Some recent experience obtained with DMT in Brazilian soils

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ABSTRACT: The objective of this paper is to show the use of DMT in Brazilian geotechnical engineering, which is gradually growing, in spite of a country where the practice in site investigations is completely dominated by the Standard Penetration Test SPT. Some Brazilian sites are presented in this paper, with the results of DMT, SPT and/or CPT, in different geological conditions.

1 HISTORICAL REVIEW

The DMT equipament has been used in Brazil for about 10 to 15 years.

It was introduced in some Federal Universities and a few private companies.

Some research at universities was developed based on DMT results, but its practical usage is increasing at a very slow rate because of the unfamiliarity of the geotechnical engineers with the interpretation of test results.

This tendency is changing gradually, with the introduction of DMT test in engineering schools, both in graduate and post graduate courses and with more results, obtained in different geological conditions, as shown in this paper.

2 SOFT SEDIMENTARY CLAY AT ALEMOA – SANTOS/SP

This site represents a sedimentary deposition of clays along the Brazilian coast.

The undrained strength (Cu) increases with depth (Z) in this site as:

$$C_u = 7{,}0+0.89 * Z$$

With C_u (kPa) and Z (m).

The horizontal stress index Kd lies between 1,8 and 2,3 as are normally consolidated clays found worlwide.

3 HYDROMECHANICAL FILL AT SANTANA DE PARNAÍBA/SP

This site represents a fill constituted of fine particles (silts and very fine sands).

The artificial process involves spraying water at the mountain, removing the soil (silt and sand), and filling in a depression, such as a lake, and the coarser sands are separated and removed for construction, leaving behind a hydromechanical fill, constituted by silts and very fine sands, wich are normally consolidated as they settle inside the water.

4 SOFT RESIDUAL SILTY SOILS AT DUQUE DE CAXIAS/RJ

This site represents a gnaissic residual soil constituted of very soft silt and silty sand, situated at the base of a montain chain.

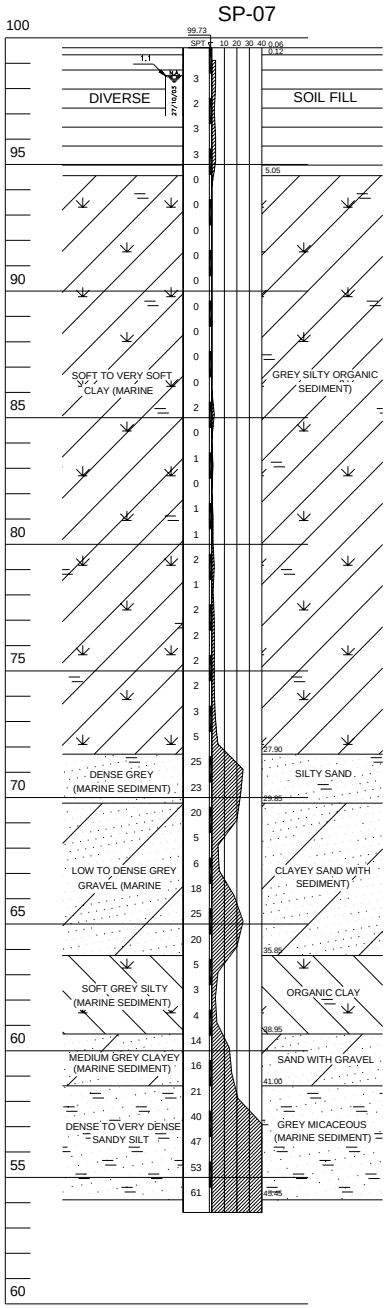
The water table is at the surface, and the use of the area involves a 5,0 m (16,4 ft) thick fill.

5 COMPACTED SILTY FILL AT CAJAMAR/SP

At this site an extensive amount of earthwork was done, to obtain a plain platform with an area of 250.000 m2 (61,7 ac), involving cuts and fills up to 30 m (98,4 ft) high.

The fill was very well compacted in 30 cm (1ft) layers at a minimum of 98% Standard Proctor Compaction.

STANDARD PENETRATION TEST RESULTS (SPT)



MARCHETTI DILATOMETER TEST RESULTS (DMT)

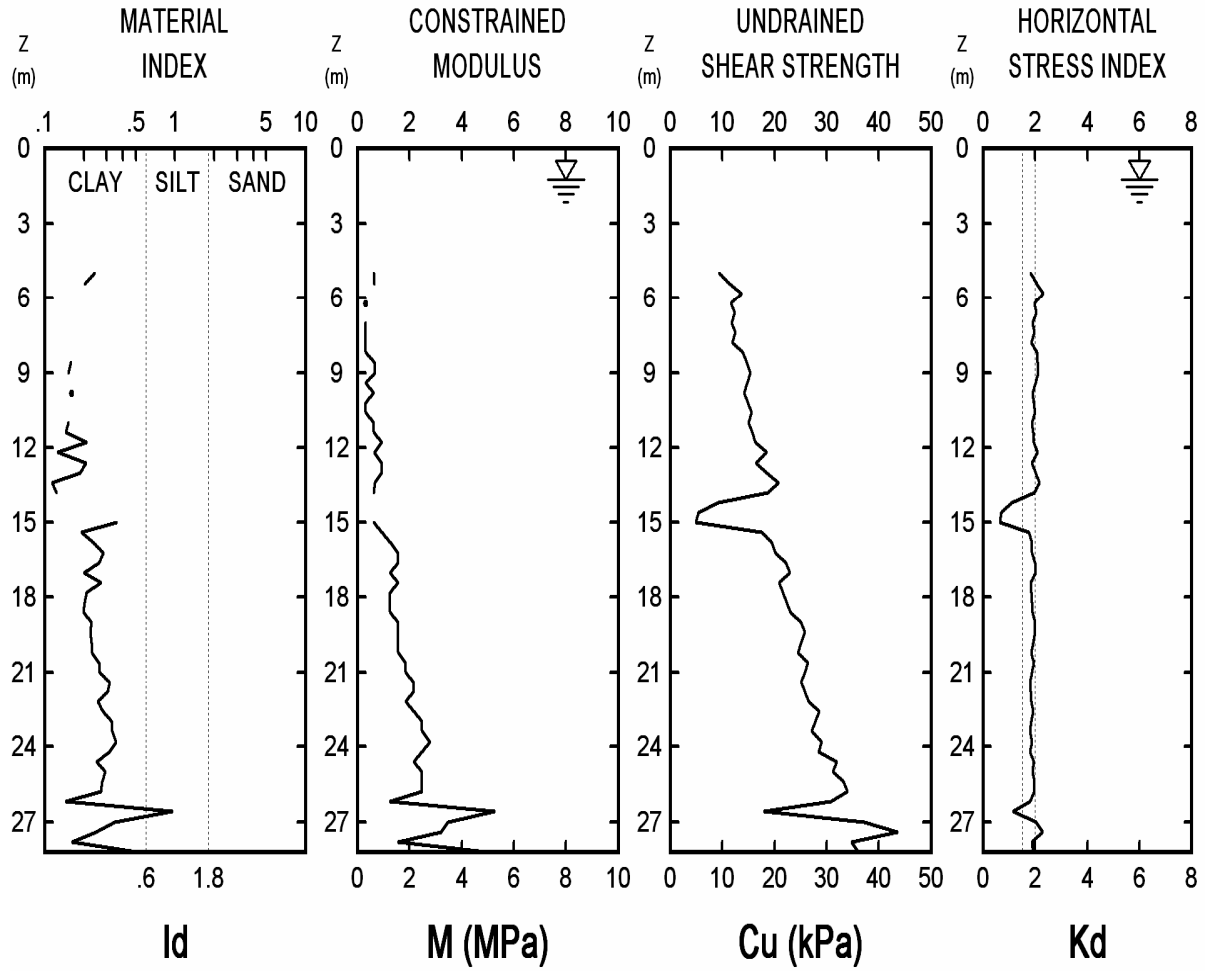
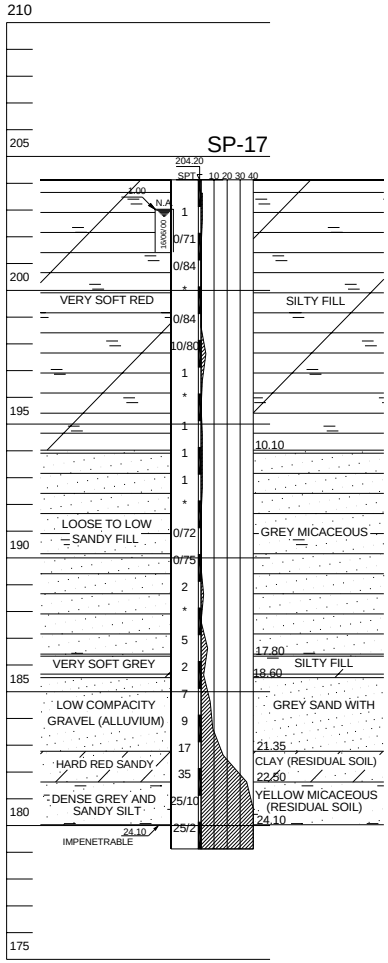
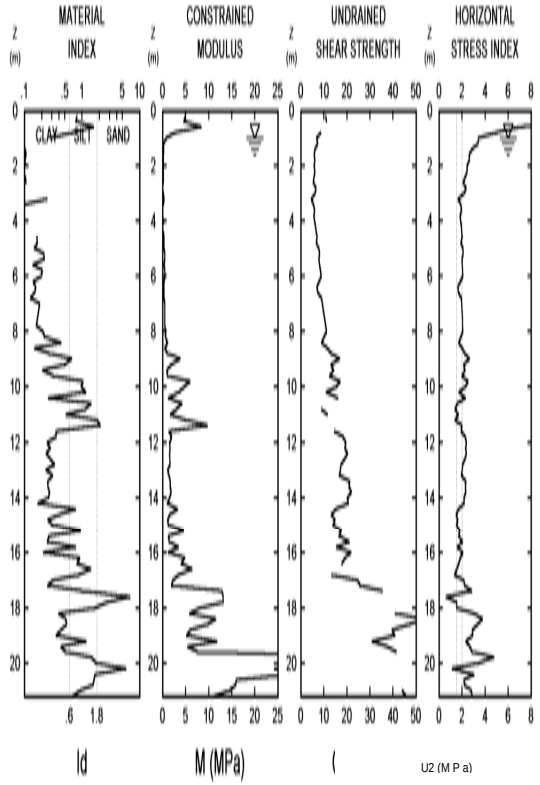


Figure 1. Soft Sedimentary Clay At Alemoa – Santos/SP

STANDARD PENETRATION TEST RESULTS (SPT)	MARCHETTI DILATOMETER TEST RESULTS (DMT)	CONE PENETRATION TEST RESULTS (CPTU)





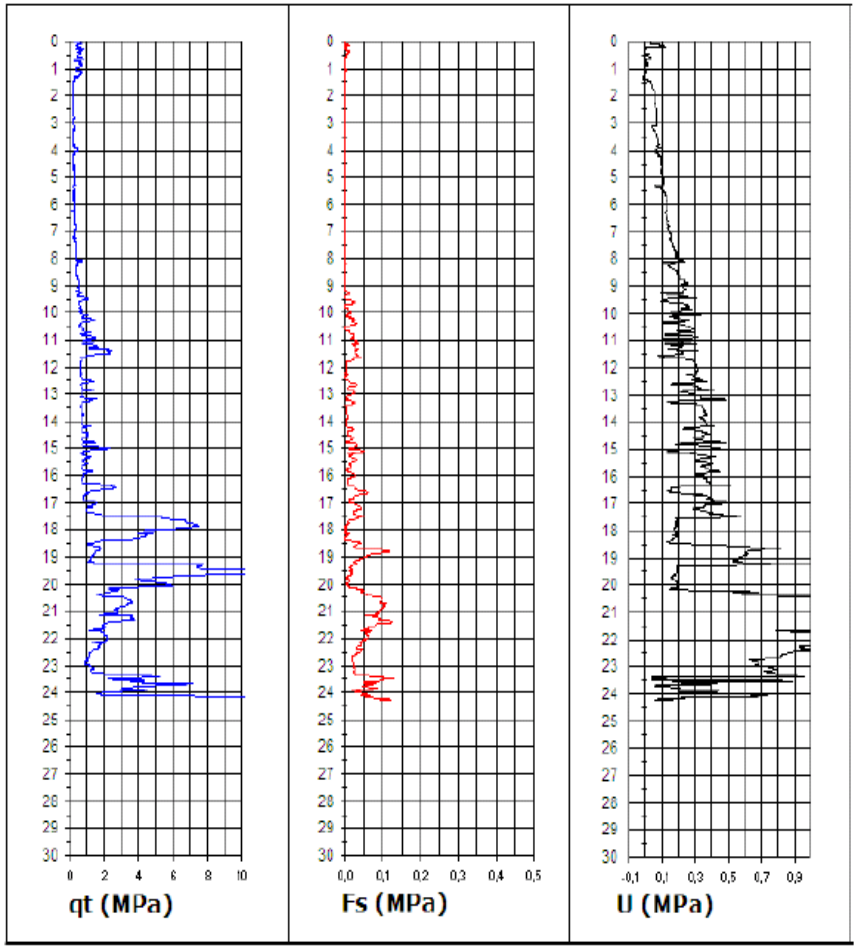


Figure 2.Hydromechanical Fill – Santana de Parnaíba/SP

BACK

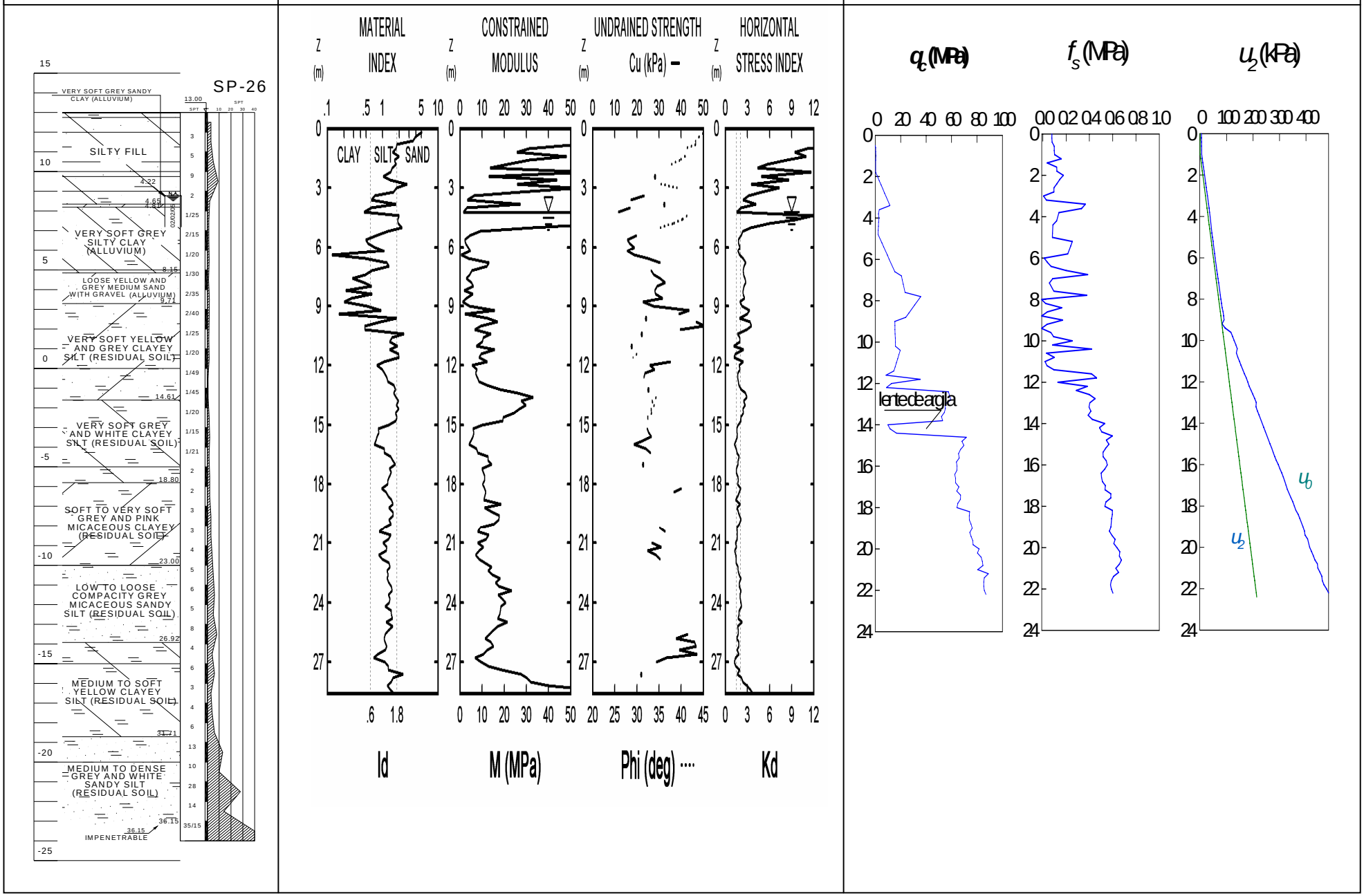


Figure 3. Soft Residual Silty Soils At Duque de Caxias/RJ

BACK

STANDARD PENETRATION TEST RESULTS (SPT)

MARCHETTI DILATOMETER TEST RESULTS (DMT)

CONE PENETRATION TEST RESULTS (CPT)

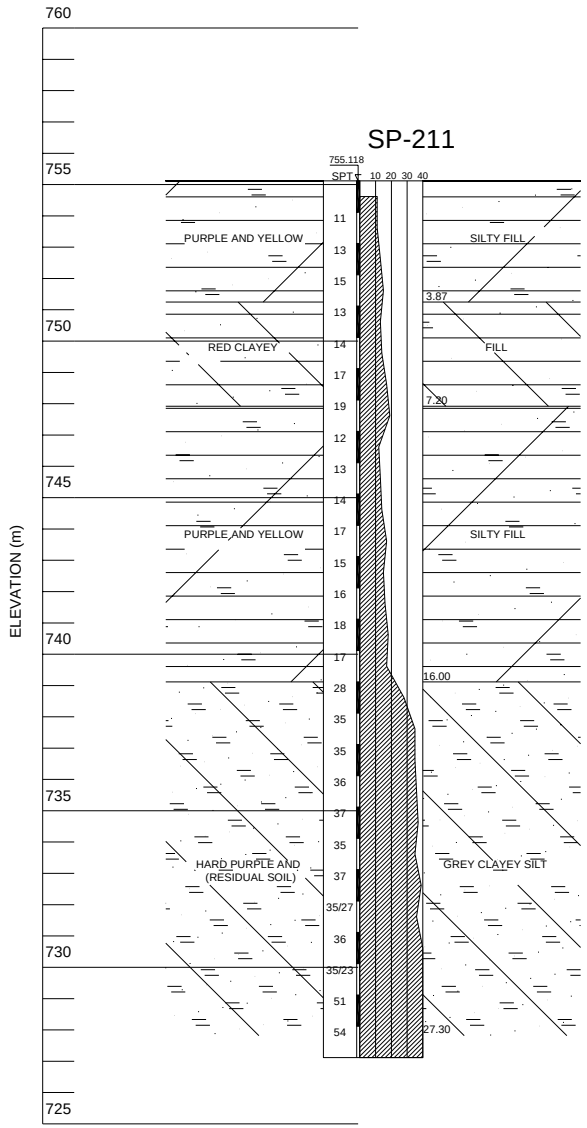
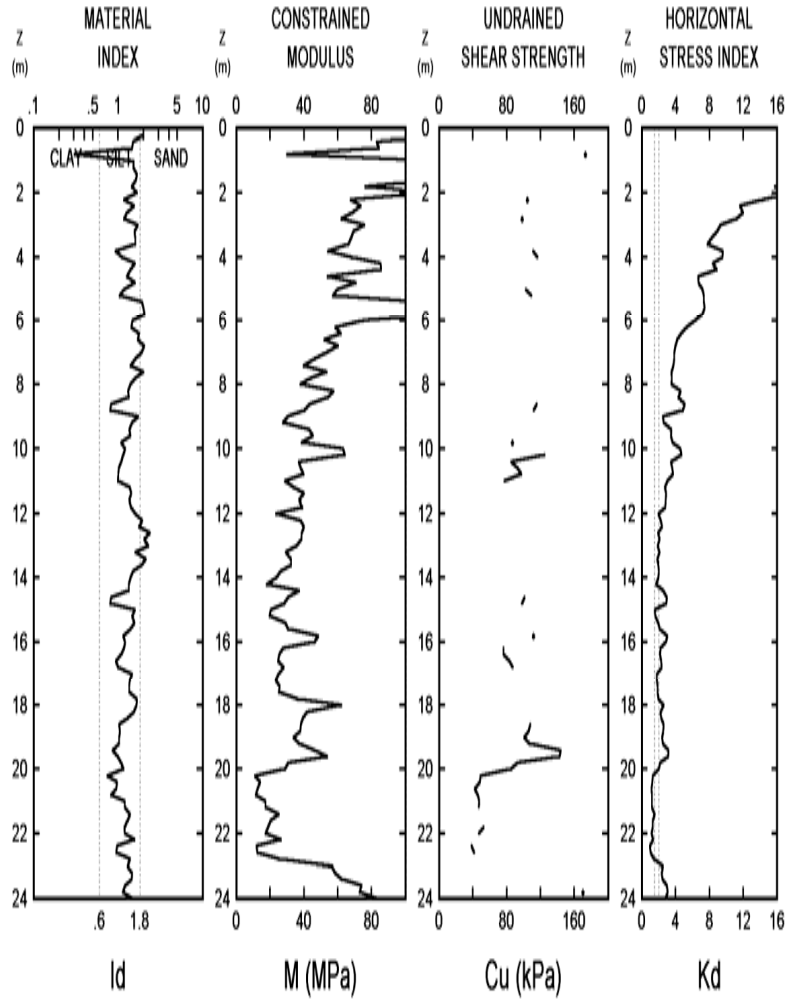
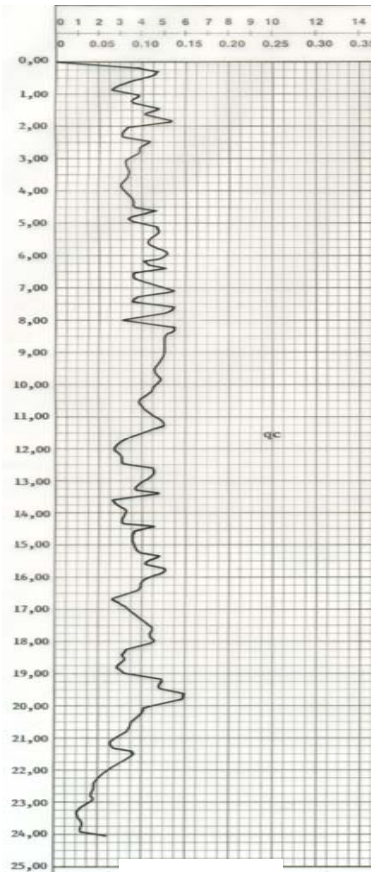


Figure 4. Compacted Silty Fill – Cajamar/SP



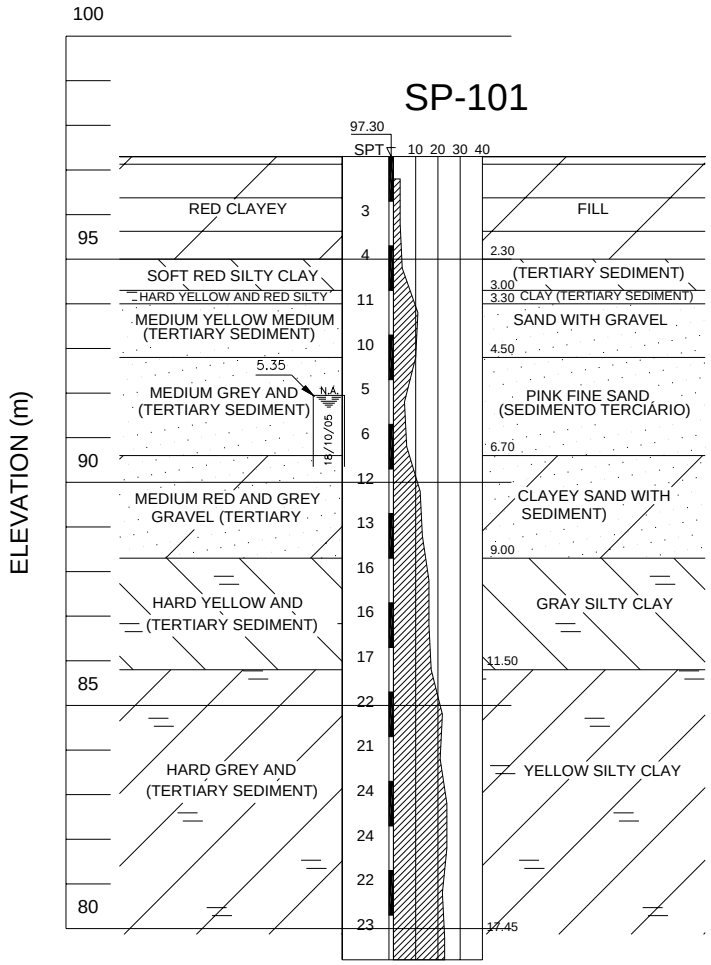
Point Resistence

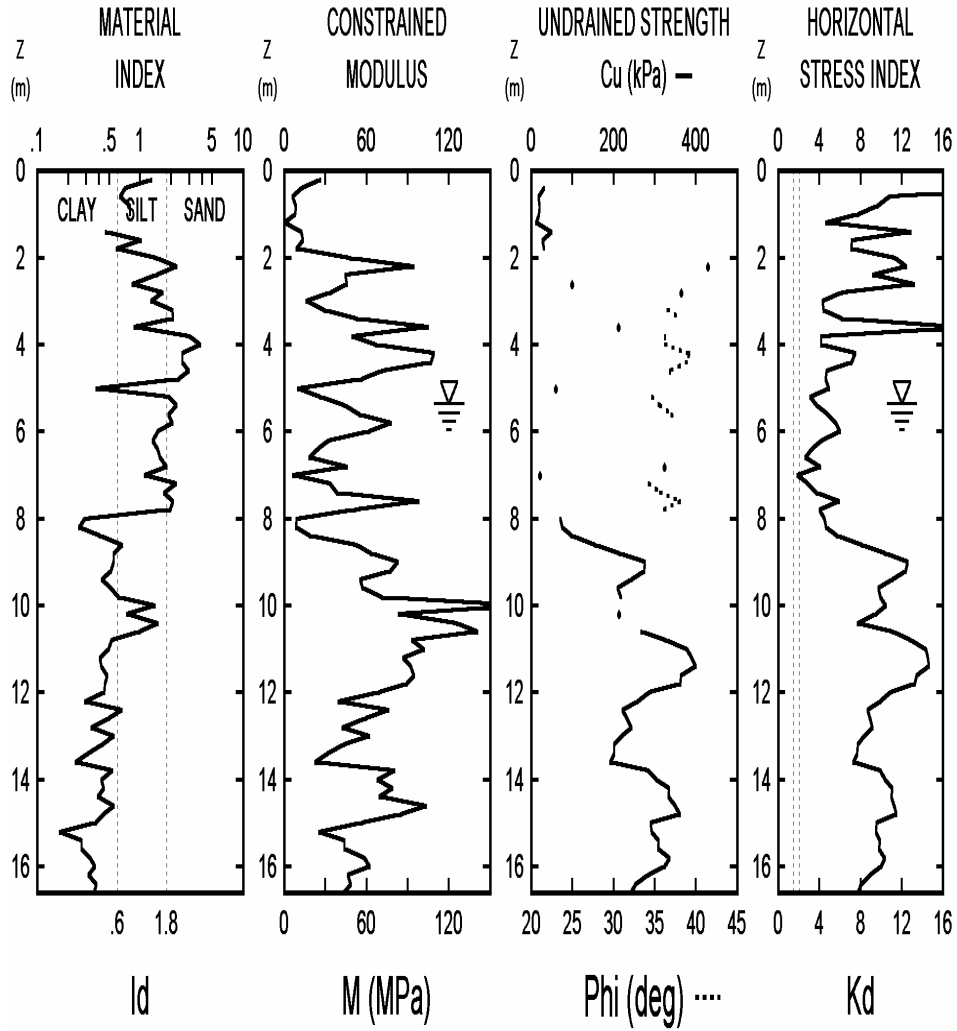


BACK

STANDARD PENETRATION TEST
RESULTS (SPT)

Figure 5. Tertiary Sediment At Sao Paulo/SP MARCHETTI DI-
LATOMETER TEST RESULTS (DMT)



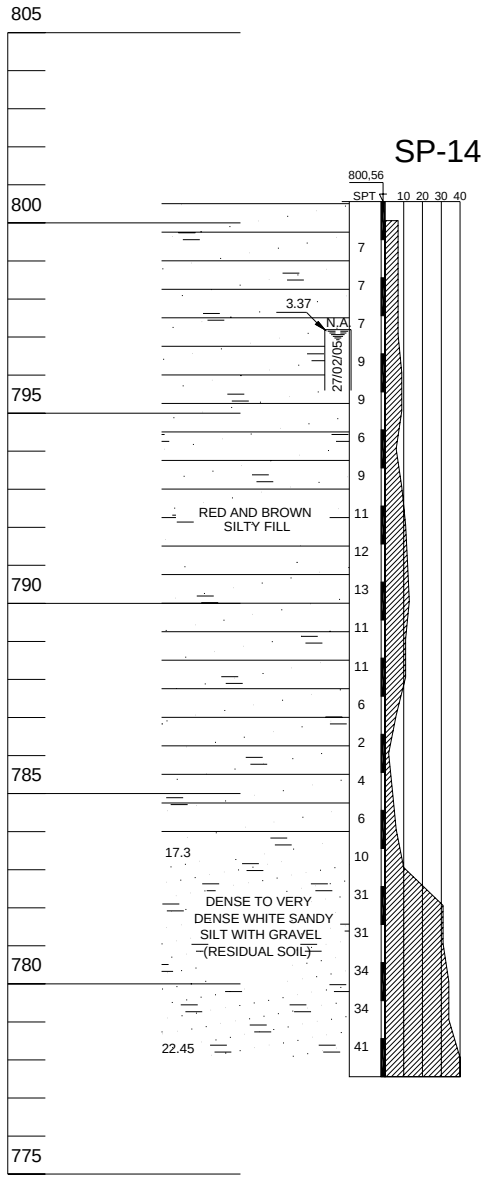


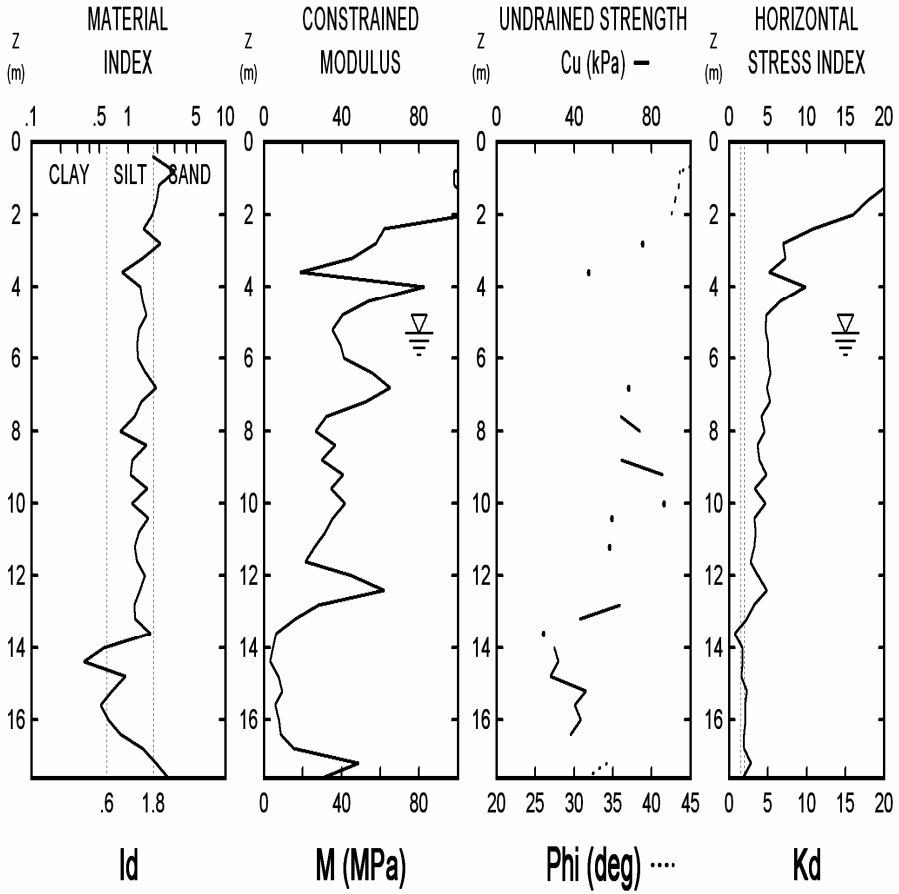
STANDARD PENETRATION TEST RESULTS (SPT)

Figure 6.Silty Fill – Embu/SP

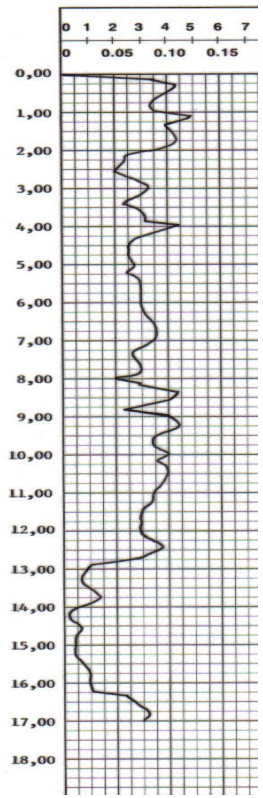
MARCHETTI DILATOMETER TEST RESULTS (DMT)

CONE PENETRATION TEST RESULTS (CPT)





Point Resistence



6 TERTIARY SEDIMENT AT SAO PAULO/SP

This site represents a typical situation of the central area of Sao Paulo city, with tertiary over consolidated sediments.

At the depth about 14 m to 16 m the silty clay is overconsolidated (OCR = 10 to 15), with an estimation of undrained strength about 300 kPa and SPT ranging about 21 to 24 blows/30 cm. (Brazilian SPT energy is about 72%).

This proportion 300 kPa / 23 = 13 is about the same recommended by Décourt (1989) ($Cu = 12{,}5 * N_{72\%}$ kPa).

7 SILT FILL – EMBU/SP

This site represents an area where a distribution centre will be built.

To help the floor slab design, the fill characteristics were studied with SPT, DMT and CPT tests.

8 CONCLUSIONS

The use of DMT as complimentary site characterization is increasing in Brazil.

Its usage in typical Brazilian subsoil conditions, is giving the necessary validation of this test in our soils.

Geotechnical engineers are confidently making design decisions based on DMT correlated parameters.

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