Typical Test Plans For The Humboldt GeoGauge™

(Soil Stiffness Gauge)

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Humboldt has been getting questions about our wishes regarding practice, test planning and data recording. This document is what Humboldt suggests.

Formerly called Humboldt Stiffness Gauge (HSG), GeoGauge is the new name to reflect its many applications.

Users should try to build confidence in Humboldt GeoGauge measurements. To do this, users need to take as much data as time will allow so they can establish measurement repeatability and reliability. We recommend that users take at least three (3) GeoGauge measurements for each density and moisture measurement. These measurements should be optimally taken along a line with locations marked. The increment between the measurement sites should be meaningful to users, we recommend ~ 2 feet (~0.6 meter). Users should also repeat measurements at as many measurement sites as possible, paying particular attention to how the ringed foot is seated each time. It is important that for each measurement, the GeoGauge is lifted off the location and then put back into place. Do not attempt to take repeated measurements without lifting or removing the GeoGauge from the spot, false readings will occur. The following pages are suggestions and are not requirements. In addition, refer to the User Guide; much of the same information is contained in it.

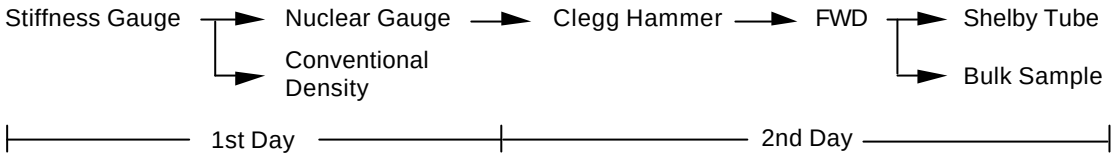
It is imperative that users see the value in stiffness measurements. Stiffness is an excellent measure of compaction uniformity. The more uniform the layer, the more likely a site will meet the needed performance at the time of construction and throughout its life. Stiffness is an excellent means to diagnose poor soil performance. Users may find measurements which do not fit well with the majority of measurements made at a location. We encourage users to dig down and find the cause of the anomalous measurements. It is not unusual to find pockets of air or soft soil, discontinuities in compaction or irregular objects. For example, if users are crossing the threshold of a backfilled trench that intersect a roadway, a sharp change in compaction will cause a premature failure in the roadway's surface. The same example applies for a pipe bed. If the bed does not uniformly support the pipe, the pipe will prematurely fail. Most importantly, stiffness and modulus are the engineering parameters used in the design of any structure. The current trend towards mechanistic design, performance specifications and contractor warranties will necessitate the measurement of the engineering parameters of soil structures in the field. The GeoGauge is the first simple, practical attempt to directly link design with practice in the field.

Again, more and repeated practice of GeoGauge seating is key to users' experience and obtaining accurate measurements.

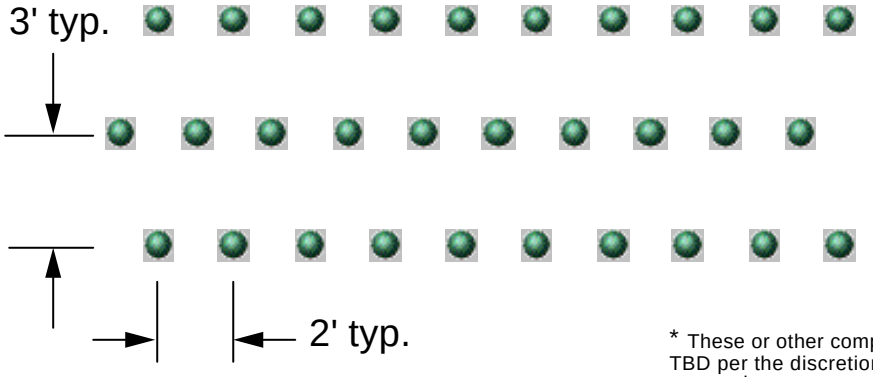
Optimal Test Plan for Evaluating the Humboldt Stiffness Gauge

(typical for each site selected)

Testing Sequence



Test Locations (30)



* These or other companion measurements to the HSG are TBD per the discretion of the evaluator. The remaining companion measurements are requested.)

Test Frequency

Stiffness Gauge: every location, repeated 3 times every 3rd location

Nuclear Gauge: every 3rd location

Conventional Density: once

Clegg Hammer*: every 3rd location

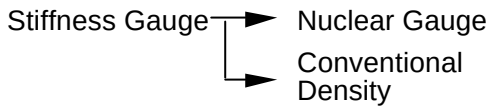
FWD*: every 4th location

Shelby Tube and/or Bulk Sample (Resilient Modulus)**:** as many locations as possiple

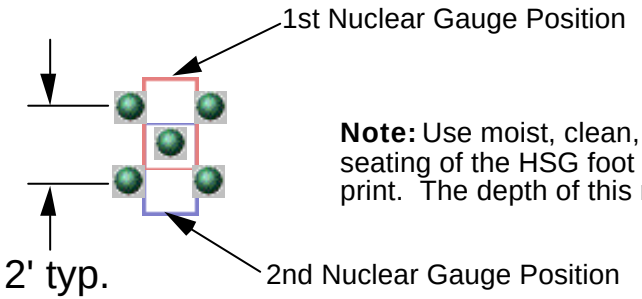
Alternative Test Plan for Evaluating the Humboldt Stiffness Gauge

(typical for each site selected,
also for use where soil surface conditions limit measurement repeatability)

Testing Sequence



Test Locations (5)



Note: Use moist, clean, fine sand or local fines to assist the proper seating of the HSG foot and enhance the visibility of the HSG's foot print. The depth of this material should not exceed 1/4".

Test Frequency

Stiffness Gauge every location, repeated 3 times

Nuclear Gauge center location, repeated twice, rotate the gauge 180 between measurements, probe @ 4" depth

Conventional Density once

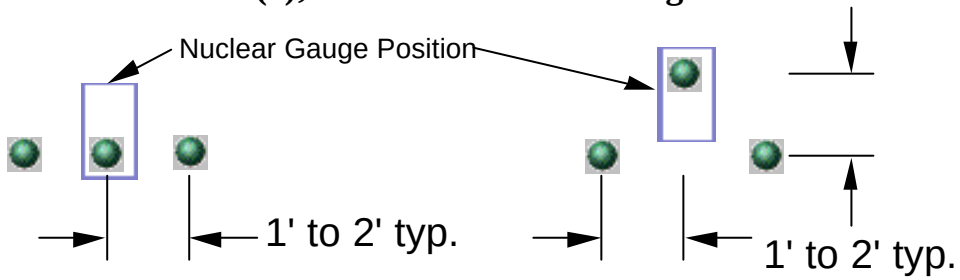
Minimum Test Plan for Evaluating the Humboldt Stiffness Gauge

(typical for each site selected)

Testing Sequence

Stiffness Gauge → Nuclear Gauge

Test Locations (3); Either of the Following



Note: Use moist, clean, fine sand or local fines to assist the proper seating of the HSG foot and enhance the visibility of the HSG's foot print. The depth of this material should not exceed 1/4".

Test Frequency

Stiffness Gauge: every location, repeated 3 times
Nuclear Gauge: center location, probe @ 4" depth

Modified Proctor (ASTM D1557-91)

Material Description	Max. Density	Opt. Moisture
	pcf	%

Recommended HSG Data Sheet

* These or other companion measurements to the HSG are TBD per the discretion of the evaluator. The remaining companion measurements are requested.)

Assumed Poisson's Ratio

Soil Classification (ASSHTO M145-91 (95))

	Stiffness Gauge			**Nuclear Density (specify method)**			**Conventional Density (specify method)**			**Clegg Hammer* (ASTM D5874-95)**		**FWD* (ASTM4694-87(95))**	**Resilient Modulus (specify method)**
	1st	2nd	3rd	Wet Density	Dry Density	Moisture Content	Wet Density	Dry Density	Moisture Content	Impact Value	Light Impact Value		
Test Location	MN/m	MN/m	MN/m	pcf	pcf	%	pcf	pcf	%	g	g	MPa	MPa
1													
2													
3													
4													
5													
6													
7													
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