

Rutgers Corner – The Clegg and measuring playing surface hardness

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A common attribute of heavily-used natural turf fields and worn-out synthetic surfaces is unacceptable playing surface hardness. In the case of natural turf fields, soil compaction and surface

hardness are the all-too-often results of the disintegration of turfgrass cover. For synthetic fields, older surfaces are often replaced due to surface hardness issues and subsequent concerns over player safety.

A systematic means is necessary to measure and evaluate the surface hardness

of sports fields. The American Society for Testing and Materials (ASTM) has developed a set of procedures utilizing a device called the Clegg Impact Soil tester (CIST) to assess the surface hardness of North American football fields (ASTM F 1936-98).

The Clegg Impact Soil Tester (CIST) is a device that can be used to measure surface hardness. The CIST consists of a cylindrical impact missile enclosed in a tube that creates minimal friction. The missile is dropped at a prescribed height of 2.0-ft on the surface to be tested. The CIST is equipped with an acceleration transducer and a hand-held electronic display that allows the user to record values generated by the CIST in units of G_{max} . G_{max} is a measure of peak deceleration, which is the impact energy of the missile absorbed by the surface. The higher the peak deceleration value (G_{max}) the more energy being returned to the object contacting the surface, or the harder the surface. To put this in perspective, Rogers et al. (1988) found a concrete basement floor produced a value of 1280 using the CIST and was reduced to 260 when the same floor was covered with a carpet pad.

The American Society for Testing and Materials guidelines for testing the surface hardness of North American football fields calls for a "drop test" using the CIST at six specified points throughout a football field, including a goal line, hash mark on the 25-yd line and mid-field at the 50-yd line. According to the specifications, a drop test consists of three successive drops with 3-minute pauses allowed in between individual drops. The G_{max} values are recorded and the 2nd and 3rd value are added and the sum is divided by two and rounded to the nearest whole number. The G_{max} value from the 1st drop is disregarded.

Numerous parameters should be reported at the time of testing. In a natural turfgrass system, the surface temperature of the field should be measured at a depth of 0.5-inch. Additionally, a visual assessment of turfgrass cover (e.g. 25%, 90%, etc.) and soil moisture (dry, damp, wet, saturated, etc.) should be made should be recorded at each test point.

Under a *Performance Requirement* heading described in the ASTM Standard, the average G_{max} value at any single test point shall not exceed 200 when tested from a drop-height of 2.0-ft. The standard further notes that the surface system (natural turfgrass or synthetic) should be replaced either in full or in part if one or more of the tested points

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is determined to have an average G_{max} value exceeding 200. ASTM adopted the maximum impact level of 200 average G_{max} for use because this value was accepted by the U.S. Consumer Product Safety Commission for similar test methods.

References

ASTM. 1999. Standard specification for shock-absorbing properties of North American football field playing systems as measured in the field. Designation: F 1936-98.

Rogers, J.N., D.V. Waddington, and J.C. Harper. 1988. Relationships between athletic field hardness and traction, vegetation, soil properties, and maintenance practices. Pa. Agric. Exp. Stn. Prog. Rep. 393. ♦

*based on photos and a site visit by the SFMANJ Award Committee
*feel free to have sports groups in your photo

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