SCTM STOP 3

Stability Of Soil-Turfgrass Systems

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The stability of soil-turfgrass systems can be defined as the ability to resist permanent deformation under a load. Such loads that can leave permanent deformation may include mowers or players on an athletic field or putting green. Soil-turfgrass systems resist deformation by a combination of interlocking of soil particles and a root zone that 'holds' turfgrass and soil together. Laboratory studies by the authors have shown that mean grain size and distribution of soil particle sizes have an effect on the strength and stability of soil. A field loading device has been developed to investigate the influence of root depth, soil variability, turf construction and maintenance procedures on the overall stability of the soil-turfgrass system. This device allows us to measure displacement of the soil-turfgrass system under an applied load. The applied load, or stress, measured in pounds per square inch is plotted against displacement of the soil-turfgrass. The initial slope of this graph is the modulus of subgrade reaction, which is a measure of the stiffness of the soil-turfgrass system. This number is also used to describe the stiffness of a spring and has units of lbs./in.^{2} or lbs./in^3. The soil-turfgrass system can be viewed as a series of springs, much like a bed mattress, which can take a certain load and 'spring back' after the load is removed. For example, a turf with a spring constant of 200 lbs./ in.^{2} /in. would compress 0.10 inches under a load of 220 lbs./ in.^{2}, typical of most mowers. Well constructed stable soil-turfgrass systems have modulus values less than 200 lbs./ in^3. Laboratory and field testing of many soils and soil-turf grass systems have shown that putting greens and PAT constructed with compacted, fine, well graded soil perform better than loose, poorly graded coarse grained soils. Well constructed soil-turfgrass systems resist rutting under mower wheels and large displacements and deformations under normal athletic turfgrass usage.