When All Else Fails - USE PROVEN GUIDELINES

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CONSIDERING THE exceptional nature of our resources and of the agronomic knowledge available, one might wonder why all putting greens are not perfect. While some puzzling situations exist, along with factors that are either imperfectly or not at all understood, nearly all poor greens can be faulted for inadequate design and construction techniques or materials.

CONSTRUCTION

As a general rule, any green more than 20 years old on a course that has 200 or more rounds daily, particularly during periods of adverse weather, is likely to be a candidate for rebuilding. Two decades ago soil profiles had not yet been engineered to withstand this level of traffic and still maintain sufficient pore space for supporting vigorous turfgrass roots. When these older greens are also overburdened with additional problems, such as shadiness, restricted air movement and non-ideal surface drainage, the very life of large sections of turf can repeatedly be in jeopardy.

What about newer greens? There is no doubt that the performance record has improved. However, it would not be safe to assume that the best available information on design and construction methods has always been used. Indeed, serious problems continue to be built into golf greens, most particularly where a rigid set of specifications has not been contracturally agreed upon and ensured through a schedule of quality control inspections and material analyses.

The United States Golf Association continues to seek improvements in the Green Section specifications for putting green construction, but it does not sanction modifications that have not been rigorously researched. Greens built in accordance with these specifications will, in most instances, cost more initially than greens built using techniques designed to make the work easier or faster. Yet it will take two or more years after they're built to realize the value of the more exacting specifications. It will take time for thorough profile settlement and turf density development to achieve maximum effects upon such vital physical characteristics as water infiltration rate, a rate that will certainly fall to no more than half (and, perhaps only one-fifth) of that determinable in the laboratory.

Nor should designs be approved that fail to resolve future problems that might reasonably be anticipated: traffic constrictions, limited cupping space, inadequate room or contouring for maintenance equipment, surface or subsurface water flow problems, and so forth.

In short, functional criteria for greens do exist, those which common sense will reveal and those which are sufficiently complex that they were developed through painstaking research. Neither sort of functional criteria can be overlooked or subrogated to other kinds of criteria without increasing the risk of ultimate disappointment. (Editor's note: single copies of the Refined Green Section Specifications For Putting Green Construction may be obtained, free of charge, from any of the Green Section regional offices, as may information about obtaining the special soil testing required for formulating and evaluating topmixes and topdressing materials.)

CORRECTIVE MEASURES

Short of rebuilding, what might be done to improve upon the problems inherent with a green not constructed to withstand today's heavy traffic?

First, look toward eliminating or modifying any other possible source of difficulty — tree root invasion, traffic concentrations, uneven irrigation patterns, drainage problems, etc. In many instances too, a hard look should be taken at the possibility of regulating total volume of play, and certainly at the wisdom of permitting play when surface soils are saturated with water. That is, readily identifiable agronomically unfavorable situations cannot be neglected, nor can management dodge responsibility for establishing and enforcing policies which protect the golf course from inadvertent damage done by golfers themselves when they are allowed to play in excessive numbers or during periods when the turf or surface soils are rendered critically sensitive to traffic stress by extremes in climatic conditions.

Second, develop a program to improve the rootzone through aerification and topdressing. A nearly complete transformation can be achieved within a year or two if the program is designed well and carried forth resolutely.

COMMITMENT

It cannot be stressed strongly enough that the attitudinal aspects of a surface improvement program are every bit as important as the technical details. In case after case that could be cited, the golf course superintendent and his club are able to consistently produce an excellent golf course in spite of having to contend with problem situations which are not significantly different from those affecting neighboring courses.

Cut away the many layers of detail that make up the rich texture of any golf course and the men responsible for it, and in the consistently successful operation you will find a steadfast will to succeed. The unavoidable setbacks are not overwhelming. Unanticipated problems are recognized for what they are, as additional factors to be fitted into the overall equation. Problems become debilitating only in proportion to the time spent in commiserating about them. With forward thinking, seeming difficulties can often be turned to advantage; but where that determination does not exist, no amount of expertise can bring about a trend reversal.

The responsibility for performance rests coequally with the superintendent and his boss(es), the individual or group responsible for ensuring support for the golf course maintenance operation as it is developed by the superintendent. Often we encounter resourceful superintendents who are unjustly criticized, men whose demonstrable level of achievement is being held back, not by their own shortcomings so much as by a lack of the necessary tangible resources, administrative policies and moral support of their efforts to provide that degree of golf course excellence desired and deserved by the players. Be clear about this — without an attitude of positive commitment seated firmly and harmoniously at both ends of the management table, the golf course and, in particular, any program set forth for improving putting surfaces is certain to fall short of expectations.

PROGRAM SPECIFICS

Rather than provide a stepwise discussion of a model program for putting surface improvement, the remaining space will be devoted to addressing some questions which are frequently raised. The references supplied at the end can be used to gain access to further literature.

Why maintain that commitment to such a program is of utmost importance? For three reasons:

(1) Additional resources must be allocated. Naturally topdressing and seed need to be pur-

The goal — smooth, healthy, dense and uniformly paced putting surfaces throughout the 18 holes.

The 16th hole at Oakland Hills Country Club, Birmingham, Michigan, a dog-leg as viewed from back of green to tee . . . excellence aesthetically and from the standpoint of play.

chased, and perhaps handling and application equipment as well. There may be other non-soil related problems to rectify. Provisions should be made for the testing of materials, both preliminary to final selection and periodically thereafter as a quality control check. Some redistribution of labor may be needed within the total man-hour requirements. A three-man crew should be able to apply a light dressing (½ cubic yard per 5,000 square feet) and restore nine greens to play in four to five hours, given efficient equipment, freedom from interference and a material which presents no handling problems. To maximize the program's effectiveness, topdressing should be carried out once each growing month, including twice (or more) at a heavier rate in conjunction with aerification for the first years of this program. From operational costs estimated using the above guidelines it will be seen that the most expensive factor can be the unit price of the topdressing material itself. Thus, it will pay to shop around.

(2) The second reason why commitment is vital is because, unlike most greens' maintenance procedures, the aerification — topdressing — seeding program intentionally disrupts the playing surface for a time in order to attain a better surface over time. Moreover, this must be done periodically through the growing season, which necessarily coincides with the active golfing season. Further still, the most disruptive parts of the program — the aerifications — need to be done according to the demands of nature's calendar, not the golfing calendar. Some golfers will, without fail, perceive this as a deliberate attempt to ruin their enjoyment of their game. With them, no amount of explanation or rational argument will prevail. One can only be firm and maintain composure. Others will at times become upset, but they can be won over. All players deserve to be kept informed well in advance, to have the program developed so as to minimize the degree and length of disruptions, and to have the golfing calendar planned around the program so that key tournaments will not conflict with it.

(3) The final reason for dwelling on commitment is that there is no way to guarantee uniformly

uneventful success in this or any other program involving the culture of growing plants. If the will to achieve success in spite of encountered difficulties is weak, the program will hit the skids long before it has been given sufficient time to prove its worth.

What if the greens present no soils-related management problems and are consistently maintained to the golfers' liking? Clearly in this situation one would be ill-advised to radically alter what is already a successful program. Be alert, however, for changing conditions, particularly to increasing traffic pressures. This is not to say that for courses where the greens are already in great shape some type of aerification and topdressing program is not needed. Very likely the prevailing good conditions are due principally to such efforts as they have been adapted to suit the particulars of the situation.

If one is unsure if the existing soils or topdressing is contributing to management difficulties, is there any way to check these materials for performance characteristics relative to some objective standards? And, is it possible for anyone to make a sufficiently accurate judgment about a putting green soil or topdressing on the basis of its appearance and feel? Yes, the soil testing laboratory located at Texas A&M University is equipped to analyze materials for comparison with the ranges currently considered acceptable for construction according to the researched and widely field tested Green Section specifications. For a preliminary inexpensive survey of existing soils, it may suffice to submit aeration core samples for a testing of infiltration rates only. To properly evaluate a topdressing material, however, a complete mechanical analysis and testing of various physical performance characteristics will always be preferred. No one lacking full certifications as a clairvoyant can tell by feel or appearance precisely what this laboratory testing of a material will reveal. It is possible, though, for those familiar with the specifications, when assisted by a simple sieve analysis, to single out those samples widely at variance, so that only the most promising of materials need be sent on for the complete evaluation.

What is the material of choice for topdressing? Remembering that we are discussing those situations in which the surface soils have proven inadequate to support both heavy traffic and vigorous turf growth, the material of choice would most importantly be one which withstands such compacting forces so as to remain well aerated. It will also be: (2) well drained, with a good infiltration rate; (3) capable of modest nutrient and water retention; (4) firm, but not hard, when in place; (5) free from weed or disease contamination; (6) easy to handle; (7) lacking any significant amount of oversized particles, those difficult to work into the turf surface; (8) readily available into the foreseeable future; (9) uniform in composition, both within each load and from load to load; and, (10) relatively inexpensive. In other words, this is a very special sort of material which should only be selected after a thorough investigation that absolutely should include the special laboratory testing mentioned already.

Note clay silt layer through the center of profile, a result of using sod grown on poor soil. The effect is permanent impairment of water movement through the green profile and a soggy, problem green.

The ideal material would conform in every respect to the Green Section specifications and would be ready to apply as delivered. The next best situation would be to so process the delivered materials as to obtain a mixture which conforms. This may involve but a simple screening operation to remove oversized particles, or it may require the more exacting process of blending materials according to a specially prepared laboratory formula.

Finally, there is the so called sand topdressing program which has come into prominence. Here it is worth noting that mixes which conform to Green Section specifications are also technically in the sand textural category. What we are really discussing then is the use of a sand which differs from the specifications in but two measurable criteria: an infiltration rate faster than the maximum suggested and a water (and nutrient) holding capacity below that recommended. Pending the results of future research, provisional acceptance is being given to such sands with a preference for those slightly "dirty" sands coming closest to also meeting the specifications for infiltration rate and water holding capacity. By sampling widely those sands readily available, one or more can be selected to send on for the complete testing. Owning a set of sand sieves would provide superintendents valuable assistance in the selection process, as well as a means to conduct quick quality control checks on each on-site delivery.

What about layering problems? Where the existing surface material is inadequate, and rebuilding has been rejected as a solution, layering cannot be avoided. Problems associated with layering can be held to a minimum, however, by being particularly careful with irrigation and by diligently carrying through on both the aerifications and the topdressings. The aerifications serve to puncture the barrier layer, the topdressings serve to continually add to the depth of the new rootzone being created.

How does the Stimpmeter fit into the picture? It is simply an instrument with which one aspect of putting green performance can be measured. The green speed and uniformity in speed from green to green may indeed be a factor to consider when determining whether or not to institute a topdressing program. Cutting height influences green speed, and it can often be lowered somewhat without incurring damaging effects but only after the topdressing program has begun and the first several applications made. It is easy to imagine, however, any number of agronomically unwise practices, such as dropping the cutting height too severely or at an inappropriate season, for which the Stimpmeter may be blamed. But it should be obvious that an instrument cannot make a decision, good or bad. It can only furnish some information for consideration in arriving at a decision.

It is here, somewhere in the middle of things, that this discussion should come to an end, so as to emphasize that this is no completely determined area of investigation. There are guidelines for us to follow in striving for putting green improvements, some of which continue to be ignored, but the field remains open for those who would seek to advance our understanding and progress.

REFERENCES

Bengeyfield, W. H. 1967
Reviving a Controversy — Bentgrass Overseeding. *USGA Green Section Record* 5(2): 10-11.

Bengeyfield, W. H. 1969
This Year Topdress Greens and See the Difference. *USGA Green Section Record* 7(1):1-4.

Brown, K. W., and R. L. Duble 1976
Physical Requirements for Golf Green Construction by USGA Specifications. *AES Progress Report* 3364C. Texas A&M University, College Station, Texas 77843.

Madison, J. H., and W. B. Davis 1977
Problems or Progress. Penncross Bentgrass Association, Salem, Oregon 97303. 16 pp.

USGA Green Section 1973
Refining the Green Section Specifications for Putting Green Construction. *USGA Green Section Record* 11(3):1-8.

USGA Green Section 1977
Topdressing Mixtures — The Green Section's Position. *USGA Green Section Record* 15(6): 5-8.

USGA Green Section Specifications for Soil Mixtures Used for Golf Greens

Particle Size Analysis of the Mixture (Size and Distribution of Particles)

Size Fraction	Particle Diameter	Tolerances
gravel	greater than 3mm	0
fine gravel	2-3mm	Max. 3%
very coarse sand	1-2mm	Max. 10% above 1mm
coarse sand	0.5-1mm	Min. 65% between .25 and 1mm
medium sand	0.25-0.5mm	Min. 65% between .25 and 1mm
fine sand	0.10-0.25mm	less than 25% below .25mm
very fine sand	0.05-0.10mm	
silt	0.002-0.05mm	less than 5%
clay	less than 0.002mm	less than 3%

Bulk Density (g/cm^3)

1.25-1.45 ideal
1.20 is minimum
1.60 is maximum

Porosity (% Pore Space when compacted at 40cm of water)

Total 40-55%
Non-capillary minimum 15%

Infiltration Rate (after compaction at 40cm of water)

4-6 inches per hour is ideal
10 inches per hour is recommended maximum
2 inches per hour is minimum for bermudagrass
3 inches per hour is minimum for bentgrass

Water Retention (at a tension of 40cm of water)

12-25% by weight at 40cm