The rate of movement of water through soil is of considerable importance in many aspects of agricultural and urban life. The entry of water into soil, the movement of water to plant roots, the flow of water to drains and wells, and the evaporation of water from the soil surface are but a few of the obvious situations in which the rate of movement plays an important role. The soil properties that determine the behavior of soil water flow systems are the hydraulic conductivity and water-retention characteristics. The hydraulic conductivity of a soil is a measure of its ability to transmit water; the water-retention characteristics are an expression of its ability to store water. These properties determine the response of a soil water system to imposed boundary conditions. In some cases, the hydraulic or soil water diffusivity, which is the ratio of the hydraulic conductivity to the differential water capacity, may be used to analyze the behavior of a soil water system. These properties are often called the hydraulic properties of the soil.

In this chapter several laboratory methods of determining the hydraulic conductivity and hydraulic diffusivity are described. Many methods for determining these properties have been given in the literature. The choice of method depends upon such factors as (i) the available equipment, (ii) the nature of the soil, (iii) the kind of samples available, (iv) the skills and knowledge of the experimenter, (v) the soil-water suction range to be covered, and (vi) the purpose for which the measurements are being made. The methods given here are, in the opinion of the authors, methods that should be useful and applicable in many cases. However, in specific instances one or more of the many other methods presented...