

Why We Need Laboratory Standards For Testing Root Zone Mixes

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LABORATORY standards are well established in the construction, medical, and many other industries. The American Society of Testing and Materials (ASTM), a national clearing house for such standards, has volumes full of standards for just about anything you can imagine. These consensus standards assure some degree of quality and continuity to their respective industries. Until now, no such standards have existed for testing USGA or other sand-based root zone mixes.

Many commercial laboratories perform physical tests on putting green root zone materials. In recent years, it has become common for golf course superintendents to split samples and send them off to different laboratories, only to receive very different

results back from the labs. This has created much confusion in the industry, not to mention a lack of confidence in laboratories.

One important goal in the USGA's review of its green construction recommendations was to assess the current practices in the labs, and to develop scientifically sound standard test methods. Visits to the labs and discussions with lab personnel [by the author] revealed that no two were performing the tests in exactly the same manner. A split sample sent to all the labs confirmed what many already knew: evaluation of samples sent to different labs sometimes produces different results. Table 1 lists the particle size analysis of the sample as reported by nine labs. The results show that there was a fair amount of variation in the

distribution of silt and clay and, to a lesser extend, sand. While it is not reported here, the labs did report very similar sand size distributions for the samples.

As part of the proposed new laboratory standards, a much more accurate method of measuring the silt and clay components of a mix has been established.

Results of the laboratory testing for the physical properties of the mix are shown in Table 2. The data show high levels of variability for infiltration, porosity, pore distribution, and moisture retention.

Much of the disparity in the results could be explained by differences in sample preparation, test procedures and, in at least two cases, mismeasurements or miscalculations. Standard methods have been developed that provide a "recipe" approach for determining these values. Most procedures have been adapted from those already published by the American Society of Agronomy or ASTM, and have been reviewed by several soil scientists.

In addition, guidelines have been established for quality assurance/quality control within the laboratories. This may be as simple as running duplicates or triplicates of samples, or running a known standard sample with each run.

While the USGA has seen to it that these standards have been developed, the industry must realize that 1) these standards are voluntary, and 2) they do not guarantee a minimum level of competence within the lab.

Any individual who obtains these procedures and follows them to the "T" should be able to produce good numbers. You should realize, however, that they may not have the agronomic experience or expertise to provide an appropriate interpretation, or to deal with follow-up questions you may have.

Nevertheless, the development of laboratory standards for root zone mixes were a long time in coming, and they should make a major difference in the quality and consistency of services received from the soil testing laboratories.

Table 1

RESULTS OF PARTICLE SIZE ANALYSIS

	Range	Mean	Std. Dev.
Sand	94.5% - 99.2%	96.6%	1.4
Silt	0 - 3.7%	1.8%	1.2
Clay	0.1% - 3.6%	1.6%	1.2

Table 2

RESULTS OF TESTING FOR PHYSICAL PROPERTIES

Physical Property	Range	Mean	Std. Dev.
Infiltration (in/hr)	7.7* - 18.8	11.4	3.8
Total porosity	40.1% - 50.9%	46.1%	2.9
Capillary porosity	14.5% - 29.7%	20.6%	4.9
Air-filled porosity	20.8% - 29.1%	25.4%	3.3
Bulk density (g/cc)	1.27 - 1.53	1.38	0.07
Moisture retention	9.9% - 22.8%	14.5%	4.1

*One lab reported a value of 0.52 in/hr. It later was determined they were reporting a value called flux density. The corrected value was 11.4 in/hr.