

ANISOTROPY OF PERMEABILITY IN SANDY RESIDUAL SOILS DEVELOPED ON THE SEDIMENTS OF THE ITARARÉ GROUP

Juliana Machado de Freitas*, David de Carvalho, Ana Elisa S. de Abreu.

Abstract

The objective of this study was to identify the occurrence of anisotropy in residual soil from the Itararé Group and that is present in the Campinas-SP region. Its characterization was carried out through geotechnical tests and the determination of its hydraulic conductivity in the horizontal and vertical directions. It is sand-silty soil with anisotropy of 10, as the average hydraulic conductivity determined in the survey was 5.7×10^{-4} cm / s and in the vertical direction was 5.7×10^{-5} cm /s. A panel was also set up to carry out the permeability tests that will be available for use at the Faculty of Agricultural Engineering (FEAGRI) of UNICAMP.

Key words:

Permeability Test, Anisotropy, Residual Soils of the Itararé Formation.

Introduction

The ease to allow water movement is a distinct characteristic for each soil type, and depends on other attributes verified in physical and geological characterization such as granulometry, density and porosity.

A very permeable soil has the passage of water facilitated, allowing the dissolution of substances and nutrients essential for the maintenance of plant life.

The determination of soil permeability is also essential for the construction of dams, foundation treatments and slope stability analyzes, directing decision making in civil construction projects.

Represented by the coefficient K, the permeability is determined in the laboratory in the constant load permeability test or variable load permeability test, depending on the type of soil to be analyzed and according to NBR 13.292.

Results and Discussion

In order to carry out permeability tests, three samples were taken in the vertical direction and three in the direction of the samples (Image 1). The samples were extracted from the Itararé Group's sandstones or diamictites, present at the campus of Unicamp in Barão Geraldo, Campinas, SP. The tests were performed in accordance with standards NBR 13.292 and 14.545. The calculated average permeability coefficients are shown in Chart 1.

With the analyzes, it was obtained that the horizontal permeability is superior to the vertical. This fact is due to the sedimentation process, which originated layers with different permeabilities, and the particles tend to have their largest dimensions oriented in the horizontal position, which generates a favorable path for the water flow in that direction. Thus, the presence of permeability anisotropy is verified.

The material characterization was also carried out, namely: particle size analysis, determination of consistency limits and X-ray diffraction test.

Image 1. Withdrawal of undisturbed soil sample



Chart 1. Horizontal and vertical permeability coefficients in residual soil developed on sandstones of the Itararé Group.

Conductivity Hydraulic Mean (cm/s)	
Horizontal	Vertical
$5,7 \times 10^{-4}$	$5,7 \times 10^{-5}$

Conclusions

This work of scientific initiation confirmed the occurrence of permeability anisotropy in the sandy soil of the Itararé Group, as expected due to sedimentary deposits and quantified this anisotropy, which is of an order of magnitude. The assembly of the panel for permeability testing was important for the University and the practical application of the research contributed significantly to the formation of the student.

Acknowledgement

We thank CNPq and UNICAMP - FACULTY OF AGRICULTURAL ENGINEERING and FACULTY OF CIVIL ENGINEERING for technical and financial support.

Associação Brasileira de Normas Técnicas - ABNT (1995) NBR 13292 - Solo - Determinação do coeficiente de permeabilidade de solos granulares à carga constante - Método de ensaio. ABNT: Rio de Janeiro. 8p.

Associação Brasileira de Normas Técnicas - ABNT (2000) NBR 14545 - Solo - Determinação do coeficiente de permeabilidade de solos argilosos à carga variável - Método de ensaio. ABNT: Rio de Janeiro. 12p.