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WHY AERIFICATION?*

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Aerification is a widely accepted practice on all types of turf areas today. It should be as much a part of a good turf management program as fertilization and irrigation. In spite of its general acceptance and wide use much confusion still seems to exist about aerification and several questions are often asked by turf managers. Those most frequently heard are: What exactly does aerification do that is beneficial to turf? How often should a turf be aerified? When, during the year, is the best time for aerification? What are the relative merits of the coring, spiking and slicing machines? When should one be used in preference to another? Completely satisfactory answers may not be possible for these questions as much of the support for the practice is empirical; clear experimental evidence is not readily obtained.

What are the benefits of aerification?

The principal function of aerification is to partially alleviate the problems caused by soil compaction, layering, surface crusting and thatch accumulation. Correction of these difficulties through aerification, even at the best, will never be complete as a large percentage of the turf remains untouched by the tines or spikes. The degree of correction will depend upon the type of equipment used, frequency of use and method of use.

As the name indicates one of the results of aerification is to improve aeration or the oxygen-carbon dioxide relationship in the soil. Regular use of aerating equipment will increase the rate at which oxygen will move into the soil, and carbon dioxide from root respiration and other sources out of the soil. As soils become compacted, and poorly drained this gas exchange is restricted, root growth is in turn reduced and the ability of the turfgrass plant to take up water and nutrients is inhibited. The turf soon becomes weak and thin with poor color. It also may be more susceptible to attack by disease causing organisms.

Letcy (2) has shown the relationship of soil aeration to bentgrass putting green quality in Table 1. The oxygcn diffusion rate (ODR) as measured by the platinum microelcctrodc must be over 20 if satisfactory bentgrass growth is to be obtained; the optimum value is much higher. The green in good condition had satisfactory O.D.R. values to at least the four inch depth, but the greens in bad and declining conditions had unsatisfactory levels even at the two inch depth.

ODR measurements in greens following aerification are shown in Table 2. Standard aerification (treatment 1) produced satisfactory ODR values at four inches, but not at 10 inches. On the other hand vertical mulching or deep acrification (treatments 2 and 3) gave satisfactory values to 10 inches and perhaps deeper. Thus, there is a direct relationship between depth of aerification and depth of good soil oxygen levels.

Of equal importance to aeration, and of course intimately associated with it, is the improved water infiltration rate resulting from the aerification practice. The holes punched into the thatch and compacted soil surface provided channels through which water may move. They may also act as small reservoirs in which water may be held allowing more time for percoluation into the soil, thus, reducing runoff.

Drainage of surface soil layers may be improved by

TABLE 1. A correlation of putting green condition with oxygen diffusion rates at different soil depths.'

Putting Green Condition	Dept of Measurement (inches)	Oxygen Diffusion Rate Value[2]
Good	2	51.6
	4	27.1
	12	3.8
Bad	2	10.0
	4	10.2
Declining	2	13.6
	4	14.7
	12	4.1

[1]Letey, J. 1961. Aeration, compactness and drainage. California Turf Culture 11:17-21.

[2]Measured in grams per square centimeter per minutes average for 20 measurements). An oxygen diffusion rate value of 20 is considered the critical level. Values below this figure will not support satisfactory growth of grass roots.

TABLE 2. The effect of three different aeration treatments on the oxygen diffusion rate at different soil depths under putting green condition.'

Aeration Treatment	Dept of Measurement (inches)	Oxygen Diffusion Rate Value'
1. Regular Mechanical Procedure (check)	2	86.3
	4	43.7
	10	4.4
2. 2" Holes 10" Deep Backfilled with loamite	2	101.2
	4	69.2
	10	22.7
3. 1" Hole 10 Deep Left Open	4	95.0
	10	72.4
		28.3

[1]Letey, J. 1961. Aeration, compaction and drainage. California Turf Culture 11:17-21.

[2]Measured in grams per square centimeter per minute (average for 20 measurements). An oxygen diffusion rate value of 20 is considered the critical level. Values below this figure will not support satisfactory growth of grass roots.

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**Professor. Plant Science Department, University of California Riverside' aerification. Layers of diverse soil textures often develop in the surface one or two inches of putting and bowling greens from repeated topdressings and buried thatch. The soil above these layers as a result is often maintained in an almost constantly saturated condition causing poor aeration and poor root growth. Aerification holes through the layers may facilitate drainage into more permeaable soil below.

However, Byrne et al (1) showed that standard aerification had little effect on water infiltration rates in a soil of bad textural and structural characteristics to a depth of 12 inches. This lack of response was attributed to the shallow depth of the holes (2 1/2. inches) in relationship to the depth of the tight soil. Even "deep aerification" to a depth of six inches provided benefits for a limited time only.

If aerification improves water infiltration it stands to reason that it will also improve movement of dissolved fertilizers into the root zone. Placement of organic, slow release or other fertilizers of low solubility where they can be easily absorbed by the grass roots as they come available is facilitated by aerification before fertilizer application. Loss or concentration of fertilizers by washing will be reduced as well. Severe turf injury frequently occurs when fertilizers are carried into low spots with runoff water because the soil is of low permeability.

Thatch decomposition can be accelerated and soil layering lessened by the mixing and cultivating action of aerification. Soil will be mixed with thatch material if the cores brought to the surface by the machine are crumbled with a drag mat. Similarly topdressing material can be mixed with the soil and thatch.

Evidence of the beneficial effects of the aerification practice can often be seen in the form of dense root growth in the aerifier holes. (Fig. 1) . Anyone or more than one of the cited benefits of aerification could be the cause of this. Sometimes in seriously compacted soils the location of aerification holes may be noted as tufts of darker green more vigorous top growth than on the area surrounding the holes. Such conditions indicate that greater benefits would be derived from a more intense program.

How often should turf be aerified?

No precise answer can be given to this question, but I have never seen a turf that has been over-aerified. Most turf would perhaps benefit from much more frequent aerification than they now receive. The poorer the soil condition (compacted, layered or heavily thatched) the more frequent should be the aerification. Where these problems do not exist they may be prevented from occurring by regular use of aerification machines. Aerification as a preventive maintenance practice is of great value even on soils specially made to resist compaction. I believe that aerification (with 2-inch spacing) as frequent as once each month of growing season would be beneficial on niany turfs. Often aerification frequency is limited by budgetary, rather than agronimc, considerations.

When should turf be aerified?

The best time in general would be during the seasons when weather conditions are most favorable for growth of the particular species being used-cool weather months for cool season grasses and warm weather months for warm season grasses. For many years we said that cool

Bentgrass roots growing in aerification holes through a compacted and layered putting green soil.

season grasses should not be aerified during hot weather. However, more recent experience has shown that if properly done bentgrass greens can be aerified at any time. We have seen occasions when greens in rapid summer decline have been saved by aerification even though temperatures were well over 90°F. The benefits of improved air-water-soil relationships seemed to far outweigh the effects of any mechanical injury. Prevention of drying around the holes is critcal during the first few days after a summer aerification.

Aerification during the period of peak *Poa annua* seed germination should be avoided if at all possible as it provides a better seedbed and encourages germination (8). If it is necessary to do so a good preemergence herbicide should be applied immediately thereafter (9).

Timing of aerification to immediately precede fertilization and top-dressing is often highly beneficial. Some benefits may also result from aerification immedately after vertical mowing and irrigation as better or deeper penetration of the tines may then be possible.

What are the relative merits of coring, spiking and slicing or slitting machines.

Information presented thus far in our discussion is based solely on studies and observations with the coring type of machine. As they remove cores of turf either by a curved spoon or hollow tine they have little tendency to compact the soil around the sides of the hole. Any "slicking" which may occur generally disappears as the walls break down with irrigation and traffic.

Spikers were used long before the hollow spoon or tine aerifiers were invented. As these tools press holes with solid tines rather than remove a core of soil the end result from regular use may be increased not reduced compaction. Spiking as a substitute for coring is therefore not recommended. Spikers are most useful to break up surface crusting of soils where the turf is thin and open or where algae growth has sealed the surface. The tines only scratch or penetrate the surface and do not enter the soil to any depth. This may aid drying of soil surface and destruction of algae.

Sometimes soils may become so dry and hard that the hallow aerification tines cannot be forced into the soil. Several passes over the area with a spiker will make numerous small depressions which will hold water permitting a gradual wetting and softening of the soil until a coring machine can at last be used. Similarly spikers may be used to open thatch for better water penetration. Little compaction if any results from their use in dry soil.

Slicing or slitting machines with thin rapidly revolving blades are newer machines and less is known about their value. Unlike spikers they do bring some soil to the surface so there is less danger of compaction around the openings. Although the soil openings are not as deep as those obtained with the hollow tine a large amount of surface may be opened by running the machine in cross directions. Thus, water infiltration may be improved considerably, but most likely for only short periods of time as the slits close in quickly.

The cutting action of the rapidly moving blades permits operation in drier soils than would be possible with coring and spiking machines. Also because of this action slicing machines may be fairly effective in mixing soil or topdressing with thatch to speed its decomposition. Turf surface appears to be damaged very little and the time from beginning of the operation to resumption of play on a green may be considerable shorter than with other types of equipment.

The final place that slicing will have in turf maintenance remains to be seen. It seems certain that slicing machines will be more useful than spikers and ultimately may replace them. However, as presently designed they cannot do what the hollow spoon or tine aerifier does in relieving compaction, maintaining good water infiltration rates, and providing a means for improving a turf soil in place.

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PREEMERGENCE AND POSTEMERGENCE CONTROL OF BROADLEAF WEEDS IN YOUNG GRASS TURF

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With the availability of new herbicides it is possible now to establish cool season turfgrasses without competition from and the unslightliness of broadleaf weeds during the early developmental stage of a new turf. Tests have been conducted by the Agricultural Extension Service Staff of the University of California to evaluate promising herbicides.

Two studies were conducted in 1969 on young turfgrass to determine the tolerance and weed control effects of the foliage applied herbicides bromoxynil (Nulawn ®) and 2,4-D. At Davis bromoxynil and the dimethylamine salt of 2,4-D were evaluated at two growth stages on young Alta tall fescue turf. Treatments were made using a spray volume of 100 gallons per acre (gpa) and included 0.25% surfactant (Surfax ®).

The grass was planted October 30, 1969, and treated on November 20 (2 inches in height) and in a second series on Deceniber 30, 1969 (5 inches in height). The daily maximum temperatures for the treatment date and the three succeeding days in the first bromoxynil, 2,4-D study ranged from 65° · 68° F. in November and 51° · 59° F. in December.

Weed species present were yellow starthistle *(Centaurea solstitialis)* , common chickweed *(Stellaria media),* milk thistle *(Silybum marianum),* fiddleneck *(Amsinskia Douglasiana),* and hedge mustard *(Sisymbrium officinale)*

In 1970 pre and postemergent siduron treatments and postemergent bromoxynil, dicamba, and 2,4-D treatments were compared at San Leandro on young ryegrass turf at three growth stages. The grass was planted October 17, 1970 and treated with bromoxynil, 2,4-D and dicamba November 2 (16 days, turf height, 1 inch), November 9 (23 days, 2 inches) and November 24 (38 days, 3 inches). The siduron treatment was made October 21, 1970, as a preemergence treatment in the first trial and November 9 as a postemergent treatment in the second trial. The first siduron treatments were applied with a knapsack sprayer using 1 gallon per plot or 450 gpa. Subsequent treatments were applied in 100 gpa.

The San Leandro temperatures were approximately 60° - 65° F. at each application. The second application in the study was applied to wet turf, and a light rain followed for 10 minutes after application.

Weed species present at San Leandro were common checkweed *(Stellaria media),* wild mustard *(Brassica kaber),* common yellow mustard *(Brassica campestris),* cheeseweed *(Malva parviflora)* , bur clover *(Medicago hispida),* curly dock *(Rumex crispus)* milk thistle *(Silybum marianum)* shepherd's purse *(Capsella bursa-pas-*

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toris) , and bristly ox-tongue *(Pricris echioides)* . Visual evaluations were taken on weed control and the effect of the herbicides on the turfgrass. On January 22, 1971, weeds were counted by species in each of 3 random, 2 square foot quadrants in each plot.

Results-Davis Study

Weed control was good with 2,4-D amine at either 0.5 or 0.75 lb. per acre at both stages of growth in the Davis trial. In the second study control appeared to be best when 2,4-D was applied at the 2 inch stage or 23 days after planting at 1/2 lb. per acre. (Table 1)

No turf injury from either herbicide was observed when applied on turf 2 inches in height. However, at the 2 pound rate of bromoxynil on older turf (5 inches) there was injury 6 months after application. The injury appeared in an area where the turf was somewhat drier due to poor sprinkler distribution. No apparent turf injury was noted with 2,4-D amine at either rate.

San Leandro Study

All rates of bromoxynil gave excellent early control of the two mustard species from 16 to 23 days after planting (Table 3). Generally on the young weeds (16 days) rates of 1 to 2 pounds per acre were required for excellent control. Rates of 1/2 to 1 lb. appeared adequate at 23 days and except for mustard 2 pounds was required at 38 days for good control. The November 24, 1970, application was not as effective, because of the older weeds, as the other treatments when evaluated at one month after treatment as indicated when weeds were counted 2 months after application. Control of mustards and bur clover was more effective with bromoxynil than common chickweek or curly dock.

Dicamba at 1/4 lb. per acre gave the best control of all weeds when the weeds were approximately 23 days of age. Dicamba gave excellent clover control and generally poor control of mustards. Dicamba gave better control of the older weeds when counted (Table 3) than bromoxynil or 2,4-D amine.

Siduron did not give commercial control of broadleaf weeds at either rate used in this second study.

Dicamba at 1/4 lb. per acre stunted the ryegrass 15 days after treatment when applied at the 2 inch height. When evaluated 5 weeks later, no stunting was noticeable. Siduron at 12 lb. per acre when applied as postplant, preemergence treatment stunted ryegrass when evaluated at 7 weeks after applicaiton. The postemergence application did not stunt the ryegrass. A 0.5 lb. 2,4-D amine application on young ryegrass turf was not injurious in this study.

In the same area of the San Leandro study 5 ft. x 10 ft. strips of several turf varieties were sprayed with 1 lb. per acre of bromoxynil without a surfactant. This was

TABLE 1. The effects of two herbicides on weed control and on young Alta tall fescue turf. (Davis)

Herbicide	Lb/A	Treated 11-20-69 (Turf, 2 inches) Weed Control* 12/29/69	5/20/70	Phytotoxicity** 5/20/70	Treated 12-20-69 (Turf, 5 inches) Weed Control 5/20/70	Phytotoxicity 5/20/70
Bromoxynil	0.5	9.1	8.1	0	7.2	0
Bromoxynil	0.75	9.4	9.3	0	7.8	0
Bromoxynil	1.0	9.4	9.1	0	8.2	0.8
Bromoxynil	2.0	9.5	9.1	0	9.0	4.5
2.4-D amine	0.5	7.8	9.0	0	9.0	0.2
214-D amine	0.75	8.3	8.9	0	9.0	0
Control		0	0.5	0	0.8	0

All data are means of 4 replications.

*Weed control: 0=no effect, 10=complete control.

**Phytotoxicity: 0==no injury, 10=dead turf.

TABLE 2. The effects of several herbicides on weed control in young ryegrass turf (San Leandro).

Herbicide	Rate Lb/A	Weed control* 11-2 application 1l-24-70	12-22-70	11-9 application 11-24-70	12-22-70	application 12-22-70
Siduron	6	3.5	2.8	4.0	4.3	N.A.***
Siduron	12	6.0	5.8**	4.8	4.8	N.A.
Bromoxynil	1/4	8.0	5.8	7.5	7.0	4.0
Bromoxynil	1/2	7.2	6.5	9.1	7.8	3.8
Bromoxynil	1	9.0	7.3	9.6	8.3	6.5
Bromoxynil	2	9.5	8.0	9.9	8.5	6.5
2,4-D amine	1/2	7.2	5.8	8.0	8.8	6.5
Dicamba	1/4	5.8	5.3	7.0**	7.0	5.0
Control	-	0	0.5	1.0	3.8	1.8

*Weed control-0=no effect, 10=complete control.

**Stunting

***N.A., herbicide not applied

applied on dry turf foliage in 100 gpa with a knapsack sprayer. Air temperature was approximately 55° F. The turf species and varieties were:

Kentucky Bluegrass

Pennstar
Fylking
Windsor
Ba-62-54
Merion
Campus
Cougar
Prato

Perennial Ryegrass

K9-123
K9-123
K9-125
NK-100
Pelo
Manhattan
Common
Park
Newport
Common

Red Fescue

Pennlawn
Ruby
Highlight
Illahee
Chewings
Reptans
Import

Colonial Bentgrass

Astoria
Highland
Holfior

Meadow Fescue

Mener
Common

No observable injury was noted 6 weeks after application on any species.

TABLE 3. Average weed counts by species from 6 square feet of herbicide treated ryegrass turf planted October, 1970, and evaluated January, 1971*

Herbicide	Rate Lb/A	Treated 11/2* (16 days)					Treated 11/9* (23 days)					Treater 11/24* (38 days)				
		A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Bromoxynil	0.25	59	21	6	23	10	25	15	0	4	4	112	33	32	10	7
Bromoxyni l	4.50	70	26	7	13	10	11	10	0	4	12	93	33	21	17	4
Bromoxynil	1.0	54	37	1	5	9	a	14	1	5	7	86	34	0	15	7
Bromoxynil	2.0	15	a	1	7	9	1	11	0	0	5	21	18	2	16	26
2,4-D amine	0.5	65	43	15	11		1	5	0	3	1	25	11	2	15	1
Dicamba	0.25	11	11	29	14	2:	3	1	21	1	1	a	13	4	2	3
Siduron	6	69	9	78	6	5	57	13	24	8	5					
Siduron	12	15	0	65	0	2	53	la	10	6	4					
Control		162	27	68	14	16	77	23	12	9	7	98	30	24	21	11

*Siduron was applied Premergence on October 21 for the first trial and November 9 as a postemergent spray for the second trial. Siduron was not applied on the third trial.

A-burclover
B-common chickweed
C-wild and common yellow mustard
D-cheeseweed
E-curly dock

PROTECT YOUR INVESTMENT IN A LANDSCAPE SPRINKLER SYSTEM*

By Albert W. Marsh, John Van Dam and Victor A. Gibeault**

This article provides checklists that a buyer and his turf manager should consult before, during, and after buying an installed sprinkler-irrigation system for turf or landscape. By following his checklist the buyer is much more likely to get the system he wants and needs. He will be encouraged to seek the right professionals for planning and design and to get them the local information they need as professional designers. Both buyer and turf manager will find that the checklists contain useful guides to steps in planning, installing, and using the sprinkler system.

Turf and landscape planings in most parts of California must be irrigated. Irrigation is almost entirely by sprinklers, which in the past have been simple, inexpensive but labor-demanding, hand-movable types. Progress in technology and equipment have made substantial changes in sprinkler system. Today, they are complicated, expensive systems that require precision engineering in both their manufacture and installation. Users buy sprinkler systems of advanced types because they irrigate with less labor and greater efficiency. Also, an economic analysis usually shows that a high-priced, sophisticated system has a lower total annual cost than a cheaper system requiring more labor and operating less efficiently.

Because of technological advances in modern sprinkler systems, the buyer usually finds it hard to distinguish on paper between a good, adequate system and an inadequate system. He tends to select the system represented by the lowest submitted bid without knowing how well the system will suit his needs. Since most of the system will be installed underground, it is difficult and expensive

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to improve an unsatisfactory system after discovering its performance is poor.

The particular meaning of several terms used in this article should be understood.

Sprinkler System-An installation of pipes, valves, and sprinkler heads (mostly underground) and accessories engineered as a unit to irrigate a turf and landscape area.

Buyer-The individual who negotiates and pays for installation of a sprinkler system. Often he is a purchasing agent for an institution (municipal government, country club, etc.) and is not specifically familiar with the actual operations of turf irrigation management.

Turf Manager-The individual who is responsible for maintaining a suitable turf and is in charge of operating the sprinkler system when installed.

Designer-A professional with engineering and hydraulic training and a knowledge of irrigation equipment and svstems. He is responsible for planning a balanced irrigation system to apply water efficiently as needed.

Installer-A contractor who installs the irrigation system purchased by the buyer. Usually he is awarded the contract by competitive bidding to furnish materials and assemble them according to a previously prepared plan.

As-Built Plan-A plan the installer prepares to scale show-exactly where all items or materials were installed including reference points for future location.

Where existing sprinkler systems are to be expanded, modified, or improved, a turf manager is usually already available to advise the buyer. But this is not usually the case for installations in new developments. It is strongly recommended that new developers hire a qualified turf manager before planning, purchasing, and installing a sprinkler-irrigation system.

The qualified turf manager plays an important part in obtaining a sprinkler system, as the following checklists show. Before installation he supplies needed information to the designer, guidance to the buyer, and assistance to the installer. During installation he can become intimately acquainted with the system and with operation details. After installation he is responsible for efficient operation and maintenance of the sprinkler-irrigation system and for other turf management requirements.

The following checklists will help the buyer and his turf manager obtain a better sprinkler system without overlooking important details in its selection, installation, and use. The lists will also be useful to the designer and installer of landscape sprinkler systems who contract with the buyer.

BUYER CHECKLIST

- ☐ Obtain the services of a professional irrigation-system designer.
- ☐ Ask the designer to visit the site with your turf manager to get local facts and needs before beginning the design.
- ☐ Have the turf manager submit local information that applies to a system design for thorough discussion by all parties concerned. (See Turf Manager Checklist A.)
- ☐ Inform the designer of the general nature of the system you want and discuss with him the estimated costs of alternate systems.
- ☐ Give the designer your local cost estimates for water and labor and suggest he prepare alternative preliminary designs on which to compute total annual costs, both fixed and variable. Alternative designs should include potential difference in fixed costs versus water and labor costs.
- ☐ It is difficult to install tile drainage after underground sprinkler laterals are in place, so have your designer or a qualified drainage consultant evaluate the potential artificial drainage needs.
- ☐ Select the lowest cost system on a total annual cost basis and instruct the designer to make a detailed plan.
- ☐ If you expect future additions or modifications, consider the economics of designing basic capacity requirements in the present system versus changing the capacity later. This foresight may materially lower eventual total cost while keeping the system's engineering balance.
- ☐ Obtain several bids for installing the final design.
- ☐ Compare bid with the assistance of the designer and your turf manager.
- ☐ Evaluate at least one recent installation made by the winning bidder.
- ☐ If the system design must be modified to equate bid price with budget limitations, the buyer, designer, bidder, and turf manager should meet to consider changes. It would be a poor modification to irreversibly underdesign the system to a lower price. If you have to modify the system, do it so later additions can correct the system to the best performance at the least cost.
- ☐ Ask the designer to visit the site during installation. Some designers supervise the entire installation. Have an advance agreement about how many visits and how much supervision he will provide.
- ☐ Specify that the designer will visit the installation after it has been operative for 1 year and that he will submit operational suggestions and comment-preferably in written report.
- ☐ Require from the installer as-built plans acceptable to your turf manager; these are very important for operation and maintenance.

TURF MANAGER CHECKLIST — A

Obtain this information and give it to the buyer and designer before a system is designed and installed.

- ☐ A scale map of the proposed turf and landscape area, showing features a golf-course or landscape architect would include:
  - ☐ Intended plantings and other cover
  - ☐ land elevations and location of natural drainways
  - ☐ water source
  - ☐ location of buildings and management control center
  - ☐ special areas that may require exceptional attention due to conditions specific to that area.
- ☐ Quantity and quality of irrigation water available.
- ☐ Specific hours available per work for irrigation.
- ☐ Prevailing winds and velocities for windy and quiet periods of the day.
- ☐ Temperature range and seasons.
- ☐ Estimated net irrigation requirements (inches per week) to maintain acceptable turf during the period of peak water use.

☐ Soils and topography conditions.
☐ Infiltration rates of soils.
☐ Know the available systems so you can suggest the type most likely to meet your local needs.
☐ Learn whether parts and service are available for the types of equipment that might be installed.
☐ Have estimates of water, labor, and other operating costs that might influence choice of system.

TURF MANAGER CHECKLIST-B

The manager should check these points during installation to familiarize himself with the system.

☐ Carefully observe all aspects of the installation.
☐ Learn where every component is placed and how to get at it for maintenance and repair.
☐ Understand how the system operates and what alternative provisions can be made in case of failure in the system.

TURF MANAGER CHECKLIST-C

These are management guidelines after installation of a system.

☐ If time-clock controllers are included, learn from the designer the technique of scheduling a program.
☐ Determine if the svstem performs as it was designed.
  ☐ Does it meet the precipitation rate requirements without runoff?
  ☐ Does it apply the requested peak water requirements?
  ☐ Does it distribute water with acceptible uniformity? Use can tests to evaluate.
  ☐ Make deviations known immediately to buyer, designer, and installer.
☐ Institute a preventive maintenance program. It should include the following.
  ☐ Keep water sources clean by frequently checking screens. If there is a pump, check it frequently for correct gpm discharge, lubrication, and cleanliness.
  ☐ Once each week during daylight briefly operate sprinklers by manual control to check their operation. Points to note are pop-up, rotation, nozzle plugging, leaks, nozzle pressure, and extraneous interference with water jet.
  ☐ Check pressure tank periodically for water lock and pressure settings.
  ☐ Periodically flush foreign material from the system.
  ☐ Keep a ready supply of sprinkler, controller, and valve parts, and other components. Make sure all parts will be available,
  ☐ Keep well acquainted with the irrigation system.
  ☐ Keep the as-built plan of the system up to date and filed for prompt reference.

SUMMARY

To have a satisfactory sprinkler system for turf and landscape and to protect the investment a buyer should

☐ Follow the checklist.
☐ Hire a qualified turf manager.
☐ Obtain the services of a reputable irrigation-system designer and acquaint him with all possible local facts, conditions, and needs.
☐ Obtain bids for installation and award contract only to installer of proven reputation.
☐ Ensure adequate supervision of installation.

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TURFGRASS TERMINOLOGY

The selected terminology list given below was prepared by the Terminology Committee of the C-5 Division of Crop Science Society of America.

Aerify-A form of cultivation whereby soil is loosened, cores are removed, and a hole or cavity remains in the turf.

Brushing-Refers to the practice of lifting leaf or stem growth on putting green grasses prior to mowing. Usually accomplished by steel brushes afflxed to mowers, and traveling ahead of the cutting reel.

Cultivation-Turfgrass cultivation is a mechanical procedure that produces a spiking, cutting or core-removing action on the soil under established turf without destroying the sod characteristics.

Cutting height-The distance above soil line at which grasses are clipped.

a. Bench setting-the height at which the bedknife is set above a flat level surface. This is the more generally accepted criterion for determining cutting height.

b. Effective cutting height-the actual height above the soil line at which grasses are cut. Varies from bench setting, depending on degree of thatching and floatation of cutting unit.

Forking-The use of garden fork as a means of cultivation or aeration to alleviate compaction and improve water infiltration.

Grain-The tendency for grass leaves and stems to grow horizontally in one or more directions rather than vertically.

Matting-Working topdressing or other materials into a turfgrass area with rakes, drag mats, brushes and other similar tools.

Permanent grasses-Grasses which are perennial in habit and which can be expected to persist in a turf, within the area where they are adapted.

Plugging-The vegetative propagation of turfgrass by means of plugs or small sod pieces. A method of establishing vegetatively propagated turfgrasses, as well as repairing damaged areas.

Rebuilding-A term which refers to those practices involving complete changes in the total turf area, for example, green, tee, lawn, fairway, or other area.

Renovation-to renew; make over; repair. A term applied to those turf improvement practices which lie beyond the scope of routine maintenance. Severe cultivation, possibly with chemical treatment, in combination with replanting or reseeding to improve the turf without complete rebuilding.

Scald-A term applied to the condition that exists when grass collapses and turns brown under waterlogged conditions. Usually occurring with high temperature.

Scalping-The practice of removing most of the green leaf surface which leaves a stubby brown turf.

Sod-Plugs, blocks, squares, or strips of turfgrass with adhering soil used for vegetative planting.

Sodding or planting of sod.

Solid sodding — Covering an area completely with pieces of sod.

Topsoil planting - The covering of an area with soil which contains viable rhizomes or stolons of grasses capable of producing a turf. This practice is used primarily on airfield slopes and highway cuts and fills where bermudagrass is to be established.

Spot sodding-Sodding by planting small pieces of sod at intervals depending on spreading ability of the grass and rapidity of coverage desired.

Spiking-The act of perforating a turf area by use of a solid tine or blade.

Sprigs-Stolons (runners) or rhizomes of turfgrasses with little or no adhering soil.

Sprigging-The planting of stolons (runners), rhizomes or vegetative segments of plants in furrows or small holes.

Sprigging, row-Planting of sprigs in rows, usually in furrows.

Sprigging, spot - Planting a group of sprigs or bunches of sprigs at intervals in holes or in furrows.

Sprigging, broadcast-Synonymous with stolonizing.

Stolonizing-Vegetative planting by broadcasting stolons on prepared seedbeds, particularly putting greens, and covering with topdressing.

Syringing-Hand hosing or sprinkling with light amounts of water on turf to prevent wilting resulting from excessive temperatures, and to reduce transpiration.

Temporary grasses-Those grasses used as a companion crop or for quick temporary cover, but which will not form a permanent turf.

Thatch-Thatch is a tightly intermingled layer of living and dead stems, leaves and roots of grasses, which develops between the layer of green vegetation and the soil surface.

Topdressing-A selected or prepared mixture of soil which may contain physical conditioning materials, nutrients and pesticides and which is spread over turfgrass areas for the purpose of improving the surface, adding to the nutrient supplying ability of the soil, or applying pesticides. Used for leveling, covering stolons or sprigs in vegetative planting, and as an aid in controlling thatch and maintaining biological balance.

Turfgrass culture-The science and practice of establishing and maintaining turfgrasses for specialized purposes, such as cover for lawns, sports areas, roadsides and similar locations.

Turfgrass nursery-An area maintained as a source of planting material and for experimentation.

Vertical mowing-Cutting by blades which move perpendicular to the soil surface. Specifically designed to thin turf, control grain, and aid in controlling and eliminating thatch.

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