

The Humboldt Soil Stiffness And Modulus Gauge

The Humboldt Stiffness Gauge (HSG) is a field instrument that nondestructively measures soil stiffness and soil modulus. The HSG vibrates, imparting small forces to the soil through a ring-shaped foot, and causes small soil deflections. The instrument determines soil stiffness as the ratio of these small forces to small deflections. It assumes a value of Poisson's ratio and derives Young's soil modulus from the stiffness. HSG measures soil stiffness in just over a minute. Soil stress and strain are determined by HSG at levels commonly found in soil applications (3 to 5 psi). Because it vibrates from 100 Hz to 200 Hz, HSG filters out soil deflections caused by nearby equipment. By using soil stiffnesses measured with HSG along with statistical quality control, the current overspecification and overcompaction of soil can be greatly reduced, thereby reducing compactive effort by approximately 30%.

When soil is compacted for pavements, pipe bedding, backfills, and foundations, soil density is used almost exclusively by the construction industry to specify, estimate, measure and control soil compaction. However, soil density may not be the desired engineering property, instead, the desired engineering property is the soil modulus or soil stiffness.

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