H. ADDITIONAL INFORMATION

30. PROVIDE ANY ADDITIONAL INFORMATION REQUESTED BY THE AGENCY. ATTACH ADDITIONAL SHEETS AS NEEDED.

In-Situ Soil Testing, L.C. (Additional Company Qualifications)

Our firm performs dilatometer, electric cone penetrometer tests with pore pressure measurements, pressuremeter (soil and rock), borehole shear tests (soil and rock), vane shear, and ko step blade tests. With our expertise and test equipment, we can recommend and perform the most appropriate in-situ test for the geotechnical engineering design. An experienced professional engineer performs the tests. For dilatometer and cone penetrometer tests, we push those probes with either 1) 15 ton truck rig, 15 ton (25 ton with earth anchors) track rig, 12 ton portable rig for inside buildings and 15 ton seafloor rig that we lower to the bottom of a river for efficient testing for bridges.

We have performed more dilatometer tests than any other firm in the United States (over 100,000 tests). We organized and edited the â€œSecond International Flat Dilatometer Conference" on April 2-5, 2006 in Arlington, Virginia. We perform dilatometer tests at either 10 or 20 centimeter intervals providing near continuous data. The dilatometer test is a calibrated static deformation test. It results correlate well with laboratory consolidation tests as documented by Pelnik, Failmezger, et. al. (1998) and Failmezger, et. al. (1999). Failmezger (2001) statistically showed that settlement predictions in sands with DMT data were at least 3 times more accurate than SPT. In clays, the accuracy is much better. Failmezger and Bullock (2004) presented a method to economically design foundations/embankments for bridges. Failmezger (2021) showed that dilatometer test data saved more than $25 million at 129 project sites. We have written spreadsheets that compute settlement beneath embankments or footings based on dilatometer data.

Our 10 sq.cm. digital CPT probe quasi-statically penetrates the soil at a constant 2 cm/sec rate measuring the tip, side friction and pore pressure using calibrated strain gauges and transducers and is significantly more accurate than 15 sq.cm. CPT probes. A computer collects the CPTU data at either 1 or 5 centimeter depth intervals and processes and displays the data on its screen. For pore pressure measurements, we use presaturated filters. The cone penetrometer test is an ideal model of a pile, continually measuring tip and sleeve friction. We have written spreadsheets that compute vertical pile capacity versus depth. Graphs of these analyses enable the engineer to easily estimate pile tip elevations.

With either the true-interval dilatometer or psuedo-interval piezocone, we can perform seismic tests at 1.0 meter intervals for the depth of the sounding. The true-interval method more accurately measures the shear or compression wave velocities than psuedo-interval method by a factor of about 10. Each test measures the shear wave velocity and shear modulus. With the seismic dilatometer, a shear wave degradation curve can be generated.

We have two types of pressuremeter equipment. For soil and weathered/decomposed rock, we use a Texam pressuremeter which can apply up to 100 bars of pressure. For rock, we use a Probex pressuremeter that applies up to 300 bars of pressure. The Probex pressuremeter uses an electronic tranducer to measure pressure and a LVDT inside the probe to measure volume. The pressuremeter test consists of inflating the pressuremeter probe in either equal pressure increments (stress controlled test) or equal volume increments (strain controlled test) until the initial volume of the probe has doubled. Our Texam presuremeter allows us to perform either strain or stress controlled tests. About 40 data points are obtained from a strain controlled test versus about 10 data points from a stress controlled test, and thus a better defined curve can be obtained from strain controlled tests. To obtain good test data requires making a high quality borehole with minimum disturbance to its side walls. Quality boreholes are best created using mud wash rotary techniques. We carefully monitor the rotation rate, advance rate and mud flow rate so that repeatable high quality boreholes are created.

The borehole shear test measures the drained shear strength parameters. A field computer accurately measures the normal and shear stresses automating those measurements . Often slope stability problems require the engineer to act quickly and evaluate the slope conditions. The engineer often does not have the time or budget to perform triaxial tests to evaluate the shear strength of the various subsurface strata. The borehole shear tests evaluate these necessary strength parameters quickly. Usually, we obtain a coefficient of correlation of 0.99 or higher from the data that we collect. This high correlation results because tests are performed in same soil at progressively higher normal stresses. The rock borehole shear test measures the strength of rock and can be used for slope stability analyses and vertical capacity of drilled shafts

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For measuring the undrained shear strength of soft clays, we use electronic vane shear equipment. The motor placed at the bottom of the hole just above the vane turns the vane at constant rate of 0.1 degrees/second and transmits the data to computer at the surface. After meausring the peak shear strength it rapidly turns the vane 10 revolutions and then measures the residual shear strength. Because the system measures the torque just above the vane, parasitic rod friction does not occur.

While vertical stresses can be estimated accurately, horizontal stresses cannot. As documented by Schmertmann (1985), ko can vary from 0.2 to 6. Loads are resisted by the soil in 2 horizontal directions but only one vertical direction. The ko step blade accurately measures horizontal stresses.

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We have created a peer reviewed CD-ROM that serves as a resource for understanding and designing using in-situ test data. One can download this information from the "resource" tab on our website, www.insitusoil.com. We have attended technical short courses on DMT, CPTU and PMT and maintained close contact with these leaders in our field. We have published over 30 technical documents and made technical presentations about in-situ tests for ASCE, several DOT agencies, and numerous international and Geo-Institute meetings/short courses and conferences. We organize the GeoVirginia conferences (premier regional conferences) and serve as chairperson for Virginia ASCE Geo-Institute Chapter. We are updating our website so that the write-up for each test has the detail of a textbook, sharing our vast knowledge with engineers worldwide.

I. AUTHORIZED REPRESENTATIVE

The foregoing is a statement of facts.

31. SIGNATURE	32. DATE
Roger A. Failmezger	11/20/2021

33. NAME AND TITLE

Roger A. Failmezger, President