

ESSENTIALS DMT. A personal view by S. Marchetti, 2001

Abstract : The Flat Dilatometer (DMT) is an in situ test quick, simple, economical, highly reproducible i.e. operator independent. It is executable with a variety of field equipment. It provides estimates of various key design parameters/ information (M, Cu, soil stratigraphy, deposit history). One of the most fitting application is evaluating the operational **modulus** and predicting **settlements**.

Most of today soil investigations (including for leading-edge research) consist of a combination of :

- Laboratory tests
- Penetration tests : Dynamic or Push-in (SPT, CPT, DMT)
- Pressuremeter tests (PMT or SBPM).

LABORATORY TESTS. As pointed out by Ladd (Tokyo, 1977) there has been a “*growing disenchantment with their reliability*” - at least for routine tests – for numerous reasons : disturbance, traumatic uncertain stress path from in situ to lab (even for a “perfect” sample, Lambe 1963). Moreover lab testing involves high cost and time, for a low number of obtained data.

According to Schmertmann (1995, Linkoping) “*while in the past the Lab had a primary role in a site investigation and Insitu complementary, today often Insitu has a primary role and Lab complementary*”.

PENETRATION TESTS such as SPT and CPT are fast and effective tools to investigate **rupture** soil characteristics and to distinguish soft/ hard layers. However, when it comes to numbers for design, especially for **settlements (increasingly controlling the design today)**, the settlement predictions have **not always been satisfactory** (Schmertmann 86, Leonards 88, Woodward 93, Massarsch 94, Failmezger 1998-2000, Failmezger 99, Pelnik 99, Mayne etc.), largely due to **missing information on stress history** (Terzaghi 67, Jamiolkowski 88).

PRESSUREMETERS are accurate and valuable tools, if used diligently by a scrupulous operator and interpreted by an experienced engineer. However they are costlier and provide more distanced data (eg. Geopac 92, Sawada 95, Schnaid 2000).

DMT is an effort to combine the **fast, economical and operator-independent** nature of static penetration tests with a **mini load-test** on the soil. Moreover DMT gives the *stress history parameter* Kd. This combination translates in estimates of **settlements about 3 times more accurate** than predicted by **penetration tests** (see numerous cases in the bibliography). Moreover the DMT, being a two-parameter test, rather than a one-parameter test, and **being more sensitive to horizontal stresses**, provides an informative picture of the site, including indications on **stress history, soil stratigraphy** and **geological genesis** of the site.

The original DMT correlations, especially those for the “working strain” *operative modulus* M and Cu, have been found to work satisfactorily in many distant regions of the world (see regional papers), hence **in general do not need local calibration**.

The **short learning time/ simplicity** of DMT translate into low costs, instrumental reliability, high **reproducibility**.

DMT Papers by various Authors describe applications of DMT to : **Compaction control, Sensing the effects of pile installations (increase/ decrease of D_r and s_h), Liquefiability of sands, Verify if a slope contains slip surfaces, Axially loaded piles in clay, Laterally loaded piles, Pavement subgrade compaction control, Subgrade Kh for anchored diaphragms, Coefficient of Consolidation and Permeability of clays, Phreatic level in sands, Help in selecting FEM input parameters** (more details in the Report ISSMGE TC16 : [DMT 2001 State of the Art Report](#) - 41 pp, 1MB).