CHAPTER I

INTRODUCTION

To understand the process of consolidation of soil, Terzaghi (1923) postulates that the settlement of soil mass is due to the expulsion of water as a consequence of a gradient in pore water pressure. As his basic objective has been limited only to the nature of the consolidatioh phenomenon, he refrained from physical and mathematical complexity and derived a differential equation for an idealized soil material employing simplified mathematical relationships. Terzaghi soil is a homogeneous porous material constituted of rigid soil particles interspersed fully with water of incompressible characteristics in which flow of water follows Darcy's law. A stress applied to a two phase material of this kind is gradually transferred to the grains as the drainage proceeds; this relationship of the volume change and the intergranular stress is considered linear, time independent and stress history independent. The escape of pore water is along the vertical path affecting

compression only in one dimension. The Terzaghi analysis presents a picture of the consolidation in soil analogous to heat conduction through a metal bar. Its rheological behaviour is identical to that of 'A Hook Body.'

The unique position of the classical theory is maintained eventhough experimental observations reveal worthwhile deviations from it mainly due to the imprecise picture of the physical nature of the real soil and inefficient mathematical technique. To explain these discrepancies attention is generally focussed on factors such as nonhomogeneity in real soil, incomplete saturation, invalidity of Darcy's law, inconstancy of permeability coefficient, inadequacy of effective stress law and nonlinearity of stress-strain law. Considerable amount of experimental and theoretical investigations of various research workers point out the chief factors and suggest the specifications for a realistic theory of consolidation. It must incorporate for instance, the characteristics of clay mineral, pore fluid and soil skeleton with due consideration to inelastic, time dependent, nonlinear and non quasistatic nature of stress strain relationship of a real soil. A promising mathematical approach to the development of a realistic theory of consolidation of clays is seen in the works of McNabb (1960) and Gibson et al (1967). Parikh and Verma (1970) of the Soil

Mechanics Department of the M.S. University of Baroda established a partial differential equation from fundamental considerations employing similar mathematical treatment. The equation has a form identical to the differential equation for the non-steady one dimensional flow of heat through moving media as against the Terzaghi classical concept of heat flow through isotropic bodies. Under the above theoretical background the present work investigates experimentally the influence of factors like the mineral type, degree of saturation, fabric structure, stress history and drainage path on the consolidation of clay.