

# Geotechnical characterization by in situ tests of a loess-like deposit in its natural state and after saturation

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**ABSTRACT:** A series of Marchetti Dilatometer Tests (DMT), Cone Penetration Tests (CPT), Ménard Pressuremeters (MPM), Field Vane Tests (FVT) and Dynamic Penetration Tests (DPSH) were performed in a silty weakly cemented loess-like soil in its natural state and after saturation. In view of the kind of soil, an important reduction in the mechanical parameters was expected with an increasing degree of saturation  $S_r$ . The aim of the experiment was to quantify, for subsequent engineering applications, the weakening of the soil. It has been verified that the decrease upon saturation of the strength parameters  $q_c$  and  $P_{IMPM}$  is very similar (from 34 to 38%) and the decrease of the deformability parameters,  $E_{MPM}$  and  $M_{DMT}$ , is roughly of the same order in both cases (61 and 68%, respectively). Such reduced stiffness ( $E_{MPM}$  or  $M_{DMT}$  after saturation) should be used for settlement prediction if an increase in water content is considered likely. The combination of DMT and CPT tests is a faster and more cost effective method to get information on strength and deformability. Besides, the combination CPT/DMT through  $K_D$  parameter and  $q_c/M_{MDT} = \alpha$  ratio clearly show the destructuration of this soil when saturated.

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More and more, today, the factor controlling the design of a foundation is not the bearing capacity but the necessity of limiting settlements. In the investigated loess-like deposit, saturating the soil resulted in a reduction in stiffness of 60-70%. Such reduced stiffness ( $E_{MPM}$  or  $M_{DMT}$  after saturation) should be used for settlement prediction if an increase in water content is considered likely.

- MPM results are valuable in that they provide indications on both strength and deformability ( $P_{IMPM}$  and  $E_{MPM}$ ). However, MPM results are highly dependent on drill quality and operator, and therefore more tests are needed to establish representative correlations. Moreover, MPMs are more costly and time consuming than CPTs and DMTs.
- The combination of DMT and CPT tests is a faster and more cost effective method to get information on strength and deformability. DMT and CPT tests can be performed with the same type of pushing equipment, they do not require a borehole having an operator dependent quality, and they provide a larger amount of data.
- Besides, the combination CPT/DMT, through  $K_D$  and  $q_c/M_{MDT} = \alpha$  ratio, clearly shows the destructuration of this soil when saturated. Figure 11 represents this phenomenon.

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