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Personal communications to Prof. S. Marchetti (1998-2000)

Dear Dr. Marchetti Jan 15, 1998

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I probably perform more dilatometer tests than anyone in the U.S. other than Schmertmann and Crapps.

The Washington D.C. area has fascinating geology. The Cretaceous-aged Potomac clays are probably the hardest in the world (according to Paul Mayne). I recently did some DMT in this formation where the bottom of the sounding had "A" readings > 60 bar! I have also tested Alluvial clays that had $M < 10$ bar.

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I find that the soil classifications from DMT can be better than CPTU, particularly with the Potomac clays.

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In the litigious U.S. society the geotechnical engineer often gives the owner overly conservative foundation designs.

I do a lot of work for the second geotechnical engineer that the owner retains to reevaluate the first design. I then perform DMT for the second consultant.

Usually the bearing pressures can be increased by a factor of at least two or spread footing can be used instead of piles. The first consultant gets eggs on his face and the second consultant smells like a rose.

Roger Failmezger

Dear Dr. Marchetti Aug 7, 2000

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I wrote a discussion to Dr. Duncan's April 2000 ASCE Geotechnical Journal article.....
In one of his examples he uses SPT data to predict settlement of a spread footing on sand. I expanded on his example and show that the error from SPT is so large that SPT for settlement predictions is a poor choice.

I show that settlement predictions with DMT are a practical and accurate method. Why should anyone use a dynamic, rarely calibrated method to try to predict how the soil will deform under a static load? Obviously, a static calibrated deformation test is needed -- DMT

Roger Failmezger

Nov 12, 1999

On "Quantifying Risk"

Most foundation designers only use "standard" penetration tests (SPT) as their means of characterizing the site. The word "standard" is in quotes because its method allows for so many variations to it that it is really not a standard. It is one of the few soil tests that is only rarely calibrated. Test error can range by a factor of 3. For the past 20+ years, professors and researchers have proven that other in-situ test methods are much better at characterizing the subsurface conditions and measuring the soil properties.

Why do foundation engineers still use SPT? The test is inexpensive and design is simple. Designers often look on charts developed in the 1940s and choose a bearing pressure. To defend their insecure and weak design, some engineers argue that they have a lot of experience with SPT and have developed local correlations. What they really have is a lot of experience with a non-calibrated test that has significant variability. Foundation engineers should use calibrated tests that accurately measure the soil's properties. Only with accurate measurements will engineers be able to perform good design.

With SPT, one cannot perform accurate settlement computations. To compute settlement, one needs a calibrated static deformation test to measure how the soil will deform or settle under the static loads that structures apply to the soil. The SPT is a dynamic penetration test, which makes it inherently flawed for predicting static soil properties. With drilling procedures, undisturbed tube samples could be obtained and laboratory consolidation tests could be performed and that data could be used for settlement analyses. These tests, however, cost about \$500 each and with their low budgets many engineers are reluctant to do them. It is also quite difficult to obtain undisturbed samples in sandy soils. Alternatively, the dilatometer test is a calibrated static field deformation test that can and should be used to accurately predict settlement. A real benefit of dilatometer tests is that their cost is only \$10 to \$20 each. As a result, a lot of them can be performed and a site can be accurately characterized.

To quantify risk, the engineer needs to collect a large amount of high quality data. A probability analysis is performed using that data. Design can then proceed to satisfy an acceptable level of risk to the owner. As shown on the graphs below, when poor quality data are obtained, geologically, sites will appear to be much more variable or heterogeneous than they actually are.

Roger Failmezger