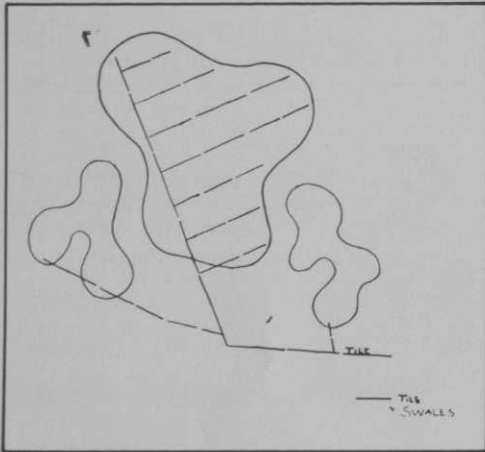


Redesigning and

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2.



1. Golfer pleasure, ease of maintenance and aesthetics are functions to consider when determining form.

2. Pitch, or slope, determines water movement, shown here by heavy arrows. 3. Drainage lines are in, grade stakes in place, and topsoil is being moved.



3.

by Michael J. Hurdzan, Ph.D.

Redesigning a putting green assumes that it is not adequately serving its intended function. If it were, it would not need to be redesigned. This process can be compared to Darwin's Theory of Natural Selection that says, in essence, that those entities that fail to adapt to environmental pressure will be replaced. With some poetic license it can be said that a golf green, or a golf course for that matter, must be functional if it is to persist and the form that an installation takes is a result of the function it must serve. The design adage is "form follows function".

In a building, the form of a door, for instance, is a result of the function it must serve. Some parameters of form are common to most all doors if their function is to permit easy entry of people. As an example, most doors are 6½' - 7' high so a person could walk through erect and most are at least 36" or so wide so one doesn't have to squeeze through. Then it should be clear that the function of the door determines the form of the door. If large volumes of people must use the doorway or if other special requirements are

recognized, then this function influences the form it must take.

The **form** of a green is determined by the functions it must serve. However, a green does not serve just one function. Golfer pleasure, ease of maintenance, and aesthetics should be considered. The amount of money available to build the green will also influence the form or at least temper the relationship of form and function.

Size is primarily a maintenance function. In general we are concerned not with total size of the putting surface but rather total cupset area. A green should have enough cupset positions so that the superintendent is not forced to return to an old cupset until it has time to fully heal itself from traffic damage. If it takes twenty-one days to heal an area in the heat of summer, and cups are changed once a day, then there should be twenty-one cupset positions. If the traffic damage area around a cup is a 16' circle then the area = πr^2 or $3.14 \times (8)^2 = 3.14 \times 64 = 200$ sq. ft. $\times 21$ positions = 4220.16 sq. ft. of cupset space. Then if you add in setback area of perimeter of the putting surface, usually 9 - 12', and allow for undulations that do not provide fair cupsets, the total size of the modern green is about 6,000 sq. ft. Like the door example, if the volume of traffic requires more or less than daily cup changes, then the total form is enlarged or reduced accordingly.

Next consider **pitch** or slope of a green.

Pitch or slope is usually lower in front and rising to the back. This elevation difference serves the function of receiving the impact of the golf ball and lessening its roll. Pitch also determines surface drainage while pitch and undulation in a putting surface can be used to drain the water from the green in several directions and not just out the front. Needless to say, the more pitch and undulation in a green, the more difficult it becomes to read and make a putt and the more visually aesthetic the green becomes.

Pitch should be at least 2% to provide good drainage and still be a fair test of golf. If steeper than 4%, a putt golf ball tends to increase its velocity as it rolls down the slope and putting is no longer a test of skill but luck. Greens are raised above grade to present better targets and permit tile drainage to fall and thus ... form follows function on slope.

Other examples of form and function are the distance of sandtraps from greens. If the sole function is to test the golfer, then traps are built within two or three feet of the green. If function is more concerned with having adequate space to turn a greens mower and other equipment, spreading out foot traffic on the apron, and preventing large quantities of sand from being blasted out onto the green, then traps are placed 10-12 feet from the putting surface. Sandtrap lips made higher than surrounding areas also prevent water from



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establishing an existing putting green



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4. The first four steps in the construction sequence are done. 5. Quality topsoil is being worked in to improve the soil structure of this future green. 6. A straw mulch will prevent erosion and help keep the seedbed moist. 7. It is essential to keep the seedbed moist, often watering eight times daily for 5-8 minutes. 8. The author is shown, using a walk behind greens mower with a drum roller. It is important to roll the green with the reels disengaged and weight in the basket for the first 5-6 times.

running into the trap and eroding the sand.

Thus a new green is designed to provide the golfer with a clearly defined and challenging target area but also to permit efficient maintenance.

How does redesign of a green take place? The most efficient and positive method is to produce a scaled drawing of the existing green and then design in desired features on paper. This method of using a scaled drawing provides those paying the bills of fifteen to twenty-five thousand dollars a chance to see what they are buying, gives the contractor or workmen a guide to establish the cost before construction, permits competitive bidding, assists construction and provides a permanent record of the green and its substructure.

Another method is to simply bulldoze out the old green and "feel" in a new green. This works only if the person directing the work has "felt" in many greens before and can envision the design and set appropriate controls. If not, then it becomes a case of "move some dirt here and if that doesn't work, move it back" — This is sort of how many wives arrange furniture. This approach is risky, time-consuming and many times the finished product is less than good.

Whatever method for establishing the new design is chosen, the construction of the green must follow an ordered sequence. This sequence is:

- 1) Remove irrigation
- 2) Strip off good sod for resodding
- 3) Strip off bad sod for disposal
- 4) Strip and store topsoil
- 5) Do earthwork — compact and shape
- 6) Bring green to final smooth sub-grade
- 7) Install tile drainage
- 8) Re-establish the contours
- 9) Retopsoil perimeter of green and banks
- 10) Install irrigation — re-establish contour
- 11) Haul in sand or amended soils
- 12) Mix and spread sand or amended soil
- 13) Compact putting surface
- 14) Grade out entire green
- 15) Seed, compact, fertilize, mulch and water

Now the green is properly built and soon the grass starts coming up through the mulch. The maintenance practices that should be followed on this seedling turf are much different than those followed for mature plants. New greens can cause a superintendent many sleepless nights if he does not understand the principles and practices of establishing new turf. Perhaps reviewing these principles and practices will prove beneficial.

WATER — New greens should NEVER be allowed to dry out on the SURFACE. This may mean watering as often as eight times a day for 5-8 minutes on each watering. Daily climatic conditions will determine the frequency and duration of the watering cycle. It is possible that if the

soils on the out slopes of the banks are particularly tight, they will not accept this watering schedule and will become too soft and saturated for their own establishment. Then handwatering of the putting surface may become necessary.

MULCH REMOVAL — If the mulch were ideally and properly applied, the seedlings would grow through the mulch and none of it would need to be removed. But the inconsistency of the mulch material, the conditions when it was applied, or operator error may result in an uneven covering of mulch; thus some must be removed.

One method of removing mulch is by using a broom or leaf rake and very carefully rake off the excess mulch. This operation can do much more damage than good if the "raker" doesn't use the touch of a surgeon, for he will rake up as much seedling turf as he will mulch.

Another method of reducing mulch on a green is to use a rotary mower at $\frac{3}{4}$ " to 1" high to chop the excess mulch. This procedure also serves as a method of first-cutting the greens.

Not all mulch should be removed for it can provide excellent protection to seedlings against winter desiccation and erosion. In early spring, the mulch may prevent turf loss from lack of water when days are warm enough for growth but nights are too cold to allow keeping the irrigation system charged. Mulch that remains on the greens will be chopped up by the mower and will simply decompose.

FERTILIZER — Very few superintendents adequately fertilize new greens because it is so different from normal schedules. We commonly recommend one pound of "N" per thousand square feet per week for 6-8 weeks in the spring. This heavy fertilization rate is because much of the nitrogen is tied up by the mulch which probably has a very high carbon to nitrogen ratio, some "N" is leached out of the amended soil profile, and the new plants need plenty of nutrients. The fertilizer ratio should be 3-1-2 with no more than 33% water insoluble nitrogen.

No lime or carbonate base material should be applied, ever, to a green until soil tests indicate the requirement. This is because most native sands are limestone sands with high carbonate content. Therefore acid-forming fertilizers are desired. Likewise, it may be necessary to apply elemental sulfur to help keep the soil solution slightly acid.

Routine application of micronutrients, especially iron, is necessary. The amended soils or sand mix on the greens is naturally an almost inert or sterile media. Except for the limited number of cation exchange sites on the organic amendment, few nutrients are going to be retained by the entire profile. A product like iron-plus works well.

MOWING — Greens should not be mowed until they are at least 1" high. Then it may be that using the rotary mower to chop the mulch will provide adequate

mowing for a few weeks. As the green grows more dense and vigorously, initial mowing with a greens mower may begin but with radically modified methods.

The only acceptable mower for bringing a new green is a walk-behind with a drum roller and caster wheels (not a grooved-front Roller). The operator should be instructed to roll the green with the mower with reels not engaged and some weight in the catcher basket for the first five to six times. He should walk very slowly and flat-footed to avoid distorting the soft surface. Upon reaching the edge of the green he does not make a swinging turn, but rather he disengages the clutch and makes a slow broad turn so he does not damage or rip out seedlings growing on the collar.

Roll the green by this method until the mower does not 'track', then the mower should be set at $\frac{3}{4}$ " and mowing begins. Gradually the height of cut should be lowered to $\frac{1}{2}$ " and remain there into winter. The following spring the same rolling and then cutting procedure with the walk-behind should be followed to minimize the disruptions caused by the winter freezing and thawing.

Most superintendents find it is 6-8 weeks before the greens and the collars can support a riding greens mower. Topdressing of new greens is not necessary if acceptable grade was achieved before seeding and the procedure with the greens mower is properly done. The height of cut can slowly be lowered to whatever the superintendent wishes usually by mid-May to early June. We strongly recommend that a green seeded in the fall and even mowed three to four times, should not be opened until around June 1. The turf stand must be mature before it is subjected the rigors of play.

Perhaps the most controversial subject about early maintenance practices is the use of **PESTICIDES**. It is well recognized that under certain conditions any pesticide can be phytotoxic. Hence judicious use of any chemical is the rule.

We recommend no pesticides the first fall and winter unless there is reason to suspect an infection or infestation. We all know that spontaneous generation does not occur so if there is to be pest injury, there must be a pest present on the new turf.

In the fall, we usually find no insect injury so insecticides are strongly avoided. With diseases, the situation is slightly different. There is the possibility of snow mold on new turf in the spring but only if there is a source of inoculum.

If new greens are built in areas surrounded by existing sod that has shown previous evidence of snow mold infection, then it is possible that the overwintering form of the disease may have gotten dragged, washed, or carried on the new green and could cause infection. If the decision is made to apply a pre-emergence chemical, it should be done as late in the year as possible to give the grass more maturation time. □