers/hour
Miles/hour	0.447	meter/second
Milliliters (ml)	0.0338	Ounces (fluid)
Milliliters	0.0002642	Gallons
ml/m^2	3.14	oz/1000 ft^2
ml/10,000 L	0.0128	fl oz/1,000 gal
Millimeters (mm)	0.03937	Inches
1 mm Hg @ 0 C	0.13332	kPa
1 mm Hg	133333.3	mPa

Metric Conversion Factors

To Convert	Multiply by	To Obtain
Ounces (fluid)	0.02957	Liters
Ounces (fluid)	29.573	Milliliters
Ounces (fluid)	0.03125	qt.
Ounces (fluid)/acre	0.0731	L/ha
Ounces (fluid)/1000 ft^2	3.18	L/ha
Ounces (weight)	28.35	Grams
Ounces (weight)	0.0625	lb
Ounces (weight)/acre	0.07	kg/ha
oz (weight)/acre	11.473	g/ha
oz (weight)/1000 ft^2	3.05	kg/ha
oz (wt.)/ft^2	305.15	g/m^2
Percent (%)	10	g/kg
Pint (liquid)	0.473	liter
pt/A	1.1692	L/ha
pt/A	0.3673	oz/1000 ft^2
pt/1,000 ft^2	0.50932	L/100 m^2
Parts per million (ppm)	2.719	lb ai/acre foot of water
PPM	0.001	Grams/L
PPM	8.34	lb/million gal
PPM	1	mg/kg
PPM	0.013	Ounces/100 gal of water
PPM	0.3295	Gal/acre-foot of water
PPM	8.2897	lbs/million gal of water
Pounds (lbs)	0.4536	Kilograms
Pounds	453.6	Grams
Pounds/acre	1.12	Kg/hectare
Pounds/A	1.0413	g/100 ft^2
Pounds/A	0.02296	lb/1000 ft^2
Pounds/acre-foot	0.3682	g/m^3
Pounds/acre-foot	0.0003682	kg/m^3
Pounds/sq.ft.	4883	Grams/sq.meter
Pounds/1000 ft^2	48.83	Kg/ha
Pounds/1000 ft^2	43.5597	lb/A
Pounds/1000 ft^2	491	g/100 m^2
Pounds/1000 ft^2	4.91	Kg/100 m^2
Pounds/yd^3	0.0005937	g/cm^3
Pounds/yd^3	594	g/m^3
Pounds/gallon	0.12	Kg/liter
PSI (lbs/sq.in.)	6.89	Kilopascals (kPa)
PSI	0.06895	Bar
PSI	0.068046	atm
PSI	2.31	feet head of water
Quarts	0.9463	Liters

Metric Conversion Factors

To Convert	Multiply by	To Obtain
Qt/A	2.3385	L/ha
Qt/A	0.7346	oz/1000 ft^2
Ton (2000 lbs)	907	kg
Ton (2000 lbs)	0.907	Ton (metric)
Ton (2000 lbs)/acre	2.241	Ton (metric)/ha
Ton (metric)	2,205	lb
Ton (metric)	1,000	kg
Ton (metric)	1.102	ton (2,000 lb)
Yards	91.44	Centimeters
Yards	0.9144	Meters
Yards	914.4	Millimeters
yd^3	27	ft^3
yd^3	0.7645	m^3
yd^3	765	L
yd^3/1000 ft^2	0.825	m^3/100 m^2
P_2O_5	0.437	P
K_2O	0.830	K
CaO	0.715	Ca
MgO	0.602	Mg

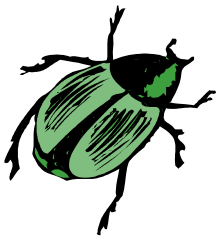
Decimal and Millimeter Length Equivalents

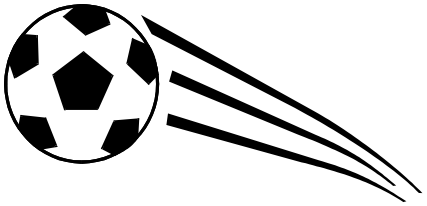
Fraction (inch)	Decimals (inch)	Millimeters
1	**1.00**	**25.4**
15/16	0.9375	23.812
7/8	0.875	22.225
13/16	0.8125	20.638
¾	**0.75**	**19.05**
11/16	0.6875	17.462
5/8	0.625	15.875
9/16	0.5625	14.288
½	**0.5**	**12.70**
7/16	0.4375	11.112
3/8	0.3750	9.525
11/32	0.34375	8.731
5/16	0.3125	7.938
9/32	0.28125	7.144
¼	**0.25**	**6.350**
15/64	0.234375	5.953
7/32	0.21875	5.556
13/64	0.203125	5.159
1/5	0.200	5.08
3/16	0.1875	4.762
23/128	0.1797	4.564
11/64	0.171875	4.366
1/6	0.167	4.242
21/128	0.1641	4.168
5/32	0.15625	3.969
1/7	0.143	3.633
19/128	0.1484	3.769
9/64	0.140625	3.572

c	**0.1250**	**3.175**
7/64	0.109375	2.778
1/10	0.100	2.540
3/32	0.09375	2.381
5/64	0.078125	1.984
1/16	0.0625	1.588
3/64	0.046875	1.191
1/32	0.03125	0.794
1/64	0.015625	0.397

Slopes

10%	=	6°	=	10:1	33%	=	18°	=	3:1
18%	=	10°	=	6:1	50%	=	26°	=	2:1
25%	=	14°	=	4:1	100%	=	45°	=	1:1





To become a member of the **South Carolina Turfgrass Foundation**, complete the following and send a check to the indicated address.

Individual Name:_____

Company/School Name:_____

Address:_____

_____

City:_____

State:_____ Zip:_____

Home telephone:_____

Work telephone:_____

E-mail:_____

Dues Information:

Regular Member: $35 ea.
Student Member: $10 ea.

Send this to:

South Carolina Turfgrass Foundation
Sam Cheatham
Executive Director
P.O. Box 1061
Lexington, SC 29071

803-957-0616
803-957-0626 (fax)