Seminar Abstract

Title: Quantifying the Rate of Three Dimensional Consolidation

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Geotechnical engineers generally quantify the coefficient of consolidation using the one dimensional consolidation theory of Terzaghi (1925), assuming drainage and strain occurs in the vertical plane only. As many field scenarios actually experience drainage in both the vertical and horizontal directions (two and three dimensional consolidation), the rate of consolidation that occurs in these situations is greater than that assumed when using one dimensional consolidation theory. The primary objective of this thesis was to quantify the rate of three dimensional consolidation. This was achieved through the derivation of an analytical solution, and validation via experimental investigation. Through the use of the analytical solution, average degree of consolidation curves for various radius/height values were obtained, with corresponding modified curve fitting parameters for both Taylor’s and Casagrande’s graphical methods developed. Furthermore, a plot was derived relating a radial factor to the time factor of consolidation, allowing the horizontal coefficient of consolidation to be determined. The implication of this study to field applications is a reduced estimate of the time of consolidation due to the consideration of horizontal drainage, resulting in more efficient project time management and cost savings.