Saturated Hydraulic Conductivity Study

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Objectives:

1. To evaluate vaiability problems in the saturated hydraulic conductivity method.
2. To develop a revised method for quantifying saturated hydraulic conductivity for rootzones for use by the testing lab industry.

Start Date: 1999
Project Duration: 1 year
Total Funding: $50,000

The USGA Green Section is confident in its construction guidelines for putting greens. A principle component of the guidelines is to have rootzone materials tested by a competent soil-testing laboratory.

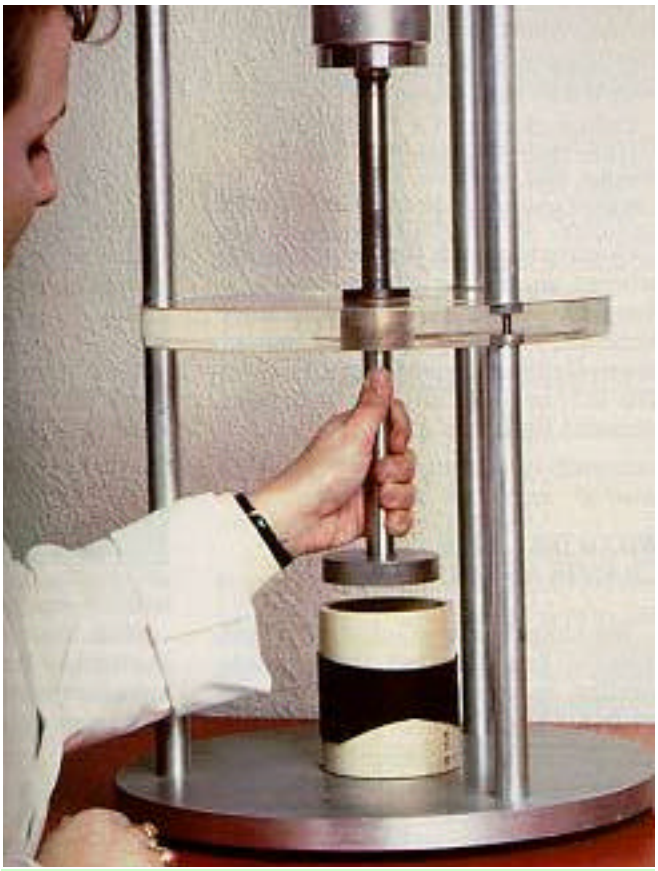
Many of the procedures conducted by these laboratories were developed specifically for testing the performance of turfgrass rootzones. As part of its on going dedication to use good science to build putting greens, the USGA supports the improvement and refinement of these laboratory procedures.

The Saturated Hydraulic Conductivity project was initiated in 1999 to evaluate documented variability problems in the saturated hydraulic conductivity (K_{sat}) method and develop a revised method for use by the rootzone testing lab industry.

Phase I of this project was to complete a laboratory site assessments of each of the testing laboratories to evaluate the implementation of ASTM method 1815-97 used to determine K_{sat}. Results indicate the current method insufficiently describes cylinder loading (step 1) and column saturation (step 2) of the method which contributes to inter-lab method variability in K_{sat} and capillary and non-capillary moisture values.

The rootzone test methods to determine saturated hydraulic conductivity are being evaluated in order to improve accuracy and precision.

As a result of the Site Assessments, Phase II of the study was initiated to address the impact of antecedent (initial sample moisture upon laboratory reception) on K_{sat} values.



The moisture content and packing procedures of sand-rootzone test columns affect the accuracy and precision of saturated hydraulic conductivity measurements.

Preliminary results from four testing labs have provided some key information. With increases in antecedent moisture from 1.0% to 14%, K_{sat} values falls substantially dependent upon lab and rootzone material source. Antecedent moisture variability only effects K_{sat} values and has no bearing on capillary, non-capillary or bulk density parameters. The Phase II results suggest that antecedent moisture contents between 6 and 10% have little influence on K_{sat} values.

Phase III of the study was to develop standard reference K_{sat} columns for assessing percolation tables used by the testing labs. Five standard reference columns have been constructed and tests indicate that these columns provide very consistent K_{sat} values.

Based on these early results, proposed revisions to ASTM 1815-97 are to: (1) specify a antecedent moisture of root zone mixes; (2) develop standardized cylinder loading techniques; and (3) all percolation table designs used in the testing labs will need to be evaluated using standard reference K_{sat} columns.

Summary Points

- Lab equipment, loading techniques, column saturation techniques, water temperature, and antecedent moisture content of the rootzone mix were all found to be significant sources of variation in the SHC test.
- Research work is being conducted to determine calibration methods to minimize the variation.