

# Physical Measurements Of Soils

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Most everyone in the turf industry is familiar with the traditional soil test. They measure pH, soluble salts, major and minor nutrients, etc. Less familiar are the physical soil test, which measure the physical properties and characteristics of soils.

One basic difference between chemical and physical analysis is that chemical properties can be quickly changed, by adding such materials as lime, fertilizers or trace elements, or by leaching with irrigation. Physical properties of soils can only be changed very slowly, if at all. Because physical structure is so hard to adjust once a golf course is constructed, it is especially important to know the physical characteristics of soils when building courses or rebuilding greens or fairways. Other major uses include the physical measurements of soils for suitability as top-dressing or trap sand, and checking the compatibility of topdressing with existing soils. This article deals with these physical soil analysis, as well as what to look for when interpreting them.

A simple, well known physical test is the texture analysis. This test breaks down the percentages of sand, silt, and clay in a soil. The texture analysis data is then used to characterize the soil into a category, such as silt loam or sand clay. For Florida turf, high percentages of silt and clay are undesirable because of their fine particle sizes. The higher sand percentages are preferred.

A more precise particle measurement is the sand fractions, or particle size analysis. In this test, the soil is passed through a series of screens to determine the percentages of the various particle sizes. The sand fraction test is to determine the percentage of sand in a commercial top-dressing. An example of a sand fraction would be:

## ANALYSIS:

%Very Coarse Sand on #18 Sieve (2-1 MM) ..	6.16
%Coarse Sand on #35 Sieve (1-0.5 MM) . . . . .	32.79
%Medium Sand on #60 Sieve (0.5-0.25 MM) .	24.39
%Fine Sand on #140 Sieve (0.25-0.10 MM) ..	33.68
%Very Fine Sand on #325 Sieve (0.10-0.05 MM)	0.98
TOTAL SAND .....	98.00%

The coarser sands are preferred, and the percentage of very fine sand should be kept to a minimum.

Moisture holding capacity is an important soil characteristic, especially in non-irrigated areas. To perform the test, artificially saturated soil must be weighed, and then the soil is oven dried and weighed again. The difference between the weights is the moisture holding capacity, expressed as a percentage. Moist soils, especially organic ones, will absorb several times their weight in water.

Percent moisture is a physical test which isn't used much in turf. It is a measure of the existing moisture content of a soil at any given time, and is determined by comparing wet and oven dry weights. The test is primarily used for bagged materials, or materials sold by weight.

Infiltration is a measurement of the ability of moisture to enter a soil. It could tell you, for instance, whether a soil would tend to "puddle" during rainy periods. The sample is placed in a vertical column, and water is gravity-fed through the soil for 30 minutes to simulate natural field settling. Then the amount of water which will enter the column is measured for 5 minutes. The analysis is expressed in millilitres of water per 5 minutes, the more the better. The ratings for infiltration of field soils are:

	ml/5 min.	
0-50	.....	Poor
50-100	.....	Fair
100-150	.....	Good
150-200	.....	High

A test often done on peat or muck is loss on ignition. In this test, the peat is placed in a very hot oven to burn off the organic portion, leaving the mineral portion behind. Loss on ignition determines the purity of a peat or muck sample, and tells, for instance, whether it contains sand or other mineral impurities.

Bulk density is a physical measurement used to give a typical weight of a soil. It is usually expressed in pounds per cubic foot. Bulk density tests are important in determining shipping weights of both bagged and bulk materials. It is often used to convert tons to cubic yards, or vice versa.

There are a few other special physical tests available in some situations, but those listed here are available at most soil testing laboratories. They are widely used by top-dressing and peat companies, fertilizer companies, potting soil producers, research labs, architects, and superintendents. A good physical soil structure can make the superintendent's job a breeze or a nightmare, and it helps a great deal to know what your dealing with.■

## It Isn't Easy

To apologize,  
To begin over,  
To be unselfish,  
To take advice,  
To admit error,  
To face a sneer,  
To be charitable,  
To keep on trying,  
To be considerate,  
To avoid mistakes,  
To forgive and forget,  
To think and then act,  
To keep out of a rut,  
To make the best of time,  
To shoulder a deserved blame,  
To recognize the silver lining,  
...BUT IT ALWAYS PAYS!