

Rapid Load Test

Notes on the unloading point method of interpretation into static force v. displacement

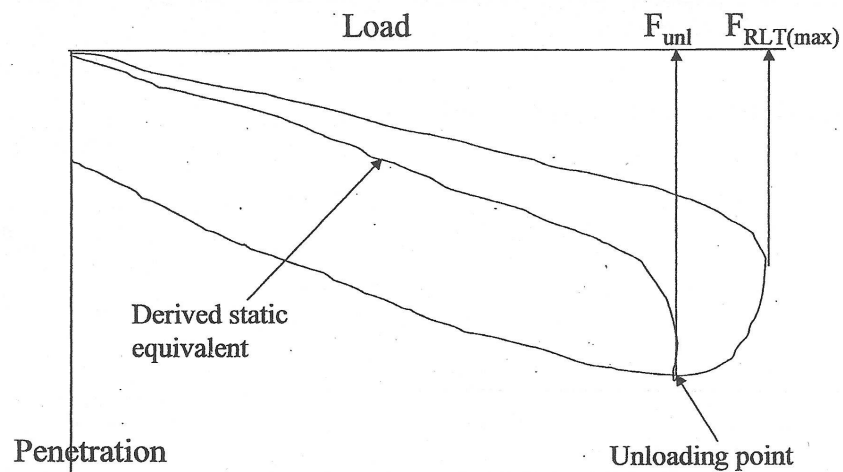


Fig. 1: Load v. penetration measured in the rapid test

Referring to figure 1, the unloading point is the point at which the penetration of the pile has stopped and it is about to begin its rebound.

During the increase of load on the pile, the total resistance to its movement, F_{RLT} , comprises three components:

$$F_{RLT} = F_s + F_v + M.a \quad \dots\dots\dots(i)$$

Where:

F_{RLT} = Force measured in RLT.

F_s = Force from static resistance of soil.

$M.a$ = Force from acceleration of the inertia of the pile.

F_v = Dynamic effect. I.e. extra force from soil caused by high velocity of pile movement.

$$= C.v$$

Where:

C = Damping coefficient.

v = velocity of movement of the pile.

At the unloading point, the pile is stationary, so $F_v = 0$, so that the maximum static resistance from the pile is, from equ. (i):

$$F_{s,max} = F_{unl} - M.a \quad \dots\dots\dots(ii)$$

Where:

$F_{unl} = F_{RLT}$ at the unloading point.

M = mass of pile. (Soil inertia is neglected.)
a = measured acceleration of the pile at the unloading point.

To obtain the graph of static pile resistance from the origin to $F_{s,max}$ the damping coefficient C is needed, to multiply by the measured velocities.

If a constant C is assumed, then it can be obtained as follows:

Assume the static soil resistance $F_{s,max}$ is constant between $F_{RLT,max}$ and F_{unl} . Then at $F_{RLT,max}$, from equn. (i):

$$F_{v,RLT,max} = F_{RLT,max} - F_{s,max} - M.a = C.v_{RLT,max}$$

$$\text{Therefore: } C = (F_{RLT,max} - F_{s,max} - M.a) / v_{RLT,max} \dots\dots(iii)$$

From this test and the interpretation given here a graph of the pile head load v. deflection is obtained. It has been shown to be sufficiently accurate for most purposes in sand soils but to overestimate a pile's capacity in clay soils. This overestimate is mainly because the assumption of a constant damping coefficient is insufficiently accurate.

Because an overestimate is unsafe, work is presently in progress to refine the interpretation in clay soils.

Note: Click here to back to the website: <http://tambew.com/rapid-load-test>