1310 ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS

AASHTO Designation T 216

1310.1 SCOPE

This method covers a procedure for determining the rate and magnitude of consolidation of soil when it is restrained laterally and loaded and drained axially.

This test is run by the Foundations Unit of the Central Lab in accordance with the AASHTO procedures.

1310.2 GENERAL DESCRIPTION

A. Primary consolidation is the process of gradually transferring the applied load from the pore water to the soil structure; that is, applying a load to a soil that is saturated causes the immediate reaction of the total load being carried by the pore water. Then, as the water has time to dissipate, the load is carried by both the water and the soil until 100 % of the water drainage occurs under the stress that has been applied. Then the load is carried entirely by the soil structure. The rate at which the primary consolidation occurs depends on the permeability of the soil.

After the primary consolidation occurs, the soil then undergoes a realignment and adjustment of the soil particles. This is called secondary consolidation.

A third type, tertiary consolidation, is primarily of concern when dealing with peats and marls. This is consolidation that occurs as a result of water being squeezed out of the plant fibers or soil structures.

B. When a load is applied to a saturated soil, the applied load is carried entirely by the water in the voids of the soil. The resulting hydraulic pressure is applied in all directions on the water in the voids. The water pressure is called pore water pressure and will dissipate at a rate determined by the permeability of the soils. The permeability of the soil is dependent on the gradation of the soil, the physical molecular structure of the soil, the natural structural layering, and the density of the soil. As the pore water pressure begins to dissipate, the applied load is transferred from the water to the soil particles until the total applied load is carried entirely by the soil particles. The water that is dissipated in a soil sample when a load is applied is called free water. When all the free water is expelled under a given, applied load, we have 100 % primary consolidation.

The amount of consolidation expected in the mineral soil depends on its relative density. Roughly, it can be shown that soils have primary settlement on saturated soils at different rates, as presented below:

SOIL RANGE	TIME to PRIMARY SETTLEMENT
Granular Soils (<10 Clay)	Fast
Plastic Soils (10 - 30% Clay)	Medium - fast
Clay to Fat Clay (> 30% Clay)	Slow
Peats & Marls	Fast to Slow (Depending on fiber size)