

Green Construction: The Right Materials Mixed Right

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UNFORTUNATELY, and despite the current knowledge of soil physical properties, many rebuilt greens continue to have a poor performance record. This is due, in many cases, to the failure of the soil mix to withstand traffic compaction and support sufficient turf root systems. This results in another rebuilding program, perhaps with a similar outcome, or intensive aeration and topdressing in an attempt to modify the original soil profile and its characteristics. The expense of rebuilding, or intensive aeration and topdressing, can and should be avoided.

Although green construction may fail for a number of reasons, two main points will be emphasized here:

1. Through laboratory analysis and recommendation of proposed construction materials, the successful performance of a soil mixture can be predicted.

2. Even with laboratory analysis and recommendation of materials, if the materials are not mixed conscientiously (uniformly and in specified proportions), poor performance of the soil mix is likely. Simple enough, but these points are too often overlooked.

USGA Green Section Specifications for Putting Green Construction require a soil mixture to have designated characteristics relating to infiltration and percolation capacity, porosity, bulk density, water retention capacity, and particle size. Soil mixtures actually meeting USGA specifications have performed well in the field. Without thorough laboratory analysis, however, it is impossible to determine if a mixture will possess the desired characteristics. The myth still persists that an individual can simply observe and feel materials pass through his fingers and thereby determine a successful green mix. True, that individual may happen to designate a successful mix, but it is only by coincidence, not a result of mystical powers or scientific technique. Who among us can accurately predict particle

size analysis from observing a mix, not to mention predicting the actual porosity and bulk density, which are dependent on the interrelationship of various particle sizes? If you want to be sure of the performance of a green mix, insist on laboratory analysis of representative samples of prospective materials. Along with analysis, a uniform supply of each material required to complete the actual green construction is essential. If no laboratory analysis is made, the future performance of the green mix cannot be predicted.

Once the proper ratio of materials has been determined, it becomes extremely important to mix them in the designated proportions. A common failure at this point is the substitution of a new

material for one designated. Substitution of untested materials will only jeopardize the performance of the mixture. If the tested materials are no longer available, new materials need to be tested and revised proper proportions determined. Using the tested materials in the designated proportions is just as important as uniform mixing of the materials.

There are several recommended ways of metering the component materials, but in the final analysis, the result depends on the competence of the workers doing the mixing. If they are not conscientious and informed, the field mixture will never be recognizable as the recommended laboratory soil mix. Whether the materials are metered

USGA Green Section Specifications for Soil Mixtures Used for Golf Greens

PARTICLE SIZE ANALYSIS

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

BULK DENSITY

(gm/cc)

1.25-1.45 ideal
1.20 is minimum
1.60 is maximum

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

POROSITY

(after compaction
at 40 cm of water)

Total 40-55%
Non-capillary minimum 15%

WATER RETENTION

(at a tension of 40 cm of water)

12-25% by weight



A typical result of on-site mixing: lack of uniformity.

onto a stockpile and tumbled two or three times, layered, sliced, and tumbled, or shoveled by hand, it is imperative that a thorough mixing be done.

FIELD EXPERIENCE has shown that accurate material measurement and subsequent thorough mixing can best be accomplished off-site. On-site mixing consistently produces pockets of non-mixed components and fails to evenly distribute the component materials through the depth of the profile. Unless the component materials are evenly distributed through the entire soil depth, the proper proportion has not been obtained.

Most professionals in the golf turf management field probably accept, in principle, the importance of laboratory analysis and conscientious mixing for successful green construction. Unfortunately, when the time comes actually to build a green, laboratory analysis and conscientious mixing are often-times neglected.

Time and expense are typical reasons given for not testing construction materials or for casually mixing materials on-site. Yet, under examination, these reasons are certainly not justified. The cost of laboratory analysis is small in comparison with overall construction costs. If the submitted materials are not acceptable and then more expensive alternative materials are found acceptable, isn't the additional expense preferable to a poorly performing green mix? Similarly, because uniform mixing is essential and off-site mixing best accomplishes uniform mixing, isn't the additional expense justified?

Laboratory analysis and conscientious mixing will unquestionably require more detailed planning and timing of green construction. An acceptable green mix must be sought well in advance of the construction date. Even if the decision to build a green is made

unexpectedly, the time required for laboratory analysis must be taken. Do not compromise the success of the green construction project just to save time.

Since the golf course superintendent will ultimately be charged with providing quality putting turf, he must be involved and concerned with the green construction project. The superintendent should insist on laboratory analysis and conscientious mixing. Yes, it will probably take additional time and money to accomplish these steps. Failure to take them will most likely result in an unsuccessful project. What will that mean to the club and the superintendent? Make that effort to obtain the right materials — then mix them right. Success is worth it!

Note: For further information on green construction, the reader is referred to "Refining the Green Section Specifications for Putting Green Construction." (*USGA Green Section Record*, May, 1973, a USGA Publication)

New Soils Laboratory Announced for Green Section Specification Tests

WE ARE HAPPY to announce that arrangements have been made with Dr. Marvin H. Ferguson's Agri-Systems Laboratory, Bryan, Texas, to conduct all future physical soil analysis requirements for USGA Green Section Specifications greens. Dr. Ferguson was instrumental in developing the Specifications in the early 1960s; he has over 20 years of laboratory and field experience.

A physical soil analysis is an essential part of the Green Section Specification program. The laboratory will require at least two gallons of the sand and one gallon each of the soil and organic matter to be used in the topmix. All materials should be packaged separately and securely. Strong plastic bags inside cardboard cartons or metal cans are most satisfactory. Do not put moist soil or sand in a paper bag — it rarely arrives intact. When materials arrive broken and mixed, the laboratory must request more material. This sort of delay can be inconvenient, aggravating and time consuming.

Paper labels packaged with moist materials deteriorate rapidly. It is a good idea to use plastic labels inside the package and also to mark the outside of the packages. The more information you can send, the better.

For fastest delivery, use Greyhound Express, if available. United Parcel Service system is also effective. If samples are sent by mail, allow double the estimated time for delivery. Please allow two weeks for testing purposes once the material arrives at the lab.

Address all materials to:

Attn: Dr. M. H. Ferguson
Agri-Systems Inc.
2 Sunny Lane (UPS)
P.O. Box 3757 (US Mail)
Bryan, TX 77805
Telephone (713) 846-6543

For complete details regarding the Green Section Specifications for Putting Green Construction, please contact the nearest Green Section Regional Office listed inside the front cover.